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What Is AWS Systems Manager?

AWS Systems Manager is an AWS service that you can use to view and control your infrastructure on AWS. Using the Systems Manager console, you can view operational data from multiple AWS services and automate operational tasks across your AWS resources. Systems Manager helps you maintain security and compliance by scanning your managed instances and reporting on (or taking corrective action on) any policy violations it detects.

A managed instance is a machine that has been configured for use with Systems Manager. Systems Manager also helps you configure and maintain your managed instances. Supported machine types include Amazon EC2 instances, on-premises servers, and virtual machines (VMs), including VMs in other cloud environments. Supported operating system types include Windows Server, multiple distributions of Linux, and Raspbian.

Using Systems Manager, you can associate AWS resources together by applying the same identifying resource tag to each of them. You can then view operational data for these resources as a resource group, to help monitor and troubleshoot.

For example, you can assign a resource tag of "Operation=North Region OS Patching" to all of the following resources:

- A group of Amazon EC2 instances
- A group of on-premises servers in your own facility
- A Systems Manager patch baseline that specifies which patches to apply to your managed instances
- An Amazon S3 bucket to store patching operation log output
- A Systems Manager maintenance window that specifies the schedule for the patching operation

After tagging the resources, you can view a consolidated dashboard in Systems Manager that reports the status of all the resources that are part of the patching operation in your North region. If a problem arises with any of these resources, you can take corrective action immediately.

Capabilities in Systems Manager

Systems Manager is comprised of individual capabilities (p. 3), which are grouped into four categories: Operations Management, Actions & Change, Instances & Nodes, and Shared Resources.

This collection of capabilities is a powerful set of tools and features that you can use to perform many operational tasks. For example:

- Group AWS resources together by any purpose or activity you choose, such as application, environment, region, project, campaign, business unit, or software lifecycle.
- Centrally define the configuration options and policies for your managed instances.
- Centrally view, investigate, and resolve operational work items related to AWS resources.
- Automate or schedule a variety of maintenance and deployment tasks.
- Use and create runbook-style SSM documents that define the actions to perform on your managed instances.
- Run a command, with rate and error controls, that targets an entire fleet of managed instances.
- Securely connect to a managed instance with a single click, without having to open an inbound port or manage SSH keys.
• Separate your secrets and configuration data from your code by using parameters, with or without encryption, and then reference those parameters from a number of other AWS services.

• Perform automated inventory by collecting metadata about your Amazon EC2 and on-premises managed instances. Metadata can include information about applications, network configurations, and more.

• View consolidated inventory data from multiple AWS Regions and accounts that you manage.

• Quickly see which resources in your account are out of compliance and take corrective action from a centralized dashboard.

• View active summaries of metrics and alarms for your AWS resources.

Systems Manager simplifies resource and application management, shortens the time to detect and resolve operational problems, and helps you operate and manage your AWS infrastructure securely at scale.

Note
AWS Systems Manager was formerly known as Amazon Simple Systems Manager (SSM) and Amazon EC2 Systems Manager (SSM). For more information, see Systems Manager Service Name History (p. 2).

What is AWS Systems Manager? (Video)

View more AWS videos on the Amazon Web Services YouTube Channel.

Systems Manager Supported Regions

AWS Systems Manager is available in the AWS Regions listed in the AWS Systems Manager Supported Regions table in the AWS General Reference. Before starting your Systems Manager configuration process, we recommend that you ensure the service is available in each of the AWS Regions you want to use it in.

For on-premises servers and VMs in your hybrid environment, we recommend that you choose the Region closest to your data center or computing environment.

Systems Manager Pricing

Some Systems Manager capabilities charge a fee. For more information, see AWS Systems Manager Pricing.

Systems Manager Service Name History

AWS Systems Manager (Systems Manager) was formerly known as "Amazon Simple Systems Manager (SSM)" and "Amazon EC2 Systems Manager (SSM)". The original abbreviated name of the service, "SSM", is still reflected in various AWS resources, including a few other service consoles. Some examples:

• **Systems Manager Agent**: SSM Agent

• **Systems Manager parameters**: SSM parameters

• **Systems Manager service endpoints**: ssm.us-east-2.amazonaws.com

• **AWS CloudFormation resource types**: AWS::SSM::Document

• **AWS Config rule identifier**: EC2_INSTANCE_MANAGED_BY_SSM

• **AWS CLI commands**: aws ssm describe-patch-baselines

• **AWS Identity and Access Management (IAM) managed policy names**: AmazonSSMReadOnlyAccess

• **Systems Manager resource ARNs**: arn:aws:ssm:us-east-2:111222333444:patchbaseline/pb-07d8884178EXAMPLE
Related Content

The following resources can help you work directly with Systems Manager.

- **AWS Blog & Podcast** – Read blog posts about Systems Manager in the AWS Management Tools Category, as well as other posts that are tagged with #Systems Manager.
- **Systems Manager Developer Forum** – Follow announcements, or post or answer a question in the AWS Systems Manager Forum.
- **AWS Systems Manager API Reference** – Provides descriptions, syntax, and usage examples for each of the Systems Manager actions and data types.
- **AWS Systems Manager section of the AWS CLI Command Reference** – Manage Systems Manager from a command line tool. Available to use on Windows, Mac, and Linux/UNIX systems.
- **AWS Systems Manager section of the AWS Tools for PowerShell Cmdlet Reference** – Manage Systems Manager with the same PowerShell tools that you use to manage your Windows, Linux, or Mac environments.
- **AWS Systems Manager Limits** in the Amazon Web Services General Reference – Provides the default limits for Systems Manager for an AWS account. Unless otherwise noted, each limit is Region-specific.

The following related resources can help you as you work with this service.

- **Classes & Workshops** – Links to role-based and specialty courses as well as self-paced labs to help sharpen your AWS skills and gain practical experience.
- **AWS Developer Tools** – Links to developer tools, SDKs, IDE toolkits, and command line tools for developing and managing AWS applications.
- **AWS Whitepapers** – Links to a comprehensive list of technical AWS whitepapers, covering topics such as architecture, security, and economics and authored by AWS Solutions Architects or other technical experts.
- **AWS Support Center** – The hub for creating and managing your AWS Support cases. Also includes links to other helpful resources, such as forums, technical FAQs, service health status, and AWS Trusted Advisor.
- **AWS Support** – The primary web page for information about AWS Support, a one-on-one, fast-response support channel to help you build and run applications in the cloud.
- **Contact Us** – A central contact point for inquiries concerning AWS billing, account, events, abuse, and other issues.
- **AWS Site Terms** – Detailed information about our copyright and trademark; your account, license, and site access; and other topics.

Learn More About Systems Manager

- Systems Manager Capabilities (p. 3)
- How Systems Manager Works (p. 6)
- About SSM Agent (p. 9)
- Supported Operating Systems (p. 10)
- Accessing Systems Manager (p. 12)
- Systems Manager Prerequisites (p. 12)

Systems Manager Capabilities

Systems Manager capabilities are grouped into the following capability types:
Operations Management

Operations Management is a suite of capabilities that help you manage your AWS resources.

CloudWatch Dashboards

Amazon CloudWatch Dashboards are customizable home pages in the CloudWatch console that you can use to monitor your resources in a single view, even those resources that are spread across different regions. You can use CloudWatch dashboards to create customized views of the metrics and alarms for your AWS resources.

OpsCenter

OpsCenter (p. 109) provides a central location where operations engineers and IT professionals can view, investigate, and resolve operational work items (OpsItems) related to AWS resources. OpsCenter is designed to reduce mean time to resolution for issues impacting AWS resources. This Systems Manager capability aggregates and standardizes OpsItems across services while providing contextual investigation data about each Opsitem, related Opsitems, and related resources. OpsCenter also provides Systems Manager Automation documents (runbooks) that you can use to quickly resolve issues. You can specify searchable, custom data for each Opsitem. You can also view automatically-generated summary reports about OpsItems by status and source.

Resource Groups

AWS Resource Groups: An AWS resource is an entity you can work with in AWS, such as Systems Manager SSM documents, patch baselines, maintenance windows, parameters, and managed instances; an Amazon Elastic Compute Cloud (Amazon EC2) instance; an Amazon Elastic Block Store (Amazon EBS) volume; a security group; or an Amazon Virtual Private Cloud (VPC). A resource group is a collection of AWS resources that are all in the same AWS Region, and that match criteria provided in a query. You build queries in the Resource Groups console, or pass them as arguments to Resource Groups commands in the AWS CLI. With Resource Groups, you can create a custom console that organizes and consolidates information based on criteria that you specify in tags. You can also use groups as the basis for viewing monitoring and configuration insights in AWS Systems Manager.

Trusted Advisor & Personal Health Dashboard (PHD)

Systems Manager hosts two online tools to help you provision your resources and monitor your account for health events. Trusted Advisor is an online tool that provides you real time guidance to help you provision your resources following AWS best practices. For more information, see Trusted Advisor.

The AWS Personal Health Dashboard provides information about AWS Health events that can affect your account. The information is presented in two ways: a dashboard that shows recent and upcoming events organized by category, and a full event log that shows all events from the past 90 days. For more information, see Getting Started with the AWS Personal Health Dashboard.

Actions & Change

Systems Manager provides the following capabilities for taking action against or changing your AWS resources.
Automation

Use Systems Manager Automation (p. 142) to automate common maintenance and deployment tasks. You can use Automation to create and update Amazon Machine Images, apply driver and agent updates, reset passwords on Windows instances, reset SSH keys on Linux instances, and apply OS patches or application updates.

Maintenance Windows

Use Maintenance Windows (p. 444) to set up recurring schedules for managed instances to run administrative tasks like installing patches and updates without interrupting business-critical operations.

Instances & Nodes

Systems Manager provides capabilities for managing your Amazon EC2 instances, your on-premises servers and virtual machines (VMs) in your hybrid environment, and other types of AWS resources (nodes).

Configuration Compliance

Use Systems Manager Configuration Compliance (p. 504) to scan your fleet of managed instances for patch compliance and configuration inconsistencies. You can collect and aggregate data from multiple AWS accounts and Regions, and then drill down into specific resources that aren’t compliant. By default, Configuration Compliance displays compliance data about Patch Manager patching and State Manager associations. You can also customize the service and create your own compliance types based on your IT or business requirements.

Inventory Management

Inventory Manager (p. 512) automates the process of collecting software inventory from managed instances. You can use Inventory Manager to gather metadata about applications, files, components, patches, and more on your managed instances.

Managed Instances

A managed instance (p. 23) is any Amazon EC2 instance or on-premises machine—a server or a virtual machine (VM)—in your hybrid environment that is configured for Systems Manager. To set up managed instances, you need to install SSM Agent on your machines (if not installed by default) and configure AWS Identity and Access Management (IAM) permissions. On-premises machines also require an activation code.

Activations

To set up servers and VMs in your hybrid environment as managed instances, you need to create a managed-instance activation (p. 41). After you complete the activation, you receive an activation code and ID. This code/ID combination functions like an Amazon EC2 access ID and secret key to provide secure access to the Systems Manager service from your managed instances.

Session Manager

Use Session Manager (p. 567) to manage your Amazon EC2 instances through an interactive one-click browser-based shell or through the AWS CLI. Session Manager provides secure and auditable instance management without the need to open inbound ports, maintain bastion hosts, or manage SSH keys. Session Manager also makes it easy to comply with corporate policies that require controlled access to instances, strict security practices, and fully auditable logs with instance access details, while still providing end users with simple one-click cross-platform access to your Amazon EC2 instances.

Run Command

Use Systems Manager Run Command (p. 615) to remotely and securely manage the configuration of your managed instances at scale. Use Run Command to perform on-demand changes like
updating applications or running Linux shell scripts and Windows PowerShell commands on a target set of dozens or hundreds of instances.

State Management

Use Systems Manager State Manager (p. 648) to automate the process of keeping your managed instances in a defined state. You can use State Manager to ensure that your instances are bootstrapped with specific software at startup, joined to a Windows domain (Windows instances only), or patched with specific software updates.

Patch Management

Use Patch Manager (p. 686) to automate the process of patching your managed instances with both security related and other types of updates. You can use Patch Manager to apply patches for both operating systems and applications. (On Windows Server, application support is limited to updates for Microsoft applications.) This capability enables you to scan instances for missing patches and apply missing patches individually or to large groups of instances by using Amazon EC2 instance tags. Patch Manager uses patch baselines, which can include rules for auto-approving patches within days of their release, as well as a list of approved and rejected patches. You can install security patches on a regular basis by scheduling patching to run as a Systems Manager maintenance window task. For Linux operating systems, you can define the repositories that should be used for patching operations as part of your patch baseline. This allows you to ensure that updates are installed only from trusted repositories regardless of what repositories are configured on the instance. For Linux, you also have the ability to update any package on the instance, not just those that are classified as operating system security updates. For Windows Server, you can also use Patch Manager to update supported Microsoft applications.

Distributor

Use Distributor (p. 752) to create and deploy packages to managed instances. Distributor lets you package your own software—or find AWS-provided agent software packages, such as AmazonCloudWatchAgent—to install on AWS Systems Manager managed instances. Distributor publishes resources, such as software packages, to AWS Systems Manager managed instances.

Shared Resources

Systems Manager uses the following shared resources for managing and configuring your AWS resources.

Systems Manager Documents

A Systems Manager document (p. 778) (SSM document) defines the actions that Systems Manager performs. SSM document types include Command documents, which are used by State Manager and Run Command, and Automation documents, which are used by Systems Manager Automation. Systems Manager includes more dozens of pre-configured documents that you can use by specifying parameters at runtime. Documents can be expressed in JSON or YAML, and include steps and parameters that you specify.

Parameter Store

Parameter Store (p. 828) provides secure, hierarchical storage for configuration data and secrets management. You can store data such as passwords, database strings, and license codes as parameter values. You can store values as plain text or encrypted data. You can then reference values by using the unique name you specified when you created the parameter.

How Systems Manager Works

Diagram 1 below shows a general example of the different processes that Systems Manager performs when executing an action like sending a command to your fleet of servers or performing an inventory
of the applications running on your on-premises servers. Each Systems Manager capability, for example Run Command and Maintenance Windows, uses a similar process of set up, execution, processing, and reporting.

1. **Configure Systems Manager**: Use the Systems Manager console, SDK, AWS CLI, or AWS Tools for Windows PowerShell to configure, schedule, automate, and run actions that you want to perform on your AWS resources.

2. **Verification and processing**: Systems Manager verifies the configurations, including permissions, and sends requests to the SSM Agent running on your instances or servers in your hybrid environment. SSM Agent performs the specified configuration changes.

3. **Reporting**: SSM Agent reports the status of the configuration changes and actions to Systems Manager in the AWS cloud. Systems Manager then sends the status to the user and various AWS services, if configured.

**Diagram 1: General Example of Systems Manager Process Flow**
AWS Systems Manager User Guide
About SSM Agent

About SSM Agent

AWS Systems Manager Agent (SSM Agent) is Amazon software that can be installed and configured on an Amazon EC2 instance, an on-premises server, or a virtual machine (VM). SSM Agent makes it possible for Systems Manager to update, manage, and configure these resources. The agent processes requests from the Systems Manager service in the AWS Cloud, and then runs them as specified in the request. SSM Agent then sends status and execution information back to the Systems Manager service by using the Amazon Message Delivery Service (service prefix: `ec2messages`).

SSM Agent must be installed on each instance you want to use with Systems Manager. SSM Agent is preinstalled, by default, on instances created from the following Amazon Machine Images (AMIs):

- Windows Server 2003-2012 R2 AMIs published in November 2016 or later
- Windows Server 2016 and 2019
- Amazon Linux
- Amazon Linux 2
- Ubuntu Server 16.04
- Ubuntu Server 18.04

On other AMIs, and on on-premises servers and virtual machines for your hybrid environment, you must install the agent manually, as described in the table below.

**Important**
An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

<table>
<thead>
<tr>
<th>Operating System Type</th>
<th>SSM Agent Installation</th>
</tr>
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| **Windows**           | Windows AMIs published before November 2016 use the EC2Config service to process requests and configure instances.  
                        | Unless you have a specific reason for using the EC2Config service or an earlier version of SSM Agent to process Systems Manager requests, we recommend that you download and install the latest version of the SSM Agent to each of your Amazon EC2 instances and managed instances in your hybrid environment. For more information, see Installing and Configuring SSM Agent on Windows Instances (p. 65). |
| **Linux**             | SSM Agent is installed by default on Amazon Linux, Amazon Linux 2, Ubuntu Server 16.04, and Ubuntu Server 18.04 LTS `base` EC2 AMIs. You must manually install SSM Agent on other versions of Amazon EC2 for Linux, including non-base images like Amazon ECS-Optimized AMIs. For more information, see Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68). |
Supported Operating Systems

Your Amazon EC2 instances, on-premises servers, and virtual machines (VMs) must be running one of the following operating systems in order to be used with AWS Systems Manager.

Operating System Types
- Windows Server (p. 10)
- Linux (p. 10)
- Raspbian (p. 12)

Windows Server

<table>
<thead>
<tr>
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Linux

Amazon Linux

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<th>Intel 64-bit (x86_64)</th>
<th>ARM 64-bit (arm64)</th>
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Note
Beginning with version 2015.03, Amazon Linux is released in Intel 64-bit (x86_64) versions only.
## Amazon Linux 2

<table>
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<tr>
<th>Versions</th>
<th>Intel 32-bit (x86)</th>
<th>Intel 64-bit (x86_64)</th>
<th>ARM 64-bit (arm64)</th>
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<tbody>
<tr>
<td>2.0 and all later versions</td>
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<td>✓</td>
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## Ubuntu Server

<table>
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<tr>
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<th>Intel 64-bit (x86_64)</th>
<th>ARM 64-bit (arm64)</th>
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## Debian Server

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<tr>
<td>Stretch (9)</td>
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## Red Hat Enterprise Linux (RHEL)

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<th>Intel 64-bit (x86_64)</th>
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## CentOS

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<th>Intel 64-bit (x86_64)</th>
<th>ARM 64-bit (arm64)</th>
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</tr>
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<td>7.1 and later 7.x versions</td>
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SUSE Linux Enterprise Server (SLES)

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<th>Intel 64-bit (x86_64)</th>
<th>ARM 64-bit (arm64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 and later 12.x versions</td>
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<td></td>
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Raspbian

<table>
<thead>
<tr>
<th>Version</th>
<th>ARM 32-bit (arm)</th>
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<tr>
<td>Jessie</td>
<td>✓</td>
</tr>
<tr>
<td>Stretch</td>
<td>✓</td>
</tr>
</tbody>
</table>

Accessing Systems Manager

You can work with Systems Manager in any of the following ways:

**Systems Manager Console**

The [AWS Systems Manager console](https://aws.amazon.com/documentation/systemsmanger/) is a browser-based interface to access and use Systems Manager.

**AWS Command Line Tools**

The AWS command line tools let you issue commands at your system's command line to perform Systems Manager and other AWS tasks, and is supported on Windows, Linux, and macOS. Using the CLI can be faster and more convenient than using the console. The command line tools also are useful if you want to build scripts that perform AWS tasks.


**Note**

On your Windows Server instances, Windows PowerShell 3.0 or later is required to run certain SSM documents (for example, the legacy `AWS-ApplyPatchBaseline` document). Verify that your Windows instances are running Windows Management Framework 3.0 or later. The framework includes PowerShell.

**AWS SDKs**

AWS provides software development kits (SDKs) that consist of libraries and sample code for various programming languages and platforms (for example, [Java](https://aws.amazon.com/documentation/java/), [Python](https://aws.amazon.com/documentation/lambda/), [Ruby](https://aws.amazon.com/documentation/lambda/), [`.NET`](https://aws.amazon.com/documentation/net/), [iOS](https://aws.amazon.com/documentation/ios/), and [Android](https://aws.amazon.com/documentation/android/), and others). The SDKs provide a convenient way to create programmatic access to Systems Manager. For information about the AWS SDKs, including how to download and install them, see [Tools for Amazon Web Services](https://aws.amazon.com/tools/).

Systems Manager Prerequisites

The prerequisites for using AWS Systems Manager to manage your Amazon EC2 instances, on-premises servers, and virtual machines (VMs) are covered step by step in the Setting Up chapters of this user guide:
To complete prerequisites for using Systems Manager

1. Create an AWS account and configure the required IAM roles.
2. Verify that Systems Manager is supported in the AWS Regions where you want to use the service.
3. Verify that you are using supported machine types that run a supported operating system.
4. For EC2 instances, create an IAM instance profile and attach it to your machines.
5. For on-premises servers and VMs, create an IAM service role for a hybrid environment.
6. Verify that you are allowing HTTPS (port 443) outbound traffic to the Systems Manager endpoints.
7. (Recommended) Create a VPC endpoint in Amazon Virtual Private Cloud to use with Systems Manager.
8. On on-premises servers, VMs, and EC2 instances created from AMIs that are not supplied by AWS, install a Transport Layer Security (TLS) certificate.
9. For on-premises servers and VMs, register the machines with Systems Manager through the managed instance activation process.
10. Install or verify installation of SSM Agent on each of your managed instances.

Integration with IAM and Amazon EC2

User access to Systems Manager, its capabilities, and its resources are controlled through policies that you use or create in AWS Identity and Access Management (IAM). If you plan to use computing resources provided by AWS, and not only on-premises servers and virtual machines (VMs), you also need to understand Amazon Elastic Compute Cloud (Amazon EC2) before you set up Systems Manager for your organization. Understanding how these services work is essential to successfully set up Systems Manager.

For more information about Amazon EC2, see the following:

- Amazon Elastic Compute Cloud (Amazon EC2)
- Getting Started with Amazon EC2 Linux Instances
- Getting Started with Amazon EC2 Windows Instances
- What is Amazon EC2? (Linux)
- What is Amazon EC2? (Windows)

For more information about IAM, see the following:

- AWS Identity and Access Management (IAM)
- Getting Started with IAM
- What is IAM?
AWS Systems Manager Quick Setup

Use AWS Systems Manager Quick Setup to quickly configure required security roles and commonly used Systems Manager capabilities on your Amazon EC2 instances. These capabilities help you manage and monitor the health of your instances while providing the minimum required permissions to get started. Specifically, Quick Setup helps you configure the following components on the instances you choose or target by using tags:

- AWS Identity and Access Management (IAM) instance profile roles for Systems Manager.
- A scheduled, bi-weekly update of SSM Agent.
- A scheduled collection of Inventory metadata every 30 minutes.
- A daily scan of your instances to identify missing patches.
- A one-time installation and configuration of the Amazon CloudWatch agent.
- A scheduled, monthly update of the CloudWatch agent.

To access Quick Setup, choose Quick Setup in the navigation pane of the Systems Manager console. You can also access Quick Setup by choosing AWS Systems Manager at the top of the navigation pane, and then choosing Get Started with Systems Manager as shown.

**Note**
You can change Quick Setup configurations at any time. Before you do, we recommend that you learn how to change configurations by using the Quick Setup Results page. For more information, see Working with Quick Setup Results (p. 18).

Permissions Roles

By default, Systems Manager doesn't have permission to communicate with or perform actions on your instances. You must grant access by using an AWS Identity and Access Management (IAM) instance profile and an IAM service role (or assume role). An instance profile is a container that passes IAM role information to an Amazon EC2 instance at launch. A service role enables Systems Manager to run commands on your instances. For more information about instance profiles, see Using Instance Profiles in the IAM User Guide. For more information about service roles, see Creating a Role to Delegate Permissions to an AWS Service.

You can choose to have Quick Setup create and configure these roles for you by choosing **Use the default role**. If you select an existing role, then that role must include IAM policies with, at minimum,
the permissions described in this topic. If you select existing roles and they don't have these permissions, then Quick Setup may fail to configure one or more selected components, or those components may fail to run correctly.

**Note**
Quick Setup doesn't override instance profiles that already exist on your instances.

## Details about the Default Instance Profile

In the **Instance profile role** section, if you choose **Use the default role**, then Quick Setup creates a new IAM instance profile that uses the **AmazonSSMManagedInstanceCore** policy and one additional policy. The **AmazonSSMManagedInstanceCore** policy enables Systems Manager to perform the following actions on your instances.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ssm:DescribeAssociation",
                "ssm:GetDeployablePatchSnapshotForInstance",
                "ssm:GetDocument",
                "ssm:GetManifest",
                "ssm:GetParameter",
                "ssm:GetParameters",
                "ssm:ListAssociations",
                "ssm:ListInstanceAssociations",
                "ssm:PutInventory",
                "ssm:PutComplianceItems",
                "ssm:PutConfigurePackageResult",
                "ssm:UpdateAssociationStatus",
                "ssm:UpdateInstanceAssociationStatus",
                "ssm:UpdateInstanceInformation"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "ssmmessages:CreateControlChannel",
                "ssmmessages:CreateDataChannel",
                "ssmmessages:OpenControlChannel",
                "ssmmessages:OpenDataChannel"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2messages:AcknowledgeMessage",
                "ec2messages:DeleteMessage",
                "ec2messages:FailMessage",
                "ec2messages:GetEndpoint",
                "ec2messages:GetMessages",
                "ec2messages:GetReply"
            ],
            "Resource": "*"
        }
    ]
}
```
Details about the Service Role

In the Systems Manager service role section, if you choose Use the default role, then Quick Setup creates a new IAM service role that includes the following policies. The first policy enables Systems Manager to perform the following actions on your instances.

```
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": [
            "iam:CreateInstanceProfile",
            "iam:ListInstanceProfilesForRole",
            "iam:PassRole",
            "ec2:DescribeIamInstanceProfileAssociations",
            "iam:GetInstanceProfile",
            "ec2:DisassociateIamInstanceProfile",
            "ec2:AssociateIamInstanceProfile",
            "iam:AddRoleToInstanceProfile"
         ],
         "Resource": "*"
      }
   ]
}
```

The following policy enables Systems Manager to perform the actions in the previous policy on your behalf. Systems Manager assumes your role to perform the actions.

```
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Principal": {
            "Service": "ssm.amazonaws.com"
         },
         "Action": "sts:AssumeRole"
      }
   ]
}
```
Note
Configuring an instance with an instance profile for Systems Manager does not give a user access to run commands or use Systems Manager capabilities on that instance. Your IAM user, group, or role must be configured with a separate permissions policy that enables you to perform actions on your instances by using Systems Manager. For more information, see Setting Up AWS Systems Manager (p. 23).

Update Systems Manager (SSM) Agent

SSM Agent is Amazon software that processes requests from the Systems Manager service in the AWS Cloud, and then runs them on your instance as specified in the request. SSM Agent is preinstalled, by default, on the following Amazon Machine Images (AMIs):

- Windows Server 2003-2012 R2 AMIs published in November 2016 or later
- Windows Server 2016 and 2019
- Amazon Linux
- Amazon Linux 2
- Ubuntu Server 16.04
- Ubuntu Server 18.04

If you enable this option, then Systems Manager automatically checks every two weeks for a new version of the agent. If there is a new version, then Systems Manager automatically updates the agent on your instance to the latest released version. We encourage you to choose this option to ensure that your instances are always running the most up-to-date version of SSM Agent. For more information about SSM Agent, including information about how to manually install the agent, see Working with SSM Agent (p. 64).

Collect Inventory from Your Instances

AWS Systems Manager Inventory provides visibility into your computing environment. You can use Inventory to collect metadata from your managed instances. You can store this metadata in a central Amazon Simple Storage Service (Amazon S3) bucket. Then use built-in tools to query the data and quickly determine which instances are running the software and configurations required by your software policy, and which instances need to be updated. Quick Setup configures collection of the following types of metadata:

- **AWS components**: EC2 driver, agents, versions, and more.
- **Applications**: Application names, publishers, versions, and more.
- **Instance details**: System name, operating system (OS) name, OS version, last boot, DNS, domain, work group, OS architecture, and more.
- **Network configuration**: IP address, MAC address, DNS, gateway, subnet mask, and more.
- **Services**: Name, display name, status, dependent services, service type, start type, and more (Windows instances only).
- **Windows roles**: Name, display name, path, feature type, installed state, and more (Windows instances only).
- **Windows updates**: Hotfix ID, installed by, installed date, and more (Windows instances only).

You can configure Systems Manager Inventory to collect the following additional types of metadata from your instances. For more information, see AWS Systems Manager Inventory (p. 512).
Scan Instances for Missing Patches Daily

If you enable this option in Quick Setup, then Systems Manager uses Patch Manager to scan your instances each day and generate a simple report in the Compliance page. The report shows how many instances are patch-compliant according to the default patch baseline. The report includes a list of each instance and its compliance status. You can navigate this list to see details about noncompliant instances. For more information about patching operations and patch baselines, see AWS Systems Manager Patch Manager (p. 686). To view compliance information, see the Systems Manager Compliance page.

Install and Configure the CloudWatch Agent

Amazon CloudWatch provides data and actionable insights to monitor your applications, understand and respond to system-wide performance changes, optimize resource utilization, and get a unified view of operational health. The CloudWatch agent collects metrics and log files from your instances and consolidates this information so that you can quickly determine the health of your instances. For more information, see Collecting Metrics and Logs from Amazon EC2 Instances and On-Premises Servers with the CloudWatch Agent. There may be added cost. For more information, see Amazon CloudWatch pricing.

Update the CloudWatch Agent Once Every Four Weeks

If you enable this option, then Systems Manager automatically checks every four weeks for a new version of the CloudWatch agent. If there is a new version, then Systems Manager automatically updates the agent on your instance to the latest released version. We encourage you to choose this option to ensure that your instances are always running the most up-to-date version of the CloudWatch agent.

Working with Quick Setup Results

Systems Manager displays the results of Quick Setup in a separate card for each option you selected.
For each option you selected, Systems Manager creates and immediately runs a State Manager association. The **Configuration status** field shows **Success** when the association successfully runs on all selected or targeted instances. If one association fails to run, **Configuration status** is **Failed**. If an association is processing, **Configuration status** is **Pending**. To update **Configuration status** for **Pending** items, refresh your browser.

**Note**
The **Inventory collection** option can take up to 10 minutes to complete, even if you only selected a few instances.

A **Configuration status** of **Not configured**, means you didn't choose the option in Quick Setup. If you see this status for **Managed instances**, it means that you didn't choose a role in the **Role selection** list. You can run Quick Setup again, as described in this topic, and choose a role.

To edit the association for a Quick Setup option, choose the **Edit** button in the option card. If you edit the association, don't choose a different SSM Document in the **Edit Association** page. If you choose a different SSM Document, the option becomes unavailable in Quick Setup. Change only the parameters and targets of the association. When you save your changes to the association, State Manager automatically runs the association.
Troubleshooting Quick Setup Results

If a Quick Setup card shows **Not configured**, you might have missed a selection on the Quick Setup page. As a first step in troubleshooting this problem, choose the **Edit all** button at the top of the Quick Setup results page and review your selections. If you missed one or more, you can choose them and then choose **Reset** to configure those options.

If you still see a problem with one or more Quick Setup results cards, then use the following procedure to troubleshoot the issue.

**To troubleshoot a failed Quick Setup configuration**

1. In the Quick Setup results page, choose **View Details** in the card with a **Configuration status** of **Failed**.

2. In the **Association ID** page, choose the **Execution history** tab.

3. Under **Execution ID**, choose the association execution that failed.

4. The **Association execution targets** page lists all of the instances where the association ran. Choose the **Output** button for an execution that failed to run.
5. In the Output page, choose Step - Output to view the error message for that step in the command execution. Each step can display a different error message. Review the error messages for all steps to help troubleshoot the issue.

If viewing the step output doesn't help troubleshoot the problem, then you can recreate the association to see if the problem persists. To recreate the association, you must first delete all associations that already exist for the Quick Setup option. You can delete an association by using the Delete button in the Quick Setup results card. You can also delete the association by choosing State Manager in the navigation pane. After you delete the association, run Quick Setup again to see if the problem persists.

Running Quick Setup Again

You can run Quick Setup again by choosing the Edit all button on the Quick Setup results page. You can choose or clear options. If you clear an option, Systems Manager doesn't delete the association. For example, if you previously selected the Collect inventory from your instances every 30 minutes option, and you clear the option when you run Quick Setup again, the original association still exists. You must either delete the association from the Quick Setup results page or from the State Manager page.
Important
If you want to run Quick Setup on new instances, we recommend that you choose the new
instances and also choose all of the instances on which you previously ran Quick Setup.
By choosing all of the instances on which you previously ran Quick Setup, you synchronize
the association executions for all of the instances. This synchronizes status and compliance
reporting. We also recommend that you target instances by using tags. New instances with
the specified tags are *automatically* added to Quick Setup associations. This means that they
automatically display status in the Quick Setup results and in the **Compliance** page.
Setting Up AWS Systems Manager

This section describes the tasks that account and system administrators perform to set up AWS Systems Manager for their organizations. After these steps are complete, users in the organization can use Systems Manager to configure and manage the Amazon Elastic Compute Cloud (Amazon EC2) instances in their account.

If you plan to use Systems Manager to manage and configure your own on-premises servers and virtual machines (VMs) in what is called a hybrid environment, follow the setup steps in Setting Up AWS Systems Manager for Hybrid Environments (p. 41). If you plan to use both Amazon EC2 instances and your own computing resources in a hybrid environment, follow the steps here first. This section presents steps in the best order for configuring the roles, users, permissions, and initial resources to use in your Systems Manager operations.

If you already use other AWS services, you have completed some of these steps. However, other steps are specific to Systems Manager. Therefore, we recommend reviewing this entire section to ensure that you are ready to use all Systems Manager capabilities.

**Note**
You can use Systems Manager Quick Setup to quickly configure an AWS Identity and Access Management (IAM) instance profile on all instances in your AWS account. Quick Setup can also create an assume role, which enables Systems Manager to securely run commands on your instances on your behalf. By using Quick Setup, you can skip step 4 and 5 in this section. For more information, see AWS Systems Manager Quick Setup (p. 14).

**Contents**
- Step 1: Sign Up for AWS (p. 23)
- Step 2: Create an Admin IAM User for AWS (p. 24)
- Step 3: Create Non-Admin IAM Users and Groups for Systems Manager (p. 25)
- Step 4: Create an IAM Instance Profile for Systems Manager (p. 29)
- Step 5: Attach an IAM Instance Profile to an Amazon EC2 Instance (p. 34)
- Step 6: (Optional) Create a Virtual Private Cloud Endpoint (p. 36)
- Step 7: (Optional) Create Systems Manager Service Roles (p. 38)
- Step 8: (Optional) Set Up Integrations with Other AWS Services (p. 40)

**Step 1: Sign Up for AWS**

If you do not have an AWS account, complete the following steps to create one.

**To sign up for an AWS account**

2. Follow the online instructions.

   Part of the sign-up procedure involves receiving a phone call and entering a verification code on the phone keypad.

Continue to Step 2: Create an Admin IAM User for AWS (p. 24).
Step 2: Create an Admin IAM User for AWS

When you first create an AWS account, you begin with a single sign-in identity that has complete access to all AWS services and resources in the account. This identity is called the AWS account root user and is accessed by signing in with the email address and password that you used to create the account. We strongly recommend that you do not use the root user for your everyday tasks, even the administrative ones. Instead, adhere to the best practice of using the root user only to create your first IAM user. Then securely lock away the root user credentials and use them to perform only a few account and service management tasks.

In this procedure, you use the AWS account root user to create your first user in AWS Identity and Access Management (IAM). You add this IAM user to an Administrators group, to ensure that you have access to all services and their resources in your account. The next time that you access your AWS account, you should sign in with the credentials for this IAM user.

To create an IAM user with limited permissions, see Step 3: Create Non-Admin IAM Users and Groups for Systems Manager (p. 25).

To create an administrator user for yourself and add the user to an administrators group (console)

1. Use your AWS account email address and password to sign in as the AWS account root user to the IAM console at https://console.aws.amazon.com/iam/.
   
   **Note**
   We strongly recommend that you adhere to the best practice of using the Administrator IAM user below and securely lock away the root user credentials. Sign in as the root user only to perform a few account and service management tasks.

2. In the navigation pane, choose Users and then choose Add user.

3. For User name, enter Administrator.

4. Select the check box next to AWS Management Console access. Then select Custom password, and then enter your new password in the text box.

5. (Optional) By default, AWS requires the new user to create a new password when first signing in. You can clear the check box next to User must create a new password at next sign-in to allow the new user to reset their password after they sign in.

6. Choose Next: Permissions.

7. Under Set permissions, choose Add user to group.

8. Choose Create group.

9. In the Create group dialog box, for Group name enter Administrators.

10. Choose Filter policies, and then select AWS managed -job function to filter the table contents.

11. In the policy list, select the check box for AdministratorAccess. Then choose Create group.

   **Note**
   You must activate IAM user and role access to Billing before you can use the AdministratorAccess permissions to access the AWS Billing and Cost Management console. To do this, follow the instructions in step 1 of the tutorial about delegating access to the billing console.

12. Back in the list of groups, select the check box for your new group. Choose Refresh if necessary to see the group in the list.

13. Choose Next: Tags.

14. (Optional) Add metadata to the user by attaching tags as key-value pairs. For more information about using tags in IAM, see Tagging IAM Entities in the IAM User Guide.

15. Choose Next: Review to see the list of group memberships to be added to the new user. When you are ready to proceed, choose Create user.
You can use this same process to create more groups and users and to give your users access to your AWS account resources. To learn about using policies that restrict user permissions to specific AWS resources, see Access Management and Example Policies.

Continue to Step 3: Create Non-Admin IAM Users and Groups for Systems Manager (p. 25).

Step 3: Create Non-Admin IAM Users and Groups for Systems Manager

Users in the administrators group for an account have access to all AWS services and resources in that account. This section describes how to create users with permissions that are limited to AWS Systems Manager.

The following Systems Manager capabilities may have additional or alternative procedures for granting user access:

- **Session Manager** - See Control User Session Access to Instances (p. 579).
- **Distributor** - See Control User Access to Packages (p. 756).
- **Maintenance Windows** - See Controlling Access to Maintenance Windows (p. 445) (see the instructions for assigning the IAM PassRole policy to an IAM user or group).

For more information about using IAM policies to control user access to Systems Manager capabilities and resources, see Using Identity-based Policies (IAM Policies) for AWS Systems Manager (p. 917).

For information about how to change permissions for an IAM user account, group, or role, see Changing Permissions for an IAM User in the IAM User Guide.

**Topics**

- Task 1: Create Policies for Tag Editor and Resource Groups (p. 25)
- Task 2: Create User Groups (p. 26)
- Task 3: Create Users and Assign Permissions (p. 27)

Task 1: Create Policies for Tag Editor and Resource Groups

You can use resource groups to organize your AWS resources. Resource groups make it easier to manage and automate tasks on large numbers of resources across AWS at one time.

Tags are properties of a resource, so they are shared across your entire account. Users in a department or specialized group can draw from a common vocabulary (tags) to create resource groups that are meaningful to their roles and responsibilities. Having a common pool of tags also means that when users share a resource group, they don't have to worry about missing or conflicting tag information.

AWS resource groups are managed in the AWS Resource Groups service. It is optional to provide the users and user groups in your account access to this service and its Tag Editor, but we recommend it for more effective management operations.

For more information about the AWS Resource Groups service and Tag Editor, see the AWS Resource Groups User Guide.

The following procedure shows how to create a custom policy that allows your account's users to access Resource Groups and Tag Editor. You need to complete this procedure only one time. In later topics, you grant these permissions by attaching the policy to users and user groups in your account.
To create a policy for Tag Editor and Resource Groups

1. Use your AWS account ID or account alias, and the credentials for your admin IAM user, to sign in to the IAM console.
2. In the navigation pane of the console, choose Policies, and then choose Create policy.
3. Choose the JSON tab and paste the following policy:

   ```json
   {
     "Version": "2012-10-17",
     "Statement": [
       {
         "Effect": "Allow",
         "Action": [
           "resource-groups:*",
           "cloudformation:DescribeStackResources",
           "cloudformation:ListStackResources",
           "tag:GetResources",
           "tag:TagResources",
           "tag:UntagResources",
           "tag:getTagKeys",
           "tag:getTagValues"
         ],
         "Resource": "*"
       }
     ]
   }
   
   This policy allows all actions for Tag Editor and Resource Groups.

5. On the Review policy page, for Name, enter SSMTagEditorAndResourceGroupAccess or another name that you prefer, and then choose Create policy.

Continue to Task 2: Create User Groups (p. 26).

Task 2: Create User Groups

You can create a user group for each policy and assign users to a group rather than attaching individual policies to each user.

You can create multiple user groups with different permission sets by omitting recommended or optional policies. You can also create custom IAM policies to grant any combination of permissions for a user. For example, you can grant a user group permission to use only the Session Manager capability in Systems Manager, as described in Control User Session Access to Instances (p. 579).

For additional examples of custom IAM policies for Systems Manager, see Customer Managed Policy Examples (p. 919).

For comprehensive information about using IAM policies for Systems Manager access, see Authentication and Access Control for AWS Systems Manager (p. 909).

To create a user group

Use the following procedure to create a user group for your Systems Manager users. You can repeat this procedure to create additional user groups with different sets of permissions.

1. In the navigation pane of the IAM console, choose Groups, and then choose Create New Group.
2. On the Set Group Name page, enter a name for the group, such as SSMUserGroup or another name that you prefer.
3. Choose Next Step.
4. On the Attach Policy page, for Filter, enter SSM.
5. In the policy list, do the following:
   - If you want to provide users with permission to use Resource Groups and the Tag Editor, choose the SSMTagEditorAndResourceGroupAccess policy that you created in the procedure Task 1: Create Policies for Tag Editor and Resource Groups (p. 25). If you gave the policy a different name, choose that name instead.
   - To provide users in this group with full access to the Systems Manager console, select the box next to AmazonSSMFullAccess.
     - or-
   - If you want users in this group only to view Systems Manager data, and not create or update resources, select the box beside AmazonSSMReadOnlyAccess.
   - To provide users with access to the Built-In Insights and Dashboard by CloudWatch pages in the Systems Manager console, select the boxes next to these managed policies:
     - AWSHealthFullAccess
       This policy grants full access to the AWS Health APIs and Notifications and the Personal Health Dashboard. It also provides access to portions of the Built-In Insights Dashboard in the Systems Manager console.
     - AWSConfigUserAccess
       This policy provides read-only access to use AWS Config, including searching by tags on resources, and reading all tags. It also provides access to portions of the Built-In Insights Dashboard in the Systems Manager console.
     - CloudWatchReadOnlyAccess
       This policy provides read-only access to CloudWatch, which is needed to view information on the Dashboard by CloudWatch in the Systems Manager console.
   - Add any other policies that provide permissions you want to grant to this user group.
6. Choose Next Step.
7. On the Review page, verify that the correct policies are added to this group, and then choose Create Group.

Continue to Task 3: Create Users and Assign Permissions (p. 27).

**Task 3: Create Users and Assign Permissions**

Create IAM users for the individuals who require access to AWS Systems Manager, and add each user to the appropriate user group to ensure that they have the right level of permissions.

**Note**

If your organization has an existing identity system, you might want to create a single sign-on (SSO) option. SSO gives users access to the AWS Management Console for your account without requiring them to have an IAM user identity. SSO also eliminates the need for users to sign in to your organization's site and to AWS separately. For more information, see Enabling Custom Identity Broker Access to the AWS Console.

Depending on whether the user accounts for this group were already created, use one of the following procedures:

**To create users and add permissions**

1. In the navigation pane of the IAM console, choose Users, and then choose Add user.
For **User name**, enter the name that the user will use to sign in to AWS Systems Manager.

3. To allow the user access to the AWS API, AWS CLI, AWS SDK, and other development tools, select the check box next to **Programmatic access**.

   This creates an access key for the new user. You can view or download the access keys when you get to the **Final** page.

4. To allow the user access to the AWS Management Console, select the check box next to **AWS Management Console access**.

   The AWS Management Console provides a web interface where you can manage your compute, storage, and other cloud resources. Within the AWS Management Console, individual services have their own console. For example, you can manage your compute resources using the Amazon EC2 console and storage through the Amazon S3 console.

   If you choose **Custom password**, enter an initial password for the user. You can optionally select **Require password reset** to force the user to create a new password the next time the user signs in.

5. Choose **Next: Permissions**.

6. On the **Set permissions for user** page, choose **Add user to group**.

7. In the group list, choose the user group to add the user to, and then choose **Next: Tags**.

8. (Optional) Add one or more tag key-value pairs to organize, track, or control access for this user, and then choose **Next: Review** to see the list of group memberships that the new user is joining.

9. Choose **Create user**.

10. To view the users' access keys (access key IDs and secret access keys), choose **Show** next to each password and access key that you want to see. To save the access keys, choose **Download .csv** and then save the file to a safe location.

   **Important**
   This is your only opportunity to view or download the secret access keys, and you must provide this information to your users before they can use the AWS API or AWS CLI. Save the user's new access key ID and secret access key in a safe and secure place. **You will not have access to the secret keys again after this step.**

11. Provide each user with his or her credentials. On the final page you can choose **Send email** next to each user. Your local mail client opens with a draft that you can customize and send. The email template includes the following details for each user:

   - User name
   - URL of the account sign-in page. Use the following example, substituting the correct account ID number or account alias:

   ```
   https://AWS-account-ID or alias.signin.aws.amazon.com/console
   ```

   For more information, see **How IAM Users Sign In to AWS** in the **IAM User Guide**.

   **Important**
   The user's password is not included in the generated email. You must provide them to the user in a way that complies with your organization's security guidelines.

**To add permissions for an existing user**

1. In the IAM console navigation pane, choose **Users**.
2. Choose the name of the user to add to a group, and then choose **Add permission**.
3. For **Add user to group**, select the box next to the group to add the user to, such as **SSMUserGroup**, or the name of a different user group that you created.
4. Add any other available permission policies to assign to the user.
5. Choose **Next: Review** to see the list of group memberships that will be added to the new user.
6. Choose **Add permissions**.

Continue to **Step 4: Create an IAM Instance Profile for Systems Manager** (p. 29).

**Step 4: Create an IAM Instance Profile for Systems Manager**

By default, AWS Systems Manager doesn’t have permission to perform actions on your instances. You must grant access by using an AWS Identity and Access Management (IAM) instance profile. An instance profile is a container that passes IAM role information to an Amazon Elastic Compute Cloud (Amazon EC2) instance at launch. You can create an instance profile for Systems Manager by attaching one or more IAM policies that define the necessary permissions to a new role or to a role you already created.

**Note**

You can use Systems Manager Quick Setup to quickly configure an instance profile on all instances in your AWS account. Quick Setup can also create an assume role, which enables Systems Manager to securely run commands on your instances on your behalf. By using Quick Setup, you can skip this step (Step 4) and Step 5. For more information, see **AWS Systems Manager Quick Setup** (p. 14).

Note the following details about creating an IAM instance profile:

- If you are configuring servers or virtual machines (VMs) in a hybrid environment for Systems Manager, you don’t need to create an instance profile for them. Instead, you must configure your servers and VMs to use an IAM service role. For more information, see **Create an IAM Service Role for a Hybrid Environment** (p. 42).
- If you change the IAM instance profile, it might take some time for the instance credentials to refresh. SSM Agent will not process requests until this happens. To speed up the refresh process, you can restart SSM Agent or restart the instance.

**About Policies for a Systems Manager Instance Profile**

This section describes the policies you can add to your EC2 instance profile for Systems Manager. To provide permissions for communication between instances and the Systems Manager API, we recommend creating custom policies that take into account your system needs and security requirements. However, as a starting point, you can use one or more of the following policies to grant permission for Systems Manager to interact with your instances. The first policy, **AmazonSSMManagedInstanceCore**, enables an instance to use AWS Systems Manager service core functionality. Depending on your operations plan, you might need permissions represented in one or more of the other three policies.

**Policy: AmazonSSMManagedInstanceCore**

Required permissions.

This AWS managed policy enables an instance to use Systems Manager service core functionality.

**Policy: A custom policy for Amazon S3 bucket access**

Required permissions in either of the following cases:

- **Case 1**: You are using a VPC endpoint to privately connect your VPC to supported AWS services and VPC endpoint services powered by PrivateLink.
SSM Agent is Amazon software that is installed on your instances and performs Systems Manager tasks. This agent requires access to specific Amazon-owned S3 buckets. These buckets are publicly accessible.

In a private VPC endpoint environment, however, you must explicitly provide access to these buckets:

```
arn:aws:s3:::patch-baseline-snapshot-region/*
arn:aws:s3:::aws-ssm-region/*
```

For more information, see Step 6: (Optional) Create a Virtual Private Cloud Endpoint (p. 36), About Minimum S3 Bucket Permissions for SSM Agent (p. 87), and VPC Endpoints in the Amazon VPC User Guide.

- **Case 2**: You plan to use an Amazon S3 bucket that you create as part of your Systems Manager operations.

Your EC2 instance profile for Systems Manager must grant access to an S3 bucket that you own for tasks like the following:

- To access scripts you store in the S3 bucket to use in commands you run.
- To store the full output of Run Command commands or Session Manager sessions.
- To access custom patch lists for use when patching your instances.

**Note**

Saving output log data in an S3 bucket is optional, but we recommend setting it up at the beginning of your Systems Manager configuration process if you have decided to do so. For more information, see Create a Bucket in the Amazon Simple Storage Service Getting Started Guide.

**Policy: AmazonSSMDirectoryServiceAccess**

Required only if you plan to join EC2 instance for Windows Server to a Microsoft AD directory.

This AWS managed policy allows SSM Agent to access AWS Directory Service on your behalf for requests to join the domain by the managed instance. For more information, see Seamlessly Join a Windows EC2 Instance in the AWS Directory Service Administration Guide.

**Policy: CloudWatchAgentServerPolicy**

Required only if you plan to install and run the CloudWatch agent on your instances to read metric and log data on an instance and write it to Amazon CloudWatch. These help you monitor, analyze, and quickly respond to issues or changes to your AWS resources.

Your instance profile needs this policy only if you will use CloudWatch features, such as CloudWatch Events or CloudWatch Logs. (You can also create a more restrictive policy that, for example, limits writing access to a specific CloudWatch Logs log stream.)

**Note**

Using CloudWatch features is optional, but we recommend setting them up at the beginning of your Systems Manager configuration process if you have decided to use them. For more information, see the Amazon CloudWatch Events User Guide and the Amazon CloudWatch Logs User Guide.

### Task 1: (Optional) Create a Custom S3 Bucket Policy for an Instance Profile

Creating a custom S3 bucket policy for your instance profile is required only if you are using a VPC endpoint or using an S3 bucket of your own in your Systems Manager operations.
For information about the AWS managed S3 buckets you provide access to in the policy below, see About Minimum S3 Bucket Permissions for SSM Agent (p. 87).

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Policies, and then choose Create policy.
3. Choose the JSON tab, and replace the default text with the following:

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": "s3:GetObject",
         "Resource": [
            "arn:aws:s3:::aws-ssm-region/*",
            "arn:aws:s3:::aws-windows-downloads-region/*",
            "arn:aws:s3:::amazon-ssm-region/*",
            "arn:aws:s3:::amazon-ssm-packages-region/*",
            "arn:aws:s3:::region-birdwatcher-prod/*",
            "arn:aws:s3:::patch-baseline-snapshot-region/*"
         ]
      },
      {
         "Effect": "Allow",
         "Action": ["s3:GetObject", "s3:PutObject", "s3:PutObjectAcl", "s3:GetEncryptionConfiguration"],
         "Resource": [
            "arn:aws:s3:::my-bucket-name/*",
            "arn:aws:s3:::my-bucket-name"
         ]
      }
   ]
}
```

1. The first Statement element is required only if you are using a VPC endpoint.

2. The second Statement element is required only if you are using an S3 bucket that you created to use in your Systems Manager operations.

3. The PutObjectAcl access control list permission is required only if you plan to support cross-account access to S3 buckets in other accounts.

4. The GetEncryptionConfiguration element is required if your S3 bucket is configured to use encryption.

5. If your S3 bucket is configured to use encryption, then the S3 bucket root (for example, arn:aws:s3:::my-bucket-name) must be listed in the Resource section. Your IAM user, group, or role must be configured with access to the root bucket.

4. If you are using a VPC endpoint in your operations, do the following:

   In the first Statement element, replace each region placeholder with the identifier of the AWS Region this policy will be used in. For example, use us-east-2 for the US East (Ohio) Region. For
a list of supported region values, see the Region column in the AWS Systems Manager Table of Regions and Endpoints topic in the AWS General Reference.

Important
We recommend that you avoid using wildcard characters (*) in place of specific Regions in this policy. For example, use arn:aws:s3:::aws-ssm-us-east-2/* and do not use arn:aws:s3:::aws-ssm-*/*. Using wildcards could provide access to Amazon S3 buckets that you don't intend to grant access to. If you want to use the instance profile for more than one Region, we recommend repeating the first Statement element for each Region.

-or-

If you are not using a VPC endpoint in your operations, you can delete the first Statement element.

5. If you are using an S3 bucket of your own in your Systems Manager operations, do the following:

In the second Statement element, replace my-bucket-name with the name of an S3 bucket in your account. You will use this bucket for your Systems Manager operations. It provides permission for objects in the bucket, using "arn:aws:s3:::my-bucket-name/*" as the resource. For more information about providing permissions for buckets or objects in buckets, see the topic Specifying Permissions in a Policy in the Amazon Simple Storage Service Developer Guide and the AWS blog post IAM Policies and Bucket Policies and ACLs! Oh, My! (Controlling Access to S3 Resources).

Note
If you use more than one bucket, provide the ARN for each one. For example, for permissions on buckets:

"Resource": [
  "arn:aws:s3:::my-first-bucket-name/*",
  "arn:aws:s3:::my-second-bucket-name/*"
]

-or-

If you are not using an S3 bucket of your own in your Systems Manager operations, you can delete the second Statement element.


7. For Name, enter a name to identify this policy, such as SSMInstanceProfileS3Policy or another name that you prefer.

8. Choose Create policy.

Task 2: Add Permissions to a Systems Manager Instance Profile (Console)

Depending on whether you are creating a new role for your instance profile or adding the necessary permissions to an existing role, use one of the following procedures.

To create an instance profile for Systems Manager managed instances (console)

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles, and then choose Create role.
3. Under Select type of trusted entity, choose AWS service.
4. Immediately under Choose the service that will use this role, choose EC2, and then choose Next: Permissions.
5. On the **Attached permissions policy** page, do the following:
   - Use the **Search** field to locate the **AmazonSSMManagedInstanceCore**. Select the box next to its name.
   - If you created a custom S3 bucket policy in the previous procedure, **Task 1: (Optional) Create a Custom S3 Bucket Policy for an Instance Profile (p. 30)**, search for it and select the box next to its name.
   - If you plan to join instances to an Active Directory managed by AWS Directory Service, search for **AmazonSSMDirectoryServiceAccess** and select the box next to its name.
   - If you plan to use CloudWatch Events or CloudWatch Logs to manage or monitor your instance, search for **CloudWatchAgentServerPolicy** and select the box next to its name.

6. Choose **Next: Tags**.
7. (Optional) Add one or more tag-key value pairs to organize, track, or control access for this role, and then choose **Next: Review**.
8. For **Role name**, enter a name for your new instance profile, such as **SSMInstanceProfile** or another name that you prefer.
   
   **Note**
   Make a note of the role name. You will choose this role when you create new instances that you want to manage by using Systems Manager.
9. (Optional) For **Role description**, enter a description for this instance profile.
10. Choose **Create role**. The system returns you to the **Roles** page.

### To add instance profile permissions for Systems Manager to an existing role (console)

2. In the navigation pane, choose **Roles**, and then choose the existing role you want to associate with an instance profile for Systems Manager operations.
3. On the **Permissions** tab, choose **Attach policies**.
4. On the **Attach permission policies** page, do the following:
Step 5: Attach an IAM Instance Profile to an Amazon EC2 Instance

The procedures in this topic describe how to attach the IAM instance profile for Systems Manager that you created in the previous topic, Step 4: Create an IAM Instance Profile for Systems Manager (p. 29), to Amazon EC2 instances. You can attach the instance profile to new Amazon EC2 instances when you launch them, or to existing Amazon EC2 instances.

SSM Agent requirements for instances

AWS Systems Manager Agent (SSM Agent) is Amazon software that can be installed and configured on an Amazon EC2 instance, an on-premises server, or a virtual machine (VM). SSM Agent makes it possible for Systems Manager to update, manage, and configure these resources.

If the Amazon Machine Image (AMI) type you choose in the first procedure doesn't come with SSM Agent preinstalled, you must manually install the agent on the new instance before it can be used with Systems Manager. If SSM Agent isn't installed on the existing EC2 instance you choose in the second procedure, you must manually install the agent on the instance before it can be used with Systems Manager.

SSM Agent is installed by default on the following AMIs:

- Windows Server 2003-2012 R2 AMIs published in November 2016 or later
- Windows Server 2016 and 2019
- Amazon Linux
- Amazon Linux 2
- Ubuntu Server 16.04
- Ubuntu Server 18.04

For information about manually installing SSM Agent on other Linux operating systems, see Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68).

TLS certificate requirement for instances

A Transport Layer Security (TLS) certificate must be installed on each managed instance you use with Systems Manager. These certificates are used to encrypt calls to other AWS services. A TLS certificate is already installed on each Amazon EC2 instance created from any Amazon Machine Image (AMI). On instances created from AMIs not supplied by Amazon, and on your own on-premises servers and...
VMs, you must install the certificate yourself. For more information, see Install a TLS certificate on On-Premises Servers and VMs (p. 45).

Topics

- Launch an Instance that Uses the Systems Manager Instance Profile (Console) (p. 35)
- Attach the Systems Manager Instance Profile to an Existing Instance (Console) (p. 35)

Launch an Instance that Uses the Systems Manager Instance Profile (Console)

To launch an instance that uses the Systems Manager instance profile (console)

1. Open the Amazon EC2 console at https://console.aws.amazon.com/ec2/.
2. On the navigation bar at the top of the screen, select the AWS Region for the instance.
3. Choose Launch Instance.
4. On the Choose an Amazon Machine Image (AMI) page, locate the AMI for the instance type you want to create, and then choose Select.
5. Choose the type of instance to launch, such as t2.micro, and then choose Next: Configure Instance Details.
6. On the Configure Instance Details page, in the IAM role drop-down list, select the instance profile you created using the procedure in Step 4: Create an IAM Instance Profile for Systems Manager (p. 29).
7. For other options on the page, make selections that meet your requirements for the instance. For more information, choose one of the following, depending on your selected operating system type:
   - Linux: Launching an Instance Using the Launch Instance Wizard in the Amazon EC2 User Guide for Linux Instances
   - Windows Server: Launching an Instance Using the Launch Instance Wizard in the Amazon EC2 User Guide for Windows Instances
8. Complete the wizard.

If you create other instances that you want to configure using Systems Manager, you must specify the instance profile for each instance.

Attach the Systems Manager Instance Profile to an Existing Instance (Console)

1. Sign in to the AWS Management Console and open the Amazon EC2 console at https://console.aws.amazon.com/ec2/.
2. In the navigation pane, under Instances, choose Instances.
3. Browse to and choose your Amazon EC2 instance from the list.
4. In the Actions menu, choose Instance Settings, Attach/Replace IAM Role.
5. For IAM role, select the instance profile you created using the procedure in Step 4: Create an IAM Instance Profile for Systems Manager (p. 29).
6. Choose Apply.

For more information about attaching IAM roles to instances, see Attaching an IAM Role to an Instance in the Amazon EC2 User Guide for Linux Instances.
Step 6: (Optional) Create a Virtual Private Cloud Endpoint

You can improve the security posture of your managed instances (including managed instances in your hybrid environment) by configuring AWS Systems Manager to use an interface VPC endpoint in Amazon Virtual Private Cloud (Amazon VPC). An interface VPC endpoint (interface endpoint) enables you to connect to services powered by AWS PrivateLink, a technology that enables you to privately access Amazon EC2 and Systems Manager APIs by using private IP addresses. PrivateLink restricts all network traffic between your managed instances, Systems Manager, and Amazon EC2 to the Amazon network. (Managed instances don't have access to the Internet.) Also, you don't need an Internet gateway, a NAT device, or a virtual private gateway.

You are not required to configure PrivateLink, but it's recommended. For more information about PrivateLink and VPC endpoints, see Accessing AWS Services Through PrivateLink.

Note
The alternative to using a VPC endpoint is to enable outbound internet access on your managed instances.

About Amazon VPC
Amazon Virtual Private Cloud (Amazon VPC) enables you to define a virtual network in your own logically isolated area within the AWS cloud, known as a virtual private cloud (VPC). You can launch your AWS resources, such as instances, into your VPC. Your VPC closely resembles a traditional network that you might operate in your own data center, with the benefits of using AWS's scalable infrastructure. You can configure your VPC; you can select its IP address range, create subnets, and configure route tables, network gateways, and security settings. You can connect instances in your VPC to the internet. You can connect your VPC to your own corporate data center, making the AWS cloud an extension of your data center. To protect the resources in each subnet, you can use multiple layers of security, including security groups and network access control lists. For more information, see the Amazon VPC User Guide.

Topics
- VPC Endpoint Restrictions and Limitations (p. 36)
- Creating VPC Endpoints for Systems Manager (p. 37)

VPC Endpoint Restrictions and Limitations
Before you configure VPC endpoints for Systems Manager, be aware of the following restrictions and limitations.

aws:domainJoin plugin
If you choose to create VPC endpoints, then be aware that requests to join a Windows instance to a domain from SSM documents that use the aws:domainJoin plugin will fail. This plugin requires the AWS Directory Service, and AWS Directory Service does not have PrivateLink endpoint support. Support for joining a Windows instance to a domain from other domain join methods depend only on Active Directory requirements (for example, ensuring that domain controllers are reachable and discoverable by using DNS and other related requirements). You can use Amazon EC2 User Data scripts to join an instance to a domain.

Cross-region requests
VPC endpoints currently do not support cross-region requests—ensure that you create your endpoint in the same region as your bucket. You can find the location of your bucket by using the Amazon S3
console, or by using the `get-bucket-location` command. Use a region-specific Amazon S3 endpoint to access your bucket; for example, mybucket.s3-us-west-2.amazonaws.com. For more information about region-specific endpoints for Amazon S3, see Amazon Simple Storage Service (S3) in Amazon Web Services General Reference. If you use the AWS CLI to make requests to Amazon S3, set your default region to the same region as your bucket, or use the `--region` parameter in your requests.

**Incoming connections**

The security group attached to the VPC endpoint must allow incoming connections on port 443 from the private subnet of the managed instance. If incoming connections are not allowed, then the managed instance cannot connect to the SSM and EC2 endpoints.

**Amazon S3 buckets**

Your VPC endpoint policy must allow at least access to the following Amazon S3 buckets:

- The S3 buckets used by Patch Manager for patch baseline operations in your AWS Region. These buckets contain the code that is retrieved and run on instances by the patch baseline service. Each AWS Region has its own patch baseline operations buckets for the code to be retrieved when a patch baseline document is run. If the code can't be downloaded, the patch baseline command will fail.

  To provide access to the buckets in your AWS Region, include the following permission in your endpoint policy:

  ```
  arn:aws:s3:::patch-baseline-snapshot-region/*
  arn:aws:s3:::aws-ssm-region/*
  ```

  `region` represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as `us-east-2` for the US East (Ohio) Region. For a list of supported `region` values, see the `Region` column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

  For example:

  ```
  arn:aws:s3:::patch-baseline-snapshot-us-east-2/*
  arn:aws:s3:::aws-ssm-us-east-2/*
  ```

- The S3 buckets listed in About Minimum S3 Bucket Permissions for SSM Agent (p. 87).

**DNS in hybrid environment**

For information about configuring DNS to work with PrivateLink endpoints in hybrid environments, see Private DNS. If you want to use your own DNS, you can use Route 53 Resolver. For more information, see Resolving DNS Queries Between VPCs and Your Network in the Amazon Route 53 Developer Guide.

**Creating VPC Endpoints for Systems Manager**

Use the following procedure to create three required and one optional separate VPC endpoints for Systems Manager. All three endpoints are required for Systems Manager to work in a VPC. The fourth is required only if you are using Session Manager capabilities. This procedure links to related procedures in the Amazon VPC User Guide.

**To create VPC endpoints for Systems Manager**

1. Follow the steps in Creating an Interface Endpoint to create the following endpoints:

   - `com.amazonaws.region.ssm`: The endpoint for the Systems Manager service.
   - `com.amazonaws.region.ec2messages`: Systems Manager uses this endpoint to make calls from SSM Agent to the Systems Manager service.
Step 7: (Optional) Create Systems Manager Service Roles

This topic explains the difference between a service role and a service-linked role for Systems Manager. It also explains when you need to create or use either type of role.

**Service role:** A service role is an AWS Identity and Access Management (IAM) that grants permissions to an AWS service so that the service can access AWS resources. Only a few Systems Manager scenarios require a service role. When you create a service role for Systems Manager, you choose the permissions to grant in order for it to access or interact with other AWS resources.

**Service-linked role:** A service-linked role is predefined by Systems Manager and includes all the permissions that the service requires to call other AWS services on your behalf.

Currently, the Systems Manager service-linked role can be used for the following:

- The Systems Manager Inventory capability uses the service-linked role to collect inventory metadata from tags and resource groups.
- The Maintenance Windows capability can use the service-linked role in some situations. Other situations require a custom service role that you create, as described below.

For more information about the service-linked role, see Using Service-Linked Roles for Systems Manager (p. 922).

Create a Service Role

You can create the following service roles as part of Systems Manager setup, or you can create them later.

**Service Role for Automation**

Automation previously required that you specify a service role so that the service had permission to perform actions on your behalf. Automation no longer requires this role because the service now operates by using the context of the user who invoked the execution.
However, the following situations still require that you specify a service role for Automation:

- When you want to restrict a user's privileges on a resource, but you want the user to run an Automation workflow that requires elevated privileges. In this scenario, you can create a service role with elevated privileges and allow the user to run the workflow.
- Operations that you expect to run longer than 12 hours require a service role.

If you need to create a service role and an instance profile role for Automation, you can use one of the following methods.

- Method 1: Use AWS CloudFormation to Configure a Service Role for Automation (p. 145)
- Method 2: Use IAM to Configure Roles for Automation (p. 146)

**Service Role for Maintenance Windows Tasks**

To run tasks on your managed instances, the Maintenance Windows service must have permission to access those resources. This permission can be granted using either a service-linked role for Systems Manager or a custom service role that you create.

You create a custom service role in the following cases:

- If you want to use Amazon Simple Notification Service (Amazon SNS) to send notifications related to maintenance window tasks run through Run Command.
- If you want to use a more restrictive set of permissions than those provided by the service-linked role.

For more information, see the following topics in the Maintenance Windows section of this user guide:

- Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445)
- (Optional) Create a Custom Service Role for Maintenance Windows (Console) (p. 446).

**Service Role for Amazon Simple Notification Service Notifications**

Amazon Simple Notification Service (Amazon SNS) is a web service that coordinates and manages the delivery or sending of messages to subscribing endpoints or clients. In Systems Manager, you can configure Amazon SNS to send notifications about the status of commands that you send using the Run Command capability, or the status of tasks run in maintenance windows.

You create a service role for Amazon SNS as part of the process of configuring the service for use with Systems Manager. After you complete this configuration, you choose whether to receive notifications for particular Run Command commands or maintenance windows tasks at the time you create each one.

For more information, see Configuring Amazon SNS Notifications for AWS Systems Manager (p. 896).

**Service Role for a Systems Manager Hybrid Environment**

If you plan to use Systems Manager to manage on-premises servers and virtual machines (VMs) in what is called a hybrid environment, you must create an IAM role for those resources to communicate with the Systems Manager service.

For more information, see Create an IAM Service Role for a Hybrid Environment (p. 42).

Continue to Step 8: (Optional) Set Up Integrations with Other AWS Services (p. 40).
Step 8: (Optional) Set Up Integrations with Other AWS Services

AWS Systems Manager integrates with a number of other AWS services. In most cases, you set up an integration after you decide to incorporate the service into your Systems Manager operations. For example:

- Referencing AWS Secrets Manager Secrets from Parameter Store Parameters (p. 90)
- Using Chef InSpec Profiles with Systems Manager Compliance (p. 105)

You can use some AWS services immediately to compile log data for later troubleshooting and analysis. You can also use AWS services to monitor and quickly respond to changes in your Systems Manager environment. Therefore, we recommend that you set up the following resources as part of your initial Systems Manager setup process.

Amazon CloudWatch Events and Amazon Simple Notification Service – CloudWatch Events lets you set up rules to detect when changes happen to AWS resources that you specify. You can configure CloudWatch Events to log status execution changes of the commands users in your account send using Systems Manager. You can create a rule to detect when a user in your organization starts or stops a session in Session Manager. You can also configure a CloudWatch event to trigger other actions in your AWS environment. For more information, see the following topics:

- Understanding Command Statuses (p. 630)
- Configuring CloudWatch Events for Run Command (p. 618)
- Monitoring Session Activity Using Amazon CloudWatch Events (Console) (p. 613)

Amazon Simple Storage Service (Amazon S3)

Run Command command output in the Systems Manager console is truncated after 2,500 characters. In order to access complete command output logs, you can store Systems Manager output in an Amazon Simple Storage Service (Amazon S3) bucket, and then use this output later for auditing or troubleshooting. You specify whether to save command output to an S3 bucket each time you run a command. You can also create an Amazon S3 key prefix (a subfolder) to help you organize the log output. For more information, see Create a Bucket in the Amazon Simple Storage Service Getting Started Guide.

Amazon CloudWatch Logs (CloudWatch Logs)

As an alternative to storing command output in an Amazon S3 bucket, you can send output to an Amazon CloudWatch Logs log group. If you specify CloudWatch Logs as the output target, Run Command periodically sends all command output and error logs to CloudWatch Logs. You can monitor output logs in near real-time, search for specific phrases, values, or patterns, and create alarms based on the search. For more information, see Configuring Amazon CloudWatch Logs for Run Command (p. 616).
Setting Up AWS Systems Manager for Hybrid Environments

This section describes the setup tasks that account and system administrators perform for a hybrid environment. A hybrid environment includes on-premises servers and virtual machines (VMs) that have been configured for use with Systems Manager, including VMs in other cloud environments. After these steps are complete, users who have been granted permissions by the AWS account administrator can use AWS Systems Manager to configure and manage their organization’s on-premises servers and virtual machines (VMs).

If you plan to use Systems Manager to manage Amazon Elastic Compute Cloud (Amazon EC2) instances, or to use both Amazon EC2 instances and your own resources in a hybrid environment, follow the steps in Setting Up AWS Systems Manager (p. 23) first.

Configuring your hybrid environment for Systems Manager enables you to do the following:

- Create a consistent and secure way to remotely manage your hybrid workloads from one location using the same tools or scripts.
- Centralize access control for actions that can be performed on your servers and VMs by using AWS Identity and Access Management (IAM).
- Centralize auditing and your view into the actions performed on your servers and VMs by recording all actions in AWS CloudTrail.

For information about using CloudTrail to monitor Systems Manager actions, see Logging AWS Systems Manager API Calls with AWS CloudTrail (p. 892).

- Centralize monitoring by configuring CloudWatch Events and Amazon SNS to send notifications about service execution success.

For information about using CloudWatch Events to monitor Systems Manager events, see Monitoring Systems Manager Events with Amazon CloudWatch Events (p. 894).

About managed instances

After you finish configuring your servers and VMs for Systems Manager as described in this section, your hybrid machines are listed in the AWS Management Console and described as managed instances. Amazon EC2 instances configured for Systems Manager are also described as managed instances. In the console, however, the IDs of your hybrid instances are distinguished from Amazon EC2 instances with the prefix “mi-“. Amazon EC2 instance IDs use the prefix “i-“.

About instance tiers

AWS Systems Manager offers a standard-instances tier and an advanced-instances tier for servers and VMs in your hybrid environment. The standard-instances tier enables you to register a maximum of 1,000 on-premises servers or VMs per AWS account per AWS Region. If you need to register more than 1,000 on-premises servers or VMs in a single account and Region, then use the advanced-instances tier. Advanced instances also enable you to connect to your hybrid machines by using AWS Systems Manager Session Manager. Session Manager provides interactive shell access to your instances. For more information, see Step 7: (Optional) Enable the Advanced-Instances Tier (p. 53) below.

Complete the procedures in this section to configure your hybrid servers and VMs for Systems Manager.

Topics
Step 1: Complete General Systems Manager Setup Steps

If you haven't already done so, complete the following general setup steps for Systems Manager in the Setting Up AWS Systems Manager (p. 23) section of this user guide. The other steps in that section are required only if you plan to manage Amazon EC2 instances.

- Sign Up for AWS (p. 23)
- Create an Admin IAM User for AWS (p. 24)
- Create Non-Admin IAM Users and Groups for Systems Manager (p. 25)
- (Optional) Create a Virtual Private Cloud Endpoint (p. 36)
- (Optional) Create Systems Manager Service Roles (p. 38)
- (Optional) Set Up Integrations with Other AWS Services (p. 40)

After ensuring that you have completed those steps, continue to Step 2: Create an IAM Service Role for a Hybrid Environment (p. 42).

Step 2: Create an IAM Service Role for a Hybrid Environment

Servers and virtual machines (VMs) in a hybrid environment require an IAM role to communicate with the Systems Manager service. The role grants AssumeRole trust to the Systems Manager service. You only need to create the service role for a hybrid environment once for each AWS account.

**Note**

Users in your company or organization who will use Systems Manager on your hybrid machines must be granted permission in IAM to call the SSM API. For more information, see Create Non-Admin IAM Users and Groups for Systems Manager (p. 25).

**S3 bucket policy requirement**

If either of the following cases are true, you must create a custom IAM permission policy for Amazon S3 buckets before completing this procedure:

- **Case 1**: You are using a VPC endpoint to privately connect your VPC to supported AWS services and VPC endpoint services powered by PrivateLink.
- **Case 2**: You plan to use an Amazon S3 bucket that you create as part of your Systems Manager operations, such as for storing output for Run Command commands or Session Manager sessions to an S3 bucket. Before proceeding, follow the steps in Create a Custom S3 Bucket Policy for an Instance Profile (p. 30). The information about S3 bucket policies in that topic also applies to your service role.
To create an IAM service role for a hybrid environment (Tools for Windows PowerShell)

1. Create a text file with a name such as `SSMService-Trust.json` with the following trust policy. Make sure to save the file with the `.json` file extension.

```json
{
    "Version": "2012-10-17",
    "Statement": {
        "Effect": "Allow",
        "Principal": {"Service": "ssm.amazonaws.com"},
        "Action": "sts:AssumeRole"
    }
}
```

2. Use `New-IAMRole` as follows to create a service role. This example creates a role named `SSMServiceRole`. You can choose another name if you prefer.

```powershell
New-IAMRole -RoleName SSMServiceRole -AssumeRolePolicyDocument (Get-Content -raw SSMService-Trust.json)
```

3. Use `Register-IAMRolePolicy` as follows to enable the service role you created to create a session token. The session token gives your managed instance permission to run commands using Systems Manager.

   **Note**
   The policies you add for a service profile for managed instances in a hybrid environment are the same policies used to create an instance profile for EC2 instances. For more information about the AWS policies used in the following commands, see Create an IAM Instance Profile for Systems Manager (p. 29).

   (Required) Run the following command to enable a managed instance to use AWS Systems Manager service core functionality.

   ```powershell
   Register-IAMRolePolicy -RoleName SSMServiceRole -PolicyArn arn:aws:iam::aws:policy/AmazonSSMManagedInstanceCore
   ```

   If you created a custom S3 bucket policy for your service role, run the following command to enable SSM Agent to access the buckets you specified in the policy. Replace `account-id` and `my-bucket-policy-name` with your AWS account ID and your bucket name.

   ```powershell
   Register-IAMRolePolicy -RoleName SSMServiceRole -PolicyArn arn:aws:iam::account-id:policy/my-bucket-policy-name
   ```

   (Optional) Run the following command to allow SSM Agent to access AWS Directory Service on your behalf for requests to join the domain by the managed instance. Your instance profile needs this policy only if you join your instances to a Microsoft AD directory.

   ```powershell
   Register-IAMRolePolicy -RoleName SSMServiceRole -PolicyArn arn:aws:iam::aws:policy/AmazonSSMDirectoryServiceAccess
   ```

   (Optional) Run the following command to allow the CloudWatch agent to run on your managed instances. This command makes it possible to read information on an instance and write it to CloudWatch. Your service profile needs this policy only if you will use CloudWatch features, such as Amazon CloudWatch Events or Amazon CloudWatch Logs.

   ```powershell
   Register-IAMRolePolicy -RoleName SSMServiceRole -PolicyArn arn:aws:iam::aws:policy/CloudWatchAgentServerPolicy
   ```
To create an IAM service role for a hybrid environment (AWS CLI)

1. Create a text file with a name such as SSMService-Trust.json with the following trust policy. Make sure to save the file with the .json file extension.

```json
{
  "Version": "2012-10-17",
  "Statement": {
    "Effect": "Allow",
    "Principal": {
      "Service": "ssm.amazonaws.com",
      "Action": "sts:AssumeRole"
    }
  }
}
```

2. Use the `create-role` command to create the service role. This example creates a role named SSMServiceRole. You can choose another name if you prefer.

```bash
aws iam create-role --role-name SSMServiceRole --assume-role-policy-document file://SSMService-Trust.json
```

3. Use `attach-role-policy` as follows to enable the service role you just created to create a session token. The session token gives your managed instance permission to run commands using Systems Manager.

   **Note**
   The policies you add for a service profile for managed instances in a hybrid environment are the same policies used to create an instance profile for EC2 instances. For more information about the AWS policies used in the following commands, see Create an IAM Instance Profile for Systems Manager (p. 29).

   (Required) Run the following command to enable a managed instance to use AWS Systems Manager service core functionality.

```bash
aws iam attach-role-policy --role-name SSMServiceRole --policy-arn arn:aws:iam::aws:policy/AmazonSSMManagedInstanceCore
```

If you created a custom S3 bucket policy for your service role, run the following command to enable SSM Agent to access the buckets you specified in the policy. Replace `account-id` and `my-bucket-policy-name` with your AWS account ID and your bucket name.

```bash
aws iam attach-role-policy --role-name SSMServiceRole --policy-arn arn:aws:iam::account-id:policy/my-bucket-policy-name
```

(Optional) Run the following command to allow SSM Agent to access AWS Directory Service on your behalf for requests to join the domain by the managed instance. Your instance profile needs this policy only if you join your instances to a Microsoft AD directory.

```bash
aws iam attach-role-policy --role-name SSMServiceRole --policy-arn arn:aws:iam::aws:policy/AmazonSSMDirectoryServiceAccess
```

(Optional) Run the following command to allow the CloudWatch agent to run on your managed instances. This command makes it possible to read information on an instance and write it to CloudWatch. Your service profile needs this policy only if you will use CloudWatch features, such as Amazon CloudWatch Events or Amazon CloudWatch Logs.

```bash
aws iam attach-role-policy --role-name SSMServiceRole --policy-arn arn:aws:iam::aws:policy/CloudWatchAgentServerPolicy
```
Step 3: Install a TLS certificate on On-Premises Servers and VMs

A Transport Layer Security (TLS) certificate must be installed on each managed instance you use with Systems Manager. AWS services use these certificates to encrypt calls to other AWS services.

A TLS certificate is already installed by default on each Amazon EC2 instance created from any Amazon Machine Image (AMI).

On base operating systems, on instances created from AMIs that are not supplied by Amazon, and on your own on-premises servers and VMs, you must install and enable a certificate from Amazon Trust Services using AWS Certificate Manager (ACM).

Each of your managed instances must have one of the following Transport Layer Security (TLS) certificates installed.

- Amazon Root CA 1
- Starfield Services Root Certificate Authority - G2
- Starfield Class 2 Certificate Authority

For information about using Amazon Trust Services certificates or ACM, see the AWS Certificate Manager User Guide.

If certificates in your computing environment are managed by a Group Policy Object (GPO), then you might need to configure Group Policy to include one of these certificates.

For more information about the Amazon Root and Starfield certificates, see the blog post How to Prepare for AWS’s Move to Its Own Certificate Authority.

Continue to Step 4: Create a Managed-Instance Activation for a Hybrid Environment (p. 45).

Step 4: Create a Managed-Instance Activation for a Hybrid Environment

To set up servers and virtual machines (VMs) in your hybrid environment as managed instances, you need to create a managed-instance activation. After you successfully complete the activation, you immediately receive an Activation Code and Activation ID. You specify this Code/ID combination when you install SSM Agent on servers and VMs in your hybrid environment. The Code/ID provides secure access to the Systems Manager service from your managed instances.

Important

Systems Manager immediately returns the Activation Code and ID to the console or the command window, depending on how you created the activation. Copy this information and store it in a safe place. If you navigate away from the console or close the command window, you might lose this information. If you lose it, you must create a new activation.
About activation expirations

An activation expiration is a window of time when you can register on-premises machines with Systems Manager. An expired activation has no impact on your servers or virtual machines (VMs) that you previously registered with Systems Manager. If an activation expires then you can’t register more servers or VMs with Systems Manager by using that specific activation. You simply need to create a new one.

Every on-premises server and VM you previously registered remains registered as a Systems Manager managed instance until you explicitly deregister it. You can deregister a managed instance on the Managed Instances page of the Systems Manager console, by using the AWS CLI command deregister-managed-instance, or by using the API action DeregisterManagedInstance.

About activation tags

If you create an activation by using either the AWS CLI or AWS Tools for Windows PowerShell, you can specify tags. Tags are optional metadata that you assign to a resource. Tags enable you to categorize a resource in different ways, such as by purpose, owner, or environment. Here is a Linux CLI example that includes tags.

```
aws ssm create-activation 
  --default-instance-name MyWebServers 
  --iam-role SSMServiceRole 
  --registration-limit 10 
  --region us-east-2 
  --tags "Key=Department,Value=Finance"
```

If you specify tags when you create an activation, then those tags are automatically assigned to your on-premises servers and VMs when you activate them.

You can't add tags to or delete tags from an existing activation. If you don't want to automatically assign tags to your on-premises servers and VMs using an activation, then you can add tags to them later. More specifically, you can tag your on-premises servers and VMs after they connect to Systems Manager for the first time. After they connect, they are assigned a managed instance ID and listed in the Systems Manager console with an ID that is prefixed with "mi-". For information about how to add tags to your managed instances without using the activation process, see AddTagsToResource.

**Note**

You can't assign tags to an activation if you create it by using the Systems Manager console. You must create it by using either the AWS CLI or Tools for Windows PowerShell.

Topics

- Create an Activation (Console) (p. 46)
- Create a Managed Instance Activation (Command Line) (p. 47)

Create an Activation (Console)

To create a managed-instance activation

2. In the navigation pane, choose Hybrid Activations.

   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Hybrid Activations.
3. Choose Create activation.
4. (Optional) In the **Activation description** field, enter a description for this activation. The description is optional, but we recommend that you enter a description if you plan to activate large numbers of servers and VMs.

5. In the **Instance limit** field, specify the total number of on-premises servers or VMs that you want to register with AWS as part of this activation.

6. In the **IAM role name** section, choose a service role option that enables your servers and VMs to communicate with AWS Systems Manager in the cloud:
   a. Choose *Use the system created default command execution role* to use a role and managed policy created by AWS.
   b. Choose *Select an existing custom IAM role that has the required permissions* to use the optional custom role you created earlier.

7. In the **Activation expiry date** field, specify an expiration date for the activation.

   **Note**
   If you want to register additional managed instances after the expiry date, you must create a new activation. The expiry date has no impact on registered and running instances.

8. (Optional) In the **Default instance name** field, specify a name.

9. Choose **Create activation**. Systems Manager immediately returns the Activation Code and ID to the console.

---

### Create a Managed Instance Activation (Command Line)

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to create a managed instance activation.

**To create an activation**

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).

2. Run the following command to create an activation.

   **Note**
   *region* represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as *us-east-2* for the US East (Ohio) Region. For a list of supported *region* values, see the **Region** column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

   **Linux CLI**

   ```bash
   aws ssm create-activation \ 
   --default-instance-name name \ 
   --iam-role iam-service-role-name \ 
   --registration-limit number_of_managed_instances \ 
   --region region \ 
   --tags "Key=a_key,Value=a_value","Key=a_2nd_key,Value=a_2nd_value"
   ```

   **Windows CLI**

   ```bash
   aws ssm create-activation ^ 
   --default-instance-name name ^ 
   --iam-role iam-service-role-name ^
   ```

---

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Step 5: Install SSM Agent for a Hybrid Environment (Windows)

This topic describes how to install SSM Agent on Windows Server machines in a hybrid environment. If you plan to use Linux machines in a hybrid environment, see the next step, Step 6: Install SSM Agent for a Hybrid Environment (Linux) (p. 50).
Important
This procedure is for servers and virtual machines (VMs) in an on-premises or hybrid environment. To download and install SSM Agent on an Amazon EC2 Windows instance, see Installing and Configuring SSM Agent on Windows Instances (p. 65).

Before you begin, locate the Activation Code and Activation ID that were sent to you after you completed the managed-instance activation earlier in Step 4: Create a Managed-Instance Activation for a Hybrid Environment (p. 45). You specify the Code and ID in the following procedure.

To install SSM Agent on servers and VMs in your hybrid environment

1. Log on to a server or VM in your hybrid environment.
2. Open Windows PowerShell in elevated (administrative) mode.
3. Copy and paste the following command block into AWS Tools for Windows PowerShell. Replace the placeholder values with the Activation Code and Activation ID generated when you create a managed-instance activation, and with the identifier of the AWS Region you want to download SSM Agent from.

   region represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as us-east-2 for the US East (Ohio) Region. For a list of supported region values, see the Region column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

   ```powershell
   $code = "activation-code"
   $id = "activation-id"
   $region = "region"
   $dir = $env:TEMP + "\ssm"
   New-Item -ItemType directory -Path $dir -Force
   cd $dir
   Start-Process .\AmazonSSMAgentSetup.exe -ArgumentList @("/q", "/log", "install.log", "CODE=$code", "ID=$id", "REGION=$region") -Wait
   Get-Content ($env:ProgramData + "\Amazon\SSM\InstanceData\registration")
   Get-Service -Name "AmazonSSMAgent"
   ```

4. Press Enter.

The command does the following:

- Downloads and installs SSM Agent onto the server or VM.
- Registers the server or VM with the SSM service.
- Returns a response to the request similar to the following:

   Directory: C:\Users\ADMINI~1\AppData\Local\Temp\2
<table>
<thead>
<tr>
<th>Mode</th>
<th>LastWriteTime</th>
<th>Length</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>d-----</td>
<td>07/07/2018 8:07 PM</td>
<td>------</td>
<td>ssm</td>
</tr>
</tbody>
</table>
   
   
   {"ManagedInstanceID":"mi-008d36be46EXAMPLE","Region":"us-east-2"}
The server or VM is now a managed instance. These instances are now identified with the prefix "mi-". You can view managed instances on the Managed Instances page in the Systems Manager console, by using the AWS CLI command describe-instance-information, or by using the API command DescribeInstanceInformation.

**Note**
You can deregister a managed instance by calling the DeregisterManagedInstance API action from either the AWS CLI or Tools for Windows PowerShell. Here's an example CLI command:

```
aws ssm deregister-managed-instance --instance-id "mi-1234567890"
```

Continue to Step 6: Install SSM Agent for a Hybrid Environment (Linux) (p. 50).

---

**Step 6: Install SSM Agent for a Hybrid Environment (Linux)**

This topic describes how to install SSM Agent on Linux machines in a hybrid environment. If you plan to use Windows Server machines in a hybrid environment, see the previous step, Step 5: Install SSM Agent for a Hybrid Environment (Windows) (p. 48).

**Important**
This procedure is for servers and virtual machines (VMs) in an on-premises or hybrid environment. To download and install SSM Agent on an Amazon EC2 Linux instance, see Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68).

Before you begin, locate the Activation Code and Activation ID that were sent to you after you completed the managed-instance activation earlier in Step 4: Create a Managed-Instance Activation for a Hybrid Environment (p. 45). You specify the Code and ID in the following procedure.

The URLs in the following scripts let you download SSM Agent from *any* AWS region. If you want to download the agent from a *specific* region, copy the URL for your operating system, and then replace `region` with an appropriate value.

`region` represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as `us-east-2` for the US East (Ohio) Region. For a list of supported `region` values, see the `Region` column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

For example, to download SSM Agent for Amazon Linux, RHEL, CentOS, and SLES 64-bit from the US West (N. California) Region (us-west-1), use the following URL:

```
```

- **Amazon Linux 2, Amazon Linux, RHEL, CentOS, and SLES 64-bit**
- **Amazon Linux, RHEL, and CentOS 32-bit**
- **Ubuntu Server 64-bit**
- **Ubuntu Server 32-bit**

- Debian Server 64-bit

- Raspbian

**To install SSM Agent on servers and VMs in your hybrid environment**

1. Log on to a server or VM in your hybrid environment.
2. Copy and paste one of the following command blocks into SSH. Replace the placeholder values with the Activation Code and Activation ID generated when you create a managed-instance activation, and with the identifier of the AWS Region you want to download SSM Agent from.

   Note that `sudo` is not necessary if you are a root user.

   `region` represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as `us-east-2` for the US East (Ohio) Region. For a list of supported `region` values, see the Region column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

**On Amazon Linux, RHEL 6.x, and CentOS 6.x**

```bash
mkdir /tmp/ssm
sudo yum install -y /tmp/ssm/amazon-ssm-agent.rpm
sudo stop amazon-ssm-agent
sudo amazon-ssm-agent -register -code "activation-code" -id "activation-id" -region "region"
sudo start amazon-ssm-agent
```

**On Amazon Linux 2, RHEL 7.x, and CentOS 7.x**

```bash
mkdir /tmp/ssm
sudo yum install -y /tmp/ssm/amazon-ssm-agent.rpm
sudo systemctl stop amazon-ssm-agent
sudo amazon-ssm-agent -register -code "activation-code" -id "activation-id" -region "region"
sudo systemctl start amazon-ssm-agent
```

**On SLES**

```bash
mkdir /tmp/ssm
sudo wget https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/linux_amd64/amazon-ssm-agent.rpm
sudo rpm --install amazon-ssm-agent.rpm
sudo systemctl stop amazon-ssm-agent
sudo amazon-ssm-agent -register -code "activation-code" -id "activation-id" -region "region"
sudo systemctl enable amazon-ssm-agent
sudo systemctl start amazon-ssm-agent
```
Step 6: Install SSM Agent for a Hybrid Environment (Linux)

On Ubuntu

```
mkdir /tmp/ssm
sudo dpkg -i /tmp/ssm/amazon-ssm-agent.deb
sudo service amazon-ssm-agent stop
sudo amazon-ssm-agent -register -code "activation-code" -id "activation-id" -region "region"
sudo service amazon-ssm-agent start
```

On Debian

```
mkdir /tmp/ssm
sudo dpkg -i /tmp/ssm/amazon-ssm-agent.deb
sudo service amazon-ssm-agent stop
sudo amazon-ssm-agent -register -code "activation-code" -id "activation-id" -region "region"
sudo service amazon-ssm-agent start
```

On Raspbian

```
mkdir /tmp/ssm
sudo dpkg -i /tmp/ssm/amazon-ssm-agent.deb
sudo service amazon-ssm-agent stop
sudo amazon-ssm-agent -register -code "activation-code" -id "activation-id" -region "region"
sudo service amazon-ssm-agent start
```

**Note**

If you see the following error in the SSM Agent error logs, then the machine ID did not persist after a reboot:

```
Unable to load instance associations, unable to retrieve associations unable to retrieve associations error occurred in RequestManagedInstanceRoleToken: MachineFingerprintDoesNotMatch: Fingerprint does not match
```

Run the following command to make the machine ID persist after a reboot.

```
umount /etc/machine-id
systemd-machine-id-setup
```

3. Press `Enter`.

The command downloads and installs SSM Agent onto the server or VM in your hybrid environment. The command stops SSM Agent, and then registers the server or VM with the SSM service. The server or VM is now a managed instance. Amazon EC2 instances configured for Systems Manager are also managed instances. In the Amazon EC2 console, however, your on-premises instances are distinguished from Amazon EC2 instances with the prefix "mi-".

**Note**

You can deregister a managed instance by calling the `DeregisterManagedInstance` API action from either the AWS CLI or Tools for Windows PowerShell. Here’s an example CLI command:
Step 7: (Optional) Enable the Advanced-Instances Tier

AWS Systems Manager offers a standard-instances tier and an advanced-instances tier for servers and VMs in your hybrid environment. The standard-instances tier enables you to register a maximum of 1,000 on-premises servers or VMs per AWS account per AWS Region. If you need to register more than 1,000 on-premises servers or VMs in a single account and Region, then use the advanced-instances tier. You can activate as many managed instances in a hybrid environment as you like in the advanced-instances tier. However, all instances configured for Systems Manager using the managed-instance activation process described earlier in Step 4: Create a Managed-Instance Activation for a Hybrid Environment (p. 45) are made available on a pay-per-use basis. This also applies to Amazon EC2 instances that use a Systems Manager on-premises activation (which is not a common scenario).

**Note**

- Advanced instances also enable you to connect to your hybrid machines by using AWS Systems Manager Session Manager. Session Manager provides interactive shell access to your instances. For more information, see AWS Systems Manager Session Manager (p. 567).
- The standard-instances limit also applies to Amazon EC2 instances that use a Systems Manager on-premises activation (which is not a common scenario).
- Microsoft application patching is only available on Amazon EC2 instances and in the advanced-instances tier. To patch Microsoft applications on on-premises servers and VMs, you must enable the advanced-instances tier. For more information, see About Patching Applications on Windows Server (p. 722).

This section describes how to configure your hybrid environment to use the advanced-instances tier.

**Before You Begin**

Review pricing details for advanced instances. Advanced instances are an account-level feature and all on-premises servers and VMs in the account and AWS Region that were added using managed-instance activation are made available on a pay-per-use basis. For more information see, AWS Systems Manager Pricing.

**Configuring Permissions to Enable the Advanced-Instances Tier**

Verify that you have permission in AWS Identity and Access Management (IAM) to change your environment from the standard-instances tier to the advanced-instances tier. You must either have the AdministratorAccess policy attached to your IAM user, group, or role. Or, you must have permission to change the Systems Manager activation-tier service setting. The activation-tier setting uses the following API actions:

- GetServiceSetting
- UpdateServiceSetting
- ResetServiceSetting
Use the following procedure to add an inline IAM policy to a user account. This policy enables a user to view the current managed-instance tier setting. This policy also enables the user to change or reset the current setting in the specified AWS account and Region.

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Users.
3. In the list, choose the name of the user to embed a policy in.
4. Choose the Permissions tab.
5. On the right side of the page, under Permission policies, choose Add inline policy.
6. Choose the JSON tab.
7. Replace the default content with the following:

```json
{
  "Version": "2012-10-17",
  "Statement": [
  {
    "Effect": "Allow",
    "Action": ["ssm:GetServiceSetting"],
    "Resource": "*"
  },
  {
    "Effect": "Allow",
    "Action": ["ssm:ResetServiceSetting",
               "ssm:UpdateServiceSetting"],
  }
  ]
}
```

9. On the Review policy page, for Name, enter a name for the inline policy. For example: Managed-Instances-Tier.
10. Choose Create policy.

Administrators can specify read-only permission by assigning the following inline policy to the user’s account.

```json
{
  "Version": "2012-10-17",
  "Statement": [
  {
    "Effect": "Allow",
    "Action": ["ssm:GetServiceSetting"],
    "Resource": "*"
  },
  {
    "Effect": "Deny",
    "Action": ["ssm:ResetServiceSetting",
               "ssm:UpdateServiceSetting"
```
Enabling the Advanced-Instances Tier (Console)

The following procedure shows you how to use the Systems Manager console to change all on-premises servers and VMs that were added using managed-instance activation, in the specified AWS account and Region, to use the advanced-instances tier.

**Important**
The following procedure describes how to change an account-level setting. This change results in charges being billed to your account. If you want to change back to the standard-instances tier, then you must contact AWS Support.

**To enable the advanced-instances tier (console)**

2. In the navigation pane, choose **Managed instances**.
3. Choose the **Settings** tab.

   If you don't see the **Settings** tab, then do the following:

   1. Verify that the console is open in the AWS Region where you created your managed instances. You can switch Regions by using the list in the top, right corner of the console.
   2. Verify that your instances meet Systems Manager requirements. For information, see **Systems Manager Prerequisites** (p. 12).
   3. For servers and VMs in a hybrid environment, verify that you completed the activation process. For more information, see **Setting Up AWS Systems Manager for Hybrid Environments** (p. 41).
4. Choose **Change account settings**.
5. Review the information in the pop-up about changing account settings, and then, if you approve, choose the option to accept and continue.

The system can take several minutes to complete the process of moving all instances from the standard-instances tier to the advanced-instances tier.

Enabling the Advanced-Instances Tier (AWS CLI)

The following procedure shows you how to use the AWS CLI to change all on-premises servers and VMs that were added using managed-instance activation, in the specified AWS account and Region, to use the advanced-instances tier.

**Important**
The following procedure describes how to change an account-level setting. This change results in charges being billed to your account. If you want to change back to the standard-instances tier, then you must contact AWS Support.

**To enable the advanced-instances tier using the AWS CLI**

1. Open the AWS CLI and run the following command to change all managed instances in the current AWS account and Region to use the advanced-instances tier.

```bash
aws session-manager update-managed-instance-activation --region us-east-1 --account-id 123456789012 --instances 12345678901234567890123456789012 --instance-type-override advanced
```
Enabling the Advanced-Instances Tier (PowerShell)


There is no output if the command succeeds.

2. Run the following command to view the current service settings for managed instances in the current AWS account and Region.


```
{"ServiceSetting": {
  "SettingId": "/ssm/managed-instance/activation-tier",
  "SettingValue": "advanced",
  "LastModifiedDate": 1555603376.138,
  "LastModifiedUser": "arn:aws:sts::123456789012:assumed-role/Administrator/Jasper",
  "Status": "PendingUpdate"
}}
```

The system can take several minutes to complete the process of moving all instances from the standard-instances tier to the advanced-instances tier.

Enabling the Advanced-Instances Tier (PowerShell)

The following procedure shows you how to use the AWS Tools for Windows PowerShell to change all on-premises servers and VMs that were added using managed-instance activation, in the specified AWS account and Region, to use the advanced-instances tier.

Important
The following procedure describes how to change an account-level setting. This change results in charges being billed to your account. If you want to change back to the standard-instances tier, then you must contact AWS Support.

To enable the advanced-instances tier using PowerShell

1. Change all managed instances in the current AWS account and Region to use the advanced-instances tier using the AWS Tools for Windows PowerShell.

```
```

There is no output if the command succeeds.

2. Run the following command to view the current service settings for managed instances in the current AWS account and Region.

```
```
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LastModifiedDate</td>
<td>4/18/2019 4:02:56 PM</td>
</tr>
<tr>
<td>LastModifiedUser</td>
<td>arn:aws:sts::123456789012:assumed-role/Administrator/Jasper</td>
</tr>
<tr>
<td>SettingId</td>
<td>/ssm/managed-instance/activation-tier</td>
</tr>
<tr>
<td>SettingValue</td>
<td>advanced</td>
</tr>
<tr>
<td>Status</td>
<td>PendingUpdate</td>
</tr>
</tbody>
</table>

The system can take several minutes to complete the process of moving all instances from the standard-instances tier to the advanced-instances tier.
Getting Started with AWS Systems Manager

This section helps you learn about and use AWS Systems Manager after your organization completes the setup steps in Setting Up AWS Systems Manager (p. 23) or Setting Up AWS Systems Manager for Hybrid Environments (p. 41).

Before You Begin

The following is useful background information to help you get started:

- The topic What Is AWS Systems Manager? (p. 1)
- The Amazon EC2 Getting Started Guide (if you are managing Amazon Elastic Compute Cloud (Amazon EC2) instances in your account).
- Understanding the Systems Manager setup requirements helps you troubleshoot problems you encounter while you use Systems Manager, such as with permissions or resource availability:
  - Setting Up AWS Systems Manager (p. 23)
  - Setting Up AWS Systems Manager for Hybrid Environments (p. 41)

When you are ready, continue with the following steps.

Topics

- Step 1: Install or Upgrade the AWS CLI (p. 58)
- Step 2: Install or Upgrade the AWS Tools for PowerShell (p. 59)
- Step 3: Practice Installing or Updating SSM Agent on an Instance (p. 60)
- Step 4: Try Systems Manager Tutorials and Walkthroughs (p. 61)

Step 1: Install or Upgrade the AWS CLI

This topic is for users who have programmatic access to use Systems Manager (or any other AWS service), and who want to run AWS CLI commands from their local machines.

Note
Programmatic access and console access are different permissions that can be granted to a user account by an AWS account administrator. A user can be granted one or both access types. For information, see Create Non-Admin IAM Users and Groups for Systems Manager (p. 25).

For information about the AWS CLI, see the AWS Command Line Interface User Guide.

For information about all Systems Manager commands you can run using the AWS CLI, see the Systems Manager section of the AWS CLI Command Reference.

To install or upgrade and then configure the AWS CLI

1. Follow the instructions in Installing the AWS Command Line Interface in the AWS Command Line Interface User Guide to install or upgrade the AWS CLI on your local machine.
Step 2: Install or Upgrade the AWS Tools for PowerShell

This topic is for users who have programmatic access to use Systems Manager (or any other AWS service), and who want to run AWS Tools for PowerShell commands from their local machines.

To install or upgrade and then configure the AWS Tools for Windows PowerShell


   Tip
   AWS Tools for PowerShell is frequently updated with new functionality. Upgrade (reinstall) the AWS Tools for PowerShell periodically to ensure that you have access to all the latest functionality.
Step 3: Practice Installing or Updating SSM Agent on an Instance

AWS Systems Manager is Amazon software that can be installed and configured on an Amazon EC2 instance, an on-premises server, or a virtual machine (VM). SSM Agent makes it possible for Systems Manager to update, manage, and configure these resources. The agent processes requests from the Systems Manager service in the AWS Cloud, and then runs them as specified in the request. SSM Agent then sends status and execution information back to the Systems Manager service by using the Amazon Message Delivery Service (service prefix: ec2messages).

In this task, you install or update the SSM Agent on an Amazon EC2 instance.

Note
If you are working with your own on-premises servers or VMs, see the following topics:

- Install SSM Agent for a Hybrid Environment (Windows) (p. 48)
- Install SSM Agent for a Hybrid Environment (Linux) (p. 50)

Prerequisites
An instance profile for Systems Manager must already be attached to the Amazon EC2 instance that you update. Refer to the following topics as needed to meet this requirement:

- Create an EC2 instance profile for Systems Manager: Create an IAM Instance Profile for Systems Manager (p. 29)
- Attach the instance profile to an EC2 instance when you create the instance: Attach an IAM Instance Profile to an Amazon EC2 Instance (p. 34)
- Attach the instance profile to an existing EC2 instance: Attaching an IAM Role to an Instance in the Amazon EC2 User Guide


In this step, you specify credentials that an AWS administrator in your organization has given you, using the following command.

```
Set-AWSCredential -AccessKey AKIAIOSFODNN7EXAMPLE -SecretKey wJalrXUtNhFEM1/K7MDENG/bPxRfY4XYEAEXKEY -StoreAs MyProfileName
```

Important
When you configure AWS Tools for PowerShell, you can run Set-DefaultAWSRegion to specify an AWS Region. Choose one of the supported Regions listed for Systems Manager in the Region and Endpoints topic in the AWS General Reference. If necessary, first verify with an administrator for your AWS account which Region you should choose.

For more information about access keys, see Managing Access Keys for IAM Users in the IAM User Guide.

3. To verify the installation or upgrade, run the following command from AWS Tools for PowerShell.

```
Get-AWSCmdletName -Service SSM
```

If successful, this command displays a list of available Systems Manager cmdlets.
Windows Server instance

To practice installing or updating SSM Agent on an Amazon EC2 instance running Windows Server instance, follow the steps in Install and Configure SSM Agent on Amazon EC2 Windows Instances (p. 66).

Linux instance

To practice installing or updating SSM Agent on an Amazon EC2 instance running Linux, follow the steps for your Linux operating system type in Manually Install SSM Agent on Amazon EC2 Linux Instances (p. 69).

Step 4: Try Systems Manager Tutorials and Walkthroughs

This topic guides you to tutorials, walkthroughs, and basic tasks to help you learn how to use Systems Manager.

Because Systems Manager is a collection of several capabilities, no single walkthrough or tutorial can introduce the entire service. Therefore, we've provided links to resources according to the capability for which they provide practice.

In most cases, you do not need to complete additional setup or configuration tasks before you start. You can complete all of the tasks if you have necessary permissions and, where needed, access to one or more managed instances.

In some cases, additional configuration, setup, or experience with Systems Manager are required before you try a tutorial or walkthrough. We have identify those tutorials and walkthroughs as "Advanced".

Compliance

The AWS Systems Manager Configuration Compliance (p. 504) capability scans your fleet of managed instances for patch compliance and configuration inconsistencies.

- Configuration Compliance Walkthrough (AWS CLI) (p. 511)

Run Command

The AWS Systems Manager Run Command (p. 615) capability provides you safe, secure remote management of your instances at scale without logging into your servers, replacing the need for bastion hosts, SSH, or remote PowerShell. It provides a simple way of automating common administrative tasks across groups of instances such as registry edits, user management, and software and patch installations.

- Walkthrough: Use the AWS CLI with Run Command (p. 634)
- Walkthrough: Use the AWS Tools for Windows PowerShell with Run Command (p. 637)

Session Manager

The AWS Systems Manager Session Manager (p. 567) capability lets you manage your Amazon EC2 instances through an interactive one-click browser-based shell or through the AWS CLI without the need to open inbound ports, maintain bastion hosts, or manage SSH keys.

- Working with Session Manager (p. 601)

Distributor
The **AWS Systems Manager Distributor** capability lets you package your own software—or find AWS-provided agent software packages, such as AmazonCloudWatchAgent—to install on Systems Manager managed instances.

- Create a Package (p. 757)
- Step 4: Add a Package to Distributor (p. 766)

**Patch Manager**

The **AWS Systems Manager Patch Manager** capability helps you select and deploy operating system and software patches automatically across large groups of Amazon EC2 instances or on-premises servers and VMs.

- Create a Custom Patch Baseline (p. 724)
- Create a Patch Group (p. 728)
- Tutorial: Patch a Server Environment (AWS CLI) (p. 735)

**Maintenance Windows**

The **AWS Systems Manager Maintenance Windows** capability lets you define a schedule for performing potentially disruptive actions on your managed instances, such as patching an operating system, updating drivers, or installing software or patches.

- Tutorial: Create and Configure a Maintenance Window (AWS CLI) (p. 463)
- Tutorial: Update a Maintenance Window (AWS CLI) (p. 490)
- Tutorial: View Information About a Maintenance Windows (AWS CLI) (p. 479)
- Tutorial: View Information About Tasks and Task Executions (AWS CLI) (p. 488)

**State Manager**

The **AWS Systems Manager State Manager** capability helps you maintain consistent configuration of your Amazon EC2 instances or on-premises servers and VMs, in a state that you define. Using State Manager, you can control configuration details such as server configurations, anti-virus definitions, firewall settings, and more.

- Creating Associations that Run MOF Files (p. 670)
- Automatically Update SSM Agent (CLI) (p. 684)
- Walkthrough: Automatically Update PV Drivers on EC2 Windows Instances (Console) (p. 685)

**Documents**

The **AWS Systems Manager Documents** capability lets you create and manage **SSM documents**. An SSM document defines the actions that Systems Manager performs on your managed instances. Systems Manager includes more than a dozen pre-configured documents that you can use by specifying parameters at runtime. Documents use JavaScript Object Notation (JSON) or YAML, and they include steps and parameters that you specify.

- Copy a Document (p. 788)
- Add a Systems Manager Document (Console) (p. 789)
- Create an SSM Document (AWS CLI) (p. 789)
- Create an SSM Document (Tools for Windows PowerShell) (p. 789)

**Parameter Store**
The AWS Systems Manager Parameter Store (p. 828) capability provides a centralized store to manage your configuration data, whether plain-text data such as database strings or secrets such as passwords. This allows you to separate your secrets and configuration data from your code. Parameters can be tagged and organized into hierarchies, helping you manage parameters more easily.

- **Walkthrough: Create and Use a Parameter in a Command (Console)** (p. 878)
- **Walkthrough: Create and Use a Parameter in a Command (AWS CLI)** (p. 879)
- **Walkthrough: Manage Parameters Using Hierarchies (AWS CLI)** (p. 883)
- **Advanced: Walkthrough: Create a Secure String Parameter and Join an Instance to a Domain (PowerShell)** (p. 881)

### Inventory

The AWS Systems Manager Inventory (p. 512) capability collects information about your instances and the software installed on them, helping you to understand your system configurations and installed applications.

- **Advanced: Walkthrough: Assign Custom Inventory Metadata to an Instance** (p. 553)
- **Advanced: Walkthrough: Configure Your Managed Instances for Inventory by Using the CLI** (p. 554)
- **Advanced: Walkthrough: Use Resource Data Sync to Aggregate Inventory Data** (p. 556)

### Automation

The AWS Systems Manager Automation (p. 142) capability allows you to safely automate operations and management tasks across AWS resources. You can automate common IT tasks, safely perform disruptive tasks in bulk, simplify complex tasks, enhance operations security, and use stored configuration scripts share best practices with the rest of your organization.

- **Advanced: Patch a Linux AMI (Console)** (p. 400)
- **Advanced: Patch a Linux AMI (AWS CLI)** (p. 403)
- **Advanced: Patch a Windows AMI** (p. 408)
- **Advanced: Simplify AMI Patching Using Automation, Lambda, and Parameter Store** (p. 412)
- **Advanced: Patch an AMI and Update an Auto Scaling Group** (p. 417)
- **Advanced: Run the EC2Rescue Tool on Unreachable Instances** (p. 422)
- **Advanced: Reset Passwords and SSH Keys on Amazon EC2 Instances** (p. 426)
- **Advanced: Using Automation with Jenkins** (p. 431)
Working with SSM Agent

AWS Systems Manager Agent (SSM Agent) is Amazon software that can be installed and configured on an Amazon EC2 instance, an on-premises server, or a virtual machine (VM). SSM Agent makes it possible for Systems Manager to update, manage, and configure these resources. The agent processes requests from the Systems Manager service in the AWS Cloud, and then runs them as specified in the request. SSM Agent then sends status and execution information back to the Systems Manager service by using the Amazon Message Delivery Service (service prefix: ec2messages).

If you monitor traffic, you will see your Amazon EC2 instances, and any on-premises servers or VMs in your hybrid environment, communicating with endpoints. For more information, see Reference: ec2messages, ssmmessages, and Other API Calls (p. 944). For information about porting SSM Agent logs to Amazon CloudWatch Logs, see Monitoring AWS Systems Manager (p. 885).

Keeping SSM Agent up-to-date

An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

Note

AMIs that include SSM Agent by default can take up to two weeks to be updated with the newest version of SSM Agent. We recommend that you configure even more frequent automated updates to SSM Agent.

Updated versions of SSM Agent are rolled out to new AWS Regions at different times. For this reason, you might receive the "Unsupported on current platform" error when trying to deploy a new version of SSM Agent in a Region.

About the local ssm-user account

Starting with version 2.3.50.0 of SSM Agent, the agent creates a local user account called ssm-user and adds it to /etc/sudoers (Linux) or to the Administrators group (Windows). On agent versions before 2.3.612.0, the account is created the first time SSM Agent starts or restarts after installation. On version 2.3.612.0 and later, the ssm-user account is created the first time a session is started on an instance. This ssm-user is the default OS user when a Session Manager session is started. You can change the permissions by moving ssm-user to a less-privileged group or by changing the sudoers file. The ssm-user account is not removed from the system when SSM Agent is uninstalled.

On Windows Server, SSM Agent handles setting a new password for the ssm-user account when each session starts. No passwords are set for ssm-user on Linux managed instances.

Starting with SSM Agent version 2.3.612.0, the ssm-user account is not created automatically on Windows Server machines that are being used as domain controllers. To use Session Manager on a Windows Server domain controller, you must create the ssm-user account manually if it isn't already present.

Important

In order for the ssm-user account to be created, the instance profile attached to the instance must provide the necessary permissions. For information, see Verify or Create an IAM Instance Profile with Session Manager Permissions (p. 573).

AMIs with SSM Agent preinstalled
SSM Agent is preinstalled, by default, on the following Amazon Machine Images (AMIs):

- Windows Server 2003-2012 R2 AMIs published in November 2016 or later
- Windows Server 2016 and 2019
- Amazon Linux
- Amazon Linux 2
- Ubuntu Server 16.04
- Ubuntu Server 18.04

You must manually install SSM Agent on Amazon EC2 instances created from other Linux AMIs, including non-base images like Amazon ECS-Optimized AMIs. You must also manually install SSM Agent on on-premises servers or VMs in your hybrid environment. For more information, see Setting Up AWS Systems Manager for Hybrid Environments (p. 41).

SSM Agent on GitHub

The source code for SSM Agent is available on GitHub so that you can adapt the agent to meet your needs. We encourage you to submit pull requests for changes that you would like to have included. However, Amazon Web Services does not currently provide support for running modified copies of this software.

Contents

- Installing and Configuring SSM Agent on Windows Instances (p. 65)
- Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68)
- Restrict Access to Root-Level Commands Through SSM Agent (p. 85)
- Automate Updates to SSM Agent (p. 86)
- Subscribe to SSM Agent Notifications (p. 86)
- About Minimum S3 Bucket Permissions for SSM Agent (p. 87)

Installing and Configuring SSM Agent on Windows Instances

SSM Agent is installed by default on instances created from Windows Server 2016 and Windows Server 2019 Amazon Machine Images (AMIs), and on instances created from Windows Server 2003-2012 R2 AMIs published in November 2016 or later.

Windows AMIs published before November 2016 use the EC2Config service to process requests and configure instances.

Unless you have a specific reason for using the EC2Config service, or an earlier version of SSM Agent, to process Systems Manager requests, we recommend that you download and install the latest version of SSM Agent to each of your Amazon EC2 instances or hybrid instances that are configured for Systems Manager.

Important

An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.
Install and Configure SSM Agent on Amazon EC2 Windows Instances

SSM Agent is installed by default on instances created from Windows Server 2016 and Windows Server 2019 Amazon Machine Images (AMIs), and on instances created from Windows Server 2003-2012 R2 AMIs published in November 2016 or later.

If your instance is a Windows Server 2003-2012 R2 instance created before November 2016, then EC2Config processes Systems Manager requests on your instance. We recommend that you upgrade your existing instances to use the latest version of EC2Config. By using the latest EC2Config installer, you install SSM Agent side-by-side with EC2Config. This side-by-side version of SSM Agent is compatible with your instances created from earlier Windows AMIs and enables you to use SSM features published after November 2016. For information about how to install the latest version of the EC2Config service, see Installing the Latest Version of EC2Config in the Amazon EC2 User Guide for Windows Instances.

**Important**
An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

If necessary, you can manually download and install the latest version of SSM Agent on your Amazon EC2 Windows instance by using the following procedure.

**Important**
This procedure applies to installing or reinstalling SSM Agent on an Amazon EC2 Windows instance. If you need to install the agent on an on-premises server or a virtual machine (VM) so it can be used with Systems Manager, see Install SSM Agent for a Hybrid Environment (Windows) (p. 48).

**To manually download and install the latest version of SSM Agent**
1. Log in to your instance by using Remote Desktop or Windows PowerShell.
2. Download the latest version of SSM Agent to your instance. You have two options for downloading:
   a. **PowerShell**

   Run the following PowerShell command. This command enables you to download SSM Agent without adjusting Internet Explorer (IE) Enhanced Security settings.

   ```powershell
   Invoke-WebRequest https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/windows_amd64/AmazonSSMAgentSetup.exe -OutFile $env:USERPROFILE\Desktop\SSMAgent_latest.exe
   ```

   **Note**
The URLs in this step let you download SSM Agent from any AWS region. If you want to download the agent from a specific region, use a region-specific URL instead:
View SSM Agent Logs on Windows Instances

SSM Agent writes information about executions, scheduled actions, errors, and health statuses to log files on each instance. You can view log files by manually connecting to an instance, or you can automatically send logs to Amazon CloudWatch Logs. For more information about sending logs to CloudWatch, see Monitoring AWS Systems Manager (p. 885).

You can view SSM Agent log files on Windows instances in the following locations.

- \%PROGRAMDATA\%\Amazon\SSM\Logs\amazon-ssm-agent.log
- \%PROGRAMDATA\%\Amazon\SSM\Logs\errors.log

For information about enabling SSM Agent debug logging, see Enable SSM Agent Debug Logging (p. 647).

Configure SSM Agent to Use a Proxy for Windows Instances

The information in this topic applies to Windows Server instances created in or after November 2016 that do not use the Nano installation option.

If your instance is a Windows Server 2003-2012 R2 instance created before November 2016, then EC2Config processes Systems Manager requests on your instance. For information about configuring EC2Config to use a proxy, see Configure Proxy Settings for the EC2Config Service.

For Windows Server 2016 instances that use the Nano installation option (Nano Server), you must connect using PowerShell. For more information, see Connect to a Windows Server 2016 Nano Server Instance.
To configure SSM Agent to use a proxy

1. Using Remote Desktop or Windows PowerShell, connect to the instance that you would like to configure to use a proxy.
2. Run the following command block in PowerShell. Replace hostname and port with the information about your proxy:

```powershell
#serviceKey = "HKLM:\SYSTEM\CurrentControlSet\Services\AmazonSSMAgent"
$keyInfo = (Get-Item -Path $serviceKey).GetValue("Environment")
$proxyVariables = @("http_proxy=hostname:port", "no_proxy=169.254.169.254")
If($keyInfo -eq $null)
{
    New-ItemProperty -Path $serviceKey -Name Environment -Value $proxyVariables -PropertyType MultiString -Force
} else {
    Set-ItemProperty -Path $serviceKey -Name Environment -Value $proxyVariables
}
Restart-Service AmazonSSMAgent
```

To reset SSM Agent proxy configuration

1. Using Remote Desktop or Windows PowerShell, connect to the instance to configure.
2. If you connected using Remote Desktop, launch PowerShell as an administrator.
3. Run the following command block in PowerShell:

```powershell
Remove-ItemProperty -Path HKLM:\SYSTEM\CurrentControlSet\Services\AmazonSSMAgent -Name Environment
Restart-Service AmazonSSMAgent
```

Installing and Configuring SSM Agent on Amazon EC2 Linux Instances

SSM Agent processes Systems Manager requests and configures your machine as specified in the request. Use the following procedures to install, configure, or uninstall SSM Agent.

**Important**

- SSM Agent is installed, by default, on Amazon Linux base AMIs dated 2017.09 and later. SSM Agent is also installed, by default, on Amazon Linux 2, Ubuntu Server 16.04, and Ubuntu Server 18.04 LTS AMIs.
- You must manually install SSM Agent on other versions of Linux, including non-base images like Amazon ECS-Optimized AMIs.

The source code for SSM Agent is available on GitHub so that you can adapt the agent to meet your needs. We encourage you to submit pull requests for changes that you would like to have included. However, AWS does not currently provide support for running modified copies of this software.

**Note**

To view details about the different versions of SSM Agent, see the release notes.

**Topics**

- Manually Install SSM Agent on Amazon EC2 Linux Instances (p. 69)
Manually Install SSM Agent on Amazon EC2 Linux Instances

Use one of the following scripts to install SSM Agent on one of the following Linux instances.

- Amazon Linux and Amazon Linux 2 (p. 69)
- Ubuntu Server (p. 71)
- Debian Server (p. 75)
- Red Hat Enterprise Linux (RHEL) (p. 77)
- CentOS (p. 78)
- SUSE Linux Enterprise Server (SLES) 12 (p. 79)
- Raspbian (p. 80)

The URLs in the following scripts let you download SSM Agent from any AWS region. If you want to download the agent from a specific region, see Download SSM Agent from a Specific Region (p. 81).

After you manually install SSM Agent, you can automatically update SSM Agent on your instances when new versions become available by using Systems Manager State Manager. For more information, see Automatically Update SSM Agent (CLI) (p. 684).

Important
These procedures apply to installing or reinstalling SSM Agent on Amazon EC2 Linux instances. If you need to install the agent on an on-premises server or a virtual machine (VM) so it can be used with Systems Manager, see Install SSM Agent for a Hybrid Environment (Linux) (p. 50).

Amazon Linux and Amazon Linux 2

Connect to your Amazon Linux or Amazon Linux 2 instance and perform the following steps to install SSM Agent. Perform these steps on each instance that will run commands using Systems Manager.

Important

- SSM Agent is installed, by default, on Amazon Linux base AMIs dated 2017.09 and later. SSM Agent is also installed, by default, on Amazon Linux 2 AMIs.
- You must manually install SSM Agent on other versions of Linux, including non-base images like Amazon ECS-Optimized AMIs.
- Instances created from an Amazon Linux AMI that are using a proxy must be running a current version of the Python requests module in order to support Patch Manager operations. For more information, see Upgrade the Python Requests Module on Amazon Linux Instances That Use a Proxy Server (p. 84).

To install SSM Agent on Amazon Linux or Amazon Linux 2

1. Use one of the following commands to download and run the SSM Agent installer.

   ![Image]

   Even though the following download URLs show `ec2-downloads-windows`, these are the correct URLs for downloading Amazon Linux and Amazon Linux 2.

   Intel (x86_64) 64-bit instances:
Manually Install SSM Agent on Amazon EC2 Linux Instances

```bash
sudo yum install -y https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/linux_amd64/amazon-ssm-agent.rpm
```

**ARM (arm64) 64-bit instances:**

```bash
sudo yum install -y https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/linux_arm64/amazon-ssm-agent.rpm
```

**Intel (x86) 32-bit instances:**

```bash
```

2. Run the following command to determine if SSM Agent is running. The command should return the message "amazon-ssm-agent is running."

**Amazon Linux**

```bash
sudo status amazon-ssm-agent
```

**Amazon Linux 2**

```bash
sudo systemctl status amazon-ssm-agent
```

3. Run the following commands if the previous command returns the message "amazon-ssm-agent is stopped."

a. Start the service.

**Amazon Linux**

```bash
sudo start amazon-ssm-agent
```

**Amazon Linux 2**

```bash
sudo systemctl enable amazon-ssm-agent
sudo systemctl start amazon-ssm-agent
```

b. Check the status of the agent.

**Amazon Linux**

```bash
sudo status amazon-ssm-agent
```

**Amazon Linux 2**

```bash
sudo systemctl status amazon-ssm-agent
```

**Important**

An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running...
on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

Ubuntu Server

Connect to your Ubuntu Server instance and perform the steps in one of following procedures to install SSM Agent on each instance that will run commands using Systems Manager.

Topics

• About SSM Agent installations on 64-bit Ubuntu Server 16.04 instances (p. 71)
• Install SSM Agent on Ubuntu Server 18.04 and 16.04 LTS 64-bit instances (with Snap package) (p. 71)
• Install SSM Agent on Ubuntu Server 16.04 and 14.04 64-bit instances (with deb installer package) (p. 73)
• Install SSM Agent on Ubuntu Server 16.04 and 14.04 32-bit instances (p. 74)

About SSM Agent installations on 64-bit Ubuntu Server 16.04 instances

Beginning with instances created from Ubuntu Server 16.04 AMIs identified with 20180627, SSM Agent is pre-installed using Snap packages. For example: ubuntu/images/hvm-ssd/ubuntu-xenial-16.04-amd64-server-20180627. On instances created from earlier AMIs, you should continue using deb installer packages.

Important
Be aware that if an instance has more than one installation of the SSM Agent (for example, one installed using a Snap, one installed using a deb installer), your agent operations will not work correctly.

You can check the source AMI ID for an instance following these steps:

1. Open the Amazon EC2 console at https://console.aws.amazon.com/ec2/.
2. In the left navigation, choose Instances.
3. Select an instance.
4. On the Description tab, locate the value in the AMI ID field.

For instances created from a 64-bit Ubuntu Server 16.04 AMI, be sure to follow the correct procedure for your SSM Agent installation type:

• Instances created from AMIs with identifier 20180627 or later: Install SSM Agent on Ubuntu Server 18.04 and 16.04 LTS 64-bit instances (with Snap package) (p. 71)
• Instances created from AMIs earlier than 20180627: Install SSM Agent on Ubuntu Server 16.04 and 14.04 64-bit instances (with deb installer package) (p. 73)

Install SSM Agent on Ubuntu Server 18.04 and 16.04 LTS 64-bit instances (with Snap package)

1. SSM Agent is installed, by default, on Ubuntu Server 18.04 and on 16.04 LTS 64-bit AMIs with an identifier of 20180627 or later. For more information about version 16.04 AMIs, see About SSM Agent installations on 64-bit Ubuntu Server 16.04 instances (p. 71).
You can use the following script if you need to install SSM Agent on an on-premises server or if you need to reinstall the agent. You don't need to specify a URL for the download, because the snap command automatically downloads the agent from the Snap app store at https://snapcraft.io.

```
sudo snap install amazon-ssm-agent --classic
```

**Note**

Note the following details about SSM Agent on Ubuntu Server 18.04 and 16.04:

- Because of a known issue with Snap, you might see a `Maximum timeout exceeded` error with `snap` commands. If you get this error, run the following commands one at a time to start the agent, stop it, and check its status:

  ```
sudo systemctl start snap.amazon-ssm-agent.amazon-ssm-agent.service
  
sudo systemctl stop snap.amazon-ssm-agent.amazon-ssm-agent.service
  
sudo systemctl status snap.amazon-ssm-agent.amazon-ssm-agent.service
  ```

- On Ubuntu Server 18.04 and 16.04, SSM Agent installer files, including agent binaries and config files, are stored in the following directory: `/snap/amazon-ssm-agent/current/`. If you make changes to the config files (`amazon-ssm-agent.json.template` and `seelog.xml.template`) then you must copy these files from the `/snap` folder to the `/etc/amazon/ssm/` folder. Log and library files have not changed (`/var/lib/amazon/ssm`, `/var/log/amazon/ssm`).

- On Ubuntu Server 18.04, use Snaps only. Don't install deb packages. Also verify that only one instance of the agent is installed and running on your instances.

- On Ubuntu Server 18.04 and 16.04, SSM Agent provides support for the arm64 processor architecture.

- On Ubuntu Server 16.04, SSM Agent is installed using either Snaps or deb installation packages, depending on the version of the 16.04 AMI. For more information, see About SSM Agent installations on 64-bit Ubuntu Server 16.04 instances (p. 71).

2. Run the following command to determine if SSM Agent is running.

   ```
sudo snap list amazon-ssm-agent
   ```

3. Run the following command to start the service if the previous command returned `amazon-ssm-agent is stopped, inactive, or disabled`.

   ```
sudo snap start amazon-ssm-agent
   ```

4. Check the status of the agent.

   ```
sudo snap services amazon-ssm-agent
   ```

**Important**

An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.
Install SSM Agent on Ubuntu Server 16.04 and 14.04 64-bit instances (with deb installer package)

1. You can use the following script if you need to install SSM Agent on an on-premises server or if you need to reinstall the agent.

   **Important**
   SSM Agent is installed by default on instances created from Ubuntu Server 16.04 LTS 64-bit AMIs with an identifier of 20180627 or later. Instances created from AMIs with earlier identifiers, for example 20171121.1 and 20180522, should continue to use deb installers.

   If SSM Agent is installed on your instance in conjunction with a Snap and you install or update SSM Agent using a deb installer package, the installation or SSM Agent operations may fail. For more information, see About SSM Agent installations on 64-bit Ubuntu Server 16.04 instances (p. 71)

   Create a temporary directory on the instance.

   ```bash
   mkdir /tmp/ssm
   ```

   Change to the temporary directory.

   ```bash
   cd /tmp/ssm
   ```

   Run the following commands.

   **Note**
   Even though the following download URL shows 'ec2-downloads-windows', this is the correct URL.

   ```bash
   wget https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/debian_amd64/amazon-ssm-agent.deb
   ```

   ```bash
   sudo dpkg -i amazon-ssm-agent.deb
   ```

2. Run one of the following commands to determine if SSM Agent is running.

   Ubuntu Server 16.04:

   ```bash
   sudo systemctl status amazon-ssm-agent
   ```

   Ubuntu Server 14.04:

   ```bash
   sudo status amazon-ssm-agent
   ```

3. Run one of the following commands to start the service if the previous command returned amazon-ssm-agent is stopped, inactive, or disabled.

   Ubuntu Server 16.04:

   ```bash
   sudo systemctl enable amazon-ssm-agent
   ```

   Ubuntu Server 14.04:

   ```bash
   sudo start amazon-ssm-agent
   ```
4. Run one of the following commands to check the status of the agent.

Ubuntu Server 16.04:

```
sudo systemctl status amazon-ssm-agent
```

Ubuntu Server 14.04:

```
sudo status amazon-ssm-agent
```

**Important**
An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

**Install SSM Agent on Ubuntu Server 16.04 and 14.04 32-bit instances**

1. Create a temporary directory on the instance.

```
mkdir /tmp/ssm
```

Change to the temporary directory.

```
cd /tmp/ssm
```

Run the following commands.

**Note**
Even though the following download URL shows 'ec2-downloads-windows', this is the correct URL.

```
```

```
sudo dpkg -i amazon-ssm-agent.deb
```

2. Run the following command to determine if SSM Agent is running:

```
sudo status amazon-ssm-agent
```

3. Run the following commands if the previous command returned `amazon-ssm-agent is stopped, inactive, or disabled`.

   a. Start the agent:

```
sudo start amazon-ssm-agent
```

   b. Check the status of the agent:

```
sudo status amazon-ssm-agent
```
Important
An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

Debian Server

Connect to your Debian Server instance and perform the steps in one of following procedures to install SSM Agent on each instance that will run commands using Systems Manager.

Topics
- Install SSM Agent on Debian Server 9 64-bit instances (with deb installer package) (p. 75)
- Install SSM Agent on Debian Server 8 64-bit instances (with deb installer package) (p. 76)

Install SSM Agent on Debian Server 9 64-bit instances (with deb installer package)

1. Connect to your Debian Server instance and perform the following steps to install SSM Agent. Perform these steps on each instance that will run commands using Systems Manager.

   Create a temporary directory on the instance.

   ```
   mkdir /tmp/ssm
   ```

   Change to the temporary directory.

   ```
   cd /tmp/ssm
   ```

   Run the following commands.

   **Note**
   Even though the following download URL shows 'ec2-downloads-windows', this is the correct URL.

   ```
   wget https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/debian_amd64/amazon-ssm-agent.deb
   ```

   ```
   sudo dpkg -i amazon-ssm-agent.deb
   ```

2. Run following command to determine if SSM Agent is running.

   ```
   sudo systemctl status amazon-ssm-agent
   ```

3. Run the following command to start the service if the previous command returned `amazon-ssm-agent is stopped, inactive, or disabled`.

   ```
   sudo systemctl enable amazon-ssm-agent
   ```

4. Run the following command to check the status of the agent.

   ```
   sudo systemctl status amazon-ssm-agent
   ```
Important
An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

Install SSM Agent on Debian Server 8 64-bit instances (with deb installer package)
1. Connect to your Debian Server instance and perform the following steps to install SSM Agent. Perform these steps on each instance that will run commands using Systems Manager.

Create a temporary directory on the instance.

```bash
mkdir /tmp/ssm
```

Change to the temporary directory.

```bash
cd /tmp/ssm
```

Run the following commands.

**Note**
Even though the following download URL shows ‘ec2-downloads-windows’, this is the correct URL.

```bash
wget https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/debian_amd64/amazon-ssm-agent.deb
```

```bash
sudo dpkg -i amazon-ssm-agent.deb
```

2. Run following command to determine if SSM Agent is running.

```bash
sudo systemctl status amazon-ssm-agent
```

3. Run the following command to start the service if the previous command returned amazon-ssm-agent is stopped, inactive, or disabled.

```bash
sudo systemctl enable amazon-ssm-agent
```

4. Run the following command to check the status of the agent.

```bash
sudo systemctl status amazon-ssm-agent
```

Important
An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running
on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

Red Hat Enterprise Linux (RHEL)

Connect to your RHEL instance and perform the following steps to install SSM Agent. Perform these steps on each instance that will run commands using Systems Manager.

To install SSM Agent on Red Hat Enterprise Linux

1. Use one of the following commands to download and run the SSM Agent installer.

   Note
   Even though the following download URLs show 'ec2-downloads-windows', these are the correct URLs.

   Intel (x86_64) 64-bit instances:
   ```bash
   sudo yum install -y https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/linux_amd64/amazon-ssm-agent.rpm
   ```

   ARM (arm64) 64-bit instances:
   ```bash
   sudo yum install -y https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/linux_arm64/amazon-ssm-agent.rpm
   ```

   Intel (x86) 32-bit instances:
   ```bash
   ```

2. Run one of the following commands to determine if SSM Agent is running. The command should return the message `amazon-ssm-agent is running`.

   RHEL 7.x:
   ```bash
   sudo systemctl status amazon-ssm-agent
   ```

   RHEL 6.x:
   ```bash
   sudo status amazon-ssm-agent
   ```

3. Run the following commands if the previous command returned `amazon-ssm-agent is stopped`.

   a. Start the service.

      RHEL 7.x:
      ```bash
      sudo systemctl enable amazon-ssm-agent
      ```

      ```bash
      sudo systemctl start amazon-ssm-agent
      ```

      RHEL 6.x:
b. Check the status of the agent.

RHEL 7.x:

```bash
sudo systemctl status.amazon-ssm-agent
```

RHEL 6.x:

```bash
sudo status.amazon-ssm-agent
```

**Important**

An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

**CentOS**

Connect to your CentOS instance and perform the following steps to install the SSM Agent. Perform these steps on each instance that will run commands using Systems Manager.

**To install SSM Agent on CentOS**

1. Use one of the following commands to download and run the SSM Agent installer.

   **Note**

   Even though the following download URLs show 'ec2-downloads-windows', these are the correct URLs.

   64-bit instances:

   ```bash
   sudo yum install -y https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/linux_amd64/amazon-ssm-agent.rpm
   ```

   32-bit instances:

   ```bash
   ```

2. Run one of the following commands to determine if SSM Agent is running. The command should return the message `amazon-ssm-agent` is running.

   **CentOS 7.x:**

   ```bash
   sudo systemctl status amazon-ssm-agent
   ```

   **CentOS 6.x:**

   ```bash
   sudo status amazon-ssm-agent
   ```
3. Run the following commands if the previous command returned `amazon-ssm-agent is stopped`.
   a. Start the service.
      
      CentOS 7.x:
      ```
      sudo systemctl enable amazon-ssm-agent
      sudo systemctl start amazon-ssm-agent
      ```
      
      CentOS 6.x:
      ```
      sudo start amazon-ssm-agent
      ```
   b. Check the status of the agent.
      
      CentOS 7.x:
      ```
      sudo systemctl status amazon-ssm-agent
      ```
      
      CentOS 6.x:
      ```
      sudo status amazon-ssm-agent
      ```

   **Important**
   An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

**SUSE Linux Enterprise Server (SLES) 12**

Connect to your SLES instance and perform the following steps to install the SSM Agent. Perform these steps on each instance that will run commands using Systems Manager.

**To install SSM Agent on SUSE Linux Enterprise Server**

1. Create a temporary directory on the instance.
   ```
   mkdir /tmp/ssm
   ```

2. Change to the temporary directory.
   ```
   cd /tmp/ssm
   ```

3. Run the following commands one at a time to download and run the SSM Agent installer.
   **Note**
   Even though the following download URL shows ‘ec2-downloads-windows’, this is the correct URL.
   
   64-bit instances:
wget https://s3.amazonaws.com/ec2-downloads-windows/SSMAgent/latest/linux_amd64/amazon-ssm-agent.rpm

```
sudo rpm --install amazon-ssm-agent.rpm
```

4. Run the following command to determine if SSM Agent is running. The command should return the message `amazon-ssm-agent is running`.

```
sudo systemctl status amazon-ssm-agent
```

5. Run the following commands if the previous command returns the message `amazon-ssm-agent is stopped`.

a. Start the service.

```
sudo systemctl enable amazon-ssm-agent
sudo systemctl start amazon-ssm-agent
```

b. Check the status of the agent.

```
sudo systemctl status amazon-ssm-agent
```

**Important**

An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

**Raspbian**

This section includes information about how to install SSM Agent on Raspbian Jessie and Raspbian Stretch, including Raspberry Pi (32-bit) devices.

**Before You Begin**

To set up your Raspbian devices as Systems Manager managed instances, you need to create a managed-instance activation. After you complete the activation, you receive an activation code and ID. This code/ID combination functions like an Amazon EC2 access ID and secret key to provide secure access to the Systems Manager service from your managed instances. Store the activation code and ID in a safe place. For more information about the activation process, see Setting Up AWS Systems Manager for Hybrid Environments (p. 41).

Connect to your Raspbian device and perform the following steps to install the SSM Agent. Perform these steps on each instance that will run commands using Systems Manager.

**To install SSM Agent on Raspbian devices**

1. Create a temporary directory on the instance.

```
mkdir /tmp/ssm
```
2. Use the following command to download and run the SSM Agent installer.

```bash
```

3. Run the following command to install SSM Agent.

```bash
sudo dpkg -i /tmp/ssm/amazon-ssm-agent.deb
```

4. Run the following command to stop SSM Agent.

```bash
sudo service amazon-ssm-agent stop
```

5. Run the following command to register the agent using the managed-instance activation code and ID you received when you completed the managed-instance activation process.

```bash
sudo amazon-ssm-agent -register -code "code" -id "ID" -region "region"
```

6. Run the following command to start SSM Agent.

```bash
sudo service amazon-ssm-agent start
```

**Note**

- If you see the following error in the SSM Agent error logs, then the machine ID did not persist after a reboot:

```
Unable to load instance associations, unable to retrieve associations unable to retrieve associations error occurred in RequestManagedInstanceRoleToken: MachineFingerprintDoesNotMatch: Fingerprint does not match
```

Run the following command to make the machine ID persist after a reboot.

```bash
umount /etc/machine-id
systemd-machine-id-setup
```

- An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

## Download SSM Agent from a Specific Region

If you want to download the agent from a specific region, copy the URL for your operating system, and then replace `region` with an appropriate value.

`region` represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as `us-east-2` for the US East (Ohio) Region. For a list of supported `region` values, see the `Region` column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

For example, to download SSM Agent for Amazon Linux, RHEL, CentOS, and SLES 64-bit from the US West 1 Region, use the following URL:

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Configure SSM Agent to Use a Proxy

You can configure SSM Agent to communicate through an HTTP proxy by adding the `http_proxy`, `https_proxy`, and `no_proxy` settings to an `amazon-ssm-agent.override` configuration file. An override file also preserves the proxy settings if you install newer or older versions of SSM Agent. This section includes procedures for `upstart` and `systemd` environments.

**Note**
Instances created from an Amazon Linux AMI that are using a proxy must be running a current version of the Python `requests` module in order to support Patch Manager operations. For more information, see Upgrade the Python Requests Module on Amazon Linux Instances That Use a Proxy Server (p. 84).

**Topics**
- Configure SSM Agent to Use a Proxy (Upstart) (p. 82)
- Configure SSM Agent to Use a Proxy (systemd) (p. 83)
- Upgrade the Python Requests Module on Amazon Linux Instances That Use a Proxy Server (p. 84)

**Configure SSM Agent to Use a Proxy (Upstart)**

1. Connect to the instance where you installed SSM Agent.
2. Open a simple editor like VIM, and specify the following settings:

   ```bash
   env http_proxy=http://hostname:port
   ```
Configure SSM Agent to Use a Proxy

env https_proxy=http(s)://hostname:port
env no_proxy=169.254.169.254

3. Save the file as `amazon-ssm-agent.override` in the following location: `/etc/init/`
4. Stop and restart SSM Agent using the following commands:

```bash
sudo stop amazon-ssm-agent
sudo start amazon-ssm-agent
```

**Note**
For more information about working with `.override` files in Upstart environments, see [init: Upstart init daemon job configuration](#).

Configure SSM Agent to Use a Proxy (systemd)

The steps in the following procedure describe how to configure SSM Agent to use a proxy in systemd environments. Some of the steps in this procedure contain explicit instructions for Ubuntu Server instances installed by using Snap.

1. Connect to the instance where you installed SSM Agent.
2. Run the following command:

```bash
systemctl edit amazon-ssm-agent
```

For Ubuntu Server instances installed by using a snap, run the following command:

```bash
systemctl edit snap.amazon-ssm-agent.amazon-ssm-agent
```

3. Specify the following settings:

```
[Service]
Environment="http_proxy=http://hostname:port"
Environment="https_proxy=http(s)://hostname:port"
Environment="no_proxy=169.254.169.254"
```

**Note**
You must add the `no_proxy` setting to the file and specify the IP address listed here. It is the instance metadata endpoint for Systems Manager. Without this IP address, calls to Systems Manager fail.

4. Save your changes. The system creates a file named `amazon-ssm-agent.override` (or `override.conf` on Amazon Linux 2) instances in the `etc/systemd/system/amazon-ssm-agent.service.d` folder.

5. Restart SSM Agent by using the following commands:

```bash
sudo systemctl stop amazon-ssm-agent
sudo systemctl daemon-reload
```

For Ubuntu Server instances installed by using a snap, restart SSM Agent by using the following command:

```bash
sudo systemctl stop amazon-ssm-agent
sudo systemctl daemon-reload
```
systemctl start snap.amazon-ssm-agent.amazon-ssm-agent

Note
For more information about working with .override files in systemd environments, see Modifying Existing Unit Files.

Upgrade the Python Requests Module on Amazon Linux Instances That Use a Proxy Server

To patch an instance that is using a proxy and that was created from an Amazon Linux AMI, Patch Manager requires a recent version of the Python requests module to be installed on the instance. We recommend always upgrading to the most recently released version.

To ensure the latest version of the Python requests module is installed, follow these steps:

1. Sign in to the Amazon Linux instance, or use the AWS-RunShellScript SSM document in Run Command, and run the following command on the instance:

   pip list | grep requests

   • If the module is installed, the request returns the version number in a response similar to the following:

   requests (1.2.3)

   • If the module is not installed, run the following command to install it:

   pip install requests

   • If pip itself is not installed, run the following command to install it:

   sudo yum install -y python-pip

2. If the module is installed, but the version listed is earlier than 2.18.4 (such as 1.2.3 shown in the previous step), run the following command to upgrade to the latest version of the Python requests module:

   pip install requests --upgrade

View SSM Agent Logs

SSM Agent writes information about executions, scheduled actions, errors, and health statuses to log files on each instance. You can view log files by manually connecting to an instance, or you can automatically send logs to Amazon CloudWatch Logs. For more information about sending logs to CloudWatch, see Monitoring AWS Systems Manager (p. 885).

You can view SSM Agent logs on Linux instances in the following locations.

• /var/log/amazon/ssm/amazon-ssm-agent.log
• /var/log/amazon/ssm/errors.log
SSM Agent standard output (stdout) and standard error (stderr) files are written to the following directory: /var/lib/amazon/ssm.

For information about enabling SSM Agent debug logging, see Enable SSM Agent Debug Logging (p. 647).

For more information about cihub/seelog configuration, see the Seelog Wiki on GitHub. For examples of cihub/seelog configurations, see the cihub/seelog examples repository on GitHub.

**Uninstall SSM Agent from Linux Instances**

Use the following commands to uninstall SSM Agent.

**Amazon Linux, Amazon Linux 2, RHEL, and CentOS**

```bash
sudo yum erase amazon-ssm-agent -y
```

**Ubuntu Server**

- **deb package installations:**
  ```bash
  sudo dpkg -r amazon-ssm-agent
  ```

- **snap package installations:**
  ```bash
  sudo snap remove amazon-ssm-agent
  ```

**Debian Server**

```bash
sudo dpkg -r amazon-ssm-agent
```

**SLES**

```bash
sudo rpm --erase amazon-ssm-agent
```

**Restrict Access to Root-Level Commands Through SSM Agent**

SSM Agent runs on Amazon EC2 instances using root permissions (Linux) or SYSTEM permissions (Windows). Because these are the highest level of system access privileges, any trusted entity that has been granted permission to send commands to SSM Agent has root or SYSTEM permissions. (In AWS, a trusted entity that can perform actions and access resources in AWS is called a principal. A principal can be an AWS account root user, an IAM user, or a role.)

This level of access is required for a principal to send authorized Systems Manager commands to SSM Agent, but also makes it possible for a principal to run malicious code by exploiting any potential vulnerabilities in SSM Agent.

In particular, permissions to run the commands `SendCommand` and `StartSession` should be carefully restricted. A good first step is to grant permissions for each command only to select principals in your organization. However, we recommend tightening your security posture even further by restricting which
instances a principal can run these commands on. This can be done in the IAM user policy assigned to the principal. In the IAM policy, you can include a condition that limits the user to running commands only on instances that are tagged with specific Amazon EC2 tags, or combinations of EC2 tags.

For example, say you have two fleets of instances, one for testing, one for production. In the IAM policy applied to junior engineers, you specify that they can run commands only on instances tagged with `ssm:resourceTag/testServer`. But for a smaller group of lead engineers, who should have access to all instances, you grant access to instances tagged with both `ssm:resourceTag/testServer` and `ssm:resourceTag/productionServer`.

Using this approach, if junior engineers attempt to run a command on a production instance, they will be denied access because their assigned IAM policy does not provide explicit access to instances tagged with `ssm:resourceTag/productionServer`.

For more information and examples, see the following topics:

- [Restricting Run Command Access Based on Instance Tags](#)
- [Restrict Session Access Based on Instance Tags](#)

## Automate Updates to SSM Agent

A new version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is still running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances using either of the following methods.

- Use a State Manager association. For information, see the State Manager topic [Automatically Update SSM Agent (CLI)](#).
- Use a maintenance window. For information, see the Maintenance Windows topics [Automatically Update SSM Agent (AWS CLI)](#) and [Automatically Update SSM Agent (Console)](#).

If you prefer to update SSM Agent on your instances manually, you can subscribe to notifications that AWS publishes when a new version of the agent is released. For information, see [Subscribe to SSM Agent Notifications](#). For information about using Run Command to manually update one or more instances with the latest version, see [Update SSM Agent by using Run Command](#).

## Subscribe to SSM Agent Notifications

Amazon Simple Notification Service (Amazon SNS) can notify you when new versions of SSM Agent are released. Use the following procedure to subscribe to these notifications.

**Tip**

You can also subscribe to notifications by watching the [SSM Agent Release Notes](#) page on GitHub.

**To subscribe to SSM Agent notifications**

2. From the Region selector in the navigation bar, choose **US East (N. Virginia)**, if it is not selected already. You must select this Region because the SNS notifications for SSM Agent that you are subscribing to are generated from this Region only.
3. In the navigation pane, choose **Subscriptions**.
4. Choose Create subscription.
5. For Create subscription, do the following:
   a. For Topic ARN, use the following Amazon Resource Name (ARN):
      
      arn:aws:sns:us-east-1:720620558202:SSM-Agent-Update
   b. For Protocol, choose Email or SMS.
   c. For Endpoint, type an email address that you can use to receive the notifications. If you choose SMS, type an area code and number.
   d. Choose Create subscription.
6. If you choose Email, you'll receive an email asking you to confirm your subscription. Open the email and follow the directions to complete your subscription.

Whenever a new version of SSM Agent is released, we send notifications to subscribers. If you no longer want to receive these notifications, use the following procedure to unsubscribe.

To unsubscribe from SSM Agent notifications
1. Open the Amazon SNS console.
2. In the navigation pane, choose Subscriptions.
3. Select the subscription and then choose Actions, Delete subscriptions. When prompted for confirmation, choose Delete.

About Minimum S3 Bucket Permissions for SSM Agent

This topic provides information about the Amazon Simple Storage Service (Amazon S3) buckets that SSM Agent might need to access to in order to perform Systems Manager operations. These buckets are publicly accessible, but in some cases, you might need to provide explicit permission in an EC2 instance profile for Systems Manager, or in a service role for instances in a hybrid environment. Most commonly, you must grant these permissions if you are using a private VPC endpoint in your Systems Manager operations. Otherwise, your resources can't access these public buckets.

To grant access to these buckets, you create a custom S3 permissions policy, and then attach it to your instance profile (for EC2 instances) or your service role (for on-premises servers and virtual machines (VMs) in a hybrid environment.

Note
These permissions only provide access to the AWS managed buckets required by SSM Agent. They don't provide the permissions that are necessary for other Amazon S3 operations. They also don't provide permission to your own S3 buckets.

For more information, see the following topics:

- Create an IAM Instance Profile for Systems Manager (p. 29)
- Create an IAM Service Role for a Hybrid Environment (p. 42)

Contents

- Required Permissions (p. 88)
- Example (p. 88)
Required Permissions

The following table describes each of the Amazon S3 policy permissions needed for using Systems Manager.

Amazon S3 permissions required by SSM Agent

<table>
<thead>
<tr>
<th>Permission</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>arn:aws:s3:::aws-ssm-<em>region/</em></td>
<td>Provides access to the Amazon S3 bucket containing modules required for use with SSM documents.</td>
</tr>
<tr>
<td>arn:aws:s3:::aws-windows-downloads-<em>region/</em></td>
<td>Required for some SSM documents that support Windows operating systems.</td>
</tr>
<tr>
<td>arn:aws:s3:::amazon-ssm-<em>region/</em></td>
<td>Required for updating SSM Agent installations. These buckets contain the SSM Agent installation packages, and the installation manifests that are referenced by the AWS-UpdateSSMAgent document and plugin.</td>
</tr>
<tr>
<td>arn:aws:s3:::amazon-ssm-packages-<em>region/</em></td>
<td>Required for using versions of SSM Agent prior to 2.2.45.0 to run the document AWS-ConfigureAWSPackage.</td>
</tr>
<tr>
<td>arn:aws:s3:::<em>-birdwatcher-prod/</em></td>
<td>Provides access to the distribution service used by version 2.2.45.0 and later of SSM Agent. This service is used to run the document AWS-ConfigureAWSPackage.</td>
</tr>
<tr>
<td>arn:aws:s3:::patch-baseline-snapshot-<em>region/</em></td>
<td>Provides access to the Amazon S3 bucket containing patch baseline snapshots. This is required if you use the AWS-RunPatchBaseline SSM document or legacy AWS-ApplyPatchBaseline SSM document.</td>
</tr>
</tbody>
</table>

*region* represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as us-east-2 for the US East (Ohio) Region. For a list of supported *region* values, see the *Region* column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

Example

The following example illustrates how to provide access to the Amazon S3 buckets required for Systems Manager operations in the US East (Ohio) Region (us-east-2).

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": "*",
            "Action": "s3:GetObject",
            "Resource": [
                "arn:aws:s3:::aws-ssm-us-east-2/*",
                "arn:aws:s3:::aws-windows-downloads-us-east-2/*",
                "arn:aws:s3:::amazon-ssm-us-east-2/*",
                "arn:aws:s3:::*-birdwatcher-prod/*",
                "arn:aws:s3:::patch-baseline-snapshot-us-east-2/*"
            ]
        }
    ]
}
```
Important
We recommend that you avoid using wildcard characters (*) in place of specific Regions in this policy. For example, use `arn:aws:s3:::aws-ssm-us-east-2/*` and do not use `arn:aws:s3:::aws-ssm-*/*`. Using wildcards could provide access to Amazon S3 buckets that you don’t intend to grant access to. If you want to use the instance profile for more than one Region, we recommend repeating the first Statement block for each Region.
Partner and Product Integration

You can use AWS Systems Manager with partner and product technologies to automate the deployment, configuration, and maintenance of your managed instances.

Contents
- Referencing AWS Secrets Manager Secrets from Parameter Store Parameters (p. 90)
- Running Scripts from GitHub and Amazon S3 (p. 93)
- Using Chef InSpec Profiles with Systems Manager Compliance (p. 105)

Referencing AWS Secrets Manager Secrets from Parameter Store Parameters

Secrets Manager helps you organize and manage important configuration data such as credentials, passwords, and license keys. Parameter Store is now integrated with Secrets Manager so that you can retrieve Secrets Manager secrets when using other AWS services that already support references to Parameter Store parameters. These services include Amazon EC2, Amazon Elastic Container Service, AWS Lambda, AWS CloudFormation, AWS CodeBuild, AWS CodeDeploy, and other Systems Manager capabilities. By using Parameter Store to reference Secrets Manager secrets, you create a consistent and secure process for calling and using secrets and reference data in your code and configuration scripts.

For more information about Secrets Manager, see What Is AWS Secrets Manager? in the AWS Secrets Manager User Guide.

Important
Parameter Store functions as a pass-through service for references to Secrets Manager secrets. Parameter Store doesn't retain data or metadata about secrets. The reference is stateless.

Restrictions

Note the following restrictions when using Parameter Store to reference Secrets Manager secrets:

- You can only retrieve Secrets Manager secrets by using the GetParameter and GetParameters API actions. Modification operations and advance querying API actions, such as DescribeParameters or GetParametersByPath, are not supported for Secrets Manager.
- You can use the AWS CLI, AWS Tools for Windows PowerShell, and the SDKs to retrieve a secret by using Parameter Store.
- When you retrieve a Secrets Manager secret from Parameter Store, the parameter name must begin with the following reserved path: /aws/reference/secretsmanager/secret_ID_in_Secrets_Manager.

Here is an example: /aws/reference/secretsmanager/CFCreds1
- Parameter Store honors IAM policies attached to Secrets Manager secrets. For example, if User 1 doesn't have access to Secret A, then User 1 can't retrieve Secret A by using Parameter Store.
- Parameters that reference Secrets Manager secrets can't use the Parameter Store versioning or history features.
- Parameter Store honors Secrets Manager version stages. If you reference a version stage, it can only use letters, numbers, a period (.), a hyphen (-), or an underscore (_). All other symbols specified in the version stage cause the reference to fail.
How to Reference a Secrets Manager Secret by Using Parameter Store

The following procedure describes how to reference a Secrets Manager secret by using Parameter Store APIs. The procedure references other procedures in the AWS Secrets Manager User Guide.

**Note**
Before you begin, verify that you have permission to reference Secrets Manager secrets in Parameter Store parameters. If you have administrator privileges in Secrets Manager and Systems Manager, then you can reference or retrieve secrets by using Parameter Store APIs. If you reference a Secrets Manager secret in a Parameter Store parameter, and you don't have permission to access that secret, then the reference fails. For more information, see Authentication and Access Control for AWS Secrets Manager in the AWS Secrets Manager User Guide.

To reference a Secrets Manager secret by using Parameter Store

1. Create a secret in Secrets Manager. For more information, see Creating and Managing Secrets with AWS Secrets Manager.
2. Reference a secret by using the AWS CLI, AWS Tools for Windows PowerShell, or the SDK. When you reference a Secrets Manager secret, the parameter name must begin with the following reserved path: /aws/reference/secretsmanager/. By specifying this path, Systems Manager knows to retrieve the secret from Secrets Manager instead of Parameter Store. Here are some example parameters that correctly reference Secrets Manager secrets:

   - /aws/reference/secretsmanager/CFCreds1
   - /aws/reference/secretsmanager/DBPass

Here is a Java code example that references an access-key and a secret-key that are stored in Secrets Manager. This code example sets up an Amazon DynamoDB client. The code retrieves configuration data and credentials from Parameter Store. The configuration data is stored as a string parameter in Parameter Store and the credentials are stored in Secrets Manager. Even though the configuration data and credentials are stored in separate services, both sets of data can be access from Parameter Store by using the GetParameter API.

```java
/**
 * Initialize AWS System Manager Client with default credentials
 */
AWSSimpleSystemsManagement ssm =
    AWSSimpleSystemsManagementClientBuilder.defaultClient();

/**
 * Example method to launch DynamoDB client with credentials different from default
 * @return DynamoDB client
 */
AmazonDynamoDB getDynamoDbClient() {
    //Getting AWS credentials from Secrets manager using GetParameter
    BasicAWSCredentials differentAWSCreds = new BasicAWSCredentials(
        getParameter("/aws/reference/secretsmanager/access-key"),
        getParameter("/aws/reference/secretsmanager/secret-key"));

    //Initialize the DDB Client with different credentials
    final AmazonDynamoDB client = AmazonDynamoDBClient.builder()
        .withCredentials(new AWSStaticCredentialsProvider(differentAWSCreds))
        .withRegion(getParameter("region")) //Getting config from Parameter Store
        .build();
}
public GetParameterResult getParameter(String parameterName) {
    GetParameterRequest request = new GetParameterRequest();
    request.setName(parameterName);
    request.setWithDecryption(true);
    return ssm.newGetParameterCall().call(request).getParameter().getValue();
}

Here are some AWS CLI examples.

AWS CLI Example 1: Reference by using the name of the secret

```
aws ssm get-parameter --name /aws/reference/secretsmanager/s1-secret --with-decryption
```

The command returns information like the following.

```
{
    "Parameter": {
        "Name": "/aws/reference/secretsmanager/s1-secret",
        "Value": "Fl*MEishm!al875",
        "Type": "SecureString",
        "LastModifiedDate": "2018-05-14T21:47:14.743Z",
        "ARN": "arn:aws:secretsmanager:us-west-1:123456789:secret:s1-secret-E18LRP",
        "SourceResult": 
        "{""
        "CreatedDate": 1526334434.743,
        "Name": "s1-secret",
        "VersionId": "aaabbccc-1111-222-333-123456789",
        "SecretString": "Fl*MEishm!al875",
        "VersionStages": ["AWSCURRENT"],
        "ARN": "arn:aws:secretsmanager:us-west-1:123456789:secret:s1-secret-E18LRP"
        }
    }
}
```

AWS CLI Example 2: Reference that includes the version ID

```
aws ssm get-parameter --name /aws/reference/secretsmanager/s1-secret:11111-aaa-bbb-ccc-123456789 --with-decryption
```

The command returns information like the following.

```
{
    "Parameter": {
        "Name": "/aws/reference/secretsmanager/s1-secret",
        "Value": "Fl*MEishm!al875",
        "Type": "SecureString",
        "LastModifiedDate": "2018-05-14T21:47:14.743Z",
        "ARN": "arn:aws:secretsmanager:us-west-1:123456789:secret:s1-secret-E18LRP",
        "SourceResult": 
        }"}
```
Running Scripts from GitHub and Amazon S3

This section describes how to use the AWS-RunRemoteScript pre-defined SSM document to download scripts from GitHub and Amazon S3, including Ansible Playbooks, Python, Ruby, and PowerShell scripts. By using this document, you no longer need to manually port scripts into Amazon EC2 or wrap them in SSM documents. Systems Manager integration with GitHub and Amazon S3 promotes infrastructure as code, which reduces the time it takes to manage instances while standardizing configurations across your fleet.

You can also create custom SSM documents that enable you to download and run scripts or other SSM documents from remote locations. For more information, see Creating Composite Documents (p. 799).

Topics
- Running Scripts from GitHub (p. 94)
- Running Scripts from Amazon S3 (p. 98)
Running Scripts from GitHub

This section describes how to download and run scripts from a private or public GitHub repository. You can run different types of scripts, including Ansible Playbooks, Python, Ruby, and PowerShell scripts.

You can also download a directory that includes multiple scripts. When you run the primary script in the directory, Systems Manager also runs any referenced scripts (as long as the referenced scripts are included in the directory).

Note the following important details about running scripts from GitHub.

- Systems Manager does not check to see if your script is capable of running on an instance. Before you download and run the script, you must verify that the required software is installed on the instance. Or, you can create a composite document that installs the software by using either Run Command or State Manager, and then downloads and runs the script.
- You are responsible for ensuring that all GitHub requirements are met. This includes refreshing your access token, as needed. You must also ensure that you don't surpass the number of authenticated or unauthenticated requests. For more information, see the GitHub documentation.

Topics

- Run Ansible Playbooks from GitHub (p. 94)
- Run Python Scripts from GitHub (p. 96)

Run Ansible Playbooks from GitHub

This section includes procedures to help you run Ansible Playbooks from GitHub by using either the console or the AWS CLI.

Before You Begin

If you plan to run a script that is stored in a private GitHub repository, then you must create a Systems Manager SecureString parameter for your GitHub security access token. You can't access a script in a private GitHub repository by manually passing your token over SSH. The access token must be passed as a Systems Manager SecureString parameter. For more information about creating a SecureString parameter, see Creating Systems Manager Parameters (p. 850).

Run an Ansible Playbook from GitHub (Console)

Run an Ansible Playbook from GitHub

2. In the navigation pane, choose Run Command.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Run Command.
3. Choose Run command.
5. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.

Note
If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.
6. In **Command parameters**, do the following:
   - In **Source Type**, select *GitHub*.
   - In the **Source Info** box, type the required information to access the source in the following format:

   ```json
   {
     "owner": "owner_name",
     "repository": "repository_name",
     "path": "path_to_scripts_or_directory",
     "tokenInfo": "{{ssm-secure:SecureString_parameter_name}}"
   }
   ```

   For example:

   ```json
   {
     "owner": "TestUser1",
     "repository": "GitHubPrivateTest",
     "path": "scripts/webserver.yml",
     "tokenInfo": "{{ssm-secure:mySecureStringParameter}}"
   }
   ```

   This example downloads a file named `webserver.yml`.

   - In the **Command Line** field, type parameters for the script execution. Here is an example.

   ```bash
   ansible-playbook -i "localhost," --check -c localhost webserver.yml
   ```

   - (Optional) In the **Working Directory** field, type the name of a directory on the instance where you want to download and run the script.

   - (Optional) In **Execution Timeout**, specify the number of seconds for the system to wait before failing the script command execution.

7. For **Other parameters**:
   - For **Comment**, type information about this command.
   - For **Timeout (seconds)**, specify the number of seconds for the system to wait before failing the overall command execution.

8. (Optional) For **Rate control**:
   - For **Concurrency**, specify either a number or a percentage of instances on which to run the command at the same time.

   **Note**
   If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.

   - For **Error threshold**, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

9. In the **Output options** section, if you want to save the command output to a file, select the **Write command output to an Amazon S3 bucket**. Type the bucket and prefix (folder) names in the boxes.

   **Note**
   The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see [Create an IAM Instance Profile for Systems Manager](p. 29).

10. In the **SNS Notifications** section, if you want notifications sent about the status of the command execution, select the **Enable SNS notifications** check box.

    For more information about configuring Amazon SNS notifications for Run Command, see [Configuring Amazon SNS Notifications for AWS Systems Manager](p. 896).

11. Choose **Run**.
Run an Ansible Playbook from GitHub by Using the AWS CLI

1. Install and configure the AWS CLI, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58).

2. Run the following command to download and run a script from GitHub.

   ```
   aws ssm send-command --document-name "AWS-RunRemoteScript" --instance-ids "instance-IDs" --parameters '{"sourceType": ["GitHub"], "sourceInfo": 
   [{"owner": "owner_name", "repository": "repository_name", 
   "path": "path_to_file_or_directory", "tokenInfo": "{{ssm-secure:name_of_your_SecureString_parameter}}"}], "commandLine": ["commands_to_run"]}
   ```

   Here is an example.

   ```
   aws ssm send-command --document-name "AWS-RunRemoteScript" --instance-ids "i-1234abcd" --parameters '{"sourceType": ["GitHub"], "sourceInfo": [{"owner": "TestUser1", "repository": "GitHubPrivateTest", "path": "scripts/webserver.yml", "tokenInfo": "{{ssm-secure:mySecureStringParameter}}" }], "commandLine": ["ansible-playbook -i "localhost," --check -c local webserver.yml"]}
   ```

Run Python Scripts from GitHub

This section includes procedures to help you run Python scripts from GitHub by using either the console or the AWS CLI.

Run a Python Script from GitHub (Console)

**Run a Python Script from GitHub**

2. In the navigation pane, choose Run Command.
   
   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Run Command.
3. Choose Run command.
5. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.

   **Note**
   If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.
6. In Command parameters, do the following:
   
   - In Source Type, select GitHub.
   - In the Source Info text box, type the required information to access the source in the following format:

     ```
     
     
     ```

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For example:

```json
{"owner":"TestUser1", "repository":"GitHubPrivateTest", "path": "scripts/python/complex-script","tokenInfo": "{{ssm-secure:mySecureStringParameter}}"}
```

This example downloads a directory of scripts named `complex-script`.

- In the **Command Line** field, type parameters for the script execution. Here is an example.

  ```
  mainFile.py argument-1 argument-2
  ```

This example runs `mainFile.py`, which can then run other scripts in the `complex-script` directory.

- (Optional) In the **Working Directory** field, type the name of a directory on the instance where you want to download and run the script.
- (Optional) In **Execution Timeout**, specify the number of seconds for the system to wait before failing the script command execution.

7. For **Other parameters**:

   - For **Comment**, type information about this command.
   - For **Timeout (seconds)**, specify the number of seconds for the system to wait before failing the overall command execution.

8. (Optional) For **Rate control**:

   - For **Concurrency**, specify either a number or a percentage of instances on which to run the command at the same time.

   **Note**
   If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.

   - For **Error threshold**, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

9. In the **Output options** section, if you want to save the command output to a file, select the **Write command output to an Amazon S3 bucket**. Type the bucket and prefix (folder) names in the boxes.

   **Note**
   The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

10. In the **SNS Notifications** section, if you want notifications sent about the status of the command execution, select the **Enable SNS notifications** check box.

   For more information about configuring Amazon SNS notifications for Run Command, see Configuring Amazon SNS Notifications for AWS Systems Manager (p. 896).

11. Choose **Run**.

---

**Run a Python Script from GitHub by Using the AWS CLI**

1. Install and configure the AWS CLI, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to download and run a script from GitHub.

```bash
aws ssm send-command --document-name "AWS-RunRemoteScript" --instance-ids "instance-IDs" --parameters "{'sourceType': ['GitHub'], 'sourceInfo': [{'"owner": "owner_name", "repository": "repository_name", "path": "path_to_script_or_directory"},], 'commandLine': ['commands_to_run']}"
```

Here is an example.

```bash
aws ssm send-command --document-name "AWS-RunRemoteScript" --instance-ids "i-abcd1234" --parameters '{"sourceType": ["GitHub"], "sourceInfo": ["{"owner": "TestUser1", "repository": "GitHubTestPublic", "path": "scripts/python/complex-script"}"], "commandLine": ["mainFile.py argument-1 argument-2"]}
```

This example downloads a directory of scripts name complex-script. The commandLine entry runs mainFile.py, which can then run other scripts in the complex-script directory.

## Running Scripts from Amazon S3

This section describes how to download and run scripts from Amazon S3. You can run different types of scripts, including Ansible Playbooks, Python, Ruby, Shell, and PowerShell.

You can also download a directory that includes multiple scripts. When you run the primary script in the directory, Systems Manager also runs any referenced scripts (as long as the referenced scripts are included in the directory).

Note the following important details about running scripts from Amazon S3.

- Systems Manager does not check to see if your script is capable of running on an instance. Before you download and run the script, you must verify that the required software is installed on the instance. Or, you can create a composite document that installs the software by using either Run Command or State Manager, and then downloads and runs the script.
- Verify that your AWS Identity and Access Management (IAM) user account, role, or group has permission to read from the S3 bucket.

### Topics

- Run Ruby Scripts from Amazon S3 (p. 98)
- Run Shell Scripts from Amazon S3 (p. 100)
- Run PowerShell Script from Amazon S3 (p. 103)

## Run Ruby Scripts from Amazon S3

This section includes procedures to help you run Ruby scripts from Amazon S3 by using either the Systems Manager console or the AWS CLI.

### Run a Ruby Script from Amazon S3 (Console)

2. In the navigation pane, choose Run Command.

- or -
If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Run Command.

3. Choose Run command.


5. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.

Note
If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.

6. In Command parameters, do the following:
   - In Source Type, select S3.
   - In the Source Info text box, type the required information to access the source in the following format:
     ```json
     {"path":"https://s3.amazonaws.com/path_to_script"}
     ```
     For example:
     ```json
     {"path":"https://s3.amazonaws.com/rubytest/scripts/ruby/helloWorld.rb"}
     ```
   - In the Command Line field, type parameters for the script execution. Here is an example.
     ```bash
     helloWorld.rb argument-1 argument-2
     ```
   - (Optional) In the Working Directory field, type the name of a directory on the instance where you want to download and run the script.
   - (Optional) In Execution Timeout, specify the number of seconds for the system to wait before failing the script command execution.

7. For Other parameters:
   - For Comment, type information about this command.
   - For Timeout (seconds), specify the number of seconds for the system to wait before failing the overall command execution.

8. (Optional) For Rate control:
   - For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.

Note
If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.

   - For Error threshold, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

9. In the Output options section, if you want to save the command output to a file, select the Write command output to an Amazon S3 bucket. Type the bucket and prefix (folder) names in the boxes.
Running Scripts from Amazon S3

Note
The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

10. In the SNS Notifications section, if you want notifications sent about the status of the command execution, select the Enable SNS notifications check box.

For more information about configuring Amazon SNS notifications for Run Command, see Configuring Amazon SNS Notifications for AWS Systems Manager (p. 896).


Run a Ruby Script from Amazon S3 by using the AWS CLI

1. Install and configure the AWS CLI, if you have not already.

For information, see Install or Upgrade the AWS CLI (p. 58).

2. Depending on the operating system type on your local machine, run one of the following commands to download and run a script from Amazon S3 (the Windows version includes the escape characters ("/") you need to run the command from your command line tool):

Windows local machine:

```
aws ssm send-command --document-name "AWS-RunRemoteScript" --targets "Key=instanceids,Values=Instance-IDs" --parameters "sourceType":"S3",sourceInfo='{"path":"https://s3.amazonaws.com/path_to_script\"'},"commandLine"="script_name_and_arguments"
```

Here is an example.

```
aws ssm send-command --document-name "AWS-RunRemoteScript" --targets "Key=instanceids,Values=i-1234567890abcdef0" --parameters '{"sourceType":"S3","sourceInfo":{"path":"https://s3.amazonaws.com/RubyTest/scripts/ruby/helloWorld.rb"},"commandLine":"helloWorld.rb argument-1 argument-2"}
```

Linux local machine:

```
aws ssm send-command --document-name "AWS-RunRemoteScript" --targets "Key=instanceids,Values=Instance-IDs" --parameters '{"sourceType":"S3","sourceInfo": [{"path":"https://s3.amazonaws.com/path_to_script\""}],"commandLine": "script_name_and_arguments"}
```

Here is an example.

```
aws ssm send-command --document-name "AWS-RunRemoteScript" --targets "Key=instanceids,Values=i-1234567890abcdef0" --parameters '{"sourceType": ["S3"],"sourceInfo": [{"path": "https://s3.amazonaws.com/RubyTest/scripts/ruby/helloWorld.rb"}],"commandLine": ["helloWorld.rb argument-1 argument-2"]}
```

Run Shell Scripts from Amazon S3

This section includes procedures to help you run Shell scripts from Amazon S3 by using either the Systems Manager console or the AWS CLI.
Run a Shell Script from Amazon S3 (Console)

Run a Shell Script from Amazon S3

2. In the navigation pane, choose Run Command.

   -or-

3. Choose Run command.
5. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.

   **Note**
   If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.

6. In Command parameters, do the following:
   - In Source Type, select S3.
   - In the Source Info text box, type the required information to access the source in the following format:

     ```json
     {"path":"https://s3.amazonaws.com/path_to_script"}
     ```

     For example:

     ```json
     {"path":"https://s3.amazonaws.com/shelltest/scripts/shell/helloWorld.sh"}
     ```

   - In the Command Line field, type parameters for the script execution. Here is an example.

     ```sh
     helloWorld.sh argument-1 argument-2
     ```

   - (Optional) In the Working Directory field, type the name of a directory on the instance where you want to download and run the script.
   - (Optional) In Execution Timeout, specify the number of seconds for the system to wait before failing the script command execution.

7. For Other parameters:
   - For Comment, type information about this command.
   - For Timeout (seconds), specify the number of seconds for the system to wait before failing the overall command execution.

8. (Optional) For Rate control:
   - For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.

   **Note**
   If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.
For **Error threshold**, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

9. In the **Output options** section, if you want to save the command output to a file, select the **Write command output to an Amazon S3 bucket**. Type the bucket and prefix (folder) names in the boxes.

   **Note**
   The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see [Create an IAM Instance Profile for Systems Manager](#).

10. In the **SNS Notifications** section, if you want notifications sent about the status of the command execution, select the **Enable SNS notifications** check box.

   For more information about configuring Amazon SNS notifications for Run Command, see [Configuring Amazon SNS Notifications for AWS Systems Manager](#).

11. Choose **Run**.

### Run a Shell Script from Amazon S3 by using the AWS CLI

1. Install and configure the AWS CLI, if you have not already.

   For information, see [Install or Upgrade the AWS CLI](#).

2. Depending on the operating system type on your local machine, run one of the following commands to download and run a script from Amazon S3 (the Windows version includes the escape characters (\) you need to run the command from your command line tool):

   **Windows** local machine:
   ```bash
   aws ssm send-command --document-name "AWS-RunRemoteScript" --targets "Key=instanceids,Values=instance-IDs" --parameters "sourceType="S3",sourceInfo='{"path":("https://s3.amazonaws.com/path_to_script")}',"commandLine"="script_name_and_arguments"
   ```

   Here is an example.
   ```bash
   aws ssm send-command --document-name "AWS-RunRemoteScript" --targets "Key=instanceids,Values=i-1234567890abcdef0" --parameters "sourceType="S3",sourceInfo='{"path":("https://s3.amazonaws.com/ShellTest/scripts/shell/helloWorld.sh")}',"commandLine":helloWorld.sh argument-1 argument-2"
   ```

   **Linux** local machine:
   ```bash
   aws ssm send-command --document-name "AWS-RunRemoteScript" --targets "Key=instanceids,Values=instance-IDs" --parameters '{"sourceType":["S3"],"sourceInfo": [{"path":("https://s3.amazonaws.com/path_to_script")}],"commandLine": ["script_name_and_arguments"]}'
   ```

   Here is an example.
   ```bash
   aws ssm send-command --document-name "AWS-RunRemoteScript" --targets "Key=instanceids,Values=i-1234567890abcdef0" --parameters '{"sourceType":["S3"],"sourceInfo": [{"path":("https://s3.amazonaws.com/ShellTest/scripts/shell/helloWorld.sh")}],"commandLine": ["helloWorld.sh argument-1 argument-2"]}'
   ```
Run PowerShell Script from Amazon S3

This section includes procedures to help you run PowerShell scripts from Amazon S3 by using either the EC2 console or the AWS CLI.

Run a PowerShell Script from Amazon S3 (Console)

2. In the navigation pane, choose Run Command.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Run Command.
3. Choose Run command.
5. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.
   
   **Note**
   If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.
6. In Command parameters, do the following:
   - In Source Type, select S3.
   - In the Source Info text box, type the required information to access the source in the following format:
     
     ```json
     {"path": "https://s3.amazonaws.com/path_to_script"}
     ```
     
     For example:
     
     ```json
     {"path": "https://s3.amazonaws.com/PowerShellTest/powershell/helloPowershell.ps1"}
     ```
   - In the Command Line field, type parameters for the script execution. Here is an example.
     
     ```bash
     helloPowershell.ps1 argument-1 argument-2
     ```
   - In the Working Directory field, type the name of a directory on the instance where you want to download and run the script.
   - In the Execution Timeout field, specify the number of seconds for the system to wait before failing the script command execution.
7. For Other parameters:
   - For Comment, type information about this command.
   - For Timeout (seconds), specify the number of seconds for the system to wait before failing the overall command execution.
8. (Optional) For Rate control:
   - For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.
Note
If you selected targets by specifying tags applied to managed instances or by specifying
AWS resource groups, and you are not certain how many instances are targeted, then
limit the number of instances that can run the document at the same time by specifying a
percentage.
• For Error threshold, specify when to stop running the command on other instances after it fails
on either a number or a percentage of instances. For example, if you specify three errors, then
Systems Manager stops sending the command when the fourth error is received. Instances still
processing the command might also send errors.
9. In the Output options section, if you want to save the command output to a file, select the Write
command output to an Amazon S3 bucket. Type the bucket and prefix (folder) names in the boxes.

Note
The S3 permissions that grant the ability to write the data to an S3 bucket are those of the
instance profile assigned to the instance, not those of the IAM user performing this task. For
more information, see Create an IAM Instance Profile for Systems Manager (p. 29).
10. In the SNS Notifications section, if you want notifications sent about the status of the command
execution, select the Enable SNS notifications check box.

For more information about configuring Amazon SNS notifications for Run Command, see
Configuring Amazon SNS Notifications for AWS Systems Manager (p. 896).

Run a PowerShell Script from S3 by Using the AWS CLI
1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Depending on the operating system type on your local machine, run one of the following commands
to download and run a script from Amazon S3 (the Windows version includes the escape characters
("\") you need to run the command from your command line tool):

Windows local machine:

```bash
aws ssm send-command --document-name "AWS-RunRemoteScript"
--targets "Key=instanceids,Values=Instance-IDs" --parameters
"sourceType="S3",sourceInfo='{"path":"https://s3.amazonaws.com/path_to_script"}',"commandLine"="script_name_and_arguments"
```

Here is an example.

```bash
aws ssm send-command --document-name "AWS-RunRemoteScript" --targets "Key=instanceids,Values=i-1234567890abcdef0" --parameters
"sourceType="S3",sourceInfo='{"path":"https://s3.amazonaws.com/PowerShellTest/scripts/powershell/helloWorld.ps1"}',"commandLine"="helloWorld.ps1 argument-1 argument-2"
```

Linux local machine:

```bash
aws ssm send-command --document-name "AWS-RunRemoteScript" --targets
"Key=instanceids,Values=Instance-IDs" --parameters '{"sourceType":"S3","sourceInfo":
["{"path":"https://s3.amazonaws.com/path_to_script\""}],"commandLine":
["script_name_and_arguments"]}"
```

Here is an example.

```bash
aws ssm send-command --document-name "AWS-RunRemoteScript" --targets
"Key=instanceids,Values=Instance-IDs" --parameters '{"sourceType":"S3","sourceInfo":
["{"path":"https://s3.amazonaws.com/path_to_script\""}],"commandLine":
["script_name_and_arguments"]}"
```
Using Chef InSpec Profiles with Systems Manager Compliance

Systems Manager now integrates with Chef InSpec. InSpec is an open-source, runtime framework that enables you to create human-readable profiles on GitHub or Amazon S3. Then you can use Systems Manager to run compliance scans and view compliant and noncompliant instances. A profile is a security, compliance, or policy requirement for your computing environment. For example, you can create profiles that perform the following checks when you scan your instances with Systems Manager Compliance:

- Check if specific ports are open or closed.
- Check if specific applications are running.
- Check if certain packages are installed.
- Check Windows Registry keys for specific properties.

You can create InSpec profiles for Amazon EC2 instances and on-premises servers or virtual machines (VMs) that you manage with Systems Manager. The following sample Chef InSpec profile checks to see if port 22 is open.

```ruby
control 'Scan Port' do
  impact 10.0
  title 'Server: Configure the service port'
  desc 'Always specify which port the SSH server should listen to. Prevent unexpected settings.'
  describe sshd_config do
    its('Port') { should eq('22') }
  end
end
```

InSpec includes a collection of resources that help you quickly write checks and auditing controls. InSpec uses the InSpec Domain-specific Language (DSL) for writing these controls in Ruby. You can also use profiles created by a large community of InSpec users. For example, the DevSec chef-os-hardening project on GitHub includes dozens of profiles to help you secure your instances and servers. You can author and store profiles in GitHub or Amazon Simple Storage Service (Amazon S3).

How It Works

Here is how the process of using InSpec profiles with Systems Manager Compliance works.

1. Either identify predefined InSpec profiles that you want to use, or create your own. You can use predefined profiles on GitHub to get started. For information about how to create your own InSpec profiles, see Compliance Automation with InSpec.
2. Store profiles in either a public or private GitHub repository, or in an Amazon S3 bucket.
3. Run Compliance with your InSpec profiles by using the AWS-RunInspecChecks SSM document. You can begin a Compliance scan by using Run Command (for on-demand scans), or you can schedule regular Compliance scans by using State Manager.
Running an InSpec Compliance Scan

This section includes information about how to run an InSpec Compliance scan by using the Systems Manager console and the AWS CLI. The console procedure shows you how to configure State Manager to run the scan. The AWS CLI procedure shows you how to configure Run Command to run the scan.

Running an InSpec Compliance Scan with State Manager by Using the Console

**To run an InSpec Compliance scan with State Manager by using the AWS Systems Manager console**

2. In the navigation pane, choose State Manager.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose State Manager.
3. Choose Create Association.
4. In the Provide association details section, enter a name.
5. In the Command document list, choose AWS-RunInspecChecks.
6. In the Document version list, choose Latest at runtime.
7. In the Parameters section, in the Source Type list, choose either GitHub or S3.
   - If you choose GitHub, then enter the path to an InSpec profile in either a public or private GitHub repository in the Source Info field. Here is an example path to a public profile provided by the Systems Manager team from the following location: https://github.com/awslabs/amazon-ssm/tree/master/Compliance/InSpec/PortCheck.

   ```json
   {"owner":"awslabs","repository":"amazon-ssm","path":"Compliance/InSpec/PortCheck","getOptions":"branch:master"}
   ```

   If you choose S3, then enter a valid URL to an InSpec profile in an Amazon S3 bucket in the Source Info field.

   For more information about how Systems Manager integrates with GitHub and Amazon S3, see Running Scripts from GitHub and Amazon S3 (p. 93).
8. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.
   - **Note**
     If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.
9. In the **Specify schedule** section, use the schedule builder options to create a schedule for when you want the Compliance scan to run.

10. In the **Output options** section, if you want to save the command output to a file, select the **Write command output to an Amazon S3 bucket**. Type the bucket and prefix (folder) names in the boxes.

   **Note**
   The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

11. Choose **Create Association**. The system creates the association and automatically runs the Compliance scan.

12. Wait several minutes for the scan to complete, and then choose **Compliance** in the navigation pane.

13. In **Corresponding managed instances**, locate instances where the **Compliance Type** column is **Custom:Inspec**.

14. Choose an instance ID to view the details of noncompliant statuses.

---

### Running an InSpec Compliance Scan with Run Command by Using the AWS CLI

1. Install and configure the AWS CLI, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58).

2. Run one of the following commands to run an InSpec profile from either GitHub or Amazon S3.

   The command takes the following parameters:
   - **sourceType**: GitHub or Amazon S3
   - **sourceInfo**: URL to the InSpec profile folder either in GitHub or an Amazon S3 bucket. The folder must contain the base InSpec file (*.yml) and all related controls (*.rb).

   **GitHub**
   ```bash
   aws ssm send-command --document-name "AWS-RunInspecChecks" --targets '[{"Key":tag:tag_name","Values":["tag_value"]}]' --parameters '{"sourceType": ["GitHub"],"sourceInfo": [{"owner":"owner_name", "repository": "repository_name", "path": "Inspec.yml_file"}]}'
   ```

   Here is an example.
   ```bash
   aws ssm send-command --document-name "AWS-RunInspecChecks" --targets '[{"Key":tag:testEnvironment","Values":["webServers"]}]' --parameters '{"sourceType": ["GitHub"],"getOptions":branch:master","sourceInfo": [{"owner":"awslabs", "repository": "amazon-ssm", "path": "Compliance/InSpec/PortCheck"}]}'
   ```

   **Amazon S3**
   ```bash
   aws ssm send-command --document-name "AWS-RunInspecChecks" --targets '[{"Key":tag:tag_name","Values":["tag_value"]}]' --parameters '{"sourceType": ["S3"],"sourceInfo": [{"path": "https://s3.amazonaws.com/directory/Inspec.yml_file\""}]}'
   ```

   Here is an example.
   ```bash
   aws ssm send-command --document-name "AWS-RunInspecChecks" --targets '[{"Key":tag:tag_name","Values":["tag_value"]}]' --parameters '{"sourceType": ["S3"],"sourceInfo": [{"path": "https://s3.amazonaws.com/directory/Inspec.yml_file\""}]}'
   ```
3. Run the following command to view a summary of the Compliance scan.

```bash
aws ssm list-resource-compliance-summaries --filters
    Key=ComplianceType,Values=Custom:Inspec
```

4. Run the following command to drill down into an instance that is not compliant.

```bash
aws ssm list-compliance-items --resource-ids instance_ID --resource-type
    ManagedInstance --filters Key=DocumentName,Values=AWS-RunInspecChecks
```

Related AWS Services

The following related services can help you assess Compliance and work with Chef.

- Amazon Inspector lets you perform security assessments on your instances based on and common vulnerabilities described in Central Internet Security (CIS) standards.
- AWS OpsWorks for Chef Automate lets you run a Chef Automate server in AWS.
Operations Management

Operations Management is a suite of capabilities that help you manage your AWS resources.

Topics
- Amazon CloudWatch Dashboards Hosted by Systems Manager (p. 109)
- AWS Systems Manager OpsCenter (p. 109)
- AWS Resource Groups (p. 140)
- Trusted Advisor and Personal Health Dashboards Hosted by Systems Manager (p. 140)

Amazon CloudWatch Dashboards Hosted by Systems Manager

Amazon CloudWatch dashboards are customizable home pages in the CloudWatch console that you can use to monitor your resources in a single view, even those resources that are spread across different Regions. You can use CloudWatch dashboards to create customized views of the metrics and alarms for your AWS resources. With dashboards, you can create the following:

- A single view for selected metrics and alarms to help you assess the health of your resources and applications across one or more regions. You can select the color used for each metric on each graph, so that you can easily track the same metric across multiple graphs.
- An operational playbook that provides guidance for team members during operational events about how to respond to specific incidents.
- A common view of critical resource and application measurements that can be shared by team members for faster communication flow during operational events.

You can create dashboards by using the console, the AWS CLI, or by using the PutDashboard API. For more information, see Using Amazon CloudWatch Dashboards in the Amazon CloudWatch User Guide.

AWS Systems Manager OpsCenter

OpsCenter provides a central location where operations engineers and IT professionals can view, investigate, and resolve operational work items (OpsItems) related to AWS resources. OpsCenter is designed to reduce mean time to resolution for issues impacting AWS resources. This Systems Manager capability aggregates and standardizes OpsItems across services while providing contextual investigation data about each OpsItem, related OpsItems, and related resources. OpsCenter also provides Systems Manager Automation documents (runbooks) that you can use to quickly resolve issues. You can specify searchable, custom data for each OpsItem. You can also view automatically-generated summary reports about OpsItems by status and source.

OpsCenter is integrated with Amazon CloudWatch Events. This means you can create CloudWatch Events rules that automatically create OpsItems for any AWS service that publishes events to CloudWatch Events. For example, you can configure SSM OpsItems as the target for the following types of events, and hundreds more:

- Security issues, such as alerts from AWS Security Hub
- Performance issues, such as a throttling event for Amazon DynamoDB or degraded Amazon Elastic Block Store (EBS) volume performance
Failures, such as an Amazon EC2 Auto Scaling group failure to launch an instance or a Systems Manager Automation execution failure

- Health alerts, such as an AWS Health alert for scheduled maintenance
- State changes, such as an Amazon EC2 instance state change from Running to Stopped

OpsCenter is also integrated with Amazon CloudWatch Application Insights for .NET and SQL Server. This means you can automatically create OpsItems for problems detected in your applications.

Operations engineers and IT professionals can create, view, and edit OpsItems by using the OpsCenter page in the AWS Systems Manager console, public API actions, the AWS CLI, AWS Tools for Windows PowerShell, or the AWS SDKs. You can also use AWS Lambda with Amazon SNS to create OpsItems from sources like CloudWatch alarms. OpsCenter public API actions also enable you to integrate OpsCenter with your case management systems and health dashboards.

**How Can OpsCenter Benefit My Organization?**

AWS Systems Manager OpsCenter enables a standard and unified experience for viewing, working on, and remediating issues related to AWS resources. A standard and unified experience improves the time it takes to remedy issues, investigate related issues, and train new operations engineers and IT professionals. A standard and unified experience also reduces the number of manual errors entered into the system of managing and remediating issues.

More specifically, OpsCenter offers the following benefits for operations engineers and organizations:

- You no longer need to navigate across multiple console pages to view, investigate, and resolve OpsItems related to AWS resources. OpsItems are aggregated, across services, in a central location.
- You can view service-specific and contextually relevant data for OpsItems that are automatically generated by Amazon CloudWatch Events and CloudWatch Application Insights for .NET and SQL Server.
- You can specify the Amazon Resource Name (ARN) of a resource related to an OpsItem. By specifying related resources, OpsCenter uses built-in logic to help you avoid creating duplicate OpsItems.
- You can view details and resolution information about similar OpsItems.
- You can quickly view information about and execute Systems Manager Automation documents (runbooks) to resolve issues.

**What Are the Features of OpsCenter?**

- **Automated and manual OpsItem creation**
  
  OpsCenter is integrated with Amazon CloudWatch Events. This means you can create CloudWatch rules that automatically create OpsItems for any AWS service that publishes events to CloudWatch Events. You can also manually create OpsItems.
  
  OpsCenter is also integrated with Amazon CloudWatch Application Insights for .NET and SQL Server. This means you can automatically create OpsItems for problems detected in your applications.

- **Detailed and searchable OpsItems**

  Each OpsItem includes multiple fields of information, including a title, ID, priority, description, the source of the OpsItem, and the date/time it was last updated. Each OpsItem also includes the following configurable features:

  - **Status**: Open, In progress, Resolved, or Open and In progress.
  - **Related resources**: A related resource is the impacted resource or the resource that triggered the Amazon CloudWatch Events event that created the OpsItem. Each OpsItem includes a Related
resources section where OpsCenter automatically lists the Amazon Resource Name (ARN) of the related resource. You can also manually specify ARNs of related resources. For some ARN types, OpsCenter automatically creates a deep link that displays details about the resource without having to visit other console pages to view that information. For example, if you specify the ARN of an EC2 instance, you can view all of the EC2-provided details about that instance in OpsCenter. You can manually add the ARNs of additional related resources. Each OpsItem can list a maximum of 100 related resource ARNs. For more information, see Working with Related Resources (p. 125).

- **Related and Similar OpsItems**: The Related OpsItems feature lets you specify the IDs of OpsItems that are in some way related to the current OpsItem. The Similar OpsItem feature automatically reviews OpsItem titles and descriptions and then lists other OpsItems that may be related or of interest to you.

- **Searchable and private operational data**: Operational data is custom data that provides useful reference details about the OpsItem. For example, you can specify log files, error strings, license keys, troubleshooting tips, or other relevant data. You enter operational data as key-value pairs. The key has a maximum length of 128 characters. The value has a maximum size of 20 KB.

  This custom data is searchable, but with restrictions. For the Searchable operational data feature, all users with access to the OpsItem Overview page (as provided by the DescribeOpsItems API action) can view and search on the specified data. For the Private operational data feature, the data is only viewable by users who have access to the OpsItem (as provided by the GetOpsItem API action).

- **Deduplication**: By specifying related resources, OpsCenter uses built-in logic to help you avoid creating duplicate OpsItems. Additionally, OpsItems that are automatically created from an event in CloudWatch include a deduplication string to reduce the number of duplicate OpsItems. For more information, see Reducing Duplicate OpsItems (p. 130).

- **Easy remediation using runbooks**

  Each OpsItem includes a Runbooks section with a list of Systems Manager Automation documents that you can use to automatically remediate common issues with AWS resources. After you execute a runbook from an OpsItem, the runbook is automatically associated with the related resource of the OpsItem for future reference and easy execution. Additionally, if you automatically set up OpsItem rules in CloudWatch by using OpsCenter, then CloudWatch automatically associates runbooks for common events. For more information, see Remediating OpsItem Issues Using Systems Manager Automation (p. 133).

- **Change notification**: You can specify the ARN of an Amazon Simple Notification Service (SNS) topic and publish notifications anytime an OpsItem is changed or edited. The SNS topic must exist in the same AWS Region as the OpsItem.

- **Comprehensive OpsItem search capabilities**: OpsCenter provides multiple search options to help you quickly locate OpsItems. Here are a few examples of how you can search: OpsItem ID, Title, Last modified time, Operational data value, Source, and Automation ID of a runbook execution, to name a few. You can further limit search results by using status filters.

- **OpsItem summary reports**

  OpsCenter includes a summary report page that automatically displays the following sections:

  - **Status summary**: a summary of OpsItems by status (Open, In progress, Resolved, Open and In progress).

  - **Sources with most open OpsItems**: a breakdown of the top AWS services with open OpsItems.

  - **OpsItems by source and age**: a count of OpsItems grouped by source and days since creation.

  For more information about viewing OpsCenter summary reports, see Viewing OpsCenter Summary Reports (p. 136).

- **IAM access control**

  By using AWS Identity and Access Management (IAM) policies, you can control which members of your organization can create, view, list, and update OpsItems. You can also assign tags to OpsItems and
then create IAM policies that give access to users and groups based on tags. For more information, see Getting Started with OpsCenter (p. 113).

- **Logging and auditing capability support**

  You can audit and log OpsCenter user actions in your AWS account through integration with other AWS services. For more information, see Auditing and Logging OpsCenter Activity (p. 140).

- **Console, CLI, PowerShell, and SDK access to OpsCenter capabilities**

  You can work with OpsCenter by using the AWS Systems Manager console, AWS CLI, AWS Tools for PowerShell, or the AWS SDK of your choice.

**How Does OpsCenter Work with Amazon CloudWatch Events? Which Service Should I Use?**

Amazon CloudWatch Events delivers a near real-time stream of system events that describe changes in AWS resources. Using simple rules that you can quickly set up, you can match events and route them to one or more target functions or streams. Generally speaking, CloudWatch Events lets you know there is a problem with your resources.

OpsCenter helps you investigate and remediate the problem. OpsCenter brings together data from CloudWatch Events or data entered manually by engineers so that your engineers can perform a thorough investigation. OpsCenter also provides Automation runbooks for quickly remediating those issues. OpsCenter integrates with CloudWatch Events by enabling you to automatically create OpsItems (or you can manually create OpsItems) to address the following types of issues: performance degradation, state changes, execution failures, maintenance notifications, and security alerts.

**Does OpsCenter Integrate with My Existing Case Management System?**

OpsCenter is designed to complement your existing case management systems. You can integrate OpsItems into your existing case management system by using public API actions. You can also maintain manual lifecycle workflows in your current systems and use OpsCenter as an investigation and remediation hub.

For information about OpsCenter public API actions, see the following API actions in the AWS Systems Manager API Reference.

- CreateOpsItem
- DescribeOpsItems
- GetOpsItem
- GetOpsSummary
- UpdateOpsItem

**Is There a Charge to Use OpsCenter?**

Yes. For more information, see AWS Systems Manager Pricing.
Does OpsCenter Work with My On-Premises and Hybrid Managed Instances?

Yes. You can use OpsCenter to investigate and remediate issues with your on-premises managed instances that are configured for Systems Manager. For more information about setting up and configuring on-premises servers and virtual machines for Systems Manager, see Setting Up AWS Systems Manager for Hybrid Environments (p. 41).

What are the resource limits for OpsCenter?

<table>
<thead>
<tr>
<th>Resource</th>
<th>Default limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of OpsItems allowed per account per AWS Region (including Open and Resolved OpsItems)</td>
<td>500,000</td>
</tr>
<tr>
<td>Maximum number of OpsItems per account per month</td>
<td>10,000</td>
</tr>
<tr>
<td>Maximum operational data value size</td>
<td>20 KB</td>
</tr>
<tr>
<td>Maximum number of associated Automation runbooks per OpsItem</td>
<td>10</td>
</tr>
<tr>
<td>Maximum number of Automation runbook executions stored in operational data under a single associated runbook</td>
<td>10</td>
</tr>
<tr>
<td>Maximum number of related resources you can specify per OpsItem</td>
<td>100</td>
</tr>
<tr>
<td>Maximum number of related OpsItems you can specify per OpsItem</td>
<td>10</td>
</tr>
<tr>
<td>Maximum length of a deduplication string</td>
<td>64 characters</td>
</tr>
</tbody>
</table>

Topics
- Getting Started with OpsCenter (p. 113)
- Creating OpsItems (p. 119)
- Working with OpsItems (p. 125)
- Remediating OpsItem Issues Using Systems Manager Automation (p. 133)
- Viewing OpsCenter Summary Reports (p. 136)
- Supported Resources Reference (p. 136)
- Auditing and Logging OpsCenter Activity (p. 140)

Getting Started with OpsCenter

Complete the following steps to get started with OpsCenter.

Topics
- Step 1: Configuring CloudWatch Events Permissions for Automatically Creating OpsItems (p. 114)
- Step 2: Configuring User or Group Permissions for OpsCenter (p. 115)
Step 3: (Optional) Create OpsItem Guidelines for Your Organization (p. 118)

Before You Begin

Before you get started with OpsCenter, review the pricing details. For more information, see AWS Systems Manager Pricing. Also, verify that your IAM user, group, or role has permission to use Systems Manager features and capabilities. For more information, see Setting Up AWS Systems Manager (p. 23).

Note
OpsCenter enables you to remediate issues with AWS resources by using Systems Manager Automation documents (runbooks). To use this remediation capability, you must have permission to run Systems Manager Automation documents. For more information, see Getting Started with Automation (p. 144).

Step 1: Configuring CloudWatch Events Permissions for Automatically Creating OpsItems

You can configure Amazon CloudWatch Events to automatically create OpsItems in response to events, such as a state change for an AWS resource, a change in security settings, or a service unavailable state. By default, Amazon CloudWatch Events doesn't have permission to create OpsItems. Grant permission by using an AWS Identity and Access Management (IAM) policy. You assign the policy to a role, and then attach the role to CloudWatch Events.

This section includes the following procedures.

- To create an OpsCenter policy for CloudWatch Events (p. 114)
- To create an OpsCenter role for CloudWatch Events (p. 115)
- To attach the OpsCenter policy to the OpsCenter role for CloudWatch Events (p. 115)

Use the following procedure to create an IAM policy that enables CloudWatch Events to automatically create OpsItems.

To create an OpsCenter policy for CloudWatch Events

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Policies.
3. Choose Create policy.
4. Choose the JSON tab.
5. Replace the default content with the following:

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "ssm:CreateOpsItem",
            "Resource": "*"
        }
    ]
}
```
7. On the Review policy page, for Name, enter a name. For example: OpsCenter-CWE-Policy.
8. For Description, enter information about this policy that identifies its purpose.
9. Choose Create policy.
Use the following procedure to create an IAM role that enables CloudWatch Events to automatically create OpsItems in OpsCenter.

To create an OpsCenter role for CloudWatch Events
1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles.
3. Choose Create role.
4. On the Create role page, under Select type of trusted entity, verify that AWS service is selected.
5. Under Choose the service that will use this role, choose CloudWatch Events.
6. Under Select your use case, choose CloudWatch Events, and then choose Next: Permissions.
7. On the Permissions page, leave the default settings and choose Next: Tags.
8. (Optional) On the Tags page, specify key-value tag pairs, and then choose Next: Review.
9. On the Review page, for Role name, enter a name. For example: OpsItem-CWE-Role.
10. For Description, either leave the default description or enter information about this role that identifies its purpose.
11. Choose Create role.

Use the following procedure to attach the policy you created earlier to the role you just created.

To attach the OpsCenter policy to the OpsCenter role for CloudWatch Events
1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles.
3. Locate the role you just created.
4. Choose the name of the role to open the Summary page.
5. (Optional) You can detach the policies that were automatically assigned to this role when you created it. Choose the X beside each policy to detach it.
6. Choose Attach policies.
7. On the Attach permissions page, locate the OpsCenter policy that you created earlier.
8. Choose this policy, and then choose Attach policy. IAM returns you to the Roles page.
9. Choose the name of the role to open the Summary page.
10. Copy the role ARN. You must specify this ARN when you configure OpsCenter to automatically create OpsItems by using CloudWatch Events. For more information, see Enabling the Default CloudWatch Events Rules for Automatically Creating OpsItems (p. 119).

CloudWatch Events now has the required permissions to automatically create OpsItems in OpsCenter.

Step 2: Configuring User or Group Permissions for OpsCenter

OpsItems can only be viewed or edited in the account where they were created. You can't share or transfer OpsItems across AWS accounts. For this reason, we recommend that you configure permissions for OpsCenter in the AWS account that is used to run your AWS workloads. You can then create AWS Identity and Access Management (IAM) users or groups in that account. In this way, multiple operations engineers or IT professionals can create, view, and edit OpsItems in the same AWS account.

OpsCenter uses the following API actions. You can use all features of OpsCenter if your IAM user, group, or role has access to these actions. You can also create more restrictive access, as described later in this section.
The following procedure describes how to add a full-access inline policy to an IAM user. If you prefer, you can specify read-only permission by assigning the following inline policy to a user's account, group, or role.

```
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": [
            "ssm:GetOpsItem",
            "ssm:GetOpsSummary",
            "ssm:DescribeOpsItems"
         ],
         "Resource": "*"
      }
   ]
}
```

For more information about creating and editing IAM policies, see Creating IAM Policies in the IAM User Guide. For information about how to assign this policy to an IAM group, see Attaching a Policy to an IAM Group.

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Users.
3. In the list, choose a name.
4. Choose the Permissions tab.
5. On the right side of the page, under Permission policies, choose Add inline policy.
6. Choose the JSON tab.
7. Replace the default content with the following:

```
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": [
            "ssm:GetOpsItem",
            "ssm:UpdateOpsItem",
            "ssm:DescribeOpsItems",
            "ssm:CreateOpsItem",
            "ssm:GetOpsSummary"
         ],
         "Resource": "*"
      }
   ]
}
```

9. On the Review policy page, for Name, enter a name for the inline policy. For example: **OpsCenter-Access-Full**.

10. Choose Create policy.

### Restricting Access to OpsItems by Using Tags

You can also restrict access to OpsItems by using an inline IAM policy that specifies tags. The policy uses the following format.

```json
{  
  "Version": "2012-10-17",
  "Statement": [  
    {  
      "Effect": "Allow",
      "Action": [  
        "One_or_more_OpsItem_API_actions"
      ],
      "Resource": "*",
      "Condition": { "StringEquals": { "ssm:resourceTag/tag_key": "tag_value" } }
    }
  ]
}
```

Here is an example that species a tag key of Department and a tag value of Finance. With this policy, the user can only call the GetOpsItem API action to view OpsItems that were previously tagged with Key=Department and Value=Finance. Users can't view any other OpsItems.

```json
{  
  "Version": "2012-10-17",
  "Statement": [  
    {  
      "Effect": "Allow",
      "Action": [  
        "ssm:GetOpsItem"
      ],
      "Resource": "*",
      "Condition": { "StringEquals": { "ssm:resourceTag/Department": "Finance" } }
    }
  ]
}
```

Here is an example that species API actions for viewing and updating OpsItems. This policy also specifies two sets of tag key-value pairs: Department-Finance and Project-Unity.

```json
{  
  "Version": "2012-10-17",
  "Statement": [  
    {  
      "Effect": "Allow",
      "Action": [  
        "ssm:GetOpsItem",
        "ssm:UpdateOpsItem"
      ],
      "Resource": "*",
      "Condition": { "StringEquals": { "ssm:resourceTag/Department": "Finance" },
                     "ssm:resourceTag/Project": "Unity" }
    }
  ]
}
```
"ssm:resourceTag/Project":"Unity"

For information about adding tags to an OpsItem, see Creating OpsItems Manually (p. 121).

**Step 3: (Optional) Create OpsItem Guidelines for Your Organization**

We recommend that each organization create a simple set of guidelines that promote consistency when creating and editing OpsItems. Guidelines make it easier for users to locate and resolve OpsItems. The guidelines for your organization should define best practices when users enter information into the following OpsItem fields.

**Note**
Amazon CloudWatch Events populates the **Title**, **Source**, and **Description** fields of automatically generated OpsItems. You can edit the **Title** and the **Description** fields, but you can't edit the **Source** field.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>Guidelines should encourage a consistent OpsItem naming experience. For example, your guidelines might require that each title include information about the impacted resource, the status, the environment, and the name or the alias of the engineer actively working the issue, if applicable. All OpsItems created by CloudWatch include a title that describes the event that caused the creation of the OpsItem, but you can edit these titles. You can search OpsItems for <strong>Title:contains</strong>. If your naming guidelines encourage consistent use of keywords, you improve your search results.</td>
</tr>
<tr>
<td><strong>Source</strong></td>
<td>Guidelines can include specifying IDs, software version numbers (if applicable) or other relevant data to help users identify the origin of the issue. You can't edit the <strong>Source</strong> field after the OpsItem is created.</td>
</tr>
<tr>
<td><strong>Priority</strong></td>
<td>(Optional) Guidelines include determining the highest and lowest priority for your organization, and any service-level agreements based on priority. You can specify priority from 1 to 5.</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Guidelines should suggest how much detail about the issue to include and any steps (if applicable) for reproducing the issue.</td>
</tr>
<tr>
<td><strong>Notifications</strong></td>
<td>Guidelines should suggest which Amazon Simple Notification Service (SNS) topic Amazon Resource Name (ARN) to specify when creating or editing OpsItems. Be aware that SNS notifications are</td>
</tr>
</tbody>
</table>
Creating OpsItems

You can create OpsItems automatically or manually. To automatically create OpsItems, you can choose a bulk option that configures multiple services in Amazon CloudWatch Events to create OpsItems for common resource issues. Or, if you prefer, you can selectively configure SSM OpsItems as the target of specific events in CloudWatch Events.

This section includes the following topics.

- Enabling the Default CloudWatch Events Rules for Automatically Creating OpsItems (p. 119)
- Configuring CloudWatch Events to Automatically Create OpsItems for Specific Events (p. 121)
- Integrating with CloudWatch Application Insights for .NET and SQL Server (p. 121)
- Creating OpsItems Manually (p. 121)

Enabling the Default CloudWatch Events Rules for Automatically Creating OpsItems

This section describes how to configure the default CloudWatch Events rules for automatically creating OpsItems in response to the following events from AWS services. Enabling these default rules is optional, but recommended. If you don't want CloudWatch Events to create OpsItems for these events, then you can specify OpsCenter as the target of specific CloudWatch Events events. For more information, see Configuring CloudWatch Events to Automatically Create OpsItems for Specific Events (p. 121).

<table>
<thead>
<tr>
<th>AWS Service</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon EC2</td>
<td>Instance State Change (Stopped, Terminated)</td>
</tr>
</tbody>
</table>
### AWS Service and Event List

<table>
<thead>
<tr>
<th>AWS Service</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon EC2</td>
<td>SSM Maintenance Window Execution (Failed, Timed Out)</td>
</tr>
<tr>
<td>Amazon EBS</td>
<td>Snapshot Notification (Copy, Create, Share, Failed)</td>
</tr>
<tr>
<td>Amazon EC2 Auto Scaling</td>
<td>EC2 Instance (Launch Unsuccessful, Termination Unsuccessful)</td>
</tr>
<tr>
<td>AWS Health</td>
<td>Amazon Relational Database Service (RDS) Maintenance Scheduled</td>
</tr>
<tr>
<td>AWS Health</td>
<td>RDS Issue Notification (example: RDS Connectivity Issue)</td>
</tr>
<tr>
<td>AWS Health</td>
<td>EC2 Maintenance Scheduled</td>
</tr>
<tr>
<td>AWS Health</td>
<td>EC2 Issue Notification (example: Instance Auto Recovery Failure)</td>
</tr>
<tr>
<td>AWS Health</td>
<td>EBS Issue Notification (example: Degraded EBS Volume Performance)</td>
</tr>
</tbody>
</table>

**Note**

In the following procedure, you must specify an IAM role with a permissions policy that enables CloudWatch Events to create OpsItems in OpsCenter. For information about how to create this role, see [Getting Started with OpsCenter](#) (p. 113).

**To configure CloudWatch Events to automatically create OpsItems from multiple AWS services**

2. In the navigation pane, choose **OpsCenter**.
3. Choose **Configure sources**.
4. Under **Step 2: OpsItem source setup**, for **IAM Role**, paste the ARN of the IAM role ARN that enables CloudWatch Events to create OpsItems in OpsCenter.
5. Choose **Set up**.
7. In the navigation pane, choose **Rules**. Verify that the list includes new rules that begin with **SSM OpsItems-***, such as **SSM OpsItems-AutoScaling-instance-launch-failure** and **SSM OpsItems-RDS-issue**.

**Note**

If you want, you can edit the new rules in CloudWatch.

After an OpsItem is created from an event, you can view the event details by opening the OpsItem and scrolling down to the **Operational data** section.
For information about how to configure the options in an OpsItem, see Working with OpsItems (p. 125).

Configuring CloudWatch Events to Automatically Create OpsItems for Specific Events

Use the following procedure to configure SSM OpsItems as the target of a CloudWatch event. When CloudWatch receives the event, it creates a new OpsItem.

To configure OpsCenter as a target of a CloudWatch event

1. Sign in to the AWS Management Console and open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. In the navigation pane, choose Events, and then either choose to create a new rule or edit an existing rule.
3. After specifying or verifying the details of the rule, choose Add target.
4. In the Select target type list, choose SSM OpsItem.
5. For Configure input, verify that Matched event is selected.
6. In the permissions section, choose Create a new role for this specific resource to create a new role with the required permissions. Or, choose Use existing role and choose the IAM role you created that gives CloudWatch permission to create OpsItems in OpsCenter. For more information about the required role and permissions, see Getting Started with OpsCenter (p. 113).
8. For Name, type a descriptive name that identifies the purpose of this rule.
9. For Description, type information about this rule.
10. Verify that the Enabled option is selected, and then choose Create rule.
11. In the navigation pane, choose Rules. Verify that the list includes a new rule that begins with AwsSSMOpsCenter-*, such as AwsSSMOpsCenter-EC2 or AwsSSMOpsCenter-DynamoDB.

After an OpsItem is created from an event, you can view the event details by opening the OpsItem and scrolling down to the Private operational data section.

For information about how to configure the options in an OpsItem, see Working with OpsItems (p. 125).

Integrating with CloudWatch Application Insights for .NET and SQL Server

OpsCenter integrates with Amazon CloudWatch Application Insights for .NET and SQL Server. This means you can automatically create OpsItems for problems detected in your applications. For information about how to configure Application Insights to create OpsItems, see Setting Up Your Application in the Amazon CloudWatch User Guide.

Creating OpsItems Manually

This section includes procedures for manually create OpsItems for issues that aren't automatically created by Amazon CloudWatch Events.

Before You Begin
Creating OpsItems

If you manually create an OpsItem for an impacted AWS resource, then collect information about that resource so that you can create an Amazon Resource Name (ARN). If you specify an ARN when you create an OpsItem, then OpsCenter automatically creates a deep link to detailed information about the resource. For example, if you specify the ARN of an impacted EC2 instance, then OpsCenter creates a deep link to the details about that instance. For information about how to create an ARN, see the Amazon Resource Names (ARNs) and AWS Service Namespaces in the Amazon Web Services General Reference.

**Note**

OpsCenter does not support creating deep links for all ARN types. To view a list of resources the support deep links based on ARNs, see Supported Resources Reference (p. 136).

This section includes the following procedures.

- To manually create an OpsItem (console) (p. 122)
- To manually create an OpsItem (AWS CLI) (p. 122)

**To manually create an OpsItem (console)**

2. In the navigation pane, choose **OpsCenter**.
3. Choose **Create OpsItem**. If you don't see this button, then choose the **OpsItems** tab, and then choose **Create OpsItem**.
4. For **Title**, enter a descriptive name to help you understand the purpose of the OpsItem.
5. For **Source**, enter the type of impacted AWS resource or other source information to help users understand the origin of the OpsItem.
   
   **Note**
   
   You can't edit the **Source** field after you create the OpsItem.
6. For **Priority**, choose the priority level.
7. For **Description**, enter information about this OpsItem including (if applicable) steps for reproducing the issue.
8. For **Deduplication string**, enter words the system should use to check for duplicate OpsItems. For more information about deduplication strings, see Reducing Duplicate OpsItems (p. 130).
9. (Optional) For **Notifications**, specify the SNS topic ARN where you want notifications sent when this OpsItem is updated. You must specify an Amazon SNS ARN that is in the same AWS Region as the OpsItem.
10. (Optional) Under **Related resources**, choose **Add** to specify the ARN of the impacted resource and any related resources.
11. Choose **Create OpsItem**.

If successful, the OpsItem opens. For information about how to configure the options in an OpsItem, see Working with OpsItems (p. 125).

**To manually create an OpsItem (AWS CLI)**

1. Open the AWS CLI and run the following command to create an OpsItem.

   ```bash
   aws ssm create-ops-item --title "Descriptive_title" --description "Information_about_the_issue" --priority Number_between_1_and_5 --source Source_of_the_issue --operational-data Up_to_20_KB_of_data_or_path_to_JSON_file --notifications Arn="SNSARN_in_same_Region" --tags "Key=key_name,Value=a_value"
   ```

   Here are some examples.
## Creating OpsItems

**Linux**

```bash
cmd
aws ssm create-ops-item --title "EC2 instance disk full" --description "Log clean up may have failed which caused the disk to be full" --priority 2 --source ec2 --operational-data '{"EC2":{"Value":"12345","Type":"SearchableString"}}' --notifications Arn="arn:aws:ssm:us-west-1:12345678:TestUser1" --tags "Key=EC2,Value=ProductionServers"
```

The following command uses the `/aws/resources` key in OperationalData to create an OpsItem with an Amazon DynamoDB related resource.

```bash
cmd
aws ssm create-ops-item --title "EC2 instance disk full" --description "Log clean up may have failed which caused the disk to be full" --priority 2 --source ec2 --operational-data '{"/aws/resources":{"Value":"[{"arn": "arn:aws:dynamodb:us-west-2:12345678:table/OpsItems"}],"Type":"SearchableString"}}' --notifications Arn="arn:aws:ssn:us-west-2:12345678:TestUser"'
```

The following command uses the `/aws/automations` key in OperationalData to create an OpsItem that specifies the AWS-ASGEnterStandby document as an associated automation runbook.

```bash
cmd
aws ssm create-ops-item --title "EC2 instance disk full" --description "Log clean up may have failed which caused the disk to be full" --priority 2 --source ec2 --operational-data '{"/aws/automations":{"Value":"[{"automationId": "AWS-ASGEnterStandby", "automationType": "AWS::SSM::Automation "}],"Type":"SearchableString"}}' --notifications Arn="arn:aws:ssn:us-west-2:12345678:TestUser"
```

**Windows**

```bash
cmd
aws ssm create-ops-item --title "RDS instance not responding" --description "RDS instance not responding to ping" --priority 1 --source RDS --operational-data={"RDS":{"Value":"abcd","Type":"SearchableString"}} --notifications Arn="arn:aws:ssn:us-west-1:12345678:TestUser1" --tags "Key=RDS,Value=ProductionServers"
```

The following command uses the `/aws/resources` key in OperationalData to create an OpsItem with an Amazon EC2 instance related resource.

```bash
cmd
aws ssm create-ops-item --title "EC2 instance disk full" --description "Log clean up may have failed which caused the disk to be full" --priority 2 --source ec2 --operational-data={"/aws/resources":{"Value":"[{"arn": "arn:aws:ec2:us-east-1:123456789012:instance/i-1234567890abcdef0"}],"Type":"SearchableString"}}}
```

The following command uses the `/aws/automations` key in OperationalData to create an OpsItem that specifies the AWS-RestartEC2Instance document as an associated automation runbook.

```bash
cmd
aws ssm create-ops-item --title "EC2 instance disk full" --description "Log clean up may have failed which caused the disk to be full" --priority 2 --source ec2 --operational-data={"/aws/automations":{"Value":"[{"automationId": "AWS-RestartEC2Instance","automationType": "AWS::SSM::Automation"}],"Type":"SearchableString"}}}
```

**Specify operational data from a file**
When you create an OpsItem, you can specify operational data from a file. The file must be a JSON file, and the contents of the file must use the following format:

```
{
  "key_name": {
    "Type": "SearchableString",
    "Value": "Up to 20 KB of data"
  }
}
```

Here is an example.

```bash
aws ssm create-ops-item --title "EC2 instance disk full" --description "Log clean up may have failed which caused the disk to be full" --priority 2 --source ec2 --operational-data file:///Users/TestUser1/Desktop/OpsItems/opsData.json --notifications Arn="arn:aws:sns:us-west-1:12345678:TestUser1" --tags "Key=EC2,Value=Production"
```

**Note**
For information about how to enter JSON-formatted parameters on the command line on different local operating systems, see Using Quotation Marks with Strings in the AWS Command Line Interface User Guide.

The system returns information like the following:

```
{
  "OpsItemId": "oi-1a2b3c4d5e6f"
}
```

2. Run the following command to view details about the OpsItem you created.

```bash
aws ssm get-ops-item --ops-item-id ID
```

The system returns information like the following:

```
{
  "OpsItem": {
    "CreatedBy": "arn:aws:iam::12345678:user/TestUser",
    "CreatedTime": 1558386334.995,
    "Description": "Log clean up may have failed which caused the disk to be full",
    "LastModifiedBy": "arn:aws:iam::12345678:user/TestUser",
    "LastModifiedTime": 1558386334.995,
    "Notifications": [
      {
        "Arn": "arn:aws:sns:us-west-1:12345678:TestUser"
      }
    ],
    "Priority": 2,
    "RelatedOpsItems": [],
    "Status": "Open",
    "OpsItemID": "oi-1a2b3c4d5e6f",
    "Title": "EC2 instance disk full",
    "Source": "ec2",
    "OperationalData": {
      "EC2": {
        "Value": "12345",
        "Type": "SearchableString"
      }
    }
  }
}
```
3. Run the following command to update the OpsItem. This command changes the status from Open (the default) to InProgress.

   ```bash
   aws ssm update-ops-item --ops-item-id ID --status InProgress
   ```

   The command has no output.

4. Run the following command again to verify that the status changed to InProgress.

   ```bash
   aws ssm get-ops-item --ops-item-id ID
   ```

---

**Working with OpsItems**

This section describes how to configure the options available in an OpsItem. For information about creating OpsItems, see Creating OpsItems (p. 119).

**Topics**

- Working with Related Resources (p. 125)
- Editing OpsItem Details (p. 126)
- Working with Related and Similar OpsItems (p. 128)
- Working with Operational Data (p. 128)
- Reducing Duplicate OpsItems (p. 130)

**Working with Related Resources**

A related resource is the impacted resource (the resource that needs to be investigated or the resource that triggered the Amazon CloudWatch Events event that created the OpsItem). Each OpsItem has a Related resources section. If CloudWatch Events creates the OpsItem, then the system automatically populates the OpsItem with the Amazon Resource Name (ARN) of the resource. You can also manually specify ARNs of related resources. For some ARN types, OpsCenter automatically creates a deep link that displays details about the resource without having to visit other console pages to view that information. For example, you can specify the ARN of an Amazon EC2 instance. In OpsCenter, you can then view all of the details that Amazon EC2 provides about that instance. To view a list of resource types that automatically create deep links to related resource, see Supported Resources Reference (p. 136).

**Note**

You can manually add the ARNs of additional related resources. Each OpsItem can list a maximum of 100 related resource ARNs.

**To view and add related resources**

2. In the navigation pane, choose OpsCenter.
3. Choose the OpsItems tab.
4. Choose an OpsItem ID.
5. To view information about the impacted resource, choose the Related resources details tab.

This tab displays information about the resource from several AWS services. Expand the Resource details section to view information about this resource as provided by the AWS service that hosts it. You can also toggle through other related resources associated with this OpsItem by using the Related resources list.

6. To add additional related resources, choose the Overview tab.

7. In the Related resources section, choose Add.

8. For Resource ARN, enter the ARN of the related resource, and then choose Add.

   Note
   If you don't know the ARN of the resource, you can manually create it. For information about how to create an ARN, see the Amazon Resource Names (ARNs) and AWS Service Namespaces in the Amazon Web Services General Reference.

Editing OpsItem Details

The OpsItem details section includes information about the OpsItem, including the description, title, source, OpsItem ID, and the status, to name a few.
For OpsItems that were created automatically, Amazon CloudWatch Events populates the **Title**, **Source**, and **Description** fields. You can edit the **Title** and the **Description** fields, but you can't edit the **Source** field.

**About OpsItem Status**

When you edit an OpsItem, you can specify a status. The **Status** list includes the following options:

<table>
<thead>
<tr>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>Active in the system, but <em>not</em> being worked on by an engineer.</td>
</tr>
<tr>
<td>In progress</td>
<td>Active in the system and being worked on by an engineer.</td>
</tr>
<tr>
<td>Resolved</td>
<td>Not active in the system, but available in Search and when using the <strong>Resolved</strong> filter on the OpsItem <strong>Overview</strong> page. You can edit a resolved OpsItem to change the status to <strong>Open</strong> or <strong>In progress</strong>.</td>
</tr>
</tbody>
</table>

You can view reports about OpsItem statuses on the **Summary** tab. For more information, see Viewing OpsCenter Summary Reports (p. 136).

**About OpsItem Priority**

When you edit an OpsItem, you can choose a priority for that OpsItem by choosing a value between 1 and 5. We recommend that your organization determine what each priority level means and a corresponding service level agreement for each.

**About the Notifications Field**

When you edit an OpsItem, you can specify the ARN of an SNS topic in the **Notifications** field. By specifying an ARN, you ensure that all stakeholders receive a notification when the OpsItem is edited, including a status change. You may find it helpful to create different ARNs for notifications about different types of AWS resources or different environments. For more information, see the *Amazon Simple Notification Service Developer Guide*. 

You can view reports about OpsItem statuses on the **Summary** tab. For more information, see Viewing OpsCenter Summary Reports (p. 136).

**About OpsItem Status**

When you edit an OpsItem, you can specify a status. The **Status** list includes the following options:
Important
The SNS topic must exist in the same AWS Region as the OpsItem. If they are in different regions, the system returns an error.

To edit OpsItem details
2. In the navigation pane, choose OpsCenter.
3. Choose an OpsItem ID to open the details page.
4. In the OpsItem details section, choose Edit.
5. Edit the details of the OpsItem according to the requirements and guidelines specified by your organization.
6. When you are finished, choose Save.

Working with Related and Similar OpsItems

The Related and Similar OpsItem features are designed to help you investigate operations issues while providing context about the scope of an issue. In the Related OpsItems section, you can specify a maximum of 10 IDs for other OpsItems that are related to the current OpsItem. OpsItems can be related in different ways, including a parent-child relationship between OpsItems, a root cause, or a duplicate.

To add a related OpsItem from Similar OpsItems
2. In the navigation pane, choose OpsCenter.
3. Choose an OpsItem ID to open the details page.
4. In the Related OpsItem section, choose Add.
5. For OpsItem ID, specify an ID.
6. Choose Add.

Working with Operational Data

Operational data is custom data that provides useful reference details about the OpsItem. For example, you can specify log files, error strings, license keys, troubleshooting tips, or other relevant data. You
enter operational data as key-value pairs. The key has a maximum length of 128 characters. The value has a maximum size of 20 KB. You can enter multiple key-value pairs of operational data.

**Important**
Operational data keys can't begin with the following: amazon, aws, amzn, ssm, /amazon, /aws, /amzn, /ssm.

---

You can choose to make the data searchable by other users in the account or you can restrict search access. Searchable data means that all users with access to the OpsItem Overview page (as provided by the DescribeOpsItems API action) can view and search on the specified data. Operational data that is not searchable is only viewable by users who have access to the OpsItem (as provided by the GetOpsItem API action).

**To add operational data to an OpsItem**

2. In the navigation pane, choose OpsCenter.
3. Choose an Opsitem ID to open the details page.
4. Expand either Operational data.
5. If no operational data exists for the OpsItem, then choose Add. If operational data already exists for the Opsitem, choose Manage.
6. For Key, specify a word or words to help users understand the purpose of the data. The key can't begin with the following: amazon, aws, amzn, ssm, /amazon, /aws, /amzn, /ssm.
7. For Value, specify the data.
8. Choose Save.

After you create operational data, you can edit the key and the value, remove the operational data, or add additional key-value pairs by choosing Manage.
Note
You can filter OpsItems by using the **Operational data** operator on the OpsItems page. In the Search box, choose **Operational data**, and then enter a key-value pair in JSON. You must enter the key-value pair by using the following format:

```
{"key":"key_name","value":"a_value"}
```

## Reducing Duplicate OpsItems

OpsCenter uses a combination of built-in logic and configurable deduplication strings to help avoid creating duplicate OpsItems. Deduplication built-in logic is applied anytime the **CreateOpsItem** API action is called. When creating the OpsItem, Systems Manager creates and stores a hash based on the deduplication string and the resource that triggered the OpsItem. When a request is made to create a new OpsItem, the system checks the deduplication string of the new request. If a matching hash exists for this deduplication string, then Systems Manager doesn't create a new OpsItem.

Note the following information about OpsCenter and deduplication:

- Deduplication strings are not case sensitive. If the system finds a matching deduplication string in an OpsItem, regardless of casing, the new OpsItem isn't created.
- If the system finds a matching deduplication string in an OpsItem, and that OpsItem has a status of Open, then the new OpsItem isn't created. If a matching deduplication string is found in an OpsItem that has a status of Resolved, then the system creates a new OpsItem.
- If the system finds a matching deduplication string in an OpsItem, but the resources are different, then the system creates the new OpsItem.

## Configuring Deduplication Strings

OpsCenter includes the following options for configuring deduplication strings.

- **Edit preconfigured deduplication strings**: Each of the OpsItem default CloudWatch Events rules includes a preconfigured deduplication string. You can edit these deduplication strings in CloudWatch Events.

- **Manually specify deduplication strings**: You can enter a deduplication string by using either the **Deduplication string** field in the console or the **OperationalData** parameter when you create a new OpsItem by using either the AWS CLI or AWS Tools for Windows PowerShell.

After the system creates an OpsItem, it populates the **Deduplication string** field, if a string was specified. Here's an example.
After you create an OpsItem, you can't edit or change the deduplication strings in that OpsItem.

This sections includes the following procedures for configuring deduplication strings.

- Editing a deduplication String in an OpsCenter Default CloudWatch Events Rule (p. 131)
- Specifying a deduplication String by Using the AWS CLI (p. 132)

**Note**
For information about entering deduplication strings when you manually create an OpsItem in the console, see Creating OpsItems Manually (p. 121).

**Editing a deduplication String in an OpsCenter Default CloudWatch Events Rule**

Use the following procedure to specify a deduplication string for a CloudWatch Events rule that targets OpsCenter.

**To edit a deduplication string in an OpsItem default CloudWatch Events rule**

2. In the navigation pane, choose Rules.
3. Choose a rule, and then choose Actions, Edit.
4. In the Targets section, expand the lower Input transformer field and locate the "operationalData": { "/aws/de\dup" JSON entry and the deduplication strings that you want to edit.
The deduplication string entry in CloudWatch Events rules uses the following JSON format.

```
"operationalData": { "/aws/dedup": {"type": "SearchableString","value": "{\"dedupString \":\"Words the system should use to check for duplicate OpsItems\")"}
```

Here is an example.

```
"operationalData": { "/aws/dedup": {"type": "SearchableString","value": "{\"dedupString \":\"SSMopsCenter-EBS-volume-performance-issue\")"}
```

5. Edit the deduplications strings, and then choose **Configure details** to finish updating the rule.

**Specifying a deduplication String by Using the AWS CLI**

You can specify a deduplication string when you manually create a new OpsItem by using the AWS CLI. You enter the deduplication string by using the `OperationalData` parameter. The parameter syntax uses JSON, as shown here.

```
--operational-data '({"aws/dedup":{"Value":"{"dedupString :\"Words the system should use to check for duplicate OpsItems\")"","Type":"SearchableString"}}
```

Here is an example command that specifies a deduplication string of `disk full`.

**Linux**

```
aws ssm create-ops-item --title "EC2 instance disk full" --description "Log clean up may have failed which caused the disk to be full" --priority 1 --source ec2 --operational-data '{"aws/dedup":{"Value":"{"dedupString :"disk full""","Type":"SearchableString"}}' --tags "Key=EC2,Value=ProductionServers" --notifications Arn="arn:aws:sns:us-west-1:12345678:TestUser"
```
Remediating OpsItem Issues Using Systems Manager Automation

AWS Systems Manager Automation helps you quickly remediate issues with AWS resources identified in your OpsItems. Automation uses predefined SSM Automation documents (runbooks) to remediate common issues with AWS resources. For example, Automation includes runbooks to perform the following actions:

- Stop, start, restart, and terminate Amazon Relational Database Service (Amazon RDS) and Amazon Elastic Compute Cloud (Amazon EC2) instances.
- Create AWS resources such as Amazon Machine Images (AMIs), Amazon Elastic Block Store (Amazon EBS) snapshots, and Amazon DynamoDB backups.
- Configure a resource to use AWS services, including Amazon CloudWatch Events, AWS CloudTrail, and Amazon Simple Storage Service (Amazon S3) bucket logging and versioning.
- Attach an AWS Identity and Access Management (IAM) instance profile to an instance.
- Troubleshoot RDP and SSH connectivity issues for EC2 instances.
- Reset access for an EC2 instance.

Each OpsItem in the AWS Management Console includes a Runbooks section, as shown in the following.

If the OpsItem was automatically created by CloudWatch (as a result of the bulk method of setting up OpsItem rules, as described in Enabling the Default CloudWatch Events Rules for Automatically Creating Opsitems (p. 119)), then the list of runbooks is automatically filtered to reflect the recommended runbooks for the specific issue. If the OpsItem was created manually or by specifying Opsitem as a target of a CloudWatch event, then the Runbooks section lists all SSM Automation runbooks.

You can view information about a runbook by either choosing the runbook name in the console or by using the Systems Manager Automation Document Details Reference (p. 294).
Using a Runbook to RemEDIATE an OpsItem Issue

When you execute a runbook from an OpsItem, you can run a simple version or you can choose the Advanced configuration option. The Advanced configuration opens the runbook in Systems Manager Automation, which provides several options for executing the runbook.

Before You Begin

Before you execute a runbook to remediate an OpsItem issue, do the following:

- Verify that you have permission to run Systems Manager Automation documents. For more information, see Getting Started with Automation (p. 144).
- Collect resource-specific ID information for the runbook that you want to execute. For example, if you want to execute a runbook that restarts an EC2 instance, then you must specify the ID of the instance to restart.

To execute a runbook to remediate an OpsItem issue

2. In the navigation pane, choose OpsCenter.
3. Choose the OpsItem ID to open the details page.
4. Scroll to the Runbooks section.
5. Use the Runbooks Search bar or the numbers in the upper right to find the runbook that you want to execute.
6. Choose a runbook, and then choose **Execute**.
7. Enter the required information for the runbook, and then choose **Execute**.
8. In the navigation pane, choose **Automation**, and then choose the **Execution ID** link to view the steps and the status of the execution.

---

### Working with Associated Runbooks

After you execute a runbook from an OpsItem, the runbook is automatically associated with the related resource of that OpsItem for future reference and easy execution. Associated runbooks are ranked higher than others in the **Runbooks** list, as shown in the following.

Associated runbooks are also available in the **Run automation** list in the **Related resources** section, as shown in the following.
Use the following procedure to execute a runbook that has already been associated with a related resource in an OpsItem. For information about adding related resources, see Working with OpsItems (p. 125).

**To execute a resource-associated runbook to remediate an OpsItem issue**

2. In the navigation pane, choose **OpsCenter**.
3. Open the OpsItem for which you want to execute a runbook.
4. In the **Related resources** section, choose the resource on which you want to execute a runbook.
5. Choose **Run automation**, and then choose the associated runbook that you want to execute.
6. Enter the required information for the runbook, and then choose **Execute**.
7. In the navigation pane, choose **Automation**, and then choose the **Execution ID** link to view the steps and the status of the execution.

**Viewing OpsCenter Summary Reports**

OpsCenter includes a summary page that automatically displays the following information:

- **OpsItem status summary**: a summary of OpsItems by status (Open and In progress, Open, or In Progress).
- **Sources with most open OpsItems**: a breakdown of the top AWS services that have open OpsItems.
- **OpsItems by source and age**: a count of OpsItems, grouped by source and days since creation.

**To view the OpsCenter Summary page**

2. In the navigation pane, choose **OpsCenter**.
3. On the OpsItems Overview page, choose **Summary**.
4. Under **OpsItems by source and age**, choose the Search bar to filter OpsItems according to **Source**. Use the list to filter according to **Status**.

**Supported Resources Reference**

OpsCenter automatically creates a deep link to the primary resource page when you specify the Amazon Resource Name (ARN) for the following types of AWS resources. For example, if you specify the ARN of an Amazon EC2 instance in the **Related Resources** field, then OpsCenter creates a deep link to the information about that instance in the Amazon EC2 console. This enables you to view detailed information about your impacted AWS resources without having to leave OpsCenter. For more information about adding related resources, see Working with Related Resources (p. 125).
## Supported Resources

<table>
<thead>
<tr>
<th>Resource Name</th>
<th>ARN Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon CloudFront distribution</td>
<td>arn:aws:cloudfront::account-id:*</td>
</tr>
<tr>
<td>Amazon CloudWatch alarm</td>
<td>arn:aws:cloudwatch:region:account-id:alarm:alarm-name</td>
</tr>
<tr>
<td>AWS CloudTrail trail</td>
<td>arn:aws:cloudtrail:region:account-id:trail/trailname</td>
</tr>
<tr>
<td>AWS CodeBuild project</td>
<td>arn:aws:codebuild:region:account-id:resourcetype/resource</td>
</tr>
<tr>
<td>Amazon DynamoDB table</td>
<td>arn:aws:dynamodb:region:account-id:table/tablename</td>
</tr>
<tr>
<td>Amazon EC2 customer gateway</td>
<td>arn:aws:ec2:region:account-id:customer-gateway/cgw-id</td>
</tr>
<tr>
<td>Amazon EC2 elastic IP</td>
<td>arn:aws:ec2:region:account-id:eip/eipalloc-id</td>
</tr>
<tr>
<td>Amazon EC2 dedicated host</td>
<td>arn:aws:ec2:region:account-id:dedicated-host/host-id</td>
</tr>
<tr>
<td>Amazon EC2 instance</td>
<td>arn:aws:ec2:region:account-id:instance/instance-id</td>
</tr>
<tr>
<td>Resource Name</td>
<td>ARN Format</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>Amazon EC2 network access control list (ACL)</td>
<td>arn:aws:ec2:region:account-id:network-acl-nacl-id</td>
</tr>
<tr>
<td>Amazon EC2 network interface</td>
<td>arn:aws:ec2:region:account-id:network-interface/eni-id</td>
</tr>
<tr>
<td>Amazon EC2 security group</td>
<td>arn:aws:ec2:region:account-id:security-group/security-group-id</td>
</tr>
<tr>
<td>Amazon EC2 subnet</td>
<td>arn:aws:ec2:region:account-id:subnet/subnet-id</td>
</tr>
<tr>
<td>Amazon EC2 volume</td>
<td>arn:aws:ec2:region:account-id:volume/volume-id</td>
</tr>
<tr>
<td>Amazon EC2 VPC</td>
<td>arn:aws:ec2:region:account-id:vpc/vpc-id</td>
</tr>
<tr>
<td>Amazon EC2 VPN connection</td>
<td>arn:aws:ec2:region:account-id:vpn-connection/vpn-id</td>
</tr>
<tr>
<td>Amazon EC2 VPN gateway</td>
<td>arn:aws:ec2:region:account-id:vpn-gateway/vgw-id</td>
</tr>
<tr>
<td>Elastic Load Balancing (classic load balancer)</td>
<td>arn:aws:elasticloadbalancing:region:account-id:loadbalancer/name</td>
</tr>
<tr>
<td>AWS Identity and Access Management (IAM) group</td>
<td>arn:aws:iam::account-id:group/group-name</td>
</tr>
<tr>
<td>IAM policy</td>
<td>arn:aws:iam::account-id:policy/policy-name</td>
</tr>
<tr>
<td>Resource Name</td>
<td>ARN Format</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>IAM role</td>
<td>arn:aws:iam::account-id:role/role-name</td>
</tr>
<tr>
<td>IAM user</td>
<td>arn:aws:iam::account-id:user/user-name</td>
</tr>
<tr>
<td>AWS Lambda function</td>
<td>arn:aws:lambda:region:account-id:function:function-name</td>
</tr>
<tr>
<td>Amazon Relational Database Service (Amazon RDS) cluster</td>
<td>arn:aws:rds:region:account-id:cluster:db-cluster-name</td>
</tr>
<tr>
<td>Amazon RDS database instance</td>
<td>arn:aws:rds:region:account-id:db:db-instance-name</td>
</tr>
<tr>
<td>Amazon RDS subscription</td>
<td>arn:aws:rds:region:account-id:es:subscription-name</td>
</tr>
<tr>
<td>Amazon RDS security group</td>
<td>arn:aws:rds:region:account-id:secgrp:security-group-name</td>
</tr>
<tr>
<td>Amazon RDS subnet group</td>
<td>arn:aws:rds:region:account-id:subgrp:subnet-group-name</td>
</tr>
<tr>
<td>Amazon Redshift cluster</td>
<td>arn:aws:redshift:region:account-id:cluster:cluster-name</td>
</tr>
<tr>
<td>Amazon Redshift parameter group</td>
<td>arn:aws:redshift:region:account-id:parametergroup:parameter-group-name</td>
</tr>
<tr>
<td>Amazon Redshift security group</td>
<td>arn:aws:redshift:region:account-id:securitygroup:security-group-name</td>
</tr>
<tr>
<td>Amazon Redshift cluster snapshot</td>
<td>arn:aws:redshift:region:account-id:securitygroup:security-group-name</td>
</tr>
<tr>
<td>Amazon Simple Storage Service (Amazon S3) bucket</td>
<td>arn:aws:s3:::bucket_name</td>
</tr>
</tbody>
</table>
Auditing and Logging OpsCenter Activity

AWS CloudTrail captures OpsCenter API calls made in the AWS Systems Manager console, the AWS CLI, and the Systems Manager SDK. You can view the information in the CloudTrail console or in an Amazon Simple Storage Service (Amazon S3) bucket. One bucket is used for all CloudTrail logs for your account.

Logs of OpsCenter actions show create, update, get, and describe OpsItem activities. For more information about viewing and using CloudTrail logs of Systems Manager activity, see Logging AWS Systems Manager API Calls with AWS CloudTrail (p. 892).

AWS Resource Groups

A resource group is a collection of AWS resources that are all in the same AWS Region, and that match criteria provided in a query. (In AWS, a resource is an entity that you can work with. Examples include an Amazon EC2 instance, an AWS CloudFormation stack, and an Amazon S3 bucket.) You build queries in the AWS Resource Groups (Resource Groups) console, or pass them as arguments to Resource Groups commands in the AWS CLI.

With AWS Resource Groups, you can create a custom console that organizes and consolidates information based on criteria that you specify in tags. After you add resources to a group you created in Resource Groups, use AWS Systems Manager tools such as Automation to simplify management tasks on your resource group. You can also use the resource groups you create as the basis for viewing monitoring and configuration insights in Systems Manager.

For information about granting the IAM users in your account access to Resource Groups and its Tag Editor in the AWS Management Console, see Create Policies for Tag Editor and Resource Groups (p. 25).

Resources

- AWS Resource Groups User Guide
- AWS CloudTrail User Guide
- AWS Config Developer Guide

Trusted Advisor and Personal Health Dashboards Hosted by Systems Manager

Systems Manager hosts two online tools to help you provision your resources and monitor your account for health events. Trusted Advisor is an online tool that provides you real time guidance to help you provision your resources following AWS best practices. For more information, see Trusted Advisor.

The AWS Personal Health Dashboard provides information about AWS Health events that can affect your account. The information is presented in two ways: a dashboard that shows recent and upcoming
events organized by category, and a full event log that shows all events from the past 90 days. For more information, see Getting Started with the AWS Personal Health Dashboard.
AWS Systems Manager Actions & Change

AWS Systems Manager provides the following capabilities for taking action against or changing your AWS resources.

Topics
- AWS Systems Manager Automation (p. 142)
- AWS Systems Manager Maintenance Windows (p. 444)

AWS Systems Manager Automation

Systems Manager Automation simplifies common maintenance and deployment tasks of Amazon EC2 instances and other AWS resources. Automation enables you to do the following.

- Build Automation workflows to configure and manage instances and AWS resources.
- Create custom workflows or use pre-defined workflows maintained by AWS.
- Receive notifications about Automation tasks and workflows by using Amazon CloudWatch Events.
- Monitor Automation progress and execution details by using the Amazon EC2 or the AWS Systems Manager console.

Automation Use Cases

This section includes common uses cases for AWS Systems Manager Automation.

Perform common IT tasks

Automation can simplify common IT tasks such as changing the state of one or more instances (using an approval workflow) and managing instance states according to a schedule. Here are some examples:

- Use the AWS-StopEC2InstanceWithApproval document to request that one or more AWS Identity and Access Management (IAM) users approve the instance stop action. After the approval is received, Automation stops the instance.
- Use the AWS-StopEC2Instance document to automatically stop instances on a schedule by using Amazon CloudWatch Events or by using a maintenance window task. For example, you can configure an Automation workflow to stop instances every Friday evening, and then restart them every Monday morning.
- Use the AWS-UpdateCloudFormationStackWithApproval document to update resources that were deployed by using CloudFormation template. The update applies a new template. You can configure the Automation to request approval by one or more IAM users before the update begins.

For information about how to run an Automation workflow by using State Manager, see Running Automation Workflows with Triggers Using State Manager (p. 182).

Safely perform disruptive tasks in bulk

Systems Manager includes features that help you target large groups of instances by using Amazon EC2 tags, and velocity controls that help you roll out changes according to the limits you define.
Use the AWS-RestartEC2InstanceWithApproval document to target an AWS resource group that includes multiple instances. You can configure the Automation workflow to use velocity controls. For example, you can specify the number of instances that should be restarted concurrently. You can also specify a maximum number of errors that are allowed before the Automation workflow is cancelled.

**Simplify complex tasks**

Automation offers one-click automations for simplifying complex tasks such as creating golden Amazon Machines Images (AMIs), and recovering unreachable EC2 instances. Here are some examples:

- Use the AWS-UpdateLinuxAmi and AWS-UpdateWindowsAmi documents to create golden AMIs from a source AMI. You can run custom scripts before and after updates are applied. You can also include or exclude specific packages from being installed. For examples of how to run these workflows, see Automation Walkthroughs (p. 400).

- Use the AWSSupport-ExecuteEC2Rescue document to recover impaired instances. An instance can become unreachable for a variety of reasons, including network misconfigurations, RDP issues, or firewall settings. Troubleshooting and regaining access to the instance previously required dozens of manual steps before you could regain access. The AWSSupport-ExecuteEC2Rescue document lets you regain access by specifying an instance ID and clicking a button. For an example of how to run this workflow, see Run the EC2Rescue Tool on Unreachable Instances (p. 422).

**Enhance operations security**

Using delegated administration, you can restrict or elevate user permissions for various types of tasks.

Delegated administration enables you to provide permissions for certain tasks on certain resource without having to give a user direct permission to access the resources. This improves your overall security profile. For example, assume that User1 doesn't have permissions to restart EC2 instances, but you would like to authorize the user to do so. Instead of allowing User1 direct permissions, you can:

- Create an IAM role with the permissions required to successfully stop and start EC2 instances.
- Create an Automation document and embed the role in the document. (The easiest way to do this is to customize the AWS-RestartEC2Instance document and embed the role in the document instead of assigning an Automation service role [or assume role]).
- Modify IAM permissions for User1 and allow the user permission to run the document.

For an example of how to delegate access to an Automation workflow, see Running an Automation Workflow by Using Delegated Administration (p. 204).

**Share best practices**

Automation lets you share best practices with rest of your organization.

You can create best practices for resource management in Automation documents and easily share the documents across AWS Regions and groups. You can also constrain the allowed values for the parameters the document accepts.

**Concepts**

AWS Systems Manager Automation uses the following concepts.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automation document</td>
<td>A Systems Manager Automation document defines the Automation workflow (the actions that Systems Manager performs on your managed instances and AWS resources). Automation includes several pre-defined Automation</td>
</tr>
</tbody>
</table>
Getting Started with Automation

To set up Automation, you must verify user access to the Automation service and situationally configure roles so that the service can perform actions on your resources. To ensure proper access to Systems Manager Automation, review the following user and service role requirements.

Verify user access

Verify that you have permission to run Automation workflows. If your AWS Identity and Access Management (IAM) user account, group, or role is assigned administrator permissions, then you have access to Systems Manager Automation. If you don’t have administrator permissions, then an administrator must give you permission by assigning the AmazonSSMFullAccess managed policy, or a policy that provides comparable permissions, to your IAM account, group, or role.

Important

The IAM policy AmazonSSMFullAccess grants permissions to Systems Manager actions. However, some Automation documents require permissions to other services,
such as the document AWS-ReleaseElasticIP, which requires IAM permissions for ec2:ReleaseAddress. Therefore, you must review the actions taken in an Automation document to ensure your IAM user account, group, or role is assigned the necessary permissions to perform the actions included in the document.

Configure service role access (situational)

Automation workflows can be initiated under the context of a service role (or assume role). This allows the service to perform actions on your behalf. If you do not specify an assume role, Automation uses the context of the user who invoked the execution.

However, the following situations require that you specify a service role for Automation:

- When you want to restrict a user’s privileges on a resource, but you want the user to run an Automation workflow that requires elevated privileges. In this scenario, you can create a service role with elevated privileges and allow the user to run the workflow.
- When you create a State Manager Association that runs an Automation workflow.
- When you have operations that you expect to run longer than 12 hours.

If you need to create a service role for Automation, you can use one of the following methods.

Topics
- Method 1: Use AWS CloudFormation to Configure a Service Role for Automation (p. 145)
- Method 2: Use IAM to Configure Roles for Automation (p. 146)

Method 1: Use AWS CloudFormation to Configure a Service Role for Automation

You can create a service role for Automation from an AWS CloudFormation template. After you create the service role, you can specify the service role in Automation workflows using the parameter AutomationAssumeRole. For information about how to run an Automation workflow using the Automation service role, see Running an Automation Workflow by Using an IAM Service Role (p. 200).

Topics
- Create the Service Role Using AWS CloudFormation (p. 145)
- Copy Role Information for Automation (p. 146)

Create the Service Role Using AWS CloudFormation

Use the following procedure to create the required IAM role for Systems Manager Automation by using AWS CloudFormation.

To create the required IAM role

1. Download the AWS-SystemsManager-AutomationServiceRole.zip folder. This folder includes the AWS-SystemsManager-AutomationServiceRole.yaml AWS CloudFormation template file.
3. Choose Create Stack.
4. In the Choose a template section, choose Upload a template to Amazon S3.
5. Choose Browse, and then choose the AWS-SystemsManager-AutomationServiceRole.yaml AWS CloudFormation template file.
6. Choose Next.
7. On the Specify Details page, in the Stack Name field, enter a name.
8. On the Options page, you don't need to make any selections. Choose Next.
9. On the Review page, scroll down and choose the I acknowledge that AWS CloudFormation might create IAM resources option.
10. Choose Create.

AWS CloudFormation shows the CREATE_IN_PROGRESS status for approximately three minutes. The status changes to CREATE_COMPLETE after the stack is created and your roles are ready to use.

**Important**
If you run an automation that invokes other services by using an AWS Identity and Access Management (IAM) service role, be aware that the service role must be configured with permission to invoke those services. This requirement applies to all AWS Automation documents (AWS-* documents) such as the AWS-ConfigureS3BucketLogging, AWS-CreateDynamoDBBackup, and AWS-RestartEC2Instance documents, to name a few. This requirement also applies to any custom Automation documents you create that invoke other AWS services by using actions that call other services. For example, if you use the aws:executeAwsApi, aws:CreateStack, or aws:copyImage actions, to name a few, then you must configure the service role with permission to invoke those services. You can enable permissions to other AWS services by adding an IAM inline policy to the role. For more information, see (Optional) Add an Automation Inline Policy to Invoke Other AWS Services (p. 147).

**Copy Role Information for Automation**

Use the following procedure to copy information about the Automation service role from the AWS CloudFormation console. You must specify these roles when you run an Automation document.

**Note**
You do not need to copy role information using this procedure if you run the AWS-UpdateLinuxAmi or AWS-UpdateWindowsAmi documents. These documents already have the required roles specified as default values. The roles specified in these documents use IAM managed policies.

**To copy the role names**

2. Select the check box next to the Automation stack you created in the previous procedure.
3. Choose the Resources tab.
4. Choose the Physical ID link for AutomationServiceRole. The IAM console opens to a summary of the Automation service role.
5. Copy the Amazon Resource Name (ARN) next to Role ARN. The ARN is similar to the following: arn:aws:iam::12345678:role/AutomationServiceRole
6. Paste the ARN into a text file to use later.

You have finished configuring the service role for Automation. You can now use the Automation service role ARN in your Automation documents.

**Method 2: Use IAM to Configure Roles for Automation**

If you need to create a service role for Systems Manager Automation, complete the following tasks. For more information on when a service role is required for Automation, see Getting Started with Automation (p. 144).
Tasks
- Task 1: Create a Service Role for Automation (p. 147)
- Task 2: Add a Trust Relationship for Automation (p. 148)
- Task 3: Attach the iam:PassRole Policy to Your Automation Role (p. 149)
- Task 4: Configure User Access to Automation (p. 150)

Task 1: Create a Service Role for Automation

Use the following procedure to create a service role (or assume role) for Systems Manager Automation.

**Note**
You can also use this role in Automation documents, such as the AWS-CreateManagedLinuxInstance document. Using this role or the ARNs in Automation documents enables Automation to perform actions in your environment, such as launch new instances and perform actions on your behalf.

To create an IAM role and allow Automation to assume it

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles, and then choose Create role.
4. In the Select your use case section, choose EC2, and then choose Next: Permissions.
5. On the Attached permissions policy page, search for the AmazonSSMAutomationRole policy, choose it, and then choose Next: Review.
6. On the Review page, type a name in the Role name box, and then type a description.
7. Choose Create role. The system returns you to the Roles page.
8. On the Roles page, choose the role you just created to open the Summary page. Note the Role Name and Role ARN. You will specify the role ARN when you attach the iam:PassRole policy to your IAM account in the next procedure. You can also specify the role name and the ARN in Automation documents.

**Note**
The AmazonSSMAutomationRole policy assigns the Automation role permission to a subset of AWS Lambda functions within your account. These functions begin with "Automation". If you plan to use Automation with Lambda functions, the Lambda ARN must use the following format:

"arn:aws:lambda:*::*:function:Automation*"

If you have existing Lambda functions whose ARNs do not use this format, then you must also attach an additional Lambda policy to your automation role, such as the AWSLambdaRole policy. The additional policy or role must provide broader access to Lambda functions within the AWS account.

(Optional) Add an Automation Inline Policy to Invoke Other AWS Services

If you run an automation that invokes other AWS services by using an IAM service role, the service role must be configured with permission to invoke those services. This requirement applies to all AWS Automation documents (AWS-* documents) such as the AWS-ConfigureS3BucketLogging, AWS-CreateDynamoDBBackup, and AWS-RebootEC2Instance documents, to name a few. This requirement also applies to any custom Automation documents you create that invoke other AWS services by using actions that call other services. For example, if you use the aws:executeAwsApi, aws:CreateStack, or aws:copyImage actions, to name a few, then you must configure the service role with permission to invoke those services. You can enable permissions to other AWS services by adding an IAM inline policy to the role.
To embed an inline policy for a service role (IAM Console)

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles.
3. In the list, choose the name of the role that you want to edit.
4. Choose the Permissions tab.
5. Choose Add inline policy.
6. Choose the JSON tab.
7. Enter a JSON policy document for the AWS services you want to invoke. Here are two example JSON policy documents.

Amazon S3 PutObject and GetObject Example

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": ["s3:PutObject", "s3:GetObject"],
            "Resource": "arn:aws:s3:::my-bucket-name/*"
        }
    ]
}
```

Amazon EC2 CreateSnapshot and DescribeSnapShots Example

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": ["ec2:CreateSnapshot", "ec2:DescribeSnapshots"],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": ["ec2:CreateSnapshot", "ec2:DescribeSnapshots"],
            "Resource": "*"
        }
    ]
}
```

For details about the IAM policy language, see IAM JSON Policy Reference in the IAM User Guide.

8. When you are finished, choose Review policy. The Policy Validator reports any syntax errors.
9. On the Review policy page, enter a Name for the policy that you are creating. Review the policy Summary to see the permissions that are granted by your policy. Then choose Create policy to save your work.
10. After you create an inline policy, it is automatically embedded in your role.

Task 2: Add a Trust Relationship for Automation

Use the following procedure to configure the service role policy to trust Automation.
To add a trust relationship for Automation

1. In the Summary page for the role you just created, choose the Trust Relationships tab, and then choose Edit Trust Relationship.
2. Add "ssm.amazonaws.com", as shown in the following example.

```json
{
  "Version":"2012-10-17",
  "Statement":[
    {
      "Sid":"",
      "Effect":"Allow",
      "Principal":{
        "Service":[
          "ec2.amazonaws.com",
          "ssm.amazonaws.com"
        ],
        "ssm.amazonaws.com"
      },
      "Action":"sts:AssumeRole"
    }
  ]
}
```
3. Choose Update Trust Policy.
4. Leave the Summary page open.

Task 3: Attach the iam:PassRole Policy to Your Automation Role

Use the following procedure to attach the iam:PassRole policy to your Automation service role. This enables the Automation service to pass the role to other services or Systems Manager capabilities when running Automation workflows.

To attach the iam:PassRole policy to your Automation role

1. In the Summary page for the role you just created, choose the Permissions tab.
2. Choose Add inline policy.
3. On the Create policy page, choose the Visual editor tab.
4. Choose Service, and then choose IAM.
5. Choose Select actions.
6. In the Filter actions text box, type PassRole, and then choose the PassRole option.
7. Choose Resources. Verify that Specific is selected, and then choose Add ARN.
8. In the Specify ARN for role field, paste the Automation role ARN that you copied at the end of Task 1. The system populates the Account and Role name with path fields.

Note
If you want the Automation service role to attach an IAM instance profile role to an EC2 instance, then you must add the ARN of the IAM instance profile role. This allows the Automation service role to pass the IAM instance profile role to the target EC2 instance.

11. On the Review Policy page, type a name and then choose Create Policy.
Task 4: Configure User Access to Automation

If your AWS Identity and Access Management (IAM) user account, group, or role is assigned administrator permissions, then you have access to Systems Manager Automation. If you don’t have administrator permissions, then an administrator must give you permission by assigning the AmazonSSMFullAccess managed policy, or a policy that provides comparable permissions, to your IAM account, group, or role.

Use the following procedure to configure a user account to use Automation. The user account you choose will have permission to configure and run Automation. If you need to create a new user account, see Creating an IAM User in Your AWS Account in the IAM User Guide.

To configure user access and attach the iam:PassRole policy to a user account

1. In the IAM navigation pane, choose Users, and then choose the user account you want to configure.
2. On the Permissions tab, in the policies list, verify that either the AmazonSSMFullAccess policy is listed or there is a comparable policy that gives the account permissions to access Systems Manager.
3. Choose Add inline policy.
4. On the Create policy page, choose Visual Editor, and then choose Choose a service.
5. From AWS Services, choose AWS Identity and Access Management.
6. For Actions, enter PassRole in the Filter actions prompt, and choose PassRole.
7. In the Resources section, choose Add ARN, paste the ARN for the Automation service role you copied at the end of Task 1, and then choose Add.
9. On the Review Policy page, provide a Name for the policy and then choose Create policy.

You have finished configuring the required roles for Automation. You can now use the Automation service role ARN in your Automation documents.

Working with Automation Executions

This section includes information about how to run Systems Manager Automation workflows. For more examples of how to run Automation workflows, see Automation Walkthroughs (p. 400).

Contents

- Running a Simple Automation Workflow (p. 150)
- Running an Automation Workflow Manually (p. 154)
- Running an Automation Workflow with Approvers (p. 160)
- Running Automation Workflows That Use Targets and Rate Controls (p. 164)
- Running Automation Workflows Based on Triggers (p. 177)
- Running Automation Workflows by Using Different Security Models (p. 196)
- Running Automation Workflows in Multiple AWS Regions and Accounts (p. 208)

Running a Simple Automation Workflow

The following procedures describe how to run a simple Systems Manager Automation workflow using the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), and AWS Tools for Windows PowerShell. The workflow runs in the context of the current AWS Identity and Access Management (IAM) user. This means that you don’t need to configure additional IAM permissions as long as you have permission to run the Automation document and any actions called by the document. If you have administrator permissions in IAM, then you already have permission to run this Automation workflow.
Note
For information about how to run an Automation workflow that uses an IAM service role or more advanced forms of delegated administration, see Running Automation Workflows by Using Different Security Models (p. 196).

Running a Simple Automation Workflow (Console)
The following procedure describes how to use the Systems Manager console to run a simple Automation workflow.

To run a simple Automation workflow
2. In the navigation pane, choose Automation, and then choose Execute automation.
3. In the Automation document list, choose a document. Choose one or more options in the Document categories pane to filter SSM documents according to their purpose. To view a document that you own, choose the Owned by me tab. To view a document that is shared with your account, choose the Shared with me tab. To view all documents, choose the All documents tab.
   Note
   You can view information about a document by choosing the document name.
4. In the Document details section, verify that Document version is set to the version that you want to run. The system includes the following version options:
   • Default version at runtime: Choose this option if the Automation document is updated periodically and a new default version is assigned.
   • Latest version at runtime: Choose this option if the Automation document is updated periodically, and you want to run the version that was most recently updated.
   • 1 (Default): Choose this option to run the first version of the document, which is the default.
5. Choose Next.
6. In the Execution Mode section, choose Simple execution.
7. In the Input parameters section, specify the required inputs. Optionally, you can choose an IAM service role from the AutomationAssumeRole list.
8. Choose Execute.

The console displays the status of the Automation execution. If the Automation fails to run, see Troubleshooting Systems Manager Automation (p. 433).

Running a Simple Automation Workflow (Command Line)
The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to run a simple Automation workflow.

To run a simple Automation workflow
1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).
2. Run the following command to start a simple Automation workflow.
   Linux
   ```bash
   aws ssm start-automation-execution \ 
   --document-name DocumentName \ 
   --parameters ParametersRequiredByDocument
   ```
Windows

```
aws ssm start-automation-execution ^
   --document-name DocumentName ^
   --parameters ParametersRequiredByDocument
```

PowerShell

```
Start-SSMAutomationExecution `^`
   -DocumentName DocumentName `^`
   -Parameter ParametersRequiredByDocument
```

Here is an example using the document `AWS-RestartEC2Instance` to restart the specified EC2 instance.

Linux

```
aws ssm start-automation-execution \
   --document-name "AWS-RestartEC2Instance" \
   --parameters "InstanceId=i-1234567890abcdef0"
```

Windows

```
aws ssm start-automation-execution ^
   --document-name "AWS-RestartEC2Instance" ^
   --parameters "InstanceId=i-1234567890abcdef0"
```

PowerShell

```
Start-SSMAutomationExecution `^`
   -DocumentName AWS-RestartEC2Instance `^`
   -Parameter @{$"InstanceId"="i-1234567890abcdef0"}
```

The system returns information like the following.

Linux

```
{
   "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab"
}
```

Windows

```
{
   "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab"
}
```

PowerShell

```
4105a4fc-f944-11e6-9d32-0123456789ab
```

3. Run the following command to retrieve the status of the Automation workflow.
The system returns information like the following.

Linux

```json
{
  "AutomationExecutionMetadataList": [
    {
      "AutomationExecutionStatus": "InProgress",
      "CurrentStepName": "stopInstances",
      "Outputs": {},
      "DocumentName": "AWS-RestartEC2Instance",
      "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab",
      "DocumentVersion": "1",
      "ResolvedTargets": {
        "ParameterValues": [],
        "Truncated": false
      },
      "AutomationType": "Local",
      "Mode": "Auto",
      "ExecutionStartTime": 1564600648.159,
      "CurrentAction": "aws:changeInstanceState",
      "ExecutedBy": "arn:aws:sts::123456789012:assumed-role/Administrator/Admin",
      "LogFile": "",
      "Targets": []
    }
  ]
}
```

Windows

```json
{
  "AutomationExecutionMetadataList": [
    {
      "AutomationExecutionStatus": "InProgress",
      "CurrentStepName": "stopInstances",
      "Outputs": {},
      "DocumentName": "AWS-RestartEC2Instance",
      "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab",
      "DocumentVersion": "1",
      "ResolvedTargets": {
        "ParameterValues": [],
        "Truncated": false
      },
      "AutomationType": "Local",
      "Mode": "Auto",
      "ExecutionStartTime": 1564600648.159,
      "CurrentAction": "aws:changeInstanceState",
      "ExecutedBy": "arn:aws:sts::123456789012:assumed-role/Administrator/Admin",
      "LogFile": "",
      "Targets": []
    }
  ]
}
```
Running an Automation Workflow Manually

The following procedures describe how to use the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), and AWS Tools for Windows PowerShell to run a Systems Manager Automation workflow using the manual execution mode. By using the manual execution mode, the Automation workflow starts in a Waiting status and pauses in the Waiting status between each step. This allows you to control when the workflow proceeds, which is useful if you need to review the result of a step before continuing.

The workflow runs in the context of the current AWS Identity and Access Management (IAM) user. This means that you don't need to configure additional IAM permissions as long as you have permission to run the Automation document and any actions called by the document. If you have administrator permissions in IAM, then you already have permission to run this Automation workflow.

**Note**
For information about how to run an Automation workflow that uses an IAM service role or more advanced forms of delegated administration, see Running Automation Workflows by Using Different Security Models (p. 196).
Running an Automation Workflow Step by Step (Console)

The following procedure shows how to use the Systems Manager console to manually run an Automation workflow step by step.

To run an Automation workflow step by step

2. In the navigation pane, choose Automation, and then choose Execute automation.
3. In the Automation document list, choose a document. Choose one or more options in the Document categories pane to filter SSM documents according to their purpose. To view a document that you own, choose the Owned by me tab. To view a document that is shared with your account, choose the Shared with me tab. To view all documents, choose the All documents tab.

   Note
   You can view information about a document by choosing the document name.

4. In the Document details section, verify that Document version is set to the version that you want to run. The system includes the following version options:
   - Default version at runtime: Choose this option if the Automation document is updated periodically and a new default version is assigned.
   - Latest version at runtime: Choose this option if the Automation document is updated periodically, and you want to run the version that was most recently updated.
   - 1 (Default): Choose this option to run the first version of the document, which is the default.
5. Choose Next.
6. In the Execution Mode section, choose Manual execution.
7. In the Input parameters section, specify the required inputs. Optionally, you can choose an IAM service role from the AutomationAssumeRole list.
8. Choose Execute.
9. Choose Execute this step when you are ready to start the first step of the Automation workflow. The Automation workflow proceeds with step one and pauses before running any subsequent steps specified in the Automation document you chose in step 3 of this procedure. If the document has multiple steps, you must select Execute this step for each step for the workflow to proceed.

   Note
   The console displays the status of the Automation execution. If the Automation fails to run a step, see Troubleshooting Systems Manager Automation (p. 433).
10. After you complete all steps specified in the Automation document, choose Complete and view results to finish the Automation workflow and view the results.

Running an Automation Workflow Step by Step (Command Line)

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to manually run an Automation workflow step by step.

To run an Automation workflow step by step

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).
2. Run the following command to start a manual Automation workflow.
Here is an example using the document `AWS-RestartEC2Instance` to restart the specified EC2 instance.

Linux

```bash
aws ssm start-automation-execution \
  --document-name AWS-RestartEC2Instance \
  --mode Interactive \
  --parameters "InstanceId=i-1234567890abcdef0"
```

Windows

```bash
aws ssm start-automation-execution ^
  --document-name "AWS-RestartEC2Instance" ^
  --mode Interactive ^
  --parameters "InstanceId=i-1234567890abcdef0"
```

PowerShell

```powershell
Start-SSMAutomationExecution `\n  -DocumentName AWS-RestartEC2Instance `\n  -Mode Interactive `\n  -Parameter @("InstanceId"="i-1234567890abcdef0")
```

The system returns information like the following.

Linux

```json
{
  "AutomationExecutionId": "ba9cd881-1b36-4d31-a698-0123456789ab"
}
```
Windows

```
{
    "AutomationExecutionId": "ba9cd881-1b36-4d31-a698-0123456789ab"
}
```

PowerShell

```
27ba8174-59ae-4e13-8626-0123456789ab
```

3. Run the following command when you are ready to start the first step of the Automation workflow. The Automation workflow proceeds with step one and pauses before running any subsequent steps specified in the Automation document you chose in step 1 of this procedure. If the document has multiple steps, you must run the following command for each step for the workflow to proceed.

Linux

```
aws ssm send-automation-signal \
    --automation-execution-id ba9cd881-1b36-4d31-a698-0123456789ab \
    --signal-type StartStep \
    --payload StepName="stopInstances"
```

Windows

```
aws ssm send-automation-signal ^ \
    --automation-execution-id ba9cd881-1b36-4d31-a698-0123456789ab ^ \
    --signal-type StartStep ^ \
    --payload StepName="stopInstances"
```

PowerShell

```
Send-SSMAutomationSignal ` 
    -AutomationExecutionId 27ba8174-59ae-4e13-8626-0123456789ab ` 
    -SignalType StartStep 
    -Payload @{"StepName="stopInstances"}
```

There is no output if the command succeeds.

4. Run the following command to retrieve the status of each step execution in the Automation workflow.

Linux

```
aws ssm describe-automation-step-executions \
    --automation-execution-id ba9cd881-1b36-4d31-a698-0123456789ab
```

Windows

```
aws ssm describe-automation-step-executions ^ 
    --automation-execution-id ba9cd881-1b36-4d31-a698-0123456789ab ^
```

PowerShell

```
Get-SSMAutomationStepExecution ` 
```
The system returns information like the following.

Linux

```json
{
   "StepExecutions": [
      {
         "StepName": "stopInstances",
         "Action": "aws:changeInstanceState",
         "ExecutionStartime": 1557167178.42,
         "ExecutionEndTime": 1557167220.617,
         "StepStatus": "Success",
         "Inputs": {
            "DesiredState": "stopped",
            "InstanceIds": "["i-1234567890abcdef0"]"
         },
         "Outputs": {
            "InstanceStates": [
               "stopped"
            ]
         },
         "StepExecutionId": "654243ba-71e3-4771-b04f-0123456789ab",
         "OverriddenParameters": {},
         "ValidNextSteps": [
            "startInstances"
         ]
      },
      {
         "StepName": "startInstances",
         "Action": "aws:changeInstanceState",
         "ExecutionStartime": 1557167273.754,
         "ExecutionEndTime": 1557167480.73,
         "StepStatus": "Success",
         "Inputs": {
            "DesiredState": "running",
            "InstanceIds": "["i-1234567890abcdef0"]"
         },
         "Outputs": {
            "InstanceStates": [
               "running"
            ]
         },
         "StepExecutionId": "8a4a1e0d-dc3e-4039-a599-0123456789ab",
         "OverriddenParameters": {}
      }
   ]
}
```

Windows

```json
{
   "StepExecutions": [
      {
         "StepName": "stopInstances",
         "Action": "aws:changeInstanceState",
         "ExecutionStartime": 1557167178.42,
         "ExecutionEndTime": 1557167220.617,
         "StepStatus": "Success",
         "Inputs": {
            "DesiredState": "stopped",
            "InstanceIds": "["i-1234567890abcdef0"]"
         },
         "Outputs": {
            "InstanceStates": [
               "stopped"
            ]
         },
         "StepExecutionId": "27ba8174-59ae-4e13-8626-e177cdci1686",
         "OverriddenParameters": {}
      }
   ]
}
```
"InstanceIds": "["i-1234567890abcdef0"]
},
"Outputs": {
  "InstanceStates": [
    "stopped"
  ]
},
"StepExecutionId": "654243ba-71e3-4771-b04f-0123456789ab",
"OverriddenParameters": {},
"ValidNextSteps": [
  "startInstances"
]
},
{
  "StepName": "startInstances",
  "Action": "aws:changeInstanceState",
  "ExecutionStartTime": 1557167273.754,
  "ExecutionEndTime": 1557167480.73,
  "StepStatus": "Success",
  "Inputs": {
    "DesiredState": "running",
    "InstanceIds": "["i-1234567890abcdef0"]"
  },
  "Outputs": {
    "InstanceStates": [
      "running"
    ]
  },
  "StepExecutionId": "8a4a1e0d-dc3e-4039-a599-0123456789ab",
  "OverriddenParameters": {}
}

PowerShell

Action : aws:changeInstanceState
ExecutionEndTime : 5/6/2019 19:45:46
ExecutionStartTime : 5/6/2019 19:45:03
FailureDetails :
FailureMessage :
Inputs :
  [{DesiredState, "stopped"}, [InstanceIds, ["i-1234567890abcdef0"]]
IsCritical : False
IsEnd : False
MaxAttempts : 0
NextStep :
OnFailure :
Outputs :
  [{InstanceStates, Amazon.Runtime.Internal.Util.AlwaysSendList`1[System.String]}]
OverriddenParameters : {}
Response :
ResponseCode :
StepExecutionId : 8fcc9641-24b7-40b3-a9be-0123456789ab
StepName : stopInstances
StepStatus : Success
TimeoutSeconds : 0
ValidNextSteps : {startInstances}

5. Run the following command to complete the Automation workflow after all steps specified within the chosen Automation document have finished.
Linux

```bash
aws ssm stop-automation-execution \ 
   --automation-execution-id ba9cd881-1b36-4d31-a698-0123456789ab \ 
   --type Complete
```

Windows

```bash
aws ssm stop-automation-execution ^ 
   --automation-execution-id ba9cd881-1b36-4d31-a698-0123456789ab ^ 
   --type Complete
```

PowerShell

```powershell
Stop-SSMAutomationExecution ` 
-AutomationExecutionId 27ba8174-59ae-4e13-8626-0123456789ab ` 
-Type Complete
```

There is no output if the command succeeds.

Running an Automation Workflow with Approvers

The following procedures describe how to use the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), and AWS Tools for Windows PowerShell to run an AWS Systems Manager Automation workflow with approvals using simple execution. The workflow uses the Automation action `aws:approve`, which temporarily pauses the Automation workflow until the designated principals either approve or deny the action. The Automation workflow runs in the context of the current AWS Identity and Access Management (IAM) user. This means that you don't need to configure additional IAM permissions as long as you have permission to run the Automation document and any actions called by the document. If you have administrator permissions in IAM, then you already have permission to run this Automation workflow.

**Note**

For information about how to run an Automation workflow that uses an IAM service role or more advanced forms of delegated administration, see Running Automation Workflows by Using Different Security Models (p. 196).

Before You Begin

In addition to the standard inputs required by the Automation document, the `aws:approve` action requires the following two parameters:

- A list of approvers. The list of approvers must contain at least one approver in the form of an IAM user or a user ARN. If multiple approvers are provided, a corresponding minimum approval count must also be specified within the automation document.

- An Amazon Simple Notification Service (Amazon SNS) topic ARN. The Amazon SNS topic name must start with `Automation`.

This procedure assumes that you have already created an Amazon SNS topic, which is required to deliver the approval request. For information, see Create a Topic in the Amazon Simple Notification Service Developer Guide.
Running an Automation Workflow with Approvers (Console)

To run an Automation workflow with approvers

The following procedure describes how to use the Systems Manager console to run an Automation workflow with approvers.

2. In the navigation pane, choose Automation, and then choose Execute automation.
3. In the Automation document list, choose a document. Choose one or more options in the Document categories pane to filter SSM documents according to their purpose. To view a document that you own, choose the Owned by me tab. To view a document that is shared with your account, choose the Shared with me tab. To view all documents, choose the All documents tab.

   Note
   You can view information about a document by choosing the document name.

4. In the Document details section, verify that Document version is set to the version that you want to run. The system includes the following version options:
   • Default version at runtime: Choose this option if the Automation document is updated periodically and a new default version is assigned.
   • Latest version at runtime: Choose this option if the Automation document is updated periodically, and you want to run the version that was most recently updated.
   • 1 (Default): Choose this option to run the first version of the document, which is the default.
5. Choose Next.
7. In the Input parameters section, specify the required input parameters.
   For example, if you chose the AWS-StartEC2InstanceWithApproval document, then you must specify or choose instance IDs for the InstanceId parameter.
8. In the Approvers section, specify the IAM users or user ARNs of approvers for the automation action.
9. In the SNSTopicARN section, specify the SNS topic ARN to use for sending approval notification. The SNS topic name must start with Automation.
10. Optionally, you can choose an IAM service role from the AutomationAssumeRole list.
11. Choose Execute automation.

The specified approver receives an Amazon SNS notification with details to approve or reject the Automation workflow. This approval action is valid for 7 days from the date of issue and can be issued using the Systems Manager console or the AWS Command Line Interface (AWS CLI).

If you chose to approve the Automation workflow, the workflow continues to run the steps included in the specified Automation document. The console displays the status of the Automation execution. If the Automation fails to run, see Troubleshooting Systems Manager Automation (p. 433).

To approve or deny an Automation workflow

2. In the navigation pane, choose Automation, and then select the Automation workflow that was run in the previous procedure.
3. Choose Actions and then choose Approve/Deny.
4. Choose to Approve or Deny and optionally provide a comment.
5. Choose Submit.
Running an Automation Workflow with Approvers (Command Line)

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to run an Automation workflow with approvers.

**To run an Automation workflow with approvers**

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.

   For information, see [Install or Upgrade the AWS CLI](p. 58) or [Install or Upgrade the AWS Tools for PowerShell](p. 59).

2. Use the following command to run an Automation workflow with approvers. In the document name section, specify an Automation document that includes the Automation action, `aws:approve`.

   For **Approvers**, specify the IAM users or user ARNs of approvers for the action. For **SNSTopic**, specify the SNS topic ARN to use to send approval notification. The SNS topic name must start with `Automation`.

   **Note**
   The specific names of the parameter values for approvers and the SNS topic depend on the values specified within the document you choose.

   **Linux**

   ```bash
   aws ssm start-automation-execution \
   --document-name "AWS-StartEC2InstanceWithApproval" \
   --parameters "InstanceId=i-1234567890abcdef0,Approvers=arn:aws:iam::123456789012:role/Administrator,SNSTopicArn=arn:aws:sns:us-east-1:123456789012:AutomationApproval"
   ```

   **Windows**

   ```bash
   aws ssm start-automation-execution ^
   --document-name "AWS-StartEC2InstanceWithApproval" ^
   --parameters "InstanceId=i-1234567890abcdef0,Approvers=arn:aws:iam::123456789012:role/Administrator,SNSTopicArn=arn:aws:sns:us-east-1:123456789012:AutomationApproval"
   ```

   **PowerShell**

   ```powershell
   Start-SSMAutomationExecution `\n   -DocumentName AWS-StartEC2InstanceWithApproval `\n   -Parameters @{
   "InstanceId"="i-1234567890abcdef0"
   "Approvers"="arn:aws:iam::123456789012:role/Administrator"
   "SNSTopicArn"="arn:aws:sns:us-east-1:123456789012:AutomationApproval"
   }
   ```

   The system returns information like the following.

   **Linux**

   ```json
   {
   "AutomationExecutionId": "df325c6d-b1b1-4aa0-8003-6cb7338213c6"
   }
   ```
To approve an Automation workflow

- Run the following command to approve an Automation workflow.

Linux

```bash
aws ssm send-automation-signal
   --automation-execution-id "4105a4fc-f944-11e6-9d32-0123456789ab" \
   --signal-type "Approve" \
   --payload "Comment=Replace_This_With_Approve_Comment"
```

Windows

```bash
aws ssm send-automation-signal ^
   --automation-execution-id "4105a4fc-f944-11e6-9d32-0123456789ab" ^
   --signal-type "Approve" ^
   --payload "Comment=Replace_This_With_Approve_Comment"
```

PowerShell

```powershell
Send-SSMAutomationSignal `-AutomationExecutionId 462fa82a-7fff-430a-8490-0123456789ab `-SignalType Approve `-Payload @{"Comment"="Replace_This_With_Approval_Comment"}
```

There is no output if the command succeeds.

To deny an Automation workflow

- Run the following command to deny an Automation workflow.

Linux

```bash
aws ssm send-automation-signal
   --automation-execution-id "4105a4fc-f944-11e6-9d32-0123456789ab" \
   --signal-type "Deny" \
   --payload "Comment=Replace_This_With_Deny_Comment"
```

Windows

```bash
aws ssm send-automation-signal ^
   --automation-execution-id "4105a4fc-f944-11e6-9d32-0123456789ab" ^
   --signal-type "Deny" ^
```
Running Automation Workflows That Use Targets and Rate Controls

AWS Systems Manager enables you to run Automation workflows on a fleet of AWS resources by using targets. Additionally, you can control the execution of the Automation across your fleet by specifying a concurrency value and an error threshold. The concurrency value determines how many resources are allowed to run the Automation simultaneously. An error threshold determines how many Automation executions are allowed to fail before Systems Manager stops sending the workflow to other resources. The concurrency and error threshold features are collectively called rate controls.

For more information about concurrency and error thresholds, see About Concurrency and Error Thresholds (p. 176). For more information about targets, see About Targets (p. 171).

The following procedures describe how to run an Automation workflow with targets and rate controls by using the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), and AWS Tools for Windows PowerShell.

Running an Automation workflow with targets and rate controls (Console)

The following procedure describes how to use the Systems Manager console to run an Automation workflow with targets and rate controls.

To run an Automation workflow with targets and rate controls

2. In the navigation pane, choose Automation, and then choose Execute automation.
3. In the Automation document list, choose a document. Choose one or more options in the Document categories pane to filter SSM documents according to their purpose. To view a document that you own, choose the Owned by me tab. To view a document that is shared with your account, choose the Shared with me tab. To view all documents, choose the All documents tab.
   
   **Note**
   
   You can view information about a document by choosing the document name.
4. In the Document details section, verify that Document version is set to the version that you want to run. The system includes the following version options:

   - **Default version at runtime**: Choose this option if the Automation document is updated periodically and a new default version is assigned.
   - **Latest version at runtime**: Choose this option if the Automation document is updated periodically, and you want to run the version that was most recently updated.
   - **1 (Default)**: Choose this option to run the first version of the document, which is the default.
5. Choose Next.
6. In the **Execution Mode** section, choose **Rate Control**. You must use this mode or **Multi-account and Region** if you want to use targets and rate controls.

7. In the **Targets** section, choose how you want to target the AWS Resources where you want to run the Automation. These options are required.
   a. Use the **Parameter** list to choose a parameter. The items in the **Parameter** list are determined by the parameters in the Automation document that you selected at the start of this procedure. By choosing a parameter you define the type of resource on which the Automation workflow runs.
   b. Use the **Targets** list to choose how you want to target resources. If you chose to target resources by using AWS Resource Groups, then choose the name of the group from the **Resource Group** list.

     If you chose to target resources by using tags, then enter the tag key and (optionally) the tag value in the fields provided. Choose **Add**.

     If you chose to target resources by using parameter values, then enter the parameter value for the parameter you chose in the Input parameters section.

8. In the **Input parameters** section, specify the required inputs. Optionally, you can choose an IAM service role from the **AutomationAssumeRole** list.

   **Note**
   You may not need to choose some of the options in the **Input parameters** section. This is because you targeted resources by using tags or a resource group. For example, if you chose the AWS-RestartEC2Instance document, then you don't need to specify or choose instance IDs in the Input parameters section. The Automation execution locates the instances to restart by using the tags or Resource Group you specified.

9. Use the options in the **Rate control** section to restrict the number of AWS resources that can run the Automation within each account-Region pair.

   In the **Concurrency** section, choose an option:
   - Choose **targets** to enter an absolute number of targets that can run the Automation workflow simultaneously.
   - Choose **percentage** to enter a percentage of the target set that can run the Automation workflow simultaneously.

10. In the **Error threshold** section, choose an option:

    - Choose **errors** to enter an absolute number of errors allowed before Automation stops sending the workflow to other resources.
    - Choose **percentage** to enter a percentage of errors allowed before Automation stops sending the workflow to other resources.

11. Choose **Execute**.

**Running an Automation Workflow with Targets and Rate Controls (Command Line)**

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to run an Automation workflow with targets and rate controls.

**To run an Automation workflow with targets and rate controls**

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).
2. Run the following command to view a list of documents.

Linux

```
aws ssm list-documents
```

Windows

```
aws ssm list-documents
```

PowerShell

```
Get-SSMDocumentList
```

Note the name of the Automation document that you want to run.

3. Run the following command to view details about the Automation document. Note a parameter name (for example, InstanceId) that you want to use for the `--target-parameter-name` option. This parameter determines the type of resource on which the Automation runs.

Linux

```
aws ssm describe-document \
   --name document_name
```

Windows

```
aws ssm describe-document ^
   --name document_name
```

PowerShell

```
Get-SSMDocumentDescription `\n   -Name document_name
```

4. Create a command that uses the targets and rate control options you want to run. Here are some template commands to help.

*Targeting using tags*

Linux

```
aws ssm start-automation-execution \ 
   --document-name document_name \ 
   --targets Key=tag:key_name,Values=value \ 
   --target-parameter-name parameter_name \ 
   --parameters "input_parameter_name1=input_parameter_value1,input_parameter_name2=input_parameter_value2" \ 
   --max-concurrency 10 \ 
   --max-errors 25%
```

Windows

```
aws ssm start-automation-execution ^
   --document-name document_name ^
```
---targets Key=tag: key_name,Values=value
--target-parameter-name parameter_name
--parameters
"input_parameter_name1"="input_parameter_value1","input_parameter_name2"="input_parameter_value2"
--max-concurrency 10
--max-errors 25%

PowerShell

$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "tag: key_name"
$Targets.Values = "value"
Start-SSMAutomationExecution
-DocumentName "DocumentName"
-Targets $Targets
-TargetParameterName "Parameter_Name"
-Parameter
@{"input_parameter_name1"="input_parameter_value1","input_parameter_name2"="input_parameter_value2"}
-MaxConcurrency "a_number_of_instances_or_a_percentage_of_target_set"
-MaxError "a_number_of_errors_or_a_percentage_of_target_set"

Targeting using parameter values

Linux

aws ssm start-automation-execution
--document-name document_name
--targets Key=ParameterValues,Values=value_1,value_2,value_3
--target-parameter-name parameter_name
--parameters "input_parameter_name1"="input_parameter_value1"
--max-concurrency 10
--max-errors 25%

Windows

aws ssm start-automation-execution
--document-name document_name
--targets Key=ParameterValues,Values=value_1,value_2,value_3
--target-parameter-name parameter_name
--parameters "input_parameter_name1"="input_parameter_value1"
--max-concurrency 10
--max-errors 25%

PowerShell

$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "ParameterValues"
$Targets.Values = "value_1","value_2","value_3"
Start-SSMAutomationExecution
-DocumentName "DocumentName"
-Targets $Targets
-TargetParameterName "Parameter_Name"
-Parameter @{"input_parameter_name1"="input_parameter_value1"}
-MaxConcurrency "a_number_of_instances_or_a_percentage_of_target_set"
-MaxError "a_number_of_errors_or_a_percentage_of_target_set"
Targeting using AWS Resource Groups

Linux

```bash
aws ssm start-automation-execution \
   --document-name document_name \
   --targets Key=ResourceGroup,Values=Resource_Group_name \
   --target-parameter-name parameter_name \
   --parameters
   "input_parameter_name1=input_parameter_value1,input_parameter_name2=input_parameter_value2" \
   --max-concurrency 10 \n   --max-errors 25%
```

Windows

```bash
aws ssm start-automation-execution ^
   --document-name document_name ^
   --targets Key=ResourceGroup,Values=Resource_Group_name ^
   --target-parameter-name parameter_name ^
   --parameters
   "input_parameter_name1=input_parameter_value1,input_parameter_name2=input_parameter_value2" ^
   --max-concurrency 10 ^
   --max-errors 25%
```

PowerShell

```powershell
$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "ResourceGroup"
$Targets.Values = "Resource_Group_Name"

Start-SSMAutomationExecution `\n   -DocumentName "DocumentName" `\n   -Targets $Targets `\n   -TargetParameterName "Parameter_Name" `\n   -Parameter
   @{"input_parameter_name1"="input_parameter_value1";"input_parameter_name2"="input_parameter_value2"} `\n   -MaxConcurrency "a_number_of_instances_or_a_percentage_of_target_set" `\n   -MaxError "a_number_of_errors_or_a_percentage_of_target_set"
```

The command returns an execution ID. Copy this ID to the clipboard. You can use this ID to view the status of the workflow.

Linux

```json
{
   "AutomationExecutionId": "a4a3c0e9-7efd-462a-8594-01234EXAMPLE"
}
```

Windows

```json
{
   "AutomationExecutionId": "a4a3c0e9-7efd-462a-8594-01234EXAMPLE"
}
```
5. Run the following command to view the workflow execution.

Linux

aws ssm describe-automation-executions \
   --filter Key=ExecutionId,Values=a4a3c0e9-7efd-462a-8594-01234EXAMPLE

Windows

aws ssm describe-automation-executions ^ \
   --filter Key=ExecutionId,Values=a4a3c0e9-7efd-462a-8594-01234EXAMPLE

PowerShell

Get-SSMAutomationExecutionList | `  
   Where {$_.AutomationExecutionId -eq "a4a3c0e9-7efd-462a-8594-01234EXAMPLE"}

6. To view details about the execution progress, run the following command.

Linux

aws ssm get-automation-execution \
   --automation-execution-id a4a3c0e9-7efd-462a-8594-01234EXAMPLE

Windows

aws ssm get-automation-execution ^ \
   --automation-execution-id a4a3c0e9-7efd-462a-8594-01234EXAMPLE

PowerShell

Get-SSMAutomationExecution `  
   -AutomationExecutionId a4a3c0e9-7efd-462a-8594-01234EXAMPLE

The system returns information like the following.

Linux

```json
{
    "AutomationExecution": {
        "StepExecutionsTruncated": false,
        "AutomationExecutionStatus": "Success",
        "MaxConcurrency": "1",
        "Parameters": {},
        "MaxErrors": "1",
        "Outputs": {},
        "DocumentName": "AWS-StopEC2Instance",
        "AutomationExecutionId": "a4a3c0e9-7efd-462a-8594-01234EXAMPLE",
        "ResolvedTargets": {
            "ParameterValues": [
                "i-02573caf3cfeEXAMPLE"
            ]
        }
    }
}
```
Windows

```json
{
    "AutomationExecution": {
        "StepExecutionsTruncated": false,
        "AutomationExecutionStatus": "Success",
        "MaxConcurrency": "1",
        "Parameters": {},
        "MaxErrors": "1",
        "Outputs": {},
        "DocumentName": "AWS-StopEC2Instance",
        "AutomationExecutionId": "a4a3c0e9-7efd-462a-8594-01234EXAMPLE",
        "ResolvedTargets": {
            "ParameterValues": ["i-02573cafcfEXAMPLE"],
            "Truncated": false
        },
        "ExecutionEndTime": 1564681619.915,
        "Targets": [
            {
                "Values": ["DEV"],
                "Key": "tag:ENV"
            }
        ],
        "DocumentVersion": "1",
        "ExecutionStartTime": 1564681576.09,
        "ExecutedBy": "arn:aws:sts::123456789012:assumed-role/Administrator/Admin",
        "StepExecutions": [
            {
                "Inputs": {
                    "InstanceId": "i-02573cafcfEXAMPLE"
                },
                "Outputs": {},
                "StepName": "i-02573cafcfEXAMPLE",
                "ExecutionEndTime": 1564681619.093,
                "StepExecutionId": "86c7b811-3896-4b78-b897-01234EXAMPLE",
                "ExecutionStartTime": 1564681576.836,
                "Action": "aws:executeAutomation",
                "StepStatus": "Success"
            }
        ],
        "TargetParameterName": "InstanceId",
        "Mode": "Auto"
    }
}
```
"StepExecutions": [  
  {  
    "Inputs": {  
      "InstanceId": "i-02573cafcfEXAMPLE"  
    },  
    "Outputs": {},  
    "StepName": "i-02573cafcfEXAMPLE",  
    "ExecutionEndTime": 1564681619.093,  
    "StepExecutionId": "86c7b811-3896-4b78-b897-01234EXAMPLE",  
    "ExecutionStartTime": 1564681576.836,  
    "Action": "aws:executeAutomation",  
    "StepStatus": "Success"  
  }  
],  
"TargetParameterName": "InstanceId",  
"Mode": "Auto"
}

PowerShell

```
AutomationExecutionId       : a4a3c0e9-7efd-462a-8594-01234EXAMPLE
AutomationExecutionStatus   : Success
CurrentAction               :
CurrentStepName             :
DocumentName                : AWS-StopEC2Instance
DocumentVersion             : 1
ExecutedBy                  : arn:aws:sts::123456789012:assumed-role/Administrator/
Admin                        :
ExecutionEndTime            : 8/1/2019 5:46:59 PM
ExecutionStartTime          : 8/1/2019 5:46:16 PM
FailureMessage              :
MaxConcurrency              : 1
MaxErrors                   : 1
Mode                        : Auto
Outputs                     : {}
Parameters                  : {}
ParentAutomationExecutionId :
ProgressCounters            :
ResolvedTargets             : Amazon.SimpleSystemsManagement.Model.ResolvedTargets
StepExecutions              : {i-02573cafcfEXAMPLE}
StepExecutionsTruncated     : False
Target                      :
TargetLocations             : {}
TargetMaps                  : {}
TargetParameterName         : InstanceId
Targets                     : {tag:Name}
```  

**Note**

You can also monitor the status of the workflow in the console. In the execution list, choose the execution you just ran and then choose the **Steps** tab. This tab shows the status of the workflow actions.

**About Targets**

The **Targets** parameter enables you to quickly define which resources in your fleet can run an Automation workflow. For example, if you want to run an Automation that restarts your managed instances, then instead of manually selecting dozens of instance IDs in the console or typing them in a command, you can target instances by specifying Amazon EC2 tags with the **Targets** parameter.
When you run an Automation that uses a target, Systems Manager creates a child Automation for each target. For example, if you target Amazon Elastic Block Store (Amazon EBS) volumes by specifying tags, and those tags resolve to 100 Amazon EBS volumes, then Systems Manager creates 100 child Automation workflows. The parent Automation is complete when all child Automations reach a final state.

Note
Any input parameters that you specify at runtime (either in the Input parameters section of the console or by using the parameters option from the command line) are automatically processed by all child Automations.

You can target resources for an Automation execution by using tags, Resource Groups, and parameter values. Additionally, you can use the TargetMaps option to target multiple parameter values from the command line or a file. The following section describes each of these targeting options in more detail.

Targeting Tags

Many AWS resources support tags, including Amazon EC2 and Amazon Relational Database Service (Amazon RDS) instances, Amazon Elastic Block Store (Amazon EBS) volumes and snapshots, Resource Groups, and Amazon Simple Storage Service (Amazon S3) buckets, to name a few. You can quickly run Automation workflows on your AWS resources by targeting tags. A tag is a key-value pair, such as Operating_System-Linux or Department-Finance. If you assign a specific name to a resource, then you can also use the word "Name" as a key, and the name of the resource as the value.

When you specify a tag as the target for an Automation, you also specify a target parameter. The target parameter uses the TargetParameterName option. By choosing a target parameter, you define the type of resource on which the Automation runs. The target parameter you specify with the tag must be a valid parameter defined in the Automation document. For example, if you want to target dozens of Amazon EC2 instances by using tags, then choose the InstanceId target parameter. By choosing this parameter, you define instances as the resource type for the Automation execution. The following screenshot uses the AWS-DetachEBSVolume document. The logical target parameter is VolumeId.

The AWS-DetachEBSVolume document also includes a special property called Target type, which is set to /AWS::EC2::Volume. This means that if the tag-key pair Finance-TestEnv returns different types of resources (for example, Amazon EC2 instances, Amazon EBS volumes, Amazon EBS snapshots) then only Amazon EBS volumes will be used.
Important
Target parameter names are case sensitive. If you run Automations by using either the
AWS CLI or AWS Tools for Windows PowerShell, then you must enter the target parameter
name exactly as it is defined in the Automation document. If you don’t, the system returns
an InvalidAutomationExecutionParametersException error. You can use the
DescribeDocument API action to see information about the available target parameters in a
specific document. Here is an example AWS CLI command that provides information about the
AWS-DeleteSnapshot document:

```
aws ssm describe-document --name AWS-DeleteSnapshot
```

Here are some example AWS CLI commands that target resources by using tags.

Example 1: Targeting tags using a key-value pair to restart Amazon EC2 instances

This example restarts all Amazon EC2 instances that are tagged with a key of Department and a value of
HumanResources. The target parameter uses the InstanceId parameter from the Automation document.
The example uses an additional parameter to run the automation by using an Automation service role
(also called an assume role).

```
aws ssm start-automation-execution --document-name AWS-RestartEC2Instance --targets
    Key=tag:Department,Values=HumanResources --target-parameter-name InstanceId --parameters
    "AutomationAssumeRole=arn:aws:iam::111122223333:role/AutomationServiceRole"
```

Example 2: Targeting tags using a key-value pair to delete Amazon EBS snapshots

The following example uses the AWS-DeleteSnapshot Automation document to delete all snapshots with
a key of Name and a value of January2018Backups. The target parameter uses the VolumeId parameter.

```
aws ssm start-automation-execution --document-name AWS-DeleteSnapshot --targets
    Key=tag:Name,Values=January2018Backups --target-parameter-name VolumeId
```

Targeting AWS Resource Groups

You can specify a single AWS resource group as the target of an Automation. Systems Manager creates a
child Automation for every object in the target Resource Group.

For example, say that one of your Resource Groups is named PatchedAMIs. This Resource Group
includes a list of 25 Windows Amazon Machine Images (AMIs) that are routinely patched. If you run an
Automation that uses the AWS-CreateManagedWindowsInstance document and target this Resource
Group, then Systems Manager creates a child Automation for each of the 25 AMIs. This means, that by
targeting the PatchedAMIs Resource Group, the Automation creates 25 instances from a list of patched
AMIs. The parent Automation is complete when all child Automations complete processing or reach a
final state.

The following AWS CLI command applies to the PatchAMIs Resource Group example. The command
takes the AmiId parameter for the --target-parameter-name option. The command doesn't include
an additional parameter defining which type of instance to create from each AMI. The AWS-
CreateManagedWindowsInstance document defaults to the t2.medium instance type, so this command
would create 25 t2.medium Windows instances.

```
aws ssm start-automation-execution --document-name AWS-CreateManagedWindowsInstance --
targets Key=ResourceGroup,Values=PatchAMIs --target-parameter-name AmiId
```

The following console example uses a Resource Group called t2-micro-instances.
Targeting Parameter Values

You can also target a parameter value. You enter ParameterValues as the key and then enter the specific resource value where you want the Automation workflow to run. If you specify multiple values, Systems Manager runs a child Automation workflow on each value specified.

For example, say that your Automation document includes an InstanceID parameter. If you target the values of the InstanceID parameter when you run the Automation, then Systems Manager runs a child Automation for each instance ID value specified. The parent Automation is complete when the Automation finishes running each specified instance, or if the execution fails. You can target a maximum of 50 parameter values.

The following example uses the AWS-CreateImage Automation document. The target parameter name specified is InstanceId. The key uses ParameterValues. The values are two Amazon EC2 instance IDs. This command creates an Automation workflow for each instance, which produces an AMI from each instance.

```
aws ssm start-automation-execution --document-name AWS-CreateImage --target-parameter-name InstanceId --targets Key=ParameterValues,Values=i-02573cafcfEXAMPLE,i-0471e0424EXAMPLE
```

**Note**

AutomationAssumeRole is not a valid parameter. Don't choose this item when running Automation workflows that target a parameter value.

Targeting Parameter Value Maps

The TargetMaps option expands your ability to target ParameterValues. You can enter an array of parameter values by using TargetMaps at the command line. You can specify a maximum of 50 parameter values at the command line. If you want to run commands that specify more than 50 parameter values, then you can enter the values in a JSON file. You can then call the file from the command line.

**Note**

TargetMaps are not supported in the console.

Use the following format to specify multiple parameter values by using the TargetMaps option in a command:
If you want to enter more than 50 parameter values for the TargetMaps option, then specify the values in a file by using the following JSON format. Using a JSON file also improves readability when providing multiple parameter values.

```
[
    {
        "parameterA": "parameterValueA1", "parameterB": "parameterValueB1",
        "parameterC": "parameterValueC1",
    },
    {
        "parameterA": "parameterValueA2", "parameterB": "parameterValueB2",
        "parameterC": "parameterValueC2",
    },
    {
        "parameterA": "parameterValueA3", "parameterB": "parameterValueB3",
        "parameterC": "parameterValueC3",
    }
]
```

Save the file with a .json file extension. You can call the file by using the following command:

```
aws ssm start-automation-execution --document-name name_of_document --target-maps full_path_to_file/file_name.json
```

You can also download the file from an Amazon S3 bucket, as long as you have permission to read data from the bucket. Use the following command format:

```
```

Here is an example scenario to help you understand the TargetMaps option. In this scenario, a user wants to create Amazon EC2 instances of different types from different AMIs. To perform this task, the user creates an Automation document named AMI_Testing. This document defines two input parameters: instanceType and imageId.

```
{
    "description": "AMI Testing",
    "schemaVersion": "0.3",
    "assumeRole": "{{assumeRole}}",
    "parameters": {
        "assumeRole": {
            "type": "String",
            "description": "Role under which to run the automation",
            "default": ""
        },
        "instanceType": {
            "type": "String",
            "description": "Type of EC2 Instance to launch for this test"
        },
        "imageId": {
            "type": "String",
            "description": "Source AMI id from which to run instance"
        }
    },
    "mainSteps": [
        "Steps to create EC2 instances"
    ]
}
```
About Concurrency and Error Thresholds

You can control the execution of an Automation workflow across a fleet of AWS resources by specifying a concurrency value and an error threshold. Concurrency and error threshold are collectively called rate controls.

Concurrency

Concurrency enables you to specify how many resources are allowed to run an Automation simultaneously. Concurrency helps to limit the impact or downtime on your resources when processing an Automation. You can specify either an absolute number of resources, for example 20, or a percentage of the target set, for example 10%.
The queueing system delivers the Automation to a single resource and waits until the initial invocation is complete before sending the Automation to two more resources. The system exponentially sends the Automation to more resources until the concurrency value is met.

**Error Thresholds**

An error threshold enables you to specify how many Automation workflows are allowed to fail before Systems Manager stops sending the Automation to other resources. You can specify either an absolute number of errors, for example 10, or a percentage of the target set, for example 10%.

If you specify an absolute number of 3 errors, for example, the system stops sending the Automation when the third error is received. If you specify 1, then the system stops sending the Automation to additional resources after the first error result is returned.

If you send an Automation to, for example, 50 instances and set the error threshold to 10%, then the system stops sending the command to additional instances when the fifth error is received. Invocations that are already running an Automation when an error threshold is reached are allowed to be completed, but some of these Automations might fail as well. If you need to ensure that there won't be more errors than the number specified for the error threshold, then set the **Concurrency** value to 1 so that Automations proceed one at a time.

**Running Automation Workflows Based on Triggers**

This section includes information about how to run Automation workflows using a trigger. Automation workflows can be initiated by several different triggers, such as Amazon CloudWatch Events, State Manager Associations, or maintenance windows. By using triggers, you can run Automation workflows as a result of a specific event or on a scheduled basis.

**Contents**

- Running Automation Workflows with Triggers using CloudWatch Events (p. 177)
- Running Automation Workflows with Triggers Using State Manager (p. 182)
- Running Automation Workflows with Triggers using Maintenance Windows (p. 190)

**Running Automation Workflows with Triggers using CloudWatch Events**

You can start an Automation workflow by specifying an Automation document as the target of an Amazon CloudWatch event. You can start workflows according to a schedule, or when a specific AWS system event occurs. For example, let's say you create an Automation document named `BootStrapInstances` that installs software on an instance when an instance starts. To specify the `BootStrapInstances` document (and corresponding workflow) as the target of a CloudWatch event, you first create a new CloudWatch Events rule. (Here's an example rule: **Service name**: EC2, **Event Type**: EC2 Instance State-change Notification, **Specific state(s)**: running, **Any instance**.) Then you use the following procedures to specify the `BootStrapInstances` document as the target of the event using the CloudWatch console, AWS Command Line Interface (AWS CLI), or AWS Tools for Windows PowerShell. When a new instance starts, the system runs the workflow and installs software.

For information about creating Automation documents, see Working with Automation Documents (p. 217).

**Creating a CloudWatch Event that Runs an Automation Workflow (Console)**

Use the following procedure to configure an Automation workflow as the target of a CloudWatch event.

**To configure an Automation document as a target of a CloudWatch event rule**

2. In the left navigation pane, choose **Events**, and then choose **Create rule**.

3. Choose **Event Pattern** or **Schedule**. **Event Pattern** lets you build a rule that generates events for specific actions in AWS services. **Schedule** lets you build a rule that generates events according to a schedule that you specify by using the cron format.

4. Choose the remaining options for the rule you want to create, and then choose **Add target**.

5. In the **Select target type** list, choose **SSM Automation**.

6. In the **Document** list, choose an Automation document to run when your target is invoked.

7. Expand **Configure document version**, and choose a version. $DEFAULT was explicitly set as the default document version in Systems Manager. You can choose a specific version, or use the latest version.

8. Expand **Configure automation parameter(s)**, and either keep the default parameter values (if available) or enter your own values.

   **Note**
   Required parameters have an asterisk (*) next to the parameter name. To create a target, you must specify a value for each required parameter. If you don't, the system creates the rule, but it won't run.

9. In the permissions section, choose an option. CloudWatch uses the role to start the Automation workflow.

10. Choose **Configure details** and complete the wizard.

**Create a CloudWatch Event that Runs an Automation Document (Command Line)**

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to create a CloudWatch event rule and configure an Automation document as the target.

**To configure an Automation document as a target of a CloudWatch event rule**

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).

2. Create a command to specify a new CloudWatch event rule. Here are some template commands to help.

   **Triggers based on a schedule**

   **Linux**

   ```bash
   aws events put-rule \
   --name "rule_name" \
   --schedule-expression "cron_or_rate_expression"
   ```

   **Windows**

   ```bash
   aws events put-rule ^
   --name "rule_name" ^
   --schedule-expression "cron_or_rate_expression"
   ```

   **PowerShell**

   ```powershell
   Write-CWERule `
   -Name "rule_name" `
   -ScheduleExpression "cron_or_rate_expression"
   ```
The following example creates a CloudWatch event rule that triggers every day at 9:00am (UTC).

**Linux**

```bash
aws events put-rule \
--name "DailyAutomationRule" \
--schedule-expression "cron(0 9 * * ? *)"
```

**Windows**

```bash
aws events put-rule ^
--name "DailyAutomationRule" ^
--schedule-expression "cron(0 9 * * ? *)"
```

**PowerShell**

```bash
Write-CWERule `\n-Name "DailyAutomationRule" `\n-ScheduleExpression "cron(0 9 * * ? *)"
```

**Triggers based on an event**

**Linux**

```bash
aws events put-rule \
--name "rule_name" \
--event-pattern "{\"source\":[\"aws.service\"],\"detail-type\": [\"service_event_detail_type\"]}"
```

**Windows**

```bash
aws events put-rule ^
--name "rule_name" ^
--event-pattern "{\"source\":[\"aws.service\"],\"detail-type\": [\"service_event_detail_type\"]}"
```

**PowerShell**

```bash
Write-CWERule `\n-Name "rule_name" `\n-EventPattern '{"source":["aws.service"],"detail-type": ["service_event_detail_type"]}'
```

The following example creates a CloudWatch event rule that triggers when any Amazon EC2 instance in the region changes state.

**Linux**

```bash
aws events put-rule \
--name "EC2InstanceStateChanges" \
--event-pattern "{\"source\":[\"aws.ec2\"],\"detail-type\":[\"EC2 Instance State-change Notification\"]}"
```
Windows

```bash
aws events put-rule
   --name "EC2InstanceStateChanges"
   --event-pattern "{"source": ["aws.ec2"], "detail-type": ["EC2 Instance State-change Notification"]}"
```

PowerShell

```powershell
Write-CWERule
   -Name "EC2InstanceStateChanges"
   -EventPattern '{"source": ["aws.ec2"], "detail-type": ["EC2 Instance State-change Notification"]}'
```

The command returns details for the new CloudWatch rule similar to the following.

Linux

```json
{
   "RuleArn": "arn:aws:events:us-east-1:123456789012:rule/automationrule"
}
```

Windows

```json
{
   "RuleArn": "arn:aws:events:us-east-1:123456789012:rule/automationrule"
}
```

PowerShell

```powershell
arn:aws:events:us-east-1:123456789012:rule/EC2InstanceStateChanges
```

3. Create a command to specify an Automation document as a target of the CloudWatch event rule you created in step 2. Here are some template commands to help.

Linux

```bash
aws events put-targets
   --rule CW_Event_Rule_Name
   --targets "{"Arn": "arn:aws:ssm:us-east-1:123456789012:automation-definition/Automation_Document_Name","Input": "{"DocumentParameter": [{"ParameterValue": "},"AutomationAssumeRole": [{"arn:aws:iам::123456789012:role/AutomationServiceRole\\"]},"Id": "Target_Id","RoleArn": "arn:aws:iам::123456789012:role/service-role/CWE_Role_Name_To_Run_Automation"}"
```

Windows

```bash
aws events put-targets
   --rule CW_Event_Rule_Name
   --targets "{"Arn": "arn:aws:ssm:us-east-1:123456789012:automation-definition/Automation_Document_Name","Input": "{"DocumentParameter": [{"ParameterValue": "},"AutomationAssumeRole": [{"arn:aws:iам::123456789012:role/AutomationServiceRole\\"]},"Id": "Target_Id","RoleArn": "arn:aws:iам::123456789012:role/service-role/CWE_Role_Name_To_Run_Automation"}"
```

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The following example creates a CloudWatch event target that starts the specified instance ID using the document `AWS-StartEC2Instance`.

**Linux**

```bash
aws events put-targets
  --rule DailyAutomationRule
  --targets '{"Arn": "arn:aws:ssm:us-east-1:123456789012:automation-definition/AWS-StartEC2Instance","Input": "{"InstanceId": ["i-02573cafcfEXAMPLE"], "AutomationAssumeRole": ["arn:aws:iam::123456789012:role/AutomationServiceRole"]}, "Id": "Target1","RoleArn": "arn:aws:iam::123456789012:role/service-role/AWS_Events_Invoke_Start_Automation_Execution_1213609520"}'
```

**Windows**

```bash
aws events put-targets ^
  --rule DailyAutomationRule ^
  --targets '{"Arn": "arn:aws:ssm:us-east-1:123456789012:automation-definition/AWS-StartEC2Instance","Input": "{"InstanceId": ["i-02573cafcfEXAMPLE"], "AutomationAssumeRole": ["arn:aws:iam::123456789012:role/AutomationServiceRole"]}, "Id": "Target1","RoleArn": "arn:aws:iam::123456789012:role/service-role/AWS_Events_Invoke_Start_Automation_Execution_1213609520"}'
```

**PowerShell**

```powershell
$Target = New-Object Amazon.CloudWatchEvents.Model.Target
$Target.Id = "Target1"
$Target.RoleArn = "arn:aws:iam::123456789012:role/service-role/AWS_Events_Invoke_Start_Automation_Execution_1213609520"
$Target.Input = '{"InstanceId": ["i-02573cafcfEXAMPLE"], "AutomationAssumeRole": ["arn:aws:iam::123456789012:role/AutomationServiceRole"]}'
Write-CWETarget
  -Rule "DailyAutomationRule" 
  -Target $Target
```

The system returns information like the following.
Running Automation Workflows with Triggers Using State Manager

You can start an Automation workflow by creating a State Manager association with an Automation document. By creating a State Manager association with an Automation document, you can target different types of AWS resources. For example, you can create associations that enforce a desired state on an AWS resource, including the following:

- Attach a Systems Manager role to Amazon EC2 instances to make them managed instances.
- Enforce desired ingress and egress rules for a security group.
- Create or delete Amazon DynamoDB (DynamoDB) backups.
- Create or delete Amazon Elastic Block Store (Amazon EBS) snapshots.
- Disable read and write permissions on Amazon Simple Storage Service (Amazon S3) buckets.
- Start, restart, or stop managed instances and Amazon Relational Database Service (Amazon RDS) instances.
- Patch Windows and Linux AMIs.

Use the following procedures to create a State Manager Association that runs an Automation workflow using the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), or AWS Tools for Windows PowerShell.

Before You Begin

Be aware of the following important details before you run Automation workflows by using State Manager.

- Before you can create an association that runs an Automation document, verify that you configured permissions for Systems Manager Automation. For more information, see Getting Started with Automation (p. 144).
- State Manager associations that run Automation documents contribute to the maximum number of concurrently running Automations in your AWS account. You can have a maximum of 25 concurrent Automations running with a maximum of 75 child Automations running at one time. For information, see AWS Systems Manager Limits.
- Systems Manager automatically creates a service-linked role so that State Manager has permission to call Systems Manager Automation API actions. If you want, you can create the service-linked role yourself by running the following command from the AWS CLI or AWS Tools for PowerShell.
Creating an Association That Runs an Automation Workflow (Console)

The following procedure describes how to use the Systems Manager console to create a State Manager association that runs an Automation workflow.

**To create a State Manager association that runs a Systems Manager Automation Workflow**

2. In the navigation pane, choose State Manager, and then choose Create association.
3. In the Name field, specify a name. This is optional, but recommended.
4. In the Document list, choose a document. Use the Search bar to filter on Document type : Equal : Automation documents. To view more Automation documents, use the numbers to the right of the Search bar.
   
   **Note**
   
   You can view information about a document by choosing the document name.

5. Choose Simple execution to run the automation on one or more targets by specifying the resource ID for those targets. Choose Rate control to run the automation across a fleet of AWS resources by specifying a targeting option such as tags or AWS Resource Groups. You can also control the execution of the automation across your resources by specifying concurrency and error thresholds.

   If you chose Rate control, the Targets section appears.

6. In the Targets section, choose a method for targeting resources.
   
   a. (Required) In the Parameter list, choose a parameter. The items in the Parameter list are determined by the parameters in the Automation document that you selected at the start of this procedure. By choosing a parameter, you define the type of resource on which the Automation workflow runs.

   b. (Required) In the Targets list, choose a method for targeting the resources.

      - **Resource Group**: Choose the name of the group from the Resource Group list. For more information about targeting AWS Resource Groups in Automation documents, see Targeting AWS Resource Groups (p. 173).

      - **Tags**: Enter the tag key and (optionally) the tag value in the fields provided. Choose Add. For more information about targeting tags in Automation documents, see Targeting Tags (p. 172).
• **Parameter Values:** Enter values in the **Input parameters** section. If you specify multiple values, Systems Manager runs a child Automation workflow on each value specified.

For example, say that your Automation document includes an **InstanceID** parameter. If you target the values of the **InstanceID** parameter when you run the Automation, then Systems Manager runs a child Automation for each instance ID value specified. The parent Automation is complete when the Automation finishes running each specified instance, or if the execution fails. You can target a maximum of 50 parameter values. For more information about targeting parameter values in Automation documents, see Targeting Parameter Values (p. 174).

7. In the **Input parameters** section, specify the required input parameters.

If you chose to target resources by using tags or a resource group, then you may not need to choose some of the options in the **Input parameters** section. For example, if you chose the AWS-RestartEC2Instance document, and you chose to target instances by using tags, then you don’t need to specify or choose instance IDs in the **Input parameters** section. The Automation execution locates the instances to restart by using the tags you specified.

**Important**

You must specify a role ARN in the **AutomationAssumeRole** field. State Manager uses the assume role to call AWS services specified in the Automation document and run Automation associations on your behalf. For more information, see Running an Automation Workflow by Using an IAM Service Role (p. 200).

8. In the **Specify schedule** section, choose **On Schedule** if you want to run the association at regular intervals. If you choose this option, then use the options provided to create the schedule using Cron or Rate expressions. For more information about Cron and Rate expressions for State Manager, see Cron and Rate Expressions for Associations (p. 940).

**Note**

Rate expressions are the preferred scheduling mechanism for State Manager associations that run Automation documents. Rate expressions allow more flexibility for running associations in the event that you reach the maximum number of concurrently running Automations. With a rate schedule, Systems Manager can retry the Automation shortly after receiving notification that concurrent Automations have reached their maximum and have been throttled.

Choose **No schedule** if you want to run the association one time.

9. (Optional) In the **Rate Control** section, choose **Concurrency** and **Error threshold** options to control the Automation execution across your AWS resources.

a. In the **Concurrency** section, choose an option:

   • Choose **targets** to enter an absolute number of targets that can run the Automation workflow simultaneously.

   • Choose **percentage** to enter a percentage of the target set that can run the Automation workflow simultaneously.

b. In the **Error threshold** section, choose an option:

   • Choose **errors** to enter an absolute number of errors allowed before Automation stops sending the workflow to other resources.

   • Choose **percentage** to enter a percentage of errors allowed before Automation stops sending the workflow to other resources.

For more information about using targets and rate controls with Automation, see Running Automation Workflows That Use Targets and Rate Controls (p. 164).

10. Choose **Create Association**.
Important
When you create an association, the association immediately runs against the specified targets. The association then runs based on the cron or rate expression you chose. If you chose No schedule, the association does not run again.

Creating an Association That Runs an Automation Workflow (Command Line)
The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to create a State Manager association that runs an Automation workflow.

To create an association that runs an Automation workflow
1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).

2. Run the following command to view a list of documents.

   Linux
   
   ```bash
   aws ssm list-documents
   ```

   Windows
   
   ```bash
   aws ssm list-documents
   ```

   PowerShell
   
   ```powershell
   Get-SSMDocumentList
   ```

   Note the name of the Automation document that you want to use for the association.

3. Run the following command to view details about the Automation document.

   Linux
   
   ```bash
   aws ssm describe-document
   --name document_name
   ```

   Note a parameter name (for example, InstanceId) that you want to use for the --automation-target-parameter-name option. This parameter determines the type of resource on which the Automation runs.

   Windows
   
   ```bash
   aws ssm describe-document
   --name document_name
   ```

   Note a parameter name (for example, InstanceId) that you want to use for the --automation-target-parameter-name option. This parameter determines the type of resource on which the Automation runs.

   PowerShell
   
   ```powershell
   Get-SSMDocumentDescription
   ```
Note a parameter name (for example, InstanceId) that you want to use for the AutomationTargetParameterName option. This parameter determines the type of resource on which the Automation runs.

4. Create a command that runs an Automation workflow using a State Manager association. Here are some template commands to help.

**Targeting using tags**

**Linux**

```bash
aws ssm create-association \
  --association-name AssociationName \
  --targets Key=tag:TagKey,Values=TagValue \
  --name AutomationDocumentName \
  --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM,(Additional parameters, if any) \
  --automation-target-parameter-name (parameter to target) \
  --schedule "cron_or_rate_expression"
```

**Windows**

```bash
aws ssm create-association ^
  --association-name AssociationName ^
  --targets Key=tag:TagKey,Values=TagValue ^
  --name AutomationDocumentName ^
  --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM,(Additional parameters, if any) ^
  --automation-target-parameter-name (parameter to target) ^
  --schedule "cron_or_rate_expression"
```

**PowerShell**

```powershell
$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "tag:TagKey"
$Targets.Values = "TagValue"

New-SSMAssociation
  -AssociationName "AssociationName"
  -Target $Targets
  -Name "AutomationDocumentName"
  -Parameters @{
      "AutomationAssumeRole"="arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM; (Additional parameters, if any)"
      "AutomationTargetParameterName" "parameter_to_target"
      "ScheduleExpression" "cron_or_rate_expression"
  }
```

**Note**

If you create an association by using the AWS CLI, use the --targets parameter to target instances for the association. Don't use the --instance-id parameter. The --instance-id parameter is a legacy parameter.
**Note**

If you create an association by using the AWS Tools for PowerShell, use the **Target** parameter to target instances for the association. Don't use the **InstanceId** parameter. The **InstanceId** parameter is a legacy parameter.

**Targeting using parameter values**

**Linux**

```
aws ssm create-association \
    --association-name AssociationName \
    --targets Key=ParameterValues,Values=value_1,value_2,value_3 \
    --name AutomationDocumentName \
    --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM,(Additional parameters, if any) \
    --automation-target-parameter-name (parameter to target) \
    --schedule "cron_or_rate_expression"
```

**Windows**

```
aws ssm create-association ^
    --association-name AssociationName ^
    --targets Key=ParameterValues,Values=value_1,value_2,value_3 ^
    --name AutomationDocumentName ^
    --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM,(Additional parameters, if any) ^
    --automation-target-parameter-name (parameter to target) ^
    --schedule "cron_or_rate_expression"
```

**PowerShell**

```
$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "ParameterValues"
$Targets.Values = "value_1","value_2","value_3"

New-SSMAssociation ` 
    -AssociationName "AssociationName" ` 
    -Target $Targets ` 
    -Name "AutomationDocumentName" ` 
    -Parameters @{ ` 
        "AutomationAssumeRole"="arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM; (Additional parameters, if any)" } ` 
    -AutomationTargetParameterName "parameter_to_target" ` 
    -ScheduleExpression "cron_or_rate_expression"
```

**Targeting using AWS Resource Groups**

**Linux**

```
aws ssm create-association \
    --association-name AssociationName \
    --targets Key=ResourceGroup,Values=Resource_Group_name \
    --name AutomationDocumentName \
    --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM,(Additional parameters, if any) \
    --automation-target-parameter-name (parameter to target) \
    --schedule "cron_or_rate_expression"
```
--schedule "cron_or_rate_expression"

Windows

```
aws ssm create-association
    --association-name AssociationName
    --targets Key=ResourceGroup,Values=Resource_Group_name
    --name AutomationDocumentName
    --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM,(Additional parameters, if any)
    --automation-target-parameter-name (parameter to target)
    --schedule "cron_or_rate_expression"
```

PowerShell

```
$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "ResourceGroup"
$Targets.Values = "Resource_Group_Name"
New-SSMAssociation
    -AssociationName "AssociationName"
    -Target $Targets
    -Name "AutomationDocumentName"
    -Parameters @{
        "AutomationAssumeRole"="arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM;
        (Additional parameters, if any)"
    }
    -AutomationTargetParameterName "parameter_to_target"
    -ScheduleExpression "cron_or_rate_expression"
```

The command returns details for the new association similar to the following.

Linux

```
{
    "AssociationDescription": {
        "ScheduleExpression": "cron(0 7 * * MON *)",
        "Name": "AWS-StartEC2Instance",
        "Parameters": {
            "AutomationAssumeRole": [
                "arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM"
            ]
        },
        "Overview": {
            "Status": "Pending",
            "DetailedStatus": "Creating"
        },
        "AssociationId": "1450b4b7-bea2-4e4b-b340-01234EXAMPLE",
        "DocumentVersion": "$DEFAULT",
        "AutomationTargetParameterName": "InstanceId",
        "LastUpdateAssociationDate": 1564686638.498,
        "Date": 1564686638.498,
        "AssociationVersion": "1",
        "AssociationName": "CLI",
        "Targets": [
            {
                "Values": [
                    "DEV"
                ],
                "Key": "tag:ENV"
            }
        ]
    }
}
```
Windows

```json
{
   "AssociationDescription": {
      "ScheduleExpression": "cron(0 7 ? * MON *)",
      "Name": "AWS-StartEC2Instance",
      "Parameters": {
         "AutomationAssumeRole": [
            "arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM"
         ],
      },
      "Overview": {
         "Status": "Pending",
         "DetailedStatus": "Creating"
      },
      "AssociationId": "1450b4b7-bea2-4e4b-b340-01234EXAMPLE",
      "DocumentVersion": "$DEFAULT",
      "AutomationTargetParameterName": "InstanceId",
      "LastUpdateAssociationDate": 1564686638.498,
      "Date": 1564686638.498,
      "AssociationVersion": "1",
      "AssociationName": "CLI",
      "Targets": [
         {
            "Values": [
               "DEV"
            ],
            "Key": "tag:ENV"
         }
      ]
   }
}
```

PowerShell

<table>
<thead>
<tr>
<th>Name</th>
<th>AWS-StartEC2Instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>InstanceId</td>
<td>:</td>
</tr>
<tr>
<td>Date</td>
<td>: 8/1/2019 7:31:38 PM</td>
</tr>
<tr>
<td>Status.Name</td>
<td>:</td>
</tr>
<tr>
<td>Status.Date</td>
<td>:</td>
</tr>
<tr>
<td>Status.Message</td>
<td>:</td>
</tr>
<tr>
<td>Status.AdditionalInfo</td>
<td>:</td>
</tr>
</tbody>
</table>

**Note**

If you use tags to create an association on one or more target instances, and then you remove the tags from an instance, that instance no longer runs the association. The instance is disassociated from the State Manager document.

**Troubleshooting State Manager Automation Executions**

Systems Manager Automation enforces a limit of 25 concurrent executions, 75 child executions, and 1,000 queued executions per account, per Region. If a State Manager association that runs an Automation document shows a status of **Failed** and a detailed status of
Working with Automation Executions

**AutomationExecutionLimitExceeded**, then your execution may have reached the limit. As a result, Systems Manager throttles the executions. To resolve this issue, do the following:

- Use a different rate or cron expression for your association. For example, if the association is scheduled to run every 30 minutes, then change the expression so that it runs every hour or two.
- Delete existing Automation executions that have a status of **Pending**. By deleting these executions, you clear the current queue.

Running Automation Workflows with Triggers using Maintenance Windows

You can start an Automation workflow by configuring an Automation document as a registered task for a maintenance window. By registering the Automation document as a registered task, the maintenance window runs the automation workflow during the scheduled maintenance period.

For example, let's say you create an Automation document named `CreateAMI` that creates an Amazon Machine Image (AMI) of instances registered as targets to the maintenance window. To specify the `CreateAMI` document (and corresponding workflow) as a registered task of a maintenance window, you first create a maintenance window and register targets. Then you use the following procedure to specify the `CreateAMI` document as a registered task within the maintenance window. When the maintenance window starts during the scheduled period, the system runs the automation workflow and creates an AMI of the registered targets.

For information about creating Automation documents, see Working with Automation Documents (p. 217).

Use the following procedures to configure an Automation workflow as a registered task for a maintenance window using the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), or AWS Tools for Windows PowerShell.

Registering an Automation Workflow Task to a Maintenance Window (Console)

The following procedure describes how to use the Systems Manager console to configure an Automation workflow as a registered task for a maintenance window.

**Before You Begin**

Before you complete the following procedure, you must create a maintenance window and register at least one target. For more information, see the following procedures:

- Create a Maintenance Window (Console) (p. 456).
- Assign Targets to a Maintenance Window (Console) (p. 457)

**To configure an Automation workflow as a registered task for a maintenance window**

2. In the left navigation pane, choose **Maintenance Windows**, and then choose the maintenance window you want to register an Automation task with.
3. Choose **Actions**. Then choose **Register Automation task** to run your choice of an Automation workflow on targets by using an Automation document.
4. For **Name**, enter a name for the task.
5. For **Description**, enter a description.
6. For **Document**, choose the Automation document that defines the tasks to run.
7. For **Document version**, choose the document version to use.
8. For **Task priority**, specify a priority for this task. 1 is the highest priority. Tasks in a maintenance window are scheduled in priority order; tasks that have the same priority are scheduled in parallel.
9. In the **Targets** section, identify the targets on which you want to run this automation workflow by specifying tags or by selecting instances manually.

**Important**
If you choose an Automation document that doesn't target managed instances, you must still select at least one maintenance window target. In this situation, we recommend registering a target for a tag key-value pair that is not used by your managed instances. For example, if you choose the Automation document `AWS-CopySnapshot`, then the resulting automation workflow targets Amazon Elastic Block Store (EBS) snapshots instead of managed instances. In this case, you can register a target to your maintenance window, which targets a tag key-value pair that is not used by your managed instances, such as key=MaintenanceWindow and value=Snapshot.

10. (Optional) For **Rate control**:

- For **Concurrency**, specify either a number or a percentage of targets on which to run the automation workflow at the same time.

**Note**
If you selected targets by choosing tag key-value pairs, and you are not certain how many targets use the selected tags, then limit the number of automation workflows that can run at the same time by specifying a percentage.

When the maintenance window runs, a new Automation execution is initiated per target. There is a limit of 25 concurrent executions of Automation and 75 child executions of Automation per AWS account. If you specify a concurrency rate greater than 25, concurrent executions greater than 25 are automatically added to the execution queue. For information, see [AWS Systems Manager Limits](https://docs.aws.amazon.com/systems-manager/latest/userguide/limits.html).

- For **Error threshold**, specify when to stop running the automation workflow on other targets after it fails on either a number or a percentage of targets. For example, if you specify three errors, then Systems Manager stops running automation workflows when the fourth error is received. Targets still processing the workflow might also send errors.

11. In the **IAM service role** area, choose one of the following options to provide permissions for Systems Manager to start the Automation workflow:

- **Create and use a service-linked role for Systems Manager**

  Service-linked roles provide a secure way to delegate permissions to AWS services because only the linked service can assume a service-linked role. Additionally, AWS automatically defines and sets the permissions of service-linked roles, depending on the actions that the linked service performs on your behalf.

  **Note**
If a service-linked role has already been created for your account, choose **Use the service-linked role for Systems Manager**.

- **Use a custom service role**

  If you want to use stricter permissions than those provided by the service-linked role, you can create a custom service role for maintenance window tasks. If you want to use Amazon SNS to send notifications related to maintenance window tasks run through Run Command, you can create a custom service role.

  To create a custom service role, see one of the following topics:

  - [Control Access to Maintenance Windows (Console)](https://docs.aws.amazon.com/systems-manager/latest/userguide/maintenance-control-access-console.html) (p. 446)
To help you decide whether to use a custom service role or the Systems Manager service-linked role with a maintenance window task, see Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445).

12. In the Input Parameters section, specify parameters for the document. For Automation documents, the system auto-populates some of the values. You can keep or replace these values.

**Important**

For Automation documents, you can optionally specify an Automation Assume Role. If you don't specify a role for this parameter, then the Automation workflow assumes the maintenance window service role you choose in step 11. As such, you must ensure that the maintenance window service role you choose has the appropriate AWS Identity and Access Management (IAM) permissions to perform the actions defined within the Automation document.

For example, the service-linked role for Systems Manager doesn't have the IAM permission `ec2:CreateSnapshot`, which is required to run the Automation document `AWS-CopySnapshot`. In this scenario, you must either use a custom maintenance window service role or specify an Automation assume role that has `ec2:CreateSnapshot` permissions. For information, see Getting Started with Automation (p. 144).

13. Choose **Register Automation task**.

**Registering an Automation Workflow Task to a Maintenance Window (Command Line)**

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to configure an Automation workflow as a registered task for a maintenance window.

**Before You Begin**

Before you complete the following procedure, you must create a maintenance window and register at least one target. For more information, see the following procedures:

- Step 1: Create the Maintenance Window (AWS CLI) (p. 463).
- Step 2: Register a Target Instance with the Maintenance Window (AWS CLI) (p. 464)

**To configure an Automation workflow as a registered task for a maintenance window**

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).

2. Create a command to configure an Automation workflow as a registered task for a maintenance window. Here are some template commands to help.

   **Linux**
   ```bash
   aws ssm register-task-with-maintenance-window \
   --window-id window_id \
   --name task_name \
   --task-arn document_name \
   --targets Key=targets,Values=value_1,value_2,value_3 \
   --service-role-arn service_role_arn \
   --task-type AUTOMATION \
   --task-invocation-parameters task_parameters_if_any \
   --priority task_priority \
   --max-concurrency a_number_of_instances_or_a_percentage_of_target_set \
   --max-errors a_number_of_errors_or_a_percentage_of_target_set
   ```
Note
If you configure an Automation workflow as a registered task by using the AWS CLI, use the --Task-Invocation-Parameters parameter to specify parameters to pass to a task when it runs. Don't use the --Task-Parameters parameter. The --Task-Parameters parameter is a legacy parameter.

Windows

```powershell
aws ssm register-task-with-maintenance-window
  --window-id window_id
  --name task_name
  --task-arn document_name
  --targets Key=targets,Values=value_1,value_2,value_3
  --service-role-arn service_role_arn
  --task-type AUTOMATION
  --task-invocation-parameters task_parameters_if_any
  --priority task_priority
  --max-concurrency a_number_of_instances_or_a_percentage_of_target_set
  --max-errors a_number_of_errors_or_a_percentage_of_target_set
```

Note
If you configure an Automation workflow as a registered task by using the AWS CLI, use the --Task-Invocation-Parameters parameter to specify parameters to pass to a task when it runs. Don't use the --Task-Parameters parameter. The --Task-Parameters parameter is a legacy parameter.

PowerShell

```powershell
Register-SSMTaskWithMaintenanceWindow
  -WindowId window_id
  -Name task_name
  -TaskArn document_name
  -Target @{ Key="targets";Values="value_1" }
  -ServiceRoleArn service_role_arn
  -TaskType "AUTOMATION"
  -Automation_Parameter
    @{ "task_parameters_1"="task_parameter_1_value";"task_parameters_2"="task_parameter_2_value" }
  -Priority task_priority
  -MaxConcurrency a_number_of_instances_or_a_percentage_of_target_set
  -MaxError a_number_of_errors_or_a_percentage_of_target_set
```

Note
If you configure an Automation workflow as a registered task by using the AWS Tools for PowerShell, use the -Automation_Parameter parameter to specify parameters to pass to a task when the task runs. Don't use the -TaskParameters parameter. The -TaskParameters parameter is a legacy parameter.

The following example configures an Automation workflow as a registered task to a maintenance window with priority 1. The Automation workflow uses the AWS-StartEC2Instance document and the specified Automation assume role to start EC2 instances registered as targets to the maintenance window. The maintenance window runs the Automation workflow simultaneously on 5 instances maximum at any given time. Also, the registered task stops running on more instances for a particular execution interval if the error count exceeds 1.

Linux

```powershell
aws ssm register-task-with-maintenance-window
  --window-id mw-0c50858d01EXAMPLE
```
Windows

```bash
aws ssm register-task-with-maintenance-window ^
--window-id mw-0c50858d01EXAMPLE ^
--name StartEC2Instances ^
--task-arn AWS-StartEC2Instance ^
--targets Key=WindowTargetIds,Values=e32eeb2-646c-4f4b-8ed1-205fbEXAMPLE ^
--service-role-arn arn:aws:iam::123456789012:role/MaintenanceWindowRole ^
--task-type AUTOMATION ^
--task-invocation-parameters "{"Automation":{"Parameters":{"InstanceId": ["{{TARGET_ID}}"]}}}" ^
--priority 1 ^
--max-concurrency 5 ^
--max-errors 1
```

PowerShell

```powershell
Register-SSMTaskWithMaintenanceWindow `  
-WindowId mw-0c50858d01EXAMPLE `  
-Name "StartEC2" `  
-TaskArn "AWS-StartEC2Instance" `  
-Target @{ Key="WindowTargetIds";Values="e32eeb2-646c-4f4b-8ed1-205fbEXAMPLE" } `  
-ServiceRoleArn "arn:aws:iam::123456789012:role/MaintenanceWindowRole" `  
-TaskType "AUTOMATION" `  
-Automation_Parameter #@{ "InstanceId"="{{TARGET_ID}}";"AutomationAssumeRole"="arn:aws:iam::123456789012:role/AutomationAssumeRole" } `  
-Priority 1 `  
-MaxConcurrency 5 `  
-MaxError 1
```

The command returns details for the new registered task similar to the following.

Linux

```json
{
  "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE"
}
```

Windows

```json
{
  "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE"
}
```
3. To view the registered task, run the following command.

**Linux**

```bash
aws ssm describe-maintenance-window-tasks --window-id mw-0c50858d01EXAMPLE
```

**Windows**

```bash
aws ssm describe-maintenance-window-tasks --window-id mw-0c50858d01EXAMPLE
```

**PowerShell**

```powershell
Get-SSMMaintenanceWindowTaskList -WindowId mw-0c50858d01EXAMPLE
```

The system returns information like the following.

**Linux**

```json
{
    "Tasks": [
        {
            "ServiceRoleArn": "arn:aws:iam::123456789012:role/MaintenanceWindowRole",
            "MaxErrors": "1",
            "TaskArn": "AWS-StartEC2Instance",
            "MaxConcurrency": "5",
            "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
            "TaskParameters": {},
            "Priority": 0,
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Type": "AUTOMATION",
            "Targets": [
                {
                    "Values": [
                        "e32ecb2-646c-4f4b-8ed1-205fbEXAMPLE"
                    ],
                    "Key": "WindowTargetIds"
                }
            ],
            "Name": "StartEC2"
        }
    ]
}
```

**Windows**

```json
{
    "Tasks": [
        {
            "ServiceRoleArn": "arn:aws:iam::123456789012:role/MaintenanceWindowRole",
            "MaxErrors": "1",
            "TaskArn": "AWS-StartEC2Instance",
            "MaxConcurrency": "5",
            "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
            "TaskParameters": {},
            "Priority": 0,
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Type": "AUTOMATION",
            "Targets": [
                {
                    "Values": [
                        "e32ecb2-646c-4f4b-8ed1-205fbEXAMPLE"
                    ],
                    "Key": "WindowTargetIds"
                }
            ],
            "Name": "StartEC2"
        }
    ]
}
```
Running Automation Workflows by Using Different Security Models

This section includes information about how to run Automation workflows by using different security models.

Topics

- Running an Automation Workflow as the Current Authenticated User (p. 196)
- Running an Automation Workflow by Using an IAM Service Role (p. 200)
- Running an Automation Workflow by Using Delegated Administration (p. 204)

Running an Automation Workflow as the Current Authenticated User

The following procedures describe how to run an Automation workflow that runs in the context of the current AWS Identity and Access Management (IAM) user using the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), and AWS Tools for Windows PowerShell. Running the Automation workflow in the context of the current IAM user means that you don't need to configure additional IAM permissions as long as you have permission to run the Automation document and any actions called

```
PowerShell

Description : 
LoggingInfo : 
MaxConcurrency : 5
MaxErrors : 1
Name : StartEC2
Priority : 1
ServiceRoleArn : arn:aws:iam::123456789012:role/MaintenanceWindowRole
Targets : {WindowTargetIds}
TaskArn : AWS-StartEC2Instance
TaskParameters : {}
Type : AUTOMATION
WindowId : mw-0c50858d01EXAMPLE
WindowTaskId : 4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE
```
by the document. If you have administrator permissions in IAM, then you have permission to run this Automation.

**Running an Automation Workflow as the Current Authenticated User (Console)**

The following procedure describes how to use the Systems Manager console to run an Automation workflow as the current authenticated user.

**To run the Automation document as the current authenticated user**

2. In the navigation pane, choose Automation, and then choose Execute automation.
3. In the Automation document list, choose a document. Choose one or more options in the Document categories pane to filter SSM documents according to their purpose. To view a document that you own, choose the Owned by me tab. To view a document that is shared with your account, choose the Shared with me tab. To view all documents, choose the All documents tab.
   
   **Note**
   
   You can view information about a document by choosing the document name.
4. In the Document details section, verify that Document version is set to the version that you want to run. The system includes the following version options:
   - **Default version at runtime**: Choose this option if the Automation document is updated periodically and a new default version is assigned.
   - **Latest version at runtime**: Choose this option if the Automation document is updated periodically, and you want to run the version that was most recently updated.
   - **1 (Default)**: Choose this option to run the first version of the document, which is the default.
5. Choose Next.
6. In the Execution Mode section, choose Simple execution.
   
   **Note**
   
   This procedure uses the Simple execution mode. However, you can alternatively choose Rate control or Manual execution and run the Automation workflow as the current authenticated user.
7. In the Input parameters section, specify the required inputs. To run the Automation workflow as the current authenticated user, do not specify an IAM service role for the value AutomationAssumeRole.
8. Choose Execute. The console displays the status of the Automation execution.

**Running an Automation Workflow as the Current Authenticated User (Command Line)**

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to run an Automation workflow as the current authenticated user.

**To run the Automation document as the current authenticated user**

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).
2. Run the following command to start an Automation workflow as the current authenticated user.
   
   **Linux**
   
   ```bash
   aws ssm start-automation-execution \ 
   --document-name DocumentName \ 
   --parameters ParametersRequiredByDocument
   ```
Windows

aws ssm start-automation-execution ^
 --document-name DocumentName ^
 --parameters ParametersRequiredByDocument

PowerShell

Start-SSMAutomationExecution `^`
 --DocumentName DocumentName `^`
 --Parameter ParametersRequiredByDocument

Here is an example using the document AWS-RestartEC2Instance to restart the specified EC2 instance.

Linux

aws ssm start-automation-execution \`
 --document-name "AWS-RestartEC2Instance" \`
 --parameters "InstanceId=i-1234567890abcdef0"

Windows

aws ssm start-automation-execution ^
 --document-name "AWS-RestartEC2Instance" ^
 --parameters "InstanceId=i-1234567890abcdef0"

PowerShell

Start-SSMAutomationExecution `^`
 --DocumentName AWS-RestartEC2Instance `^`
 --Parameter @{"InstanceId"="i-1234567890abcdef0"}

The system returns information like the following.

Linux

```
{
   "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab"
}
```

Windows

```
{
   "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab"
}
```

PowerShell

```
4105a4fc-f944-11e6-9d32-0123456789ab
```

3. Run the following command to retrieve the status of the Automation workflow.
Linux

```bash
aws ssm describe-automation-executions \
--filter "Key=ExecutionId,Values=4105a4fc-f944-11e6-9d32-0123456789ab"
```

Windows

```bash
aws ssm describe-automation-executions ^
--filter "Key=ExecutionId,Values=4105a4fc-f944-11e6-9d32-0123456789ab"
```

PowerShell

```powershell
Get-SSMAutomationExecutionList | `
Where {$_.AutomationExecutionId -eq "4105a4fc-f944-11e6-9d32-0123456789ab"}
```

The system returns information like the following.

**Linux**

```json
{
  "AutomationExecutionMetadataList": [
    {
      "AutomationExecutionStatus": "InProgress",
      "CurrentStepName": "stopInstances",
      "Outputs": {},
      "DocumentName": "AWS-RestartEC2Instance",
      "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab",
      "DocumentVersion": "1",
      "ResolvedTargets": {
        "ParameterValues": [],
        "Truncated": false
      },
      "AutomationType": "Local",
      "Mode": "Auto",
      "ExecutionStartTime": 1564600648.159,
      "CurrentAction": "aws:changeInstanceState",
      "ExecutedBy": "arn:aws:sts::123456789012:assumed-role/Administrator/Admin",
      "LogFile": "",
      "Targets": []
    }
  ]
}
```

**Windows**

```json
{
  "AutomationExecutionMetadataList": [
    {
      "AutomationExecutionStatus": "InProgress",
      "CurrentStepName": "stopInstances",
      "Outputs": {},
      "DocumentName": "AWS-RestartEC2Instance",
      "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab",
      "DocumentVersion": "1",
      "ResolvedTargets": {
        "ParameterValues": [],
        "Truncated": false
      },
      "AutomationType": "Local",
      "Mode": "Auto",
      "ExecutionStartTime": 1564600648.159,
      "CurrentAction": "aws:changeInstanceState",
      "ExecutedBy": "arn:aws:sts::123456789012:assumed-role/Administrator/Admin",
      "LogFile": "",
      "Targets": []
    }
  ]
}
```
Running an Automation Workflow by Using an IAM Service Role

The following procedures describe how to use the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), and AWS Tools for Windows PowerShell to run an Automation workflow using an AWS Identity and Access Management (IAM) service role (or assume role). The service role gives the Automation workflow permission to perform actions on your behalf. Configuring a service role is useful when you want to restrict permissions and run actions with least privilege. This is useful, for example, when you want to restrict a user's privileges on a resource, such as an Amazon EC2 instance, but you want to allow the user to run an Automation workflow that performs a specific set of actions. In this scenario, you can create a service role with elevated privileges and allow the user to run the Automation workflow.

Before You Begin

Before you complete the following procedures, you must create the IAM service role and configure a trust relationship for Automation. For more information, see Task 1: Create a Service Role for Automation (p. 147) and Task 2: Add a Trust Relationship for Automation (p. 148).

Running an Automation Workflow by Using an IAM Service Role (Console)

The following procedure describes how to use the Systems Manager console to run an Automation workflow that uses an IAM service role (or assume role).
To run an Automation workflow using a service role

2. In the navigation pane, choose Automation, and then choose Execute automation.
3. In the Automation document list, choose a document. Choose one or more options in the Document categories pane to filter SSM documents according to their purpose. To view a document that you own, choose the Owned by me tab. To view a document that is shared with your account, choose the Shared with me tab. To view all documents, choose the All documents tab.

   **Note**
   You can view information about a document by choosing the document name.

4. In the Document details section, verify that Document version is set to the version that you want to run. The system includes the following version options:

   - Default version at runtime: Choose this option if the Automation document is updated periodically and a new default version is assigned.
   - Latest version at runtime: Choose this option if the Automation document is updated periodically, and you want to run the version that was most recently updated.
   - 1 (Default): Choose this option to run the first version of the document, which is the default.
5. Choose Next.
6. In the Execution Mode section, choose Simple execution.

   **Note**
   This procedure uses the Simple execution mode. However, you can alternatively choose Rate control, Multi-account and Region, or Manual execution and run the Automation workflow using a service role.

7. In the Input parameters section, specify the required inputs. In the Automation Assume Role box, paste the ARN of the IAM service role.
8. Choose Execute. The console displays the status of the Automation execution.

Running an Automation Workflow by Using an IAM Service Role (Command Line)

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to run an Automation workflow that uses an IAM service role (or assume role).

To run an Automation workflow using a service role

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).

2. Run the following command to start an Automation workflow that uses an IAM service role.

   **Linux**
   ```bash
   aws ssm start-automation-execution \ 
   --document-name DocumentName \ 
   --parameters
   "ParametersRequiredByDocument","AutomationAssumeRole=arn:aws:iam::123456789012:role/AmazonSSMAutomationRole"
   ```

   **Windows**
   ```powershell
   aws ssm start-automation-execution ^
   --document-name DocumentName ^
   ```
Here is an example using the document `AWS-RestartEC2Instance` to restart the specified EC2 instance using the IAM service role `AmazonSSMAutomationRole`.

Linux

```bash
aws ssm start-automation-execution \
  --document-name "AWS-RestartEC2Instance" \
  --parameters
    "InstanceId=i-1234567890abcdef0","AutomationAssumeRole=arn:aws:iam::123456789012:role/AmazonSSMAutomationRole"
```

Windows

```bash
aws ssm start-automation-execution ^
  --document-name "AWS-RestartEC2Instance" ^
  --parameters
    "InstanceId=i-1234567890abcdef0","AutomationAssumeRole=arn:aws:iam::123456789012:role/AmazonSSMAutomationRole"
```

PowerShell

```powershell
Start-SSMAutomationExecution `\n  -DocumentName "AWS-RestartEC2Instance" `\n  -Parameter @{ `\n    "ParametersRequiredByDocument"="ParameterValues"; `\n    "AutomationAssumeRole"="arn:aws:iam::123456789012:role/AmazonSSMAutomationRole"`\n  }
```

The system returns information like the following.

Linux

```json
{
  "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab"
}
```

Windows

```json
{
  "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab"
}
```
3. Run the following command to retrieve the status of the Automation workflow.

Linux

```bash
aws ssm describe-automation-executions
  --filter "Key=ExecutionId,Values=4105a4fc-f944-11e6-9d32-0123456789ab"
```

Windows

```bash
aws ssm describe-automation-executions
  --filter "Key=ExecutionId,Values=4105a4fc-f944-11e6-9d32-0123456789ab"
```

PowerShell

```powershell
Get-SSMAutomationExecutionList | ` Where {$_._.AutomationExecutionId -eq "4105a4fc-f944-11e6-9d32-0123456789ab"}
```

The system returns information like the following.

Linux

```json
{
  "AutomationExecutionMetadataList": [
    {
      "AutomationExecutionStatus": "InProgress",
      "CurrentStepName": "stopInstances",
      "Outputs": {},
      "DocumentName": "AWS-RestartEC2Instance",
      "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab",
      "DocumentVersion": "1",
      "ResolvedTargets": {
        "ParameterValues": [],
        "Truncated": false
      },
      "AutomationType": "Local",
      "Mode": "Auto",
      "ExecutionStartTime": 1564600648.159,
      "CurrentAction": "aws:changeInstanceState",
      "ExecutedBy": "arn:aws:sts::123456789012:assumed-role/Administrator/"
    }
  ]
}
```

Windows

```json
{
  "AutomationExecutionMetadataList": [
    {
      "AutomationExecutionStatus": "InProgress",
      "CurrentStepName": "stopInstances",
      "Outputs": {},
      "DocumentName": "AWS-RestartEC2Instance",
      "AutomationExecutionId": "4105a4fc-f944-11e6-9d32-0123456789ab",
      "DocumentVersion": "1",
      "ResolvedTargets": {
        "ParameterValues": [],
        "Truncated": false
      },
      "AutomationType": "Local",
      "Mode": "Auto",
      "ExecutionStartTime": 1564600648.159,
      "CurrentAction": "aws:changeInstanceState",
      "ExecutedBy": "arn:aws:sts::123456789012:assumed-role/Administrator/"
    }
  ]
}
```
For more examples of how to use Systems Manager Automation, see Automation Walkthroughs (p. 400). For information about how to get started with Automation, see Getting Started with Automation (p. 144).

Running an Automation Workflow by Using Delegated Administration

When you run an AWS Systems Manager Automation workflow, by default, the Automation runs in the context of the AWS Identity and Access Management (IAM) user who initiated the execution. This means, for example, if your IAM user account has administrator permissions, then the Automation runs with administrator permissions and full access to the resources being configured by the Automation workflow.

As a security best practice, we recommend that you run Automation workflows by using an IAM service role (also called an assumed role) that is configured with the AmazonSSMAutomationRole managed policy. Using an IAM service role to run Automation is called delegated administration.
When you use a service role, the Automation workflow is allowed to run against the AWS resources, but the user who ran the Automation has restricted access (or no access) to those resources. For example, you can configure a service role and use it with Automation to restart one or more Amazon EC2 instances. The Automation workflow restarts the instances, but the service role does not give the user permission to access those instances.

You can specify a service role at runtime when you run an Automation workflow, or you can create custom Automation documents and specify the service role directly in the document. If you specify a service role, either at runtime or in an Automation document, then the service runs in the context of the specified service role. If you don't specify a service role, then the system creates a temporary session in the context of the user and runs the Automation.

**Note**
You must specify a service role for Automation workflows that you expect to run longer than 12 hours. If you start a long-running Automation in the context of a user, the user's temporary session expires after 12 hours.

Delegated administration ensures elevated security and control of your AWS resources. It also enables an enhanced auditing experience because actions are being performed against your resources by a central service role instead of multiple IAM accounts.

To properly illustrate how delegated administration can work in an organization, this topic describes the following tasks as though these tasks were performed by three different people in an organization:

- Create a test IAM user account called AutomationRestrictedOperator (Administrator).
- Create an IAM service role for Automation (Administrator).
- Create a simple Automation document (based on a preexisting Automation document) that specifies the service role (SSM Document Author).
- Run the Automation as the test user (Restricted Operator).

In some organizations, all three of these tasks are performed by the same person, but identifying the different roles here shows how delegated administration enables enhanced security in complex organizations.

**Important**
As a security best practice, we recommend that you always use a service role to run Automation workflows, even if you are an administrator who performs all of these tasks.

The procedures in this section link to topics in other AWS guides or other Systems Manager topics. We recommend that you open links to other topics in a new tab in your web browser so you don't lose your place in this topic.

**Topics**
- [Create a Test User Account](#)
- [Create an IAM Service Role for Automation](#)
- [Create a custom Automation Document](#)
- [Run the Custom Automation Document](#)

**Create a Test User Account**
This section describes how to create an IAM test user account with restricted permissions. The permissions set allows the user to run Automation workflows, but the user doesn't have access to the AWS resources targeted by Automation. The operator can also view the results of the Automation workflows. You start by creating the custom IAM permissions policy, and then you create the user account and assign permissions to it.
Create an IAM Test User

1. Create a permissions policy named OperatorRestrictedPermissions. For information about how to create a new IAM permissions policy, see Create an IAM Policy (Console) in the IAM User Guide. Create the policy on the JSON tab, and specify the following permissions set.

```json
{
   "Version":"2012-10-17",
   "Statement":[
      {
         "Effect":"Allow",
         "Action":
         [ "ssm:DescribeAutomationExecutions",
           "ssm:DescribeAutomationStepExecutions",
           "ssm:DescribeDocument",
           "ssm:GetAutomationExecution",
           "ssm:GetDocument",
           "ssm:ListDocuments",
           "ssm:ListDocumentVersions",
           "ssm:StartAutomationExecution"
         ],
         "Resource":"*"
      }
   ]
}
```

2. Create a new IAM user account named AutomationRestrictedOperator. For information about how to create a new IAM user, see Creating IAM Users (Console) in the IAM User Guide. When prompted, choose Attach existing policies directly, and choose the policy you just created.

3. Note the user name, password, and the Console login link. You will log into this account later in this topic.

Create an IAM Service Role for Automation

The following procedure links to other topics to help you create the service role and to configure Automation to trust this role.

To create the service role and enable Automation to trust it

1. Create the Automation service role. For information, see Task 1: Create a Service Role for Automation (p. 147).
2. Note the service role Amazon Resource Name (ARN). You will specify this ARN in the next procedure.
3. Configure a trust policy so that Automation trusts the service role. For more information, see Task 2: Add a Trust Relationship for Automation (p. 148).

Create a custom Automation Document

This section describes how to create a custom Automation document that restarts Amazon EC2 instances. AWS provides a default SSM document for restarting instances called AWS-RestartEC2Instance. The following procedure copies the content of that document to show you how to enter the service role in a document when you create your own. By specifying the service role directly in the document, the user running the document does not require iam:PassRole permissions. Without iam:PassRole permissions, the user can’t use the service role elsewhere in AWS.

To create a custom Automation document

2. In the navigation pane, choose **Documents**.

-or-

If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Documents** in the navigation pane.

3. Choose **Create document**.

4. In the **Name** field, type a name for the document, such as Restart-EC2InstanceDemo.

5. In the **Document type** list, choose **Automation document**.

6. In the **Content** section, choose **JSON**, and then paste the following content. Replace **AssumeRoleARN** with the ARN of the service role you created in the previous procedure.

```json
{
  "description": "Restart EC2 instances(s)",
  "schemaVersion": "0.3",
  "assumeRole": "AssumeRoleARN",
  "parameters": {
    "InstanceId": {
      "type": "StringList",
      "description": "(Required) EC2 Instance to restart"
    }
  },
  "mainSteps": [
    {
      "name": "stopInstances",
      "action": "aws:changeInstanceState",
      "inputs": {
        "InstanceIds": "{{ InstanceId }}",
        "DesiredState": "stopped"
      }
    },
    {
      "name": "startInstances",
      "action": "aws:changeInstanceState",
      "inputs": {
        "InstanceIds": "{{ InstanceId }}",
        "DesiredState": "running"
      }
    }
  ]
}
```

7. Choose **Create document**.

### Run the Custom Automation Document

The following procedure describes how to run the document you just created using the restricted operator role you created earlier in this topic. The user can run the document you created earlier because their IAM account permissions enable them to see and run the document. The user can't, however, log on to the instances that you will restart with this Automation workflow.

1. In the [https://console.aws.amazon.com/ec2/](https://console.aws.amazon.com/ec2/), copy the instance IDs for one or more instances that you want to restart by using the following Automation workflow.

2. Sign out of the AWS Management Console, and then sign back in by using the test user account [Console login link](https://console.aws.amazon.com/ec2/) that you copied earlier.


4. In the navigation pane, choose **Automation**.

-or-

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If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Automation.

5. Choose Execute automation.

6. Choose the custom Automation document you created earlier in this topic.

7. In the Document details section, verify that Document version is set to 1 (Default).

8. Choose Next.

9. In the Execution mode section, choose Simple execution.

10. In the Input parameters section, type one or more instance IDs that you want to restart, and then choose Execute.

Execution details describes the status of the Automation. Step 1 stops the instances. Step 2 starts the instances.

Running Automation Workflows in Multiple AWS Regions and Accounts

You can run AWS Systems Manager Automations across multiple AWS Regions and AWS accounts or AWS Organizational Units (OUs) from an Automation management account. Running Automations in multiple Regions and accounts or OUs reduces the time required to administer your AWS resources while enhancing the security of your computing environment.

For example, you can centrally implement patching and security updates, remediate compliance drift on VPC configurations or Amazon S3 bucket policies, and manage resources, such as Amazon EC2 instances, at scale. The following graphic shows an example of a user who is running the AWS-RestartEC2Instances document in multiple Regions and accounts from an Automation management account. The Automation locates the instances by using the specified tags in the specified Regions and accounts.

Note
When you run an Automation across multiple Regions and accounts, you target resources by using tags or the name of an AWS resource group. The Automation fails to run on those resources that don't have the specified tag or that aren't included in the specified resource group.
Important
Your account is charged for running Automations in multiple Regions and accounts. Multi-Region and account step executions are considered special steps. There is no step limit for special steps, but your account is charged for each step processed by Systems Manager. For more information, see the AWS Systems Manager Pricing page.

How It Works

Running Automations across multiple Regions and accounts or OUs works as follows:

1. Verify that all resources on which you want to run the Automation, in all Regions and accounts or OUs, use identical tags. If they don't, you can add them to an AWS resource group and target that group. For more information, see What Is AWS Resource Groups?
2. Sign in to the AWS Identity and Access Management (IAM) account that you want to configure as the Automation Master account.
3. Use the procedure in this topic to create an IAM execution role called AWS-SystemsManager-AutomationExecutionRole. This role gives the user permission to run Automation workflows.
4. Use the procedure in this topic to create a second IAM role called AWS-SystemsManager-AutomationAdministrationRole. This role gives the user permission to run Automation workflows in multiple AWS accounts and OUs.
5. Choose the Automation document, Regions, and accounts or OUs where you want to run the Automation workflow.
6. Run the Automation.
7. Use the GetAutomationExecution, DescribeAutomationStepExecutions, and DescribeAutomationExecutions API actions from the AWS Systems Manager console or the AWS CLI to monitor workflow progress.
Setting Up Management Account Permissions for Multi-Region and Multi-Account Automation Execution

Use the following procedure to create the required IAM roles for Systems Manager Automation multi-Region and multi-account execution by using AWS CloudFormation. This procedure describes how to create the `AWS-SystemsManager-AutomationExecutionRole` role. You must create this role in every account that you want to target to run multi-Region and multi-account Automations.

This procedure also describes how to create the `AWS-SystemsManager-AutomationAdministrationRole` role. You only need to create this role in the Automation management account.

To create the required IAM roles for Multi-Region and Multi-Account Automation Executions by using AWS CloudFormation

1. Download the `AWS-SystemsManager-AutomationExecutionRole.zip` folder. This folder includes the `AWS-SystemsManager-AutomationExecutionRole.json` AWS CloudFormation template file.
3. Choose `Create Stack`.
4. In the `Choose a template section`, choose `Upload a template to Amazon S3`.
5. Choose `Browse`, and then choose the `AWS-SystemsManager-AutomationExecutionRole.json` AWS CloudFormation template file.
6. Choose `Next`.
7. On the `Specify Details` page, in the `Stack Name` field, enter a name.
8. In the `Parameters` section, in the `MasterAccountID` field, enter the ID for the account that you want to use to run multi-Region and multi-account Automations.
9. Choose `Next`.
10. On the `Options` page, enter values for any options you want to use. Choose `Next`.
11. On the `Review` page, scroll down and choose the `I acknowledge that AWS CloudFormation might create IAM resources` option.
12. Choose `Create`.

AWS CloudFormation shows the `CREATE_IN_PROGRESS` status for approximately three minutes. The status changes to `CREATE_COMPLETE`.

13. Repeat this procedure in every account that you want to target to run multi-Region and multi-account Automations.
14. Download the `AWS-SystemManager-AutomationAdministrationRole.zip` folder and repeat this procedure for the `AWS-SystemManager-AutomationAdministrationRole` role. You only need to create the `AWS-SystemManager-AutomationAdministrationRole` role in the Automation management account.

Run an Automation in Multiple Regions and Accounts (Console)

The following procedure describes how to use the Systems Manager console to run an Automation in multiple Regions and accounts from the Automation management account.

Before You Begin

Before you complete the following procedure, note the following information:

- AWS account IDs or OUs where you want to run the Automation.
- AWS Systems Manager Regions where you want to run the Automation.
- The tag key and the tag value, or the name of the resource group, where you want to run the Automation.
To run an Automation workflow in multiple Regions and accounts

2. In the navigation pane, choose Automation, and then choose Execute automation.
3. In the Automation document list, choose a document. Choose one or more options in the Document categories pane to filter SSM documents according to their purpose. To view a document that you own, choose the Owned by me tab. To view a document that is shared with your account, choose the Shared with me tab. To view all documents, choose the All documents tab.

   **Note**
   You can view information about a document by choosing the document name.

4. In the Document details section, verify that Document version is set to the version that you want to run. The system includes the following version options:

   - **Default version at runtime**: Choose this option if the Automation document is updated periodically and a new default version is assigned.
   - **Latest version at runtime**: Choose this option if the Automation document is updated periodically, and you want to run the version that was most recently updated.
   - **1 (Default)**: Choose this option to run the first version of the document, which is the default.

5. Choose Next.
6. On the Execute automation document page, choose Multi-account and Region.
7. In the Target accounts and Regions section, use the Accounts and organizational (OUs) field to specify the different AWS accounts or AWS Organizational Units (OUs) where you want to run the Automation. Separate multiple accounts or OUs with a comma.
8. Use the AWS Regions list to choose one or more Regions where you want to run the Automation.
9. Use the Multi-Region and account rate control options to restrict the Automation execution to a limited number of accounts running in a limited number of Regions. These options don't restrict the number of AWS resources that can run the Automations.

   a. In the Location (account-Region pair) concurrency section, choose an option to restrict the number of Automation workflows that can run in multiple accounts and Regions at the same time. For example, if you choose to run an Automation in five (5) AWS accounts, which are located in four (4) AWS Regions, then Systems Manager runs Automations in a total of 20 account-Region pairs. You can use this option to specify an absolute number, such as 2, so that the Automation only runs in two account-Region pairs at the same time. Or you can specify a percentage of the account-Region pairs that can run at the same time. For example, with 20 account-Region pairs, if you specify 20%, then the Automation simultaneously runs in a maximum of five (5) account-Region pairs.

      - Choose targets to enter an absolute number of account-Region pairs that can run the Automation workflow simultaneously.
      - Choose percent to enter a percentage of the total number of account-Region pairs that can run the Automation workflow simultaneously.

   b. In the Error threshold section, choose an option:

      - Choose errors to enter an absolute number of errors allowed before Automation stops sending the workflow to other resources.
      - Choose percent to enter a percentage of errors allowed before Automation stops sending the workflow to other resources.

10. In the Targets section, choose how you want to target the AWS Resources where you want to run the Automation. These options are required.

   a. Use the Parameter list to choose a parameter. The items in the Parameter list are determined by the parameters in the Automation document that you selected at the start of this procedure.
By choosing a parameter you define the type of resource on which the Automation workflow runs.

b. Use the **Targets** list to choose how you want to target resources. If you chose to target resources by using AWS Resource Groups, then choose the name of the group from the **Resource Group** list.

If you chose to target resources by using tags, then enter the tag key and (optionally) the tag value in the fields provided. Choose **Add**.

If you chose to target resources by using parameter values, then enter the parameter value for the parameter you chose in the Input parameters section.

11. In the **Input parameters** section, specify the required inputs. Optionally, you can choose an IAM service role from the **AutomationAssumeRole** list.

   **Note**
   You may not need to choose some of the options in the **Input parameters** section. This is because you targeted resources in multiple Regions and accounts by using tags or a resource group. For example, if you chose the AWS-RestartEC2Instance document, then you don't need to specify or choose instance IDs in the **Input parameters** section. The Automation execution locates the instances to restart by using the tags you specified.

12. Use the options in the **Rate control** section to restrict the number of AWS resources that can run the Automation within each account-Region pair.

   In the **Concurrency** section, choose an option:
   - Choose **targets** to enter an absolute number of targets that can run the Automation workflow simultaneously.
   - Choose **percentage** to enter a percentage of the target set that can run the Automation workflow simultaneously.

13. In the **Error threshold** section, choose an option:
   - Choose **errors** to enter an absolute number of errors allowed before Automation stops sending the workflow to other resources.
   - Choose **percentage** to enter a percentage of errors allowed before Automation stops sending the workflow to other resources.

14. Choose **Execute**.

Run an Automation in Multiple Regions and Accounts (Command Line)

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to run an Automation in multiple Regions and accounts from the Automation management account.

**Before You Begin**

Before you complete the following procedure, note the following information:

- AWS account IDs or OUs where you want to run the Automation.
- **AWS Systems Manager** Regions where you want to run the Automation.
- The tag key and the tag value, or the name of the resource group, where you want to run the Automation.

**To run an Automation workflow in multiple Regions and accounts**

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.
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For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).

2. Use the following format to create a command to run an Automation workflow in multiple Regions and accounts.

**Linux**

```bash
aws ssm start-automation-execution \
  --document-name name_of_Automation_document \
  --parameters
    AutomationAssumeRole=arn:aws:iam::Automation_management_account_ID:role/AWS-SystemsManager-AutomationAdministrationRole \
    --target-parameter-name parameter_name (required) \
    --targets Key=tag_key,Values=tag_value \
  --target-locations
    Accounts=account_ID_1,account_ID_2,account_ID_3,Regions=Region_1,Region_2,ExecutionRoleName=AWS-SystemsManager-AutomationExecutionRole
```

**Windows**

```bash
aws ssm start-automation-execution ^
  --document-name name_of_Automation_document ^
  --parameters
    AutomationAssumeRole=arn:aws:iam::Automation_management_account_ID:role/AWS-SystemsManager-AutomationAdministrationRole ^
    --target-parameter-name parameter_name (required) ^
    --targets Key=tag_key,Values=tag_value ^
  --target-locations
    Accounts=account_ID_1,account_ID_2,account_ID_3,Regions=Region_1,Region_2,ExecutionRoleName=AWS-SystemsManager-AutomationExecutionRole
```

**PowerShell**

```powershell
$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "target_key"
$Targets.Values = "target_value"

Start-SSMAutomationExecution \
  -DocumentName "name_of_Automation_document" \
  -Parameter @(
    "AutomationAssumeRole="arn:aws:iam::Automation_management_account_ID:role/AWS-SystemsManager-AutomationAdministratorRole" } \
    -TargetParameterName "parameter_name (required)" \
  -Target $Targets \
  -TargetLocation @{
    "Accounts"="account_ID_1","account_ID_2","account_ID_3";
    "Regions"="Region_1","Region_2";
    "ExecutionRoleName="AWS-SystemsManager-AutomationExecutionRole" }
```

Here are a few examples.

**Example 1:** This example restarts Amazon EC2 instances in the 123456789012 and 987654321098 accounts, which are located in the us-east-2 and us-west-1 Regions. The instances must be tagged with the tag key-pair value Env-PROD.

**Linux**

```bash
aws ssm start-automation-execution \
  --document-name name_of_Automation_document \
  --parameters
    AutomationAssumeRole=arn:aws:iam::Automation_management_account_ID:role/AWS-SystemsManager-AutomationAdministrationRole \
    --target-parameter-name parameter_name (required) \
    --targets Key=tag_key,Values=tag_value \
  --target-locations
    Accounts=account_ID_1,account_ID_2,account_ID_3,Regions=Region_1,Region_2,ExecutionRoleName=AWS-SystemsManager-AutomationExecutionRole
```

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Windows

```bash
aws ssm start-automation-execution
   --document-name AWS-RestartEC2Instance
   --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/AWS-SystemsManager-AutomationAdministrationRole
   --target-parameter-name InstanceId
   --targets Key=tag:Env,Values=PROD
   --target-locations Accounts=123456789012,987654321098,Regions=us-east-2,us-west-1,ExecutionRoleName=AWS-SystemsManager-AutomationExecutionRole
```

PowerShell

```powershell
$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "tag:Env"
$Targets.Values = "PROD"
Start-SSMAutomationExecution
   -DocumentName "AWS-RestartEC2Instance"
   -Parameter @{
       "AutomationAssumeRole"="arn:aws:iam::123456789012:role/AWS-SystemsManager-AutomationAdministrationRole"
   }
   -TargetParameterName "InstanceId"
   -Target $Targets
   -TargetLocation @{
       "Accounts"="123456789012", "987654321098";
       "Regions"="us-east-2", "us-west-1";
       "ExecutionRoleName"="AWS-SystemsManager-AutomationExecutionRole"
   }
```

Example 2: This example restarts Amazon EC2 instances in the 123456789012 and 987654321098 accounts, which are located in the eu-central-1 Region. The instances must be members of the prod-instances AWS resource group.

Linux

```bash
aws ssm start-automation-execution
   --document-name AWS-RestartEC2Instance
   --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/AWS-SystemsManager-AutomationAdministrationRole
   --target-parameter-name InstanceId
   --targets Key=ResourceGroup,Values=prod-instances
   --target-locations Accounts=123456789012,987654321098,Regions=eu-central-1,ExecutionRoleName=AWS-SystemsManager-AutomationExecutionRole
```

Windows

```bash
aws ssm start-automation-execution
   --document-name AWS-RestartEC2Instance
   --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/AWS-SystemsManager-AutomationAdministrationRole
   --target-parameter-name InstanceId
```
--targets Key=ResourceGroup,Values=prod-instances ^
--target-locations Accounts=123456789012,987654321098,Regions=eu-central-1,ExecutionRoleName=AWS-SystemsManager-AutomationExecutionRole

PowerShell

```powershell
$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "ResourceGroup"
$Targets.Values = "prod-instances"
Start-SSMAutomationExecution `  
-DocumentName "AWS-RestartEC2Instance" `  
-Parameter @{  
  "AutomationAssumeRole"="arn:aws:iam::123456789012:role/AWS-SystemsManager-AutomationAdministrationRole" } `  
-TargetParameterName "InstanceId" `  
-Target $Targets `  
-TargetLocation @{  
  "Accounts"="123456789012", "987654321098";  
  "Regions"="eu-central-1";  
  "ExecutionRoleName"="AWS-SystemsManager-AutomationExecutionRole" } 
```

Example 3: This example restarts Amazon EC2 instances in the ou-1a2b3c-4d5e6c AWS organizational unit (OU). The instances are located in the us-west-1 and us-west-2 Regions. The instances must be members of the WebServices AWS resource group.

Linux

```
aws ssm start-automation-execution \
  --document-name AWS-RestartEC2Instance \
  --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/AWS-SystemsManager-AutomationAdministrationRole \
  --target-parameter-name InstanceId \
  --targets Key=ResourceGroup,Values=WebServices \
  --target-locations Accounts=ou-1a2b3c-4d5e6c,Regions=us-west-1,us-west-2,ExecutionRoleName=AWS-SystemsManager-AutomationExecutionRole
```

Windows

```
aws ssm start-automation-execution ^
  --document-name AWS-RestartEC2Instance ^
  --parameters AutomationAssumeRole=arn:aws:iam::123456789012:role/AWS-SystemsManager-AutomationAdministrationRole ^
  --target-parameter-name InstanceId ^
  --targets Key=ResourceGroup,Values=WebServices ^
  --target-locations Accounts=ou-1a2b3c-4d5e6c,Regions=us-west-1,us-west-2,ExecutionRoleName=AWS-SystemsManager-AutomationExecutionRole
```

PowerShell

```
$Targets = New-Object Amazon.SimpleSystemsManagement.Model.Target
$Targets.Key = "ResourceGroup"
$Targets.Values = "WebServices"
Start-SSMAutomationExecution `  
-DocumentName "AWS-RestartEC2Instance" `  
-Parameter @{  
  "AutomationAssumeRole"="arn:aws:iam::123456789012:role/AWS-SystemsManager-AutomationAdministrationRole" } `  
```

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-TargetParameterName "InstanceId"
-Target #Targets
-TargetLocation @{
  "Accounts"="ou-1a2b3c-4d5e6c";
  "Regions"="us-west-1";
  "ExecutionRoleName"="AWS-SystemsManager-AutomationExecutionRole" }

The system returns information similar to the following.

Linux

```
{
  "AutomationExecutionId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE"
}
```

Windows

```
{
  "AutomationExecutionId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE"
}
```

PowerShell

```
4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE
```

3. Run the following command to view the workflow execution.

Linux

```
aws ssm describe-automation-executions
   --filters Key=ExecutionId,Values=4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE
```

Windows

```
aws ssm describe-automation-executions ^
   --filters Key=ExecutionId,Values=4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE
```

PowerShell

```
Get-SSMAutomationExecutionList | `
   Where {$_.AutomationExecutionId -eq "a4a3c0e9-7efd-462a-8594-01234EXAMPLE"}
```

4. Run the following command to view details about the execution progress.

Linux

```
aws ssm get-automation-execution
   --automation-execution-id 4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE
```

Windows

```
aws ssm get-automation-execution ^
   --automation-execution-id 4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE
```
PowerShell

```powershell
Get-SSMAutomationExecution -AutomationExecutionId a4a3c0e9-7efd-462a-8594-01234EXAMPLE
```

**Note**
You can also monitor the status of the workflow in the console. In the execution list, choose the execution you just ran and then choose the **Steps** tab. This tab shows the status of the workflow actions.

**Related Content**

Centralized multi-account and multi-Region patching with AWS Systems Manager Automation

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## Working with Automation Documents

A Systems Manager Automation document defines the actions that Systems Manager performs on your managed instances and AWS resources. Documents use JavaScript Object Notation (JSON) or YAML, and they include steps and parameters that you specify. Steps run in sequential order.

Automation documents are Systems Manager documents of type Automation, as opposed to Command and Policy documents. Automation documents currently support schema version 0.3. Command documents use schema version 1.2, 2.0, or 2.2. Policy documents use schema version 2.0 or later.

To view information about the actions or plugins that you can specify in a Systems Manager Automation document, see Systems Manager Automation Actions Reference (p. 241). To view information about the plugins for all other SSM documents, see SSM Document Plugin Reference (p. 803).

**Important**
If you run an automation that invokes other services by using an AWS Identity and Access Management (IAM) service role, be aware that the service role must be configured with permission to invoke those services. This requirement applies to all AWS Automation documents (AWS-* documents) such as the AWS-ConfigureS3BucketLogging, AWS-CreateDynamoDBBackup, and AWS-RestartEC2Instance documents, to name a few. This requirement also applies to any custom Automation documents you create that invoke other AWS services by using actions that call other services. For example, if you use the `aws:executeAwsApi`, `aws:CreateStack`, or `aws:copyImage` actions, to name a few, then you must configure the service role with permission to invoke those services. You can enable permissions to other AWS services by adding an IAM inline policy to the role. For more information, see (Optional) Add an Automation Inline Policy to Invoke Other AWS Services (p. 147).

**Contents**

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- Invoking Other AWS Services from a Systems Manager Automation Workflow (p. 228)
- Sharing a Systems Manager Automation Document (p. 238)
- Systems Manager Automation Documents Reference (p. 240)

---

## Creating Dynamic Automation Workflows with Conditional Branching

By default, the steps that you define in the `mainSteps` section of an Automation document run in sequential order. After one action is completed, the next action specified in the `mainSteps` section
begins. Furthermore, if an action fails to run, the entire Automation workflow fails (by default). You can use the `aws:branch` Automation action and the Automation document options described in this section to create Automation workflows that perform **conditional branching**. This means that you can create Automation workflows that jump to a different step after evaluating different choices or that dynamically respond to changes when a step completes. Here is a list of options that you can use to create dynamic Automation workflows:

- **`aws:branch`**: This automation action enables you to create a dynamic Automation workflow that evaluates multiple choices in a single step and then jumps to a different step in the Automation document based on the results of that evaluation.
- **`nextStep`**: This option specifies which step in an Automation workflow to process next after successfully completing a step.
- **`isEnd`**: This option stops an Automation execution at the end of a specific step. The default value for this option is false.
- **`isCritical`**: This option designates a step as critical for the successful completion of the Automation. If a step with this designation fails, then Automation reports the final status of the Automation as Failed. The default value for this option is true.
- **`onFailure`**: This option indicates whether the workflow should abort, continue, or go to a different step on failure. The default value for this option is abort.

The following section describes the `aws:branch` Automation action. For more information about the `nextStep`, `isEnd`, `isCritical`, and `onFailure` workflow options, see Examples of How to Use Dynamic Workflow Options (p. 226).

**Working with the `aws:branch` action**

The `aws:branch` action offers the most dynamic conditional branching options for Automation workflows. As noted earlier, this action enables your Automation workflow to evaluate multiple conditions in a single step and then jump to a new step based on the results of that evaluation. The `aws:branch` action functions like an **IF-ELIF-ELSE** statement in programming.

Here is a YAML example of an `aws:branch` step:

```yaml
- name: ChooseOSforCommands
  action: aws:branch
  inputs:
    Choices:
    - NextStep: runPowerShellCommand
      Variable: "{{GetInstance.platform}}"
      StringEquals: Windows
    - NextStep: runShellCommand
      Variable: "{{GetInstance.platform}}"
      StringEquals: Linux
    Default:
      PostProcessing
```

When you specify the `aws:branch` action for a step, you specify **Choices** that the workflow must evaluate. The workflow can evaluate **Choices** based on the value of a parameter that you specified in the **Parameters** section of the Automation document. The workflow can also evaluate **Choices** based on output from a previous step.

The Automation workflow evaluates each choice by using a Boolean expression. If the evaluation determines that the first choice is true, then the workflow jumps to the step designated for that choice. If the evaluation determines that the first choice is false, then the workflow evaluates the next choice. If your step includes three or more **Choices**, then the workflow evaluates each choice in sequential order until it evaluates a choice that is true. The workflow then jumps to the designated step for the true choice.
If none of the Choices are true, the workflow checks to see if the step contains a Default value. A Default value defines a step that the workflow should jump to if none of the choices are true. If no Default value is specified for the step, then the Automation workflow processes the next step in the document.

Here is an `aws:branch` step in YAML named `chooseOSfromParameter`. The step includes two Choices: (NextStep: runWindowsCommand) and (NextStep: runLinuxCommand). The Automation workflow evaluates these Choices to determine which command to run for the appropriate operating system. The Variable for each choice uses `{{OSName}}`, which is a parameter that the document author defined in the Parameters section of the document.

```yaml
mainSteps:
  - name: chooseOSfromParameter
    action: aws:branch
    inputs:
      Choices:
        - NextStep: runWindowsCommand
          Variable: "{{OSName}}"
          StringEquals: Windows
        - NextStep: runLinuxCommand
          Variable: "{{OSName}}"
          StringEquals: Linux
```

Here is an `aws:branch` step in YAML named `chooseOSfromOutput`. The step includes two Choices: (NextStep: runPowerShellCommand) and (NextStep: runShellCommand). The Automation workflow evaluates these Choices to determine which command to run for the appropriate operating system. The Variable for each choice uses `{{GetInstance.platform}}`, which is the output from an earlier step in the document. This example also includes an option called Default. If the workflow evaluates both Choices, and neither choice is true, then the Automation workflow jumps to a step called `PostProcessing`.

```yaml
mainSteps:
  - name: chooseOSfromOutput
    action: aws:branch
    inputs:
      Choices:
        - NextStep: runPowerShellCommand
          Variable: "{{GetInstance.platform}}"
          StringEquals: Windows
        - NextStep: runShellCommand
          Variable: "{{GetInstance.platform}}"
          StringEquals: Linux
        Default:
          PostProcessing
```

Creating an `aws:branch` step in an Automation document

When you create an `aws:branch` step in an Automation document, you define the Choices the workflow should evaluate to determine which step the workflow should jump to next. As noted earlier, Choices are evaluated by using a Boolean expression. Each choice must define the following options:

- **NextStep**: The next step in the Automation document to process if the designated choice is true.
- **Variable**: Specify either the name of a parameter that is defined in the Parameters section of the Automation document, or specify an output object from a previous step in the Automation document.

Specify parameter variables by using the following form:

```
Variable: "{{name_of_parameter}}"
```
Specify output object variables by using the following form:

Variable: "{{previousStepName.outputFieldName}}"

**Note**
Creating the output variable is described in more detail in the next section, About Creating the Output Variable (p. 221).

- **Operation**: The criteria used to evaluate the choice, such as StringEquals: Linux. The `aws:branch` action supports the following operations:

**String operations**
- StringEquals
- EqualsIgnoreCase
- StartsWith
- EndsWith
- Contains

**Numeric operations**
- NumericEquals
- NumericGreater
- NumericLesser
- NumericGreaterOrEquals
- NumericLesserOrEquals

**Boolean operation**
- BooleanEquals

**Important**
When you create an Automation document, the system validates each operation in the document. If an operation is not supported, the system returns an error when you try to create the document.

- **Default**: Specify a fallback step that the workflow should jump to if none of the Choices are true.

**Note**
If you don't want to specify a Default value, then you can specify the `isEnd` workflow option. If none of the Choices are true and no Default value is specified, then the Automation workflow stops at the end of the step.

Use the following templates to help you construct the `aws:branch` step in your Automation documents:

**YAML template**

```yaml
mainSteps:
- name: a name for the step
  action: aws:branch
  inputs:
    Choices:
    - NextStep: step to jump to if evaluation for this choice is true
      Variable: "{{parameter name or output from previous step}}"
      Operation type: Operation value
    - NextStep: step to jump to if evaluation = true
      Variable: "{{parameter name or output from previous step}}"
      Operation type: Operation value
```

220
Default:

*step to jump to if all choices are false*

**JSON template**

```json
{
  "mainSteps": [
    {
      "name": "a name for the step",
      "action": "aws:branch",
      "inputs": {
        "choices": [
          {
            "NextStep": "step to jump to if evaluation for this choice is true",
            "Variable": "{{parameter name or output from previous step}}",
            "Operation type": "Operation value"
          },
          {
            "NextStep": "step to jump to if evaluation = true",
            "Variable": "{{parameter name or output from previous step}}",
            "Operation type": "Operation value"
          }
        ],
        "Default": "step to jump to if all choices are false"
      }
    }
  ]
}
```

**About Creating the Output Variable**

To create an `aws:branch` choice that references the output from a previous step, you need to identify the name of the previous step and the name of the output field. You then combine the names of the step and the field by using the following format:

**Variable:** `"{{previousStepName.outputFieldName}}"`

For example, the first step below is named `GetInstance`. And then, under `outputs`, there is a field called `platform`. In the second step (`ChooseOSforCommands`), the author wants to reference the output from the platform field as a variable. To create the variable, simply combine the step name (`GetInstance`) and the output field name (`platform`) to create **Variable:** `"{{GetInstance.platform}}"`.

```json
mainSteps:
- Name: GetInstance
  action: aws:executeAwsApi
  inputs:
    Service: ssm
    Api: DescribeInstanceInformation
  outputs:
    - Name: myInstanceId
      Selector: ".InstanceInformationList[0].InstanceId"
      Type: String
    - Name: platform
      Selector: ".InstanceInformationList[0].PlatformType"
      Type: String
  name: ChooseOSforCommands
  action: aws:branch
  inputs:
    Choices:
    - NextStep: runPowerShellCommand
      Variable: "{{GetInstance.platform}}"
```
StringEquals: Windows
- NextStep: runShellCommand
  Variable: "{{GetInstance.platform}}"
StringEquals: Linux
  Default: Sleep

Here is a JSON example that shows how "Variable": "{{ describeInstance.Platform }}" is created from the previous step ("describeInstance") and the output field ("Platform").

```json
{
  "name": "describeInstance",
  "action": "aws:executeAwsApi",
  "onFailure": "Abort",
  "inputs": {
    "Service": "ec2",
    "Api": "DescribeInstances",
    "InstanceIds": [
      "{{ InstanceId }}"
    ]
  },
  "outputs": [
    {
      "Name": "Platform",
      "Selector": "$ .Reservations[0].Instances[0].Platform",
      "Type": "String"
    }
  ],
  "nextStep": "branchOnInstancePlatform"
},
{
  "name": "branchOnInstancePlatform",
  "action": "aws:branch",
  "inputs": {
    "Choices": [
      {
        "NextStep": "runEC2RescueForWindows",
        "Variable": "{{ describeInstance.Platform }}",
        "StringEquals": "windows"
      }
    ],
    "Default": "runEC2RescueForLinux"
  }
}
```

Example aws:branch Automation Documents

Here are some example Automation documents that use `aws:branch`.

**Example 1: Using aws:branch with an output variable to run commands based on the operating system type**

In the first step of this sample (`GetInstance`), the document author uses the `aws:executeAwsApi` action to call the `ssm DescribeInstanceInformation` API action. The author uses this action to determine the type of operating system being used by an instance. The `aws:executeAwsApi` action outputs the instance ID and the platform type.

In the second step (`ChooseOSforCommands`), the author uses the `aws:branch` action with two `Choices` (NextStep: `runPowerShellCommand`) and (NextStep: `runShellCommand`). The Automation workflow evaluates the operating system of the instance by using the output from the previous step (Variable: "{{GetInstance.platform}}"). The Automation workflow jumps to a step for the designated operating system.
Example 2: Using `aws:branch` with a parameter variable to run commands based on the operating system type

The document author defines several parameter options at the beginning of the document in the parameters section. One parameter is named `OperatingSystemName`. In the first step (ChooseOS), the author uses the `aws:branch` action with two `Choices` (NextStep: `runWindowsCommand`) and (NextStep: `runLinuxCommand`). The variable for these choices references the parameter option
specified in the parameters section (Variable: "{{OperatingSystemName}}"). When the user runs this Automation workflow, they specify a value at runtime for OperatingSystemName. The Automation workflow uses the runtime parameter during the Choices evaluation. The Automation workflow jumps to a step for the designated operating system based on the runtime parameter specified for OperatingSystemName.

```yaml
---
schemaVersion: '0.3'
assumeRole: "{{AutomationAssumeRole}}"
parameters:
  AutomationAssumeRole:
    default: ""
type: String
  OperatingSystemName:
    type: String
  LinuxInstanceId:
    type: String
  WindowsInstanceId:
    type: String
mainSteps:
  - name: ChooseOS
    action: aws:branch
    inputs:
      Choices:
      - NextStep: runWindowsCommand
        Variable: "{{OperatingSystemName}}"
        StringEquals: windows
      - NextStep: runLinuxCommand
        Variable: "{{OperatingSystemName}}"
        StringEquals: linux
      Default:
        Sleep
  - name: runLinuxCommand
    action: aws:runCommand
    inputs:
      DocumentName: "AWS-RunShellScript"
      InstanceIds:
        - "{{LinuxInstanceId}}"
      Parameters:
        commands:
        - ls
        isEnd: true
  - name: runWindowsCommand
    action: aws:runCommand
    inputs:
      DocumentName: "AWS-RunPowerShellScript"
      InstanceIds:
        - "{{WindowsInstanceId}}"
      Parameters:
        commands:
        - date
        isEnd: true
  - name: Sleep
    action: aws:sleep
    inputs:
      Duration: PT3S
```

**Creating Complex Branching Documents with Operators**

You can create complex branching documents by using the **And**, **Or**, and **Not** operators in your `aws:branch` steps.

**The 'And' Operator**
Use the **And** operator when you want multiple variables to be true for a choice. In the following example, the first choice evaluates if an instance is running and uses the Windows operating system. If the evaluation of **both** of these variables is true, then the Automation workflow jumps to the `runPowerShellCommand` step. If one or more of the variables is false, then the workflow evaluates the variables for the second choice.

```json
mainSteps:
- name: switch2
  action: aws:branch
  inputs:
  Choices:
  - And:
    - Variable: "{{GetInstance.pingStatus}}" StringEquals: running
    - Variable: "{{GetInstance.platform}}" StringEquals: Windows
      NextStep: runPowerShellCommand
  
    - And:
      - Variable: "{{GetInstance.pingStatus}}" StringEquals: running
      - Variable: "{{GetInstance.platform}}" StringEquals: Linux
        NextStep: runShellCommand
      Default: sleep3

```

**The 'Or' Operator**

Use the **Or** operator when you want *any* of multiple variables to be true for a choice. In the following example, the first choice evaluates if a parameter string is Windows and if the output from an AWS Lambda step is true. If the evaluation determines that **either** of these variables is true, then the Automation workflow jumps to the `RunPowerShellCommand` step. If both variables are false, then the workflow evaluates the variables for the second choice.

```json
- Or:
  - Variable: "{{parameter1}}" StringEquals: Windows
    - Variable: "{{BooleanParam1}}" BooleanEquals: true
      NextStep: RunPowershellCommand
  
  - Or:
    - Variable: "{{parameter2}}" StringEquals: Linux
      - Variable: "{{BooleanParam2}}" BooleanEquals: true
        NextStep: RunShellScript

```

**The 'Not' Operator**

Use the **Not** operator when you want to jump to a step defined when a variable is *not* true. In the following example, the first choice evaluates if a parameter string is Not Linux. If the evaluation determines that the variable is not Linux, then the Automation workflow jumps to the `sleep2` step. If the evaluation of the first choice determines that it is Linux, then the workflow evaluates the next choice.

```json
mainSteps:
- name: switch
  action: aws:branch
  inputs:
    Choices:
```
Examples of How to Use Dynamic Workflow Options

This section includes different examples of how to use dynamic workflow options in an Automation document. Each example in this section extends the following Automation document. This document has two actions. The first action is named `InstallMsiPackage`. It uses the `aws:runCommand` action to install an application on a Windows Server instance. The second action is named `TestInstall`. It uses the `aws:invokeLambdaFunction` action to perform a test of the installed application if the application installed successfully. Step one specifies `onFailure: Abort`. This means that if the application did not install successfully, the Automation workflow execution stops before step two.

Example 1: Automation document with two linear actions

```yaml
---
schemaVersion: '0.3'
description: Install MSI package and run validation.
assumeRole: "{{automationAssumeRole}}"
parameters:
  automationAssumeRole:
    type: String
    description: "(Required) Assume role."
  packageName:
    type: String
    description: "(Required) MSI package to be installed."
  instanceIds:
    type: String
    description: "(Required) Comma separated list of instances."
mainSteps:
- name: InstallMsiPackage
  action: aws:runCommand
  maxAttempts: 2
  onFailure: Abort
  inputs:
    InstanceIds:
    - i-02573c0cfceEXAMPLE
    - i-0471e04240EXAMPLE
    - i-07782c72f0EXAMPLE
  DocumentName: AWS-RunPowerShellScript
  Parameters:
  commands:
  - msiexec /i {{packageName}}
- name: TestInstall
  action: aws:invokeLambdaFunction
  maxAttempts: 1
  timeoutSeconds: 500
  inputs:
  - FunctionName: TestLambdaFunction
..."
the workflow jumps to an action called PostFailure (onFailure: step:PostFailure) to run an AWS Lambda function to perform some action in the event the install failed. If the install succeeds, then the workflow process jumps to the TestInstall action (nextStep: TestInstall). Both the TestInstall and the PostFailure steps use the isEnd option (isEnd: true) so that the workflow finishes the workflow execution when either of those steps is completed.

**Note**
Using the isEnd option in the last step of the mainSteps section is optional. If the last step does not jump to other steps, then the Automation workflow stops after running the action in the last step.

**Example 2: A dynamic workflow that jumps to different steps**

```yaml
mainSteps
- name: InstallMsiPackage
  action: aws:runCommand
  onFailure: step:PostFailure
  maxAttempts: 2
  inputs:
    InstanceIds:
    - i-02573cafcfEXAMPLE
    - i-0471e04240EXAMPLE
  DocumentName: AWS-RunPowerShellScript
  Parameters:
    commands:
      - msiexec /i {{packageName}}
  nextStep: TestInstall
- name: TestInstall
  action: aws:invokeLambdaFunction
  maxAttempts: 1
  timeoutSeconds: 500
  inputs:
    FunctionName: TestLambdaFunction
    isEnd: true
- name: PostFailure
  action: aws:invokeLambdaFunction
  maxAttempts: 1
  timeoutSeconds: 500
  inputs:
    FunctionName: PostFailureRecoveryLambdaFunction
    isEnd: true
...
```

**Note**
Before processing an Automation document, the system verifies that the document does not create an infinite loop. If an infinite loop is detected, Automation returns an error and a circle trace showing which steps create the loop.

**Creating a Dynamic Workflow that Defines Critical Steps**

You can specify that a step is critical for the overall success of the Automation workflow. If a critical step fails, then Automation reports the status of the execution as failed, even if one or more steps ran successfully. In the following example, the user identifies the VerifyDependencies step if the InstallMsiPackage step fails (onFailure: step:VerifyDependencies). The user specifies that the InstallMsiPackage step is not critical (isCritical: false). In this example, if the application failed to install, Automation processes the VerifyDependencies step to determine if one or more dependencies is missing, which therefore caused the application install to fail.

**Example 3: Defining critical steps for the Automation workflow**

```yaml
---
name: InstallMsiPackage
```
Invoking Other AWS Services from a Systems Manager Automation Workflow

You can invoke other AWS services and other Systems Manager capabilities in your Automation workflow by using the following Automation actions in your Automation documents.

- **aws:executeAwsApi**: This Automation action calls and runs AWS API actions. Most API actions are supported, although not all API actions have been tested. For example, the following API actions are supported: CreateImage, Delete bucket, RebootDBInstance, and CreateGroups, to name a few. Streaming API actions, such as the Get Object action, aren't supported.

- **aws:waitForAwsResourceProperty**: This Automation action enables your workflow to wait for a specific resource state or event state before continuing the workflow. For example, you can use this action with the Amazon Relational Database Service (Amazon RDS) DescribeDBInstances API action to pause an Automation workflow so that a database instance has time to start.

- **aws:assertAwsResourceProperty**: This Automation action enables you to assert a specific resource state or event state for a specific Automation step. For example, you can specify that an Automation step must wait for an Amazon EC2 instance to start. Then it will call the Amazon EC2 DescribeInstanceStatus API action with the DesiredValue property of running. This ensures that the Automation workflow waits for a running instance and then continues when the instance is, in fact, running.

Here is a sample Automation document in YAML that uses the aws:executeAwsApi action to disable read and write permissions on an Amazon S3 bucket.

```yaml
---
description: Disable S3-Bucket's public WriteRead access via private ACL
schemaVersion: "0.3"
assumeRole: "{{ AutomationAssumeRole }}"
parameters:
  S3BucketName:
    type: String
    description: (Required) S3 Bucket subject to access restriction
  AutomationAssumeRole:
    type: String
    description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
    default: ""
mainSteps:
  - name: DisableS3BucketPublicReadWrite
    action: aws:executeAwsApi
    inputs:
      Service: s3
      Api: PutBucketAcl
      Bucket: "{{S3BucketName}}"
      ACL: private
```

---
description: Disable S3-Bucket's public WriteRead access via private ACL
schemaVersion: "0.3"
assumeRole: "{{ AutomationAssumeRole }}"
parameters:
  S3BucketName:
    type: String
    description: (Required) S3 Bucket subject to access restriction
  AutomationAssumeRole:
    type: String
    description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
    default: ""
mainSteps:
  - name: DisableS3BucketPublicReadWrite
    action: aws:executeAwsApi
    inputs:
      Service: s3
      Api: PutBucketAcl
      Bucket: "{{S3BucketName}}"
      ACL: private
```
Here is a sample Automation document in YAML that uses all three actions. The document does the following:

- Uses the aws:executeAwsApi action to call the Amazon EC2 DescribeImages API action to get the name of a specific Windows Server 2016 AMI. It outputs the image ID as `ImageId`.
- Uses the aws:executeAwsApi action to call the Amazon EC2 RunInstances API action to launch one instance that uses the `ImageId` from the previous step. It outputs the instance ID as `InstanceId`.
- Uses the aws:waitForAwsResourceProperty action to poll the Amazon EC2 DescribeInstanceStatus API action to wait for the instance to reach the `running` state. The action times out in 60 seconds. The step times out if the instance state failed to reach `running` after 60 seconds of polling.
- Uses the aws:assertAwsResourceProperty action to call the Amazon EC2 DescribeInstanceStatus API action to assert that the instance is in the `running` state. The step fails if the instance state is not `running`.

```yaml
---
description: Sample Automation Document Using AWS API Actions
schemaVersion: '0.3'
assumeRole: '{{ AutomationAssumeRole }}'
parameters:
  AutomationAssumeRole:
    type: String
    description: "(Optional) The ARN of the role that allows Automation to perform the actions on your behalf."
    default: ''
  ImageName:
    type: String
    description: "(Optional) Image Name to launch ec2 instance with."
    default: "Windows_Server-2016-English-Full-Base-2018.07.11"
mainSteps:
  - name: getImageId
    action: aws:executeAwsApi
    inputs:
      Service: ec2
      Api: DescribeImages
      Filters:
        - Name: "name"
          Values:
            - "{{ ImageName }}"
    outputs:
      - Name: ImageId
        Selector: "$.Images[0].ImageId"
        Type: "String"
  - name: launchOneInstance
    action: aws:executeAwsApi
    inputs:
      Service: ec2
      Api: RunInstances
      ImageId: "{{ getImageId.ImageId }}"
      MaxCount: 1
      MinCount: 1
    outputs:
      - Name: InstanceId
        Selector: "$.Instances[0].InstanceId"
        Type: "String"
  - name: waitUntilInstanceStateRunning
    action: aws:waitForAwsResourceProperty
    # timeout is strongly encouraged for action - aws:waitForAwsResourceProperty
    timeoutSeconds: 60
```
Working with Inputs and Outputs

Each of the previously described Automation actions enables you to call a specific API action by specifying the service namespace, the API action name, the input parameters, and the output parameters. Inputs are defined by the API action that you choose. You can view the API actions (also called methods) by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all API actions (methods) for Amazon Relational Database Service (Amazon RDS) are listed on the following page: Amazon RDS methods.

You can view the schema for each Automation action in the following locations:

- `aws:assertAwsResourceProperty` (p. 250)
- `aws:executeAwsApi` (p. 269)
- `aws:waitForAwsResourceProperty` (p. 283)

The schemas include descriptions of the required fields for using each action.

Using the Selector/PropertySelector Fields

Each Automation action requires that you specify either an output Selector (for `aws:executeAwsApi`) or a PropertySelector (for `aws:assertAwsResourceProperty` and `aws:waitForAwsResourceProperty`). These fields are used to process the JSON response from an AWS API action. These fields use the JSONPath syntax.

Here is an example to help illustrate this concept for the `aws:executeAwsApi` action:

```yaml
---
mainSteps:
  - name: getImageId
    action: aws:executeAwsApi
    inputs:
      Service: ec2
      Api: DescribeImages
      Filters:
        - Name: "name"
          Values:
            - "{{ ImageName }}"
```
In the `aws:executeAwsApi` step `getImageId`, the workflow invokes the `DescribeImages` API action and receives a response from `ec2`. The workflow then applies `Selector - "$.Images[0].ImageId"` to the API response and assigns the selected value to the output `ImageId` variable. Other steps in the same Automation workflow can use the value of `ImageId` by specifying `"{{ getImageId.ImageId }}"`.

Here is an example to help illustrate this concept for the `aws:waitForAwsResourceProperty` action:

```json
- name: waitUntilInstanceStateRunning
  action: aws:waitForAwsResourceProperty
  # timeout is strongly encouraged for action - aws:waitForAwsResourceProperty
  timeoutSeconds: 60
  inputs:
    Service: ec2
    Api: DescribeInstanceStatus
    InstanceIds:
      - "{{ launchOneInstance.InstanceId }}"
    PropertySelector: "$InstanceStatuses[0].InstanceState.Name"
    DesiredValues:
      - running
```

In the `aws:waitForAwsResourceProperty` step `waitUntilInstanceStateRunning`, the workflow invokes the `DescribeInstanceStatus` API action and receives a response from `ec2`. The workflow then applies `PropertySelector - "$InstanceStatuses[0].InstanceState.Name"` to the response and checks if the specified returned value matches a value in the `DesiredValues` list (in this case `running`). The step repeats the process until the response returns an instance state of `running`.

Using JSONPath in an Automation Workflow

A JSONPath expression is a string beginning with "$." that is used to select one of more components within a JSON element. The following list includes information about JSONPath operators that are supported by Systems Manager Automation:

- **Dot-notated child (.)**: Use with a JSON object. This operator selects the value of a specific key.
- **Deep-scan (..)**: Use with a JSON element. This operator scans the JSON element level by level and selects a list of values with the specific key. Note that the return type of this operator is always a JSON array. In the context of an Automation step output type, the operator can be either `StringList` or `MapList`.
- **Array-Index ([ ])**: Use with a JSON array. This operator gets the value of a specific index.

To better understand JSONPath operators, review the following JSON response from the `ec2 DescribeInstances` API action. Below this response are several examples that show different results by applying different JSONPath expressions to the response from the `DescribeInstances` API action.

```json
{
    "NextToken": "abcdefg",
    "Reservations": [
        {
            "OwnerId": "123456789012",
            "ReservationId": "r-abcd12345678910",
            "Instances": [
                {
                    "InstanceId": "i-abcd12345678910",
                    "State": {
                        "Code": 16,  // 16 = running
                        "Name": "running"
                    }
                }
            ]
        }
    ]
}
```
"Instances": [  
  {  
    "ImageId": "ami-12345678",  
    "BlockDeviceMappings": [  
      {  
        "Ebs": {  
          "DeleteOnTermination": true,  
          "Status": "attached",  
          "VolumeId": "vol-000000000000"  
        },  
        "DeviceName": "/dev/xvda"  
      },  
      "State": {  
        "Code": 16,  
        "Name": "running"  
      }  
    ],  
    "Groups": []  
  },  
  {  
    "OwnerId": "123456789012",  
    "ReservationId": "r-12345678910abcd",  
    "Instances": [  
      {  
        "ImageId": "ami-12345678",  
        "BlockDeviceMappings": [  
          {  
            "Ebs": {  
              "DeleteOnTermination": true,  
              "Status": "attached",  
              "VolumeId": "vol-11111111111"  
            },  
            "DeviceName": "/dev/xvda"  
          },  
          "State": {  
            "Code": 80,  
            "Name": "stopped"  
          }  
        ],  
        "Groups": []  
      }  
    ]  
  }]

**JSONPath Example 1: Get a specific String from a JSON response**

**JSONPath:**
```
$.Reservations[0].Instances[0].ImageId
```

**Returns:**
"ami-12345678"

**Type:** String

**JSONPath Example 2: Get a specific Boolean from a JSON response**

**JSONPath:**
```
$.Reservations[0].Instances[0].BlockDeviceMappings[0].Ebs.DeleteOnTermination
```

---

232
Returns:
true
Type: Boolean

**JSONPath Example 3: Get a specific Integer from a JSON response**

JSONPath:
$.Reservations[0].Instances[0].State.Code

Returns:
16
Type: Integer

**JSONPath Example 4: Deep scan a JSON response, then get all of the values for Volumeld as a StringList**

JSONPath:
$.Reservations..BlockDeviceMappings..VolumeId

Returns:
[  
  "vol-000000000000",
  "vol-111111111111"
]
Type: StringList

**JSONPath Example 5: Get a specific BlockDeviceMappings object as a StringMap**

JSONPath:
$.Reservations[0].Instances[0].BlockDeviceMappings[0]

Returns:
{  
  "Ebs" : {
    "DeleteOnTermination" : true,
    "Status" : "attached",
    "VolumeId" : "vol-000000000000"
  },
  "DeviceName" : "/dev/xvda"
}
Type: StringMap

**JSONPath Example 6: Deep scan a JSON response, then get all of the State objects as a MapList**

JSONPath:
$.Reservations..Instances..State

Returns:
[ 
  {  
    "Code" : 16,
    "Name" : "running"
  },
  {  
    "Code" : 80,
    "Name" : "stopped"
  }
]
Important

If you run an automation that invokes other services by using an AWS Identity and Access Management (IAM) service role, be aware that the service role must be configured with permission to invoke those services. This requirement applies to all AWS Automation documents (AWS-* documents) such as the AWS-ConfigureS3BucketLogging, AWS-CreateDynamoDBBackup, and AWS-RebootEC2Instance documents, to name a few. This requirement also applies to any custom Automation documents you create that invoke other AWS services by using actions that call other services. For example, if you use the aws:executeAwsApi, aws:CreateStack, or aws:copyImage actions, to name a few, then you must configure the service role with permission to invoke those services. You can enable permissions to other AWS services by adding an IAM inline policy to the role. For more information, see (Optional) Add an Automation Inline Policy to Invoke Other AWS Services (p. 147).

Sample Walkthrough: Start an Amazon RDS Instance from a Systems Manager Automation Workflow

This sample walkthrough shows you how to create and run an Automation document in YAML that uses all three API actions to see if an Amazon Relational Database Service (Amazon RDS) database instance is running. If the instance isn't running, the workflow starts it.

To invoke an Amazon RDS API action from a Systems Manager Automation

1. Open a text editor and paste the following Automation document content into the file. Specify an Automation role and the instance ID to check. You will add the mainSteps actions later.

```yaml
---
description: Start RDS instance
schemaVersion: "0.3"
assumeRole: "The_Automation_role_to_use_when_running_the_document"
parameters:
  InstanceId: The_instance_ID_to_start
    type: String
    description: (Required) RDS instance ID to start
  AutomationAssumeRole:
    type: String
    description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
    default: ""
mainSteps:
```

2. For the first step of the workflow, you need to determine if the instance is already running. You can use the aws:assertAwsResourceProperty action to determine and assert a specific instance status. Before you can add the aws:assertAwsResourceProperty action to the document, you must determine and specify the required inputs. The following list describes how to determine and specify the required inputs. You can view an example of how to enter this information in the Automation document following the list.

   a. View the schema to see all available inputs for the `aws:assertAwsResourceProperty (p. 250)` action.

   b. Determine the namespace of the service to invoke. You can view a list of AWS service namespaces in Amazon Resource Names (ARNs) and AWS Service Namespaces in the Amazon Web Services General Reference. The namespace for Amazon RDS is `rds`.

   c. Determine which Amazon RDS API action enables you to view the status of a database instance. You can view the API actions (also called methods) on the Amazon RDS methods page.
d. Specify one or more request parameters for the DescribeDBInstances API action. For example, this action uses the DBInstanceIdentifier request parameter.

e. Determine one or more PropertySelectors. A PropertySelector is a response object that is returned by the request of this API action. For example, on the Amazon RDS methods. Choose the describe_db_instances method and scroll down to the Response Structure section. DBInstances is listed as a response object. For the purposes of this walkthrough, specify DBInstances and DBInstanceStatus as the PropertySelectors. Remember that PropertySelectors are entered by using JSONPath. This means that you format the information in the Automation document like this:

   PropertySelector: "$.DBInstances[0].DBInstanceStatus".

f. Specify one or more DesiredValues. If you don’t know the values you want to specify, then run the DescribeDBInstances API action to determine possible values. For this walkthrough, specify available and starting.

g. Enter the information you collected into the Automation document as shown in the following example.

```
---
description: Start RDS instance
schemaVersion: "0.3"
assumeRole: "The_Automation_role_to_use_when_running_the_document"
parameters:
  InstanceId: The_instance_ID_to_start
  type: String
  description: (Required) RDS Instance Id to stop
AutomationAssumeRole:
  type: String
  description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
  default: ""
mainSteps:
  - name: AssertNotStartingOrAvailable
    action: aws:assertAwsResourceProperty
    isCritical: false
    onFailure: step:StartInstance
    nextStep: CheckStart
    inputs:
      Service: rds
      Api: DescribeDBInstances
      DBInstanceIdentifier: "{{InstanceId}}"
      PropertySelector: "$.DBInstances[0].DBInstanceStatus"
      DesiredValues: ["available", "starting"]
```

3. Specify an aws:executeAwsApi action in the mainSteps section to start the instance if the previous action determined that it is not started.

   a. View the schema to see all available inputs for aws:executeAwsApi (p. 269).
   b. Specify the Amazon RDS StartDBInstance API action to start the instance.
   c. Enter the information you collected into the Automation document as shown in the following example.

```
---
description: Start RDS instance
schemaVersion: "0.3"
assumeRole: "{{ The_Automation_role_to_use_when_running_the_document }}"
parameters:
  InstanceId:
```
4. Specify an `aws:waitForAwsResourceProperty` action in the `mainSteps` section to wait for the instance to start before finishing the Automation workflow.

a. View the schema to see all available inputs for the `aws:waitForAwsResourceProperty` (p. 283).

b. Specify the Amazon RDS `DescribeDBInstances` API action to determine the instance status.

c. Specify `$ DBInstances[0].DBInstanceStatus` as the `PropertySelector`.

d. Specify `available` as the `DesiredValue`.

e. Enter the information you collected into the Automation document as shown in the following example.

```yaml
---
description: Start RDS instance
schemaVersion: "0.3"
assumeRole: "{{ The_Automation_role_to_use_when_running_the_document }}"
parameters:
  InstanceId:
    type: String
    description: (Required) RDS Instance Id to stop
  AutomationAssumeRole:
    type: String
    description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
    default: ""
mainSteps:
  - name: AssertNotStartingOrAvailable
    action: aws:assertAwsResourceProperty
    isCritical: false
    onFailure: step:StartInstance
    nextStep: CheckStart
    inputs:
      Service: rds
      Api: DescribeDBInstances
      DBInstanceIdentifier: "{{InstanceId}}"
      PropertySelector: "$ .DBInstances[0].DBInstanceStatus"
      DesiredValues: ["available", "starting"]
  - name: StartInstance
    action: aws:executeAwsApi
    inputs:
      Service: rds
      Api: StartDBInstance
      DBInstanceIdentifier: "{{InstanceId}}"
```
PropertySelector: "$.DBInstances[0].DBInstanceStatus"
DesiredValues: ["available", "starting"]

- name: StartInstance
  action: aws:executeAwsApi
  inputs:
    Service: rds
    Api: StartDBInstance
    DBInstanceIdentifier: "{{InstanceId}}"

- name: CheckStart
  action: aws:waitForAwsResourceProperty
  onFailure: Abort
  maxAttempts: 10
  timeoutSeconds: 600
  inputs:
    Service: rds
    Api: DescribeDBInstances
    DBInstanceIdentifier: "{{InstanceId}}"
    PropertySelector: "$.DBInstances[0].DBInstanceStatus"
    DesiredValues: ["available"]
    isEnd: true

5. Save the file as sample.yaml.
6. Run the following command in the AWS CLI to add the document to your AWS account.

   ```bash
   aws ssm create-document --name sampleDoc --document-type Automation --document-format YAML --content file://sample.yaml
   ```

7. Run the following command to run the Automation execution by using the document you just created. Make a note of the execution ID returned by Systems Manager after you start the execution.

   ```bash
   aws ssm start-automation-execution --document-name sampleDoc
   ```

8. Run the following command to view the execution status.

   ```bash
   aws ssm get-automation-execution --automation-execution-id automation_execution_id
   ```

### Predefined Automation Documents that Invoke AWS APIs

Systems Manager Automation includes the following predefined SSM Automation documents that invoke AWS APIs.

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWS-StartRdsInstance</td>
<td>Start an Amazon RDS instance.</td>
</tr>
<tr>
<td>AWS-StopRdsInstance</td>
<td>Stop an Amazon RDS instance.</td>
</tr>
<tr>
<td>AWS-RebootRdsInstance</td>
<td>Reboot an Amazon RDS instance.</td>
</tr>
<tr>
<td>AWS-CreateSnapshot</td>
<td>Create an Amazon Elastic Block Store (Amazon EBS) volume snapshot.</td>
</tr>
<tr>
<td>AWS-DeleteSnapshot</td>
<td>Delete an Amazon EBS volume snapshot.</td>
</tr>
<tr>
<td>AWS-ConfigureS3BucketLogging</td>
<td>Enable logging on an Amazon Simple Storage Service (Amazon S3) bucket.</td>
</tr>
</tbody>
</table>
**Document Name** | **Purpose**
---|---
AWS-DisableS3BucketPublicReadWrite | Disable read and write permissions on an Amazon S3 bucket by using a private ACL.
AWS-ConfigureS3BucketVersioning | Enable or suspend versioning on an Amazon S3 bucket.
AWS-DeleteDynamoDbBackup | Delete a Amazon DynamoDB (DynamoDB) table backup.

Either click the links in the table above, or use the following procedure to view more details about these Automation documents in the Systems Manager console.

2. In the navigation pane, choose Documents.
   
   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (=) to open the navigation pane, and then choose Documents in the navigation pane.
3. Choose a document, and then choose View details.
4. Choose the Content tab.

**Sharing a Systems Manager Automation Document**

You can share a Systems Manager Automation document by using the AWS Systems Manager console, or by programmatically calling the ModifyDocumentPermission API operation using the AWS Command Line Interface (AWS CLI), AWS Tools for Windows PowerShell, or the AWS SDK. Before you share an Automation document, get the AWS account IDs of the people with whom you want to share. You will specify these account IDs when you share the document.

**Topics**
- Share an Automation Document (Console) (p. 238)
- Share a Document (AWS CLI) (p. 239)

**Share an Automation Document (Console)**

**To share an Automation document**

2. In the navigation pane, choose Documents.
   
   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (=) to open the navigation pane, and then choose Documents in the navigation pane.
3. In the documents list, choose the document you want to share, and then choose View details. On the Permissions tab, verify that you are the document owner. Only a document owner can share a document.
4. To share the command publicly, choose Public and then choose Save. To share the command privately, choose Private, enter the AWS account ID, choose Add, and then choose Save.
Share a Document (AWS CLI)

The following procedure requires that you specify an AWS Region for your AWS CLI session.

1. Open the AWS CLI on your local computer and run the following command to specify your credentials.

```
aws config
AWS Access Key ID: [your key]
AWS Secret Access Key: [your key]
Default region name: region
Default output format [None]:
```

*region* represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as *us-east-2* for the US East (Ohio) Region. For a list of supported *region* values, see the *Region* column in the AWS Systems Manager Table of Regions and Endpoints in the *AWS General Reference*.

2. Use the following command to list all of the Systems Manager Automation documents that are available for you. The list includes documents that you created and documents that were shared with you.

```
aws ssm list-documents --document-filter-list key=Owner,value=all
key=DocumentType,value=Automation
```

3. Use the following command to list all of the Systems Manager Automation documents that you created.

```
aws ssm list-documents --document-filter-list key=Owner,value=self
key=DocumentType,value=Automation
```

4. Use the following command to get a specific document.

```
aws ssm get-document --name document name
```

5. Use the following command to get a description of the document.

```
aws ssm describe-document --name document name
```

6. Use the following command to view the permissions for the document.

```
aws ssm describe-document-permission --name document name --permission-type Share
```

7. Use the following command to modify the permissions for the document and share it. You must be the owner of the document to edit the permissions. This command privately shares the document with a specific individual, based on that person's AWS account ID.

```
aws ssm modify-document-permission --name document name --permission-type Share
--account-ids-to-add AWS account ID
```

Use the following command to share a document publicly.

```
aws ssm modify-document-permission --name document name --permission-type Share
--account-ids-to-add all
```
Share an Automation Document (AWS Tools for Windows PowerShell)

The following procedure requires that you specify a region for your PowerShell session.

1. Open **AWS Tools for Windows PowerShell** on your local computer and run the following command to specify your credentials.

   ```bash
   Set-AWSCredentials -AccessKey your key -SecretKey your key
   ```

2. Use the following command to set the region for your PowerShell session. The example uses the us-west-2 region.

   ```bash
   Set-DefaultAWSRegion -Region us-west-2
   ```

3. Use the following command to list all of the Systems Manager Automation documents available for you. The list includes documents that you created and documents that were shared with you.

   ```bash
   Get-SSMDocumentList -DocumentFilterList (@{"key"="Owner";"value"="All"},@{"key"="DocumentType";"value"="Automation"})
   ```

4. Use the following command to list all of the Systems Manager Automation documents that you have created.

   ```bash
   Get-SSMDocumentList -DocumentFilterList (@{"key"="Owner";"value"="Self"},@{"key"="DocumentType";"value"="Automation"})
   ```

5. Use the following command to get a specific document.

   ```bash
   Get-SSMDocument -Name document name
   ```

6. Use the following command to get a description of the document.

   ```bash
   Get-SSMDocumentDescription -Name document name
   ```

7. Use the following command to view the permissions of the document.

   ```bash
   Get-SSMDocumentPermission -Name document name -PermissionType Share
   ```

8. Use the following command to modify the permissions for the document and share it. You must be the owner of the document to edit the permissions. This command privately shares the document with a specific individual, based on that person's AWS account ID.

   ```bash
   Edit-SSMDocumentPermission -Name document name -PermissionType Share -AccountIdsToAdd AWS account ID
   ```

   Use the following command to share a document publicly.

   ```bash
   Edit-SSMDocumentPermission -Name document name -AccountIdsToAdd ('all') -PermissionType Share
   ```

**Systems Manager Automation Documents Reference**

To help you get started quickly, Systems Manager provides pre-defined Automation documents. These documents are maintained by Amazon Web Services and AWS Support. The Actions Reference describes the actions (or plugins) that you can specify in an Automation document. The Automation Document
Details Reference describes each of the predefined Automation documents provided by AWS Systems Manager and AWS Support.

**Important**

If you run an automation that invokes other services by using an AWS Identity and Access Management (IAM) service role, be aware that the service role must be configured with permission to invoke those services. This requirement applies to all AWS Automation documents (AWS-* documents) such as the AWS-ConfigureS3BucketLogging, AWS-CreateDynamoDBBackup, and AWS-RestartEC2Instance documents, to name a few. This requirement also applies to any custom Automation documents you create that invoke other AWS services by using actions that call other services. For example, if you use the aws:executeAwsApi, aws:CreateStack, or aws:copyImage actions, to name a few, then you must configure the service role with permission to invoke those services. You can enable permissions to other AWS services by adding an IAM inline policy to the role. For more information, see *(Optional) Add an Automation Inline Policy to Invoke Other AWS Services (p. 147).*

**Topics**

- Systems Manager Automation Actions Reference (p. 241)
- Automation System Variables (p. 285)
- Systems Manager Automation Document Details Reference (p. 294)

**Systems Manager Automation Actions Reference**

This reference describes the actions (or plugins) that you can specify in an AWS Systems Manager Automation document. For information about plugins for other types of SSM documents, see *SSM Document Plugin Reference (p. 803).*

Systems Manager Automation runs steps defined in Automation documents. Each step is associated with a particular action. The action determines the inputs, behavior, and outputs of the step. Steps are defined in the `mainSteps` section of your Automation document.

You don't need to specify the outputs of an action or step. The outputs are predetermined by the action associated with the step. When you specify step inputs in your Automation documents, you can reference one or more outputs from an earlier step. For example, you can make the output of `aws:runInstances` available for a subsequent `aws:runCommand` action. You can also reference outputs from earlier steps in the `Output` section of the Automation document.

**Important**

If you run an automation that invokes other services by using an AWS Identity and Access Management (IAM) service role, be aware that the service role must be configured with permission to invoke those services. This requirement applies to all AWS Automation documents (AWS-* documents) such as the AWS-ConfigureS3BucketLogging, AWS-CreateDynamoDBBackup, and AWS-RestartEC2Instance documents, to name a few. This requirement also applies to any custom Automation documents you create that invoke other AWS services by using actions that call other services. For example, if you use the aws:executeAwsApi, aws:CreateStack, or aws:copyImage actions, to name a few, then you must configure the service role with permission to invoke those services. You can enable permissions to other AWS services by adding an IAM inline policy to the role. For more information, see *(Optional) Add an Automation Inline Policy to Invoke Other AWS Services (p. 147).*

**Topics**

- Common Properties In All Actions (p. 242)
- aws:approve (p. 246)
- aws:assertAwsResourceProperty (p. 250)
Common Properties In All Actions

The following properties are common to all actions:

**JSON**

```json
"mainSteps": [
  {
    "name": "name",
    "action": "action",
    "maxAttempts": value,
    "timeoutSeconds": value,
    "onFailure": "value",
    "inputs": {
      ...
    }
  },
  {
    "name": "name",
    "action": "action",
    "maxAttempts": value,
    "timeoutSeconds": value,
    "onFailure": "value",
    "inputs": {
      ...
    }
  }
]
```

**YAML**

```yaml
mainSteps:
  - name: name
    action: action
    maxAttempts: value
    timeoutSeconds: value
    onFailure: value
```
name

An identifier that must be unique across all step names in the document.
Type: String
Required: Yes

action

The name of the action the step is to run. aws:runCommand (p. 274) is an example of an action you can specify here. This document provides detailed information about all available actions.
Type: String
Required: Yes

maxAttempts

The number of times the step should be retried in case of failure. If the value is greater than 1, the step is not considered to have failed until all retry attempts have failed. The default value is 1.
Type: Integer
Required: No

timeoutSeconds

The execution timeout value for the step. If the timeout is reached and the value of maxAttempts is greater than 1, then the step is not considered to have timed out until all retries have been attempted.

The aws:changeInstanceState action has a default timeoutSeconds value of 3600. For all other actions, there is no default value.
Type: Integer
Required: No

onFailure

Indicates whether the workflow should abort, continue, or go to a different step on failure. The default value for this option is abort.
Type: String
Valid values: Abort | Continue | step:step_name
Required: No

isEnd

This option stops an Automation execution at the end of a specific step. The Automation execution stops if the step execution failed or succeeded. The default value is false.
Type: Boolean

Valid values: true | false

Required: No

Here is an example of how to enter this option in the mainSteps section of your document:

**JSON**

```
"mainSteps": [  
  {    
    "name": "InstallMsiPackage",
    "action": "aws:runCommand",
    "onFailure": "step:PostFailure",
    "maxAttempts": 2,
    "inputs": {
      "InstanceIds": [
        "i-1234567890EXAMPLE",
        "i-abcdefghiEXAMPLE"
      ],
      "DocumentName": "AWS-RunPowerShellScript",
      "Parameters": {
        "commands": ["msiexec /i {{packageName}}"
      ]
    },
    "nextStep": "TestPackage"
  },  
  {    
    "name": "TestPackage",
    "action": "aws:invokeLambdaFunction",
    "maxAttempts": 1,
    "timeoutSeconds": 500,
    "inputs": {
      "FunctionName": "TestLambdaFunction"
    },
    "isEnd": true
  }
]
```

**YAML**

```
mainSteps:  
  - name: InstallMsiPackage
    action: aws:runCommand
    onFailure: step:PostFailure
    maxAttempts: 2
    inputs:  
      InstanceIds:
        - i-1234567890EXAMPLE
        - i-abcdefghiEXAMPLE
      DocumentName: AWS-RunPowerShellScript
      Parameters:
        commands: ["msiexec /i {{packageName}}"]
    nextStep: TestPackage
  - name: TestPackage
    action: aws:invokeLambdaFunction
    maxAttempts: 1
    timeoutSeconds: 500
    inputs:  
      FunctionName: TestLambdaFunction
```
nextStep

Specifies which step in an Automation workflow to process next after successfully completing a step.

Here is an example of how to enter this option in the mainSteps section of your document:

**JSON**

```
"mainSteps": [
    {
        "name": "InstallMsiPackage",
        "action": "aws:runCommand",
        "onFailure": "step:PostFailure",
        "maxAttempts": 2,
        "inputs": {
            "InstanceIds": [
                "i-1234567890EXAMPLE",
                "i-abcdefghiEXAMPLE"
            ],
            "DocumentName": "AWS-RunPowerShellScript",
            "Parameters": {
                "commands": [
                    "msiexec /i {{packageName}}"
                ]
            }
        },
        "nextStep": "TestPackage"
    }
]
```

**YAML**

```
mainSteps:
- name: InstallMsiPackage
  action: aws:runCommand
  onFailure: step:PostFailure
  maxAttempts: 2
  inputs:
    InstanceIds:
    - i-1234567890EXAMPLE
    - i-abcdefghiEXAMPLE
    DocumentName: AWS-RunPowerShellScript
    Parameters:
      commands:
      - msiexec /i {{packageName}}
  nextStep: TestPackage
```

isCritical

Designates a step as critical for the successful completion of the Automation. If a step with this designation fails, then Automation reports the final status of the Automation as Failed. The default value for this option is true.

**Type**: Boolean

**Valid values**: true | false

**Required**: No

Here is an example of how to enter this option in the mainSteps section of your document:

**JSON**

```
"isCritical": true
```

**YAML**

```
isCritical: true
```
"mainSteps": [
    {
        "name": "InstallMsiPackage",
        "action": "aws:runCommand",
        "onFailure": "step:SomeOtherStep",
        "isCritical": false,
        "maxAttempts": 2,
        "inputs": {
            "InstanceIds": ["i-1234567890EXAMPLE", "i-abcdefghiEXAMPLE"],
            "DocumentName": "AWS-RunPowerShellScript",
            "Parameters": {
                "commands": [
                    "msiexec /i {{packageName}}"
                ]
            },
            "nextStep": "TestPackage"
        }
    }
]

YAML

mainSteps:
- name: InstallMsiPackage
  action: aws:runCommand
  onFailure: step:SomeOtherStep
  isCritical: false
  maxAttempts: 2
  inputs:
    InstanceIds:
    - i-1234567890EXAMPLE, i-abcdefghiEXAMPLE
    DocumentName: AWS-RunPowerShellScript
    Parameters:
      commands:
      - msiexec /i {{packageName}}
    nextStep: TestPackage

inputs

The properties specific to the action.

Type: Map

Required: Yes

aws:approve

Temporarily pauses an Automation execution until designated principals either approve or reject the action. After the required number of approvals is reached, the Automation execution resumes. You can insert the approval step any place in the mainSteps section of your Automation document.

**Note**

The default timeout for this action is 7 days (604800 seconds). You can limit or extend the timeout by specifying the timeoutSeconds parameter for an aws:approve step. If the automation step reaches the timeout value before receiving all required approval decisions, then the step and the automation stop running and return a status of Timed Out.

In the following example, the aws:approve action temporarily pauses the Automation workflow until one approver either accepts or rejects the workflow. Upon approval, the document runs a simple PowerShell command.
"description":"RunInstancesDemo1",
"schemaVersion":"0.3",
"assumeRole":"{{ assumeRole }}",
"parameters":{
  "assumeRole":{
    "type":"String"
  },
  "message":{
    "type":"String"
  }
},
"mainSteps":[
  {
    "name":"approve",
    "action":"aws:approve",
    "timeoutSeconds":1000,
    "onFailure":"Abort",
    "inputs":{
      "Message":"{{ message }}",
      "MinRequiredApprovals":1,
      "Approvers":[
        "arn:aws:iam::12345678901:user/AWS-User-1"
      ]
    }
  },
  {
    "name":"run",
    "action":"aws:runCommand",
    "inputs":{
      "InstanceIdS":[]
    },
    "DocumentName":"AWS-RunPowerShellScript",
    "Parameters":{
      "commands":[]
    }
  }
}]
---
description: RunInstancesDemo1
schemaVersion: '0.3'
assumeRole: "{{ assumeRole }}"
parameters:
  assumeRole:
    type: String
message:
  type: String
mainSteps:
- name: approve
  action: aws:approve
  timeoutSeconds: 1000
  onFailure: Abort
  inputs:
You can approve or deny Automations that are waiting for approval in the console.

**To approve or deny waiting Automations**

2. In the navigation pane, choose Automation.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Automation.
3. Choose the option next to an Automation with a status of Waiting.
5. Review the details of the Automation.
6. Choose either Approve or Deny, type an optional comment, and then choose Submit.

**Input**

**JSON**

```json
{
  "Message": "Please approve this step of the Automation.",
  "MinRequiredApprovals": 3,
  "Approvers": [
    "IamUser1",
    "IamUser2",
    "arn:aws:iam::12345678901:user/IamUser3",
    "arn:aws:iam::12345678901:role/IamRole"
  ]
}
```

**YAML**

```yaml
```
Message: Please approve this step of the Automation.
MinRequiredApprovals: 3
Approvers:
- IamUser1
- IamUser2
- arn:aws:iam::12345678901:user/IamUser3
- arn:aws:iam::12345678901:role/IamRole

NotificationArn
The ARN of an Amazon SNS topic for Automation approvals. When you specify an `aws:approve` step in an Automation document, Automation sends a message to this topic letting principals know that they must either approve or reject an Automation step. The title of the Amazon SNS topic must be prefixed with “Automation”.

Type: String
Required: No

Message
The information you want to include in the SNS topic when the approval request is sent. The maximum message length is 4096 characters.

Type: String
Required: No

MinRequiredApprovals
The minimum number of approvals required to resume the Automation execution. If you don't specify a value, the system defaults to one. The value for this parameter must be a positive number. The value for this parameter can't exceed the number of approvers defined by the `Approvers` parameter.

Type: Integer
Required: No

Approvers
A list of AWS authenticated principals who are able to either approve or reject the action. The maximum number of approvers is 10. You can specify principals by using any of the following formats:
- An AWS Identity and Access Management (IAM) user name
- An IAM user ARN
- An IAM role ARN
- An IAM assume role user ARN

Type: StringList
Required: Yes

Output

ApprovalStatus
The approval status of the step. The status can be one of the following: Approved, Rejected, or Waiting. Waiting means that Automation is waiting for input from approvers.
Type: String

ApproverDecisions

A JSON map that includes the approval decision of each approver.

Type: MapList

**aws:assertAwsResourceProperty**

The `aws:assertAwsResourceProperty` action enables you to assert a specific resource state or event state for a specific Automation step. For example, you can specify that an Automation step must wait for an Amazon EC2 instance to start. Then it will call the Amazon EC2 `DescribeInstanceStatus` API action with the DesiredValue property of `running`. This ensures that the Automation workflow waits for a running instance and then continues when the instance is, in fact, running.

For more information and examples of how to use this action, see Invoking Other AWS Services from a Systems Manager Automation Workflow (p. 228).

**Input**

Inputs are defined by the API action that you choose.

**JSON**

```json
{
    "action": "aws:assertAwsResourceProperty",
    "inputs": {
        "Service": "The official namespace of the service",
        "Api": "The API action or method name",
        "API action inputs or parameters": "A value",
        "PropertySelector": "Response object",
        "DesiredValues": ["Desired property values"
    ]
}
}
```

**YAML**

```
action: aws:assertAwsResourceProperty
inputs:
  Service: The official namespace of the service
  Api: The API action or method name
  API action inputs or parameters: A value
  PropertySelector: Response object
  DesiredValues:
    - Desired property values
```

**Service**

The AWS service namespace that contains the API action that you want to run. For example, the namespace for Systems Manager is `ssm`. The namespace for Amazon EC2 is `ec2`. You can view a list of supported AWS service namespaces in the Available Services section of the AWS CLI Command Reference.

Type: String

Required: Yes
Api

The name of the API action that you want to run. You can view the API actions (also called methods) by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all API actions (methods) for Amazon Relational Database Service (Amazon RDS) are listed on the following page: Amazon RDS methods.

Type: String

Required: Yes

API action inputs

One or more API action inputs. You can view the available inputs (also called parameters) by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all methods for Amazon RDS are listed on the following page: Amazon RDS methods. Choose the describe_db_instances method and scroll down to see the available parameters, such as DBInstanceIdentifier, Name, and Values. Use the following format to specify more than one input.

JSON

```
"inputs":{
    "Service":"The official namespace of the service",
    "Api":"The API action name",
    "API input 1":"A value",
    "API Input 2":"A value",
    "API Input 3":"A value"
}
```

YAML

```
inputs:
    Service: The official namespace of the service
    Api: The API action name
    API input 1: A value
    API Input 2: A value
    API Input 3: A value
```

Type: Determined by chosen API action

Required: Yes

PropertySelector

The JSONPath to a specific attribute in the response object. You can view the response objects by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all methods for Amazon RDS are listed on the following page: Amazon RDS methods. Choose the describe_db_instances method and scroll down to the Response Structure section. DBInstances is listed as a response object.

Type: Integer, Boolean, String, StringList, StringMap, or MapList

Required: Yes

DesiredValues

The expected status or state on which to continue the Automation workflow. If you specify a Boolean value, you must use a capital letter such as True or False.
**aws:branch**

The `aws:branch` action enables you to create a dynamic Automation workflow that evaluates different choices in a single step and then jumps to a different step in the Automation document based on the results of that evaluation.

When you specify the `aws:branch` action for a step, you specify Choices that the workflow must evaluate. The Choices can be based on either a value that you specified in the Parameters section of the Automation document, or a dynamic value generated as the output from the previous step. The Automation workflow evaluates each choice by using a Boolean expression. If the first choice is true, then the workflow jumps to the step designated for that choice. If the first choice is false, the workflow evaluates the next choice. The workflow continues evaluating each choice until it process a true choice. The workflow then jumps to the designated step for the true choice.

If none of the choices are true, the workflow checks to see if the step contains a default value. A default value defines a step that the workflow should jump to if none of the choices are true. If no default value is specified for the step, then the Automation workflow processes the next step in the document.

The `aws:branch` action supports complex choice evaluations by using a combination of And, Not, and Or operators. For more information about how to use `aws:branch`, including example documents and examples that use different operators, see Creating Dynamic Automation Workflows with Conditional Branching (p. 217).

**Input**

Specify one or more Choices in a step. The Choices can be based on either a value that you specified in the Parameters section of the Automation document, or a dynamic value generated as the output from the previous step. Here is a YAML sample that evaluates a parameter.

```yaml
mainSteps:
  - name: chooseOS
    action: aws:branch
    inputs:
      Choices:
        - NextStep: runWindowsCommand
          Variable: "{{Name of a parameter defined in the Parameters section. For example: OS_name}}"
          StringEquals: windows
        - NextStep: runLinuxCommand
          Variable: "{{Name of a parameter defined in the Parameters section. For example: OS_name}}"
          StringEquals: linux
      Default: sleep3
```

Here is a YAML sample that evaluates output from a previous step.

```yaml
mainSteps:
  - name: chooseOS
    action: aws:branch
    inputs:
      Choices:
        - NextStep: runPowerShellCommand
          Variable: "{{Name of a response object. For example: GetInstance.platform}}"
          StringEquals: Windows
```

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Choices

One or more expressions that the Automation should evaluate when determining the next step to process. Choices are evaluated by using a Boolean expression. Each choice must define the following options:

- **NextStep**: The next step in the Automation document to process if the designated choice is true.
- **Variable**: Specify either the name of a parameter that is defined in the Parameters section of the Automation document. Or specify an output object from a previous step in the Automation document. For more information about creating variables for `aws:branch`, see About Creating the Output Variable (p. 221).
- **Operation**: The criteria used to evaluate the choice. The `aws:branch` action supports the following operations:
  
  **String operations**
  - StringEquals
  - EqualsIgnoreCase
  - StartsWith
  - EndsWith
  - Contains
  
  **Numeric operations**
  - NumericEquals
  - NumericGreater
  - NumericLesser
  - NumericGreaterOrEquals
  - NumericLesser
  - NumericLesserOrEquals
  
  **Boolean operation**
  - BooleanEquals

**Important**
When you create an Automation document, the system validates each operation in the document. If an operation is not supported, the system returns an error when you try to create the document.

Default

The name of a step the workflow should jump to if none of the Choices are true.

Type: String

Required: No

**Note**
The `aws:branch` action supports And, Or, and Not operators. For examples of `aws:branch` that use operators, see Creating Dynamic Automation Workflows with Conditional Branching (p. 217).
aws:changeInstanceState

Changes or asserts the state of the instance.

This action can be used in assert mode (do not run the API to change the state but verify the instance is in the desired state.) To use assert mode, set the CheckStateOnly parameter to true. This mode is useful when running the Sysprep command on Windows, which is an asynchronous command that can run in the background for a long time. You can ensure that the instance is stopped before you create an AMI.

Input

JSON

```json
{
    "name": "stopMyInstance",
    "action": "aws:changeInstanceState",
    "maxAttempts": 3,
    "timeoutSeconds": 3600,
    "onFailure": "Abort",
    "inputs": {
        "InstanceIds": ["i-1234567890abcdef0"],
        "CheckStateOnly": true,
        "DesiredState": "stopped"
    }
}
```

YAML

```
name: stopMyInstance
action: aws:changeInstanceState
maxAttempts: 3
timeoutSeconds: 3600
onFailure: Abort
inputs:
  InstanceIds:
    - i-1234567890abcdef0
  CheckStateOnly: true
  DesiredState: stopped
```

InstanceIds

The IDs of the instances.

Type: StringList

Required: Yes

CheckStateOnly

If false, sets the instance state to the desired state. If true, asserts the desired state using polling.

Default: false

Type: Boolean

Required: No

DesiredState

The desired state. When set to running, this action waits for the Amazon EC2 state to be Running, the Instance Status to be OK, and the System Status to be OK before completing.
Type: String

Valid values: running | stopped | terminated

Required: Yes

Force

If set, forces the instances to stop. The instances do not have an opportunity to flush file system caches or file system metadata. If you use this option, you must perform file system check and repair procedures. This option is not recommended for Windows instances.

Type: Boolean

Required: No

AdditionalInfo

Reserved.

Type: String

Required: No

Output

None

`aws:copyImage`

Copies an AMI from any region into the current region. This action can also encrypt the new AMI.

Input

This action supports most CopyImage parameters. For more information, see CopyImage.

The following example creates a copy of an AMI in the Seoul region (`SourceImageID: ami-0fe10819, SourceRegion: ap-northeast-2`). The new AMI is copied to the region where you initiated the Automation action. The copied AMI will be encrypted because the optional `Encrypted` flag is set to true.

JSON

```
{
    "name": "createEncryptedCopy",
    "action": "aws:copyImage",
    "maxAttempts": 3,
    "onFailure": "Abort",
    "inputs": {
        "SourceImageId": "ami-0fe10819",
        "SourceRegion": "ap-northeast-2",
        "ImageName": "Encrypted Copy of LAMP base AMI in ap-northeast-2",
        "Encrypted": true
    }
}
```

YAML

```
name: createEncryptedCopy
action: aws:copyImage
```
maxAttempts: 3
onFailure: Abort
inputs:
  SourceImageId: ami-0fe10819
  SourceRegion: ap-northeast-2
  ImageName: Encrypted Copy of LAMP base AMI in ap-northeast-2
  Encrypted: true

SourceRegion

The region where the source AMI currently exists.

Type: String
Required: Yes

SourceImageId

The AMI ID to copy from the source region.

Type: String
Required: Yes

ImageName

The name for the new image.

Type: String
Required: Yes

ImageDescription

A description for the target image.

Type: String
Required: No

Encrypted

Encrypt the target AMI.

Type: Boolean
Required: No

KmsKeyId

The full Amazon Resource Name (ARN) of the AWS Key Management Service CMK to use when encrypting the snapshots of an image during a copy operation. For more information, see CopyImage.

Type: String
Required: No

ClientToken

A unique, case-sensitive identifier that you provide to ensure request idempotency. For more information, see CopyImage.

Type: String
Required: No

Output

ImageId
The ID of the copied image.

ImageState
The state of the copied image.
Valid values: available | pending | failed

aws:createImage
Creates a new AMI from an instance that is either running or stopped.

Input

This action supports most CreateImage parameters. For more information, see CreateImage.

JSON

```
{
    "name": "createMyImage",
    "action": "aws:createImage",
    "maxAttempts": 3,
    "onFailure": "Abort",
    "inputs": {
        "InstanceId": "i-1234567890abcdef0",
        "ImageName": "AMI Created on{{global:DATE_TIME}}",
        "NoReboot": true,
        "ImageDescription": "My newly created AMI"
    }
}
```

YAML

```
name: createMyImage
action: aws:createImage
maxAttempts: 3
onFailure: Abort
inputs:
    InstanceId: i-1234567890abcdef0
    ImageName: AMI Created on{{global:DATE_TIME}}
    NoReboot: true
    ImageDescription: My newly created AMI
```

InstanceId
The ID of the instance.
Type: String
Required: Yes

ImageName
The name for the image.
NoReboot

A boolean literal.

By default, Amazon EC2 attempts to shut down and reboot the instance before creating the image. If the No Reboot option is set to true, Amazon EC2 doesn't shut down the instance before creating the image. When this option is used, file system integrity on the created image can't be guaranteed.

If you do not want the instance to run after you create an AMI image from it, first use the aws:changeInstanceState (p. 254) plugin to stop the instance, and then use this aws:createImage plugin with the NoReboot option set to true.

Type: Boolean
Required: No

BlockDeviceMappings

The block devices for the instance.
Type: Map
Required: No

Output

ImageId

The ID of the newly created image.

ImageState

An execution script provided as a string literal value. If a literal value is entered, then it must be Base64-encoded.
Required: No

aws:createStack

Creates a new AWS CloudFormation stack from a template.

Input

JSON

```json
{
   "name": "makeStack",
   "action": "aws:createStack",
   "maxAttempts": 1,
   "onFailure": "Abort",
   "inputs": {
```
"Capabilities": [  "CAPABILITY_IAM"  ],  "StackName": "myStack",  "TemplateURL": "http://s3.amazonaws.com/mybucket/myStackTemplate",  "TimeoutInMinutes": 5}
}

YAML

name: makeStack
action: aws:createStack
maxAttempts: 1
onFailure: Abort
inputs:
  Capabilities:
  - CAPABILITY_IAM
  StackName: myStack
  TemplateURL: http://s3.amazonaws.com/mybucket/myStackTemplate
  TimeoutInMinutes: 5

Capabilities

A list of values that you specify before AWS CloudFormation can create certain stacks. Some stack templates include resources that can affect permissions in your AWS account. For example, creating new AWS Identity and Access Management (IAM) users can affect permissions in your account. For those stacks, you must explicitly acknowledge their capabilities by specifying this parameter.

The only valid values are CAPABILITY_IAM and CAPABILITY_NAMED_IAM. The following resources require you to specify this parameter.

- AWS::IAM::AccessKey
- AWS::IAM::Group
- AWS::IAM::InstanceProfile
- AWS::IAM::Policy
- AWS::IAM::Role
- AWS::IAM::User
- AWS::IAM::UserToGroupAddition

If your stack template contains these resources, we recommend that you review all permissions associated with them and edit their permissions, if necessary.

If you have IAM resources, you can specify either capability. If you have IAM resources with custom names, you must specify CAPABILITY_NAMED_IAM. If you don't specify this parameter, this action returns an InsufficientCapabilities error.

For more information, see Acknowledging IAM Resources in AWS CloudFormation Templates.

Type: array of Strings

Valid Values: CAPABILITY_IAM | CAPABILITY_NAMED_IAM

Required: No

ClientRequestToken

A unique identifier for this CreateStack request. Specify this token if you set maxAttempts in this step to a value greater than 1. By specifying this token, AWS CloudFormation knows that you're not attempting to create a new stack with the same name.
Type: String
Required: No
Pattern: [a-zA-Z0-9][-a-zA-Z0-9]*

DisableRollback
Set to true to disable rollback of the stack if stack creation failed.
Conditional: You can specify either the DisableRollback parameter or the OnFailure parameter, but not both.
Default: false
Type: Boolean
Required: No

NotificationARNs
The Amazon SNS topic ARNs for publishing stack-related events. You can find SNS topic ARNs using the Amazon SNS console, https://console.aws.amazon.com/sns/v3/home.
Type: array of Strings
Array Members: Maximum number of 5 items.
Required: No

OnFailure
Determines the action to take if stack creation failed. You must specify DO_NOTHING, ROLLBACK, or DELETE.
Conditional: You can specify either the OnFailure parameter or the DisableRollback parameter, but not both.
Default: ROLLBACK
Type: String
Valid Values: DO_NOTHING | ROLLBACK | DELETE
Required: No

Parameters
A list of Parameter structures that specify input parameters for the stack. For more information, see the Parameter data type.
Type: array of Parameter objects
Required: No

ResourceTypes
The template resource types that you have permissions to work with for this create stack action. For example: AWS::EC2::Instance, AWS::EC2::* or Custom::MyCustomInstance. Use the following syntax to describe template resource types.
- For all AWS resources:
AWS::*

• For all custom resources:

Custom::*

• For a specific custom resource:

Custom::logical_ID

• For all resources of a particular AWS service:

AWS::service_name::*

• For a specific AWS resource:

AWS::service_name::resource_logical_ID

If the list of resource types doesn't include a resource that you're creating, the stack creation fails. By default, AWS CloudFormation grants permissions to all resource types. IAM uses this parameter for AWS CloudFormation-specific condition keys in IAM policies. For more information, see Controlling Access with AWS Identity and Access Management.

Type: array of Strings

Length Constraints: Minimum length of 1. Maximum length of 256.

Required: No

RoleARN

The Amazon Resource Name (ARN) of an IAM role that AWS CloudFormation assumes to create the stack. AWS CloudFormation uses the role's credentials to make calls on your behalf. AWS CloudFormation always uses this role for all future operations on the stack. As long as users have permission to operate on the stack, AWS CloudFormation uses this role even if the users don't have permission to pass it. Ensure that the role grants the least amount of privileges.

If you don't specify a value, AWS CloudFormation uses the role that was previously associated with the stack. If no role is available, AWS CloudFormation uses a temporary session that is generated from your user credentials.

Type: String


Required: No

StackName

The name that is associated with the stack. The name must be unique in the region in which you are creating the stack.

**Note**

A stack name can contain only alphanumeric characters (case sensitive) and hyphens. It must start with an alphabetic character and cannot be longer than 128 characters.

Type: String

Required: Yes
StackPolicyBody

Structure containing the stack policy body. For more information, see Prevent Updates to Stack Resources.

Conditional: You can specify either the StackPolicyBody parameter or the StackPolicyURL parameter, but not both.

Type: String


Required: No

StackPolicyURL

Location of a file containing the stack policy. The URL must point to a policy located in an Amazon S3 bucket in the same region as the stack. The maximum file size allowed for the stack policy is 16 KB.

Conditional: You can specify either the StackPolicyBody parameter or the StackPolicyURL parameter, but not both.

Type: String


Required: No

Tags

Key-value pairs to associate with this stack. AWS CloudFormation also propagates these tags to the resources created in the stack. You can specify a maximum number of 10 tags.

Type: array of Tag objects

Required: No

TemplateBody

Structure containing the template body with a minimum length of 1 byte and a maximum length of 51,200 bytes. For more information, see Template Anatomy.

Conditional: You can specify either the TemplateBody parameter or the TemplateURL parameter, but not both.

Type: String

Length Constraints: Minimum length of 1.

Required: No

TemplateURL

Location of a file containing the template body. The URL must point to a template that is located in an Amazon S3 bucket. The maximum size allowed for the template is 460,800 bytes. For more information, see Template Anatomy.

Conditional: You can specify either the TemplateBody parameter or the TemplateURL parameter, but not both.

Type: String

Required: No

**TimeoutInMinutes**

The amount of time that can pass before the stack status becomes `CREATE_FAILED`. If `DisableRollback` is not set or is set to `false`, the stack will be rolled back.

Type: Integer

Valid Range: Minimum value of 1.

Required: No

**Outputs**

**StackId**

Unique identifier of the stack.

Type: String

**StackStatus**

Current status of the stack.

Type: String

Valid Values: `CREATE_IN_PROGRESS` | `CREATE_FAILED` | `CREATE_COMPLETE` |
| `ROLLBACK_IN_PROGRESS` | `ROLLBACK_FAILED` | `ROLLBACK_COMPLETE` |
| `DELETE_IN_PROGRESS` | `DELETE_FAILED` | `DELETE_COMPLETE` |
| `UPDATE_IN_PROGRESS` | `UPDATE_COMPLETE_CLEANUP_IN_PROGRESS` | `UPDATE_COMPLETE` |
| `UPDATE_ROLLBACK_IN_PROGRESS` | `UPDATE_ROLLBACK_FAILED` |
| `UPDATE_ROLLBACK_COMPLETE_CLEANUP_IN_PROGRESS` | `UPDATE_ROLLBACK_COMPLETE` |
| `REVIEW_IN_PROGRESS`

Required: Yes

**StackStatusReason**

Success or failure message associated with the stack status.

Type: String

Required: No

For more information, see [CreateStack](#).

**Security Considerations**

Before you can use the `aws:createStack` action, you must assign the following policy to the IAM Automation assume role. For more information about the assume role, see [Task 1: Create a Service Role for Automation (p. 147)](#).

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": ["sqs:*"],
```

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aws:createTags

Create new tags for Amazon EC2 instances or Systems Manager managed instances.

**Input**

This action supports most EC2 CreateTags and SSM AddTagsToResource parameters. For more information, see CreateTags and AddTagsToResource.

The following example shows how to tag an AMI and an instance as being production resources for a particular department.

**JSON**

```
{
   "name": "createTags",
   "action": "aws:createTags",
   "maxAttempts": 3,
   "onFailure": "Abort",
   "inputs": {
      "ResourceType": "EC2",
      "ResourceIds": [
         "ami-9a3768fa",
         "i-02951acd5111a8169"
      ],
      "Tags": [
         {
            "Key": "production",
            "Value": ""
         },
         {
            "Key": "department",
            "Value": "devops"
         }
      ]
   }
}
```

**YAML**

```
name: createTags
action: aws:createTags
maxAttempts: 3
onFailure: Abort
inputs:

   ResourceType: EC2
   ResourceIds:
      - ami-9a3768fa
      - i-02951acd5111a8169
   Tags:
      - Key: production
        Value: ''
      - Key: department
        Value: devops
```
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### ResoureIds
The IDs of the resource(s) to be tagged. If resource type is not "EC2", this field can contain only a single item.

Type: String List
Required: Yes

### Tags
The tags to associate with the resource(s).

Type: List of Maps
Required: Yes

### ResourceType
The type of resource(s) to be tagged. If not supplied, the default value of "EC2" is used.

Type: String
Required: No

Valid Values: EC2 | ManagedInstance | MaintenanceWindow | Parameter

### Output
None

**aws:deleteImage**

Deletes the specified image and all related snapshots.

### Input
This action supports only one parameter. For more information, see the documentation for DeregisterImage and DeleteSnapshot.

**JSON**

```json
{
  "name": "deleteMyImage",
  "action": "aws:deleteImage",
  "maxAttempts": 3,
  "timeoutSeconds": 180,
  "onFailure": "Abort",
  "inputs": {
    "ImageId": "ami-12345678"
  }
}
```

**YAML**

```yaml
name: deleteMyImage
action: aws:deleteImage
maxAttempts: 3
timeoutSeconds: 180
onFailure: Abort
inputs:
  ImageId: ami-12345678
```
Imageld

The ID of the image to be deleted.

Type: String

Required: Yes

Output

None

/aws:deleteStack

Deletes an AWS CloudFormation stack.

Input

JSON

```json
{
    "name": "deleteStack",
    "action": "aws:deleteStack",
    "maxAttempts": 1,
    "onFailure": "Abort",
    "inputs": {
        "StackName": "{{stackName}}"
    }
}
```

YAML

```yaml
name: deleteStack
action: aws:deleteStack
maxAttempts: 1
onFailure: Abort
inputs:
    StackName: "{{stackName}}"
```

ClientRequestToken

A unique identifier for this DeleteStack request. Specify this token if you plan to retry requests so that AWS CloudFormation knows that you're not attempting to delete a stack with the same name. You can retry DeleteStack requests to verify that AWS CloudFormation received them.

Type: String


Pattern: [a-zA-Z][a-zA-Z0-9]*

Required: No

RetainResources

This input applies only to stacks that are in a DELETE_FAILED state. A list of logical resource IDs for the resources you want to retain. During deletion, AWS CloudFormation deletes the stack, but does not delete the retained resources.

Retaining resources is useful when you can't delete a resource, such as a non-empty Amazon S3 bucket, but you want to delete the stack.
Type: array of strings

Required: No

RoleARN

The Amazon Resource Name (ARN) of an IAM role that AWS CloudFormation assumes to create the stack. AWS CloudFormation uses the role's credentials to make calls on your behalf. AWS CloudFormation always uses this role for all future operations on the stack. As long as users have permission to operate on the stack, AWS CloudFormation uses this role even if the users don't have permission to pass it. Ensure that the role grants the least amount of privileges.

If you don't specify a value, AWS CloudFormation uses the role that was previously associated with the stack. If no role is available, AWS CloudFormation uses a temporary session that is generated from your user credentials.

Type: String


Required: No

StackName

The name or the unique stack ID that is associated with the stack.

Type: String

Required: Yes

Security Considerations

Before you can use the `aws:deleteStack` action, you must assign the following policy to the IAM Automation assume role. For more information about the assume role, see Task 1: Create a Service Role for Automation (p. 147).

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": [
            "sqs:*",
            "cloudformation:DeleteStack",
            "cloudformation:DescribeStacks"
         ],
         "Resource": "*
      }
   ]
}
```

**aws:executeAutomation**

Runs a secondary Automation workflow by calling a secondary Automation document. With this action, you can create Automation documents for your most common workflows, and reference those documents during an Automation execution. This action can simplify your Automation documents by removing the need to duplicate steps across similar documents.

The secondary Automation runs in the context of the user who initiated the primary Automation. This means that the secondary Automation uses the same IAM role or user account as the user who started the first Automation.
**Important**
If you specify parameters in a secondary Automation that use an assume role (a role that uses the iam:passRole policy), then the user or role that initiated the primary Automation must have permission to pass the assume role specified in the secondary Automation. For more information about setting up an assume role for Automation, see Method 2: Use IAM to Configure Roles for Automation (p. 146).

**Input**

**JSON**
```
{
   "name":"Secondary_Automation_Workflow",
   "action":"aws:executeAutomation",
   "maxAttempts":3,
   "timeoutSeconds":3600,
   "onFailure":"Abort",
   "inputs":{
      "DocumentName":"secondaryWorkflow",
      "RuntimeParameters":{
         "instanceIds":[
            "i-1234567890abcdef0"
         ]
      }
   }
}
```

**YAML**
```
name: Secondary_Automation_Workflow
action: aws:executeAutomation
maxAttempts: 3
timeoutSeconds: 3600
onFailure: Abort
inputs:
   DocumentName: secondaryWorkflow
   RuntimeParameters:
      instanceIds:
      - i-1234567890abcdef0
```

**DocumentName**

The name of the secondary Automation document to run during the step. The document must belong to the same AWS account as the primary Automation document.

Type: String

Required: Yes

**DocumentVersion**

The version of the secondary Automation document to run. If not specified, Automation runs the default document version.

Type: String

Required: Yes

**RuntimeParameters**

Required parameters for the secondary document execution. The mapping uses the following format: {
   "parameter1" : ["value1"],  
   "parameter2" : ["value2"]
}
Output

Output

The output generated by the secondary execution. You can reference the output by using the following format: `Secondary_Automation_Step_Name`.Output

Type: StringList

ExecutionId

The execution ID of the secondary execution.

Type: String

Status

The status of the secondary execution.

Type: String

**aws:executeAwsApi**

Calls and runs AWS API actions. Most API actions are supported, although not all API actions have been tested. For example, the following API actions are supported: CreateImage, Delete bucket, RebootDBInstance, and CreateGroups, to name a few. Streaming API actions, such as the Get Object action, aren't supported. For more information and examples of how to use this action, see Invoking Other AWS Services from a Systems Manager Automation Workflow (p. 228).

Input

Inputs are defined by the API action that you choose.

**JSON**

```json
{
  "action":"aws:executeAwsApi",
  "inputs":{
    "Service":"The official namespace of the service",
    "Api":"The API action or method name",
    "API action inputs or parameters":"A value"
  },
  "outputs":{
    "Name":"The name for a user-specified output key",
    "Selector":"A response object specified by using JSONPath format",
    "Type":"The data type"
  }
}
```

**YAML**

```yaml
action: aws:executeAwsApi
inputs:
  Service: The official namespace of the service
```
Service

The AWS service namespace that contains the API action that you want to run. For example, the namespace for Systems Manager is `ssm`. The namespace for Amazon EC2 is `ec2`. You can view a list of supported AWS service namespaces in the Available Services section of the AWS CLI Command Reference.

Type: String

Required: Yes

Api

The name of the API action that you want to run. You can view the API actions (also called methods) by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all API actions (methods) for Amazon RDS are listed on the following page: Amazon RDS methods.

Type: String

Required: Yes

API action inputs

One or more API action inputs. You can view the available inputs (also called parameters) by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all methods for Amazon RDS are listed on the following page: Amazon RDS methods. Choose the describe_db_instances method and scroll down to see the available parameters, such as `DBInstanceIdentifier`, `Name`, and `Values`.

JSON

```
"inputs":{
  "Service": "The official namespace of the service",
  "Api": "The API action name",
  "API input 1": "A value",
  "API Input 2": "A value",
  "API Input 3": "A value"
}
```

YAML

```
inputs:
  Service: The official namespace of the service
  Api: The API action name
  API input 1: A value
  API Input 2: A value
  API Input 3: A value
```

Type: Determined by chosen API action

Required: Yes
Name

A name for the output.
Type: String
Required: Yes

Selector

The JSONPath to a specific attribute in the response object. You can view the response objects by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all methods for Amazon RDS are listed on the following page: Amazon RDS methods. Choose the describe_db_instances method and scroll down to the Response Structure section. DBInstances is listed as a response object.

Type: Integer, Boolean, String, StringList, StringMap, or MapList
Required: Yes

Type

The data type for the response element.
Type: Varies
Required: Yes

aws:executeStateMachine

Run an AWS Step Functions state machine.

Input

This action supports most parameters for the Step Functions StartExecution API action.

JSON

```json
{
  "name": "executeTheStateMachine",
  "action": "aws:executeStateMachine",
  "inputs": { 
    "stateMachineArn": "StateMachine_ARN",
    "input": "{\"parameters\":\"values\"},
    "name": "name"
  }
}
```

YAML

```yaml
name: executeTheStateMachine
action: aws:executeStateMachine
inputs:
  stateMachineArn: StateMachine_ARN
  input: '{"parameters":"values"}'
  name: name
```

stateMachineArn

The ARN of the Step Functions state machine.
Type: String
Required: Yes

name

The name of the execution.

Type: String
Required: No

input

A string that contains the JSON input data for the execution.

Type: String
Required: No

aws:invokeLambdaFunction

Invokes the specified Lambda function.

Input

This action supports most invoked parameters for the Lambda service. For more information, see Invoke.

JSON

```json
{
   "name": "invokeMyLambdaFunction",
   "action": "aws:invokeLambdaFunction",
   "maxAttempts": 3,
   "timeoutSeconds": 120,
   "onFailure": "Abort",
   "inputs": {
      "FunctionName": "MyLambdaFunction"
   }
}
```

YAML

```yaml
name: invokeMyLambdaFunction
action: aws:invokeLambdaFunction
maxAttempts: 3
timeoutSeconds: 120
onFailure: Abort
inputs:
   FunctionName: MyLambdaFunction
```

FunctionName

The name of the Lambda function. This function must exist.

Type: String

Required: Yes

Qualifier

The function version or alias name.
Type: String
Required: No

InvocationType

The invocation type. The default is RequestResponse.
Type: String
Valid values: Event | RequestResponse | DryRun
Required: No

LogType

If Tail, the invocation type must be RequestResponse. AWS Lambda returns the last 4 KB of log data produced by your Lambda function, base64-encoded.
Type: String
Valid values: None | Tail
Required: No

ClientContext

The client-specific information.
Required: No

Payload

The JSON input for your Lambda function.
Required: No

Output

StatusCode

The function execution status code.

FunctionError

Indicates whether an error occurred while running the Lambda function. If an error occurred, this field will show either Handled or Unhandled. Handled errors are reported by the function. Unhandled errors are detected and reported by AWS Lambda.

LogResult

The base64-encoded logs for the Lambda function invocation. Logs are present only if the invocation type is RequestResponse, and the logs were requested.

Payload

The JSON representation of the object returned by the Lambda function. Payload is present only if the invocation type is RequestResponse.

aws:pause

This action pauses the Automation execution. Once paused, the execution status is Waiting. To continue the Automation execution, use the SendAutomationSignal API action with the Resume signal type.
Input

The input is as follows.

**JSON**

```json
{
  "name": "pauseThis",
  "action": "aws:pause",
  "inputs": {}
}
```

**YAML**

```yaml
name: pauseThis
action: aws:pause
inputs: {}
```

Output

None

**aws:runCommand**

Runs the specified commands.

**Note**

Automation only supports output of one Run Command action. A document can include multiple Run Command actions and plugins, but output is supported for only one action and plugin at a time.

Input

This action supports most send command parameters. For more information, see SendCommand.

**JSON**

```json
{
  "name": "installPowerShellModule",
  "action": "aws:runCommand",
  "inputs": {
    "DocumentName": "AWS-InstallPowerShellModule",
    "InstanceIds": ["i-1234567890abcdef0"],
    "Parameters": {
      "source": "https://my-s3-url.com/MyModule.zip",
      "sourceHash": "ASDFWER12321WRW"
    }
  }
}
```

**YAML**

```yaml
name: installPowerShellModule
action: aws:runCommand
inputs:
  DocumentName: AWS-InstallPowerShellModule
  InstanceIds:
    - i-1234567890abcdef0
  Parameters:
```
DocumentName

The name of the Run Command document.

Type: String

Required: Yes

InstanceIds

The instance IDs where you want the command to run. You can specify a maximum of 50 IDs. If you don’t want to specify individual instance IDs, then you can send commands to a fleet of instances by using the Targets parameter. The Targets parameter accepts Amazon EC2 tags. For more information about how to use the Targets parameter, see Using Targets and Rate Controls to Send Commands to a Fleet (p. 625).

Type: StringList

Required: No (If you don’t specify InstanceIds, then you must specify the Targets parameter.)

Targets

An array of search criteria that targets instances by using a Key,Value combination that you specify. Targets is required if you don’t provide one or more instance IDs in the call. For more information about how to use the Targets parameter, see Using Targets and Rate Controls to Send Commands to a Fleet (p. 625).

Type: MapList (The schema of the map in the list must match the object. For information, see Target in the AWS Systems Manager API Reference.)

Required: No (If you don’t specify Targets, then you must specify InstanceIds.)

Here is an example:

```json
{
    "name": "installPowerShellModule",
    "action": "aws:runCommand",
    "inputs": {
        "DocumentName": "AWS-InstallPowerShellModule",
        "Targets": [
            {
                "Key": "tag:Stage",
                "Values": [
                    "Gamma",
                    "Beta"
                ]
            },
            {
                "Key": "tag-key",
                "Values": [
                    "Suite"
                ]
            }
        ],
        "Parameters": {
            "source": "https://my-s3-url.com/MyModule.zip ",
            "sourceHash": "ASDFWER12321WRW"
        }
    }
}
```
Parameters

The required and optional parameters specified in the document.

Type: Map

Required: No

CloudWatchOutputConfig

Configuration options for sending command output to Amazon CloudWatch Logs. For more information about sending command output to CloudWatch Logs, see Configuring Amazon CloudWatch Logs for Run Command (p. 616).

Type: StringMap (The schema of the map must match the object. For more information, see CloudWatchOutputConfig in the AWS Systems Manager API Reference).

Required: No

Here is an example:

```json
{
  "name": "installPowerShellModule",
  "action": "aws:runCommand",
  "inputs": {
    "DocumentName": "AWS-InstallPowerShellModule",
    "InstanceIds": ["i-1234567890abcdef0"],
    "Parameters": {
      "source": "https://my-s3-url.com/MyModule.zip",
      "sourceHash": "ASDFWER12321WRW"
    },
    "CloudWatchOutputConfig": {
      "CloudWatchLogGroupName": "CloudWatchGroupForSSMAutomationService",
      "CloudWatchOutputEnabled": true
    }
  }
}
```

Comment

User-defined information about the command.

Type: String

Required: No

DocumentHash

The hash for the document.

Type: String

Required: No

DocumentHashType

The type of the hash.

Type: String

Valid values: Sha256 | Sha1

Required: No
NotificationConfig

   The configurations for sending notifications.
   Required: No

OutputS3BucketName

   The name of the S3 bucket for command execution responses.
   Type: String
   Required: No

OutputS3KeyPrefix

   The prefix.
   Type: String
   Required: No

ServiceRoleArn

   The ARN of the IAM role.
   Type: String
   Required: No

TimeoutSeconds

   The run-command timeout value, in seconds.
   Type: Integer
   Required: No

Output

CommandId

   The ID of the command.

Status

   The status of the command.

ResponseCode

   The response code of the command.

Output

   The output of the command.

aws:runInstances

   Launches a new instance.

Input

   The action supports most API parameters. For more information, see the RunInstances API documentation.
**JSON**

```
{
    "name": "launchInstance",
    "action": "aws:runInstances",
    "maxAttempts": 3,
    "timeoutSeconds": 1200,
    "onFailure": "Abort",
    "inputs": {
        "ImageId": "ami-12345678",
        "InstanceType": "t2.micro",
        "MinInstanceCount": 1,
        "MaxInstanceCount": 1,
        "IamInstanceProfileName": "myRunCmdRole",
        "TagSpecifications": [
            {
                "ResourceType": "instance",
                "Tags": [
                    {
                        "Key": "LaunchedBy",
                        "Value": "SSMAutomation"
                    },
                    {
                        "Key": "Category",
                        "Value": "HighAvailabilityFleetHost"
                    }
                ]
            }
        ]
    }
}
```

**YAML**

```
name: launchInstance
action: aws:runInstances
maxAttempts: 3
timeoutSeconds: 1200
onFailure: Abort
inputs:
    ImageId: ami-12345678
    InstanceType: t2.micro
    MinInstanceCount: 1
    MaxInstanceCount: 1
    IamInstanceProfileName: myRunCmdRole
TagSpecifications:
    - ResourceType: instance
    Tags:
        - Key: LaunchedBy
          Value: SSMAutomation
        - Key: Category
          Value: HighAvailabilityFleetHost
```

**ImageId**

The ID of the Amazon Machine Image (AMI).

- **Type**: String
- **Required**: Yes

**InstanceType**

The instance type.
If an instance type value is not provided, the m1.small instance type is used.

**Type:** String

**Required:** No

**MinInstanceCount**

The minimum number of instances to be launched.

**Type:** String

**Required:** No

**MaxInstanceCount**

The maximum number of instances to be launched.

**Type:** String

**Required:** No

**AdditionalInfo**

Reserved.

**Type:** String

**Required:** No

**BlockDeviceMappings**

The block devices for the instance.

**Type:** MapList

**Required:** No

**ClientToken**

The identifier to ensure idempotency of the request.

**Type:** String

**Required:** No

**DisableApiTermination**

Enables or disables instance API termination

**Type:** Boolean

**Required:** No

**EbsOptimized**

Enables or disabled EBS optimization.

**Type:** Boolean

**Required:** No

**IamInstanceProfileArn**

The ARN of the IAM instance profile for the instance.
Type: String  
Required: No  
IamInstanceProfileName  
The name of the IAM instance profile for the instance.  
Type: String  
Required: No  
InstanceInitiatedShutdownBehavior  
Indicates whether the instance stops or terminates on system shutdown.  
Type: String  
Required: No  
KernelId  
The ID of the kernel.  
Type: String  
Required: No  
KeyName  
The name of the key pair.  
Type: String  
Required: No  
MaxInstanceCount  
The maximum number of instances to filter when searching for offerings.  
Type: Integer  
Required: No  
MinInstanceCount  
The minimum number of instances to filter when searching for offerings.  
Type: Integer  
Required: No  
Monitoring  
Enables or disables detailed monitoring.  
Type: Boolean  
Required: No  
NetworkInterfaces  
The network interfaces.  
Type: MapList  
Required: No
Placement
   The placement for the instance.
   Type: StringMap
   Required: No

PrivateIpAddress
   The primary IPv4 address.
   Type: String
   Required: No

RamdiskId
   The ID of the RAM disk.
   Type: String
   Required: No

SecurityGroupIds
   The IDs of the security groups for the instance.
   Type: StringList
   Required: No

SecurityGroups
   The names of the security groups for the instance.
   Type: StringList
   Required: No

SubnetId
   The subnet ID.
   Type: String
   Required: No

TagSpecifications
   The tags to apply to the resources during launch. You can only tag instances and volumes at launch. The specified tags are applied to all instances or volumes that are created during launch. To tag an instance after it has been launched, use the aws:createTags (p. 264) action.
   Type: MapList (For more information, see TagSpecification.)
   Required: No

UserData
   An execution script provided as a string literal value. If a literal value is entered, then it must be Base64-encoded.
   Type: String
   Required: No
Output

InstanceId

The IDs of the instances.

aws:sleep

Delays Automation execution for a specified amount of time. This action uses the International Organization for Standardization (ISO) 8601 date and time format. For more information about this date and time format, see ISO 8601.

Input

You can delay execution for a specified duration.

JSON

```json
{
   "name": "sleep",
   "action": "aws:sleep",
   "inputs": {
      "Duration": "PT10M"
   }
}
```

YAML

```yaml
name: sleep
action: aws:sleep
inputs:
   Duration: PT10M
```

You can also delay execution until a specified date and time. If the specified date and time has passed, the action proceeds immediately.

JSON

```json
{
   "name": "sleep",
   "action": "aws:sleep",
   "inputs": {
      "Timestamp": "2020-01-01T00:00:00Z"
   }
}
```

YAML

```yaml
name: sleep
action: aws:sleep
inputs:
   Timestamp: '2020-01-01T01:00:00Z'
```

Note

Automation currently supports a maximum delay of 604800 seconds (7 days).

Duration

An ISO 8601 duration. You can't specify a negative duration.
Type: String

Required: No

**Timestamp**

An ISO 8601 timestamp. If you don't specify a value for this parameter, then you must specify a value for the `Duration` parameter.

Type: String

Required: No

**Output**

None

**aws:waitForAwsResourceProperty**

The `aws:waitForAwsResourceProperty` action enables your Automation workflow to wait for a specific resource state or event state before continuing the workflow. For more information and examples of how to use this action, see Invoking Other AWS Services from a Systems Manager Automation Workflow (p. 228).

**Input**

Inputs are defined by the API action that you choose.

**JSON**

```json
{
  "action": "aws:waitForAwsResourceProperty",
  "inputs": {
    "Service": "The official namespace of the service",
    "Api": "The API action or method name",
    "API action inputs or parameters": "A value",
    "PropertySelector": "Response object",
    "DesiredValues": ["Desired property value"]
  }
}
```

**YAML**

```yaml
action: aws:waitForAwsResourceProperty
inputs:
  Service: The official namespace of the service
  Api: The API action or method name
  API action inputs or parameters: A value
  PropertySelector: Response object
  DesiredValues:
    - Desired property value
```

**Service**

The AWS service namespace that contains the API action that you want to run. For example, the namespace for Systems Manager is `ssm`. The namespace for Amazon EC2 is `ec2`. You can view a list
of supported AWS service namespaces in the Available Services section of the AWS CLI Command Reference.

Type: String
Required: Yes

Api

The name of the API action that you want to run. You can view the API actions (also called methods) by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all API actions (methods) for Amazon RDS are listed on the following page: Amazon RDS methods.

Type: String
Required: Yes

API action inputs

One or more API action inputs. You can view the available inputs (also called parameters) by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all methods for Amazon RDS are listed on the following page: Amazon RDS methods. Choose the describe_db_instances method and scroll down to see the available parameters, such as DBInstanceIdentifier, Name, and Values.

JSON

```json
"inputs":{
   "Service":"The official namespace of the service",
   "Api":"The API action name",
   "API input 1":"A value",
   "API Input 2":"A value",
   "API Input 3":"A value"
}
```

YAML

```yaml
inputs:
   Service: The official namespace of the service
   Api: The API action name
   API input 1: A value
   API Input 2: A value
   API Input 3: A value
```

Type: Determined by chosen API action
Required: Yes

PropertySelector

The JSONPath to a specific attribute in the response object. You can view the response objects by choosing a service in the left navigation on the following Services Reference page. Choose a method in the Client section for the service that you want to invoke. For example, all methods for Amazon RDS are listed on the following page: Amazon RDS methods. Choose the describe_db_instances method and scroll down to the Response Structure section. DBInstances is listed as a response object.

Type: Integer, Boolean, String, StringList, StringMap, or MapList
Required: Yes
DesiredValues

The expected status or state on which to continue the Automation workflow.

Type: Varies

Required: Yes

### Automation System Variables

Systems Manager Automation documents use the following variables. For an example of how these variables are used, view the JSON source of the AWS-UpdateWindowsAmi document.

**To view the JSON source of the AWS-UpdateWindowsAmi document**

2. In the navigation pane, choose Documents.
3. In the document list, use either the Search bar or the numbers to the right of the Search bar to choose the document **AWS-UpdateWindowsAmi**.
4. Choose the Content tab.

### System Variables

Automation documents currently support the following system variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>global:ACCOUNT_ID</td>
<td>The AWS account ID of the AWS Identity and Access Management (IAM) user or role in which Automation runs.</td>
</tr>
<tr>
<td>global:DATE</td>
<td>The date (at execution time) in the format yyyy-MM-dd.</td>
</tr>
<tr>
<td>global:DATE_TIME</td>
<td>The date and time (at execution time) in the format yyyy-MM-dd_HH.mm.ss.</td>
</tr>
<tr>
<td>global:REGION</td>
<td>The Region that the document is run in. For example, us-east-2.</td>
</tr>
</tbody>
</table>

### Automation Variables

Automation documents currently support the following automation variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>automation:EXECUTION_ID</td>
<td>The unique identifier assigned to the current automation execution. For example, 1a2b3c-1a2b3c-1a2b3c-1a2b3c1a2b3c1a2b3c.</td>
</tr>
</tbody>
</table>

**Topics**

- Terminology (p. 286)
- Supported Scenarios (p. 289)
- Unsupported Scenarios (p. 291)
## Terminology

The following terms describe how variables and parameters are resolved.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant ARN</td>
<td>A valid ARN without variables</td>
<td>arn:aws:iam::123456789012:role/roleName</td>
</tr>
<tr>
<td>Document parameter</td>
<td>A parameter defined at the document level for an Automation document (for example, instanceId). The parameter is used in a basic string replace. Its value is supplied at Start Execution time.</td>
<td>{ &quot;description&quot;: &quot;Create Image Demo&quot;, &quot;version&quot;: &quot;0.3&quot;, &quot;assumeRole&quot;: &quot;Your_Automation_Assume_Role_ARN&quot;, &quot;parameters&quot;: { &quot;instanceId&quot;: { &quot;type&quot;: &quot;STRING&quot;, &quot;description&quot;: &quot;Instance to create image from&quot; } } }</td>
</tr>
<tr>
<td>System variable</td>
<td>A general variable substituted into the document when any part of the document is evaluated.</td>
<td>&quot;activities&quot;: [ { &quot;id&quot;: &quot;copyImage&quot;, &quot;activityType&quot;: &quot;AWS-CopyImage&quot;, &quot;maxAttempts&quot;: 1, &quot;onFailure&quot;: &quot;Continue&quot;, &quot;inputs&quot;: { &quot;ImageName&quot;: &quot;{{imageName}}&quot;, &quot;SourceImageId&quot;: &quot;{{sourceImageId}}&quot;, &quot;SourceRegion&quot;: &quot;{{sourceRegion}}&quot;, &quot;Encrypted&quot;: true, &quot;ImageDescription&quot;: &quot;Test CopyImage Description created on {{global:DATE}}&quot; } } ]</td>
</tr>
<tr>
<td>Automation variable</td>
<td>A variable relating to the automation execution substituted into the document when any part of the document is evaluated.</td>
<td>{ &quot;name&quot;: &quot;runFixedCmds&quot;, &quot;action&quot;: &quot;aws:runCommand&quot;, &quot;maxAttempts&quot;: 1, &quot;onFailure&quot;: &quot;Continue&quot;, &quot;inputs&quot;: { &quot;DocumentName&quot;: &quot;AWS-RunPowerShellScript&quot;, &quot;InstanceIds&quot;: [ &quot;{{LaunchInstance.InstanceIds}}&quot; ] }, &quot;Parameters&quot;: {</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
<td>Example</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| "commands": [     | "dir",
|                     | "date",
|                     | "echo {Hello
|                     | {{ssm:administratorName}}}",
|                     | "{{outputFormat}}" -f
|                     | "left","right","{{global:DATE}}","{{automation:EXECUTION_ID}}"
|                     | ]                                                                         |                                                                         |
|             |                                                                            |                                                                         |

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
</table>
| SSM parameter   | A variable defined within Parameter Store. It is not declared as a document parameter. It may require permissions to access. | `{   "description": "Run Command Demo",   "schemaVersion": "0.3",   "assumeRole": "arn:aws:iam::123456789012:role/roleName",   "parameters": {   "commands": {   "type": STRING_LIST,   "description": "list of commands to run as part of first step" },   "instanceIds": {   "type": STRING_LIST,   "description": "list of instances to run commands on" }   },   "mainSteps": [   {   "name": "runFixedCmds",   "action": "aws:runCommand",   "maxAttempts": 1,   "onFailure": "Continue",   "inputs": {   "DocumentName": "AWS-RunPowerShellScript",   "InstanceIds": [   "{LaunchInstance.InstanceIds}"   ],   "Parameters": {   "commands": [   "dir",   "date",   "echo {Hello {{ssm:administratorName}}},{{outputFormat}} -f "left","right","{{global:DATE}}","{{automation:EXECUTION_ID}}","{{global:TIME}}""   ]   }   }   }   ]   }"
### Supported Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Comments</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant ARN assumeRole at create</td>
<td>An authorization check is performed to verify that the calling user is permitted to pass the given assumeRole.</td>
<td>{ &quot;description&quot;: &quot;Test all Automation resolvable parameters&quot;, &quot;schemaVersion&quot;: &quot;0.3&quot;, &quot;assumeRole&quot;: &quot;arn:aws:iam::123456789012:role/roleName&quot;, &quot;parameters&quot;: { ...</td>
</tr>
<tr>
<td>Document parameter supplied for assumeRole at create</td>
<td>Must be defined in the parameter list of the document.</td>
<td>{ &quot;description&quot;: &quot;Test all Automation resolvable parameters&quot;, &quot;schemaVersion&quot;: &quot;0.3&quot;, &quot;assumeRole&quot;: &quot;{{dynamicARN}}&quot;, &quot;parameters&quot;: { ...</td>
</tr>
<tr>
<td>Value supplied for document parameter at start.</td>
<td>Customer supplies the value to use for a parameter. Any execution inputs supplied at start time need to be defined in the parameter list of the document.</td>
<td>... &quot;parameters&quot;: { &quot;amiId&quot;: { &quot;type&quot;: &quot;STRING&quot;, &quot;default&quot;: &quot;ami-7f2e6015&quot;, &quot;description&quot;: &quot;list of commands to run as part of first step&quot; }, ...</td>
</tr>
<tr>
<td>SSM parameter referenced within step definition</td>
<td>The variable exists within the customer's account and the assumeRole for the document has access to the variable. A check is performed at create time to confirm the assumeRole has access. SSM parameters do not need to be set in the parameter list of the document.</td>
<td>... &quot;mainSteps&quot;: [ { &quot;name&quot;: &quot;RunSomeCommands&quot;, &quot;action&quot;: &quot;aws:runCommand&quot;, &quot;maxAttempts&quot;: 1, &quot;onFailure&quot;: &quot;Continue&quot;, &quot;inputs&quot;: { &quot;DocumentName&quot;: &quot;AWS:RunPowerShell&quot;, &quot;InstanceIds&quot;: [&quot;{{LaunchInstance.InstanceIds}}&quot;], &quot;Parameters&quot;: { &quot;commands&quot; : [</td>
</tr>
</tbody>
</table>

---

289
<table>
<thead>
<tr>
<th>Scenario</th>
<th>Comments</th>
<th>Example</th>
</tr>
</thead>
</table>
| **System variable referenced within step definition** | A system variable is substituted into the document at execution time. The value injected into the document is relative to when the substitution occurs. That is, the value of a time variable injected at step 1 is different from the value injected at step 3 because of the time it takes to run the steps between. System variables do not need to be set in the parameter list of the document. | "echo {Hello \{ssm:administratorName\}}"  

...  

...  

...  

... |
| **Automation variable referenced within step definition** | Automation variables do not need to be set in the parameter list of the document. The only supported Automation variable is `automation:EXECUTION_ID`. | "mainSteps": [  

"name":  

"invokeLambdaFunction",  

"action":  

"aws:invokeLambdaFunction",  

"maxAttempts": 1,  

"onFailure":  

"Continue",  

"inputs": {  

"FunctionName":  

"Hello-World-LambdaFunction",  

"Payload":  

{"executionId":  

{"automation:EXECUTION_ID"}}"  

}  

}, ...
<table>
<thead>
<tr>
<th>Scenario</th>
<th>Comments</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to output from previous step within next step definition.</td>
<td>This is parameter redirection. The output of a previous step is referenced using the syntax <code>{stepName.OutputName}</code>). This syntax cannot be used by the customer for document parameters. This is resolved at the time of execution for the referring step. The parameter is not listed in the parameters of the document.</td>
<td>...</td>
</tr>
</tbody>
</table>

```
"mainSteps": [
  {
    "name": "LaunchInstance",
    "action": "aws:runInstances",
    "maxAttempts": 1,
    "onFailure": "Continue",
    "inputs": {
      "ImageId": "{{amiId}}",
      "MinInstanceCount": 1,
      "MaxInstanceCount": 2
    }
  },
  {
    "name": "changeState",
    "action": "aws:changeInstanceState",
    "maxAttempts": 1,
    "onFailure": "Continue",
    "inputs": {
      "InstanceIds": ["{{LaunchInstance.InstanceIds}}"],
      "DesiredState": "terminated"
    }
  }
]
```

Unsupported Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Comment</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSM Parameter supplied for assumeRole at create</td>
<td>Not supported.</td>
<td>...</td>
</tr>
</tbody>
</table>

```
{
  "description": "Test all Automation resolvable parameters",
  "schemaVersion": "0.3",
  "assumeRole": "{{ssm:administratorRoleARN}}",
  "parameters": {
...
```

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Comment</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable step definition</td>
<td>The definition of a step in the document is constructed by variables.</td>
<td>...</td>
</tr>
</tbody>
</table>

```
"mainSteps": [
  {
...
```


### Scenario | Comment | Example
---|---|---
"name": "LaunchInstance", "action": "aws:runInstances", "{{attemptModel}}": 1, "onFailure": "Continue", "inputs": { "ImageId": "ami-12345678", "MinInstanceCount": 1, "MaxInstanceCount": 2 } ...

User supplies input:
{ "attemptModel": "minAttempts" }

---
**Cross referencing document parameters**

The user supplies an input parameter at start time, which is a reference to another parameter in the document.

... "parameters": {
  "amiId": {
    "type": "STRING",
    "default": "ami-7f2e6015",
    "description": "list of commands to run as part of first step"
  },
  "otherAmiId": {
    "type": "STRING",
    "description": "The other amiId to try if this one fails".
  },
  "default": "{{amiId}}"
}, ...

...
### Scenario

Multi-level expansion

### Comment

The document defines a variable that evaluates to the name of a variable. This sits within the variable delimiters (that is `{ { } }`) and is expanded to the value of that variable/parameter.

### Example

```
...  
  "parameters": {  
    "param1": {  
      "type": "STRING",  
      "default": "param2",  
      "description": "The parameter to reference"  
    },  
    "param2": {  
      "type": "STRING",  
      "default": "echo {Hello world}",  
      "description": "What to run"  
    }  
  },  
  "mainSteps": [{  
    "name": "runFixedCmds",  
    "action": "aws:runCommand",  
    "maxAttempts": 1,  
    "onFailure": "Continue",  
    "inputs": {  
      "DocumentName": "AWS-RunPowerShellScript",  
      "InstanceId": "{{LaunchInstance.InstanceIds}}",  
      "Parameters": {  
        "commands": [ "{{ {{param1}} }}"]  
      }  
    }  
  }  
...  

Note: The customer intention here would be to run a runCommand of "echo {Hello world}"
### Scenario | Comment | Example
---|---|---
Referencing output from a document step that is a different variable type | The user references the output from a preceding document step within a subsequent step. The output is a variable type that does not meet the requirements of the action in the subsequent step. | ... 
mainSteps:
- name: getImageId
  action: aws:executeAwsApi
  inputs:
  Service: ec2
  Api: DescribeImages
  Filters:
  - Name: "name"
    Values:
    - "{{ ImageName }}"
  outputs:
  - Name: ImageIdList
    Selector: ".Images"
    Type: "StringList"
- name: copyMyImages
  action: aws:copyImage
  maxAttempts: 3
  onFailure: Abort
  inputs:
  SourceImageId:
  {{ getImageId.ImageIdList }}
  SourceRegion: ap-northeast-2
  ImageName: Encrypted
  Copies of LAMP base AMI in ap-northeast-2
  Encrypted: true
... 
Note: You must provide the type required by the Automation action. In this case, aws:copyImage requires a "String" type variable but the preceding step outputs a "StringList" type variable.

### Systems Manager Automation Document Details Reference

This section includes topics that describe each of the Systems Manager Automation documents that are owned by AWS and AWS Support. Each page provides an explanation of the required and optional parameters you can specify when using the document. Each page also lists the steps in the document and the output of the execution, if any.

You can view the JSON for these documents in the Systems Manager console.

2. In the navigation pane, choose Documents.
   - or -
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane.
3. Choose a document, and then choose View details.
4. Choose the Content tab.
Note
This section does not include a separate page for documents that require approval such as the AWS-CreateManagedLinuxInstanceWithApproval or AWS-StopEC2InstanceWithApproval document. Any document name that includes *WithApproval*, means the document includes the *aws:approve* (p. 246) action. This action temporarily pauses an Automation execution until designated principals either approve or reject the action. After the required number of approvals is reached, the Automation execution resumes.

Topics
- AWS.Support-ActivateWindowsWithAmazonLicense (p. 296)
- AWS-ASGEnterStandby (p. 298)
- AWS-ASGExitStandby (p. 299)
- AWS-AttachEBSVolume (p. 300)
- AWS-AttachIAMToInstance (p. 301)
- AWS-ConfigureCloudWatchOnEC2Instance (p. 303)
- AWS-ConfigureS3BucketLogging (p. 304)
- AWS-ConfigureS3BucketVersioning (p. 306)
- AWS-CopySnapshot (p. 307)
- AWSEC2-CloneInstanceAndUpgradeWindows (p. 308)
- AWSEC2-CloneInstanceAndUpgradeSQLServer (p. 310)
- AWS-CreateDynamoDBBackup (p. 312)
- AWS-CreateImage (p. 313)
- AWS-CreateJiraIssue (p. 314)
- AWS-CreateManagedLinuxInstance (p. 316)
- AWS-CreateManagedWindowsInstance (p. 318)
- AWS-CreateSnapshot (p. 320)
- AWS-DeleteCloudFormationStack (p. 321)
- AWS-DeleteDynamoDBBackup (p. 322)
- AWS-DeleteDynamoDBTableBackups (p. 323)
- AWS-DeleteEBSVolumeSnapshots (p. 324)
- AWS-DeleteImage (p. 325)
- AWS-DeleteSnapshot (p. 326)
- AWS-DetachEBSVolume (p. 327)
- AWS-DisablePublicAccessForSecurityGroup (p. 328)
- AWS-Disables3BucketPublicReadWrite (p. 329)
- AWS-EnableCloudTrail (p. 330)
- AWS-Enables3BucketEncryption (p. 331)
- AWSSupport-ExecuteEC2Rescue (p. 332)
- AWSSupport-GrantPermissionsToIAMUser (p. 334)
- AWSSupport-ManageRDPSettings (p. 338)
- AWSSupport-ManageWindowsService (p. 340)
- AWS-PatchASGInstance (p. 342)
- AWS-PatchInstanceWithRollback (p. 343)
- AWS-PublishSNSNotification (p. 345)
- AWS-RebootRDSInstance (p. 346)
- AWSSupport-ResetAccess (p. 347)
AWSSupport-ActivateWindowsWithAmazonLicense

Description

The AWSSupport-ActivateWindowsWithAmazonLicense automation document activates an Amazon EC2 Windows Server instance with a license provided by Amazon by contacting SSM Agent installed on your managed instance. Optionally, you can remediate Windows activation offline, which requires a stop and start of your EC2 instance. If Windows is not activated, the document verifies, and when needed repairs, the Windows route table (route to Amazon KMS servers), the KMS settings (server and port), and attempts to activate Windows. Note: this document cannot be used on Bring Your Own License (BYOL) Windows instances. For information about using your own license, see Microsoft Licensing on AWS.

Document Type

Automation

Owner

Amazon

Platforms

Windows

Parameters

• InstanceId
  Type: String
Description: (Required) ID of your EC2 Windows managed instance.

• ForceActivation

  Type: String

  Allowed values: True, False

  Default: False

Description: (Optional) Set it to True if you want to proceed even if Windows is already activated.

• AllowOffline

  Type: String

  Allowed values: True, False

  Default: False

Description: (Optional) Set it to true if you allow an offline Windows activation remediation in case the online troubleshooting fails, or the provided instance is not a managed instance. Note: The offline method requires the provided EC2 instance be stopped and then started. Data stored in instance store volumes will be lost. The public IP address will change if you are not using an Elastic IP.

• SubnetId

  Type: String

  Default: CreateNewVPC

Description: (Optional) Offline only - The subnet ID for the EC2Rescue instance used to perform the offline troubleshooting. Use SelectedInstanceSubnet to use the same subnet as your instance, or CreateNewVPC to create a new VPC. IMPORTANT: The subnet must be in the same Availability Zone as InstanceId, and it must allow access to the SSM endpoints.

• AutomationAssumeRole

  Type: String

  Description: (Optional) The IAM role for this execution. If no role is specified, AWS Systems Manager Automation will use the permissions of the user that runs this document.

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWSSupportActivateWindowsWithAmazonLicense --parameters "InstanceId=INSTANCEID"
```

Send the command with ForceActivation = True

```
aws ssm start-automation-execution --document-name AWSSupportActivateWindowsWithAmazonLicense --parameters "InstanceId=INSTANCEID,ForceActivation=True"
```

Send the command with AllowOffline = True

```
aws ssm start-automation-execution --document-name AWSSupportActivateWindowsWithAmazonLicense --parameters "InstanceId=INSTANCEID,AllowOffline=True"
```
Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Required IAM Permissions

It is recommended that the EC2 instance receiving the command has an IAM role with the AmazonSSMManagedInstanceCore Amazon managed policy attached. You must have at least ssm:ExecuteAutomation and ssm:SendCommand to run the automation and send the command to the instance, plus ssm:GetAutomationExecution to be able to read the automation output. For the offline remediation, see the permissions needed by AWSSupport-StartEC2RescueWorkflow.

Document Steps

1. aws:assertAwsResourceProperty - Check the provided instance's platform is Windows.
2. aws:assertAwsResourceProperty - Confirm the provided instance is a managed instance
   a. (Online activation fix) If the input instance is a managed instance, then run aws:runCommand to run the PowerShell script to attempt to fix Windows activation.
   b. (Offline activation fix) If the input instance is not a managed instance:
      i. aws:assertAwsResourceProperty - Verifies the AllowOffline flag is set to True. If so, the offline fix starts, otherwise the workflow ends.
      ii. aws:executeAutomation - Invoke AWSSupport-StartEC2RescueWorkflow with the Windows activation offline fix script. The script leverages EC2Config or EC2Launch depending on the OS version.
      iii. aws:executeAwsApi - Read the result from AWSSupport-StartEC2RescueWorkflow.

Outputs

activateWindows.Output
getActivateWindowsOfflineResult.Output

AWS-ASGEnterStandby

Description

Change the standby state of an Amazon EC2 instance in an Auto Scaling group.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- AutomationAssumeRole
  Type: String
Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- InstanceId
  
  Type: String
  
  Description: (Required) ID of an Amazon EC2 instance for which you want to change the standby state within an Auto Scaling group.

- LambdaRoleArn
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-ASGEnterStandby --parameters "parameters"
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

- aws:createStack
- aws:invokeLambdaFunction
- aws:deleteStack

Outputs

None

AWS-ASGExitStandby

Description

Change the standby state of an Amazon EC2 instance in an Auto Scaling group.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux
Parameters

- **AutomationAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- **InstanceId**
  
  Type: String
  
  Description: (Required) ID of an Amazon EC2 instance for which you want to change the standby state within an Auto Scaling group.

- **LambdaRoleArn**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-ASGExitStandby --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

- `aws:createStack`
- `aws:invokeLambdaFunction`
- `aws:deleteStack`

Outputs

None

**AWS-AttachEBSVolume**

Description

Attach an Amazon Elastic Block Store (Amazon EBS) volume to an Amazon EC2 instance.

Document Type

Automation

Owner

Amazon
Platforms
Windows, Linux

Parameters
• AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
• Device
  Type: String
  Description: (Required) The device name (for example, /dev/sdh or xvdh ).
• InstanceId
  Type: String
  Description: (Required) The ID of the instance where you want to attach the volume.
• VolumeId
  Type: String
  Description: (Required) The ID of the Amazon EBS volume. The volume and instance must be in the same Availability Zone.

Examples
Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-AttachEBSVolume --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps
aws:createStack
aws:deleteStack

Outputs
None

AWS-AttachIAMToInstance

Description
Attach an AWS Identity and Access Management (IAM) role to a managed instance.

Document Type
Automation

Owner
Amazon

Platforms
Windows, Linux

Parameters

• AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

• InstanceId
  Type: String
  Description: (Required) The ID of the instance on which you want to assign an IAM role.

• RoleName
  Type: String
  Description: (Required) The IAM role name to add to the managed instance.

• ForceReplace
  Type: Boolean
  Description: (Optional) Flag to specify whether to replace the existing IAM profile or not.
  Default: true

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWS-AttachIAMToInstance --
parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --
query 'AutomationExecution.Output'
```

Document Steps

1. aws:executeAwsApi - DescribeInstanceProfile - Find the IAM instance profile attached to the Amazon EC2 instance.
2. aws:branch - CheckInstanceProfileAssociations - Check the IAM instance profile attached to the Amazon EC2 instance.
   a. If an IAM instance profile is attached and ForceReplace is set to true:
      i. aws:executeAwsApi - DisassociateIamInstanceProfile - Disassociate the IAM instance profile from the Amazon EC2 instance.
b. `aws:executeAwsApi - ListInstanceProfilesForRole` - List instance profiles for the IAM role provided.

c. `aws:branch - CheckInstanceProfileCreated` - Check if the IAM role provided has an associated instance profile.

i. If the IAM role has an associated instance profile:
   A. `aws:executeAwsApi - AttachIAMProfileToInstance` - Attach the IAM instance profile role to the Amazon EC2 instance.

i. If the IAM role does not have an associated instance profile:
   A. `aws:executeAwsApi - CreateInstanceProfileForRole` - Create an instance profile role for the specified IAM role.
   B. `aws:executeAwsApi - AddRoleToInstanceProfile` - Attach the instance profile role to the specified IAM role.
   C. `aws:executeAwsApi - GetInstanceProfile` - Get the instance profile data for the specified IAM role.
   D. `aws:executeAwsApi - AttachIAMProfileToInstanceWithRetry` - Attach the IAM instance profile role to the Amazon EC2 instance.

**Outputs**

AttachIAMProfileToInstanceWithRetry.AssociationId

GetInstanceProfile.InstanceProfileName

GetInstanceProfile.InstanceProfileArn

AttachIAMProfileToInstance.AssociationId

ListInstanceProfilesForRole.InstanceProfileName

ListInstanceProfilesForRole.InstanceProfileArn

**AWS-ConfigureCloudWatchOnEC2Instance**

**Description**

Configure Amazon CloudWatch on a managed instance.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- **AutomationAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
  
- **InstanceId**
Type: String
Description: (Required) The ID of the managed that you want to configure to use CloudWatch.

- LambdaAssumeRole
  Type: String
  Description: (Optional) The ARN of the role assumed by Lambda.

- properties
  Type: String
  Description: (Optional) The configuration for CloudWatch in JSON format.

- status
  Allowed values: Enabled, Disabled
  Default: Enabled
  Description: (Optional) Specifies whether to enable or disable CloudWatch. Valid values: "Enabled" | "Disabled".

Examples
Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-ConfigureCloudWatchOnEC2Instance --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --
query 'AutomationExecution.Output'
```

Document Steps

- aws:createStack
- aws:invokeLambdaFunction
- aws:deleteStack

Outputs

None

AWS-ConfigureS3BucketLogging

Description

Enable logging on an Amazon Simple Storage Service (Amazon S3) bucket.

Document Type

Automation

Owner
Amazon

Platforms
Windows, Linux

Parameters

- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
- BucketName
  Type: String
  Description: (Required) The name of the Amazon S3 Bucket for which you want to configure logging.
- GrantedPermission
  Type: String
  Allowed values: FULL_CONTROL, READ, WRITE
  Description: (Required) Logging permissions assigned to the grantee for the bucket.
- GranteeEmailAddress
  Type: String
  (Optional) Email address of the grantee.
- GranteeId
  Type: String
  Description: (Optional) The canonical user ID of the grantee.
- GranteeType
  Type: String
  Allowed values: CanonicalUser, AmazonCustomerByEmail, Group
  Description: (Required) Type of grantee.
- GranteeUri
  Type: String
  Description: (Optional) URI of the grantee group.
- TargetBucket
  Type: String
  Description: (Required) Specifies the bucket where you want Amazon S3 to store server access logs. You can have your logs delivered to any bucket that you own. You can also configure multiple buckets to deliver their logs to the same target bucket. In this case you should choose a different TargetPrefix for each source bucket so that the delivered log files can be distinguished by key.
- TargetPrefix
  Type: String
Default: /

Description: (Optional) Specifies a prefix for the keys under which the log files will be stored.

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWS-ConfigureS3BucketLogging --parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

```
aws:executeAwsApi
aws:executeAwsApi
aws:executeAwsApi
aws:executeAwsApi
aws:sleep
```

Outputs

None

AWS-ConfigureS3BucketVersioning

Description

Configure versioning for an Amazon Simple Storage Service (Amazon S3) bucket.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- **AutomationAssumeRole**
  
  Type: String

  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- **BucketName**
Type: String

Description: (Required) The name of the S3 Bucket whose encryption configuration will be managed.

- VersioningState
  
  Type: String

  Allowed values: Enabled, Suspended

  Default: Enabled

  Description: (Optional) Applied to the VersioningConfiguration.Status. When set to 'Enabled', this process enables versioning for the objects in the bucket, all objects added to the bucket receive a unique version ID. When set to 'Suspended', this process disables versioning for the objects in the bucket. All objects added to the bucket receive the version ID null.

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-ConfigureS3BucketVersioning --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

- `aws:executeAwsApi`

Outputs

None

AWS-CopySnapshot

Description

Copy a snapshot of an Amazon Elastic Block Store (Amazon EBS) volume.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- AutomationAssumeRole
Type: String
Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- Description
  Type: String
  Description: (Optional) A description for the Amazon EBS snapshot.

- LambdaAssumeRole
  Type: String
  Description: (Optional) The ARN of the role assumed by Lambda.

- SnapshotId
  Type: String
  Description: (Required) The ID of the Amazon EBS snapshot to copy.

- SourceRegion
  Type: String
  Description: (Required) The region where the source snapshot currently exists.

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWS-CopySnapshot --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps
- aws:createStack
- aws:invokeLambdaFunction
- aws:deleteStack

Outputs
- copySnapshot.Payload

AWSSEC2-CloneInstanceAndUpgradeWindows

Description

Create an Amazon Machine Image (AMI) from a Windows Server 2008 R2 instance, and then upgrade the AMI to Windows Server 2012 R2. The upgrade operation is a multi-step process that can take 2 hours to complete. The automation creates an AMI from the instance and then launches the newly created AMI in the VPC/Subnet you provide. The Automation workflow performs an in-place upgrade from
Windows Server 2008 R2 to Windows server 2012 R2. The workflow also updates or installs the AWS drivers required by the upgraded instance. After the upgrade, the workflow creates a new AMI and then terminates the upgraded instance.

You can test application functionality by launching the new AMI in your VPC. After you finish testing, and before you perform another upgrade, schedule application downtime before completely switching over to the upgraded instance.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows

**Prerequisites**

- Verify that SSM Agent is installed on your instance. For more information, see Installing and Configuring SSM Agent on Windows Instances (p. 65).
- The subnet ID specified must be a public subnet with the auto-assign public IPv4 address set to true. For more information, see Modifying the Public IPv4 Addressing Attribute for Your Subnet in the Amazon VPC User Guide.
- This Automation works only with Windows Server 2008 R2 instances.
- This Automation works only on instances with an unencrypted EBS root volume. If the specified instance has an encrypted root volume, the Automation workflow fails.
- Configure the Windows Server 2008 R2 instance with an AWS Identity and Access Management (IAM) instance profile role. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).
- Verify that the instance has 20 GB of free disk space in the boot disk.
- If the instance does not use an AWS-provided Windows license, then specify an EBS Snapshot ID that includes Windows Server 2012 R2 installation media. To do this:
  - Verify that the Amazon EC2 instance is running Windows Server 2012 or later.
  - Create a 6 GB EBS volume in the same Availability Zone where the instance is running. Attach the volume to the instance. Mount it, for example, as drive D.
  - Right-click the ISO and mount it to an instance as, for example, drive E.
  - Copy the content of the ISO from drive E:\ to drive D:\
  - Create an EBS snapshot of the 6 GB volume created in step 2 above.

**Limitations**

This Automation doesn't support upgrading Windows domain controllers, clusters, or Windows workstations. This Automation also doesn't support Windows instances with the following roles installed.

- Remote Desktop Session Host (RDSH)
- Remote Desktop Connection Broker (RDCB)
- Remote Desktop Virtualization Host (RDVH)
- Remote Desktop Web Access (RDWA)

**Parameters**
• Instanceld

Type: String

Description: (Required) The instance running Windows Server 2008 R2.

• IamInstanceProfile

Type: String

Description: (Required) The name of the IAM instance profile that enables Systems Manager to manage the instance.

• SubnetId

Type: String

Description: (Required) Provide a subnet for the upgrade process. Verify that the subnet has outbound connectivity to AWS services, Amazon S3, and Microsoft (to download patches).

• BYOLWindowsMediaSnapshotId

Type: String

Description: (Optional) The ID of the Amazon EBS snapshot to copy that includes Windows Server 2012 R2 installation media. Required only if you are upgrading a BYOL instance.

• KeepPreUpgradeImageBackUp

Type: String

Description: (Optional) If set True, the Automation doesn't delete the AMI created from the instance before the upgrade. If set to True, then you must delete the AMI. By default, the AMI is deleted.

• RebootInstanceBeforeTakingImage

Type: String

Description: (Optional) If set True, the Automation reboots the instance before creating a pre-upgrade AMI. By default, the Automation doesn't reboot before upgrade.

AWSEC2-CloneInstanceAndUpgradeSQLServer

Description

Create an AMI from an Amazon EC2 Windows instance running SQL Server 2008 (or later), and then upgrade the AMI to SQL Server 2016. The upgrade is a multi-step process that can take 2 hours to complete. The Automation creates the AMI from the instance, and then launches the new AMI in the subnet that you provide. The Automation then performs an in-place upgrade of SQL Server 2008 (or later) to SQL Server 2016. After the upgrade, the Automation creates a new AMI before terminating the upgraded instance.

You can test application functionality by launching the new AMI in your VPC. After you finish testing, and before you perform another upgrade, schedule application downtime before completely switching over to the upgraded instance.

Note

If you want to modify the computer name of the EC2 instance launched from the new AMI, see Rename a Computer that Hosts a Stand-Alone Instance of SQL Server.

Document Type

Automation
Prerequisites

• The Amazon EC2 instance must use a version of Windows Server that is Windows Server 2008 R2 (or later) and SQL Server 2008 (or later).
• Verify that SSM Agent is installed on your instance. For more information, see Installing and Configuring SSM Agent on Windows Instances (p. 65).
• Configure the instance to use an AWS Identity and Access Management (IAM) instance profile role. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).
• Verify that the instance has 20 GB of free disk space in the instance boot disk.
• For instances that use a Bring Your Own License (BYOL) SQL Server version, the following additional prerequisites apply:
  • Provide an EBS snapshot ID that includes SQL Server 2016 installation media. To do this:
    1. Verify that the Amazon EC2 instance is running Windows Server 2008 R2 or later.
    2. Create a 6 GB EBS volume in the same Availability Zone where the instance is running. Attach the volume to the instance. Mount it, for example, as drive D.
    3. Right-click the ISO and mount it to an instance as, for example, drive E.
    4. Copy the content of the ISO from drive E:\ to drive D:\
    5. Create an EBS snapshot of the 6 GB volume created in step 2.

Limitations

• The upgrade can only be performed on a SQL Server using Windows authentication.
• Verify that no security patch updates are pending on the instances. Open Control Panel, then choose Check for updates.
• SQL Server deployments in HA and mirroring mode are not supported.

Parameters

• InstanceId
  Type: String
  Description: (Required) The instance running Windows Server 2008 R2 (or later) and SQL Server 2008 (or later).
• IamInstanceId
  Type: String
  Description: (Required) The IAM instance profile.
• SubnetId
  Type: String
  Description: (Required) Provide a subnet for the upgrade process. Verify that the subnet has outbound connectivity to AWS services, Amazon S3, and Microsoft (to download patches).
• SQLServerSnapshotId

  Type: String

  Description: (Conditional) Snapshot ID for SQL Server 2016 installation media. This parameter is required for instances that use a BYOL SQL Server version. This parameter is optional for SQL Server license-included instances (instances launched using an AWS provided Amazon Machine Image for Windows Server with Microsoft SQL Server).

• KeepPreUpgradeImageBackUp

  Type: String

  Description: (Optional) If set to True, the Automation doesn't delete the AMI created from the instance before the upgrade. If set to True, then you must delete the AMI. By default, the AMI is deleted.

• RebootInstanceBeforeTakingImage

  Type: String

  Description: (Optional) If set to True, the Automation reboots the instance before creating a pre-upgrade AMI. By default, the Automation doesn't reboot before upgrade.

Outputs

AMIIId: The ID of the AMI created from the instance that was upgraded to SQL Server 2016

AWS-CreateDynamoDBBackup

Description

Create a backup of an Amazon DynamoDB table.

Document Type

Automation

Owner

Amazon

Platforms

This document is not restricted to specific operating system.

Parameters

• AutomationAssumeRole

  Type: String

  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

• BackupName

  Type: String

  Description: (Required) Name of the backup to create.

• LambdaAssumeRole

  Type: String
Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.

- **TableName**
  
  **Type:** String
  
  **Description:** (Required) Name of the DynamoDB table.

**Examples**

Start the automation

```
aws ssm start-automation-execution --document-name AWS-CreateDynamoDbBackup --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Document Steps**

- `aws:createStack`
- `aws:invokeLambdaFunction`
- `aws:invokeLambdaFunction`
- `aws:deleteStack`

**Outputs**

- `createDynamoDbBackup.Payload`

**AWS-CreateImage**

**Description**

Create a new Amazon Machine Image (AMI) from an Amazon EC2 instance.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

- **AutomationAssumeRole**
  
  **Type:** String
Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- InstanceId
  Type: String
  Description: (Required) The ID of the Amazon EC2 instance.

- NoReboot
  Type: Boolean
  Description: (Optional) Do not reboot the instance before creating the image.

**Examples**

Start the automation

```
aws ssm start-automation-execution --document-name AWS-CreateImage --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Document Steps**

```
aws:createImage
```

**Outputs**

```
createdImage.ImageId
```

**AWS-CreateJiraIssue**

**Description**

Create an issue in Jira.

**Document Type**

Automation

**Owner**

Amazon

**Platform(s)**

Windows, Linux

**Parameters**

- IssueDescription
  Type: String
Description: (Required) A detailed description of the issue.

• IssueSummary
  Type: String
  Description: (Required) A brief summary of the issue.

• IssueTypeName
  Type: String
  Description: (Required) The name of the type of issue you want to create (for example, Task, Sub-task, Bug, etc.).

• JiraURL
  Type: String
  Description: (Required) The url of the Jira instance.

• JiraUsername
  Type: String
  Description: (Required) The name of the user the issue will be created with.

• ProjectKey
  Type: String
  Description: (Required) The key of the project the issue should be created in.

• SSMPParameterName
  Type: String
  Description: (Required) The name of an encrypted SSM Parameter containing the API key or password for the Jira user.

• AssigneeName
  Type: String
  Description: (Optional) The username of the person the issue should be assigned to.

• DueDate
  Type: String
  Description: (Optional) The due date for the issue in yyyy-mm-dd format.

• PriorityName
  Type: String
  Description: (Optional) The name of the priority of the issue.

Examples

Start the automation

aws ssm start-automation-execution --document-name AWS-CreateJiraIssue --parameters parameters
Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Document Steps**

- **aws:createStack** - Create CloudFormation stack to create Lambda IAM role and function.
- **aws:invokeLambdaFunction** - Invoke Lambda function to create the Jira issue
- **aws:deleteStack** - Delete the CloudFormation stack created.

**Outputs**

- **IssueId**: ID of the newly created Jira issue

**AWS-CreateManagedLinuxInstance**

**Description**

Create an Amazon EC2 Linux instance that is configured for Systems Manager.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- **AmiId**
  
  Type: String  
  
  Description: (Required) AMI ID to use for launching the instance.

- **AutomationAssumeRole**
  
  Type: String  
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf

- **GroupName**
  
  Type: String  
  
  Default: SSMSecurityGroupForLinuxInstances  
  
  Description: (Required) Security group name to create.

- **InstanceType**
  
  Type: String
Default: t2.medium

Description: (Required) Type of instance to launch. Default is t2.medium.

- **KeyPairName**
  
  Type: String
  
  Description: (Required) Key pair to use when creating instance.

- **RemoteAccessCidr**
  
  Type: String
  
  Default: 0.0.0.0/0
  
  Description: (Required) Creates Security group with port for SSH(Port range 22) open to IPs specified by CIDR (default is 0.0.0.0/0). If the security group already exists it will not be modified and rules will not be changed.

- **RoleName**
  
  Type: String
  
  Default: SSMManagedInstanceProfileRole
  
  Description: (Required) Role name to create.

- **StackName**
  
  Type: String
  
  Default: CreateManagedInstanceStack{{automation:EXECUTION_ID}}
  
  Description: (Optional) Specify stack name used by this document

- **SubnetId**
  
  Type: String
  
  Default: Default
  
  Description: (Required) New instance will be deployed into this subnet or in the default subnet if not specified.

- **VpcId**
  
  Type: String
  
  Default: Default
  
  Description: (Required) New instance will be deployed into this Amazon Virtual Private Cloud (Amazon VPC) or in the default Amazon VPC if not specified.

**Examples**

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-CreateManagedLinuxInstance --parameters parameters
```

Retrieve the execution output
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'

**Document Steps**

aws:createStack
aws:deleteStack

**Outputs**

None

**AWS-CreateManagedWindowsInstance**

**Description**

Create an Amazon EC2 Windows instance that is configured for Systems Manager.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- **AmiId**
  
  Type: String
  
  Default: {{ssm:/aws/service/ami-windows-latest/Windows_Server-2016-English-Full-Base}}
  
  Description: (Required) AMI ID to use for launching the instance.

- **AutomationAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf

- **GroupName**
  
  Type: String
  
  Default: SSMSecurityGroupForLinuxInstances
  
  Description: (Required) Security group name to create.

- **InstanceType**
  
  Type: String
  
  Default: t2.medium
Description: (Required) Type of instance to launch. Default is t2.medium.

- **KeyPairName**
  
  Type: String
  
  Description: (Required) Key pair to use when creating instance.

- **RemoteAccessCidr**
  
  Type: String
  
  Default: 0.0.0.0/0
  
  Description: (Required) Creates security group with port for RDP (Port range 3389) open to IPs specified by CIDR (default is 0.0.0.0/0). If the security group already exists it will not be modified and rules will not be changed.

- **RoleName**
  
  Type: String
  
  Default: SSMMangedInstanceProfileRole
  
  Description: (Required) Role name to create.

- **StackName**
  
  Type: String
  
  Default: CreateManagedInstanceStack{{automation:EXECUTION_ID}}
  
  Description: (Optional) Specify stack name used by this document.

- **SubnetId**
  
  Type: String
  
  Default: Default
  
  Description: (Optional) Specify subnet to use for this instance.

- **VpcId**
  
  Type: String
  
  Default: Default
  
  Description: (Optional) Specify VPC to use for this instance.

**Examples**

Start the automation

```bash/aws ssm start-automation-execution --document-name AWS-CreateManagedWindowsInstance --parameters parameters```

Retrieve the execution output
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'

**Document Steps**

aws:createStack  
aws:deleteStack  

**Outputs**

None  

**AWS-CreateSnapshot**

**Description**

Create a snapshot of an Amazon EBS volume.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- **AutomationAssumeRole**  
  Type: String  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- **Description**  
  Type: String  
  Description: (Optional) A description for the snapshot

- **VolumeId**  
  Type: String  
  Description: (Required) The ID of the volume.

**Examples**

Start the automation

```
aws ssm start-automation-execution --document-name AWS-CreateSnapshot -- parameters parameters
```

Retrieve the execution output
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'

**Document Steps**

aws:executeAwsApi

aws:waitForAwsResourceProperty

**Outputs**

createSnapshot.Payload

**AWS-DeleteCloudFormationStack**

**Description**

Delete an AWS CloudFormation stack.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- AutomationAssumeRole
  
  Type: String

  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- StackNameOrId
  
  Type: String

  Description: (Required) Name or Unique ID of the CloudFormation stack to be deleted

**Examples**

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-DeleteCloudFormationStack --parameters
```

Retrieve the execution output
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'

**Document Steps**

aws:deleteStack

**Outputs**

None

**AWS-DeleteDynamoDBBackup**

**Description**

Delete the backup of an Amazon DynamoDB table.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- AutomationAssumeRole
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- BackupArn
  
  Type: String
  
  Description: (Required) ARN of the DynamoDB table backup to delete.

**Examples**

Start the automation

aws ssm start-automation-execution --document-name AWS-DeleteDynamoDbBackup --parameters

Retrieve the execution output

aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'

**Document Steps**
aws:executeAwsApi

Outputs
None

AWS-DeleteDynamoDBTableBackups

Description
Delete DynamoDB table backups based on retention days or count.

Document Type
Automation

Owner
Amazon

Platforms
Windows, Linux

Parameters
- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
- LambdaAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.
- RetentionCount
  Type: String
  Default: 10
  Description: (Optional) The number of backups to retain for the table. If more than the specified number of backup exist, the oldest backups beyond that number are deleted. Either RetentionCount or RetentionDays can be used, not both.
- RetentionDays
  Type: String
  Description: (Optional) The number of days to retain backups for the table. Backups older than the specified number of days are deleted. Either RetentionCount or RetentionDays can be used, not both.
- TableName
  Type: String
  Description: (Required) Name of the DynamoDB table.

Examples
Start the automation

```
aws ssm start-automation-execution --document-name AWS-DeleteDynamoDbTableBackups --
parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --
query 'AutomationExecution.Output'
```

**Document Steps**

- `aws:createStack`
- `aws:invokeLambdaFunction`
- `aws:deleteStack`

**Outputs**

- `deleteDynamoDbTableBackups.Payload`

**AWS-DeleteEBSVolumeSnapshots**

**Description**

Delete a snapshot of an Amazon Elastic Block Store (Amazon EBS) volume.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- **AutomationAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- **LambdaAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.

- **RetentionCount**
  
  Type: String
Default: 10

Description: (Optional) Number of snapshots to keep for the volume. Either RetentionCount or RetentionDays should be mentioned, not both.

- RetentionDays
  
  Type: String
  
  Description: (Optional) Number of days to keep snapshots for the volume. Either RetentionCount or RetentionDays should be mentioned, not both

- VolumeId
  
  Type: String
  
  Description: (Required) The volume identifier to delete snapshots for.

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-DeleteEbsVolumeSnapshots --parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

- aws:createStack
- aws:invokeLambdaFunction
- aws:deleteStack

Outputs

- deleteVolumeSnapshots.Payload

AWS-DeleteImage

Description

Delete an Amazon Machine Image (AMI) and all associated snapshots.

Document Type

Automation

Owner

Amazon

Platforms
Parameters

- AutomationAssumeRole
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
- ImageId
  
  Type: String
  
  Description: (Required) The ID of the AMI.

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWS-DeleteImage --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

aws:deleteImage

Outputs

None

AWS-DeleteSnapshot

Description

Delete a snapshot of an Amazon EBS volume.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- AutomationAssumeRole
Type: String
Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- SnapshotId
  Type: String
  Description: (Required) The ID of the EBS snapshot.

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-DeleteSnapshot --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

aws:executeAwsApi

Outputs

None

AWS-DetachEBSVolume

Description

Detach an Amazon EBS volume from an Amazon EC2 instance.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
• LambdaAssumeRole
  Type: String
  Description: (Optional) The ARN of the role assumed by Lambda
• VolumeId
  Type: String
  Description: (Required) The ID of the EBS volume. The volume and instance must be within the same Availability Zone

Examples
Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-DetachEBSVolume --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps
aws:createStack
aws:invokeLambdaFunction
aws:deleteStack

Outputs
detachVolume.LogResult

AWS-DisablePublicAccessForSecurityGroup

Description
This document disables default SSH and RDP ports that are opened to all IP addresses.

Important
This document fails with an "InvalidPermission.NotFound" error for security groups that meet both of the following criteria: 1) The security group is located in a non-default VPC; and 2) The inbound rules for the security group don't specify open ports using all four of the following patterns:

- 0.0.0.0/0
- ::/0
- SSH or RDP port + 0.0.0.0/0
- SSH or RDP port + ::/0

If the security group is located in a non-default VPC and, for example, specifies open ports using only the SSH or RDP port + 0.0.0.0/0 format, then the document fails to run.
**Document Type**
Automation

**Owner**
Amazon

**Platform(s)**
Windows, Linux

**Parameters**
- **GroupId**
  Type: String
  Description: (Required) The ID of the security group for which the ports should be disabled.
- **IpAddressToBlock**
  Type: String
  Description: (Optional) Additional IPv4 addresses from which access should be blocked, in the format 1.2.3.4/32.
- **AutomationAssumeRole**
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

**Examples**
Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-DisablePublicAccessForSecurityGroup --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Outputs**
None

**AWS-Disables3BucketPublicReadWrite**

**Description**
Use Amazon Simple Storage Service (Amazon S3) Block Public Access to disable read and write access for a public Amazon S3 bucket. For more information, see [Using Amazon S3 Block Public Access](https://docs.aws.amazon.com/AmazonS3/latest/userguide/public-access-block.html) in the *Amazon Simple Storage Service Developer Guide*. 
Automation

Owner
Amazon

Platforms
Windows, Linux

Parameters
- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
- S3BucketName
  Type: String
  Description: (Required) Amazon S3 bucket on which you want to restrict access.

Examples
Start the automation

```
aws ssm start-automation-execution --document-name AWS-DisableS3BucketPublicReadWrite --parameters <parameters>
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps
aws:executeAwsApi

Outputs
None

AWS-EnableCloudTrail

Description
Create an AWS CloudTrail trail and configure logging to an Amazon S3 bucket.

Document Type
Automation

Owner
Amazon

Platform(s)
Windows, Linux

Parameters

- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- S3BucketName
  Type: String
  Description: (Required) Name of the Amazon S3 bucket designated for publishing log files.

  Note
  The S3 bucket must exist and the bucket policy must grant CloudTrail permission to write to it. For information, see Amazon S3 Bucket Policy for CloudTrail.

- TrailName
  Type: String
  Description: (Required) The name of the new trail.

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-EnableCloudTrail --parameters TrailName=TrailName,S3BucketName=s3bucketname,AutomationAssumeRole=arn:aws:iam::123456789012:role/AutomationRole
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

aws:executeAwsApi - cloudtrail:CreateTrail

Outputs

None

AWS-Enables3BucketEncryption

Description

Enable encryption for an Amazon Simple Storage Service (Amazon S3) bucket (encrypt the contents of the bucket).
**Document Type**
Automation

**Owner**
Amazon

**Platforms**
Windows, Linux

**Parameters**

- **AutomationAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- **BucketName**
  
  Type: String
  
  Description: (Required) The name of the Amazon S3 bucket where you want to encrypt the contents.

- **SSEAlgorithm**
  
  Type: String
  
  Default: AES256
  
  Description: (Optional) Server-side encryption algorithm to use for the default encryption.

**Examples**

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-EnableS3BucketEncryption --parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Document Steps**
aws:executeAwsApi

**Outputs**
None

**Description**
This document will use the EC2Rescue tool to troubleshoot and where possible repair common connectivity issues with the specified EC2 instance (Windows or Linux).

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- **UnreachableInstanceId**
  
  **Type:** String
  
  **Description:** (Required) ID of your unreachable EC2 instance. IMPORTANT: AWS Systems Manager Automation stops this instance, and creates an AMI before attempting any operations. Data stored in instance store volumes will be lost. The public IP address will change if you are not using an Elastic IP.

- **SubnetId**
  
  **Type:** String
  
  **Default:** CreateNewVPC
  
  **Description:** (Optional) The subnet ID for the EC2Rescue instance. By default, AWS Systems Manager Automation creates a new VPC. Alternatively, Use SelectedInstanceSubnet to use the same subnet as your instance, or specify a custom subnet ID. IMPORTANT: The subnet must be in the same Availability Zone as UnreachableInstanceId, and it must allow access to the SSM endpoints.

- **EC2RescueInstanceType**
  
  **Type:** String
  
  **Allowed values:** t2.small, t2.medium, t2.large
  
  **Default:** t2.small
  
  **Description:** (Required) The EC2 instance type for the EC2Rescue instance. Recommended size: t2.small.

- **LogDestination**
  
  **Type:** String
  
  **Description:** (Optional) S3 bucket name in your account where you want to upload the troubleshooting logs. Make sure the bucket policy does not grant unnecessary read/write permissions to parties that do not need access to the collected logs.

- **AssumeRole**
  
  **Type:** String
  
  **Description:** (Optional) The IAM role for this execution. If no role is specified, AWS Systems Manager Automation will use your IAM permissions to run this document.
EC2Rescue an instance

```bash
aws ssm start-automation-execution --document-name AWSSupport-ExecuteEC2Rescue --parameters
'UnreachableInstanceId=INSTANCEID'
```

EC2Rescue an instance and use the current instance subnet for the EC2Rescue instance

```bash
aws ssm start-automation-execution --document-name AWSSupport-ExecuteEC2Rescue --parameters
'UnreachableInstanceId=INSTANCEID,SubnetId=SelectedInstanceSubnet'
```

EC2Rescue an instance and use a custom subnet for the EC2Rescue instance

```bash
aws ssm start-automation-execution --document-name AWSSupport-ExecuteEC2Rescue --parameters
'UnreachableInstanceId=INSTANCEID,SubnetId=SUBNETID'
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --
query 'AutomationExecution.Output'
```

**Required IAM Permissions**

You must have at least `ssm:ExecuteAutomation` and `ssm:GetAutomationExecution` to be able to read the automation output. For more information about the required permissions see [AWSSupport-StartEC2RescueWorkflow](#).

**Document Steps**

1. `aws:assertAwsResourceProperty` - Assert if the provided instance is Windows
   a. (EC2Rescue for Windows) If the provided instance is Windows:
      i. `aws:executeAutomation` - Invoke AWSSupport-StartEC2RescueWorkflow with the EC2Rescue for Windows offline script
      ii. `aws:executeAwsApi` - Retrieve the backup AMI ID from the nested automation
      iii. `aws:executeAwsApi` - Retrieve the EC2Rescue summary from the nested automation
   b. (EC2Rescue for Linux) If the provided instance is Linux:
      i. `aws:executeAutomation` - Invoke AWSSupport-StartEC2RescueWorkflow with the EC2Rescue for Linux offline script
      ii. `aws:executeAwsApi` - Retrieve the backup AMI ID from the nested automation
      iii. `aws:executeAwsApi` - Retrieve the EC2Rescue summary from the nested automation

**Outputs**

- `getEC2RescueForWindowsResult.Output`
- `getWindowsBackupAmi.ImageId`
- `getEC2RescueForLinuxResult.Output`
- `getLinuxBackupAmi.ImageId`

[AWSSupport-GrantPermissionsToIAMUser](#)

**Description**

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This document grants the specified permissions to an IAM group (new or existing), and adds the existing IAM user to it. Policies you can choose from: Billing or Support. To enable billing access for IAM, remember to also activate IAM user and federated user access to the Billing and Cost Management pages.

**Important**
If you provide an existing IAM group, all current IAM users in the group receive the new permissions.

**Document Type**

Automation

**Owner**

Amazon

**Parameters**

- **IAMUserName**
  
  Type: String
  
  Default: ExampleUser
  
  Description: (Required) Must be an existing user.

- **IAMGroupName**
  
  Type: String
  
  Default: ExampleSupportAndBillingGroup
  
  Description: (Required) Can be a new or existing group. Must comply with IAM Entity Name Limits.

- **Permissions**
  
  Type: String
  
  Allowed values: SupportFullAccess, BillingFullAccess, SupportAndBillingFullAccess
  
  Default: SupportAndBillingFullAccess
  

- **AutomationAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf. If no role is specified, AWS Systems Manager Automation will use the permissions of the user that runs this document.

- **LambdaAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role assumed by lambda.

**Examples**
Add IAM user BillingUser to IAM group BillingGroup and grant full access to the AWS Billing and Cost Management console

```bash
aws ssm start-automation-execution --document-name "AWSSupport-GrantPermissionsToIAMUser" --parameters "IAMGroupName=BillingGroup, IAMUserName=BillingUser, Permissions=BillingFullAccess"
```

Add IAM user SupportUser to IAM group SupportGroup and grant full access to Support Center

```bash
aws ssm start-automation-execution --document-name "AWSSupport-GrantPermissionsToIAMUser" --parameters "IAMGroupName=SupportGroup, IAMUserName=SupportUser, Permissions=SupportFullAccess"
```

Add IAM user SupportAndBillingUser to IAM group SupportAndBillingGroup and grant full access both Support Center and the AWS Billing and Cost Management console

```bash
aws ssm start-automation-execution --document-name "AWSSupport-GrantPermissionsToIAMUser" --parameters "IAMGroupName=SupportAndBillingGroup, IAMUserName=SupportAndBillingUser"
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Required IAM Permissions**

Least privileges depend on how AWSSupport-GrantPermissionsToIAMUser is run.

**Direct execution**

It is recommended you have the **AmazonSSMAutomationRole** Amazon managed policy attached, and the following additional permissions to be able to create the Lambda function and the IAM Role to pass to Lambda:

```json
{
   "Version": "2012-10-17",
   "Statement": [
   {
      "Action": [
         "lambda:InvokeFunction",
         "lambda:CreateFunction",
         "lambda:DeleteFunction",
         "lambda:GetFunction"
      ],
      "Resource": "arn:aws:lambda:*:ACCOUNTID:function:AWSSupport-*",
      "Effect": "Allow"
   },
   {
      "Effect": "Allow",
      "Action": [
         "iam:CreateGroup",
         "iam:AddUserToGroup",
         "iam:ListAttachedGroupPolicies",
         "iam:GetGroup",
         "iam:GetUser"
      ],
      "Resource": [
         "arn:aws:iam::*:user/*",
      ]
   }
],
```

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"arn:aws:iam::*:group/*",
],
{
"Effect" : "Allow",
"Action" : [
    "iam:AttachGroupPolicy"
],
"Resource": "+",
"Condition": {
    "ArnEquals": {
        "iam:PolicyArn": [
            "arn:aws:iam::aws:policy/AWSSupportAccess"
        ]
    }
}
},
{
"Effect" : "Allow",
"Action" : [
    "iam:ListAccountAliases",
    "iam:GetAccountSummary"
],
"Resource" : "*
}
]

Using AutomationAssumeRole and LambdaAssumeRole

The user must have the `ssm:ExecuteAutomation` permissions on the document, and `iam:PassRole` on the IAM roles passed as AutomationAssumeRole and LambdaAssumeRole. Here are the permissions each IAM role needs:

AutomatonAssumeRole

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": [
                "lambda:InvokeFunction",
                "lambda:CreateFunction",
                "lambda:DeleteFunction",
                "lambda:GetFunction"
            ],
            "Resource": 
                "arn:aws:lambda::*:ACCOUNTID:function:AWSSupport-*",
            "Effect": "Allow"
        }
    ]
}
```

LambdaAssumeRole

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
```
Document Steps

1. `aws:createStack` - Run AWS CloudFormation Template to create a Lambda function.
2. `aws:invokeLambdaFunction` - Run Lambda to set IAM permissions.
3. `aws:deleteStack` - Delete CloudFormation Template.

**Outputs**

- `configureIAM.Payload`

**AWSSupport-ManageRDPSettings**

**Description**

The AWSSupport-ManageRDPSettings automation document allows the user to manage common Remote Desktop Protocol (RDP) settings, such as the RDP port and Network Layer Authentication (NLA). By default, the document reads and outputs the values of the settings.

**Important**

Changes to the RDP settings should be carefully reviewed before running this document.

**Document Type**

Automation
Parameters

- InstanceId
  Type: String
  Description: (Required) The ID of the managed instance to manage the RDP settings of.
- RDPPortAction
  Type: String
  Allowed values: Check, Modify
  Default: Check
  Description: (Required) An action to apply to the RDP port: Check, Modify.
- RDPPort
  Type: String
  Default: 3389
  Description: (Optional) Specify the new RDP port. Used only when the action is set to Modify. The port number must be between 1025-65535. Note: After the port is changed, the RDP service is restarted.
- NLASettingAction
  Type: String
  Allowed values: Check, Enable, Disable
  Default: Check
  Description: (Required) An action to perform on the NLA setting: Check, Enable, Disable.
- RemoteConnections
  Type: String
  Allowed values: Check, Enable, Disable
  Default: Check
  Description: (Required) An action to perform on the fDenyTSCConnections setting: Check, Enable, Disable.
- AutomationAssumeRole
  Type: String
  Description: (Optional) The IAM role for this execution. If no role is specified, AWS Systems Manager Automation will use the permissions of the user that runs this document.

Examples
Check RDP Settings

```bash
aws ssm start-automation-execution --document-name "AWSSupport-ManageRDPSettings" --parameters "InstanceId=INSTANCEID"
```

Restore the default RDP port (3389), disable NLA, enable remote connections

```bash
aws ssm start-automation-execution --document-name "AWSSupport-ManageRDPSettings" --parameters "InstanceId=INSTANCEID,RDPPortAction=Modify, RDPPort=3389, NLASettingAction=Disable,RemoteConnections=Enable"
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Required IAM Permissions**

The EC2 instance receiving the command must have an IAM role with the `AmazonSSMManagedInstanceCore` Amazon managed policy attached. The user must have at least `ssm:SendCommand` to send the command to the instance, plus `ssm:GetCommandInvocation` to be able to read the command output.

**Document Steps**

`aws:runCommand` - Run the PowerShell script to change or check the RDP settings on the target instance.

**Outputs**

`manageRDPSettings.Output`

**AWSSupport-ManageWindowsService**

**Description**

The AWSSupport-ManageWindowsService automation document enables a user to stop, start, restart, pause, or disable any Windows service on the target instance.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows

**Parameters**

- `InstanceId`
  
  **Type:** String
  
  **Description:** (Required) The ID of the managed instance to manage the RDP settings of.
• WindowsServiceName
  Type: String
  Description: (Required) A valid Windows service name.
• StartupType
  Type: String
  Allowed values: Check, Auto, Demand, Disabled, DelayedAutoStart
  Default: Check
  Description: (Required) A startup type to apply to the Windows service: Auto, Demand (Manual), Disabled, DelayAutoStart, Check.
• ServiceAction
  Type: String
  Allowed values: Check, Restart, Force-Restart, Start, Stop, Force-Stop, Pause
  Default: Check
  Description: (Required) An action to apply to the Windows service: Restart, Force-Restart, Start, Stop, Force-Stop, Pause, Check. Note: Force-Restart and Force-Stop can be used to restart and to stop a service that has dependent services.
• AutomationAssumeRole
  Type: String
  Description: (Optional) The IAM role for this execution. If no role is specified, AWS Systems Manager Automation will use the permissions of the user that runs this document.

Examples

Check RDP Settings

```
aws ssm start-automation-execution --document-name "AWSSupport-ManageWindowsService" --parameters "InstanceId=i-1234567890abcdef0, WindowsServiceName=TermService"
```

Change the Startup Type of the TermService to Auto and change Service Action to Start

```
aws ssm start-automation-execution --document-name "AWSSupport-ManageWindowsService" --parameters "InstanceId=i-1234567890abcdef0, WindowsServiceName=TermService, StartupType=Auto, ServiceAction=Start"
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Required IAM Permissions

It is recommended that the EC2 instance receiving the command has an IAM role with the AmazonSSMManagedInstanceCore Amazon managed policy attached. The user must have at least ssm:ExecuteAutomation and ssm:SendCommand to run the automation and send the command to the instance, plus ssm:GetAutomationExecution to be able to read the automation output.
Document Steps

aws:runCommand - Run the PowerShell script to apply the desired configuration to the Windows service on the target instance.

Outputs

manageWindowsService.Output

AWS-PatchASGInstance

Description

Patch Amazon EC2 instances in an Auto Scaling group.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

• AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

• InstanceId
  Type: String
  Description: (Required) ID of the instance to patch. Don't specify an instance ID that is configured to run during a Maintenance Window.

• LambdaRoleArn
  Type: String
  Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.

• WaitForInstance
  Type: String
  Default: PT2M
  Description: (Optional) Duration the Automation should sleep to allow the instance to come back into service.

• WaitForReboot
  Type: String
  Default: PT5M
Description: (Optional) Duration the Automation should sleep to allow a patched instance to reboot.

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWS-PatchAsgInstance --
parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --
query 'AutomationExecution.Output'
```

Document Steps

aws:createTags
aws:executeAutomation
aws:runCommand
aws:sleep
aws:executeAutomation
aws:createTags
aws:sleep

Outputs

None

AWS-PatchInstanceWithRollback

Description

Brings Amazon EC2 instance into compliance with standing baseline; rolls back root volume on failure.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- AutomationAssumeRole
  Type: String
Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- **InstanceId**
  
  Type: String
  
  Description: (Required) EC2 InstanceId to which we apply the patch-baseline.

- **LambdaAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.

- **ReportS3Bucket**
  
  Type: String
  
  Description: (Optional) Amazon S3 Bucket destination for the Compliance Report generated during process.

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-PatchInstanceWithRollback --parameters InstanceId=i-1234567890abcdef0
```

```json
{
  "AutomationExecutionId": "ab08779f-002d-42dd-9222-0123456789ab"
}
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --query 'AutomationExecution Output'
```

Document Steps

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</tr>
</tbody>
</table>

**Outputs**
- IdentifyRootVolume.Payload
- PrePatchSnapshot.Output
- SaveComplianceReportToS3.Payload
- RestoreFromSnapshot.Payload
- CheckCompliance.Payload

**AWS-PublishSNSNotification**

**Description**
Publish a notification to Amazon SNS.

**Document Type**
Automation

**Owner**
Amazon

**Platform(s)**
Windows, Linux

**Parameters**
- **AutomationAssumeRole**
  - Type: String
  - Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
- **Message**
  - Type: String
  - Description: (Required) The message to include in the SNS notification.
- **TopicARN**
  - Type: String
  - Description: (Required) The ARN of the SNS topic to publish the notification to.

**Examples**
Start the automation

Retrieve the execution output

aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'

Document Steps

aws:executeAwsApi - sns:Publish

Outputs

None

AWS-RebootRDSInstance

Description

Reboot an Amazon Relational Database Service (Amazon RDS) instance.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- AutomationAssumeRole
  
  Type: String

  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- InstanceId

  Type: String

  Description: (Required) The ID of the Amazon RDS instance that you want to reboot.

Examples

Start the automation

aws ssm start-automation-execution --document-name AWS-RebootRdsInstance --parameters parameters
Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Document Steps**

- `aws:assertAwsResourceProperty`
- `aws:executeAwsApi`
- `aws:waitForAwsResourceProperty`

**Outputs**

None

**AWSSupport-ResetAccess**

**Description**

This document will use the EC2Rescue tool on the specified EC2 instance to re-enable password decryption via the EC2 Console (Windows), or to generate and add a new SSH key pair (Linux). If you lost your key pair, this automation will create a password-enabled AMI that you can use to launch a new EC2 instance with a key pair you own (Windows).

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- **InstanceId**

  Type: String

  Description: (Required) ID of the EC2 instance you want to reset access for.

  **Important**

  Systems Manager Automation stops this instance, and creates an AMI before attempting any operations. Data stored in instance store volumes will be lost. The public IP address will change if you are not using an Elastic IP.

- **SubnetId**

  Type: String

  Default: CreateNewVPC

  Description: (Optional) The subnet ID for the EC2Rescue instance. By default, Systems Manager Automation creates a new VPC. Alternatively, Use SelectedInstanceSubnet to use the same subnet as your instance, or specify a custom subnet ID.
Important
The subnet must be in the same Availability Zone as InstanceId, and it must allow access to the SSM endpoints.

- EC2RescueInstanceType
  
  Type: String
  
  Allowed values: t2.small, t2.medium, t2.large
  
  Default: t2.small
  
  Description: (Required) The EC2 instance type for the EC2Rescue instance. Recommended size: t2.small.

- AssumeRole
  
  Type: String
  
  Description: (Optional) The IAM role for this execution. If no role is specified, AWS Systems Manager Automation will use the permissions of the user that runs this document.

Examples

Enable EC2 password generation for Windows

/aws ssm start-automation-execution --document-name AWSSupport-ResetAccess --parameters 'InstanceId=WINDOWSINSTANCEID'

Enable EC2 password generation for Windows and use the provided instance's subnet for the EC2Rescue instance

/aws ssm start-automation-execution --document-name AWSSupport-ResetAccess --parameters 'InstanceId=WINDOWSINSTANCEID,SubnetId=SelectedInstanceSubnet'

Generate a new SSH key for Linux

/aws ssm start-automation-execution --document-name AWSSupport-ResetAccess --parameters 'InstanceId=LINUXINSTANCEID'

Generate a new SSH key for Linux and use the provided instance's subnet for the EC2Rescue instance

/aws ssm start-automation-execution --document-name AWSSupport-ResetAccess --parameters 'InstanceId=LINUXINSTANCEID,SubnetId=SelectedInstanceSubnet'

Retrieve the execution output

/aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'

Required IAM Permissions

You must have at least ssm:ExecuteAutomation, ssm:GetParameter (to retrieve the SSH key parameter name) and ssm:GetAutomationExecution to be able to read the automation output. For more information about the required permissions, see AWSSupport-StartEC2RescueWorkflow (p. 371).

Document Steps
1. `aws:assertAwsResourceProperty` - Assert if the provided instance is Windows.
   a. (EC2Rescue for Windows) If the provided instance is Windows:
      i. `aws:executeAutomation` - Invoke AWSSupport-StartEC2RescueWorkflow with the EC2Rescue for Windows offline password reset script
      ii. `aws:executeAwsApi` - Retrieve the backup AMI ID from the nested automation
      iii. `aws:executeAwsApi` - Retrieve the password-enabled AMI ID from the nested automation
      iv. `aws:executeAwsApi` - Retrieve the EC2Rescue summary from the nested automation
   b. (EC2Rescue for Linux) If the provided instance is Linux:
      i. `aws:executeAutomation` - Invoke AWSSupport-StartEC2RescueWorkflow with the EC2Rescue for Linux offline SSH key injection script
      ii. `aws:executeAwsApi` - Retrieve the backup AMI ID from the nested automation
      iii. `aws:executeAwsApi` - Retrieve the SSM parameter name for the injected SSH key
      iv. `aws:executeAwsApi` - Retrieve the EC2Rescue summary from the nested automation

**Outputs**

getEC2RescueForWindowsResult.Output
getWindowsBackupAmi.ImageId
getWindowsPasswordEnabledAmi.ImageId
getEC2RescueForLinuxResult.Output
getLinuxBackupAmi.ImageId
getLinuxSSHKeyParameter.Name

**AWS-ReleaseElasticIP**

**Description**

Release the specified Elastic IP address using the allocation ID.

**Document Type**

Automation

**Owner**

Amazon

**Platform(s)**

Windows, Linux

**Parameters**

- AutomationAssumeRole
  
  **Type:** String

  **Description:** (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- AllocationId
  
  **Type:** String
Description: (Required) The Allocation ID of the Elastic IP address.

Examples

Start the automation

```shell
aws ssm start-automation-execution --document-name AWS-ReleaseElasticIP --parameters
  AllocationId=eipalloc-0123456789abcdefg
```

Retrieve the execution output

```shell
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --
  query 'AutomationExecution.Output'
```

Document Steps

```shell
aws:executeAwsApi - ec2:ReleaseAddress
```

Outputs

None

AWS-ResizeInstance

Description

Change the instance type of an Amazon EC2 instance.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your
  behalf.
- InstanceId
  Type: String
  Description: (Required) The ID of the instance.
- InstanceType
Type: String

Description: (Required) The instance type.

- LambdaAssumeRole

Type: String

Description: (Optional) The ARN of the role assumed by Lambda.

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-ResizeInstance --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

- aws:createStack
- aws:changeInstanceState
- aws:invokeLambdaFunction
- aws:changeInstanceState
- aws:deleteStack

Outputs

None

AWS-RestartEC2Instance

Description

Restart one or more Amazon EC2 instances.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux
Parameters

- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
- InstanceId
  Type: StringList
  Description: (Required) EC2 instance(s) to restart

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWS-RestartEC2Instance --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

- aws:changeInstanceState
- aws:changeInstanceState

Outputs

None

AWSSupport-SendLogBundleToS3Bucket

Description

The AWSSupport-SendLogBundleToS3Bucket Automation document uploads a log bundle generated by the EC2Rescue tool from the target instance to the specified S3 bucket. The automation execution installs the platform specific version of EC2Rescue based on the platform of the target instance. EC2Rescue is then used to collect all the available operating system (OS) logs.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux
Parameters

- **InstanceId**
  
  Type: String
  
  Description: (Required) The ID of the Windows or Linux managed instance you want to collect logs from.

- **S3BucketName**
  
  Type: String
  
  Description: (Required) S3 bucket to upload the logs to.

- **S3Path**
  
  Type: String
  
  Default: AWSSupport-SendLogBundleToS3Bucket/
  
  Description: (Optional) S3 path for the collected logs.

- **AutomationAssumeRole**
  
  Type: String
  
  Description: (Optional) The IAM role for this execution. If no role is specified, AWS Systems Manager Automation will use the permissions of the user that runs this document.

Examples

Collect logs from INSTANCEID and upload them to S3 Bucket mybucket

```
aws ssm start-automation-execution --document-name AWSSupport-SendLogBundleToS3Bucket --parameters "InstanceId=INSTANCEID, S3BucketName=mybucket"
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Required IAM Permissions

It is recommended that the EC2 instance receiving the command has an IAM role with the `AmazonSSMManagedInstanceCore` Amazon managed policy attached. The user must have at least `ssm:ExecuteAutomation` and `ssm:SendCommand` to run the automation and send the command to the instance, plus `ssm:GetAutomationExecution` to be able to read the automation output.

Document Steps

1. **aws:runCommand** - Install EC2Rescue via AWS-ConfigureAWSPackage.
2. **aws:runCommand** - Run the PowerShell script to collect Windows troubleshooting logs with EC2Rescue.
3. **aws:runCommand** - Run the bash script to collect Linux troubleshooting logs with EC2Rescue.

Outputs

`collectAndUploadWindowsLogBundle.Output`
AWS-SetupInventory

Description
Create a Systems Manager Inventory association for one or more managed instances. The system collects metadata from your instances according to the schedule in the association. For more information, see AWS Systems Manager Inventory (p. 512).

Document Type
Automation

Owner
Amazon

Platforms
Windows, Linux

Parameters
• Applications
  Type: String
  Default: Enabled
  Description: (Optional) Collect metadata about installed applications.
• AssociatedDocName
  Type: String
  Default: AWS-GatherSoftwareInventory
  Description: (Optional) The name of the SSM document used to collect Inventory from the managed instance.
• AssociationName
  Type: String
  Description: (Optional) A name for the Inventory association that will be assigned to the instance.
• AssocWaitTime
  Type: String
  Default: PT5M
  Description: (Optional) Amount of time that Inventory collection should pause when the Inventory association start time is reached. The time uses ISO 8601 format.
• AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
• AwsComponents
Type: String
Default: Enabled
Description: (Optional) Collect metadata for AWS Components like amazon-ssm-agent.

- **CustomInventory**
  Type: String
  Default: Enabled
  Description: (Optional) Collect custom inventory metadata.

- **Files**
  Type: String
  Description: (Optional) Collect metadata about files on your instances. For more information about how to collect this type of Inventory data, see Working with File and Windows Registry Inventory (p. 518). Requires SSMAgent version 2.2.64.0 or later. Linux example: [{"Path": "/usr/bin", "Pattern": ["aws", "ssm"], "Recursive":false},{"Path": "/var/log", "Pattern": ["amazon.*"], "Recursive":true, "DirScanLimit":1000}] Windows example: [{"Path": "%PROGRAMFILES%", "Pattern": ["*.exe"], "Recursive":true}]

- **InstanceDetailedInformation**
  Type: String
  Default: Enabled
  Description: (Optional) Collect additional information about the instance, including the CPU model, speed, and the number of cores, to name a few.

- **InstanceIds**
  Type: String
  Default: *
  Description: (Required) Amazon EC2 instances that you want to inventory.

- **LambdaAssumeRole**
  Type: String
  Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.

- **NetworkConfig**
  Type: String
  Default: Enabled
  Description: (Optional) Collect metadata about network configurations.

- **OutputS3BucketName**
  Type: String
  Description: (Optional) Name of an Amazon S3 bucket where you want to write Inventory log data.

- **OutputS3KeyPrefix**
  Type: String
Description: (Optional) An Amazon S3 key prefix (subfolder) where you want to write Inventory log data.

- `OutputS3Region`
  
  **Type:** String
  
  **Description:** (Optional) The name of the AWS Region where the Amazon S3 exists.

- `Schedule`
  
  **Type:** String
  
  **Default:** `cron(0 */30 * * ? *)`
  
  **Description:** (Optional) A cron expression for the Inventory association schedule. The default is every 30 minutes.

- `Services`
  
  **Type:** String
  
  **Default:** Enabled
  
  **Description:** (Optional, Windows OS only, requires SSMAgent version 2.2.64.0 and above) Collect data for service configurations.

- `WindowsRegistry`
  
  **Type:** String
  
  **Description:** (Optional) Collect metadata about Microsoft Windows Registry keys. For more information about how to collect this type of Inventory data, see Working with File and Windows Registry Inventory (p. 518). Requires SSMAgent version 2.2.64.0 or later. Example:

  ```json
  [{"Path":"HKEY_CURRENT_CONFIG\System","Recursive":true},{"Path":"HKEY_LOCAL_MACHINE \SOFTWARE\Amazon\MachineImage", "ValueNames":["AMIName"]}
  ```

- `WindowsRoles`
  
  **Type:** String
  
  **Default:** Enabled
  
  **Description:** (Optional) Collect information about Windows roles on the instance. Applies to Windows operating systems only. Requires SSMAgent version 2.2.64.0 or later.

- `WindowsUpdates`
  
  **Type:** String
  
  **Default:** Enabled
  
  **Description:** (Optional) Collect data about all Windows Updates on the instance.

**Examples**

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-SetupInventory --parameters parameters
```

Retrieve the execution output
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'

**Document Steps**

aws:createStack
aws:invokeLambdaFunction
aws:sleep
aws:invokeLambdaFunction
aws:deleteStack

**Outputs**

None

**AWSSupport-SetupIPMonitoringFromVPC**

**Description**

AWSSupport-SetupIPMonitoringFromVPC creates an Amazon EC2 instance in the specified subnet and monitors selected target IPs (IPv4 or IPv6) by continuously running ping, MTR, traceroute and tracetcp tests. The results are stored in Amazon CloudWatch Logs logs, and metric filters are applied to quickly visualize latency and packet loss statistics in a CloudWatch dashboard.

**Additional Information**

The CloudWatch Logs data can be used for network troubleshooting and analysis of pattern/trends. Additionally, you can configure CloudWatch alarms with Amazon SNS notifications when packet loss and/or latency reach a threshold. The data can also be used when opening a Premium Support case, to help isolate an issue quickly and reduce time to resolution when investigating a network issue.

**Note**

To clean up resources created by AWSSupport-SetupIPMonitoringFromVPC, you can run the Automation document AWSSupport-TerminateIPMonitoringFromVPC. For more information, see AWSSupport-TerminateIPMonitoringFromVPC (p. 382).

**Document Type**

Automation

**Owner**

Amazon

**Parameters**

- **SubnetId**
  
  Type: String
  
  Description: (Required) The subnet ID for the monitor instance. Be aware that if you specify a private subnet, then you must make sure there is Internet access to allow the monitor instance to setup the test (meaning, install the CloudWatch Logs agent, interact with Systems Manager and CloudWatch).

- **TargetIPs**
Type: String

Description: (Required) Comma separated list of IPv4s and/or IPv6s to monitor. No spaces allowed. Maximum size is 255 characters. Be aware that if you provide an invalid IP, then the automation will fail and rollback the test setup.

- **CloudWatchLogGroupNamePrefix**
  Type: String

  Default: /AWSSupport-SetupIPMonitoringFromVPC

  Description: (Optional) Prefix used for each CloudWatch log group created for the test results.

- **CloudWatchLogGroupRetentionInDays**
  Type: String

  Allowed values: 1,3,5,7,14,30,60,90,120,150,180,365,400,545,731,1827,3653

  Default: 7

  Description: (Optional) Number of days you want to keep the network monitoring results for.

- **InstanceType**
  Type: String

  Allowed values: t2.micro, t2.small,t2.medium,t2.large

  Default: t2.micro

  Description: (Optional) The Amazon EC2 instance type for the EC2Rescue instance. Recommended size: t2.micro.

- **AutomationAssumeRole**
  Type: String

  Description: (Optional) The AWS Identity and Access Management (IAM) role for this execution. If no role is specified, then Systems Manager Automation uses the permissions of the user that runs this document.

### Examples

**Start the automation**

```
aws ssm start-automation-execution --document-name AWSSupport-SetupIPMonitoringFromVPC --parameters 'SubnetId=SUBNETID,TargetIPs="IPV41,IPV42,IPV61"'
```

**Retrieve the execution output**

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

### Required IAM Permissions

It is recommended that the user who runs the automation have the **AmazonSSMAutomationRole** IAM managed policy attached. In addition, the user must have the following policy attached to their user account, group, or role:
Document Steps

1. `aws:executeAwsApi` - describe the provided subnet.
2. `aws:branch` - evaluate the TargetIPs input.
(IPv6) If TargetIPs contains an IPv6:

- `aws:assertAwsResourceProperty` - check the provided subnet has an IPv6 pool associated

3. `aws:executeAwsApi` - get the latest Amazon Linux 2 AMI from Parameter Store.

4. `aws:executeAwsApi` - create a security group for the test in the subnet’s VPC.

(Cleanup) If the security group creation fails:

- `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

5. `aws:executeAwsApi` - allow all outbound traffic in the test security group.

(Cleanup) If the security group egress rule creation fails:

- `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

6. `aws:executeAwsApi` - create an IAM role for the test Amazon EC2 instance

(Cleanup) If the role creation fails:

a. `aws:executeAwsApi` - delete the IAM role created by the automation, if it exists.

b. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

7. `aws:executeAwsApi` - attach the AmazonSSMManagedInstanceCore managed policy

(Cleanup) If the policy attachment fails:

a. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation, if attached.

b. `aws:executeAwsApi` - delete the IAM role created by the automation.

c. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

8. `aws:executeAwsApi` - attach an inline policy to allow setting CloudWatch log group retentions and creating a CloudWatch dashboard

(Cleanup) If the inline policy attachment fails:

a. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation, if created.

b. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

c. `aws:executeAwsApi` - delete the IAM role created by the automation.

d. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

9. `aws:executeAwsApi` - create an IAM instance profile.

(Cleanup) If the instance profile creation fails:

a. `aws:executeAwsApi` - delete the IAM instance profile created by the automation, if it exists.

b. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.

c. `aws:executeAwsApi` - delete the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

d. `aws:executeAwsApi` - delete the IAM role created by the automation.

e. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

10. `aws:executeAwsApi` - associate the IAM instance profile to the IAM role.

(Cleanup) If the instance profile and role association fails:

a. `aws:executeAwsApi` - remove the IAM instance profile from the role, if associated.

b. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.

c. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.
d. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

e. `aws:executeAwsApi` - delete the IAM role created by the automation.

f. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

11 `aws:sleep` - wait for the instance profile to become available.

12 `aws:runInstances` - create the test instance in the specified subnet, and with the instance profile created earlier attached.

(Cleanup) If the step fails:

a. `aws:changeInstanceState` - terminate the test instance.

b. `aws:executeAwsApi` - remove the IAM instance profile from the role.

c. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.

d. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.

e. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

f. `aws:executeAwsApi` - delete the IAM role created by the automation.

g. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

13 `aws:branch` - evaluate the TargetIPs input.

(IPv6) If TargetIPs contains an IPv6:

`aws:executeAwsApi` - assign an IPv6 to the test instance.

14 `aws:waitForAwsResourceProperty` - wait for the test instance to become a managed instance.

(Cleanup) If the step fails:

a. `aws:changeInstanceState` - terminate the test instance.

b. `aws:executeAwsApi` - remove the IAM instance profile from the role.

c. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.

d. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.

e. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

f. `aws:executeAwsApi` - delete the IAM role created by the automation.

g. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

15 `aws:runCommand` - install test pre-requisites:

(Cleanup) If the step fails:

a. `aws:changeInstanceState` - terminate the test instance.

b. `aws:executeAwsApi` - remove the IAM instance profile from the role.

c. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.

d. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.

e. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

f. `aws:executeAwsApi` - delete the IAM role created by the automation.

g. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

16 `aws:runCommand` - validate the provided IPs are syntactically correct IPv4 and/or IPv6 addresses:

(Cleanup) If the step fails:

a. `aws:changeInstanceState` - terminate the test instance.

b. `aws:executeAwsApi` - remove the IAM instance profile from the role.

c. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.
d. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.

e. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

f. `aws:executeAwsApi` - delete the IAM role created by the automation.

g. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

17. `aws:runCommand` - define the MTR test for each of the provided IPs.

(Cleanup) If the step fails:

a. `aws:changeInstanceState` - terminate the test instance.

b. `aws:executeAwsApi` - remove the IAM instance profile from the role.

c. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.

d. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.

e. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

f. `aws:executeAwsApi` - delete the IAM role created by the automation.

g. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

18. `aws:runCommand` - define the first ping test for each of the provided IPs.

(Cleanup) If the step fails:

a. `aws:changeInstanceState` - terminate the test instance.

b. `aws:executeAwsApi` - remove the IAM instance profile from the role.

c. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.

d. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.

e. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

f. `aws:executeAwsApi` - delete the IAM role created by the automation.

g. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

19. `aws:runCommand` - define the second ping test for each of the provided IPs.

(Cleanup) If the step fails:

a. `aws:changeInstanceState` - terminate the test instance.

b. `aws:executeAwsApi` - remove the IAM instance profile from the role.

c. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.

d. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.

e. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

f. `aws:executeAwsApi` - delete the IAM role created by the automation.

g. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

20. `aws:runCommand` - define the tracepath test for each of the provided IPs.

(Cleanup) If the step fails:

a. `aws:changeInstanceState` - terminate the test instance.

b. `aws:executeAwsApi` - remove the IAM instance profile from the role.

c. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.

d. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.

e. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

f. `aws:executeAwsApi` - delete the IAM role created by the automation.

g. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.
21 **aws:runCommand** - define the traceroute test for each of the provided IPs.

(Cleanup) If the step fails:

a. **aws:changeInstanceState** - terminate the test instance.
b. **aws:executeAwsApi** - remove the IAM instance profile from the role.
c. **aws:executeAwsApi** - delete the IAM instance profile created by the automation.
d. **aws:executeAwsApi** - delete the CloudWatch inline policy from the role created by the automation.
e. **aws:executeAwsApi** - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.
f. **aws:executeAwsApi** - delete the IAM role created by the automation.
g. **aws:executeAwsApi** - delete the security group created by the automation, if it exists.

22 **aws:runCommand** - configure CloudWatch logs.

(Cleanup) If the step fails:

a. **aws:changeInstanceState** - terminate the test instance.
b. **aws:executeAwsApi** - remove the IAM instance profile from the role.
c. **aws:executeAwsApi** - delete the IAM instance profile created by the automation.
d. **aws:executeAwsApi** - delete the CloudWatch inline policy from the role created by the automation.
e. **aws:executeAwsApi** - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.
f. **aws:executeAwsApi** - delete the IAM role created by the automation.
g. **aws:executeAwsApi** - delete the security group created by the automation, if it exists.

23 **aws:runCommand** - schedule cronjobs to run each test every minute.

(Cleanup) If the step fails:

a. **aws:changeInstanceState** - terminate the test instance.
b. **aws:executeAwsApi** - remove the IAM instance profile from the role.
c. **aws:executeAwsApi** - delete the IAM instance profile created by the automation.
d. **aws:executeAwsApi** - delete the CloudWatch inline policy from the role created by the automation.
e. **aws:executeAwsApi** - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.
f. **aws:executeAwsApi** - delete the IAM role created by the automation.
g. **aws:executeAwsApi** - delete the security group created by the automation, if it exists.

24 **aws:sleep** - wait for the tests to generate some data.

25 **aws:runCommand** - set the desired CloudWatch log group retentions.

(Cleanup) If the step fails:

a. **aws:changeInstanceState** - terminate the test instance.
b. **aws:executeAwsApi** - remove the IAM instance profile from the role.
c. **aws:executeAwsApi** - delete the IAM instance profile created by the automation.
d. **aws:executeAwsApi** - delete the CloudWatch inline policy from the role created by the automation.
e. **aws:executeAwsApi** - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.
f. **aws:executeAwsApi** - delete the IAM role created by the automation.
g. **aws:executeAwsApi** - delete the security group created by the automation, if it exists.

26 **aws:runCommand** - set the CloudWatch log group metric filters.

(Cleanup) If the step fails:

a. **aws:changeInstanceState** - terminate the test instance.
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b. **aws:executeAwsApi** - remove the IAM instance profile from the role.

c. **aws:executeAwsApi** - delete the IAM instance profile created by the automation.

d. **aws:executeAwsApi** - delete the CloudWatch inline policy from the role created by the automation.

e. **aws:executeAwsApi** - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

f. **aws:executeAwsApi** - delete the IAM role created by the automation.

g. **aws:executeAwsApi** - delete the security group created by the automation, if it exists.

27. **aws:runCommand** - create the CloudWatch dashboard.

   (Cleanup) If the step fails:

   a. **aws:executeAwsApi** - delete the CloudWatch dashboard, if it exists.
   
   b. **aws:changeInstanceState** - terminate the test instance.

   c. **aws:executeAwsApi** - remove the IAM instance profile from the role.
   
   d. **aws:executeAwsApi** - delete the IAM instance profile created by the automation.

   e. **aws:executeAwsApi** - delete the CloudWatch inline policy from the role created by the automation.

   f. **aws:executeAwsApi** - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.

   g. **aws:executeAwsApi** - delete the IAM role created by the automation.

   h. **aws:executeAwsApi** - delete the security group created by the automation, if it exists.

**Outputs**

createCloudWatchDashboards.Output - the URL of the CloudWatch dashboard.

createManagedInstance.InstanceIds - the test instance ID.

**AWS-SetupManagedInstance**

**Description**

Configure an instance with an AWS Identity and Access Management (IAM) role for Systems Manager access.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- **AutomationAssumeRole**

  Type: String

  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- **Instanceld**

  Type: String
Description: (Required) ID of the Amazon EC2 instance to configure

- **LambdaAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.

- **RoleName**
  
  Type: String
  
  Default: SSMRoleForManagedInstance
  
  Description: (Optional) The name of the IAM role for the Amazon EC2 instance. If this role does not exist, it will be created. When specifying this value, verify that the role contains the `AmazonSSMManagedInstanceCore` Managed Policy.

**Examples**

Start the automation

```
aws ssm start-automation-execution --document-name AWS-SetupManagedInstance --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Document Steps**

- **aws:executeAutomation**
- **aws:runCommand**
- **aws:executeAutomation**

**Outputs**

None

**AWS-SetupManagedRoleOnEC2Instance**

**Description**

Configure an instance with the SSMRoleForManagedInstance managed IAM role for Systems Manager access.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**
Windows, Linux

**Parameters**

- **AutomationAssumeRole**
  
  *Type: String*
  
  *Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.*

- **InstanceId**
  
  *Type: String*
  
  *Description: (Required) ID of the Amazon EC2 instance to configure*

- **LambdaAssumeRole**
  
  *Type: String*
  
  *Description: (Optional) The ARN of the role that allows Lambda created by Automation to perform the actions on your behalf. If not specified a transient role will be created to run the Lambda function.*

- **RoleName**
  
  *Type: String*
  
  *Default: SSMRoleForManagedInstance*
  
  *Description: (Optional) The name of the IAM role for the Amazon EC2 instance. If this role does not exist, it will be created. When specifying this value, verify that the role contains the AmazonSSMManagedInstanceCore Managed Policy.*

**Examples**

Start the automation

```
aws ssm start-automation-execution --document-name AWS-SetupManagedRoleOnEc2Instance --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Document Steps**

- `aws:createStack`
- `aws:invokeLambdaFunction`
- `aws:invokeLambdaFunction`
- `aws:invokeLambdaFunction`
- `aws:deleteStack`

**Outputs**
None

**AWSEC2-SQLServerDBRestore**

**Description**

The AWSEC2-SQLServerDBRestore document restores Microsoft SQL Server database backups stored in Amazon S3 to SQL Server 2017 running on an Amazon Elastic Compute Cloud (EC2) Linux instance. You may provide your own EC2 instance running SQL Server 2017 Linux. If an EC2 instance is not provided, the automation workflow launches and configures a new Ubuntu 16.04 EC2 instance with SQL Server 2017. The automation supports restoring full, differential, and transactional log backups. This automation accepts multiple database backup files and automatically restores the most recent valid backup of each database in the files provided.

To automate both backup and restore of an on-premises SQL Server database to an Amazon EC2 instance running SQL Server 2017 Linux, see the AWS-signed PowerShell script `MigrateSQLServerToEC2Linux.ps1`.

**Important**

This automation workflow resets the SQL Server server administrator (SA) user password every time the workflow runs. After the automation workflow is complete, you must set your own SA user password again before you connect to the SQL Server instance.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Linux

**Prerequisites**

- This Automation document only works with Linux EC2 instances running SQL Server.
- This Automation workflow must be run by a user with, at minimum, the permissions designated in the Required IAM Permissions section below.
- If you are providing your own EC2 instance:
  - Configure the EC2 instance with an AWS Identity and Access Management (IAM) instance profile that has the AmazonSSMManagedInstanceCore managed policy attached. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).
  - Verify that SSM Agent is installed on your EC2 instance. For more information, see Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68).
  - Verify that the EC2 instance has enough free disk space to download and restore the SQL Server backups.

**Limitations**

This automation does not support restoring to SQL Server running on EC2 Windows instances. This automation only restores database backups that are compatible with SQL Server Linux 2017. For more information, see Editions and Supported Features of SQL Server 2017 on Linux.

**Required IAM Permissions**

The user who runs the Automation workflow must have the following permissions:

```json
{
  
}
Parameters

- **S3Input**
  Type: String
  Description: (Required) S3 bucket name, comma-separated list of S3 object keys, or comma-separated list of pre-signed S3 URLs containing the SQL backup files to be restored.

- **IsS3PresignedUrl**
  Type: String
  Description: (Optional) If S3Input is a pre-signed S3 URL, indicate "yes".
  Default value: "no"
  Allowed values: "yes", "no"

- **InstanceId**
  Type: String
  Description: (Optional) The instance running SQL Server 2017 on Linux. If no InstanceId is provided, the automation launches a new Amazon EC2 instance using the InstanceType and SQLServerEdition provided.

- **InstanceType**
  Type: String
  Description: (Optional) The instance type of the EC2 instance to be launched.

- **SQLServerEdition**
  Type: String
  Description: (Optional) The edition of SQL Server 2017 to be installed on the newly created EC2 instance.
  Allowed values: "Standard", "Enterprise", "Web", "Express"
• SubnetId
  Type: String
  Description: (Optional) The subnet in which to launch the new EC2 instance. The subnet must have outbound connectivity to AWS services. If a value for SubnetId is not provided, the automation uses the default subnet.

• IamInstanceProfileName
  Type: String
  Description: (Optional) The IAM instance profile to attach to the new EC2 instance. The IAM instance profile must have the AmazonSSMManagedInstanceCore managed policy attached.

• DataDirectorySize
  Type: String
  Description: (Optional) Desired volume size (GiB) of the SQL Server Data directory for the new EC2 instance.
  Default value: 100

• LogDirectorySize
  Type: String
  Description: (Optional) Desired volume size (GiB) of the SQL Server Log directory for the new EC2 instance.
  Default value: 100

• TempDbDirectorySize
  Type: String
  Description: (Optional) Desired volume size (GiB) of the SQL Server TempDB directory for the new EC2 instance.
  Default value: 100

• DatabaseNames
  Type: String
  Description: (Optional) Comma-separated list of the names of databases to restore.

• KeyPair
  Type: String
  Description: (Optional) Key pair to use when creating the new EC2 instance.

Examples
Start the automation using an existing EC2 instance with two databases.

```bash
aws ssm start-automation-execution --document-name AWSEC2-RestoreSQLServer --
  parameters "InstanceId='i-1234567890abcdef0',S3Input='sample-bucket/sample-
  prefix',DatabaseNames='sample-database1, sample-database2'"
```

Start the automation and launch a new EC2 instance with the specified SQL Server edition.
aws ssm start-automation-execution --document-name AWSEC2-RestoreSQLServer --parameters "InstanceType='m4.large',SQLServerEdition='Standard',S3Input='sample-bucket/sample-backup-1.bak, sample-bucket/sample-backup-2.bak',IamInstanceProfileName='sample-profile-name',KeyPair='sample-keypair-name'"

Start the automation and launch a new EC2 instance with the specified SQL Server edition using a presigned S3 URL.


Retrieve the execution output.

aws ssm get-automation-execution --automation-execution-id ExecutionID --output text --query 'AutomationExecution.Output'

Document Steps

For new EC2 instances:
1. aws:executeAwsApi - Retrieve the AMI ID for SQL Server 2017 on Ubuntu 16.04.
2. aws:runInstances - Launch a new EC2 Linux instance.
3. aws:waitForAwsResourceProperty - Wait for the newly created EC2 instance to be ready.
4. aws:executeAwsApi - Reboot the instance if the instance is not ready.
5. aws:assertAwsResourceProperty - Verify that SSM Agent is installed.
6. aws:runCommand - Run the SQL Server restore script in PowerShell.

For existing EC2 instances:
1. aws:waitForAwsResourceProperty - Verify that the EC2 instance is ready.
2. aws:executeAwsApi - Reboot the instance if the instance is not ready.
3. aws:assertAwsResourceProperty - Verify that SSM Agent is installed.
4. aws:runCommand - Run the SQL Server restore script in PowerShell.

Outputs

getInstance.InstanceId
restoreToNewInstance.Output
restoreToExistingInstance.Output
AWS-StartEC2Instance

Description

Start one or more Amazon EC2 instances.
Document Type
Automation

Owner
Amazon

Platforms
Windows, Linux

Parameters
- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
- InstanceId
  Type: StringList
  Description: (Required) Amazon EC2 instance(s) to start.

Examples
Start the automation

```
aws ssm start-automation-execution --document-name AWS-StartEC2Instance --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query AutomationExecutionOutput
```

Document Steps
```
aws:changeInstanceState
```

Outputs
None

AWSSupport-StartEC2RescueWorkflow

Description
The AWSSupport-StartEC2RescueWorkflow automation document runs the provided base64 encoded script (Bash or Powershell) on a helper instance created to rescue your instance. The root volume of your instance is attached and mounted to the helper instance, also known as the EC2Rescue instance. If your instance is Windows, provide a Powershell script. Otherwise, use Bash. The workflow sets some environment variables which you can use in your script. The environment variables contain information...
about the input you provided, as well as information about the offline root volume. The offline volume is already mounted and ready to use. For example, you can save a Desired State Configuration file to an offline Windows root volume, or chroot to an offline Linux root volume and perform an offline remediation.

Additional Information

To base64 encode a script, you can use either Powershell or Bash. Powershell:

```powershell
[System.Convert]::ToBase64String([System.Text.Encoding]::Unicode.GetBytes([System.IO.File]::ReadAllText('PATH_TO_FILE')))
```

Bash:

```bash
base64 PATH_TO_FILE
```

Here is a list of environment variables you can use in your offline scripts, depending on the target OS Windows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Example value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$env:EC2RESCUE_ACCOUNT_ID</td>
<td>{{ global:ACCOUNT_ID }}</td>
<td>123456789012</td>
</tr>
<tr>
<td>$env:EC2RESCUE_DATE</td>
<td>{{ global:DATE }}</td>
<td>2018-09-07</td>
</tr>
<tr>
<td>$env:EC2RESCUE_DATE_TIME</td>
<td>{{ global:DATE_TIME }}</td>
<td>2018-09-07_18.09.59</td>
</tr>
<tr>
<td>$env:EC2RESCUE_EC2RW_DIR</td>
<td>EC2Rescue for Windows installation path</td>
<td>C:\Program Files\Amazon\EC2Rescue</td>
</tr>
<tr>
<td>$env:EC2RESCUE_EXECUTION_ID</td>
<td>{{ automation:EXECUTION_ID }}</td>
<td>7ef8008e-219b-4aca-8bb5-65e2e898e20b</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_CURRENT_CONTROL_SET</td>
<td>Offline Windows Current Control Set path</td>
<td>HKLM:\AWSTempSystem\ControlSet001</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_DRIVE</td>
<td>Offline Windows drive letter</td>
<td>D:\</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_EBS_DEVICE</td>
<td>Offline root volume EBS device</td>
<td>xvdf</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_KERNEL_VER</td>
<td>Offline Windows Kernel version</td>
<td>6.1.7601.24214</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_OS_ARCHITECTURE</td>
<td>Offline Windows architecture</td>
<td>AMD64</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_OS_CAPTION</td>
<td>Offline Windows caption</td>
<td>Windows Server 2008 R2 Datacenter</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_OS_TYPE</td>
<td>Offline Windows OS type</td>
<td>Server</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_PROGRAM_FILES_DIR</td>
<td>Offline Windows Program files directory path</td>
<td>D:\Program Files</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_PROGRAM_FILES_X86_DIR</td>
<td>Program files x86 directory path</td>
<td>D:\Program Files (x86)</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_REGISTRY_DIR</td>
<td>Offline Windows registry directory path</td>
<td>D:\Windows\System32\config</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
<td>Example value</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td>---------------</td>
</tr>
<tr>
<td>$env:EC2RESCUE_OFFLINE_SYSTEM_ROOT</td>
<td>Windows system root directory path</td>
<td>D:\Windows</td>
</tr>
<tr>
<td>$env:EC2RESCUE_REGION</td>
<td>{{ global:REGION }}</td>
<td>us-west-1</td>
</tr>
<tr>
<td>$env:EC2RESCUE_S3_BUCKET</td>
<td>{{ S3BucketName }}</td>
<td>mybucket</td>
</tr>
<tr>
<td>$env:EC2RESCUE_S3_PREFIX</td>
<td>{{ S3Prefix }}</td>
<td>myprefix/</td>
</tr>
<tr>
<td>$env:EC2RESCUE_SOURCE_INSTANCE</td>
<td>{{ Instanceld }}</td>
<td>i-abcdefgh123456789</td>
</tr>
<tr>
<td>$script:EC2RESCUE_OFFLINE_WINDOWS_INSTALL</td>
<td>Offline Windows Installation metadata</td>
<td>Customer Powershell Object</td>
</tr>
</tbody>
</table>

Linux:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Example value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC2RESCUE_ACCOUNT_ID</td>
<td>{{ global:ACCOUNT_ID }}</td>
<td>123456789012</td>
</tr>
<tr>
<td>EC2RESCUE_DATE</td>
<td>{{ global:DATE }}</td>
<td>2018-09-07</td>
</tr>
<tr>
<td>EC2RESCUE_DATE_TIME</td>
<td>{{ global:DATE_TIME }}</td>
<td>2018-09-07_18.09.59</td>
</tr>
<tr>
<td>EC2RESCUE_EC2RL_DIR</td>
<td>EC2Rescue for Linux installation path</td>
<td>/usr/local/ec2rl-1.1.3</td>
</tr>
<tr>
<td>EC2RESCUE_EXECUTION_ID</td>
<td>{{ automation:EXECUTION_ID }}</td>
<td>7ef8008e-219b-4aca-8bb5-65e2e898e20b</td>
</tr>
<tr>
<td>EC2RESCUE_OFFLINE_DEVICE</td>
<td>Offline device name</td>
<td>/dev/xvdfl</td>
</tr>
<tr>
<td>EC2RESCUE_OFFLINE_EBS_DEVICE</td>
<td>Offline root volume EBS device</td>
<td>/dev/sdf</td>
</tr>
<tr>
<td>EC2RESCUE_OFFLINE_SYSTEM_ROOT</td>
<td>Offline root volume mount point</td>
<td>/mnt/mount</td>
</tr>
<tr>
<td>EC2RESCUE_PYTHON</td>
<td>Python version</td>
<td>python2.7</td>
</tr>
<tr>
<td>EC2RESCUE_REGION</td>
<td>{{ global:REGION }}</td>
<td>us-west-1</td>
</tr>
<tr>
<td>EC2RESCUE_S3_BUCKET</td>
<td>{{ S3BucketName }}</td>
<td>mybucket</td>
</tr>
<tr>
<td>EC2RESCUE_S3_PREFIX</td>
<td>{{ S3Prefix }}</td>
<td>myprefix/</td>
</tr>
<tr>
<td>EC2RESCUE_SOURCE_INSTANCE</td>
<td>{{ Instanceld }}</td>
<td>i-abcdefgh123456789</td>
</tr>
</tbody>
</table>

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**
• Instanceld
  Type: String
  Description: (Required) ID of your EC2 instance. IMPORTANT: AWS Systems Manager Automation stops
  this instance. Data stored in instance store volumes will be lost. The public IP address will change if
  you are not using an Elastic IP.
• OfflineScript
  Type: String
  Description: (Required) Base64 encoded script to run against the helper instance. Use Bash if your
  source instance is Linux, and PowerShell if it is Windows.
• EC2RescueInstanceType
  Type: String
  Allowed values: t2.small, t2.medium, t2.large
  Default: t2.small
  Description: (Optional) The EC2 instance type for the EC2Rescue instance.
• SubnetId
  Type: String
  Default: SelectedInstanceSubnet
  Description: (Optional) The subnet ID for the EC2Rescue instance. By default, the same subnet where
  the provided instance resides is used. IMPORTANT: If you provide a custom subnet, it must be in the
  same Availability Zone as Instanceld, and it must allow access to the SSM endpoints.
• S3BucketName
  Type: String
  Description: (Optional) S3 bucket name in your account where you want to upload the troubleshooting
  logs. Make sure the bucket policy does not grant unnecessary read/write permissions to parties that do
  not need access to the collected logs.
• S3Prefix
  Type: String
  Default: AWSSupport-EC2Rescue
  Description: (Optional) A prefix for the S3 logs.
• AMIPrefix
  Type: String
  Default: AWSSupport-EC2Rescue
  Description: (Optional) A prefix for the backup AMI name.
• CreatePreEC2RescueBackup
  Type: String
  Allowed values: True, False
  Default: False
Description: (Optional) Set it to True to create an AMI of InstanceId before running the script. The AMI will persist after the automation completes. It is your responsibility to secure access to the AMI, or to delete it.

- **CreatePostEC2RescueBackup**
  
  **Type:** String

  **Allowed values:** True,False

  **Default:** False

  Description: (Optional) Set it to True to create an AMI of InstanceId after running the script, before starting it. The AMI will persist after the automation completes. It is your responsibility to secure access to the AMI, or to delete it.

- **UniqueId**
  
  **Type:** String

  **Default:** {{ automation:EXECUTION_ID }}

  Description: (Optional) A unique identifier for the workflow.

- **AutomationAssumeRole**
  
  **Type:** String

  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf. If no role is specified, Systems Manager Automation uses your IAM permissions to run this document.

**Examples**

Print environment variables on a Windows helper instance

```
aws ssm start-automation-execution --document-name "AWSSupport-StartEC2RescueWorkflow" --parameters "InstanceId=WINDOWSINSTANCEID,OfflineScript=R2V0LUNoaWxkSXRlbSB1bnY6KiB8IFNvcnQtT2JqZWN0IE5hbWU="
```

Print environment variables on a Linux helper instance

```
aws ssm start-automation-execution --document-name "AWSSupport-StartEC2RescueWorkflow" --parameters "InstanceId=LINUXINSTANCEID,OfflineScript=IyEvYmluL2Jhc2gKcHJpbnRlbnYgCBzb3J0"
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Required IAM Permissions**

It is recommended the user who runs the automation have the **AmazonSSMAutomationRole** IAM managed policy attached. In addition to that policy, the user must have:

```
{
   "Version": "2012-10-17",
   "Statement": [
```
{ "Action": [
   "lambda:InvokeFunction",
   "lambda:DeleteFunction",
   "lambda:GetFunction"
].
"Effect": "Allow"
},
{ "Action": [
   "s3:GetObject",
   "s3:GetObjectVersion"
].
"Resource": [ 
   "arn:aws:s3:::awssupport-ssm.*/*.template",
   "arn:aws:s3:::awssupport-ssm.*/*.zip"
].
"Effect": "Allow"
},
{ "Action": [
   "iam:CreateRole",
   "iam:CreateInstanceProfile",
   "iam:GetRole",
   "iam:GetInstanceProfile",
   "iam:PutRolePolicy",
   "iam:DetachRolePolicy",
   "iam:AttachRolePolicy",
   "iam:PassRole",
   "iam:AddRoleToInstanceProfile",
   "iam:RemoveRoleFromInstanceProfile",
   "iam:DeleteRole",
   "iam:DeleteRolePolicy",
   "iam:DeleteInstanceProfile"
].
"Resource": [ 
   "arn:aws:iam::An-AWS-Account-ID:role/AWSSupport-EC2Rescue-*",
].
"Effect": "Allow"
},
{ "Action": [ 
   "lambda:CreateFunction",
   "ec2:CreateVpc",
   "ec2:ModifyVpcAttribute",
   "ec2:DeleteVpc",
   "ec2:CreateInternetGateway",
   "ec2:AttachInternetGateway",
   "ec2:DetachInternetGateway",
   "ec2:DeleteInternetGateway",
   "ec2:CreateSubnet",
   "ec2:DeleteSubnet",
   "ec2:CreateRoute",
   "ec2:DeleteRoute",
   "ec2:CreateRouteTable",
   "ec2:AssociateRouteTable",
   "ec2:DisassociateRouteTable",
   "ec2:DeleteRouteTable",
   "ec2:CreateVpcEndpoint",
   "ec2:DeleteVpcEndpoint",
   "ec2:ModifyVpcEndpoint",
   "ec2:Describe*"
]
Document Steps

1. **aws:executeAwsApi** - Describe the provided instance
2. **aws:executeAwsApi** - Describe the provided instance's root volume
3. **aws:assertAwsResourceProperty** - Check the root volume device type is EBS
4. **aws:assertAwsResourceProperty** - Check the root volume is not encrypted
5. **aws:assertAwsResourceProperty** - Check the provide subnet ID
   a. (Use current instance subnet) - If *SubnetId = SelectedInstanceSubnet* then run **aws:createStack** to deploy the EC2Rescue CloudFormation stack
   b. (Create new VPC) - If *SubnetId = CreateNewVPC* then run **aws:createStack** to deploy the EC2Rescue CloudFormation stack
   c. (Use custom subnet) - In all other cases:
      a. **aws:assertAwsResourceProperty** - Check the provided subnet is in the same Availability Zone as the provided instance
      b. **aws:createStack** - Deploy the EC2Rescue CloudFormation stack
6. **aws:invokeLambdaFunction** - Perform additional input validation
7. **aws:executeAwsApi** - Update the EC2Rescue CloudFormation stack to create the EC2Rescue helper instance
8. **aws:waitForAwsResourceProperty** - Wait for the EC2Rescue CloudFormation stack update to complete
9. **aws:executeAwsApi** - Describe the EC2Rescue CloudFormation stack output to obtain the EC2Rescue helper instance ID
10. **aws:waitForAwsResourceProperty** - Wait for the EC2Rescue helper instance to become a managed instance
11. **aws:changeInstanceState** - Stop the provided instance
12. **aws:changeInstanceState** - Stop the provided instance
13. **aws:changeInstanceState** - Force stop the provided instance
14. **aws:assertAwsResourceProperty** - Check the CreatePreEC2RescueBackup input value
   a. (Create pre-EC2Rescue backup) - If *CreatePreEC2RescueBackup = True*
   b. **aws:executeAwsApi** - Create an AMI backup of the provided instance
   c. **aws:createTags** - Tag the AMI backup
15. **aws:runCommand** - Install EC2Rescue on the EC2Rescue helper instance
16. **aws:executeAwsApi** - Detach the root volume from the provided instance
17. **aws:assertAwsResourceProperty** - Check the provided instance platform
   a. (Instance is Windows):
      a. **aws:executeAwsApi** - Attach the root volume to the EC2Rescue helper instance as *xvdf*
      b. **aws:sleep** - Sleep 10 seconds
      c. **aws:runCommand** - Run the provided offline script in Powershell
   b. (Instance is Linux):
      a. **aws:executeAwsApi** - Attach the root volume to the EC2Rescue helper instance as */dev/sdf*
aws:sleep - Sleep 10 seconds
aws:runCommand - Run the provided offline script in Bash
18aws:changeInstanceState - Stop the EC2Rescue helper instance
19aws:changeInstanceState - Force stop the EC2Rescue helper instance
20aws:executeAwsApi - Detach the root volume from the EC2Rescue helper instance
21aws:executeAwsApi - Attach the root volume back to the provided instance
22aws:assertAwsResourceProperty - Check the CreatePostEC2RescueBackup input value
   a. (Create post-EC2Rescue backup) - If *CreatePostEC2RescueBackup = True*
   b. aws:executeAwsApi - Create an AMI backup of the provided instance
   c. aws:createTags - Tag the AMI backup
23aws:executeAwsApi - Restore the initial delete on termination state for the root volume of the
   provided instance
24aws:changeInstanceState - Restore the initial state of the provided instance (running/stopped)
25aws:deleteStack - Delete the EC2Rescue CloudFormation stack

Outputs
runScriptForLinux.Output
runScriptForWindows.Output
preScriptBackup.ImageId
postScriptBackup.ImageId

AWS-StartRDSInstance

Description
Start an Amazon Relational Database Service (Amazon RDS) instance.

Document Type
Automation

Owner
Amazon

Platforms
Windows, Linux

Parameters
- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
- InstanceId
  Type: String
Description: (Required) ID of the Amazon RDS instance to start.

Examples
Start the automation

```
aws ssm start-automation-execution --document-name AWS-StartRdsInstance --parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps
aws:assertAwsResourceProperty
aws:executeAwsApi
aws:waitForAwsResourceProperty

Outputs
None

AWS-StopEC2Instance

Description
Stop one or more Amazon EC2 instances.

Document Type
Automation

Owner
Amazon

Platforms
Windows, Linux

Parameters
- AutomationAssumeRole
  Type: String
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
- InstanceId
  Type: StringList
Description: (Required) IDs of one or more Amazon EC2 instances to stop

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-StopEC2Instance --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

aws:changeInstanceState

aws:changeInstanceState

Outputs

None

AWS-StopRDSInstance

Description

Stop an Amazon Relational Database Service (Amazon RDS) instance. This document calls the StopDBInstance API action. The StopDBInstance API doesn't apply to Aurora MySQL and Aurora PostgreSQL. For Aurora clusters, you must use the StopDBCluster API action instead.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- AutomationAssumeRole
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.
  
- Instanceld
  
  Type: String
Description: (Required) ID of the Amazon RDS instance to stop.

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWS-StopRdsInstance --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --
query 'AutomationExecution.Output'
```

Document Steps

`aws:assertAwsResourceProperty`

`aws:executeAwsApi`

`aws:waitForAwsResourceProperty`

Outputs

None

**AWS-TerminateEC2Instance**

Description

Terminate one or more Amazon EC2 instances.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- **AutomationAssumeRole**
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- **InstanceId**
  
  Type: StringList
  
  Description: (Required) IDs of one or more Amazon EC2 instances to terminate.
Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-TerminateEC2Instance --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

aws:changeInstanceState

Outputs

None

**AWSSupport-TerminateIPMonitoringFromVPC**

Description

AWSSupport-TerminateIPMonitoringFromVPC terminates an IP monitoring test previously started by AWSSupport-SetupIPMonitoringFromVPC. Data related to the specified test ID will be deleted.

Document Type

Automation

Owner

Amazon

Parameters

- **AutomationExecutionId**
  
  Type: String
  
  Description: (Required) AWSSupport-SetupIPMonitoringFromVPC automation execution ID of the test you want to terminate.

- **SubnetId**
  
  Type: String
  
  Description: (Required) The subnet ID for the monitor instance.

- **InstanceId**
  
  Type: String
  
  Description: (Required) The instance ID for the monitor instance.

- **AutomationAssumeRole**
  
  Type: String
Description: (Optional) The IAM role for this execution. If no role is specified, AWS Systems Manager Automation will use the permissions of the user that runs this document.

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWSSupportTest-TerminateIPMonitoringFromVPC --parameters 'AutomationExecutionId=ID,SubnetId=ID,InstanceId=ID,'
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id ID --output text --query 'AutomationExecution.Output'
```

Required IAM Permissions

It is recommended that the user who runs the automation have the AmazonSSMAutomationRole IAM managed policy attached. In addition, the user must have the following policy attached to their user account, group, or role:

```
{
    "Version": "2012-10-17",
    "Statement": [
        { "Action": [
            "iam:DetachRolePolicy",
            "iam:RemoveRoleFromInstanceProfile",
            "iam:DeleteRole",
            "iam:DeleteInstanceProfile",
            "iam:DeleteRolePolicy"
        ],
        "Resource": [
            "arn:aws:iam::An-AWS-Account-ID:role/AWSSupport/SetupIPMonitoringFromVPC_*",
            "arn:aws:iam::An-AWS-Account-ID:instance-profile/AWSSupport/SetupIPMonitoringFromVPC_*",
        ],
        "Effect": "Allow"
    },
    { "Action": [
        "iam:DetachRolePolicy"
    ],
    "Resource": [
        "arn:aws:iam::aws:policy/service-role/AmazonSSMManagedInstanceCore"
    ],
    "Effect": "Allow"
    },
    { "Action": [
        "cloudwatch:DeleteDashboards"
    ],
    "Resource": [
        "*"
    ],
    "Effect": "Allow"
}
```

Document Steps

1. `aws:assertAwsResourceProperty` - check AutomationExecutionId and InstanceId are related to the same test.
2. `aws:assertAwsResourceProperty` - check SubnetId and InstanceId are related to the same test.
3. `aws:executeAwsApi` - retrieve the test security group.
4. `aws:executeAwsApi` - delete the CloudWatch dashboard.
5. `aws:changeInstanceState` - terminate the test instance.
6. `aws:executeAwsApi` - remove the IAM instance profile from the role.
7. `aws:executeAwsApi` - delete the IAM instance profile created by the automation.
8. `aws:executeAwsApi` - delete the CloudWatch inline policy from the role created by the automation.
9. `aws:executeAwsApi` - detach the AmazonSSMManagedInstanceCore managed policy from the role created by the automation.
10. `aws:executeAwsApi` - delete the IAM role created by the automation.
11. `aws:executeAwsApi` - delete the security group created by the automation, if it exists.

Outputs

None

AWSSupport-TroubleshootRDP

Description

The AWSSupport-TroubleshootRDP automation document allows the user to check or modify common settings on the target instance which may impact Remote Desktop Protocol (RDP) connections, such as the RDP port, Network Layer Authentication (NLA) and Windows Firewall profiles. Optionally, changes can be applied offline by stopping and starting the instance, if the user explicitly allows for offline remediation. By default, the document reads and outputs the values of the settings.

Important

Changes to the RDP settings, RDP service and Windows Firewall profiles should be carefully reviewed before running this document.

Document Type

Automation

Owner

Amazon

Platforms

Windows

Parameters

- InstanceId
  
  Type: String

  Description: (Required) The ID of the instance to troubleshoot the RDP settings of.

- Action

  Type: String
Allowed values: CheckAll, FixAll, Custom

Default: Custom

Description: (Optional) [Custom] Use the values from Firewall, RDPServiceStartupType, RDPServiceAction, RDPPortAction, NLASettingAction and RemoteConnections to manage the settings. [CheckAll] Read the values of the settings without changing them. [FixAll] Restore RDP default settings, and disable the Windows Firewall.

- AllowOffline
  Type: String
  Allowed values: True, False
  Default: False

Description: (Optional) Fix only - Set it to true if you allow an offline RDP remediation in case the online troubleshooting fails, or the provided instance is not a managed instance. Note: For the offline remediation, SSM Automation stops the instance, and creates an AMI before attempting any operations.

- Firewall
  Type: String
  Allowed values: Check, Disable
  Default: Check

Description: (Optional) Check or disable the Windows firewall (all profiles).

- RDPServiceAction
  Type: String
  Allowed values: Check, Start, Restart, Force-Restart
  Default: Check

Description: (Optional) Check, start, restart, or force-restart the RDP service (TermService).

- RDPServiceStartupType
  Type: String
  Allowed values: Check, Auto
  Default: Check

Description: (Optional) Check or set the RDP service to automatically start when Windows boots.

- RDPPortAction
  Type: String
  Allowed values: Check, Modify
  Default: Check

Description: (Optional) Check the current port used for RDP connections, or modify the RDP port back to 3389 and restart the service.

- NLASettingAction
Type: String

Allowed values: Check, Disable

Default: Check

Description: (Optional) Check or disable Network Layer Authentication (NLA).

- RemoteConnections
  Type: String

  Allowed values: Check, Enable

  Default: Check

  Description: (Optional) An action to perform on the fDenyTSConnections setting: Check, Enable.

- SubnetId
  Type: String

  Default: SelectedInstanceSubnet

  Description: (Optional) Offline only - The subnet ID for the EC2Rescue instance used to perform the offline troubleshooting. If no subnet ID is specified, AWS Systems Manager Automation will create a new VPC. IMPORTANT: The subnet must be in the same Availability Zone as InstanceId, and it must allow access to the SSM endpoints.

- S3BucketName
  Type: String

  Description: (Optional) Offline only - S3 bucket name in your account where you want to upload the troubleshooting logs. Make sure the bucket policy does not grant unnecessary read/write permissions to parties that do not need access to the collected logs.

- AutomationAssumeRole
  Type: String

  Description: (Optional) The IAM role for this execution. If no role is specified, AWS Systems Manager Automation will use the permissions of the user that runs this document.

Examples

Check the current RDP status

```
aws ssm start-automation-execution --document-name "AWSSupport-TroubleshootRDP" --parameters "InstanceId=INSTANCEID"
```

Check the current RDP status

```
aws ssm start-automation-execution --document-name "AWSSupport-TroubleshootRDP" --parameters "InstanceId=INSTANCEID"
```

Disable the Windows firewall

```
aws ssm start-automation-execution --document-name "AWSSupport-TroubleshootRDP" --parameters "InstanceId=INSTANCEID,Action=Custom,Firewall=Disable"
```
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Restore the default RDP port

```bash
aws ssm start-automation-execution --document-name "AWSSupport-TroubleshootRDP" --
parameters "InstanceId=INSTANCEID, RDPPortAction=Modify"
```

Disable NLA

```bash
aws ssm start-automation-execution --document-name "AWSSupport-TroubleshootRDP" --
parameters "InstanceId=INSTANCEID, NLASettingAction=Disable"
```

Allow remote connections

```bash
aws ssm start-automation-execution --document-name "AWSSupport-TroubleshootRDP" --
parameters "InstanceId=INSTANCEID, RemoteConnections=Allow"
```

Restore RDP default settings and disable all Windows Firewall profiles

```bash
aws ssm start-automation-execution --document-name "AWSSupport-TroubleshootRDP" --
parameters "InstanceId=INSTANCEID, Action=FixAll"
```

Restore RDP default settings and disable all Windows Firewall profiles, with offline remediation if needed

```bash
aws ssm start-automation-execution --document-name "AWSSupport-TroubleshootRDP" --
parameters "InstanceId=INSTANCEID, Action=FixAll, AllowOffline=True"
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --
query 'AutomationExecution.Output'
```

Required IAM Permissions

It is recommended that the EC2 instance receiving the command has an IAM role with the
AmazonSSMManagedInstanceCore Amazon managed policy attached. For the online remediation,
the user must have at least ssm:DescribeInstanceInformation, ssm:ExecuteAutomation
and ssm:SendCommand to run the automation and send the command to the instance, plus
ssm:GetAutomationExecution to be able to read the automation output. For the offline remediation,
the user must have at least ssm:DescribeInstanceInformation, ssm:ExecuteAutomation,
ec2:DescribeInstances, plus ssm:GetAutomationExecution to be able to read the automation
output. AWSSupport-TroubleshootRDP calls AWSSupport-ExecuteEC2Rescue to perform the offline
remediation - please review the permissions for AWSSupport-ExecuteEC2Rescue to ensure you can run
the automation successfully.

Document Steps

1. aws:assertAwsResourceProperty - Check if the instance is a Windows instance
2. aws:assertAwsResourceProperty - Check if the instance is a managed instance
3. (Online troubleshooting) If the instance is a managed instance, then:
   a. aws:assertAwsResourceProperty - Check the provided Action value
   b. (Online check) If the Action = CheckAll, then:
      ```bash
      aws:runPowerShellScript - Runs the PowerShell script to get the Windows Firewall profiles status.
      aws:executeAutomation - Calls AWSSupport-ManageWindowsService to get the RDP service status.
      ```
aws:executeAutomation - Calls AWSSupport-ManageRDPSettings to get the RDP settings.
c. (Online fix) If the **Action** = FixAll, then:
   - aws:runPowerShellScript - Runs the PowerShell script to disable all Windows Firewall profiles.
   - aws:executeAutomation - Calls AWSSupport-ManageWindowsService to start the RDP service.
   - aws:executeAutomation - Calls AWSSupport-ManageRDPSettings to enable remote connections and disable NLA.
d. (Online management) If the **Action** = Custom, then:
   - aws:runPowerShellScript - Runs the PowerShell script to manage the Windows Firewall profiles.
   - aws:executeAutomation - Calls AWSSupport-ManageWindowsService to manage the RDP service.
   - aws:executeAutomation - Calls AWSSupport-ManageRDPSettings to manage the RDP settings.
4. (Offline remediation) If the instance is not a managed instance then:
a. aws:assertAwsResourceProperty - Assert **AllowOffline** = True
b. aws:assertAwsResourceProperty - Assert **Action** = FixAll
c. aws:assertAwsResourceProperty - Assert the value of SubnetId
   (Use the provided instance's subnet) If SubnetId is SELECTED_INSTANCE_SUBNET
   - aws:executeAwsApi - Retrieve the current instance's subnet.
   - aws:executeAutomation - Run AWSSupport-ExecuteEC2Rescue with provided instance's subnet.
d. (Use the provided custom subnet) If SubnetId is not SELECTED_INSTANCE_SUBNET
   - aws:executeAutomation - Run AWSSupport-ExecuteEC2Rescue with provided SubnetId value.

**Outputs**

manageFirewallProfiles.Output
manageRDPServiceSettings.Output
manageRDPSettings.Output
checkFirewallProfiles.Output
checkRDPServiceSettings.Output
checkRDPSettings.Output
disableFirewallProfiles.Output
restoreDefaultRDPServiceSettings.Output
restoreDefaultRDPSettings.Output
troubleshootRDPOffline.Output
troubleshootRDPOfflineWithSubnetId.Output
**AWSSupport-TroubleshootSSH**

**Description**
The AWSSupport-TroubleshootSSH automation document installs the Amazon EC2Rescue tool for Linux, and then uses the EC2Rescue tool to check or attempt to fix common issues that prevent a remote connection to the Linux machine via SSH. Optionally, changes can be applied offline by stopping and starting the instance, if the user explicitly allows for offline remediation. By default, the document operates in read-only mode.

**Document Type**
Automation

**Owner**
Amazon

**Platforms**
Linux

**Parameters**

- **InstanceId**
  Type: String
  Description: (Required) ID of your EC2 Linux instance.

- **Action**
  Type: String
  Allowed values: CheckAll,FixAll
  Default: CheckAll
  Description: (Required) Specify whether to check for issues without fixing them or to check and automatically fix any discovered issues.

- **AllowOffline**
  Type: String
  Allowed values: True,False
  Default: False
  Description: (Optional) Fix only - Set it to true if you allow an offline SSH remediation in case the online troubleshooting fails, or the provided instance is not a managed instance. Note: For the offline remediation, SSM Automation stops the instance, and creates an AMI before attempting any operations.

- **SubnetId**
  Type: String
  Default: SelectedInstanceSubnet
  Description: (Optional) Offline only - The subnet ID for the EC2Rescue instance used to perform the offline troubleshooting. If no subnet ID is specified, AWS Systems Manager Automation will create a new VPC.

**Important**
The subnet must be in the same Availability Zone as InstanceId, and it must allow access to the SSM endpoints.
• **S3BucketName**

  Type: String

  Description: (Optional) Offline only - S3 bucket name in your account where you want to upload the troubleshooting logs. Make sure the bucket policy does not grant unnecessary read/write permissions to parties that do not need access to the collected logs.

• **AutomationAssumeRole**

  Type: String

  Description: (Optional) The IAM role for this execution. If no role is specified, Systems Manager Automation will use the permissions of the user that runs this document.

### Examples

**Check the current SSH status**

```bash
aws ssm start-automation-execution --document-name AWSSupport-TroubleshootSSH --parameters "InstanceId=INSTANCEID"
```

**Perform an online fix of all detected SSH issues**

```bash
aws ssm start-automation-execution --document-name AWSSupport-TroubleshootSSH --parameters "InstanceId=INSTANCEID,Action=FixAll"
```

**Perform an offline fix of all detected SSH issues**

```bash
aws ssm start-automation-execution --document-name AWSSupport-TroubleshootSSH --parameters "InstanceId=INSTANCEID,Action=FixAll,AllowOffline=True"
```

**Retrieve the execution output**

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

### Required IAM Permissions

It is recommended that the EC2 instance receiving the command has an IAM role with the [AmazonSSMManagedInstanceCore](https://docs.aws.amazon.com/systems-manager/latest/userguide/s话oal-lifecycle-package.html) Amazon managed policy attached. For the online remediation, the user must have at least [ssm:DescribeInstanceInformation](https://docs.aws.amazon.com/systems-manager/latest/userguide/s话oal-keep-alive.html), [ssm:ExecuteAutomation](https://docs.aws.amazon.com/systems-manager/latest/userguide/s話oal-command-execution.html), and [ssm:SendCommand](https://docs.aws.amazon.com/systems-manager/latest/userguide/s話oal-command-send.html) to run the automation and send the command to the instance, plus [ssm:GetAutomationExecution](https://docs.aws.amazon.com/systems-manager/latest/userguide/s話oal-automation-exectutation.html) to be able to read the automation output. For the offline remediation, the user must have at least [ssm:DescribeInstanceInformation](https://docs.aws.amazon.com/systems-manager/latest/userguide/s話oal-keep-alive.html), [ssm:ExecuteAutomation](https://docs.aws.amazon.com/systems-manager/latest/userguide/s話oal-command-execution.html), [ec2:DescribeInstances](https://docs.aws.amazon.com/AWSEC2/latest/APIReference/API_DescribeInstances.html), plus [ssm:GetAutomationExecution](https://docs.aws.amazon.com/systems-manager/latest/userguide/s話oal-automation-exectutation.html) to be able to read the automation output. AWSSupport-TroubleshootSSH calls AWSSupport-ExecuteEC2Rescue to perform the offline remediation - please review the permissions for AWSSupport-ExecuteEC2Rescue to ensure you can run the automation successfully.

### Document Steps

1. **aws:assertAwsResourceProperty** - Check if the instance is a managed instance
   
   a. (Online remediation) If the instance is a managed instance, then:
      
      i. **aws:configurePackage** - Install EC2Rescue for Linux via AWS-ConfigureAWSPackage.
      
      ii. **aws:runCommand** - Run the bash script to run EC2Rescue for Linux.
b. (Offline remediation) If the instance is not a managed instance then:
   i. `aws:assertAwsResourceProperty - Assert AllowOffline = True`
   ii. `aws:assertAwsResourceProperty - Assert Action = FixAll`
   iii. `aws:assertAwsResourceProperty - Assert the value of SubnetId`
   iv. (Use the provided instance's subnet) If SubnetId is SelectedInstanceSubnet use `aws:executeAutomation` to run AWSSupport-ExecuteEC2Rescue with provided instance's subnet.
   v. (Use the provided custom subnet) If SubnetId is not SelectedInstanceSubnet use `aws:executeAutomation` to run AWSSupport-ExecuteEC2Rescue with provided SubnetId value.

**Outputs**

`troubleshootSSH.Output`

`troubleshootSSHOffline.Output`

`troubleshootSSHOfflineWithSubnetId.Output`

**AWS-UpdateCloudFormationStack**

**Description**

Update an AWS CloudFormation stack by using an AWS CloudFormation template stored in an Amazon S3 bucket.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- **AutomationAssumeRole**
  
  Type: String

  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf.

- **LambdaAssumeRole**
  
  Type: String

  Description: (Required) The ARN of the role assumed by Lambda

- **StackNameOrId**
  
  Type: String

  Description: (Required) Name or Unique ID of the AWS CloudFormation stack to be updated

- **TemplateUrl**
  
  Type: String
Description: (Required) Amazon S3 bucket location that contains the updated CloudFormation template (e.g. https://s3.amazonaws.com/example/updated.template)

Examples

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-UpdateCloudFormationStack --parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps

- `aws:createStack`
- `aws:invokeLambdaFunction`
- `aws:deleteStack`

Outputs

None

**AWS-UpdateLinuxAmi**

Description

Update an Amazon Machine Image (AMI) with Linux distribution packages and Amazon software.

Document Type

Automation

Owner

Amazon

Platforms

Windows, Linux

Parameters

- AutomationAssumeRole
  - Type: String
  - Default: arn:aws:iam::{{global:ACCOUNT_ID}}:role/AutomationServiceRole
  - Description: (Required) The ARN of the role that allows Automation to perform the actions on your behalf.
- ExcludePackages
Type: String
Default: none

Description: (Optional) Names of packages to hold back from updates, under all conditions. By default ("none"), no package is excluded.

- IamInstanceProfileName
  Type: String
  Default: ManagedInstanceProfile
  Description: (Required) The instance profile that enables Systems Manager to manage the instance.

- IncludePackages
  Type: String
  Default: all
  Description: (Optional) Only update these named packages. By default ("all"), all available updates are applied.

- InstanceType
  Type: String
  Default: t2.micro
  Description: (Optional) Type of instance to launch as the workspace host. Instance types vary by Region.

- PostUpdateScript
  Type: String
  Default: none
  Description: (Optional) URL of a script to run after package updates are applied. Default ("none") is to not run a script.

- PreUpdateScript
  Type: String
  Default: none
  Description: (Optional) URL of a script to run before updates are applied. Default ("none") is to not run a script.

- SourceAmiId
  Type: String
  Description: (Required) The source Amazon Machine Image ID.

- TargetAmiName
  Type: String
  Default: UpdateLinuxAmi_from_{{SourceAmiId}}_on_{{global:DATE_TIME}}
  Description: (Optional) The name of the new AMI that will be created. Default is a system-generated string including the source AMI id, and the creation time and date.
**Examples**

Start the automation

```bash
aws ssm start-automation-execution --document-name AWS-UpdateLinuxAmi --parameters parameters
```

Retrieve the execution output

```bash
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Document Steps**

- `aws:runInstances`
- `aws:runCommand`
- `aws:runCommand`
- `aws:changeInstanceState`
- `aws:createImage`
- `aws:changeInstanceState`

**Outputs**

- `createImage.ImageId`

**AWS-UpdateWindowsAmi**

**Description**

Update a Microsoft Windows Amazon Machine Image (AMI). By default, this document installs all Windows updates, Amazon software, and Amazon drivers. It then runs Sysprep to create a new AMI. Supports Windows Server 2008 R2 or later.

**Document Type**

Automation

**Owner**

Amazon

**Platforms**

Windows, Linux

**Parameters**

- `AutomationAssumeRole`
  
  Type: String
  
  Default: arn:aws:iam::{{global:ACCOUNT_ID}}:role/AutomationServiceRole
Description: (Required) The ARN of the role that allows Automation to perform the actions on your behalf.

- Categories
  Type: String
  Description: (Optional) Specify one or more update categories. You can filter categories using comma-separated values. Options: Application, Connectors, CriticalUpdates, DefinitionUpdates, DeveloperKits, Drivers, Feature Packs, Guidance, Microsoft, SecurityUpdates, Service Packs, Tools, Update Rollups, Updates. Valid formats include a single entry, for example: CriticalUpdates. Or you can specify a comma-separated list: CriticalUpdates, SecurityUpdates. NOTE: There cannot be any spaces around the commas.

- ExcludeKbs
  Type: String
  Description: (Optional) Specify one or more Microsoft Knowledge Base (KB) article IDs to exclude. You can exclude multiple IDs using comma-separated values. Valid formats: KB9876543 or 9876543.

- IamInstanceProfileName
  Type: String
  Default: ManagedInstanceProfile
  Description: (Required) The name of the role that enables Systems Manager to manage the instance.

- IncludeKbs
  Type: String
  Description: (Optional) Specify one or more Microsoft Knowledge Base (KB) article IDs to include. You can install multiple IDs using comma-separated values. Valid formats: KB9876543 or 9876543.

- InstanceType
  Type: String
  Default: t2.medium
  Description: (Optional) Type of instance to launch as the workspace host. Instance types vary by region. Default is t2.medium.

- PostUpdateScript
  Type: String
  Description: (Optional) A script provided as a string. It will run after installing OS updates.

- PreUpdateScript
  Type: String
  Description: (Optional) A script provided as a string. It will run prior to installing OS updates.

- PublishedDateAfter
  Type: String
  Description: (Optional) Specify the date that the updates should be published after. For example, if 01/01/2017 is specified, any updates that were found during the Windows Update search that have been published on or after 01/01/2017 will be returned.

- PublishedDateBefore
Type: String

Description: (Optional) Specify the date that the updates should be published before. For example, if 01/01/2017 is specified, any updates that were found during the Windows Update search that have been published on or before 01/01/2017 will be returned.

- PublishedDaysOld
  
  Type: String
  
  Description: (Optional) Specify the amount of days old the updates must be from the published date. For example, if 10 is specified, any updates that were found during the Windows Update search that have been published 10 or more days ago will be returned.

- SeverityLevels
  
  Type: String
  
  Description: (Optional) Specify one or more MSRC severity levels associated with an update. You can filter severity levels using comma-separated values. By default patches for all security levels are selected. If value supplied, the update list is filtered by those values. Options: Critical, Important, Low, Moderate or Unspecified. Valid formats include a single entry, for example: Critical. Or, you can specify a comma separated list: Critical,Important,Low.

- SourceAmiId
  
  Type: String
  
  Description: (Required) The source Amazon Machine Image ID.

- SubnetId
  
  Type: String
  
  Description: (Optional) Specify the SubnetId if you want to launch into a specific subnet.

- TargetAmiName
  
  Type: String
  
  Default: UpdateWindowsAmi_from_{{SourceAmiId}}_on_{{global:DATE_TIME}}
  
  Description: (Optional) The name of the new AMI that will be created. Default is a system-generated string including the source AMI id, and the creation time and date.

Examples

Start the automation

```
aws ssm start-automation-execution --document-name AWS-UpdateWindowsAmi --parameters parameters
```

Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

Document Steps
aws:runInstances
aws:runCommand
aws:runCommand
aws:runCommand
aws:runCommand
aws:runCommand
aws:runCommand
aws:runCommand
aws:runCommand
aws:runCommand
aws:changeInstanceState
aws:createImage
aws:changeInstanceState

**Outputs**
CreateImage.ImageId

**AWSSupport-UpgradeWindowsAWSDrivers**

**Description**
The AWSSupport-UpgradeWindowsAWSDrivers upgrades or repairs storage and network AWS drivers on the specified Amazon EC2 instance. The document attempts to install the latest versions of AWS drivers online by calling SSM Agent. If SSM Agent is not contactable, the document can perform an offline installation of the AWS drivers if explicitly requested. Note: Both the online and offline upgrade will create an AMI before attempting any operations, which will persist after the automation completes. It is your responsibility to secure access to the AMI, or to delete it. The online method restarts the instance as part of the upgrade process, while the offline method requires the provided Amazon EC2 instance be stopped and then started.

**Note**
This document will fail on a domain controller. To update AWS PV drivers on a domain controller, see [Upgrade a Domain Controller (AWS PV Upgrade)](#).

**Document Type**
Automation

**Owner**
Amazon

**Platforms**
Windows

**Parameters**
- InstanceId
Type: String
Description: (Required) ID of your Amazon EC2 Windows instance.

- AllowOffline
  
  Type: String
  
  Allowed values: True, False
  
  Default: False
  
  Description: (Optional) Set it to true if you allow an offline drivers upgrade in case the online installation cannot be performed. Note: The offline method requires the provided EC2 instance be stopped and then started. Data stored in instance store volumes will be lost. The public IP address will change if you are not using an Elastic IP.

- SubnetId
  
  Type: String
  
  Default: SelectedInstanceSubnet
  
  Description: (Optional) Offline only - The subnet ID for the EC2Rescue instance used to perform the offline drivers upgrade. If no subnet ID is specified, Systems Manager Automation will create a new VPC.
  
  **Important**
  
  The subnet must be in the same Availability Zone as InstanceId, and it must allow access to the SSM endpoints.

- ForceUpgrade
  
  Type: String
  
  Allowed values: True, False
  
  Default: False
  
  Description: (Optional) Offline only - Set it to true if you allow the offline drivers upgrade to proceed even though your instance already has the latest drivers installed.

- AutomationAssumeRole
  
  Type: String
  
  Description: (Optional) The ARN of the role that allows Automation to perform the actions on your behalf. If no role is specified, Systems Manager Automation uses your IAM permissions to run this document.

**Examples**

Start the automation

```
aws ssm start-automation-execution --document-name AWSSupport-UpgradeWindowsAWSDrivers --parameters "InstanceId=INSTANCEID"
```

Start the automation and allow an offline upgrade

```
aws ssm start-automation-execution --document-name AWSSupport-UpgradeWindowsAWSDrivers --parameters "InstanceId=INSTANCEID,AllowOffline=True"
```
Retrieve the execution output

```
aws ssm get-automation-execution --automation-execution-id EXECUTIONID --output text --query 'AutomationExecution.Output'
```

**Required IAM Permissions**

It is recommended that the EC2 instance receiving the command has an IAM role with the `AmazonSSMManagedInstanceCore` Amazon managed policy attached. You must have at least `ssm:ExecuteAutomation` and `ssm:SendCommand` to run the automation and send the command to the instance, plus `ssm:GetAutomationExecution` to be able to read the automation output. If you are performing an offline upgrade, see the permissions required by `AWSSupport-StartEC2RescueWorkflow` (p. 371).

**Document Steps**

1. `aws:assertAwsResourceProperty` - Verifies the input instance is Windows.
2. `aws:assertAwsResourceProperty` - Verifies the input instance is a managed instance. If so, the online upgrade starts, otherwise the offline upgrade is evaluated.
   a. (Online upgrade) If the input instance is a managed instance:
      i. `aws:createImage` - Creates an AMI backup.
      ii. `aws:createTags` - Tags the AMI backup.
      iii. `aws:runCommand` - Installs ENA network driver via AWS-ConfigureAWSPackage.
      iv. `aws:runCommand` - Installs NVMe driver via AWS-ConfigureAWSPackage.
      v. `aws:runCommand` - Installs AWS PV driver via AWS-ConfigureAWSPackage.
   b. (Offline upgrade) If the input instance is not a managed instance:
      i. `aws:assertAwsResourceProperty` - Verifies the AllowOffline flag is set to True. If so, the offline upgrade starts, otherwise the workflow ends.
      ii. `aws:changeInstanceState` - Stop the source instance.
      iii. `aws:changeInstanceState` - Force-stop the source instance.
      iv. `aws:createImage` - Create an AMI backup of the source instance.
      v. `aws:createTags` - Tag the AMI backup of the source instance.
      vi. `aws:executeAwsApi` - Enable ENA for the instance
      viii. (Offline upgrade) If `ForceUpgrade` = True then run `aws:executeAutomation` to invoke `AWSSupport-StartEC2RescueWorkflow` with the drivers force upgrade script. This installs the drivers regardless of the current version that is installed.
    ix. (Offline upgrade) If `ForceUpgrade` = False then run `aws:executeAutomation` to invoke `AWSSupport-StartEC2RescueWorkflow` with the drivers upgrade script.

**Outputs**

- `preUpgradeBackup.ImageId`
- `preOfflineUpgradeBackup.ImageId`
- `installAwsEnaNetworkDriverOnInstance.Output`
- `installAWSNVMeOnInstance.Output`
- `installAWSPVDriverOnInstance.Output`
- `upgradeDriversOffline.Output`
Automation Walkthroughs

The following walkthroughs help you get started with Systems Manager Automation using a predefined Automation document.

Before you begin, you must configure Automation roles and permissions. For more information, see Getting Started with Automation (p. 144). For information about creating a custom Automation document, see Patch a Windows AMI (p. 408).

Walkthroughs

- Patching Amazon Machines Images (p. 400)
- Using AWS Support Self-Service Automations (p. 422)
- Using Automation with Jenkins (p. 431)

Patching Amazon Machines Images

This section includes walkthroughs that describe how to patch or update Amazon Machines Images (AMIs).

Topics

- Patch a Linux AMI (Console) (p. 400)
- Patch a Linux AMI (AWS CLI) (p. 403)
- Patch a Windows AMI (p. 408)
- Simplify AMI Patching Using Automation, Lambda, and Parameter Store (p. 412)
- Patch an AMI and Update an Auto Scaling Group (p. 417)

Patch a Linux AMI (Console)

This Systems Manager Automation walkthrough shows you how to use the console and the Systems Manager AWS-UpdateLinuxAmi document to automatically patch a Linux AMI with the latest versions of packages that you specify. The AWS-UpdateLinuxAmi document also automates the installation of additional site-specific packages and configurations. You can update a variety of Linux distributions using this walkthrough, including Ubuntu, CentOS, RHEL, SLES, or Amazon Linux AMIs. For a full list of supported Linux versions, see Patch Manager Prerequisites (p. 687).

The AWS-UpdateLinuxAmi document enables you to automate image-maintenance tasks without having to author the workflow in JSON or YAML. You can use the AWS-UpdateLinuxAmi document to perform the following types of tasks.

- Upgrade all distribution packages and Amazon software on an Amazon Linux, Red Hat, Ubuntu, SLES, or CentOS Amazon Machine Image (AMI). This is the default document behavior.
- Install SSM Agent on an existing image to enable Systems Manager capabilities, such as remote command execution using Run Command or software inventory collection using Inventory.
- Install additional software packages.

Before You Begin

Before you begin working with Automation documents, configure roles and, optionally, CloudWatch Events for Automation. For more information, see Getting Started with Automation (p. 144). This
walkthrough also requires that you specify the name of an AWS Identity and Access Management (IAM) instance profile. For more information about creating an IAM instance profile, see Create an IAM Instance Profile for Systems Manager (p. 29).

The AWS-UpdateLinuxAmi document accepts the following input parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SourceAmid</td>
<td>String</td>
<td>(Required) The source AMI ID.</td>
</tr>
<tr>
<td>IamInstanceProfileName</td>
<td>String</td>
<td>(Required) The name of the IAM instance profile role you created in Create an IAM Instance Profile for Systems Manager (p. 29). The instance profile role gives Automation permission to perform actions on your instances, such as running commands or starting and stopping services. The Automation document uses only the name of the instance profile role. If you specify the Amazon Resource Name (ARN), the Automation execution fails.</td>
</tr>
<tr>
<td>AutomationAssumeRole</td>
<td>String</td>
<td>(Required) The name of the IAM service role you created in Getting Started with Automation (p. 144). The service role (also called an assume role) gives Automation permission to assume your IAM role and perform actions on your behalf. For example, the service role allows Automation to create a new AMI when running the <code>aws:createImage</code> action in an Automation document. For this parameter, the complete ARN must be specified.</td>
</tr>
<tr>
<td>TargetAmiName</td>
<td>String</td>
<td>(Optional) The name of the new AMI after it is created. The default name is a system-generated string that includes the source AMI ID, and the creation time and date.</td>
</tr>
<tr>
<td>InstanceType</td>
<td>String</td>
<td>(Optional) The type of instance to launch as the workspace host. Instance types vary by region. The default type is t2.micro.</td>
</tr>
<tr>
<td>PreUpdateScript</td>
<td>String</td>
<td>(Optional) URL of a script to run before updates are applied. Default (<code>\&quot;none\&quot;</code>) is to not run a script.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>PostUpdateScript</td>
<td>String</td>
<td>(Optional) URL of a script to run after package updates are applied. Default &quot;none&quot; is to not run a script.</td>
</tr>
<tr>
<td>IncludePackages</td>
<td>String</td>
<td>(Optional) Only update these named packages. By default &quot;all&quot;, all available updates are applied.</td>
</tr>
<tr>
<td>ExcludePackages</td>
<td>String</td>
<td>(Optional) Names of packages to hold back from updates, under all conditions. By default &quot;none&quot;, no package is excluded.</td>
</tr>
</tbody>
</table>

**Automation Steps**

The AWS-UpdateLinuxAmi document includes the following Automation steps, by default.

**Step 1: launchInstance (aws:runInstances action)**

This step launches an instance using Amazon EC2 userdata and an IAM instance profile role. Userdata installs the appropriate SSM Agent, based on the operating system. Installing SSM Agent enables you to utilize Systems Manager capabilities such as Run Command, State Manager, and Inventory.

**Step 2: updateOSSoftware (aws:runCommand action)**

This step runs the following commands on the launched instance:

- Downloads an update script from Amazon S3.
- Runs an optional pre-update script.
- Updates distribution packages and Amazon software.
- Runs an optional post-update script.

The execution log is stored in the /tmp folder for the user to view later.

If you want to upgrade a specific set of packages, you can supply the list using the IncludePackages parameter. When provided, the system attempts to update only these packages and their dependencies. No other updates are performed. By default, when no include packages are specified, the program updates all available packages.

If you want to exclude upgrading a specific set of packages, you can supply the list to the ExcludePackages parameter. If provided, these packages remain at their current version, independent of any other options specified. By default, when no exclude packages are specified, no packages are excluded.

**Step 3: stopInstance (aws:changeInstanceState action)**

This step stops the updated instance.

**Step 4: createImage (aws:createImage action)**

This step creates a new AMI with a descriptive name that links it to the source ID and creation time. For example: “AMI Generated by EC2 Automation on {{global:DATE_TIME}} from {{SourceAmiId}}” where DATE_TIME and SourceID represent Automation variables.

**Step 5: terminateInstance (aws:changeInstanceState action)**

This step cleans up the execution by terminating the running instance.
Output

The execution returns the new AMI ID as output.

Note

By default, when Automation runs the AWS-UpdateLinuxAmi document, the system creates a temporary instance in the default VPC (172.30.0.0/16). If you deleted the default VPC, you will receive the following error:

VPC not defined 400

To solve this problem, you must make a copy of the AWS-UpdateLinuxAmi document and specify a subnet ID. For more information, see VPC not defined 400 (p. 433).

To create a patched AMI using Automation (AWS Systems Manager)

2. In the navigation pane, choose Automation.

   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Automation.

3. Choose Execute automation.
4. In the Automation document list, choose AWS-UpdateLinuxAmi.
5. In the Document details section, verify that Document version is set to Default version at runtime.
6. Choose Next.
7. In the Execution mode section, choose Simple Execution.
8. In the Input parameters section, enter the information you collected in the Before You Begin section.
9. Choose Execute. The console displays the status of the Automation execution.

After the workflow finishes, launch a test instance from the updated AMI to verify changes.

Note

If any step in the workflow fails, information about the failure is listed on the Automation Executions page. The workflow is designed to terminate the temporary instance after successfully completing all tasks. If a step fails, the system might not terminate the instance. So if a step fails, manually terminate the temporary instance.

Patch a Linux AMI (AWS CLI)

This Systems Manager Automation walkthrough shows you how to use the AWS CLI and the Systems Manager AWS-UpdateLinuxAmi document to automatically patch a Linux AMI with the latest versions of packages that you specify. The AWS-UpdateLinuxAmi document also automates the installation of additional site-specific packages and configurations. You can update a variety of Linux distributions using this walkthrough, including Ubuntu, CentOS, RHEL, SLES, or Amazon Linux AMIs. For a full list of supported Linux versions, see Patch Manager Prerequisites (p. 687).

The AWS-UpdateLinuxAmi document enables you to automate image-maintenance tasks without having to author the workflow in JSON or YAML. You can use the AWS-UpdateLinuxAmi document to perform the following types of tasks.

- Upgrade all distribution packages and Amazon software on an Amazon Linux, Red Hat, Ubuntu, SLES, or CentOS Amazon Machine Image (AMI). This is the default document behavior.
- Install SSM Agent on an existing image to enable Systems Manager capabilities, such as remote command execution using Run Command or software inventory collection using Inventory.
Before You Begin

Before you begin working with Automation documents, configure roles and, optionally, CloudWatch Events for Automation. For more information, see Getting Started with Automation (p. 144). This walkthrough also requires that you specify the name of an AWS Identity and Access Management (IAM) instance profile. For more information about creating an IAM instance profile, see Create an IAM Instance Profile for Systems Manager (p. 29).

The AWS-UpdateLinuxAmi document accepts the following input parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SourceAmiId</td>
<td>String</td>
<td>(Required) The source AMI ID. You can automatically reference the latest Amazon EC2 Linux AMI ID by using a Systems Manager Parameter Store public parameter. For more information, see Query for the latest Amazon Linux AMI IDs using AWS Systems Manager Parameter Store.</td>
</tr>
<tr>
<td>IamInstanceProfileName</td>
<td>String</td>
<td>(Required) The name of the IAM instance profile role you created in Create an IAM Instance Profile for Systems Manager (p. 29). The instance profile role gives Automation permission to perform actions on your instances, such as running commands or starting and stopping services. The Automation document uses only the name of the instance profile role. If you specify the Amazon Resource Name (ARN), the Automation execution fails.</td>
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<tr>
<td>AutomationAssumeRole</td>
<td>String</td>
<td>(Required) The name of the IAM service role you created in Getting Started with Automation (p. 144). The service role (also called an assume role) gives Automation permission to assume your IAM role and perform actions on your behalf. For example, the service role allows Automation to create a new AMI when running the aws:createImage action in an Automation document. For this parameter, the complete ARN must be specified.</td>
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<td>Parameter</td>
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<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>TargetAmiName</td>
<td>String</td>
<td>(Optional) The name of the new AMI after it is created. The default name is a system-generated string that includes the source AMI ID, and the creation time and date.</td>
</tr>
<tr>
<td>InstanceType</td>
<td>String</td>
<td>(Optional) The type of instance to launch as the workspace host. Instance types vary by region. The default type is t2.micro.</td>
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<tr>
<td>PreUpdateScript</td>
<td>String</td>
<td>(Optional) URL of a script to run before updates are applied. Default (&quot;none&quot;) is to not run a script.</td>
</tr>
<tr>
<td>PostUpdateScript</td>
<td>String</td>
<td>(Optional) URL of a script to run after package updates are applied. Default (&quot;none&quot;) is to not run a script.</td>
</tr>
<tr>
<td>IncludePackages</td>
<td>String</td>
<td>(Optional) Only update these named packages. By default (&quot;all&quot;), all available updates are applied.</td>
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<tr>
<td>ExcludePackages</td>
<td>String</td>
<td>(Optional) Names of packages to hold back from updates, under all conditions. By default (&quot;none&quot;), no package is excluded.</td>
</tr>
</tbody>
</table>

**Automation Steps**

The AWS-UpdateLinuxAmi document includes the following Automation steps, by default.

**Step 1: launchInstance (aws:runInstances action)**

This step launches an instance using Amazon EC2 userdata and an IAM instance profile role. Userdata installs the appropriate SSM Agent, based on the operating system. Installing SSM Agent enables you to utilize Systems Manager capabilities such as Run Command, State Manager, and Inventory.

**Step 2: updateOSSoftware (aws:runCommand action)**

This step runs the following commands on the launched instance:

- Downloads an update script from Amazon S3.
- Runs an optional pre-update script.
- Updates distribution packages and Amazon software.
- Runs an optional post-update script.

The execution log is stored in the /tmp folder for the user to view later.

If you want to upgrade a specific set of packages, you can supply the list using the IncludePackages parameter. When provided, the system attempts to update only these packages.
and their dependencies. No other updates are performed. By default, when no `include` packages are specified, the program updates all available packages.

If you want to exclude upgrading a specific set of packages, you can supply the list to the `ExcludePackages` parameter. If provided, these packages remain at their current version, independent of any other options specified. By default, when no `exclude` packages are specified, no packages are excluded.

**Step 3: stopInstance (aws:changeInstanceState action)**

This step stops the updated instance.

**Step 4: createImage (aws:createImage action)**

This step creates a new AMI with a descriptive name that links it to the source ID and creation time. For example: "AMI Generated by EC2 Automation on {{global:DATE_TIME}} from {{SourceAmiId}}" where `DATE_TIME` and `SourceId` represent Automation variables.

**Step 5: terminateInstance (aws:changeInstanceState action)**

This step cleans up the execution by terminating the running instance.

**Output**

The execution returns the new AMI ID as output.

**Note**

By default, when Automation runs the `AWS-UpdateLinuxAmi` document, the system creates a temporary instance in the default VPC (172.30.0.0/16). If you deleted the default VPC, you will receive the following error:

VPC not defined 400

To solve this problem, you must make a copy of the `AWS-UpdateLinuxAmi` document and specify a subnet ID. For more information, see VPC not defined 400 (p. 433).

**To create a patched AMI using Automation**

1. Install and configure the AWS CLI, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58).

2. Run the following command to run the `AWS-UpdateLinuxAmi` document and run the Automation workflow. In the parameters section, specify an AMI source ID, an Amazon EC2 instance profile role, and your Automation service role.

   ```bash
   aws ssm start-automation-execution \
   --document-name "AWS-UpdateLinuxAmi" \
   --parameters \ 
   "SourceAmiId=ami-0080e4c5bc078760e, \ 
   IamInstanceProfileName=ManagedInstanceRole, \ 
   AutomationAssumeRole='arn:aws:iam::{global:ACCOUNT_ID}:role/AutomationServiceRole'"
   
   The command returns an execution ID. Copy this ID to the clipboard. You will use this ID to view the status of the workflow.

   ```

   ```json
   { 
     "AutomationExecutionId": "ID"
   }
   ```

3. To view the workflow execution using the AWS CLI, run the following command:

   ```bash
   aws ssm describe-automation-executions
   ```
4. To view details about the execution progress, run the following command.

```
aws ssm get-automation-execution --automation-execution-id ID
```

The update process can take 30 minutes or more to complete.

**Note**
You can also monitor the status of the workflow in the console. In the execution list, choose the execution you just ran and then choose the **Steps** tab. This tab shows you the status of the workflow actions.

After the workflow finishes, launch a test instance from the updated AMI to verify changes.

**Note**
If any step in the workflow fails, information about the failure is listed on the **Automation Executions** page. The workflow is designed to terminate the temporary instance after successfully completing all tasks. If a step fails, the system might not terminate the instance. So if a step fails, manually terminate the temporary instance.

### Additional Automation AWS CLI Examples

You can manage other aspects of Automation execution using the following tasks.

#### Stop an Execution

Run the following to stop a workflow. The command doesn't terminate associated instances.

```
aws ssm stop-automation-execution --automation-execution-id ID
```

#### Create Versions of Automation Documents

You can't change an existing automation document, but you can create a new version using the following command:

```
aws ssm update-document --name "patchWindowsAmi" --content file:///Users/test-user/Documents/patchWindowsAmi.json --document-version "$LATEST"
```

Run the following command to view details about the existing document versions:

```
aws ssm list-document-versions --name "patchWindowsAmi"
```

The command returns information like the following:

```json
{
   "DocumentVersions": [
   {
      "IsDefaultVersion": false,
      "Name": "patchWindowsAmi",
      "DocumentVersion": "2",
      "CreatedDate": 1475799950.484
   },
   {
      "IsDefaultVersion": false,
      "Name": "patchWindowsAmi",
      "DocumentVersion": "1",
      "CreatedDate": 1475799931.064
   }
   ]
}
```
Run the following command to update the default version for execution. The default execution version only changes when you explicitly set it to a new version. Creating a new document version does not change the default version.

```
aws ssm update-document-default-version --name patchWindowsAmi --document-version 2
```

**Delete a Document**

Run the following command to delete an automation document:

```
aws ssm delete-document --name patchWindowsAMI
```

**Patch a Windows AMI**

The `AWS-UpdateWindowsAmi` document enables you to automate image maintenance tasks on your Amazon Windows AMIs without having to author the workflow in JSON or YAML. This document is supported for Windows Server 2008 R2 or later. You can use the `AWS-UpdateWindowsAmi` document to perform the following types of tasks.

- Install all Windows updates and upgrade Amazon software (default behavior).
- Install specific Windows updates and upgrade Amazon software.
- Customize an AMI using your scripts.

**Before You Begin**

Before you begin working with Automation documents, configure roles and, optionally, CloudWatch Events for Automation. For more information, see Getting Started with Automation (p. 144). This walkthrough also requires that you specify the name of an AWS Identity and Access Management (IAM) instance profile. For more information about creating an IAM instance profile, see Create an IAM Instance Profile for Systems Manager (p. 29).

**Note**

Updates to SSM Agent are typically rolled out to different regions at different times. When you customize or update an AMI, use only source AMIs published for the region that you are working in. This will ensure that you are working with the latest SSM Agent released for that region and avoid compatibility issues.

The `AWS-UpdateWindowsAmi` document accepts the following input parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SourceAmiId</td>
<td>String</td>
<td>(Required) The source AMI ID. You can automatically reference the latest Windows Server AMI ID by using a Systems Manager Parameter Store <code>public</code> parameter. For more information, see Query for the latest Windows AMI IDs using AWS Systems Manager Parameter Store.</td>
</tr>
<tr>
<td>IamInstanceProfileName</td>
<td>String</td>
<td>(Required) The name of the IAM instance profile role you created in Create an IAM Instance Profile for Systems</td>
</tr>
<tr>
<td>Parameter</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>AutomationAssumeRole</td>
<td>String</td>
<td>(Required) The name of the IAM service role you created in Getting Started with Automation (p. 144). The service role (also called an assume role) gives Automation permission to assume your IAM role and perform actions on your behalf. For example, the service role allows Automation to create a new AMI when running the <code>aws:createImage</code> action in an Automation document. For this parameter, the complete ARN must be specified.</td>
</tr>
<tr>
<td>TargetAmiName</td>
<td>String</td>
<td>(Optional) The name of the new AMI after it is created. The default name is a system-generated string that includes the source AMI ID, and the creation time and date.</td>
</tr>
<tr>
<td>InstanceType</td>
<td>String</td>
<td>(Optional) The type of instance to launch as the workspace host. Instance types vary by region. The default type is <code>t2.medium</code>.</td>
</tr>
<tr>
<td>PreUpdateScript</td>
<td>String</td>
<td>(Optional) A script to run before updating the AMI. Enter a script in the Automation document or at runtime as a parameter.</td>
</tr>
<tr>
<td>PostUpdateScript</td>
<td>String</td>
<td>(Optional) A script to run after updating the AMI. Enter a script in the Automation document or at runtime as a parameter.</td>
</tr>
</tbody>
</table>

Manager (p. 29). The instance profile role gives Automation permission to perform actions on your instances, such as running commands or starting and stopping services. The Automation document uses only the name of the instance profile role. If you specify the Amazon Resource Name (ARN), the Automation execution fails.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IncludeKbs</td>
<td>String</td>
<td>(Optional) Specify one or more Microsoft Knowledge Base (KB) article IDs to include. You can install multiple IDs using comma-separated values. Valid formats: KB9876543 or 9876543.</td>
</tr>
<tr>
<td>ExcludeKbs</td>
<td>String</td>
<td>(Optional) Specify one or more Microsoft Knowledge Base (KB) article IDs to exclude. You can exclude multiple IDs using comma-separated values. Valid formats: KB9876543 or 9876543.</td>
</tr>
<tr>
<td>Categories</td>
<td>String</td>
<td>(Optional) Specify one or more update categories. You can filter categories using comma-separated values. Options: Critical Update, Security Update, Definition Update, Update Rollup, Service Pack, Tool, Update, or Driver. Valid formats include a single entry, for example: Critical Update. Or, you can specify a comma separated list: Critical Update, Security Update, Definition Update.</td>
</tr>
<tr>
<td>SeverityLevels</td>
<td>String</td>
<td>(Optional) Specify one or more MSRC severity levels associated with an update. You can filter severity levels using comma-separated values. Options: Critical, Important, Low, Moderate or Unspecified. Valid formats include a single entry, for example: Critical. Or, you can specify a comma separated list: Critical, Important, Low.</td>
</tr>
</tbody>
</table>

**Automation Steps**

The AWS-UpdateWindowsAmi document includes the following Automation steps, by default.

**Step 1: launchInstance (aws:runInstances action)**

This step launches an instance with an IAM instance profile role from the specified SourceAmiID.

**Step 2: runPreUpdateScript (aws:runCommand action)**

This step enables you to specify a script as a string that runs before updates are installed.
Step 3: updateEC2Config (aws:runCommand action)

This step uses the AWS-InstallPowerShellModule public document to download an AWS public PowerShell module. Systems Manager verifies the integrity of the module by using an SHA-256 hash. Systems Manager then checks the operating system to determine whether to update EC2Config or EC2Launch. EC2Config runs on Windows Server 2008 R2 through Windows Server 2012 R2. EC2Launch runs on Windows Server 2016.

Step 4: updateSSMAgent (aws:runCommand action)

This step updates SSM Agent by using the AWS-UpdateSSMAgent public document.

Step 5: updateAWSPVDriver (aws:runCommand action)

This step updates AWS PV drivers by using the AWS-ConfigureAWSPackage public document.

Step 6: updateAwsEnaNetworkDriver (aws:runCommand action)

This step updates AWS ENA Network drivers by using the AWS-ConfigureAWSPackage public document.

Step 7: installWindowsUpdates (aws:runCommand action)

This step installs Windows updates by using the AWS-InstallWindowsUpdates public document. By default, Systems Manager searches for and installs all missing updates. You can change the default behavior by specifying one of the following parameters: IncludeKbs, ExcludeKbs, Categories, or SeverityLevels.

Step 8: runPostUpdateScript (aws:runCommand action)

This step enables you to specify a script as a string that runs after the updates have been installed.

Step 9: runSysprepGeneralize (aws:runCommand action)

This step uses the AWS-InstallPowerShellModule public document to download an AWS public PowerShell module. Systems Manager verifies the integrity of the module by using an SHA-256 hash. Systems Manager then runs sysprep using AWS-supported methods for either EC2Launch (Windows Server 2016) or EC2Config (Windows Server 2008 R2 through 2012 R2).

Step 10: stopInstance (aws:changeInstanceState action)

This step stops the updated instance.

Step 11: createImage (aws:createImage action)

This step creates a new AMI with a descriptive name that links it to the source ID and creation time. For example: “AMI Generated by EC2 Automation on {{global:DATE_TIME}} from {{SourceAmiId}}” where DATE_TIME and SourceID represent Automation variables.

Step 12: TerminatenInstance (aws:changeInstanceState action)

This step cleans up the execution by terminating the running instance.

Output

This section enables you to designate the outputs of various steps or values of any parameter as the Automation output. By default, the output is the ID of the updated Windows AMI created by the execution.

Note

By default, when Automation runs the AWS-UpdateWindowsAmi document and creates a temporary instance, the system uses the default VPC (172.30.0.0/16). If you deleted the default VPC, you will receive the following error:

VPC not defined 400

To solve this problem, you must make a copy of the AWS-UpdateWindowsAmi document and specify a subnet ID. For more information, see VPC not defined 400 (p. 433).
To create a patched Windows AMI by using Automation

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to run the AWS-UpdateWindowsAmi document. In the parameters section, specify an AMI source ID, an Amazon EC2 instance profile role, and your Automation service role. The example command below uses a recent Amazon EC2 AMI to minimize the number of patches that need to be applied. If you run this command more than once, you must specify a unique value for targetAMIname. AMI names must be unique.

   ```bash
   aws ssm start-automation-execution --document-name="AWS-UpdateWindowsAmi" --parameters
   SourceAmiId='ami-0246f4914689c475f',IamInstanceProfileName='ManagedInstanceProfile',AutomationAssumeRole='{{global:ACCOUNT_ID}}:role/AutomationServiceRole'
   
   The command returns an execution ID. Copy this ID to the clipboard. You will use this ID to view the status of the workflow.

   ```

   ```json
   {
     "AutomationExecutionId": "ID"
   }
   
   3. To view the workflow execution using the AWS CLI, run the following command:

   ```bash
   aws ssm describe-automation-executions
   
   4. To view details about the execution progress, run the following command.

   ```bash
   aws ssm get-automation-execution --automation-execution-id ID
   
   **Note**
   Depending on the number of patches applied, the Windows patching process run in this sample workflow can take 30 minutes or more to complete.

Simplify AMI Patching Using Automation, Lambda, and Parameter Store

The following example expands on how to update a Windows AMI, as described in Patch a Windows AMI (p. 408). This example uses the model where an organization maintains and periodically patches their own, proprietary AMIs rather than building from Amazon EC2 AMIs.

The following procedure shows how to automatically apply operating system (OS) patches to a Windows AMI that is already considered to be the most up-to-date or latest AMI. In the example, the default value of the parameter SourceAmiId is defined by a Systems Manager Parameter Store parameter called latestAmi. The value of latestAmi is updated by an AWS Lambda function invoked at the end of the Automation workflow. As a result of this Automation process, the time and effort spent patching AMIs is minimized because patching is always applied to the most up-to-date AMI.

**Before You Begin**

Configure Automation roles and, optionally, CloudWatch Events for Automation. For more information, see Getting Started with Automation (p. 144).

**Contents**

- Task 1: Create a Parameter in Systems Manager Parameter Store (p. 413)
- Task 2: Create an IAM Role for AWS Lambda (p. 413)
- Task 3: Create an AWS Lambda Function (p. 413)
Task 1: Create a Parameter in Systems Manager Parameter Store

Create a string parameter in Parameter Store that uses the following information:

- **Name**: latestAmi.
- **Value**: a Windows AMI ID. For example: ami-188d6e0e.

For information about how to create a Parameter Store string parameter, see Creating Systems Manager Parameters (p. 850).

Task 2: Create an IAM Role for AWS Lambda

Use the following procedure to create an IAM service role for AWS Lambda. This role includes the AWSLambdaExecute and AmazonSSMFullAccess managed policies. These policies give Lambda permission to update the value of the latestAmi parameter using a Lambda function and Systems Manager.

**To create an IAM service role for Lambda**

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles, and then choose Create New Role.
3. For Role name, type a role name that can help you identify the purpose of this role, for example, lambda-ssm-role. Role names must be unique within your AWS account. After you type the name, choose Next Step at the bottom of the page. **Note**
   Because various entities might reference the role, you cannot change the name of the role after it has been created.
4. On the Select Role Type page, choose the AWS Service Roles section, and then choose AWS Lambda.
5. On the Attach Policy page, choose AWSLambdaExecute and AmazonSSMFullAccess, and then choose Next Step.
6. Choose Create Role.

Task 3: Create an AWS Lambda Function

Use the following procedure to create a Lambda function that automatically updates the value of the latestAmi parameter.

**To create a Lambda function**

1. Sign in to the AWS Management Console and open the AWS Lambda console at https://console.aws.amazon.com/lambda/.
2. Choose Create a Lambda function.
3. On the Create function page, choose Author from scratch.
4. For Function name, type Automation-UpdateSsmParam.
5. In the Runtime list, choose Python 2.7.
6. In the Permissions section, choose Use an existing role and choose the service role for Lambda that you created in Task 2.
7. Choose Create function.
8. In the Lambda function code section, delete the pre-populated code in the field, and then paste the following code sample.
from __future__ import print_function
import json
import boto3

print('Loading function')

#Updates an SSM parameter
#Expects parameterName, parameterValue
def lambda_handler(event, context):
    print("Received event: " + json.dumps(event, indent=2))

    # get SSM client
    client = boto3.client('ssm')

    #confirm parameter exists before updating it
    response = client.describe_parameters(
        Filters=[
            {
                'Key': 'Name',
                'Values': [ event['parameterName'] ]
            },
        ]
    )

    if not response['Parameters']:
        print('No such parameter')
        return 'SSM parameter not found.'

    #if parameter has a Description field, update it PLUS the Value
    if 'Description' in response['Parameters'][0]:
        description = response['Parameters'][0]['Description']
        response = client.put_parameter(
            Name=event['parameterName'],
            Value=event['parameterValue'],
            Description=description,
            Type='String',
            Overwrite=True
        )
    else:
        response = client.put_parameter(
            Name=event['parameterName'],
            Value=event['parameterValue'],
            Type='String',
            Overwrite=True
        )

    responseString = 'Updated parameter %s with value %s.' % (event['parameterName'], event['parameterValue'])

    return responseString

9. Choose Save.
10. To test the Lambda function, from the Select a test event menu, choose Configure test events.
11. For Event name, enter a name for the test event, such as MyTestEvent.
12. Replace the existing text with the following JSON.

```json
{
}
```
13. Choose **Create**.

14. Select **Test** to test the function. The output should state that the parameter was successfully updated and include details about the update. For example, “Updated parameter latestAmi with value ami-123456”.

(Task 4: Create an Automation Document and Patch the AMI)

Use the following procedure to create and run an Automation document that patches the AMI you specified for the **latestAmi** parameter. After the Automation workflow completes, the value of **latestAmi** is updated with the ID of the newly-patched AMI. Subsequent executions use the AMI created by the previous execution.

**To create an Automation document and patch an AMI**

2. In the navigation pane, choose **Documents**.

     - or -

     If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Documents** in the navigation pane.
3. Choose **Create document**.
4. In the **Name** field, type **UpdateMyLatestWindowsAmi**.
5. In the **Document type** list, choose **Automation document**.
6. Delete the brackets in the **Content** field, and then paste the following JSON sample document.

   **Note**
   You must change the values of **assumeRole** and **IamInstanceProfileName** in this sample with the service role ARN and instance profile role you created when Getting Started with Automation (p. 144).

```json
{
    "description":"Systems Manager Automation Demo – Patch AMI and Update SSM Param",
    "schemaVersion":"0.3",
    "assumeRole":"the role ARN you created",
    "parameters":{
        "sourceAMIid":{
            "type":"String",
            "description":"AMI to patch",
            "default": "{{ssm:latestAmi}}"
        },
        "targetAMIname":{
            "type":"String",
            "description":"Name of new AMI",
            "default": "patchedAMI-{{global:DATE_TIME}}"
        }
    }
}
```

7. **mainSteps**:

   ```json
   {
       "name":"startInstances",
       "action":"aws:runInstances",
       "timeoutSeconds":1200,
       "maxAttempts":1,
       "onFailure":"Abort",
       "inputs":{
           "parameterName":"latestAmi",
           "parameterValue":"your AMI ID"
       }
   }
   ```

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"ImageId": "{{ sourceAMIid }}",
"InstanceType": "m3.large",
"MinInstanceCount": 1,
"MaxInstanceCount": 1,
"IamInstanceProfileName": "the name of the IAM role you created"
},
{
"name": "installMissingWindowsUpdates",
"action": "aws:runCommand",
"maxAttempts": 1,
"onFailure": "Continue",
"inputs": {
"DocumentName": "AWS-InstallWindowsUpdates",
"InstanceIds": [
"{{ startInstances.InstanceIds }}"
],
"Parameters": {
"UpdateLevel": "Important"
}
}
},
{
"name": "stopInstance",
"action": "aws:changeInstanceState",
"maxAttempts": 1,
"onFailure": "Continue",
"inputs": {
"InstanceIds": [
"{{ startInstances.InstanceIds }}"
],
"DesiredState": "stopped"
}
},
{
"name": "createImage",
"action": "aws:createImage",
"maxAttempts": 1,
"onFailure": "Continue",
"inputs": {
"InstanceId": "{{ startInstances.InstanceIds }}",
"ImageName": "{{ targetAMIname }}",
"NoReboot": true,
"ImageDescription": "AMI created by EC2 Automation"
}
},
{
"name": "terminateInstance",
"action": "aws:changeInstanceState",
"maxAttempts": 1,
"onFailure": "Continue",
"inputs": {
"InstanceIds": [
"{{ startInstances.InstanceIds }}"
],
"DesiredState": "terminated"
}
},
{
"name": "updateSsmParam",
"action": "aws:invokeLambdaFunction",
"timeoutSeconds": 1200,
"maxAttempts": 1,
"onFailure": "Abort",
"inputs": {
"FunctionName": "Automation-UpdateSsmParam",
"
7. Choose Create document to save the document.
8. In the navigation pane, choose Automations, and then choose Execute automation.
10. In the Document details section verify that Document version is set to 1.
11. In the Execution mode section, choose Execute the entire automation at once.
12. Leave the Targets and Rate Control option disabled.
13. After execution completes, choose Parameter Store in the navigation pane and confirm that the new value for latestAmi matches the value returned by the Automation workflow. You can also verify the new AMI ID matches the Automation output in the AMIs section of the EC2 console.

**Patch an AMI and Update an Auto Scaling Group**

The following example builds on the Simplify AMI Patching Using Automation, Lambda, and Parameter Store (p. 412) example by adding a step that updates an Auto Scaling group with the newly-patched AMI. This approach ensures that new images are automatically made available to different computing environments that use Auto Scaling groups.

The final step of the Automation workflow in this example uses an AWS Lambda function to copy an existing launch configuration and set the AMI ID to the newly-patched AMI. The Auto Scaling group is then updated with the new launch configuration. In this type of Auto Scaling scenario, users could terminate existing instances in the Auto Scaling group to force a new instance to launch that uses the new image. Or, users could wait and allow scale-in or scale-out events to naturally launch newer instances.

**Before You Begin**

Complete the following tasks before you begin this example.

- Configure IAM roles for Automation. Systems Manager requires an instance profile role and a service role ARN to process Automation workflows. For more information, see Getting Started with Automation (p. 144).
- If you are not familiar with Lambda, we recommend that you create a simple Lambda function by using the Create a Simple Lambda Function topic in the AWS Lambda Developer Guide. The topic will help you understand, in detail, some of the steps required to create a Lambda function.

**Task 1: Create an IAM Role for AWS Lambda**

Use the following procedure to create an IAM service role for AWS Lambda. This role includes the AWSLambdaExecute and AutoScalingFullAccess managed policies. These policies give Lambda permission to create a new Auto Scaling group with the latest, patched AMI using a Lambda function.

**To create an IAM service role for Lambda**

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles, and then choose Create role.
3. On the Select type of trusted entity page, under AWS Service, choose Lambda.
4. In the Select your use case section, choose Lambda, and then choose Next: Permissions.
5. On the Attach permissions policy page, search for AWSLambdaExecute, and then choose the option next to it. Search for AutoScalingFullAccess, and then choose the option next to it.
6. Choose Next: Review.
7. On the Review page, verify that AWSLambdaExecute and AutoScalingFullAccess are listed under Policies.

![Policies](image)

8. Type a name in the Role name box, and then type a description.
9. Choose Create role. The system returns you to the Roles page.

Task 2: Create an AWS Lambda Function

Use the following procedure to create a Lambda function that automatically updates an existing Auto Scaling group with the latest, patched AMI.

To create a Lambda function

1. Sign in to the AWS Management Console and open the AWS Lambda console at https://console.aws.amazon.com/lambda/.
2. Choose Create function.
3. Verify that Author from scratch is selected.
4. In the Name field type Automation-UpdateAsg.
5. In the Runtime list, choose Python 2.7.
6. In the Role list, verify that Choose an existing role is selected.
7. In the Existing role list, choose the role you created earlier.
8. Choose Create function. The system displays a code and configuration page for Automation-UpdateAsg.
9. Make no changes in the Designer section.
10. In the Function code section, delete the pre-populated code in the lambda_function field, and then paste the following code sample.

```python
from __future__ import print_function
import json
import datetime
import time
import boto3
print('Loading function')
```

418
def lambda_handler(event, context):
    print("Received event: "+json.dumps(event, indent=2))

    # get autoscaling client
    client = boto3.client('autoscaling')

    # get object for the ASG we're going to update, filter by name of target ASG
    response = client.describe_auto_scaling_groups(AutoScalingGroupNames=[event['targetASG']])

    if not response['AutoScalingGroups']:
        return 'No such ASG'

    # get name of InstanceID in current ASG that we'll use to model new Launch Configuration after
    sourceInstanceId = response.get('AutoScalingGroups')[0]['Instances'][0]['InstanceId']

    # create LC using instance from target ASG as a template, only diff is the name of
    the new LC and new AMI
    timeString = time.time()
    timeStringScheme = datetime.datetime.fromtimestamp(timeString).strftime('%Y-%m-%d %H-%M-%S')
    newLaunchConfigName = 'LC '+ event['newAmiID'] + ' ' + timeStringScheme
    client.create_launch_configuration(
        InstanceId = sourceInstanceId,
        LaunchConfigurationName=newLaunchConfigName,
        ImageId= event['newAmiID']
    )

    # update ASG to use new LC
    response = client.update_auto_scaling_group(AutoScalingGroupName = event['targetASG'],LaunchConfigurationName = newLaunchConfigName)

    return 'Updated ASG '%s' with new launch configuration '%s' which includes AMI '%s'.' % (event['targetASG'], newLaunchConfigName, event['newAmiID'])

11. Specify the remaining configuration options on this page.
12. Choose Save.
13. Choose Test.
14. In the Configure test event page, verify that Create new test event is selected.
15. In the Event template list, verify that Hello World is selected.
16. In the Event name field, type a name.
17. Replace the existing sample with the following JSON. Enter an AMI ID and Auto Scaling group.

```json
{
  "newAmiID":"valid AMI ID",
  "targetASG":"name of your Auto Scaling group"
}
```

18. Choose Save.
19. Choose Test. The output states that the Auto Scaling group was successfully updated with a new launch configuration.

Task 3: Create an Automation Document, Patch the AMI, and Update the Auto Scaling Group

Use the following procedure to create and run an Automation document that patches the AMI you specified for the latestAmi parameter. The Automation workflow then updates the Auto Scaling group to use the latest, patched AMI.
To create and run the Automation document

2. In the navigation pane, choose **Documents**.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Documents** in the navigation pane.
3. Choose **Create document**.
4. In the **Name** field, type PatchAmiandUpdateAsg.
5. In the **Document type** list, choose **Automation document**.
6. Delete the brackets in the **Content** field, and then paste the following JSON sample document.

   **Note**
   You must change the values of **assumeRole** and **IamInstanceProfileName** in this sample with the service role ARN and instance profile role you created when **Getting Started with Automation** (p. 144).

```
{
  "description": "Systems Manager Automation Demo - Patch AMI and Update ASG",
  "schemaVersion": "0.3",
  "assumeRole": "the service role ARN you created",
  "parameters": {
    "sourceAMIid": {
      "type": "String",
      "description": "AMI to patch"
    },
    "targetAMIname": {
      "type": "String",
      "description": "Name of new AMI",
      "default": "patchedAMI-{{global:DATE_TIME}}"
    },
    "targetASG": {
      "type": "String",
      "description": "Autosaling group to Update"
    }
  },
  "mainSteps": [
    { 
      "name": "startInstances",
      "action": "aws:runInstances",
      "timeoutSeconds": 1200,
      "maxAttempts": 1,
      "onFailure": "Abort",
      "inputs": {
        "ImageId": "{{ sourceAMIid }}",
        "InstanceType": "m3.large",
        "MinInstanceCount": 1,
        "MaxInstanceCount": 1,
        "IamInstanceProfileName": "the name of the instance IAM role you created"
      }
    },
    {
      "name": "installMissingWindowsUpdates",
      "action": "aws:runCommand",
      "maxAttempts": 1,
      "onFailure": "Continue",
      "inputs": {
        "DocumentName": "AWS-InstallWindowsUpdates",
        "InstanceIds": [
          "{{ startInstances.InstanceIds }}"
        ]
      }
    }
  ]
}
```
7. Choose **Create document** to save the document.
8. Choose **Automations**, and then choose **Execute automation**.
9. In the **Automation document** list, choose **PatchAmiandUpdateAsg**.
10. In the **Document details** section verify that **Document version** is set to 1.
11. In the **Execution mode** section, choose **Execute the entire automation at once**.
12. Leave the **Targets and Rate Control** option disabled.
13. Specify a Windows AMI ID for `sourceAMIid` and your Auto Scaling group name for `targetASG`.
14. Choose **Execute automation**.
15. After execution completes, in the Amazon EC2 console, choose **Auto Scaling**, and then choose **Launch Configurations**. Verify that you see the new launch configuration, and that it uses the new AMI ID.
16. Choose **Auto Scaling**, and then choose **Auto Scaling Groups**. Verify that the Auto Scaling group uses the new launch configuration.
17. Terminate one or more instances in your Auto Scaling group. Replacement instances will be launched with the new AMI ID.

**Note**
You can further automate deployment of the new AMI by editing the Lambda function to gracefully terminate instances. You can also invoke your own Lambda function and utilize the ability of AWS CloudFormation to update Auto Scaling groups. For more information, see `UpdatePolicy` Attribute.

### Using AWS Support Self-Service Automations

This section describes how to run Automations created by the AWS Support team to help you troubleshoot common issues with your AWS resources.

**Topics**
- Run the EC2Rescue Tool on Unreachable Instances (p. 422)
- Reset Passwords and SSH Keys on Amazon EC2 Instances (p. 426)

### Run the EC2Rescue Tool on Unreachable Instances

EC2Rescue can help you diagnose and troubleshoot problems on Amazon EC2 Linux and Windows Server instances. You can run the tool manually, as described in Using EC2Rescue for Linux Server and Using EC2Rescue for Windows Server. Or, you can run the tool automatically by using Systems Manager Automation and the **AWSSupport-ExecuteEC2Rescue** document. The **AWSSupport-ExecuteEC2Rescue** document is designed to perform a combination of Systems Manager actions, AWS CloudFormation actions, and Lambda functions that automate the steps normally required to use EC2Rescue.

You can use the **AWSSupport-ExecuteEC2Rescue** document to troubleshoot and potentially remediate different types of operating system (OS) issues. See the following topics for a complete list:

**Windows:** See **Rescue Action** in Using EC2Rescue for Windows Server with the Command Line.

**Linux:** Some EC2Rescue for Linux modules detect and attempt to remediate issues. For more information, see the **aws-ec2rescue-linux** documentation for each module on GitHub.

**How It Works**

Troubleshooting an instance with Automation and the **AWSSupport-ExecuteEC2Rescue** document works as follows:

- You specify the ID of the unreachable instance and run the Automation workflow.
- The system creates a temporary VPC, and then runs a series of Lambda functions to configure the VPC.
- The system identifies a subnet for your temporary VPC in the same Availability Zone as your original instance.
- The system launches a temporary, SSM-enabled helper instance.
Before You Begin

Before you run the following Automation, do the following:

• Copy the instance ID of the unreachable instance. You will specify this ID in the procedure.
• Optionally, collect the ID of a subnet in the same availability zone as your unreachable instance. The EC2Rescue instance will be created in this subnet. If you don't specify a subnet, then Automation creates a new temporary VPC in your AWS account. Verify that your AWS account has at least one VPC available. By default, you can create five VPCs in a Region. If you already created five VPCs in the Region, the automation fails without making changes to your instance. For more information, see VPC and Subnets.
• Optionally, you can create and specify an AWS Identity and Access Management (IAM) role for Automation. If you don't specify this role, then Automation runs in the context of the user who ran the automation. For more information about creating roles for Automation, see Running an Automation Workflow by Using an IAM Service Role (p. 200).

Granting AWSSupport-EC2Rescue Permissions to Perform Actions On Your Instances

EC2Rescue needs permission to perform a series of actions on your instances during the Automation execution. These actions invoke the AWS Lambda, IAM, and Amazon EC2 services to safely and securely attempt to remediate issues with your instances. If you have Administrator-level permissions in your AWS account and/or VPC, you might be able to run the automation without configuring permissions, as described in this section. If you don't have Administrator-level permissions, then you or an administrator must configure permissions by using one of the following options.

• Granting Permissions By Using IAM Policies (p. 423)
• Granting Permissions By Using An AWS CloudFormation Template (p. 425)

Granting Permissions By Using IAM Policies

You can either attach the following IAM policy to your IAM user account, group, or role as an inline policy; or, you can create a new IAM managed policy and attach it to your user account, group, or role. For more information about adding an inline policy to your user account, group, or role see Working With Inline Policies. For more information about creating a new managed policy, see Working With Managed Policies.

**Note**

If you create a new IAM managed policy, you must also attach the AmazonSSMAutomationRole managed policy to it so that your instances can communicate with the Systems Manager API.

IAM Policy for AWSSupport-EC2Rescue

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": [
                "lambda:InvokeFunction",
                ... other actions ...
            ]
        }
    ]
}
```
"lambda:DeleteFunction",
"lambda:GetFunction"
],
"Effect": "Allow"
},
{
"Action": [
"s3:GetObject",
"s3:GetObjectVersion"
],
"Resource": [
"arn:aws:s3:::awssupport-ssm.*/*.template",
"arn:aws:s3:::awssupport-ssm.*/*.zip"
],
"Effect": "Allow"
},
{
"Action": [
"iam:CreateRole",
"iam:CreateInstanceProfile",
"iam:GetRole",
"iam:GetInstanceProfile",
"iam:PutRolePolicy",
"iam:DetachRolePolicy",
"iam:AttachRolePolicy",
"iam:PassRole",
"iam:AddRoleToInstanceProfile",
"iam:RemoveRoleFromInstanceProfile",
"iam:DeleteRole",
"iam:DeleteRolePolicy",
"iam:DeleteInstanceProfile"
],
"Resource": [
],
"Effect": "Allow"
},
{
"Action": [
"lambda:CreateFunction",
"ec2:CreateVpc",
"ec2:ModifyVpcAttribute",
"ec2:DeleteVpc",
"ec2:CreateInternetGateway",
"ec2:AttachInternetGateway",
"ec2:DetachInternetGateway",
"ec2:CreateSubnet",
"ec2:DeleteSubnet",
"ec2:CreateRoute",
"ec2:DeleteRoute",
"ec2:CreateRouteTable",
"ec2:AssociateRouteTable",
"ec2:DisassociateRouteTable",
"ec2:DeleteRouteTable",
"ec2:CreateVpcEndpoint",
"ec2:DeleteVpcEndpoint",
"ec2:ModifyVpcEndpoint",
"ec2:Describe*"
],
"Resource": "*",
"Effect": "Allow"
}
Granting Permissions By Using An AWS CloudFormation Template

AWS CloudFormation automates the process of creating IAM roles and policies by using a preconfigured template. Use the following procedure to create the required IAM roles and policies for the EC2Rescue Automation by using AWS CloudFormation.

To create the required IAM roles and policies for EC2Rescue

1. Choose the Launch Stack button. The button opens the AWS CloudFormation console and populates the Specify an Amazon S3 template URL field with the URL to the EC2Rescue template.
   
   **Note**
   
   Choose View to view the template.

2. Choose Next.
3. On the Specify Details page, in the Stack Name field, either choose to keep the default value or specify your own value. Choose Next.
4. On the Options page, you don’t need to make any selections. Choose Next.
5. On the Review page, scroll down and choose the I acknowledge that AWS CloudFormation might create IAM resources option.
6. Choose Create.

   AWS CloudFormation shows the CREATE_IN_PROGRESS status for approximately three minutes. The status changes to CREATE_COMPLETE after the stack has been created.
7. In the stack list, choose the option next to the stack you just created, and then choose the Outputs tab.
8. Copy the Value. The is the ARN of the AssumeRole. You will specify this ARN when you run the Automation.

Running the Automation

**Important**

The following Automation execution stops the unreachable instance. Stopping the instance can result in lost data on attached instance store volumes (if present). Stopping the instance can also cause the public IP to change, if no Elastic IP is associated.

To run the AWSSupport-ExecuteEC2Rescue Automation

2. In the navigation pane, choose Automation.

   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Automation.
3. Choose Execute automation.
4. In the Automation document section, choose Owned by Me or Amazon from the list.
5. In the documents list, choose AWSSupport-ExecuteEC2Rescue. The document owner is Amazon.
6. In the **Document details** section verify that **Document version** is set to the highest default version. For example, **6 (default)**.

7. In the **Execution mode** section, choose **Simple Execution**.

8. In the **Input parameters** section, specify the following parameters:

   a. For **UnreachableInstanceId**, specify the ID of the unreachable instance.
   
   b. For **LogDestination**, specify an Amazon S3 bucket if you want to collect operating system-level logs while troubleshooting your instance. Logs are automatically uploaded to the specified bucket.
   
   c. For **EC2RescueInstanceType**, specify an instance type for the EC2Rescue instance. The default instance type is t2.small.
   
   d. For **SubnetId**, specify a subnet in an existing VPC in the same availability zone as the unreachable instance. By default, Systems Manager creates a new VPC, but you can specify a subnet in an existing VPC if you want.

   **Note**
   
   If you don’t see the option to specify a bucket or a subnet ID, verify that you are using the latest **Default** version of the document.

   e. For **AssumeRole**, if you created roles for this Automation by using the CloudFormation procedure described earlier in this topic, then specify the AssumeRole ARN that you copied from the CloudFormation console.

9. Choose **Execute automation**.

The Automation creates a backup AMI as part of the workflow. All other resources created by the Automation workflow are automatically deleted, but this AMI remains in your account. The AMI is named using the following convention:

```
Backup AMI: AWSSupport-EC2Rescue:UnreachableInstanceId
```

You can locate this AMI in the Amazon EC2 console by searching on the Automation execution ID.

---

**Reset Passwords and SSH Keys on Amazon EC2 Instances**

You can use the **AWSSupport-ResetAccess** document to automatically reenable local Administrator password generation on Amazon EC2 Windows instances, and to generate a new SSH key on Amazon EC2 Linux instances. The **AWSSupport-ResetAccess** document is designed to perform a combination of Systems Manager actions, AWS CloudFormation actions, and Lambda functions that automate the steps normally required to reset the local administrator password.

You can use Automation with the **AWSSupport-ResetAccess** document to solve the following problems:

**Windows**

*You lost the EC2 key pair:* To resolve this problem, you can use the **AWSSupport-ResetAccess** document to create a password-enabled AMI from your current instance, launch a new instance from the AMI, and select a key pair you own.

*You lost the local Administrator password:* To resolve this problem, you can use the **AWSSupport-ResetAccess** document to generate a new password that you can decrypt with the current EC2 key pair.

**Linux**

*You lost your EC2 key pair, or you configured SSH access to the instance with a key you lost:* To resolve this problem, you can use the **AWSSupport-ResetAccess** document to create a new SSH key for your current instance, which enables you to connect to the instance again.

**Note**

If your EC2 Windows instance is configured for Systems Manager, you can also reset your local Administrator password by using EC2Rescue and Run Command. For more information, see

How It Works

Troubleshooting an instance with Automation and the AWSSupport-ResetAccess document works as follows:

- You specify the ID of the instance and run the Automation workflow.
- The system creates a temporary VPC, and then runs a series of Lambda functions to configure the VPC.
- The system identifies a subnet for your temporary VPC in the same Availability Zone as your original instance.
- The system launches a temporary, SSM-enabled helper instance.
- The system stops your original instance, and creates a backup. It then attaches the original root volume to the helper instance.
- The system uses Run Command to run EC2Rescue on the helper instance. On Windows, EC2Rescue enables password generation for the local Administrator by using EC2Config or EC2Launch on the attached, original root volume. On Linux, EC2Rescue generates and injects a new SSH key and saves the private key, encrypted, in Parameter Store. When finished, EC2Rescue reattaches the root volume back to the original instance.
- The system creates a new Amazon Machine Image (AMI) of your instance, now that password generation is enabled. You can use this AMI to create a new EC2 instance, and associate a new key pair if needed.
- The system restarts your original instance, and terminates the temporary instance. The system also terminates the temporary VPC and the Lambda functions created at the start of the automation.
- **Windows**: Your instance generates a new password you can decode from the EC2 console using the current key pair assigned to the instance.
- **Linux**: You can SSH to the instance by using the SSH key stored in Systems Manager Parameter Store as /ec2rl/openssh/instance_id/key.

Before You Begin

Before you run the following Automation, do the following:

- Copy the instance ID of the instance on which you want to reset the Administrator password. You will specify this ID in the procedure.
- Optionally, collect the ID of a subnet in the same availability zone as your unreachable instance. The EC2Rescue instance will be created in this subnet. If you don’t specify a subnet, then Automation creates a new temporary VPC in your AWS account. Verify that your AWS account has at least one VPC available. By default, you can create five VPCs in a Region. If you already created five VPCs in the Region, the automation fails without making changes to your instance. For more information, see VPC and Subnets.
- Optionally, you can create and specify an AWS Identity and Access Management (IAM) role for Automation. If you don’t specify this role, then Automation runs in the context of the user who ran the automation. For more information about creating roles for Automation, see Running an Automation Workflow by Using an IAM Service Role (p. 200).

Granting AWSSupport-EC2Rescue Permissions to Perform Actions On Your Instances

EC2Rescue needs permission to perform a series of actions on your instances during the Automation execution. These actions invoke the AWS Lambda, IAM, and Amazon EC2 services to safely and securely attempt to remediate issues with your instances. If you have Administrator-level permissions in your AWS account and/or VPC, you might be able to run the automation without configuring permissions, as
described in this section. If you don't have Administrator-level permissions, then you or an administrator
must configure permissions by using one of the following options.

- Granting Permissions By Using IAM Policies (p. 428)
- Granting Permissions By Using An AWS CloudFormation Template (p. 429)

Granting Permissions By Using IAM Policies

You can either attach the following IAM policy to your IAM user account, group, or role as an inline
policy; or, you can create a new IAM managed policy and attach it to your user account, group, or role.
For more information about adding an inline policy to your user account, group, or role see Working With
Inline Policies. For more information about creating a new managed policy, see Working With Managed
Policies.

**Note**

If you create a new IAM managed policy, you must also attach the `AmazonSSMAutomationRole`
managed policy to it so that your instances can communicate with the Systems Manager API.

**IAM Policy for AWSSupport-ResetAccess**

```json
{
"Version": "2012-10-17",
"Statement": [
{
"Action": [
"lambda:InvokeFunction",
"lambda:DeleteFunction",
"lambda:GetFunction"
],
"Effect": "Allow"
},
{
"Action": [
"s3:GetObject",
"s3:GetObjectVersion"
],
"Resource": [
"arn:aws:s3:::awssupport-ssm::*/*.template",
"arn:aws:s3:::awssupport-ssm::*/*.zip"
],
"Effect": "Allow"
},
{
"Action": [
"iam:CreateRole",
"iam:CreateInstanceProfile",
"iam:GetRole",
"iam:GetInstanceProfile",
"iam:PutRolePolicy",
"iam:DetachRolePolicy",
"iam:AttachRolePolicy",
"iam:PassRole",
"iam:AddRoleToInstanceProfile",
"iam:RemoveRoleFromInstanceProfile",
"iam:DeleteRole",
"iam:DeleteRolePolicy",
"iam:DeleteInstanceProfile"
],
"Resource": [
"arn:aws:iam::An-AWS-Account-ID:role/AWSSupport-EC2Rescue-*",
],
```

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Granting Permissions By Using An AWS CloudFormation Template

AWS CloudFormation automates the process of creating IAM roles and policies by using a preconfigured template. Use the following procedure to create the required IAM roles and policies for the EC2Rescue Automation by using AWS CloudFormation.

To create the required IAM roles and policies for EC2Rescue

1. Choose the **Launch Stack** button. The button opens the AWS CloudFormation console and populates the **Specify an Amazon S3 template URL** field with the URL to the EC2Rescue template.

   **Note**
   Choose **View** to view the template.

<table>
<thead>
<tr>
<th>View</th>
<th>Launch</th>
</tr>
</thead>
<tbody>
<tr>
<td>View</td>
<td>![Launch Stack](Launch Stack)</td>
</tr>
</tbody>
</table>

2. Choose **Next**.
3. On the **Specify Details** page, in the **Stack Name** field, either choose to keep the default value or specify your own value. Choose **Next**.
4. On the **Options** page, you don’t need to make any selections. Choose **Next**.
5. On the **Review** page, scroll down and choose the **I acknowledge that AWS CloudFormation might create IAM resources** option.
6. Choose **Create**.

AWS CloudFormation shows the **CREATE_IN_PROGRESS** status for approximately three minutes. The status changes to **CREATE_COMPLETE** after the stack has been created.
7. In the stack list, choose the option next to the stack you just created, and then choose the **Outputs** tab.

8. Copy the **Value**. The is the ARN of the AssumeRole. You will specify this ARN when you run the Automation.

   **Note**
   This procedure creates an AWS CloudFormation stack in the US East (Ohio) Region (us-east-2), but the IAM role created by this process is a global resource available in all Regions.

**Running the Automation**

The following procedure describes how to run the **AWSSupport-ResetAccess** document by using the AWS Systems Manager console.

**Important**

The following Automation execution stops the instance. Stopping the instance can result in lost data on attached instance store volumes (if present). Stopping the instance can also cause the public IP to change, if no Elastic IP is associated. To avoid these configuration changes, use Run Command to reset access. For more information, see Using EC2Rescue for Windows Server with Systems Manager Run Command in the *Amazon EC2 User Guide for Windows Instances*.

**To run the AWSSupport-ResetAccess Automation**

2. In the navigation pane, choose **Automation**.

   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Automation**.
3. Choose **Execute automation**.
4. In the **Document name** section, choose **Owned by Me or Amazon** from the list.
5. In the documents list, choose **AWSSupport-ResetAccess**. The document owner is Amazon.
6. In the **Document details** section verify that **Document version** is set to the highest default version. For example, 4 (default).
7. In the **Execution mode** section, choose **Simple Execution**.
8. In the **Input parameters** section, specify the following parameters:
   a. For **InstanceID**, specify the ID of the unreachable instance.
   b. For **EC2RescueInstanceType**, specify an instance type for the EC2Rescue instance. The default instance type is t2.small.
   c. For **SubnetId**, specify a subnet in an existing VPC in the same availability zone as the instance you specified. By default, Systems Manager creates a new VPC, but you can specify a subnet in an existing VPC if you want.

   **Note**
   If you don’t see the option to specify a subnet ID, verify that you are using the latest Default version of the document.
   d. For **Assume Role**, if you created roles for this Automation by using the CloudFormation procedure described earlier in this topic, then specify the AssumeRole ARN that you copied from the CloudFormation console.
9. Choose **Execute**.
10. To monitor the execution progress, choose the running Automation, and then choose the **Steps** tab. When the execution is finished, choose the **Descriptions** tab, and then choose **View output** to
view the results. To view the output of individual steps, choose the **Steps** tab, and then choose **View Outputs** next to a step.

The Automation creates a backup AMI and a password-enabled AMI as part of the workflow. All other resources created by the Automation workflow are automatically deleted, but these AMIs remain in your account. The AMIs are named using the following conventions:

- **Backup AMI**: AWSSupport-EC2Rescue:`InstanceId`
- **Password-enabled AMI**: AWSSupport-EC2Rescue: Password-enabled AMI from `InstanceId`

You can locate these AMIs by searching on the Automation execution ID.

For Linux, the new SSH private key for your instance is saved, encrypted, in Parameter Store. The parameter name is `/ec2rl/openssh/instance_id/key`.

### Using Automation with Jenkins

If your organization uses Jenkins software in a CI/CD pipeline, you can add Automation as a post-build step to pre-install application releases into Amazon Machines Images (AMIs). You can also use the Jenkins scheduling feature to call Automation and create your own operating system (OS) patching cadence.

The example below shows how to invoke Automation from a Jenkins server that is running either on-premises or in Amazon EC2. For authentication, the Jenkins server uses AWS credentials based on an AWS Identity and Access Management (IAM) user that you create in the example. If your Jenkins server is running in Amazon EC2, you can also authenticate it using an IAM instance profile role.

**Note**

Be sure to follow Jenkins security best-practices when configuring your instance.

### Before You Begin

Complete the following tasks before you configure Automation with Jenkins.

- Complete the [Simplify AMI Patching Using Automation, Lambda, and Parameter Store](#) example. The following example uses the `UpdateMyLatestWindowsAmi` automation document created in that example.
- Configure IAM roles for Automation. Systems Manager requires an instance profile role and a service role ARN to process Automation workflows. For more information, see [Getting Started with Automation](#).
- After you configure IAM roles for Automation, use the following procedure to create an IAM user account for your Jenkins server. The Automation workflow uses the IAM user account’s Access key and Secret key to authenticate the Jenkins server during execution.

### To create a user account for the Jenkins server

1. From the Users page on the IAM console, choose **Add User**.
2. In the **Set user details** section, specify a user name (for example, Jenkins).
3. In the **Select AWS access type** section, choose **Programmatic Access**.
4. Choose **Next:Permissions**.
5. In the **Set permissions for** section, choose **Attach existing policies directly**.
6. In the filter field, type **AmazonSSMFullAccess**.
7. Choose the check box next to the policy, and then choose **Next:Review**.
8. Verify the details, and then choose **Create**.
9. Copy the Access and Secret keys to a text file. You will specify these credentials in the next procedure.

Use the following procedure to configure the AWS CLI on your Jenkins server.

**To configure the Jenkins server for Automation**

1. If it's not already installed, download the AWS CLI to your Jenkins server. For more information, see Installing the AWS Command Line Interface.
2. In a terminal window on your Jenkins server, run the following commands to configure the AWS CLI.

   ```bash
   sudo su - jenkins
   aws configure
   ```

   For information, see Install or Upgrade the AWS CLI (p. 58).
3. When prompted, enter the AWS Access key and Secret key you received when you created the Jenkins user in IAM. Specify a default region. For more information about configuring the AWS CLI see Configuring the AWS Command Line Interface.

Use the following procedure to configure your Jenkins project to invoke Automation.

**To configure your Jenkins server to invoke Automation**

1. Open the Jenkins console in a web browser.
2. Choose the project that you want to configure with Automation, and then choose Configure.
3. On the Build tab, choose Add Build Step.
4. Choose Execute shell or Execute Windows batch command (depending on your operating system).
5. In the Command box, run an AWS CLI command like the following:

   ```bash
   aws --region the AWS Region of your source AMI ssm start-automation-execution --document-name your document name --parameters parameters for the document
   ```

   The following example command uses the UpdateMyLatestWindowsAmi document and the Systems Manager Parameter latestAmi created in Simplify AMI Patching Using Automation, Lambda, and Parameter Store (p. 412):

   ```bash
   aws --region region-id ssm start-automation-execution --document-name UpdateMyLatestWindowsAmi --parameters "sourceAMIid='{{ssm:latestAmi}}'"
   ```

   In Jenkins, the command looks like the example in the following screenshot.
6. In the Jenkins project, choose Build Now. Jenkins returns output similar to the following example.

```
Troubleshooting Systems Manager Automation

Use the following information to help you troubleshoot problems with the Automation service. This topic includes specific tasks to resolve issues based on Automation error messages.

Topics
- Common Automation Errors (p. 433)
- Automation Execution Failed to Start (p. 441)
- Execution Started, but Status is Failed (p. 442)
- Execution Started, but Timed Out (p. 443)

Common Automation Errors

This section includes information about common Automation errors.

VPC not defined 400

By default, when Automation runs either the AWS-UpdateLinuxAmi document or the AWS-UpdateWindowsAmi document, the system creates a temporary instance in the default VPC (172.30.0.0/16). If you deleted the default VPC, you will receive the following error:

VPC not defined 400

To solve this problem, you must create a new Automation document that includes the subnet ID. Copy a sample document below that includes the subnet ID parameter and create a new document.

AWS-UpdateLinuxAmi
```
"sourceAmiId":{
  "type":"String",
  "description":"(Required) The source Amazon Machine Image ID."
},
"iamInstanceProfileName":{
  "type":"String",
  "description":"(Required) The name of the role that enables Systems Manager (SSM) to manage the instance."
},
"automationAssumeRole":{
  "type":"String",
  "description":"(Required) The ARN of the role that allows Automation to perform the actions on your behalf."
},
"subnetId":{
  "type":"String",
  "description":"(Required) The subnet that the created instance will be placed into."}
},
"targetAmiName":{
  "type":"String",
  "description":"(Optional) The name of the new AMI that will be created. Default is a system-generated string including the source AMI id, and the creation time and date."
},
"instanceType":{
  "type":"String",
  "description":"(Optional) Type of instance to launch as the workspace host. Instance types vary by region. Default is t2.micro."
},
"preUpdateScript":{
  "type":"String",
  "description":"(Optional) URL of a script to run before updates are applied. Default ("none") is to not run a script."
},
"postUpdateScript":{
  "type":"String",
  "description":"(Optional) URL of a script to run after package updates are applied. Default ("none") is to not run a script."
},
"includePackages":{
  "type":"String",
  "description":"(Optional) Only update these named packages. By default ("all"), all available updates are applied."
},
"excludePackages":{
  "type":"String",
  "description":"(Optional) Names of packages to hold back from updates, under all conditions. By default ("none"), no package is excluded."}
"mainSteps": [
    {
        "name": "launchInstance",
        "action": "aws:runInstances",
        "maxAttempts": 3,
        "timeoutSeconds": 1200,
        "onFailure": "Abort",
        "inputs": {
            "ImageId": "{{ SourceAmiId }}",
            "InstanceType": "{{ InstanceType }}",
            "SubnetId": "{{ SubnetId }}",
            "MinInstanceCount": 1,
            "MaxInstanceCount": 1,
            "IamInstanceProfileName": "{{ IamInstanceProfileName }}"
        }
    },
    {
        "name": "updateOSSoftware",
        "action": "aws:runCommand",
        "maxAttempts": 3,
        "timeoutSeconds": 3600,
        "onFailure": "Abort",
        "inputs": {
            "DocumentName": "AWS-RunShellScript",
            "InstanceIds": "{{ launchInstance.InstanceIds }}",
            "Parameters": {
                "commands": [
                    "set -e",
                    "[ -x \"$(which wget)\" ] && get_contents='wget $1 -O -',
                    "[ -x \"$(which curl)\" ] && get_contents='curl -s -f $1'",
                    "chmod +x /tmp/aws-update-linux-instance",
                ]
            }
        }
    },
    {
        "name": "stopInstance",
        "action": "aws:changeInstanceState",
        "maxAttempts": 3,
        "timeoutSeconds": 1200,
        "onFailure": "Abort",
        "inputs": {
            "InstanceIds": "{{ launchInstance.InstanceIds }}",
            "DesiredState": "stopped"
        }
    },
    {
        "name": "createImage",
        "action": "aws:createImage",
        "maxAttempts": 3,
        "onFailure": "Abort",
        "inputs": {
            "InstanceId": "{{ launchInstance.InstanceIds }}"
        }
    }
]
AWS-UpdateWindowsAmi

```json
{
  "schemaVersion": "0.3",
  "description": "Updates a Microsoft Windows AMI. By default it will install all Windows updates, Amazon software, and Amazon drivers. It will then sysprep and create a new AMI. Supports Windows Server 2008 R2 and greater.",
  "assumeRole": "{{ AutomationAssumeRole }}",
  "parameters": {
    "SourceAmiId": {
      "type": "String",
      "description": "(Required) The source Amazon Machine Image ID."
    },
    "IamInstanceProfileName": {
      "type": "String",
      "description": "(Required) The name of the role that enables Systems Manager to manage the instance."
    },
    "AutomationAssumeRole": {
      "type": "String",
      "description": "(Required) The ARN of the role that allows Automation to perform the actions on your behalf."
    },
    "SubnetId": {
      "type": "String",
      "description": "(Required) The subnet that the created instance will be placed into."
    },
    "TargetAmiName": {
      "type": "String",
      "description": "(Optional) The name of the new AMI that will be created. Default is a system-generated string including the source AMI id, and the creation time and date."
    },
    "InstanceType": {
      "type": "String",
      "description": "(Optional) Type of instance to launch as the workspace host. Instance types vary by region. Default is t2.medium."
    }
  }
}
```
Troubleshooting Systems Manager Automation

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IncludeKbs:
  - type: String
  - description: (Optional) Specify one or more Microsoft Knowledge Base (KB) article IDs to include. You can install multiple IDs using comma-separated values. When specified, the categories and security level values are ignored. Valid formats: KB9876543 or 9876543.
  - default: ""

ExcludeKbs:
  - type: String
  - description: (Optional) Specify one or more Microsoft Knowledge Base (KB) article IDs to exclude. You can exclude multiple IDs using comma-separated values. When specified, all these KBs are excluded from install process. Valid formats: KB9876543 or 9876543.
  - default: ""

Categories:
  - type: String
  - description: (Optional) Specify one or more update categories. You can filter categories using comma-separated values. By default patches for all categories are selected. If value supplied, the update list is filtered by those values. Options: Critical Update, Security Update, Definition Update, Update Rollup, Service Pack, Tool, Update or Driver. Valid formats include a single entry, for example: Critical Update. Or, you can specify a comma separated list: Critical Update, Security Update, Definition Update. NOTE: There cannot be any spaces around the commas.
  - default: ""

SeverityLevels:
  - type: String
  - description: (Optional) Specify one or more MSRC severity levels associated with an update. You can filter severity levels using comma-separated values. By default patches for all security levels are selected. If value supplied, the update list is filtered by those values. Options: Critical, Important, Low, Moderate or Unspecified. Valid formats include a single entry, for example: Critical. Or, you can specify a comma separated list: Critical, Important, Low.
  - default: ""

PreUpdateScript:
  - type: String
  - description: (Optional) A script provided as a string. It will run prior to installing OS updates.
  - default: ""

PostUpdateScript:
  - type: String
  - description: (Optional) A script provided as a string. It will run after installing OS updates.
  - default: ""

mainSteps:

- name: "LaunchInstance",
  action: "aws:runInstances",
  timeoutSeconds: 1800,
  maxAttempts: 3,
  onFailure: "Abort",
  inputs: {
    "ImageId": "{{ SourceAmiId }}",
    "InstanceType": "{{ InstanceType }}",
    "SubnetId": "{{ SubnetId }}",
    "MinInstanceCount": 1,
    "MaxInstanceCount": 1,
    "IamInstanceProfileName": "{{ IamInstanceProfileName }}" }


```json
},
{
  "name": "RunPreUpdateScript",
  "action": "aws:runCommand",
  "maxAttempts": 3,
  "onFailure": "Abort",
  "timeoutSeconds": 1800,
  "inputs": {
    "DocumentName": "AWS-RunPowerShellScript",
    "InstanceIds": [{
      "{{ LaunchInstance.InstanceIds }}"
    }],
    "Parameters": {
      "commands": "{{ PreUpdateScript }}"
    }
  }
},
{
  "name": "UpdateSSMAgent",
  "action": "aws:runCommand",
  "maxAttempts": 3,
  "onFailure": "Abort",
  "timeoutSeconds": 600,
  "inputs": {
    "DocumentName": "AWS-UpdateSSMAgent",
    "InstanceIds": [{
      "{{ LaunchInstance.InstanceIds }}"
    }]
  }
},
{
  "name": "UpdateEC2Config",
  "action": "aws:runCommand",
  "maxAttempts": 3,
  "onFailure": "Abort",
  "timeoutSeconds": 7200,
  "inputs": {
    "DocumentName": "AWS-InstallPowerShellModule",
    "InstanceIds": [{
      "{{ LaunchInstance.InstanceIds }}"
    }],
    "Parameters": {
      "executionTimeout": "7200",
      "sourceHash": "14CAD416F4A054B94EDB2091EA4B99E542368BE5895BDD466B567C1ABA87C87C",
      "commands": [
        "Set-ExecutionPolicy -ExecutionPolicy Unrestricted -Force",
        "Import-Module AWSUpdateWindowsInstance",
        "if ([Environment]:OSVersion.Version.Major -ge 10) {
          "Install-AwsUwiEC2Launch -Id {{ automation:EXECUTION_ID }}",
        } else {
          "Install-AwsUwiEC2Config -Id {{ automation:EXECUTION_ID }}",
        }
      ]
    }
  }
},
{
  "name": "UpdateAWSPVDriver",
  "action": "aws:runCommand",
  "maxAttempts": 3,
  "onFailure": "Abort",
  "timeoutSeconds": 600,
  "inputs": {
```
"DocumentName": "AWS-ConfigureAWSPackage",
"InstanceIds": [
    "{{ LaunchInstance.InstanceIds }}"
],
"Parameters": {
    "name": "AWSPVDriver",
    "action": "Install"
  }
},
{
  "name": "InstallWindowsUpdates",
  "action": "aws:runCommand",
  "maxAttempts": 3,
  "onFailure": "Abort",
  "timeoutSeconds": 14400,
  "inputs": {
    "DocumentName": "AWS-InstallWindowsUpdates",
    "InstanceIds": [
        "{{ LaunchInstance.InstanceIds }}"
    ],
    "Parameters": {
        "Action": "Install",
        "IncludeKbs": "{{ IncludeKbs }}",
        "ExcludeKbs": "{{ ExcludeKbs }}",
        "Categories": "{{ Categories }}",
        "SeverityLevels": "{{ SeverityLevels }}"
    }
  }
},
{
  "name": "RunPostUpdateScript",
  "action": "aws:runCommand",
  "maxAttempts": 3,
  "onFailure": "Abort",
  "timeoutSeconds": 1800,
  "inputs": {
    "DocumentName": "AWS-RunPowerShellScript",
    "InstanceIds": [
        "{{ LaunchInstance.InstanceIds }}"
    ],
    "Parameters": {
        "commands": "{{ PostUpdateScript }}"
    }
  }
},
{
  "name": "RunSysprepGeneralize",
  "action": "aws:runCommand",
  "maxAttempts": 3,
  "onFailure": "Abort",
  "timeoutSeconds": 7200,
  "inputs": {
    "DocumentName": "AWS-InstallPowerShellModule",
    "InstanceIds": [
        "{{ LaunchInstance.InstanceIds }}"
    ],
    "Parameters": {
        "executionTimeout": "7200",
        "sourceHash": "14CAD416F4A05489E4BE2091E04B99E542368BE5895BD466B567C1ABA87C87C",
        "commands": [
            "Set-ExecutionPolicy -ExecutionPolicy Unrestricted -Force",
            "Import-Module AWSUpdateWindowsInstance"
        ]
    }
  }
}
"Start-AwsUwiSysprep -Id {{ automation:EXECUTION_ID }}"
}
{
"name":"StopInstance",
"action":"aws:changeInstanceState",
"maxAttempts":3,
"timeoutSeconds":7200,
"onFailure":"Abort",
"inputs":{
"InstanceIds":
"{{ LaunchInstance.InstanceIds }}",
"CheckStateOnly":false,
"DesiredState":"stopped"
}
},
{
"name":"CreateImage",
"action":"aws:createImage",
"maxAttempts":3,
"onFailure":"Abort",
"inputs":{
"InstanceId":"{{ LaunchInstance.InstanceIds }}",
"ImageName":"{{ TargetAmiName }}",
"NoReboot":true,
"ImageDescription":"Test CreateImage Description"
}
},
{
"name":"CreateTags",
"action":"aws:createTags",
"maxAttempts":3,
"onFailure":"Abort",
"inputs":{
"ResourceType":"EC2",
"ResourceIds":
"{{ CreateImage.ImageId }}",
"Tags":[
{ "Key":"Original_AMI_ID",
"Value":"Created from {{ SourceAmiId }}"
}
]
}
},
{
"name":"TerminateInstance",
"action":"aws:changeInstanceState",
"maxAttempts":3,
"onFailure":"Abort",
"inputs":{
"InstanceIds":
"{{ LaunchInstance.InstanceIds }}",
"DesiredState":"terminated"
}
],
"outputs":[
"CreateImage.ImageId"
]
Automation Execution Failed to Start

An Automation execution can fail with an access denied error or an invalid assume role error if you have not properly configured IAM users, roles, and policies for Automation.

Access Denied

The following examples describe situations when an Automation execution failed to start with an access denied error.

Access Denied to Systems Manager API

**Error message:** User: user arn is not authorized to perform: ssm:StartAutomationExecution on resource: document arn (Service: AWSSimpleSystemsManagement; Status Code: 400; Error Code: AccessDeniedException; Request ID: xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx)

- Possible cause 1: The IAM user attempting to start the Automation execution does not have permission to invoke the StartAutomationExecution API. To resolve this issue, attach the required IAM policy to the user account that was used to start the execution. For more information, see Task 4: Configure User Access to Automation (p. 150).
- Possible cause 2: The IAM user attempting to start the Automation execution has permission to invoke the StartAutomationExecution API, but does not have permission to invoke the API by using the specific Automation document. To resolve this issue, attach the required IAM policy to the user account that was used to start the execution. For more information, see Task 4: Configure User Access to Automation (p. 150).

Access Denied Because of Missing PassRole Permissions

**Error message:** User: user arn is not authorized to perform: iam:PassRole on resource: automation assume role arn (Service: AWSSimpleSystemsManagement; Status Code: 400; Error Code: AccessDeniedException; Request ID: xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx)

The IAM user attempting to start the Automation execution does not have PassRole permission for the assume role. To resolve this issue, attach the iam:PassRole policy to the role of the IAM user attempting to start the Automation execution. For more information, see Task 3: Attach the iam:PassRole Policy to Your Automation Role (p. 149).

Invalid Assume Role

When you run an Automation, an assume role is either provided in the document or passed as a parameter value for the document. Different types of errors can occur if the assume role is not specified or configured properly.

Malformed Assume Role

**Error message:** The format of the supplied assume role ARN is invalid. The assume role is improperly formatted. To resolve this issue, verify that a valid assume role is specified in your Automation document or as a runtime parameter when running the Automation.

Assume Role Can’t Be Assumed

**Error message:** The defined assume role is unable to be assumed. (Service: AWSSimpleSystemsManagement; Status Code: 400; Error Code: InvalidAutomationExecutionParametersException; Request ID: xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx)
• Possible cause 1: The assume role does not exist. To resolve this issue, create the role. For more information, see the section called “Getting Started with Automation” (p. 144). Specific details for creating this role are described in the following topic, Task 1: Create a Service Role for Automation (p. 147).

• Possible cause 2: The assume role does not have a trust relationship with the Systems Manager service. To resolve this issue, create the trust relationship. For more information, see Task 2: Add a Trust Relationship for Automation (p. 148).

Execution Started, but Status is Failed

Action-Specific Failures

Automation documents contain steps and steps run in order. Each step invokes one or more AWS service APIs. The APIs determine the inputs, behavior, and outputs of the step. There are multiple places where an error can cause a step to fail. Failure messages indicate when and where an error occurred.

To see a failure message in the EC2 console, choose the View Outputs link of the failed step. To see a failure message from the AWS CLI, call get-automation-execution and look for the FailureMessage attribute in a failed StepExecution.

In the following examples, a step associated with the aws:runInstance action failed. Each example explores a different type of error.

1. Missing Image

   Error message: Automation Step Execution fails when it is launching the instance(s). Get Exception from RunInstances API of ec2 Service. Exception Message from RunInstances API: [The image id 'ami id'] does not exist (Service: AmazonEC2; Status Code: 400; Error Code: InvalidAMIId.NotFound; Request ID: xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx)]. Please refer to Automation Service Troubleshooting Guide for more diagnosis details.

   The aws:runInstances action received input for an ImageId that doesn't exist. To resolve this problem, update the automation document or parameter values with the correct AMI ID.

2. Assume Role Policy Doesn't Have Sufficient Permissions

   Error message: Automation Step Execution fails when it is launching the instance(s). Get Exception from RunInstances API of ec2 Service. Exception Message from RunInstances API: [You are not authorized to perform this operation. Encoded authorization failure message: xxxxxxx (Service: AmazonEC2; Status Code: 403; Error Code: UnauthorizedOperation; Request ID: xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx)]. Please refer to Automation Service Troubleshooting Guide for more diagnosis details.

   The assume role doesn't have sufficient permission to invoke the RunInstances API on Amazon EC2 instances. To resolve this problem, attach an IAM policy to the assume role that has permission to invoke the RunInstances API. For more information, see the Method 2: Use IAM to Configure Roles for Automation (p. 146).

3. Unexpected State

   Error message: Step fails when it is verifying launched instance(s) are ready to be used. Instance i-xxxxxxxx entered unexpected state: shutting-down. Please refer to Automation Service Troubleshooting Guide for more diagnosis details.

   • Possible cause 1: There is a problem with the instance or the Amazon EC2 service. To resolve this problem, log in to the instance or review the instance system log to understand why the instance started shutting down.
• Possible cause 2: The user data script specified for the `aws:runInstances` action has a problem or incorrect syntax. Verify the syntax of the user data script. Also, verify that the user data scripts doesn't shut down the instance, or invoke other scripts that shut down the instance.

**Action-Specific Failures Reference**

When a step fails, the failure message might indicate which service was being invoked when the failure occurred. The following table lists the services invoked by each action. The table also provides links to information about each service.

<table>
<thead>
<tr>
<th>Action</th>
<th>AWS Service(s) Invoked by This Action</th>
<th>For Information About This Service</th>
<th>Troubleshooting Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>aws:runInstances</td>
<td>Amazon EC2</td>
<td>Amazon EC2 User Guide</td>
<td>Troubleshooting EC2 Instances</td>
</tr>
<tr>
<td>aws:changeInstanceState</td>
<td>Amazon EC2</td>
<td>Amazon EC2 User Guide</td>
<td>Troubleshooting EC2 Instances</td>
</tr>
<tr>
<td>aws:runCommand</td>
<td>Systems Manager</td>
<td>AWS Systems Manager Run Command (p. 615)</td>
<td>Troubleshooting Systems Manager Run Command (p. 645)</td>
</tr>
<tr>
<td>aws:createImage</td>
<td>Amazon EC2</td>
<td>Amazon Machines Images</td>
<td></td>
</tr>
<tr>
<td>aws:createStack</td>
<td>AWS CloudFormation</td>
<td>AWS CloudFormation User Guide</td>
<td>Troubleshooting AWS CloudFormation</td>
</tr>
<tr>
<td>aws:deleteStack</td>
<td>AWS CloudFormation</td>
<td>AWS CloudFormation User Guide</td>
<td>Troubleshooting AWS CloudFormation</td>
</tr>
<tr>
<td>aws:deleteImage</td>
<td>Amazon EC2</td>
<td>Amazon Machines Images</td>
<td></td>
</tr>
<tr>
<td>aws:copyImage</td>
<td>Amazon EC2</td>
<td>Amazon Machines Images</td>
<td></td>
</tr>
<tr>
<td>aws:createTag</td>
<td>Amazon EC2, Systems Manager</td>
<td>EC2 Resource and Tags</td>
<td></td>
</tr>
<tr>
<td>aws:invokeLambdaFunction</td>
<td>AWS Lambda</td>
<td>AWS Lambda Developer Guide</td>
<td>Troubleshooting Lambda</td>
</tr>
</tbody>
</table>

**Automation Service Internal Error**

**Error message:** Internal Server Error. Please refer to Automation Service Troubleshooting Guide for more diagnosis details.

A problem with the Automation service is preventing the specified Automation document from running correctly. To resolve this issue, contact AWS Support. Provide the execution ID and customer ID, if available.

**Execution Started, but Timed Out**

**Error message:** Step timed out while step is verifying launched instance(s) are ready to be used. Please refer to Automation Service Troubleshooting Guide for more diagnosis details.
AWS Systems Manager User Guide  

Maintenance Windows  

A step in the `aws:runInstances` action timed out. This can happen if the step action takes longer to run than the value specified for `timeoutSeconds` in the step. To resolve this issue, specify a longer value for `timeoutSeconds`. If that does not solve the problem, investigate why the step takes longer to run than expected.

AWS Systems Manager Maintenance Windows  

AWS Systems Manager Maintenance Windows let you define a schedule for when to perform potentially disruptive actions on your instances such as patching an operating system, updating drivers, or installing software or patches. Maintenance Windows also lets you schedule actions on numerous other AWS resource types, such as Amazon Simple Storage Service (Amazon S3) buckets, Amazon Simple Queue Service (Amazon SQS) queues, AWS Key Management Service (AWS KMS) keys, and many more. For a full list of supported resource types that you can include in a maintenance window target, see Supported Resources for AWS Resource Groups in the AWS Resource Groups User Guide.

Each maintenance window has a schedule, a maximum duration, a set of registered targets (the instances or other AWS resources that are acted upon), and a set of registered tasks. You can add tags to your maintenance windows when you create or update them. (Tags are keys that help identify and sort your resources within your organization.) You can also specify dates that a maintenance window should not run before or after, and you can specify the international time zone on which to base the maintenance window schedule. (For an explanation of how the various schedule-related options for maintenance windows relate to one another, see Reference: Maintenance Windows Scheduling and Active Period Options (p. 942.).)

Maintenance windows support running four types of tasks:

- Systems Manager Run Command commands
  - For more information about Run Command, see AWS Systems Manager Run Command (p. 615).
- Systems Manager Automation workflows
  - For more information about Automation workflows, see AWS Systems Manager Automation (p. 142).
- AWS Lambda functions
  - For more information about Lambda functions, see Working with Lambda Functions in the AWS Lambda Developer Guide.
- AWS Step Functions tasks
  - For more information about Step Functions, see the AWS Step Functions Developer Guide.

This means you can use maintenance windows to perform tasks like the following on your selected targets:

- Install or update applications.
- Apply patches.
- Install or update SSM Agent.
- Run PowerShell commands and Linux shell scripts by using a Systems Manager Run Command task.
- Build Amazon Machine Images (AMIs), boot-strap software, and configure instances by using a Systems Manager Automation task.
- Run AWS Lambda functions that trigger additional actions, such as scanning your instances for patch updates.
- Run AWS Step Functions state machines to perform tasks such as removing an instance from an Elastic Load Balancing environment, patching the instance, and then adding the instance back to the Elastic Load Balancing environment.
• Target instances that are offline by specifying an AWS resource group as the target.

Contents
• Controlling Access to Maintenance Windows (p. 445)
• Working with Maintenance Windows (Console) (p. 455)
• Systems Manager Maintenance Windows Tutorials (AWS CLI) (p. 461)
• Maintenance Windows Walkthroughs (p. 496)

Controlling Access to Maintenance Windows

Before users in your account can create and schedule maintenance window tasks, they must be granted the necessary permissions. To grant these permissions to users, an administrator must perform these two tasks:

Task 1: Configure instance permissions

Provide the Maintenance Windows service with the AWS Identity and Access Management (IAM) permissions needed to run maintenance window tasks on your instances by doing one of the following:

• Create a custom service role for maintenance window tasks
• Create a service-linked role for Systems Manager

You specify one of these roles as part of the configuration when you create a maintenance window task. This allows Systems Manager to run tasks in maintenance windows on your behalf.

Note
A service-linked role for Systems Manager might already have been created in your account. Currently, the service-linked role also provides permissions for the Inventory capability.

To help you decide whether to use a custom service role or the Systems Manager service-linked role with a maintenance window task, see Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445).

Task 2: Configure user permissions

Granting `iam:PassRole` permissions to the users in your account who assigns tasks to maintenance windows. This allows them to pass the role to the maintenance window service. Without this explicit permission, a user can't assign tasks to a maintenance window.

Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks?

To run maintenance tasks on your target instances, the Maintenance Windows service must have permission to access and run tasks on your instances. You can provide this permission by specifying either the Systems Manager service-linked role or a custom service role as part of a task configuration.

The type of role you should choose depends on the following factors:

Custom service role: Use a custom service role for maintenance window tasks in these cases:

• If you want to use Amazon Simple Notification Service (Amazon SNS) to send notifications related to maintenance window tasks run through Run Command. You can enable SNS notifications when you create a maintenance window task.
• If you want to use a more restrictive set of permissions than those provided by the service-linked role. The service-linked role supports very limited resource-level constraints. For example, say you want
to allow maintenance window tasks to run on a limited set of instances, or you want to allow only certain SSM documents run on your target instances. In these cases, you specify stricter permissions in a custom service role.

- If you need a more permissive or expanded set of permissions than those provided by the service-linked role. Some actions in Automation documents require expanded permissions.

For example, some Automation actions work with AWS CloudFormation stacks. Therefore, the permissions `cloudformation:CreateStack`, `cloudformation:DescribeStack`, and `cloudformation:DeleteStack` are required.

Another example: the Automation document `AWS-CopySnapshot` requires permission to create an Amazon Elastic Block Store (Amazon EBS) snapshot, and so the service role needs the permission `ec2:CreateSnapshot`. This permission isn't included in the service-linked role for Systems Manager.

For information about the role permissions needed by Automation documents, see the document descriptions in Systems Manager Automation Document Details Reference (p. 294).

**Systems Manager service-linked role:** We recommend that you use a Systems Manager service-linked role in all other cases.

For more information about the Systems Manager service-linked role, see Service-Linked Role Permissions for Systems Manager (p. 922).

**Topics**
- Control Access to Maintenance Windows (Console) (p. 446)
- Control Access to Maintenance Windows (AWS CLI) (p. 449)
- Troubleshooting IAM Maintenance Window Permissions (p. 455)

**Control Access to Maintenance Windows (Console)**

The following procedures describe how to use the AWS Systems Manager console to create the required roles and permissions for maintenance windows.

**Topics**
- Task 1: (Optional) Create a Custom Service Role for Maintenance Windows (Console) (p. 446)
- Task 2: Assign the IAM PassRole Policy to an IAM User or Group (Console) (p. 448)

**Task 1: (Optional) Create a Custom Service Role for Maintenance Windows (Console)**

Use the following procedure to create a custom service role for the Maintenance Windows capability so that Systems Manager can run tasks on your behalf.

**Important**

A custom service role is not required if you choose to use a Systems Manager service-linked role to let maintenance windows run tasks on your behalf instead. If you do not have a Systems Manager service-linked role in your account, you can create it when you create or update a maintenance window task using the Systems Manager console. For more information, see the following topics:

- Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445)
To create a custom service role (console)

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles, and then choose Create role.
3. Mark the following selections:
   1. Select type of trusted entity area: AWS service
   2. Choose the service that will use this role area: EC2
   3. Select your use case area: EC2
4. Choose Next: Permissions.
5. In the list of policies, select the box next to AmazonSSMMaintenanceWindowRole, and then choose Next: Review.
6. In Role name, enter a name that identifies this role as a Maintenance Windows role; for example my-maintenance-window-role.
7. Optional: Change the default role description to reflect the purpose of this role. For example: "Performs Maintenance Window tasks on your behalf."
8. Choose Create role. The system returns you to the Roles page.
9. Choose the name of the role you just created.
10. Choose the Trust relationships tab, and then choose Edit trust relationship.
11. Delete the current policy, and then copy and paste the following policy into the Policy Document field:

   ```json
   {
   "Version":"2012-10-17",
   "Statement":[
   {
   "Sid":"",
   "Effect":"Allow",
   "Principal":{
   "Service":[
   "ssm.amazonaws.com",
   "ec2.amazonaws.com",
   "sns.amazonaws.com"
   ],
   "Action":"sts:AssumeRole"
   }
   ]
   }
   }
   
   Note
   "sns.amazonaws.com" is required only if you plan to use Amazon SNS to send notifications related to maintenance window tasks run through Run Command. See step 13 below for more information.
12. Choose Update Trust Policy, and then copy or make a note of the role name and the Role ARN value on the Summary page. You specify this information when you create your maintenance window.
13. If you plan to configure a maintenance window to send notifications about command statuses using Amazon SNS, when run through a Run Command command task, do the following:
   1. Choose the Permissions tab.
2. Choose **Add inline policy**, and then choose the **JSON** tab.
3. In **Policy Document**, paste the following:

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": "iam:PassRole",
         "Resource": "sns-access-role-arn"
      }
   ]
}
```

`sns-access-role-arn` represents the ARN of the existing IAM role to be for sending SNS notifications related to the maintenance window, in the format of `arn:aws:iam::account-id:role/role-name`. For example: `arn:aws:iam::111222333444:role/my-sns-access-role`.

**Note**
In the Systems Manager console, this ARN is selected in the **IAM Role** list on the Register run command task page. For information, see Assign Tasks to a Maintenance Window (Console) (p. 458). In the Systems Manager API, this ARN is entered as the value of `ServiceRoleArn` in the `SendCommand` request.

4. Choose **Review policy**.
5. For **Name**, enter a name to identify this as a policy to allow sending Amazon SNS notifications.
14. Choose **Create policy**.

**Task 2: Assign the IAM PassRole Policy to an IAM User or Group (Console)**

When you register a task with a maintenance window, you specify either a custom service role or a Systems Manager service-linked role to run the actual task operations. This is the role that the service assumes when it runs tasks on your behalf. Before that, to register the task itself, you must assign the IAM PassRole policy to an IAM user account or an IAM group. This allows the IAM user or IAM group to specify, as part of registering those tasks with the maintenance window, the role that should be used when running tasks. For information, see Granting a User Permissions to Pass a Role to an AWS Service in the IAM User Guide.

Depending on whether you are assigning the `iam: Passrole` permission to an individual user or a group, use one of the following procedures to provide the minimum permissions required to register tasks with a maintenance window.

**To assign the IAM PassRole policy to an IAM user account (console)**

2. Choose **Users**, and then choose the name of the user account you want to update.
3. On the **Permissions** tabs, in the policies list, verify that the `AmazonSSMFullAccess` policy is listed, or that there is a comparable policy that gives the IAM user permission to call the Systems Manager API. Add the permission if it is not included already. For information, see Adding and Removing IAM Policies (Console) in the IAM User Guide.
4. Choose **Add inline policy**.
5. On the **Create policy** page, on the **Visual editor** tab, in the **Select a service** area, choose **IAM**.
6. In the **Actions** area, choose **PassRole**.

**Tip**
Type `passr` in the filter box to quickly locate **PassRole**.
7. Choose the **Resources** line, and then choose **Add ARN**.
8. For **Specify ARN for role**, paste the role ARN you created in the previous procedure, and then choose **Save changes**.
9. Choose **Review policy**.
10. On the **Review policy** page, enter a name in the **Name** box to identify this PassRole policy, and then choose **Create policy**.

**To assign the IAM PassRole policy to an IAM group (console)**

2. In the navigation pane, choose **Groups**.
3. In the list of groups, select the name of the group you want to assign the **iam:PassRole** permission to.
4. In the **Inline Policies** area, do one of the following:
   - If no inline policies have been added yet, choose **click here**.
   - If one or more inline policies have been added, choose **Create Group Policy**.
5. Select **Policy Generator**, and then choose **Select**.
6. Make the following selections:
   1. **Effect**: Allow
   2. **AWS Service**: Identity and Access Management
   3. **Actions**: PassRole
   4. **Amazon Resource Name (ARN)**: Enter the ARN of the maintenance window role you created in Task 1: (Optional) Create a Custom Service Role for Maintenance Windows (Console) (p. 446)
7. Choose **Add Statement**, and then choose **Next Step**.
8. Choose **Apply Policy**.

**Control Access to Maintenance Windows (AWS CLI)**

The following procedures describe how to use the AWS CLI to create the required roles and permissions for Maintenance Windows.

**Topics**

- Task 1: (Optional) Create a Custom Service Role for Maintenance Windows (AWS CLI) (p. 449)
- Task 2: Assign the IAM PassRole Policy to an IAM User or Group (p. 451)

**Task 1: (Optional) Create a Custom Service Role for Maintenance Windows (AWS CLI)**

**Important**

A custom service role is not required if you choose to use a Systems Manager service-linked role to let maintenance windows run tasks on your behalf instead. If you do not have a Systems Manager service-linked role in your account, you can create it when you create or update a maintenance window task using the Systems Manager console. For more information, see the following topics:

- Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445)
- Service-Linked Role Permissions for Systems Manager (p. 922)
• **Assign Tasks to a Maintenance Window (Console) (p. 458)**

1. Copy and paste the following trust policy into a text file. Save the file with the following name and file extension: `mw-role-trust-policy.json`.

   **Note**

   "sns.amazonaws.com" is required only if you plan to use Amazon SNS to send notifications related to maintenance window tasks run through the SendCommand API or `send-command` in the AWS CLI.

   ```json
   {
       "Version": "2012-10-17",
       "Statement": [
           {
               "Effect": "Allow",
               "Principal": {
                   "Service": [
                       "ssm.amazonaws.com",
                       "ec2.amazonaws.com",
                       "sns.amazonaws.com"
                   ]
               },
               "Action": "sts:AssumeRole"
           }
       ]
   }
   ```

2. Open the AWS CLI and run the following command in the directory where you placed `mw-role-trust-policy.json` in order to create a maintenance window role called `mw-task-role`. The command assigns the policy you created in the previous step to this role:

   ```bash
   aws iam create-role --role-name mw-task-role --assume-role-policy-document file://mw-role-trust-policy.json
   ```

   The system returns information like the following:

   ```json
   {
     "Role": {
       "AssumeRolePolicyDocument": {
         "Version": "2012-10-17",
         "Statement": [
           {
             "Action": "sts:AssumeRole",
             "Effect": "Allow",
             "Principal": {
               "Service": [
                 "ssm.amazonaws.com",
                 "ec2.amazonaws.com",
                 "sns.amazonaws.com"
               ]
             }
           }
         ],
       
       "RoleId": "AROAIIZKPBKS2LEXAMPLE",
       "CreateDate": "2017-04-03T01:37:32Z",
       "RoleName": "mw-task-role",
       "Path": "/",
       "Arn": "arn:aws:iam::123456789012:role/mw-task-role"
     }
   }
   ```
**Note**  
Make a note of the RoleName and the Arn. You specify these when you create a maintenance window.

3. Run the following command to attach the AmazonSSMMaintenanceWindowRole managed policy to the role you created in step 2:

```bash
cat
aws iam attach-role-policy --role-name mw-task-role --policy-arn
arn:aws:iam::aws:policy/service-role/AmazonSSMMaintenanceWindowRole
```

**Task 2: Assign the IAM PassRole Policy to an IAM User or Group**

When you register a task with a maintenance window, you specify either a custom service role or a Systems Manager service-linked role to run the actual task operations. This is the role that the service assumes when it runs tasks on your behalf. Before that, to register the task itself, you must assign the IAM PassRole policy to an IAM user account or an IAM group. This allows the IAM user or IAM group to specify, as part of registering those tasks with the maintenance window, the role that should be used when running tasks. For information, see Granting a User Permissions to Pass a Role to an AWS Service in the *IAM User Guide*.

**To assign the IAM PassRole policy to an IAM user account or group (AWS CLI)**

1. Copy and paste the following IAM policy into a text editor and save it with the following name and file extension: `mw-passrole-policy.json`.

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Sid": "Stmt1491345526000",
         "Effect": "Allow",
         "Action": [
            "iam:GetRole",
            "iam:PassRole",
            "ssm:RegisterTaskWithMaintenanceWindow"
         ],
         "Resource": [ "*" ]
      }
   ]
}
```

2. Open the AWS CLI.

3. Depending on whether you are assigning the permission to an IAM user or group, run one of the following commands.

   - **For an IAM user:**

     ```bash
cat
aws iam put-user-policy --user-name user-name --policy-name "policy-name" --policy-document path-to-document
```

   For `user-name`, specify the IAM user who assigns tasks to maintenance windows. For `policy-name`, specify the name you want to use to identify the policy. For `path-to-document`, specify the path to the file you saved in step 1. For example: `file://C:\Temp\mw-passrole-policy.json`
Control Access to Maintenance Windows (Tools for Windows PowerShell)

The following procedures describe how to use the Tools for Windows PowerShell to create the required roles and permissions for the Maintenance Windows capability.

Topics
- Task 1: (Optional) Create a Custom Service Role for Maintenance Windows (AWS CLI) (p. 452)
- Task 2: Assign the IAM PassRole Policy to an IAM User or Group (AWS CLI) (p. 453)

Task 1: (Optional) Create a Custom Service Role for Maintenance Windows (AWS CLI)

Important
A custom service role is not required if you choose to use a Systems Manager service-linked role to let maintenance windows run tasks on your behalf instead. If you do not have a Systems Manager service-linked role in your account, you can create it when you create or update a maintenance window task using the Systems Manager console. For more information, see the following topics:
- Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445)
1. Copy and paste the following trust policy into a text file. Save the file with the following name and file extension: mw-role-trust-policy.json.

Note
"sns.amazonaws.com" is required only if you plan to use Amazon SNS to send notifications related to maintenance window tasks run through the SendCommand API.

```json
{
  "Version":"2012-10-17",
  "Statement": [
    {
      "Effect":"Allow",
      "Principal": {
        "Service": ["ssm.amazonaws.com", "ec2.amazonaws.com", "sns.amazonaws.com"]
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

2. Open Tools for Windows PowerShell and run the following command to create a role with a name that identifies this role as a maintenance window role; for example mw-maintenance-window-role. The role uses the policy that you created in the previous step:

```powershell
New-IAMRole -RoleName "mw-task-role" -AssumeRolePolicyDocument (Get-Content -raw .\mw-role-trust-policy.json)
```

The system returns information like the following.

```
Arn : arn:aws:iam::123456789012:role/mw-task-role
AssumeRolePolicyDocument : ExampleDoc12345678
CreateDate : 4/4/2017 11:24:43
Path : / 
RoleId : AROAIIZKPBKS2LEXAMPLE
RoleName : mw-task-role
```

3. Run the following command to attach the AmazonSSMMaintenanceWindowRole managed policy to the role you created in the previous step:

```powershell
Register-IAMRolePolicy -RoleName mw-task-role -PolicyArn arn:aws:iam::aws:policy/service-role/AmazonSSMMaintenanceWindowRole
```

Task 2: Assign the IAM PassRole Policy to an IAM User or Group (AWS CLI)

When you register a task with a maintenance window, you specify either a custom service role or a Systems Manager service-linked role to run the actual task operations. This is the role that the service assumes when it runs tasks on your behalf. Before that, to register the task itself, you must assign the IAM PassRole policy to an IAM user account or an IAM group. This allows the IAM user or IAM group to specify, as part of registering those tasks with the maintenance window, the role that should be used
when running tasks. For information, see Granting a User Permissions to Pass a Role to an AWS Service in the IAM User Guide.

1. Copy and paste the following IAM policy into a text editor and save it with the .json file extension.

```json
{
  "Version":"2012-10-17",
  "Statement": [
    {
      "Sid":"Stmt1491345526000",
      "Effect":"Allow",
      "Action": ["iam:GetRole", "iam:PassRole", "ssm:RegisterTaskWithMaintenanceWindow"],
      "Resource": ["*"]
    }
  ]
}
```


3. Depending on whether you are assigning the permission to an IAM user or group, run one of the following commands.

   - For an IAM user:

     ```powershell
     Write-IAMUserPolicy -UserName user-name -PolicyDocument (Get-Content -raw path-to-document) -PolicyName policy-name
     ```

     For `user-name`, specify the IAM user who assigns tasks to maintenance windows. For `policy-name`, specify the name you want to use to identify the policy. For `path-to-document`, specify the path to the file you saved in step 1. For example: `C:\temp\passrole-policy.json`

     **Note**
     If you plan to register tasks for maintenance windows using the AWS Systems Manager console, you must also assign the AmazonSSMFullAccess policy to your user account. Run the following command to assign this policy to your account:

     ```powershell
     Register-IAMUserPolicy -UserName user-name -PolicyArn arn:aws:iam::aws:policy/AmazonSSMFullAccess
     ```

   - For an IAM group:

     ```powershell
     Write-IAMGroupPolicy -GroupName group-name -PolicyDocument (Get-Content -raw path-to-document) -PolicyName policy-name
     ```

     For `group-name`, specify the IAM group that assigns tasks to maintenance windows. For `policy-name`, specify the name you want to use to identify the policy. For `path-to-document`, specify the path to the file you saved in step 1. For example: `C:\temp\passrole-policy.json`

     **Note**
     If you plan to register tasks for maintenance windows using the AWS Systems Manager console, you must also assign the AmazonSSMFullAccess policy to your user account. Run the following command to assign this policy to your group:
Register-IAMGroupPolicy -GroupName group-name -PolicyArn arn:aws:iam::aws:policy/AmazonSSMFullAccess

Run the following command to verify that the policy has been assigned to the group:

Get-IAMGroupPolicies -GroupName group-name

Troubleshooting IAM Maintenance Window Permissions

Use the following information to help you troubleshoot common issues with Maintenance Windows permissions in AWS Systems Manager.

**Edit Task Error:** On the page for editing a maintenance window task, the IAM role list returns an error message: "We couldn't find the IAM maintenance window role specified for this task. It might have been deleted, or it might not have been created yet."

**Problem 1:** The IAM maintenance window role you originally specified was deleted after you created the task.

**Possible fixes:** (1) Select a different IAM maintenance window role, if one exists in your account, or create a new one and select it for the task. (2) Create or select a Systems Manager service-linked role. For more information, see Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445).

**Problem 2:** If the task was created using the AWS CLI, Tools for Windows PowerShell, or an AWS SDK, a non-existent IAM maintenance window role name could have been specified. For example, the IAM maintenance window role could have been deleted before you created the task, or the role name could have been typed incorrectly, such as myrole instead of my-role.

**Possible fixes:** (1) Select the correct name of the IAM maintenance window role you want to use, or create a new one to specify for the task. (2) Create or select a Systems Manager service-linked role. For more information, see Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445).

Working with Maintenance Windows (Console)

This section describes how to create, configure, and update, and delete maintenance windows using the Systems Manager console. This section also provides information about managing the targets and tasks of a maintenance window.

**Important**
We recommend that you initially create and configure maintenance windows in a test environment.

**Before You Begin**

Before you create a maintenance window, you must configure access to Maintenance Windows. For more information, see Controlling Access to Maintenance Windows (p. 445).

**Topics**
- Create a Maintenance Window (Console) (p. 456)
- Assign Targets to a Maintenance Window (Console) (p. 457)
- Assign Tasks to a Maintenance Window (Console) (p. 458)
- Update or Delete a Maintenance Window (Console) (p. 460)
Create a Maintenance Window (Console)

In this procedure, you create a maintenance window and specify its basic options, such as name, schedule, and duration. In later steps, you choose the targets, or resources, that it updates and the tasks that run during the maintenance window execution.

**Note**
For an explanation of how the various schedule-related options for maintenance windows relate to one another, see Reference: Maintenance Windows Scheduling and Active Period Options (p. 942).

**To create a Maintenance Window (console)**

2. In the navigation pane, choose Maintenance Windows.
3. Choose Create a maintenance window.
4. For Name, enter a descriptive name to help you identify this maintenance window as a test maintenance window.
5. For Description, enter a description.
6. Choose Allow unregistered targets if you want to allow a maintenance window task to run on managed instances, even if you have not registered those instances as targets. If you choose this option, then you can choose the unregistered instances (by instance ID) when you register a task with the maintenance window.
   
   If you don't choose this option, then you must choose previously-registered targets when you register a task with the maintenance window.
7. Specify a schedule for the maintenance window by using one of the three scheduling options.
   
   For information about building cron/rate expressions, see Reference: Cron and Rate Expressions for Systems Manager (p. 936).
8. For Duration, enter the number of hours the maintenance window will run. The value you specify determines the specific end time for the maintenance window based on the time it begins. No maintenance window tasks are permitted to start after the resulting end time minus the number of hours you specify for Stop initiating tasks in the next step.
   
   For example, if the maintenance window starts at 3 PM, the duration is three hours, and the Stop initiating tasks value is one hour, no maintenance window tasks can start after 5 PM.
9. For Stop initiating tasks, enter the number of hours before the end of the maintenance window that the system should stop scheduling new tasks to run.
10. (Optional) For Start date (optional), specify a date and time, in ISO-8601 Extended format, for when you want the maintenance window to become active. This allows you to delay activation of the maintenance window until the specified future date.
11. (Optional) For End date (optional), specify a date and time, in ISO-8601 Extended format, for when you want the maintenance window to become inactive. This allows you to set a date and time in the future after which the maintenance window no longer runs.
12. (Optional) For Time zone (optional), specify the time zone to base scheduled maintenance window executions on, in Internet Assigned Numbers Authority (IANA) format. For example: "America/Los_Angeles", "etc/UTC", or "Asia/Seoul".
   
   For more information about valid formats, see the Time Zone Database on the IANA website.
13. (Optional) In the Manage tags area, apply one or more tag key name/value pairs to the maintenance window.
   
   Tags are optional metadata that you assign to a resource. Tags enable you to categorize a resource in different ways, such as by purpose, owner, or environment. For example, you might want to tag a
maintenance window to identify the type of tasks it runs, the types of targets, and the environment it runs in. In this case, you could specify the following key name/value pairs:

- Key=TaskType, Value=AgentUpdate
- Key=OS, Value=Windows
- Key=Environment, Value=Production

14. Choose **Create maintenance window**. The system returns you to the maintenance window page. The state of the maintenance window you just created is **Enabled**.

**Assign Targets to a Maintenance Window (Console)**

In this procedure, you register a target with a maintenance window. In other words, you specify which resources the maintenance window performs actions on.

**To assign targets to a maintenance window (console)**

1. In the list of maintenance windows, choose the maintenance window to add targets to.
2. Choose **Actions**, and then choose **Register targets**.
3. (Optional) For **Target name**, enter a name for the targets.
4. (Optional) For **Description**, enter a description.
5. (Optional) For **Owner information**, specify information to include in any CloudWatch Events raised while running tasks for these targets in this maintenance window.

   For information about using CloudWatch Events to monitor Systems Manager events, see Monitoring Systems Manager Events with Amazon CloudWatch Events (p. 894).

6. In the **Targets** area, choose one of the options described in the following table.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specify instance tags</strong></td>
<td>For <strong>Instance tags</strong>, specify one or more tag keys and (optional) values that have been or will be added to managed instances in your account. When the maintenance window runs, it attempts to perform tasks on all of the managed instances to which these tags have been added.</td>
</tr>
<tr>
<td><strong>Choose instances manually</strong></td>
<td>From the list, select the box for each instance that you want to include in the maintenance window target. The list includes all instances in your account that are configured for use with Systems Manager. If you don't see an instance you want to include in the target, verify that the required setup steps have been completed:</td>
</tr>
<tr>
<td></td>
<td>- For Amazon EC2 instances, see Setting Up AWS Systems Manager (p. 23).</td>
</tr>
<tr>
<td></td>
<td>- For on-premises instances and virtual machines (VMs), see Setting Up AWS Systems Manager for Hybrid Environments (p. 41)</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Choose resource groups</strong></td>
<td>For <strong>Resource group</strong>, choose the name of an existing resource group in your account from the list.</td>
</tr>
<tr>
<td></td>
<td>For information about creating and working with resource groups, see the following topics:</td>
</tr>
<tr>
<td></td>
<td>• What is AWS Resource Groups? in the AWS Resource Groups User Guide</td>
</tr>
<tr>
<td></td>
<td>• Resource Groups and Tagging for AWS in the AWS News Blog</td>
</tr>
<tr>
<td></td>
<td>For <strong>Resource types</strong>, select up to five available resource types, or choose <strong>All resource types</strong>.</td>
</tr>
<tr>
<td></td>
<td>If the tasks you assign to the maintenance window do not act on one of the resource types you added to the target, the system might report an error. Tasks for which a supported resource type is found continue to run despite these errors.</td>
</tr>
<tr>
<td></td>
<td>For example, suppose you add the following resource types to this target:</td>
</tr>
<tr>
<td></td>
<td>• AWS::S3::Bucket</td>
</tr>
<tr>
<td></td>
<td>• AWS::DynamoDB::Table</td>
</tr>
<tr>
<td></td>
<td>• AWS::EC2::Instance</td>
</tr>
<tr>
<td></td>
<td>But later, when you add tasks to the maintenance window, you include only tasks that perform actions on instances, such as applying a patch baseline or rebooting an instance. In the maintenance window log, an error might be reported for no S3 buckets or DynamoDB tables being found. However, the maintenance window still runs tasks on the instances in your resource group.</td>
</tr>
</tbody>
</table>

7. Choose **Register targets**.

If you want to assign more targets to this maintenance window, choose the **Targets** tab, and then choose **Register target**. With this option, you can choose a different means of targeting. For example, if you previously targeted instances by instance ID, you can register new targets and target instances by specifying tags applied to managed instances or choosing resource types from a resource group.

**Assign Tasks to a Maintenance Window (Console)**

In this procedure, you add a task to a maintenance window. Tasks are the actions performed on a resource during a maintenance window execution.

The following four types of tasks can be added to a maintenance window:

• Systems Manager Run Command commands
• Systems Manager Automation workflows
• AWS Lambda functions
• AWS Step Functions tasks

To assign tasks to a maintenance window

1. In the list of maintenance windows, choose a maintenance window.
2. Choose Actions and then, choose the option for the type of task you want to register with the maintenance window:
   • Register Run command task
   • Register Automation task
   • Register Lambda task
   • Register Step Functions task
3. For Name, enter a name for the task.
4. For Description, enter a description.
5. For Document, choose the SSM Command or Automation document that defines the tasks to run.
6. For Document version (for Automation tasks), choose the document version to use.
7. For Task priority, specify a priority for this task. 1 is the highest priority. Tasks in a maintenance window are scheduled in priority order with tasks that have the same priority scheduled in parallel.
8. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.
   
   **Note**
   If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.

9. (Optional) For Rate control:
   • For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.
     
     **Note**
     If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.
   • For Error threshold, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

10. In the IAM service role area, choose one of the following options to provide permissions for Systems Manager to run tasks on your target instances:

   • Create and use a service-linked role for Systems Manager
     
     Service-linked roles provide a secure way to delegate permissions to AWS services because only the linked service can assume a service-linked role. Additionally, AWS automatically defines and sets the permissions of service-linked roles, depending on the actions that the linked service performs on your behalf.
     
     **Note**
     If a service-linked role has already been created for your account, choose Use the service-linked role for Systems Manager.

   • Use a custom service role
You can create a custom service role for maintenance window tasks if you want to use stricter permissions than those provided by the service-linked role. Or you can create a custom service role if you want to use Amazon SNS to send notifications related to maintenance window tasks run through Run Command.

If you need to create a custom service role, see one of the following topics:
- Control Access to Maintenance Windows (Console) (p. 446)
- Control Access to Maintenance Windows (AWS CLI) (p. 449)

To help you decide whether to use a custom service role or the Systems Manager service-linked role with a maintenance window task, see Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445).

11. In the Input Parameters section, specify parameters for the document. For Automation documents, the system auto-populates some of the values. You can keep or replace these values.

12. Complete the wizard.

**Update or Delete a Maintenance Window (Console)**

You can update or delete a maintenance window. You can also update or delete the targets or tasks of a maintenance window. If you edit the details of a maintenance window, you can change the schedule, targets, and tasks. You can also specify names and descriptions for windows, targets, and tasks, which helps you better understand their purpose, and makes it easier to manage your queue of windows.

This section describes how to update or delete a maintenance window, targets, and tasks by using the AWS Systems Manager console. For examples of how to do this by using the AWS CLI, see Tutorial: Update a Maintenance Window (AWS CLI) (p. 490).

**Topics**
- Update or Delete a Maintenance Window (Console) (p. 460)
- Update or Delete Maintenance Window Targets (Console) (p. 461)
- Update or Delete Maintenance Window Tasks (Console) (p. 461)

**Update or Delete a Maintenance Window (Console)**

You can update a maintenance window to change its name, description, and schedule, and whether the maintenance window should allow unregistered targets.

**To update or delete a maintenance window**

2. In the navigation pane, choose Maintenance Windows.
3. Choose the maintenance window that you want to update or delete, and then do one of the following:
   - Choose Delete. The system prompts you to confirm your actions.
   - Choose Edit. On the Edit maintenance window page, change the values and options that you want, and then choose Edit maintenance window.

   For information about the configuration choices you can make, see Create a Maintenance Window (Console) (p. 456).
Update or Delete Maintenance Window Targets (Console)

You can update or delete the targets of a maintenance window. If you choose to update a maintenance window target you can specify a new target name, description, and owner. You can also choose different targets.

**To update or delete the targets of a maintenance window**

2. In the navigation pane, choose **Maintenance Windows**.
3. Choose the name of the maintenance window that you want to update, and then do one of the following:
   - To update targets, choose **Edit**.
   - To delete targets, choose **Deregister targets**, and then choose the **Targets** tab.

   Choose the target to delete, and then choose **Deregister target**. In the **Deregister maintenance windows target** window, leave the **Safely deregister target** option selected if you want the system to check if the target is referenced by any tasks before deleting it. If the target is referenced by a task, the system returns an error and doesn't delete the target. Clear the **Safely deregister target** option if you want the system to delete the target even if it is referenced by a task.

   Choose **Deregister**.

Update or Delete Maintenance Window Tasks (Console)

You can update or delete the tasks of a maintenance window. If you choose to update, you can specify a new task name, description, and owner. For Run Command and Automation tasks, you can choose a different SSM document for the tasks. You can't, however, edit a task to change its type. For example, if you created an Automation task, you can't edit that task and change it to a Run Command task.

**To update or delete the tasks of a maintenance window (console)**

2. In the navigation pane, choose **Maintenance Windows**.
3. Choose the maintenance window that you want to update.
4. Choose the **Tasks** tab.
5. If you want to delete a task, choose the small x button next to **Edit**. If you want to edit the task, choose **Edit**.
6. Change the values and options that you want, and then choose **Edit Task**. The system returns you to the maintenance window page.

Systems Manager Maintenance Windows Tutorials (AWS CLI)

This section includes tutorials that help you learn how to use the AWS Command Line Interface (AWS CLI) to do the following:

- Create and configure a maintenance window
- View information about a maintenance window
• View information about maintenance windows tasks and task executions
• Update a maintenance window
• Delete a maintenance window

Complete prerequisites

Before trying these tutorials, complete the following prerequisites.

• **Configure the AWS CLI on your local machine:** Before you can run AWS CLI commands, you must install and configure the CLI on your local machine. For information, see Install or Upgrade the AWS CLI (p. 58).

• **Verify maintenance window roles and permissions:** An AWS administrator in your account must grant you the AWS Identity and Access Management (IAM) permissions you need to manage maintenance windows using the CLI. For information, see Controlling Access to Maintenance Windows (p. 445).

• **Create or configure a Systems Manager-compatible instance:** You need at least one Amazon EC2 instance that is configured for use with Systems Manager in order to complete the tutorials. This means that SSM Agent is installed on the instance, and an IAM instance profile for Systems Manager is attached to the instance.

We recommend launching an instance from one of the following Amazon Machine Image (AMI) types. SSM Agent is preinstalled on each one:

• Windows Server 2003-2012 R2 AMIs published in November 2016 or later
• Windows Server 2016 and 2019
• Amazon Linux
• Amazon Linux 2
• Ubuntu Server 16.04
• Ubuntu Server 18.04

For information about installing SSM Agent on an instance, see the following topics:

• Installing and Configuring SSM Agent on Windows Instances (p. 65)
• Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68)

For information about creating and attaching an IAM instance profile for Systems Manager to your instance, see the following topics:

• Create an IAM Instance Profile for Systems Manager (p. 29)
• Attach an IAM Instance Profile to an Amazon EC2 Instance (p. 34)

• **Create additional resources as needed:** Many Run Command tasks do not require you to create resources other than those listed in this prerequisites topic. For that reason, we provide a simple Run Command task for you to use your first time through the tutorials. You also need an Amazon EC2 instance that is configured to use with Systems Manager, as described above. After you configure that instance, you can register a simple Run Command task.

The Systems Manager Maintenance Windows capability supports running four types of tasks:

• Systems Manager Run Command commands
• Systems Manager Automation workflows
• AWS Lambda functions
• AWS Step Functions tasks

In general, if a maintenance window task that you want to run requires additional resources, you should create them first. For example, if you want a maintenance window that runs an AWS Lambda function, create the Lambda function before you begin; for a Run Command task, create the S3 bucket that you can save command output to (if you plan to do so); and so on.
Keep track of resource IDs

As you complete the tasks in this AWS CLI tutorial, keep track of resource IDs generated by the commands you run. You use many of these as input for subsequent commands. For example, when you create the maintenance window, the system provides you with a maintenance window ID in this format:

```
{
  "WindowId": "mw-0c50858d01EXAMPLE"
}
```

Make a note of the following system-generated IDs because the tutorials in this section use them:

- WindowId
- WindowTargetId
- WindowTaskId
- WindowExecutionId
- TaskExecutionId
- InvocationId
- ExecutionId

You also need the ID of the Amazon EC2 instance you plan to use in the tutorial. For example:

```
i-02573cafcfEXAMPLE
```

Tutorials

- Tutorial: Create and Configure a Maintenance Window (AWS CLI) (p. 463)
- Tutorial: View Information About a Maintenance Windows (AWS CLI) (p. 479)
- Tutorial: View Information About Tasks and Task Executions (AWS CLI) (p. 488)
- Tutorial: Update a Maintenance Window (AWS CLI) (p. 490)
- Tutorial: Delete a Maintenance Window (AWS CLI) (p. 496)

Tutorial: Create and Configure a Maintenance Window (AWS CLI)

This tutorial demonstrates how to use the AWS CLI to create and configure a maintenance window, its targets, and its tasks. The main path through the tutorial consists of simple steps. You create a single maintenance window, identify a single target, and set up a simple task for the maintenance window to run. Along the way, we provide information you can use to try more complicated scenarios.

As you follow the steps in this tutorial, replace the values in italicized red text with your own options and IDs. For example, replace the maintenance window ID mw-0c50858d01EXAMPLE and the instance ID i-02573cafcfEXAMPLE with IDs of resources you create.

Contents

- Step 1: Create the Maintenance Window (AWS CLI) (p. 463)
- Step 2: Register a Target Instance with the Maintenance Window (AWS CLI) (p. 464)
- Step 3: Register a Task with the Maintenance Window (AWS CLI) (p. 467)

Step 1: Create the Maintenance Window (AWS CLI)

In this step, you create a maintenance window and specify its basic options, such as name, schedule, and duration. In later steps, you choose the instance it updates and the task it runs.
In our example, you create a maintenance window that runs every five minutes. Normally, you would not run a maintenance window this frequently. However, this rate lets you see your tutorial results quickly. We'll show you how to change to a less frequent rate after the task has run successfully.

To create a maintenance window (AWS CLI)

1. Open the AWS CLI and run the following command to create a maintenance window that does the following:
   - Runs every five minutes for up to two hours (as needed).
   - Prevents new tasks from starting within one hour of the end of the maintenance window execution.
   - Allows unassociated targets (instances that you haven't registered with the maintenance window).
   - Indicates through the use of custom tags that its creator intends to use it in a tutorial.

   ```bash
   aws ssm create-maintenance-window --name "My-First-Maintenance-Window" --schedule "rate(5 minutes)" --duration 2 --cutoff 1 --allow-unassociated-targets --tags "Key=Purpose,Value=Tutorial"
   ```

   The system returns information like the following:

   ```json
   {
   "WindowId":"mw-0c50858d01EXAMPLE"
   }
   ```

2. Now run this command to view details about this and any other maintenance windows already in your account:

   ```bash
   aws ssm describe-maintenance-windows
   ```

   The system returns information like the following:

   ```json
   {
   "WindowIdentities": [
   {
   "WindowId": "mw-0c50858d01EXAMPLE",
   "Name": "My-First-Maintenance-Window",
   "Enabled": true,
   "Duration": 2,
   "Cutoff": 1,
   }
   ]
   }
   ```

Continue to Step 2: Register a Target Instance with the Maintenance Window (AWS CLI) (p. 464).

Step 2: Register a Target Instance with the Maintenance Window (AWS CLI)

In this step, you register a target with your new maintenance window. In this case, you specify which instance to update when the maintenance window runs.

For an example of registering more than one instance at a time using instance IDs, examples of using tags to identify multiple instances, and examples of specifying resource groups as targets, see Examples: Register Targets with a Maintenance Window (p. 465).
**Note**
You should already have created an Amazon EC2 instance to use in this step, as described in the Maintenance Windows tutorial prerequisites (p. 461).

**To register a target instance with a maintenance window (AWS CLI)**

1. Run the following command:

   ```bash
   aws ssm register-target-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --resource-type "INSTANCE" --target "Key=InstanceIds,Values=i-02573cafcfEXAMPLE"
   
   The system returns information like the following
   ```
   ```json
   { "WindowTargetId": "e32eecb2-646c-4f4b-8ed1-205fbEXAMPLE" }
   ```

2. Now run the following command to view details about your maintenance window target:

   ```bash
   aws ssm describe-maintenance-window-targets --window-id "mw-0c50858d01EXAMPLE"
   
   The system returns information like the following:
   ```
   ```json
   { "Targets": [ { "WindowId": "mw-0c50858d01EXAMPLE", "WindowTargetId": "e32eecb2-646c-4f4b-8ed1-205fbEXAMPLE", "ResourceType": "INSTANCE", "Targets": [ { "Key": "InstanceIds", "Values": [ "i-02573cafcfEXAMPLE" ] } ] } ] }
   ```

Continue to Step 3: Register a Task with the Maintenance Window (AWS CLI) (p. 467).

**Examples: Register Targets with a Maintenance Window**

You can register a single instance as a target using its instance ID, as demonstrated in Step 2: Register a Target Instance with the Maintenance Window (AWS CLI) (p. 464). You can also register one or more instances as targets using the command formats on this page.

In general, there are two methods for identifying the instances you want to use as maintenance window targets: specifying individual instances, and using resource tags. The resource tags method provides more options, as shown in examples 2-3.

You can also specify one or more resource groups as the target of a maintenance window. A resource group can include instances and many other types of supported AWS resources. Examples 4 and 5, next, demonstrate how to add resource groups to your maintenance window targets.

For information about limits for the Maintenance Windows capability, in addition to those specified in the following examples, see AWS Systems Manager Limits in the Amazon Web Services General Reference.

Topics

- Example 1: Register Multiple Targets Using Instance IDs (p. 466)
- Example 2: Register Targets Using Resource Tags Applied to Instances (p. 466)
- Example 3: Register Targets Using a Group of Tag Keys (Without Tag Values) (p. 466)
- Example 4: Register Targets Using a Resource Group Name (p. 467)

Example 1: Register Multiple Targets Using Instance IDs

Use the following command format to register multiple instances as targets using their instance IDs:

```bash
aws ssm register-target-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --resource-type "INSTANCE" --target "Key=InstanceIds,Values=i-02573cafcfEXAMPLE,i-0471e04240EXAMPLE,i-07782c72faEXAMPLE"
```

Recommended use: Most useful when registering a unique group of instances with any maintenance window for the first time and they do not share a common instance tag.

Limits: You can specify up to 50 instances total for each maintenance window target.

Example 2: Register Targets Using Resource Tags Applied to Instances

Use the following command format to register instances that are all already tagged with a key-value pair you have assigned:

```bash
aws ssm register-target-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --resource-type "INSTANCE" --target "Key=tag:Region,Values=East"
```

Recommended use: Most useful when registering a unique group of instances with any maintenance window for the first time and they do share a common instance tag.

Limits: You can specify up to five key-value pairs total for each target.

Note

You can tag a group of instances with the tag-key Patch Group and assign the instances a common key value, such as my-patch-group. Patch Manager evaluates the Patch Group key on instances to help determine which patch baseline applies to them. If your task will run the AWS-RunPatchBaseline SSM document (or the legacy AWS-ApplyPatchBaseline SSM document), you can specify the same Patch Group key-value pair when you register targets with a maintenance window. For example: --target "Key=tag:Patch Group,Values=my-patch-group". Doing so enables you to easily use a maintenance window to update patches on a group of instances that are already associated with the same patch baseline. For more information, see About Patch Groups (p. 717).

Example 3: Register Targets Using a Group of Tag Keys (Without Tag Values)

Use the following command to register instances that all have one or more tag keys assigned to them, regardless of their key values.

```bash
aws ssm register-target-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --resource-type "INSTANCE" --target "Key=tag-key,Values=Name,Instance-Type,CostCenter"
```

Recommended use: Useful when you want to target instances by specifying multiple tag keys (without their values) rather than just one tag-key or a tag key-value pair.

Limits: You can specify up to five tag-keys total for each target.
Example 4: Register Targets Using a Resource Group Name

Use the following command to register a specified resource group, regardless of the type of resources it contains. If the tasks you assign to the maintenance window do not act on a type of resource included in this resource group, the system might report an error. Tasks for which a supported resource type is found continue to run despite these errors.

```bash
aws ssm register-target-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --resource-type "RESOURCE_GROUP" --target "Key=resource-groups:Name,Values=MyResourceGroup"
```

**Recommended use:** Useful when you want to quickly specify a resource group as a target without evaluating whether all of its resource types will be targeted by a maintenance window, or when you know that the resource group contains only the resource types that your tasks perform actions on.

**Limits:**
- You can specify only one resource group as a target.

Example 5: Register Targets by Filtering Resource Types in a Resource Group

Use the following command to register only certain resource types that belong to a resource group that you specify. With this option, even if you add a task for a resource type that belongs to the resource group, the task won’t run if you haven’t explicitly added the resource type to the filter.

```bash
aws ssm register-target-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --resource-type "RESOURCE_GROUP" --target "Key=resource-groups:Name,Values=MyResourceGroup"
"Key=resource-groups:ResourceTypeFilters,Values=AWS::EC2::Instance,AWS::ECS::Cluster"
```

**Recommended use:** Useful when you want to maintain strict control over the types of AWS resources your maintenance window can run actions on, or when your resource group contains a large number of resource types and you want to avoid unnecessary error reports in your maintenance window logs.

**Limits:**
- You can specify only one resource group as a target.

Step 3: Register a Task with the Maintenance Window (AWS CLI)

In this step of the tutorial, you register a Run Command task that runs the **df** command on your Amazon EC2 instance for Linux. The results of this standard Linux command show how much space is free and how much is used on the disk file system of your instance.

- or -

If you are targeting an Amazon EC2 instance for Windows Server instance instead of Linux, replace **df** in the following command with **ipconfig**. Output from this command lists details about the IP address, subnet mask, and default gateway for adapters on the target instance.

When you are ready to register other task types, or use more of the available Run Command options, see Examples: Register Tasks with a Maintenance Window (p. 470). There, we provide more information about all four task types, and some of their most important options, to help you plan for more extensive real-world scenarios.

**To register a task with a maintenance window**

1. Depending on the operating system type on your local machine, run one of the following commands. The version to run from a local Windows machine includes the escape characters ("/") that you need to run the command from your command line tool.

   **Windows** local machine:

   ```bash
   aws ssm register-task-with-maintenance-window --window-id mw-0c50858d01EXAMPLE --task-arn "AWS-RunShellScript" --max-concurrency 1 --max-errors 1 --priority 10 --
   ```
targets "Key=InstanceIds,Values=i-02573cafcfEXAMPLE" --task-type "RUN_COMMAND" --task-invocation-parameters='{"RunCommand":{"Parameters":{"commands":["df"]}}}'

Linux local machine:

aws ssm register-task-with-maintenance-window --window-id mw-0c50858d01EXAMPLE --task-arn "AWS-RunShellScript" --max-concurrency 1 --max-errors 1 --priority 10 --targets "Key=InstanceIds,Values=i-0471e042fEXAMPLE" --task-type "RUN_COMMAND" --task-invocation-parameters '{"RunCommand":{"Parameters":{"commands":["df"]}}}'

The system returns information similar to the following:

```json
{
  "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE"
}
```

2. Now run the following command to view details about the maintenance window task you created.

```bash
aws ssm describe-maintenance-window-tasks --window-id mw-0c50858d01EXAMPLE
```

3. The system returns information similar to the following:

```json
{
  "Tasks": [ 
    {
      "WindowId": "mw-0c50858d01EXAMPLE",
      "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
      "TaskArn": "AWS-RunShellScript",
      "Type": "RUN_COMMAND",
      "Targets": [ 
        {
          "Key": "InstanceIds",
          "Values": [ "i-02573cafcfEXAMPLE" ]
        }
      ],
      "TaskParameters": {},
      "Priority": 10,
      "ServiceRoleArn": "arn:aws:iam::123456789012:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM",
      "MaxConcurrency": "1",
      "MaxErrors": "1"
    }
  ]
}
```

4. Wait until the task has had time to run, based on the schedule you specified in Step 1: Create the Maintenance Window (AWS CLI) (p. 463). For example, if you specified `--schedule "rate(5 minutes)"`, wait five minutes. Then run the following command to view information about any executions that occurred for this task.

```bash
aws ssm describe-maintenance-window-executions --window-id mw-0c50858d01EXAMPLE
```

The system returns information similar to the following:

```json
{
  "WindowExecutions": [ 
    {
      "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE"
    }
  ]
}
```
Tip
After the task completes successfully, you can decrease the rate at which the maintenance window runs. For example, run the following command to decrease the frequency to once a week:

```
aws ssm update-maintenance-window --window-id mw-0c50858d01EXAMPLE --schedule "rate(7 days)"
```

For information about managing maintenance window schedules, see Reference: Cron and Rate Expressions for Systems Manager (p. 936) and Reference: Maintenance Windows Scheduling and Active Period Options (p. 942).

For information about using the AWS CLI to modify a maintenance window, see Tutorial: Update a Maintenance Window (AWS CLI) (p. 490).

For practice running AWS CLI commands to view more details about your maintenance window task and its executions, continue to Tutorial: View Information About Tasks and Task Executions (AWS CLI) (p. 488).

About tutorial command output

It's beyond the scope of this tutorial to use the AWS CLI to view the output of the Run Command command associated with your maintenance window task executions.

You could view this data, however, using the AWS CLI. (You could also view the output in the Systems Manager console or in a log file stored in an Amazon S3 bucket, if you had configured the maintenance window to store command output there.) You would find that the output of the `df` command on a Linux instance is similar to the following:

```
Filesystem  1K-blocks  Used  Available  Use%  Mounted on
/devtmpfs  485716  0  485716    0%  /dev
tmpfs  503624  0  503624    0%  /dev/shm
tmpfs  503624  328  503296    1%  /run
tmpfs  503624  0  503624    0%  /sys/fs/cgroup
/dev/xvda1  8376300  1464160  6912140   18%  /
```

The output of the `ipconfig` command on a Windows Server instance is similar to the following:

```
Windows IP Configuration

Ethernet adapter Ethernet 2:
    Connection-specific DNS Suffix . : example.com
    IPv4 Address . . . . . . . . . . . . . . . . . . . . . . : 10.24.34.0/23
    Subnet Mask . . . . . . . . . . . . . . . . . . . . . . : 255.255.255.255
    Default Gateway . . . . . . . . . . . . . . . . . . . . : 0.0.0.0
```
Examples: Register Tasks with a Maintenance Window

You can register a Systems Manager Run Command task with a maintenance window using the AWS CLI, as demonstrated in Step 3: Register a Task with the Maintenance Window (AWS CLI) (p. 467). You can also register tasks for Systems Manager Automation workflows, AWS Lambda functions, and AWS Step Functions tasks, as demonstrated below.

In this topic, we provide examples of using the `register-task-with-maintenance-window` CLI command to register each of the four supported task types with a maintenance window. The examples are for demonstration only, but you can modify them to create working task registration commands.

Using the `--cli-input-json` option

To better manage your task options, you can use the command option `--cli-input-json`, with option values referenced in a JSON file.

To use the sample JSON file content we provide in the following examples, do the following on your local machine:

1. Create a file with a name such as `MyRunCommandTask.json`, `MyAutomationTask.json`, or another name that you prefer.
2. Copy the contents of our JSON sample into the file.
3. Modify the contents of the file for your task registration, and then save the file.
4. In the same directory where you stored the file, run the following command. Substitute your file name for `MyFile.json`.

```
aws ssm register-task-with-maintenance-window --cli-input-json file:///MyFile.json
```

About pseudo parameters

In some examples, we use *pseudo parameters* as the method to pass ID information to your tasks. For example, `{{TARGET_ID}}` is used to pass instance ID information to Automation, Lambda, and Step Functions tasks in our examples. For more information about pseudo parameters in `--task-invocation-parameters` content, see About Pseudo Parameters (p. 477).

More information
For information about some fundamental `register-task-with-maintenance-window` options, see About register-task-with-maintenance-windows Options (p. 474).

For comprehensive information about command options, see the following topics:

- `register-task-with-maintenance-window` in the AWS CLI Command Reference
- `RegisterTaskWithMaintenanceWindow` in the AWS Systems Manager API Reference

Task Registration Examples

The following sections provide a sample AWS CLI command for registering a supported task type and a JSON sample that can be used with the --cli-input-json option.

**Note**
The CLI commands we provide are formatted to run from a local Linux machine. To run them from a local Windows machine, remove the line breaks (\) from the ends of the lines. The sample JSON content format works on both Linux and Windows local machines.

Register a Systems Manager Run Command Task

The following examples demonstrate how to register Systems Manager Run Command tasks with a maintenance window using the AWS CLI:

**AWS CLI command:**

```
aws ssm register-task-with-maintenance-window --window-id mw-0c50858d01EXAMPLE \ 
--task-arn "AWS-RunShellScript" --max-concurrency 1 --max-errors 1 --priority 10 \ 
--targets "Key=InstanceIds,Values=i-02573cafcfEXAMPLE" --task-type "RUN_COMMAND" \ 
--task-invocation-parameters "{"RunCommand":{"Parameters":{"commands":["df"]}}}
```

**JSON content to use with --cli-input-json file option:**

```
{
  "TaskType": "RUN_COMMAND",
  "WindowId": "mw-0c50858d01EXAMPLE",
  "Description": "My Run Command task to update SSM Agent on an instance",
  "MaxConcurrency": "1",
  "MaxErrors": "1",
  "Name": "My-Run-Command-Task",
  "Priority": 10,
  "Targets": [
    {
      "Key": "WindowTargetIds",
      "Values": [
        "e32eeb2-646c-4f4b-8ed1-205fbEXAMPLE"
      ]
    }
  ],
  "TaskArn": "AWS-UpdateSSMAgent",
  "TaskInvocationParameters": {
    "RunCommand": {
      "Comment": "A TaskInvocationParameters test comment",
      "NotificationConfig": {
        "NotificationEvents": [
          "All"
        ],
        "NotificationType": "Invocation"
      },
      "OutputS3BucketName": "my-s3-bucket-name",
      "OutputS3KeyPrefix": "my-s3-bucket-folder-name",
      "TimeoutSeconds": 3600
    }
  }
}
```
Register a Systems Manager Automation Task

The following examples demonstrate how to register Systems Manager Automation tasks with a maintenance window using the AWS CLI:

**AWS CLI command:**

```
aws ssm register-task-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" \
--targets Key=WindowTargetIds,Values=e32eece2-646c-4f4b-8ed1-205fbEXAMPLE \
--task-arn "AWS-PatchInstanceWithRollback" \
--service-role-arn arn:aws:iam::123456789012:role/MyMaintenanceWindowServiceRole \
--task-type AUTOMATION \
--task-invocation-parameters \  
"Automation={DocumentVersion=5,Parameters={instanceId='{{TARGET_ID}}'}}" \
--priority 0 --max-concurrency 10 --max-errors 5 --name "My-Automation-Task" \
--description "A description for my Automation task"
```

**JSON content to use with --cli-input-json file option:**

```
{
  "WindowId": "mw-0c50858d01EXAMPLE",
  "Targets": [
    {
      "Key": "WindowTargetIds",
      "Values": [
        "e32eece2-646c-4f4b-8ed1-205fbEXAMPLE"
      ]
    }
  ],
  "TaskArn": "AWS-PatchInstanceWithRollback",
  "TaskType": "AUTOMATION",
  "MaxConcurrency": "10",
  "MaxErrors": "10",
  "TaskInvocationParameters": {
    "Automation": {
      "DocumentVersion": "1",
      "Parameters": {
        "instanceId": [
          "{{TARGET_ID}}"
        ]
      }
    }
  }
}
```

Register an AWS Lambda Task

The following examples demonstrate how to register AWS Lambda function tasks with a maintenance window using the AWS CLI.

For these examples, the user who created the Lambda function named it `SSMRestart-my-instances` and created two parameters called `targetId` and `targetType`.

**Important**

The IAM policy for Maintenance Windows requires that you prefix Lambda function (or alias) names with `SSM`. Before you proceed to register this type of task, you must update its name in AWS Lambda to include `SSM`. For example, if your Lambda function name is `MyLambdaFunction`, change it to `SSMMyLambdaFunction`.

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AWS CLI command:

```bash
aws ssm register-task-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" \
--targets "Key=WindowTargetIds,Values=e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE" --priority 2 \
--max-concurrency 10 --max-errors 5 --name "My-Lambda-Example" \
--description "A description for my LAMBDA example task" --task-type "LAMBDA" \
--task-invocation-parameters '{"Lambda":{"Payload":{"targetId":"{{TARGET_ID}}","targetType":"{{TARGET_TYPE}}"},"Qualifier": "$LATEST"}'}
```

JSON content to use with `--cli-input-json` file option:

```json
{
    "WindowId": "mw-0c50858d01EXAMPLE",
    "Targets": [
        {
            "Key": "WindowTargetIds",
            "Values": [
                "e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE"
            ]
        }
    ],
    "TaskArn": "SSM_RestartMyInstances",
    "TaskType": "LAMBDA",
    "MaxConcurrency": "10",
    "MaxErrors": "10",
    "TaskInvocationParameters": {
        "Lambda": {
            "ClientContext": "ew0KICAi--truncated--0KIEXAMPLE",
            "Payload": "{ "targetId": "{TARGET_ID}", "targetType": "{TARGET_TYPE}" }",
            "Qualifier": "$LATEST"
        }
    },
    "Name": "My-Lambda-Task",
    "Description": "A description for my LAMBDA task",
    "Priority": 5
}
```

Register an AWS Step Functions Task

The following examples demonstrate how to register AWS Step Functions state machine tasks with a maintenance window using the AWS CLI.

For these examples, the user who created the Step Functions state machine created a state machine named `SSMMyStateMachine` with a parameter called `targetId`.

**Important**

The IAM policy for Maintenance Windows requires that you prefix Step Functions state machine names with SSM. Before you proceed to register this type of task, you must update its name in AWS Step Functions to include SSM. For example, if your state machine name is `MyStateMachine`, change it to `SSMMyStateMachine`.

AWS CLI command:

```bash
aws ssm register-task-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" \
--targets "Key=WindowTargetIds,Values=e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE" \
--task-arn arn:aws:states:us-east-2:123456789012:stateMachine:SSMMyStateMachine-
MggigEXAMPLE \n--task-type STEP_FUNCTIONS \n```

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--task-invocation-parameters '{"StepFunctions":{"Input":"{\\"targetId\\":\\"{{TARGET_ID}}\\"}\"}, "Name": "{\"{{INVOCATION_ID}}\"\"}" \"--priority 0 --max-concurrency 10 --max-errors 5 \" --name "My-Step-Functions-Task" --description "A description for my Step Functions task"

JSON content to use with --cli-input-json file option:

```
{
  "WindowId": "mw-0c5058d01EXAMPLE",
  "Targets": [
    {
      "Key": "WindowTargetIds",
      "Values": [
        "e32eeb2-646c-4f4b-8ed1-205fbEXAMPLE"
      ]
    }
  ],
  "TaskArn": "SSM_MyStateMachine",
  "TaskType": "STEP_FUNCTIONS",
  "MaxConcurrency": "10",
  "MaxErrors": "10",
  "TaskInvocationParameters": {
    "StepFunctions": {
      "Input": "{\\"targetId\\":\\"{{TARGET_ID}}\\"\"},
      "Name": "{\"{{INVOCATION_ID}}\"\"}"
    }
  },
  "Name": "My-Step-Functions-Task",
  "Description": "A description for my Step Functions task",
  "Priority": 5
}
```

About register-task-with-maintenance-windows Options

The register-task-with-maintenance-window command provides several options for configuring a task according to your needs. Some are required, some are optional, and some apply to only a single maintenance window task type.

This topic provides information about some of these options to help you work with samples in this tutorial section. For information about all command options, see register-task-with-maintenance-window in the AWS CLI Command Reference.

About the --task-arn option

The option --task-arn is used to specify the resource that the task uses during execution. The value that you specify depends on the type of task you are registering, as described in the following table.

<table>
<thead>
<tr>
<th>Maintenance window task type</th>
<th>TaskArn value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RUN_COMMAND</strong> and <strong>AUTOMATION</strong></td>
<td>TaskArn is the SSM document name or ARN. For example:</td>
</tr>
<tr>
<td></td>
<td>AWS-RunBatchShellScript</td>
</tr>
<tr>
<td></td>
<td>or-</td>
</tr>
</tbody>
</table>
Maintenance window task type | TaskArn value
--- | ---
**LAMBDA** | TaskArn is the function name or ARN. For example:

SSMMy-Lambda-Function

-or-


**Important**
The IAM policy for maintenance windows requires that you prefix Lambda function (or alias) names with SSM. Before you register this type of task, you must update its name in AWS Lambda to include SSM. For example, if your Lambda function name is MyLambdaFunction, change it to SSMMyLambdaFunction.

**STEP_FUNCTIONS** | TaskArn is the state machine ARN. For example:


**Important**
The IAM policy for maintenance windows requires that you prefix Step Functions state machine names with SSM. Before you register this type of task, you must update its name in AWS Step Functions to include SSM. For example, if your state machine name is MyStateMachine, change it to SSMMystateMachine.

---

**About the --service-role-arn option**

The role for Systems Manager to assume when running the maintenance window task.

Specifying a service role ARN is optional. If you do not specify a service role ARN, Systems Manager creates a service-linked role or uses your account's service-linked role.

Note that the service-linked role for Systems Manager doesn't provide the permissions needed for all scenarios. For more information, see [Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks?](p. 445)

**About the --task-invocation-parameters option**

The --task-invocation-parameters option is used to specify the parameters that are unique to each of the four task types. The supported parameters for each of the four task types are described in the following table.

**Note**
For information about using pseudo parameters in --task-invocation-parameters content, such as {{TARGET_ID}}, see [About Pseudo Parameters](p. 477).

Task invocation parameters options for maintenance window tasks

---
### Maintenance window task type

<table>
<thead>
<tr>
<th>Task Type</th>
<th>Available Parameters</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AUTOMATION</strong></td>
<td>DocumentVersion, Parameters</td>
<td>&quot;TaskInvocationParameters&quot;: { &quot;Automation&quot;: { &quot;DocumentVersion&quot;: &quot;3&quot;, &quot;Parameters&quot;: { &quot;instanceid&quot;: [ &quot;{{TARGET_ID}}&quot; ] } } }</td>
</tr>
</tbody>
</table>
### About Pseudo Parameters

When you register a task, you use the `--task-invocation-parameters` option to specify the parameters that are unique to each of the four task types. You can also reference certain values using *pseudo parameter* syntax, such as `{{TARGET_ID}}`. When the maintenance window task runs, it passes the correct values instead of the pseudo parameter placeholders.

For Run Command tasks, the connections to targets (instances) are handled automatically. For the other task types—Automation, Step Functions, and Lambda—you must include the `{{TARGET_ID}}` pseudo parameters in the `--task-invocation-parameters` option. When the task runs, the actual instance ID is supplied in place of `{{TARGET_ID}}`.

### Examples

For example, suppose that your payload for a Lambda task needs to reference the instance ID and target type when it runs. If the task would only ever run on a single instance, with instance ID `i-02573cafcfEXAMPLE`, you could use the following:

```json
"TaskType": "LAMBDA",
"TaskInvocationParameters": {
  "Lambda": {
    "Payload": "{ \"targetId\": \"i-02573cafcfEXAMPLE\", \"targetType\": \"INSTANCE \" }",
    "Qualifier": "$LATEST",
    "ClientContext": "ew0KICAi--truncated--0KIEXAMPLE"
  }
}
```
However, if you include multiple instance IDs in the custom "targetId" field, the operation fails. Therefore, to run the task on multiple instances, you use the {{TARGET_ID}} and {{TARGET_TYPE}} pseudo parameters. In this case, the ID of each instance in the target group is passed to the task execution through the {{TARGET_ID}} pseudo parameter, and the task runs on every instance in your target group:

```
"TaskType": "LAMBDA",
"TaskInvocationParameters": {
    "Lambda": {
        "ClientContext": "ew0KICAi--truncated--OKIEXAMPLE",
        "Payload": "{"\"targetId\": "{\"TARGET_ID\"}, \"targetType\": "{\"TARGET_TYPE\"}"",
        "Qualifier": "$LATEST"
    }
}
```

As another example, to run an Automation task that stops your Amazon EC2 instances, you specify the AWS-StopEC2Instance SSM document as the TaskArn value and use the {{TARGET_ID}} pseudo parameter:

```
"TaskArn": "AWS-StopEC2Instance",
"TaskType": "AUTOMATION",
"TaskInvocationParameters": {
    "Automation": {
        "DocumentVersion": "1",
        "Parameters": {
            "instanceId": [{
                "{\"TARGET_ID\"}
            }
        }
    }
}
```

**Available pseudo parameters**

The following list describes the pseudo parameters that you can specify using the {{PSEUDO_PARAMETER}} syntax in the --task-invocation-parameters option.

- **TARGET_ID**: The ID of the target. If the target type is INSTANCE (currently the only supported type), then the target ID is the instance ID.
- **TARGET_TYPE**: The type of target. Currently only INSTANCE is supported.
- **WINDOW_ID**: The ID of the target maintenance window.
- **WINDOW_TASK_ID**: The ID of the window task that is executing.
- **WINDOW_TARGET_ID**: The ID of the window target that includes the target (target ID).
- **WINDOW_EXECUTION_ID**: The ID of the current window execution.
- **TASK_EXECUTION_ID**: The ID of the current task execution.
- **INVOCATION_ID**: The ID of the current invocation.
**Tutorial: View Information About a Maintenance Windows (AWS CLI)**

This tutorial includes commands to help you update or get information about your maintenance windows, tasks, executions, and invocations. The examples are organized by command to demonstrate how to use command options to filter for the type of detail you want to see.

As you follow the steps in this tutorial, replace the values in italicized red text with your own options and IDs. For example, replace the maintenance window ID `mw-0c50858d01EXAMPLE` and the instance ID `i-02573cafcfEXAMPLE` with IDs of resources you create.

For information about setting up and configuring the CLI, see [Installing the AWS Command Line Interface](#) and [Configuring the AWS Command Line Interface](#).

**Command Examples**

- Examples for `describe-maintenance-windows` (p. 479)
- Examples for `describe-maintenance-window-targets` (p. 481)
- Examples for `describe-maintenance-window-tasks` (p. 481)
- Examples for `describe-maintenance-windows-for-target` (p. 484)
- Examples for `describe-maintenance-window-executions` (p. 484)
- Examples for `describe-maintenance-window-schedule` (p. 485)

**Examples for `describe-maintenance-windows`**

List all maintenance windows in your AWS account

Run the following command:

```
aws ssm describe-maintenance-windows
```

The system returns information like the following:

```
{
  "WindowIdentities": [
    {
      "WindowId": "mw-0c50858d01EXAMPLE",
      "Name": "My-First-Maintenance-Window",
      "Enabled": true,
      "Duration": 2,
      "Cutoff": 0,
      "NextExecutionTime": "2019-05-18T17:01:01.137Z"
    },
    {
      "WindowId": "mw-9a8b7c6d5eEXAMPLE",
      "Name": "My-Second-Maintenance-Window",
      "Enabled": true,
      "Duration": 4,
      "Cutoff": 1,
      "NextExecutionTime": "2019-05-30T03:30:00.137Z"
    }
  ]
}
```

List all enabled maintenance windows

Run the following command:
aws ssm describe-maintenance-windows --filters "Key=Enabled,Values=true"

The system returns information like the following:

```json
{
  "WindowIdentities": [
    {
      "WindowId": "mw-0c50858d01EXAMPLE",
      "Name": "My-First-Maintenance-Window",
      "Enabled": true,
      "Duration": 2,
      "Cutoff": 0,
      "NextExecutionTime": "2019-05-18T17:01:01.137Z"
    },
    {
      "WindowId": "mw-9a8b7c6d5eEXAMPLE",
      "Name": "My-Second-Maintenance-Window",
      "Enabled": true,
      "Duration": 4,
      "Cutoff": 1,
      "NextExecutionTime": "2019-05-30T03:30:00.137Z"
    }
  ]
}
```

**List all disabled maintenance windows**

Run the following command:

```bash
aws ssm describe-maintenance-windows --filters "Key=Enabled,Values=false"
```

The system returns information like the following:

```json
{
  "WindowIdentities": [
    {
      "WindowId": "mw-6e5c9d4b7cEXAMPLE",
      "Name": "My-Disabled-Maintenance-Window",
      "Enabled": false,
      "Duration": 2,
      "Cutoff": 1
    }
  ]
}
```

**List all maintenance windows having names that start with a certain prefix**

Run the following command:

```bash
aws ssm describe-maintenance-windows --filters "Key=Name,Values=My"
```

The system returns information like the following:

```json
{
  "WindowIdentities": [
    {
      "WindowId": "mw-0c50858d01EXAMPLE",
      "Name": "My-First-Maintenance-Window",
      "Enabled": true,
```
Examples for 'describe-maintenance-window-targets''

Display the targets for a maintenance window matching a specific owner information value

Run the following command:

```
aws ssm describe-maintenance-window-targets --window-id "mw-6e5c9d4b7cEXAMPLE" --filters "Key=Type,Values=INSTANCE"
```

**Note**
The supported filter keys are Type, WindowTargetId and OwnerInformation.

The system returns information like the following:

```
{
  "Targets": [
    {
      "WindowId": "mw-6e5c9d4b7cEXAMPLE",
      "WindowTargetId": "e32eeceb2-646c-4f4b-8ed1-205fbEXAMPLE",
      "ResourceType": "INSTANCE",
      "Targets": [
        {
          "Key": "InstanceIds",
          "Values": [
            "i-02573cafcfEXAMPLE",
            "i-0471e04240EXAMPLE",
            "i-07782c72faEXAMPLE"
          ]
        }
      ]
    }
  ]
}
```

Examples for 'describe-maintenance-window-tasks'

Show all registered tasks that invoke the AWS-RunPowerShellScript Run Command

Run the following command:
aws ssm describe-maintenance-window-tasks --window-id "mw-0c50858d01EXAMPLE" --filters "Key=TaskArn,Values=AWS-RunPowerShellScript"

The system returns information like the following:

```

{  
    "Tasks": [  
        {  
            "ServiceRoleArn": "arn:aws:iam::111122223333:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM",
            "MaxErrors": "1",
            "TaskArn": "AWS-RunPowerShellScript",
            "MaxConcurrency": "1",
            "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
            "TaskParameters": {  
                "commands": [  
                    {  
                        "Values": [  
                            "driverquery.exe"
                        ]
                    }
                ]
            },
            "Priority": 3,
            "Type": "RUN_COMMAND",
            "Targets": [  
                {  
                    "TaskTargetId": "i-02573cafcfEXAMPLE",
                    "TaskTargetType": "INSTANCE"
                }
            ]
        },  
        {  
            "ServiceRoleArn": "arn:aws:iam::111122223333:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM",
            "MaxErrors": "1",
            "TaskArn": "AWS-RunPowerShellScript",
            "MaxConcurrency": "1",
            "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
            "TaskParameters": {  
                "commands": [  
                    {  
                        "Values": [  
                            "ipconfig"
                        ]
                    }
                ]
            },
            "Priority": 1,
            "Type": "RUN_COMMAND",
            "Targets": [  
                {  
                    "TaskTargetId": "i-02573cafcfEXAMPLE",
                    "TaskTargetType": "WINDOW_TARGET"
                }
            ]
        }
    ],
    "Priority": 3,
    "Type": "RUN_COMMAND",
    "Targets": [
        {  
            "TaskTargetId": "i-02573cafcfEXAMPLE",
            "TaskTargetType": "INSTANCE"
        }
    ]
}  
```

Show all registered tasks that have a priority of "3"

Run the following command:

```
aws ssm describe-maintenance-window-tasks --window-id "mw-9a8b7c6d5eEXAMPLE" --filters "Key=Priority,Values=3"
```
The system returns information like the following:

```json
{
  "Tasks": [
    {
      "ServiceRoleArn": "arn:aws:iam::111122223333:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM",
      "MaxErrors": "1",
      "TaskArn": "AWS-RunPowerShellScript",
      "MaxConcurrency": "1",
      "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
      "TaskParameters": {
        "commands": {
          "Values": [
            "driverquery.exe"
          ]
        }
      },
      "Priority": 3,
      "Type": "RUN_COMMAND",
      "Targets": [
        {
          "TaskTargetId": "i-02573cafcfEXAMPLE",
          "TaskTargetType": "INSTANCE"
        }
      ]
    }
  ]
}
```

Show all registered tasks that have a priority of "1" and use Run Command

Run the following command:

```bash
aws ssm describe-maintenance-window-tasks --window-id "mw-0c50858d01EXAMPLE" --filters "Key=Priority,Values=1" "Key=TaskType,Values=RUN_COMMAND"
```

The system returns information like the following:

```json
{
  "Tasks": [
    {
      "WindowId": "mw-0c50858d01EXAMPLE",
      "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
      "TaskArn": "AWS-RunShellScript",
      "Type": "RUN_COMMAND",
      "Targets": [
        {
          "Key": "InstanceIds",
          "Values": [
            "i-02573cafcfEXAMPLE"
          ]
        }
      ],
      "TaskParameters": {},
      "Priority": 1,
      "ServiceRoleArn": "arn:aws:iam::111122223333:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM",
      "MaxConcurrency": "1",
      "MaxErrors": "1"
    }
  ]
}
```
"WindowTaskId": "8a5c4629-31b0-4edd-8aea-33698EXAMPLE",
"TaskArn": "AWS-UpdateSSMAgent",
"Type": "RUN_COMMAND",
"Targets": [
  {
    "Key": "InstanceIds",
    "Values": [
      "i-0471e04240EXAMPLE"
    ]
  }
],
"TaskParameters": {},
"Priority": 1,
"ServiceRoleArn": "arn:aws:iam::111122223333:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM",
"MaxConcurrency": "1",
"MaxErrors": "1",
"Name": "My-Run-Command-Task",
"Description": "My Run Command task to update SSM Agent on an instance"
]
}

Examples for 'describe-maintenance-windows-for-target'

List information about the maintenance window targets or tasks associated with a specific instance

Run the following command:

```
aws ssm describe-maintenance-windows-for-target --resource-type INSTANCE --targets "Key=InstanceIds,Values=i-02573cafcfEXAMPLE" --max-results 10
```

The system returns information like the following:

```
{
  "WindowIdentities": [
    {
      "WindowId": "mw-0c50858d01EXAMPLE",
      "Name": "My-First-Maintenance-Window"
    },
    {
      "WindowId": "mw-9a8b7c6d5eEXAMPLE",
      "Name": "My-Second-Maintenance-Window"
    }
  ]
}
```

Examples for 'describe-maintenance-window-executions'

List all tasks run before a certain date

Run the following command:

```
aws ssm describe-maintenance-window-executions --window-id "mw-9a8b7c6d5eEXAMPLE" --filters "Key=ExecutedBefore,Values=2019-05-12T05:00:00Z"
```

The system returns information like the following:

```
{
  "WindowExecutions": [
    {
    }
  ]
}
```
"WindowId": "mw-0c50858d01EXAMPLE",
"WindowExecutionId": "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE",
"Status": "FAILED",
"StatusDetails": "The following SSM parameters are invalid: LevelUp",
"StartTime": 1557617747.993,
"EndTime": 1557617748.101
},
{
"WindowId": "mw-9a8b7c6d5eEXAMPLE",
"WindowExecutionId": "791b72e0-f0da-4021-8b35-f95dfEXAMPLE",
"Status": "SUCCESS",
"StartTime": 1557594085.428,
"EndTime": 1557594090.978
},
{
"WindowId": "mw-0c50858d01EXAMPLE",
"WindowExecutionId": "ecec60fa-6bb0-4d26-98c7-140308EXAMPLE",
"Status": "SUCCESS",
"StartTime": 1557593793.483,
"EndTime": 1557593798.978
}
]
}]

List all tasks run after a certain date

Run the following command:

```
aws ssm describe-maintenance-window-executions --window-id "mw-9a8b7c6d5eEXAMPLE" --filters 
"Key=ExecutedAfter,Values=2018-12-31T17:00:00Z"
```

The system returns information like the following:

```
{
 "WindowExecutions": [

  
  "WindowId": "mw-0c50858d01EXAMPLE",
  "WindowExecutionId": "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE",
  "Status": "FAILED",
  "StatusDetails": "The following SSM parameters are invalid: LevelUp",
  "StartTime": 1557617747.993,
  "EndTime": 1557617748.101
  

  "WindowId": "mw-9a8b7c6d5eEXAMPLE",
  "WindowExecutionId": "791b72e0-f0da-4021-8b35-f95dfEXAMPLE",
  "Status": "SUCCESS",
  "StartTime": 1557594085.428,
  "EndTime": 1557594090.978
  

  "WindowId": "mw-0c50858d01EXAMPLE",
  "WindowExecutionId": "ecec60fa-6bb0-4d26-98c7-140308EXAMPLE",
  "Status": "SUCCESS",
  "StartTime": 1557593793.483,
  "EndTime": 1557593798.978
  

]
}
```

Examples for 'describe-maintenance-window-schedule'

Display the next ten scheduled maintenance window runs for a particular instance
Run the following command:

```
aws ssm describe-maintenance-window-schedule --resource-type INSTANCE --targets 
"Key=InstanceIds,Values=i-07782c72faEXAMPLE" --max-results 10
```

The system returns information like the following:

```
{
    "ScheduledWindowExecutions": [ 
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "My-First-Maintenance-Window",
            "ExecutionTime": "2019-05-18T23:35:24.902Z"
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "My-First-Maintenance-Window",
            "ExecutionTime": "2019-05-25T23:35:24.902Z"
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "My-First-Maintenance-Window",
            "ExecutionTime": "2019-06-01T23:35:24.902Z"
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "My-First-Maintenance-Window",
            "ExecutionTime": "2019-06-08T23:35:24.902Z"
        },
        {
            "WindowId": "mw-9a8b7c65d5eEXAMPLE",
            "Name": "My-Second-Maintenance-Window",
            "ExecutionTime": "2019-06-15T23:35:24.902Z"
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "My-First-Maintenance-Window",
            "ExecutionTime": "2019-06-22T23:35:24.902Z"
        },
        {
            "WindowId": "mw-9a8b7c65d5eEXAMPLE",
            "Name": "My-Second-Maintenance-Window",
            "ExecutionTime": "2019-06-29T23:35:24.902Z"
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "My-First-Maintenance-Window",
            "ExecutionTime": "2019-07-06T23:35:24.902Z"
        },
        {
            "WindowId": "mw-9a8b7c65d5eEXAMPLE",
            "Name": "My-Second-Maintenance-Window",
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "My-First-Maintenance-Window",
            "ExecutionTime": "2019-07-20T23:35:24.902Z"
        }
    ],
    "NextToken": "AAEABUXdceT92FvtKld/dGHELj5Mi+GKW/EXAMPLE"
}
```
Display the maintenance window schedule for instances tagged with a certain key-value pair

Run the following command:

```bash
aws ssm describe-maintenance-window-schedule --resource-type INSTANCE --targets Key=tag:prod,Values=rhel7
```

The system returns information like the following:

```
{
    "ScheduledWindowExecutions": [
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "DemoRateStartDate",
            "ExecutionTime": "2019-10-20T05:34:56-07:00"
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "DemoRateStartDate",
            "ExecutionTime": "2019-10-21T05:34:56-07:00"
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "DemoRateStartDate",
            "ExecutionTime": "2019-10-22T05:34:56-07:00"
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "Name": "DemoRateStartDate",
            "ExecutionTime": "2019-10-23T05:34:56-07:00"
        }
    ],
    "NextToken": "AAEABccwSXqQRGKiTZ1yzGELR6cxW4W/EXAMPLE"
}
```

Display start times for next four runs of a maintenance window

Run the following command:

```bash
aws ssm describe-maintenance-window-schedule --window-id "mw-0c50858d01EXAMPLE" --max-results "4"
```

The system returns information like the following:

```
{
    "WindowSchedule": [
        {
            "ScheduledWindowExecutions": [
                {
                    "ExecutionTime": "2019-10-04T10:10:10Z",
                    "Name": "My-First-Maintenance-Window",
                    "WindowId": "mw-0c50858d01EXAMPLE"
                },
                {
                    "ExecutionTime": "2019-10-11T10:10:10Z",
                    "Name": "My-First-Maintenance-Window",
```

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Tutorial: View Information About Tasks and Task Executions (AWS CLI)

This tutorial demonstrates how to use the AWS CLI to view details about your completed maintenance window task executions.

If you are continuing directly from Tutorial: Create and Configure a Maintenance Window (AWS CLI) (p. 463), make sure you have allowed enough time for your maintenance window to run at least once in order to see its execution results.

As you follow the steps in this tutorial, replace the values in italicized red text with your own options and IDs. For example, replace the maintenance window ID mw-0c50858d01EXAMPLE and the instance ID i-02573cafcfEXAMPLE with IDs of resources you create.

To view information about tasks and task executions (AWS CLI)

1. Run the following command to view a list of task executions for a specific maintenance window:

    aws ssm describe-maintenance-window-executions --window-id "mw-0c50858d01EXAMPLE"

The system returns information like the following:

```json
{
    "WindowExecutions": [
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "WindowExecutionId": "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE",
            "Status": "SUCCESS",
            "StartTime": 1557593793.483,
            "EndTime": 1557593798.978
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "WindowExecutionId": "791b72e0-f0da-4021-8b35-f95dfEXAMPLE",
            "Status": "SUCCESS",
            "StartTime": 1557593493.096,
            "EndTime": 1557593498.611
        },
        {
            "WindowId": "mw-0c50858d01EXAMPLE",
            "WindowExecutionId": "ecec60fa-6bb0-4d26-98c7-140308EXAMPLE",
            "Status": "SUCCESS",
            "StatusDetails": "No tasks to execute."
        }
    ]
}
```
2. Run the following command to get information about a maintenance window task execution:

```
aws ssm get-maintenance-window-execution --window-execution-id "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE"
```

The system returns information like the following:

```
{
  "WindowExecutionId": "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE",
  "TaskIds": [
    "c9b05aba-197f-4d8d-be34-e73fbEXAMPLE"
  ],
  "Status": "SUCCESS",
  "StartTime": 1557593493.096,
  "EndTime": 1557593498.611
}
```

3. Run the following command to list the tasks run as part of a maintenance window execution:

```
aws ssm describe-maintenance-window-execution-tasks --window-execution-id "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE"
```

The system returns information like the following:

```
{
  "WindowExecutionTaskIdentities": [
    {
      "WindowExecutionId": "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE",
      "TaskExecutionId": "c9b05aba-197f-4d8d-be34-e73fbEXAMPLE",
      "Status": "SUCCESS",
      "StartTime": 1557593493.162,
      "EndTime": 1557593498.57,
      "TaskArn": "AWS-RunShellScript",
      "TaskType": "RUN_COMMAND"
    }
  ]
}
```

4. Run the following command to get the details of a task execution:

```
aws ssm get-maintenance-window-execution-task --window-execution-id "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE" --task-id "c9b05aba-197f-4d8d-be34-e73fbEXAMPLE"
```

The system returns information like the following:

```
{
  "WindowExecutionId": "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE",
  "TaskExecutionId": "c9b05aba-197f-4d8d-be34-e73fbEXAMPLE",
  "TaskArn": "AWS-RunShellScript",
  "ServiceRole": "arn:aws:iam::111122233333:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM",
  "Type": "RUN_COMMAND",
  "TaskParameters": [
```
5. Run the following command to get the specific task invocations performed for a task execution.

```bash
aws ssm describe-maintenance-window-execution-task-invocations --window-execution-id "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE" --task-id "c9b05aba-197f-4d8d-be34-e73fbEXAMPLE"
```

The system returns information like the following.

```json
{
  "WindowExecutionTaskInvocationIdentities": [
    {
      "WindowExecutionId": "14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE",
      "TaskExecutionId": "c9b05aba-197f-4d8d-be34-e73fbEXAMPLE",
      "InvocationId": "c336d2ab-09de-44ba-8f6a-6136cEXAMPLE",
      "ExecutionId": "76a5a04f-caf6-490c-b448-92c02EXAMPLE",
      "TaskType": "RUN_COMMAND",
      "Parameters": "{"documentName":"AWS-RunShellScript","instanceIds": ["i-02573cafcfEXAMPLE"],"maxConcurrency":"1","maxErrors":"1","parameters": {"commands": ["df"]}}",
      "Status": "SUCCESS",
      "StatusDetails": "Success",
      "StartTime": 1557593493.222,
      "EndTime": 1557593498.466
    }
  ]
}
```

**Tutorial: Update a Maintenance Window (AWS CLI)**

This tutorial demonstrates how to use the AWS CLI to update a maintenance window. It also shows you how to update different task types, including those for Systems Manager Run Command, Systems Manager Automation, AWS Lambda, and AWS Step Functions.

The examples in this section use the following Systems Manager actions for updating a maintenance window.

- UpdateMaintenanceWindow
- UpdateMaintenanceWindowTarget
- UpdateMaintenanceWindowTask
• **DeregisterTargetFromMaintenanceWindow**

For information about using the Systems Manager console to update a maintenance window, see Update or Delete a Maintenance Window (Console) (p. 460).

As you follow the steps in this tutorial, replace the values in italicized red text with your own options and IDs. For example, replace the maintenance window ID `mw-0c50858d01EXAMPLE` and the instance ID `i-02573cafcfEXAMPLE` with IDs of resources you create.

**To update a maintenance window (AWS CLI)**

1. Open the AWS CLI and run the following command to update a target to include a name and a description:

```bash
code
aws ssm update-maintenance-window-target --window-id "mw-0c50858d01EXAMPLE" --window-target-id "e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE" --name "My-Maintenance-Window-Target" --description "Description for my maintenance window target"
```

The system returns information like the following:

```json
{
  "WindowId": "mw-0c50858d01EXAMPLE",
  "WindowTargetId": "e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE",
  "Targets": [
    {
      "Key": "InstanceIds",
      "Values": [
        "i-02573cafcfEXAMPLE"
      ]
    }
  ],
  "Name": "My-Maintenance-Window-Target",
  "Description": "Description for my maintenance window target"
}
```

2. Run the following command to use the replace option to remove the description field and add an additional target. The description field is removed, because the update does not include the field (a null value). Be sure to specify an additional instance that has been configured for use with Systems Manager:

```bash
code
aws ssm update-maintenance-window-target --window-id "mw-0c50858d01EXAMPLE" --window-target-id "d208dedf-3f6b-41ff-ace8-8e751EXAMPLE" --targets "Key=InstanceIds,Values=i-02573cafcfEXAMPLE,i-0471e04240EXAMPLE" --name "My-Maintenance-Window-Target" --replace
```

The system returns information like the following:

```json
{
  "WindowId": "mw-0c50858d01EXAMPLE",
  "WindowTargetId": "e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE",
  "Targets": [
    {
      "Key": "InstanceIds",
      "Values": [
        "i-02573cafcfEXAMPLE",
        "i-0471e04240EXAMPLE"
      ]
    }
  ],
}
```
3. The start-date option allows you to delay activation of a maintenance window until a specified future date. The end-date option allows you to set a date and time in the future after which the maintenance window no longer runs. Specify the options in ISO-8601 Extended format.

Run the following command to specify a date and time range for regularly scheduled maintenance window executions:

```bash
aws ssm update-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --start-date "2020-10-01T10:10:10Z" --end-date "2020-11-01T10:10:10Z"
```

4. If you created a Run Command task, run the following command to update it:

**Tip**
If your target is an Amazon EC2 instance for Windows Server, change df to ipconfig, and AWS-RunShellScript to AWS-RunPowerShellScript in the following command.

```bash
aws ssm update-maintenance-window-task --window-id "mw-0c50858d01EXAMPLE" --window-task-id "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE" --targets "Key=WindowTargetIds,Values=e32eeb2-646c-4f4b-8ed1-205fbEXAMPLE" --task-arn "AWS-RunShellScript" --service-role-arn "arn:aws:iam::111122223333:role/MaintenanceWindowsRole" --task-invocation-parameters "RunCommand={Comment=Revising my Run Command task,Parameters={commands=ipconfig}}" --priority 1 --max-concurrency 10 --max-errors 4 --name "My-Task-Name" --description "A description for my Run Command task"
```

The system returns information like the following:

```json
{
  "WindowId": "mw-0c50858d01EXAMPLE",
  "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
  "Targets": [
    {
      "Key": "WindowTargetIds",
      "Values": [
        "e32eeb2-646c-4f4b-8ed1-205fbEXAMPLE"
      ]
    }
  ],
  "TaskArn": "AWS-RunShellScript",
  "ServiceRoleArn": "arn:aws:iam::111122223333:role/MaintenanceWindowsRole",
  "TaskParameters": {},
  "TaskInvocationParameters": {
    "RunCommand": {
      "Comment": "Revising my Run Command task",
      "Parameters": {
        "commands": [
          "ipconfig"
        ]
      }
    }
  },
  "Priority": 1,
  "MaxConcurrency": "10",
  "MaxErrors": "4",
  "Name": "My-Task-Name",
  "Description": "A description for my Run Command task"
}
```

5. If you are updating a Lambda task, adapt and run the following command to update the task:
aws ssm update-maintenance-window-task --window-id mw-0c50858d01EXAMPLE --window-task-id 4f7ca192-7e9a-40fe-912-5cb1EXAMPLE --targets
"Key=WindowTargetIds,Values=e32eeb2-646c-4f4b-8ed1-205fEXAMPLE" --task-arn
"arn:aws:iam::1112223333:role/MaintenanceWindowsRole" --task-invocation-parameters '{"Task":"Lambda":{"Payload":"{"targetId":"{TARGET_ID}}","targetType": "{{TARGET_TYPE}}"}}'} --priority 1 --max-concurrency 10 --max-errors 5 --name "New-Lambda-Task-Name" --description "A description for my Lambda task"

The system returns information like the following:

```json
{
  "WindowId": "mw-0c50858d01EXAMPLE",
  "WindowTaskId": "4f7ca192-7e9a-40fe-912-5cb1EXAMPLE",
  "Targets": [
    {
      "Key": "WindowTargetIds",
      "Values": "e32eeb2-646c-4f4b-8ed1-205fEXAMPLE"
    }
  ],
  "ServiceRoleArn": "arn:aws:iam::1112223333:role/MaintenanceWindowsRole",
  "TaskParameters": {},
  "TaskInvocationParameters": {
    "Lambda": {
      "Payload": "e30="
    }
  },
  "Priority": 1,
  "MaxConcurrency": "10",
  "MaxErrors": "5",
  "Name": "New-Lambda-Task-Name",
  "Description": "A description for my Lambda task"
}
```

6. If you are updating an AWS Step Functions task, adapt and run the following command to update its task-invocation-parameters:

aws ssm update-maintenance-window-task --window-id mw-0c50858d01EXAMPLE --window-task-id 4f7ca192-7e9a-40fe-912-5cb1EXAMPLE --targets
"Key=WindowTargetIds,Values=e32eeb2-646c-4f4b-8ed1-205fEXAMPLE" --task-arn
"arn:aws:iam::1111222333:role/MaintenanceWindowsRole" --task-invocation-parameters '{"StepFunctions":"{"Input":"{"instanceId":"{TARGET_ID}}"}}'} --priority 0 --max-concurrency 10 --max-errors 5 --name "My-Step-Functions-Task" --description "A description for my Step Functions task"

The system returns information like the following:

```json
{
  "WindowId": "mw-0c50858d01EXAMPLE",
  "WindowTaskId": "4f7ca192-7e9a-40fe-912-5cb1EXAMPLE",
  "Targets": [
    {
      "Key": "WindowTargetIds",
      "Values": ["e32eeb2-646c-4f4b-8ed1-205fEXAMPLE"
    ]
  ],
  "TaskParameters": {},
  "TaskInvocationParameters": {
    "StepFunctions": {
      "Input": "{"instanceId":"{TARGET_ID}"}
    }
  },
  "Priority": 0,
  "MaxConcurrency": "10",
  "MaxErrors": "5",
  "Name": "My-Step-Functions-Task",
  "Description": "A description for my Step Functions task"
}
```
7. Run the following command to unregister a target from a maintenance window. This example uses the `safe` parameter to determine if the target is referenced by any tasks and therefore safe to unregister:

```bash
aws ssm deregister-target-from-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --window-target-id "e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE" --safe
```

The system returns information like the following:

```
An error occurred (TargetInUseException) when calling the DeregisterTargetFromMaintenanceWindow operation: This Target cannot be deregistered because it is still referenced in Task: 4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE
```

8. Run the following command to unregister a target from a maintenance window even if the target is referenced by a task. You can force the unregister operation by using the `no-safe` parameter:

```bash
aws ssm deregister-target-from-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --window-target-id "e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE" --no-safe
```

The system returns information like the following:

```
{
    "WindowId": "mw-0c50858d01EXAMPLE",
    "WindowTargetId": "e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE"
}
```

9. Run the following command to update a Run Command task. This example uses a Systems Manager Parameter Store parameter called `UpdateLevel`, which is formatted as follows:'{{ssm:UpdateLevel}}'

```bash
aws ssm update-maintenance-window-task --window-id "mw-0c50858d01EXAMPLE" --window-task-id "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE" --targets "Key=InstanceIds,Values=i-02573cafcfEXAMPLE" --task-invocation-parameters "RunCommand={Comment=A comment for my task update,Parameters={UpdateLevel='{{ssm:UpdateLevel}}'}}"
```

The system returns information like the following:

```
{
    "WindowId": "mw-0c50858d01EXAMPLE",
    "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
    "Targets": [
        {
            "Key": "InstanceIds",
            "Values": [
```
10. Run the following command to update an Automation task to specify WINDOW_ID and WINDOW_TASK_ID parameters for the task-invocation-parameters parameter:

```
aws ssm update-maintenance-window-task --window-id "mw-0c50858d01EXAMPLE" --window-task-id "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE" --targets "key=WindowTargetIds,Values=e32eech2-646c-4f4b-8ed1-205fbEXAMPLE" --task-arn "AutoTestDoc" --service-role-arn arn:aws:iam::1111222333:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM --task-invocation-parameters "Automation={Parameters={instanceId='{{TARGET_ID}}',initiator='{{WINDOW_ID}}.Task-{{WINDOW_TASK_ID}}'}}" --priority 3 --max-concurrency 10 --max-errors 5
```

The system returns information like the following:

```
{
"WindowId": "mw-0c50858d01EXAMPLE",
"WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
"Targets": [
    {
        "Key": "WindowTargetIds",
        "Values": [
            "e32eech2-646c-4f4b-8ed1-205fbEXAMPLE"
        ]
    }
],
"TaskArn": "AutoTestDoc",
"ServiceRoleArn": "arn:aws:iam::1111222333:role/aws-service-role/ssm.amazonaws.com/AWSServiceRoleForAmazonSSM",
"TaskParameters": {},
"TaskInvocationParameters": {
    "Automation": {
        "Parameters": {
            "multi": [
                "{{WINDOW_TASK_ID}}"
            ],
            "single": [
                "{{WINDOW_ID}}"
            ]
        }
    }
},
```
Tutorial: Delete a Maintenance Window (AWS CLI)

To delete a maintenance window you created in these tutorials, run the following command:

```
aws ssm delete-maintenance-window --window-id "mw-0c50858d01EXAMPLE"
```

The system returns information like the following:

```
{
   "WindowId":"mw-0c50858d01EXAMPLE"
}
```

Maintenance Windows Walkthroughs

The walkthroughs in this section show you how to create an AWS Systems Manager maintenance window using either the AWS Command Line Interface or the AWS Systems Manager Console. The maintenance window that you create updates SSM Agent on managed instances.

Contents
- Walkthrough: Create a Maintenance Window to Update SSM Agent (AWS CLI) (p. 496)
- Walkthrough: Create a Maintenance Window to Update SSM Agent (Console) (p. 500)

You can also view sample commands in the Systems Manager AWS CLI Reference.

Walkthrough: Create a Maintenance Window to Update SSM Agent (AWS CLI)

The following walkthrough shows you how to use the AWS CLI to create an AWS Systems Manager maintenance window. The walkthrough also describes how to register your managed instances as targets and register a Run Command task to update SSM Agent.

Before You Begin

Before you complete the following procedure, you must either have administrator privileges on the instances you want to configure or you must have been granted the appropriate permissions in AWS Identity and Access Management (IAM). Additionally, verify that you have at least one running Amazon EC2 instance (Linux or Windows) that is configured for Systems Manager. For more information, see Systems Manager Prerequisites (p. 12).

Topics
- Step 1: Get Started (p. 497)
- Step 2: Create the Maintenance Window (p. 497)
- Step 3: Register Maintenance Window Targets (AWS CLI) (p. 498)
- Step 4: Register a Run Command Task for the Maintenance Window to Update SSM Agent (p. 499)
Step 1: Get Started

To run commands using the AWS CLI

1. Install and configure the AWS CLI, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58).

2. Verify that an instance is ready to be registered as a target for a maintenance window.
   
   Run the following command to view which instances are online.
   
   ```bash
   aws ssm describe-instance-information --query "InstanceInformationList[*]"
   ```
   
   Run the following command to view details about a particular instance.
   
   ```bash
   aws ssm describe-instance-information --instance-information-filter-list
   key=InstanceIds,valueSet=instance ID
   ```

Step 2: Create the Maintenance Window

Use the following procedure to create a maintenance window and specify its basic options, such as schedule and duration.

Create a maintenance window (AWS CLI)

1. Open the AWS CLI and run the following commands to create a maintenance window that runs weekly on Sundays at 02:00, in the United States Pacific time zone, with a 1 hour cutoff:
   
   ```bash
   aws ssm create-maintenance-window --name "My-First-Maintenance-Window" --schedule "cron(0 2 ? * SUN *)" --duration 2 --schedule-timezone "America/Los_Angeles" --cutoff 1 --no-allow-unassociated-targets
   ```
   
   For information about creating cron expressions for the `schedule` parameter, see Reference: Cron and Rate Expressions for Systems Manager (p. 936).
   
   For an explanation of how the various schedule-related options for maintenance windows relate to one another, see Reference: Maintenance Windows Scheduling and Active Period Options (p. 942).
   
   The system returns information like the following:
   
   ```json
   {
      "WindowId":"mw-0c50858d01EXAMPLE"
   }
   ```

2. To list this and any other maintenance windows created in your AWS account in your current AWS Region, run the following command:
   
   ```bash
   aws ssm describe-maintenance-windows
   ```
   
   The system returns information like the following:
   
   ```json
   {
      "WindowIdentities": [,
      {
         "Cutoff": 1,
         
   ```
Step 3: Register Maintenance Window Targets (AWS CLI)

Use the following procedure to register a target with your maintenance window created in Step 2. By registering a target, you specify which instances to update.

To register maintenance window targets (AWS CLI)

1. Run the following command:

   ```bash
   aws ssm register-target-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --target "Key=InstanceIds,Values=i-02573cafcfEXAMPLE" --resource-type "INSTANCE"
   ``

   The system returns information like the following, which includes a maintenance window target ID. Copy or note the WindowTargetId value. You must specify this ID in the next step to register a task for this maintenance window.

   ```json
   {
     "WindowTargetId": "1a2b3c4d-1a2b-1a2b-1a2b-1a2b3c4d-1a2"
   }
   ```

   **Alternative commands**

   Use the following command to register multiple managed instances:

   ```bash
   aws ssm register-target-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --targets "Key=InstanceIds,Values=i-02573cafcfEXAMPLE,i-0471e04240EXAMPLE" --resource-type "INSTANCE"
   ``

   Use the following command to register instances by using Amazon EC2 tags. For example:

   ```bash
   aws ssm register-target-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --targets "Key=tag:Environment,Values=Prod" "Key=tag:Role,Values=Web" --resource-type "INSTANCE"
   ``

2. Run the following command to display the targets for a maintenance window:

   ```bash
   aws ssm describe-maintenance-window-targets --window-id "mw-0c50858d01EXAMPLE"
   ``

   The system returns information like the following:

   ```json
   {
     "Targets": [
       {
         "ResourceType": "INSTANCE",
         "WindowId": "mw-0c50858d01EXAMPLE",
         "Targets": [
           {
             "InstanceId": "i-02573cafcfEXAMPLE"
           }
        ]
      }
   }
   ```
Step 4: Register a Run Command Task for the Maintenance Window to Update SSM Agent

Use the following procedure to register a Run Command task for the maintenance window you created in Step 2. The Run Command task updates SSM Agent on the registered targets.

To register a Run Command task for a maintenance window to update SSM Agent (AWS CLI)

1. Run the following command to register a Run Command task for the maintenance window using the WindowTargetId value in Step 3. The task updates SSM Agent by using the AWS-UpdateSSMAgent document.

   ```bash
   aws ssm register-task-with-maintenance-window --window-id "mw-0c50858d01EXAMPLE" --task-arn "AWS-UpdateSSMAgent" --name "UpdateSSMAgent" --targets "Key=WindowTargetIds,Values=e32eeb2-646c-4f4b-8ed1-205fbEXAMPLE" --service-role-arn "arn:aws:iam::1122334455:role/MW-Role" --task-type "RUN_COMMAND" --max-concurrency 1 --max-errors 1 --priority 10
   ```

   **Note**

   If the targets you registered in the preceding step are Windows Server 2012 R2 or earlier, you must use the AWS-UpdateEC2Config document.

   The system returns information like the following:

   ```json
   { "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE" }
   ```

2. Run the following command to list all registered tasks for a maintenance window.
AWS Systems Manager User Guide
Maintenance Windows Walkthroughs

aws ssm describe-maintenance-window-tasks --window-id "mw-0c50858d01EXAMPLE"

The system returns information like the following:

```
{
  "Tasks": [
    {
      "ServiceRoleArn": "arn:aws:iam::111122223333:role/MW-Role",
      "MaxErrors": "1",
      "TaskArn": "AWS-UpdateSSMAgent",
      "MaxConcurrency": "1",
      "WindowTaskId": "4f7ca192-7e9a-40fe-9192-5cb15EXAMPLE",
      "TaskParameters": {},
      "Priority": 10,
      "WindowId": "mw-0c50858d01EXAMPLE",
      "Type": "RUN_COMMAND",
      "Targets": [
        {
          "Values": [
            "e32eeeb2-646c-4f4b-8ed1-205fbEXAMPLE"
          ],
          "Key": "WindowTargetIds"
        }
      ],
      "Name": "UpdateSSMAgent"
    }
  ]
}
```

Walkthrough: Create a Maintenance Window to Update SSM Agent (Console)

The following walkthrough shows you how to use the AWS Systems Manager console to create an AWS Systems Manager maintenance window. The walkthrough also describes how to register your managed instances as targets and register a Run Command task to update SSM Agent.

Before You Begin

Before you complete the following procedure, you must either have administrator privileges on the instances you want to configure or you must have been granted the appropriate permissions in AWS Identity and Access Management (IAM). Additionally, verify that you have at least one running Amazon EC2 instance (Linux or Windows) that is configured for Systems Manager. For more information, see Systems Manager Prerequisites (p. 12).

Topics
- Step 1: Create the Maintenance Window (Console) (p. 500)
- Step 2: Register Maintenance Window Targets (Console) (p. 501)
- Step 3: Register a Run Command Task for the Maintenance Window to Update SSM Agent (Console) (p. 502)

Step 1: Create the Maintenance Window (Console)

To create a maintenance window (console)

2. In the navigation pane, choose **Maintenance Windows**.
3. Choose **Create maintenance window**.
4. For **Name**, enter a descriptive name to help you identify this maintenance window as a test maintenance window.
5. For **Description**, enter a description.
6. Choose **Allow unregistered targets** if you want to allow a maintenance window task to run on managed instances, even if you have not registered those instances as targets. If you choose this option, then you can choose the unregistered instances (by instance ID) when you register a task with the maintenance window.
   
   If you don't choose this option, then you must choose previously-registered targets when you register a task with the maintenance window.
7. Specify a schedule for the maintenance window by using one of the three scheduling options.
   
   For information about building cron/rate expressions, see Reference: Cron and Rate Expressions for Systems Manager (p. 936).
8. For **Duration**, enter the number of hours the maintenance window should run.
9. For **Stop initiating tasks**, enter the number of hours before the end of the maintenance window that the system should stop scheduling new tasks to run.
10. (Optional) For **Start date (optional)**, specify a date and time, in ISO-8601 Extended format, for when you want the maintenance window to become active. This allows you to delay activation of the maintenance window until the specified future date.
11. (Optional) For **End date (optional)**, specify a date and time, in ISO-8601 Extended format, for when you want the maintenance window to become inactive. This allows you to set a date and time in the future after which the maintenance window no longer runs.
12. (Optional) For **Time zone (optional)**, specify the time zone to base scheduled maintenance window executions on, in Internet Assigned Numbers Authority (IANA) format. For example: “America/Los_Angeles”, “etc/UTC”, or “Asia/Seoul”.
   
   For more information about valid formats, see the Time Zone Database on the IANA website.
13. Choose **Create maintenance window**. The system returns you to the maintenance window page. The maintenance window you just created is in the Enabled state.

### Step 2: Register Maintenance Window Targets (Console)

Use the following procedure to register a target with the maintenance window you created in Step 1. By registering a target, you specify which instances to update.

**To assign targets to a maintenance window (console)**

1. In the list of maintenance windows, choose the maintenance window you just created.
2. Choose **Actions**, and then choose **Register targets**.
3. For **Target Name**, enter a name for the target.
4. For **Description**, enter a description.
5. (Optional) For **Owner information**, specify your name or work alias. Owner information is included in any Amazon CloudWatch Events raised while running tasks for these targets in this maintenance window.
   
   For information about using CloudWatch Events to monitor Systems Manager events, see Monitoring Systems Manager Events with Amazon CloudWatch Events (p. 894).
6. In the **Select targets by** section, choose **Specifying Tags** to target instances by using Amazon EC2 tags that you previously assigned to the instances. Choose **Manually Selecting Instances** to choose individual instances according to their instance IDs.
Note
If you don’t see the instances that you want to target, verify that those instances are configured for Systems Manager. For more information, see Setting Up AWS Systems Manager (p. 23).

7. Choose Register target.

Step 3: Register a Run Command Task for the Maintenance Window to Update SSM Agent (Console)

Use the following procedure to register a Run Command task for the maintenance window you created in Step 1. The Run Command task updates SSM Agent on the registered targets.

To assign tasks to a maintenance window (console)

1. In the list of maintenance windows, choose the maintenance window you just created.
2. Choose Actions, and then choose Register Run Command task.
3. For Name, enter a name for the task, such as UpdateSSMAgent.
4. For Description, enter a description.
5. For Document, choose the SSM Command document AWS-UpdateSSMAgent.

Note
If the targets you registered in the preceding step are Windows Server 2012 R2 or earlier, you must use the AWS-UpdateEC2Config document.

6. For Task priority, specify a priority for this task. 1 is the highest priority. Tasks in a maintenance window are scheduled in priority order with tasks that have the same priority scheduled in parallel.

7. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.

Note
If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.

8. (Optional) For Rate control:

   • For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.

     Note
     If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.

   • For Error threshold, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

9. For IAM service role, choose one of the following options to provide permissions for Systems Manager to run tasks on your target instances:

   • Create and use a service-linked role for Systems Manager

Service-linked roles provide a secure way to delegate permissions to AWS services because only the linked service can assume a service-linked role. Additionally, AWS automatically defines and sets the permissions of service-linked roles, depending on the actions that the linked service performs on your behalf.
Note
If a service-linked role has already been created for your account, choose **Use the service-linked role for Systems Manager**.

- **Use a custom service role**

  You can create a custom service role for maintenance window tasks if you want to use stricter permissions than those provided by the service-linked role. Or you can create a custom service role if you want to use Amazon Simple Notification Service (Amazon SNS) to send notifications related to maintenance window tasks run through Run Command.

  If you need to create a custom service role, see one of the following topics:
  
  - Control Access to Maintenance Windows (Console) (p. 446)
  - Control Access to Maintenance Windows (AWS CLI) (p. 449)

To help you decide whether to use a custom service role or the Systems Manager service-linked role with a maintenance window task, see *Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks?* (p. 445).

10. In the *Output options* section, you can optionally enable writing command output to an Amazon S3 bucket. If you choose to enable this option, specify the Amazon S3 bucket name and optional S3 key prefix to which you want the command output written.

11. In the *SNS notifications* section, you can optionally enable Systems Manager to send notifications about command statuses using Amazon SNS. If you choose to enable this option, you need to specify the following:

   a. The IAM role to trigger Amazon SNS notifications.
   b. The Amazon SNS topic to be used.
   c. The specific event types about which you want to be notified.
   d. The notification type that you want to receive when the status of a command changes.

   For commands sent to multiple instances, choose **Invocation** to receive notification on an invocation (per-instance) basis when the status of each invocation changes.

12. In the *Input Parameters* section, you can optionally provide a specific version of SSM Agent to install, or you can allow SSM Agent service to be downgraded to an earlier version. However, for this walkthrough we don't provide a version. Therefore, SSM Agent is be updated to the latest version.

13. Choose **Register Run Command task**.
AWS Systems Manager Instances & Nodes

AWS Systems Manager provides the following capabilities for managing your Amazon EC2 instances, your on-premises servers and virtual machines (VMs) in your hybrid environment, and other types of AWS resources (nodes).

Topics
- AWS Systems Manager Configuration Compliance (p. 504)
- AWS Systems Manager Inventory (p. 512)
- AWS Systems Manager Managed Instances (p. 563)
- AWS Systems Manager Activations (p. 567)
- AWS Systems Manager Session Manager (p. 567)
- AWS Systems Manager Run Command (p. 615)
- AWS Systems Manager State Manager (p. 648)
- AWS Systems Manager Patch Manager (p. 686)
- AWS Systems Manager Distributor (p. 752)

AWS Systems Manager Configuration Compliance

You can use AWS Systems Manager Configuration Compliance to scan your fleet of managed instances for patch compliance and configuration inconsistencies. You can collect and aggregate data from multiple AWS accounts and Regions, and then drill down into specific resources that aren't compliant. By default, Configuration Compliance displays current compliance data about Systems Manager Patch Manager patching and Systems Manager State Manager associations. Systems Manager Compliance offers the following additional benefits and features:

- View compliance history and change tracking for Patch Manager patching data and State Manager associations by using AWS Config.
- Customize Systems Manager Compliance to create your own compliance types based on your IT or business requirements.
- Remediate issues by using Systems Manager Run Command, State Manager, or Amazon CloudWatch Events.
- Port data to Amazon Athena and Amazon QuickSight to generate fleet-wide reports.

Configuration Compliance is offered at no additional charge. You only pay for the AWS resources that you use.

Note
Systems Manager integrates with Chef InSpec. InSpec is an open-source, runtime framework that enables you to create human-readable profiles on GitHub or Amazon S3. Then you can use Systems Manager to run compliance scans and view compliant and noncompliant instances. For more information, see Using Chef InSpec Profiles with Systems Manager Compliance (p. 105).
Getting Started with Configuration Compliance

To get started with Configuration Compliance, complete the following tasks.

<table>
<thead>
<tr>
<th>Task</th>
<th>For More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Compliance works with Patch Manager patch data, State Manager associations, and custom compliance types on Systems Manager managed instances. Verify that your Amazon EC2 instances and hybrid machines are configured as managed instances by verifying Systems Manager prerequisites.</td>
<td>Systems Manager Prerequisites (p. 12)</td>
</tr>
<tr>
<td>Update SSM Agent on your managed instances to the latest version.</td>
<td>Working with SSM Agent (p. 64)</td>
</tr>
<tr>
<td>If you plan to monitor patch compliance, verify that you've configured Systems Manager Patch Manager. You must perform patching operations by using Patch Manager before Configuration Compliance can display patch compliance data.</td>
<td>AWS Systems Manager Patch Manager (p. 686)</td>
</tr>
<tr>
<td>If you plan to monitor association compliance, verify that you've created State Manager associations. You must create associations before Configuration Compliance can display association compliance data.</td>
<td>AWS Systems Manager State Manager (p. 648)</td>
</tr>
<tr>
<td>(Optional) Configure the system to view compliance history and change tracking.</td>
<td>Viewing Compliance Configuration History and Change Tracking (p. 509)</td>
</tr>
<tr>
<td>(Optional) Create custom compliance types.</td>
<td>Configuration Compliance Walkthrough (AWS CLI) (p. 511)</td>
</tr>
<tr>
<td>(Optional) Create a Resource Data Sync to aggregate all compliance data in a target Amazon S3 bucket.</td>
<td>Creating a Resource Data Sync for Configuration Compliance (p. 505)</td>
</tr>
</tbody>
</table>

Creating a Resource Data Sync for Configuration Compliance

You can use Systems Manager Resource Data Sync to send compliance data from all of your managed instances to a target Amazon S3 bucket. When you create the sync, you can specify managed instances from multiple AWS accounts, AWS Regions, and your on-premises hybrid environment. Resource Data Sync then automatically updates the centralized data when new compliance data is collected. With all compliance data stored in a target Amazon S3 bucket, you can use services like Amazon Athena and
Amazon QuickSight to query and analyze the aggregated data. Configuring Resource Data Sync for configuration compliance is a one-time operation.

The following graphic shows how Resource Data Sync aggregates all data from different accounts, Regions, and your hybrid environment to a central repository.

Use the following procedure to create a Resource Data Sync for Configuration Compliance by using the Amazon EC2 console.

**To create and configure an Amazon S3 Bucket for Resource Data Sync (console)**

1. Open the Amazon S3 console at https://console.aws.amazon.com/s3/.
2. Create a bucket to store your aggregated Inventory data. For more information, see Create a Bucket in the Amazon Simple Storage Service Getting Started Guide. Make a note of the bucket name and the AWS Region where you created it.
3. Choose the Permissions tab, and then choose Bucket Policy.
4. Copy and paste the following bucket policy into the policy editor. Replace *Bucket-Name* and *Account-ID* with the name of the Amazon S3 bucket you created and a valid AWS account ID. Optionally, replace *Bucket-Prefix* with the name of an Amazon S3 prefix (subdirectory). If you didn't create a prefix, remove *Bucket-Prefix* from the ARN in the policy.

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "SSMBucketPermissionsCheck",
      "Effect": "Allow",
      "Principal": {
          "Service": "ssm.amazonaws.com"
      },
      "Action": "s3:GetBucketAcl",
      "Resource": "arn:aws:s3:::Bucket-Name"
    },
    {
      "Sid": "SSMBucketDelivery",
      "Effect": "Allow",
      "Principal": {
          "AWS": "Account-ID"
      },
      "Action": "s3:GetObject",
      "Resource": "arn:aws:s3:::Bucket-Name/Bucket-Prefix/" + "*"
    }
  ]
}
```
To create a Resource Data Sync

2. In the navigation pane, choose Managed Instances.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Managed Instances.
3. Choose Resource Data Syncs, and then choose Create resource data sync.
4. In the Sync name field, type a name for the sync configuration.
5. In the Bucket name field, type the name of the Amazon S3 bucket you created at the start of this procedure.
6. (Optional) In the Bucket prefix field, type the name of an Amazon S3 bucket prefix (subdirectory).
7. In the Bucket region field, choose This region if the Amazon S3 bucket you created is located in the current AWS Region. If the bucket is located in a different AWS Region, choose Another region, and type the name of the Region.
   
   **Note**
   If the sync and the target Amazon S3 bucket are located in different regions, you may be subject to data transfer pricing. For more information, see Amazon S3 Pricing.
8. Choose Create.

Working With Configuration Compliance

Configuration Compliance collects and reports data about the status of Patch Manager patching, State Manager associations, and custom compliance types. This section includes details about each of these compliance types and how to view Systems Manager compliance data. This section also includes information about how to view compliance history and change tracking.

**Note**
Systems Manager integrates with Chef InSpec. InSpec is an open-source, runtime framework that enables you to create human-readable profiles on GitHub or Amazon S3. Then you can use Systems Manager to run compliance scans and view compliant and noncompliant instances. For more information, see Using Chef InSpec Profiles with Systems Manager Compliance (p. 105).

Topics
- About Patch Compliance (p. 508)
- About State Manager Association Compliance (p. 508)
- About Custom Compliance (p. 508)
About Patch Compliance

After you use Systems Manager Patch Manager to install patches on your instances, compliance status information is immediately available to you in the console or in response to AWS CLI commands or corresponding Systems Manager API actions.

For information about patch compliance status values, see About Patch Compliance States (p. 711).

About State Manager Association Compliance

After you create one or more State Manager associations, compliance status information is immediately available to you in the console or in response to AWS CLI commands or corresponding Systems Manager API actions. For associations, Configuration Compliance shows statuses of Compliant or Non-compliant and the severity level assigned to the association, such as Critical or Medium.

About Custom Compliance

You can assign compliance metadata to a managed instance. This metadata can then be aggregated with other compliance data for compliance reporting purposes. For example, say that your business runs versions 2.0, 3.0, and 4.0 of software X on your managed instances. The company wants to standardize on version 4.0, meaning that instances running versions 2.0 and 3.0 are non-compliant. You can use the PutComplianceItems API action to explicitly note which managed instances are running older versions of software X. Currently you can only assign compliance metadata by using the AWS CLI, AWS Tools for Windows PowerShell, or the SDKs. The following CLI sample command assigns compliance metadata to a managed instance and specifies the compliance type in the required format Custom:

```bash
aws ssm put-compliance-items --resource-id i-1234567890abcdef0 --resource-type ManagedInstance --compliance-type Custom:SoftwareXCheck --execution-summary ExecutionTime=AnyStringToDenoteTimeOrDate --items Id=Version2.0,Title=SoftwareXVersion,Severity=CRITICAL,Status=NON_COMPLIANT
```

Compliance managers can then view summaries or create reports about which instances are or aren't compliant. You can assign a maximum of 10 different custom compliance types to an instance.

For an example of how to create a custom compliance type and view compliance data, see Configuration Compliance Walkthrough (AWS CLI) (p. 511).

Viewing Current Compliance Data

This section describes how to view compliance data in the AWS Systems Manager console and by using the AWS CLI. For information about how to view patch and association compliance history and change tracking, see Viewing Compliance Configuration History and Change Tracking (p. 509).

Topics

- Viewing Current Compliance Data (Console) (p. 508)
- Viewing Current Compliance Data (AWS CLI) (p. 509)

Viewing Current Compliance Data (Console)

Use the following procedure to view compliance data in the Systems Manager console.
To view current compliance reports in the Systems Manager console

2. In the navigation pane, choose Compliance.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Compliance in the navigation pane.
3. In the Corresponding managed instances area, choose an instance ID to view its detailed configuration compliance report.

   **Note**
   For information about fixing compliance issues, see Remediating Compliance Issues (p. 510).

Viewing Current Compliance Data (AWS CLI)

You can view summaries of compliance data for patching, associations, and custom compliance types in the AWS CLI by using the following AWS CLI commands.

- list-compliance-summaries
  Returns a summary count of compliant and non-compliant association statuses according to the filter you specify. (API: ListComplianceSummaries)

- list-resource-compliance-summaries
  Returns a resource-level summary count. The summary includes information about compliant and non-compliant statuses and detailed compliance-item severity counts, according to the filter criteria you specify. (API: ListResourceComplianceSummaries)

You can view additional compliance data for patching by using the following AWS CLI commands.

- describe-patch-group-state
  Returns high-level aggregated patch compliance state for a patch group. (API: DescribePatchGroupState)

- describe-instance-patch-states-for-patch-group
  Returns the high-level patch state for the instances in the specified patch group. (API: DescribeInstancePatchStatesForPatchGroup)

   **Note**
   For an illustration of how to configure patching and view patch compliance details by using the AWS CLI, see Tutorial: Patch a Server Environment (AWS CLI) (p. 735).

Viewing Compliance Configuration History and Change Tracking

Systems Manager Configuration Compliance displays current patching and association compliance data for your managed instances. You can view patching and association compliance history and change tracking by using AWS Config. AWS Config provides a detailed view of the configuration of AWS resources in your AWS account. This includes how the resources are related to one another and how they were configured in the past so that you can see how the configurations and relationships change over time. To view patching and association compliance history and change tracking, you must enable the following resources in AWS Config:

- SSM:PatchCompliance
• SSM:AssociationCompliance

For information about how to choose and configure these specific resources in AWS Config, see Selecting Which Resources AWS Config Records in the AWS Config Developer Guide.

Note
For information about AWS Config pricing, see Pricing.

Remediating Compliance Issues

You can quickly remediate patch and association compliance issues by using Systems Manager Run Command. You can target either instance IDs or Amazon EC2 tags and run the AWS-RunPatchBaseline document or the AWS-RefreshAssociation document. If refreshing the association or re-running the patch baseline fails to resolve the compliance issue, then you need to investigate your associations, patch baselines, or instance configurations to understand why the Run Command executions did not resolve the problem.

For more information about patching, see AWS Systems Manager Patch Manager (p. 686) and About the SSM Document AWS-RunPatchBaseline (p. 706).

For more information about associations, see Working with Associations in Systems Manager (p. 650).

For more information about running a command, see Running Commands Using Systems Manager Run Command (p. 622).

Specify Configuration Compliance as the target of a CloudWatch Events event

You can also configure CloudWatch Events to perform an action in response to Configuration Compliance events. For example, if one or more instances fail to install Critical patch updates or run an association that installs anti-virus software, then you can configure CloudWatch to run the AWS-RunPatchBaseline document or the AWS-RefreshAssociation document when the Configuration Compliance event occurs.

Use the following procedure to configure Configuration Compliance as the target of a CloudWatch event.

To configure Configuration Compliance as the target of a CloudWatch event (console)

1. Sign in to the AWS Management Console and open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. In the left navigation pane, choose Events, and then choose Create rule.
3. Choose Event Pattern. Event Pattern lets you build a rule that generates events for specific actions in AWS services.
4. In the Service Name field, choose EC2 Simple Systems Manager (SSM)
5. In the Event Type field, choose Configuration Compliance.
6. Choose Add target.
7. In the Select target type list, choose SSM Run Command.
8. In the Document list, choose an SSM document to run when your target is invoked. For example, choose AWS-RunPatchBaseline for a non-compliant patch event, or choose AWS-RefreshAssociation for a non-compliant association event.
9. Specify information for the remaining fields and parameters.

Note
Required fields and parameters have an asterisk (*) next to the name. To create a target, you must specify a value for each required parameter or field. If you don’t, the system creates the rule, but the rule won’t be run.
10. Choose Configure details and complete the wizard.
Configuration Compliance Walkthrough (AWS CLI)

The following procedure walks you through the process of using the `PutComplianceItems` API action to assign custom compliance metadata to a resource. You can also use this API action to manually assign patch or association compliance metadata to an instance, as shown in the following walkthrough. For more information about custom compliance, see About Custom Compliance (p. 508).

**To assign custom compliance metadata to a managed instance (AWS CLI)**

1. Install and configure the AWS CLI, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58).

2. Run the following command to assign custom compliance metadata to an instance. Currently the only supported resource type is `ManagedInstance`.

   ```bash
   aws ssm put-compliance-items --resource-id Instance ID --resource-type ManagedInstance --compliance-type Custom:User-defined string --execution-summary ExecutionTime=User-defined time and/or date value --items Id=User-defined ID,Title=User-defined title,Severity=One or more comma-separated severities:CRITICAL, MAJOR, MINOR, INFORMATIONAL, or UNSPECIFIED,Status=COMPLIANT or NON_COMPLIANT
   ```

3. Repeat the previous step to assign additional custom compliance metadata to one or more instances. You can also manually assign patch or association compliance metadata to managed instances by using the following commands:

   **Association compliance metadata**

   ```bash
   aws ssm put-compliance-items --resource-id Instance ID --resource-type ManagedInstance --compliance-type Association --execution-summary ExecutionTime=User-defined time and/or date value --items Id=User-defined ID,Title=User-defined title,Severity=One or more comma-separated severities:CRITICAL, MAJOR, MINOR, INFORMATIONAL, or UNSPECIFIED,Status=COMPLIANT or NON_COMPLIANT,Details="{DocumentName=The SSM document for the association,DocumentVersion=A version number}"
   ```

   **Patch compliance metadata**

   ```bash
   aws ssm put-compliance-items --resource-id Instance ID --resource-type ManagedInstance --compliance-type Patch --execution-summary ExecutionTime=User-defined time and/or date value,ExecutionId=User-defined ID,ExecutionType=Command --items Id=for example, KB12345,Title=User-defined title,Severity=One or more comma-separated severities:CRITICAL, MAJOR, MINOR, INFORMATIONAL, or UNSPECIFIED,Status=COMPLIANT or NON_COMPLIANT,Details="{PatchGroup=Name of group,PatchSeverity=The patch severity, for example, CRITICAL}"
   ```

4. Run the following command to view a list of compliance items for a specific managed instance. Use filters to drill down into specific compliance data.

   ```bash
   aws ssm list-compliance-items --resource-ids Instance ID --resource-types ManagedInstance --filters One or more filters.
   ```

   The following examples show you how to use this command with filters.

   ```bash
   aws ssm list-compliance-items --resource-ids i-1234567890abcdef0 --resource-type ManagedInstance --filters Key=DocumentName,Values=AWS-RunPowerShellScript Key=Status,Values=NON_COMPLIANT,Type=NotEqual Key=Id,Values=cee20ae7-6388-488e-8be1-a88cc6c46dcc Key=Severity,Values=UNSPECIFIED
   ```
aws ssm list-resource-compliance-summaries --filters
Key=OverallSeverity,Values=UNSPECIFIED

aws ssm list-resource-compliance-summaries --filters
Key=OverallSeverity,Values=UNSPECIFIED Key=ComplianceType,Values=Association
Key=InstanceId,Values=i-1234567890abcdef0

5. Run the following command to view a summary of compliance statuses. Use filters to drill down into specific compliance data.

aws ssm list-resource-compliance-summaries --filters One or more filters.

The following examples show you how to use this command with filters.

aws ssm list-resource-compliance-summaries --filters Key=ExecutionType,Values=Command

aws ssm list-resource-compliance-summaries --filters
Key=AWS:InstanceInformation.PlatformType,Values=Windows
Key=OverallSeverity,Values=CRITICAL

6. Run the following command to view a summary count of compliant and non-compliant resources for a compliance type. Use filters to drill down into specific compliance data.

aws ssm list-compliance-summaries --filters One or more filters.

The following examples show you how to use this command with filters.

aws ssm list-compliance-summaries --filters
Key=AWS:InstanceInformation.PlatformType,Values=Windows
Key=PatchGroup,Values=TestGroup

aws ssm list-compliance-summaries --filters
Key=AWS:InstanceInformation.PlatformType,Values=Windows
Key=ExecutionId,Values=4adf0526-6aed-4694-97a5-145222f4c2b6

**AWS Systems Manager Inventory**

AWS Systems Manager Inventory provides visibility into your Amazon EC2 and on-premises computing environment. You can use Inventory to collect metadata from your managed instances. You can store this metadata in a central Amazon Simple Storage Service (Amazon S3) bucket, and then use built-in tools to query the data and quickly determine which instances are running the software and configurations required by your software policy, and which instances need to be updated. You can configure Inventory on all of your managed instances by using a one-click procedure. You can also configure and view inventory data from multiple AWS Regions and accounts.

If the pre-configured metadata types collected by Systems Manager Inventory don't meet your needs, then you can create custom inventory. Custom inventory is simply a JSON file with information that you provide and add to the managed instance in a specific directory. When Systems Manager Inventory collects data, it captures this custom inventory data. For example, if you run a large datacenter, you can specify the rack location of each of your servers as custom inventory. You can then view the rack space data when you view other inventory data.
**Important**

Systems Manager Inventory collects only metadata from your managed instances. Inventory does not access proprietary information or data.

The following table lists the types of metadata that you can collect with Systems Manager Inventory. The table also lists the instances you can collect inventory information from and the collection intervals you can specify.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metadata types</td>
<td>You can configure Inventory to collect the following types of metadata:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Applications</strong>: Application names, publishers, versions, etc.</td>
</tr>
<tr>
<td></td>
<td>• <strong>AWS components</strong>: EC2 driver, agents, versions, etc.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Files</strong>: Name, size, version, installed date, modification and last accessed times, etc.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Network configuration</strong>: IP address, MAC address, DNS, gateway, subnet mask, etc.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Windows updates</strong>: Hotfix ID, installed by, installed date, etc.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Instance details</strong>: System name, operating systems (OS) name, OS version, last boot, DNS, domain, work group, OS architecture, etc.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Services</strong>: Name, display name, status, dependent services, service type, start type, etc.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Tags</strong>: Tags assigned to your instances.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Windows Registry</strong>: Registry key path, value name, value type, and value.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Windows roles</strong>: Name, display name, path, feature type, installed state, etc.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Custom inventory</strong>: Metadata that was assigned to a managed instance as described in Working with Custom Inventory (p. 541).</td>
</tr>
</tbody>
</table>

**Note**

To view a list of all metadata collected by Inventory, see Metadata Collected by Inventory (p. 515).

<table>
<thead>
<tr>
<th>Instances to collect information from</th>
<th>You can choose to inventory all instances in your AWS account, individually select instances, or target groups of instances by using Amazon EC2 tags. For more information about performing inventory collection on all of your instances, see Inventory All Managed Instances in Your AWS Account (p. 524).</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to collect information</td>
<td>You can specify a collection interval in terms of minutes, hours, days, and weeks. The shortest collection interval is every 30 minutes.</td>
</tr>
</tbody>
</table>
**Note**
Depending on the amount of data collected, the system can take several minutes to report the data to the output you specified. After the information is collected, the metadata is sent over a secure HTTPS channel to a plain-text AWS store that is accessible only from your AWS account.

You can view the data in the AWS Systems Manager console on the **Inventory** page, which includes several predefined cards to help you query the data.

![Inventory page](image)

**Note**
Inventory cards automatically filter out Amazon EC2 managed instances with a state of *Terminated* and *Stopped*. For on-premises managed instances, Inventory cards automatically filter out instances with a state of *Terminated*.

If you create a Resource Data Sync to synchronize and store all of your data in a single Amazon S3 bucket, then you can drill down into the data on the **Inventory Detailed View** page. For more information, see *Querying Inventory Data from Multiple Regions and Accounts* (p. 527).

**Contents**
- Learn More About Systems Manager Inventory (p. 515)
- Configuring Resource Data Sync for Inventory (p. 520)
Learn More About Systems Manager Inventory

When you configure Systems Manager Inventory, you specify the type of metadata to collect, the instances from where the metadata should be collected, and a schedule for metadata collection. These configurations are saved with your AWS account as a Systems Manager State Manager association. An association is simply a configuration.

**Note**
Inventory only collects metadata. It does not collect any personal or proprietary data.

**Topics**
- Metadata Collected by Inventory (p. 515)
- Working with File and Windows Registry Inventory (p. 518)
- Related AWS Services (p. 520)

## Metadata Collected by Inventory

The following sample shows the complete list of metadata collected by each Inventory plugin.

```
[
  {
    "typeName": "AWS:InstanceInformation",
    "version": "1.0",
    "attributes": [
      { "name": "AgentType", "dataType": "STRING"},
      { "name": "AgentVersion", "dataType": "STRING"},
      { "name": "ComputerName", "dataType": "STRING"},
      { "name": "IamRole", "dataType": "STRING"},
      { "name": "InstanceId", "dataType": "STRING"},
      { "name": "IpAddress", "dataType": "STRING"},
      { "name": "PlatformName", "dataType": "STRING"},
      { "name": "PlatformType", "dataType": "STRING"},
      { "name": "PlatformVersion", "dataType": "STRING"},
      { "name": "ResourceType", "dataType": "STRING"}
    ]
  },
  {
    "typeName": "AWS:Application",
    "version": "1.1",
    "attributes": [
      { "name": "Name", "dataType": "STRING"},
      { "name": "ApplicationType", "dataType": "STRING"},
      { "name": "Publisher", "dataType": "STRING"},
      { "name": "Version", "dataType": "STRING"},
      { "name": "InstalledTime", "dataType": "STRING"},
      { "name": "Architecture", "dataType": "STRING"},
      { "name": "URL", "dataType": "STRING"},
      { "name": "Summary", "dataType": "STRING"}
    ]
  }
]```
{"typeName" : "AWS:File",
"version": "1.0",
"attributes": [
    { "name": "Name",          "dataType": "STRING"},
    { "name": "Size",          "dataType": "STRING"},
    { "name": "Description",   "dataType": "STRING"},
    { "name": "FileVersion",   "dataType": "STRING"},
    { "name": "InstalledDate", "dataType": "STRING"},
    { "name": "ModificationTime", "dataType": "STRING"},
    { "name": "LastAccessTime", "dataType": "STRING"},
    { "name": "ProductName",   "dataType": "STRING"},
    { "name": "InstalledDir",  "dataType": "STRING"},
    { "name": "ProductLanguage", "dataType": "STRING"},
    { "name": "CompanyName",   "dataType": "STRING"},
    { "name": "ProductVersion", "dataType": "STRING"}
]}
},
{ "typeName" : "AWS:AWSComponent",
"version": "1.0",
"attributes": [
    { "name": "Name",          "dataType": "STRING"},
    { "name": "ApplicationType", "dataType": "STRING"},
    { "name": "Publisher",      "dataType": "STRING"},
    { "name": "Version",        "dataType": "STRING"},
    { "name": "InstalledTime",  "dataType": "STRING"},
    { "name": "Architecture",   "dataType": "STRING"},
    { "name": "URL",            "dataType": "STRING"}
]}
},
{ "typeName" : "AWS:WindowsUpdate",
"version": "1.0",
"attributes": [
    { "name": "HotFixId",       "dataType": "STRING"},
    { "name": "Description",    "dataType": "STRING"},
    { "name": "InstalledTime",  "dataType": "STRING"},
    { "name": "InstalledBy",    "dataType": "STRING"}
]}
},
{ "typeName" : "AWS:Network",
"version": "1.0",
"attributes": [
    { "name": "Name",          "dataType": "STRING"},
    { "name": "SubnetMask",     "dataType": "STRING"},
    { "name": "Gateway",        "dataType": "STRING"},
    { "name": "DHCPServer",     "dataType": "STRING"},
    { "name": "DNSServer",      "dataType": "STRING"},
    { "name": "MacAddress",     "dataType": "STRING"},
    { "name": "IPV4",           "dataType": "STRING"},
    { "name": "IPV6",           "dataType": "STRING"}
]}
},
{ "typeName" : "AWS:PatchSummary",
"version": "1.0",
"attributes": [
    { "name": "PatchGroup",     "dataType": "STRING"},
    { "name": "BaselineId",     "dataType": "STRING"},
    { "name": "WindowsUpdate",  "dataType": "STRING"},
    { "name": "Network",        "dataType": "STRING"},
    { "name": "AWSComponent",   "dataType": "STRING"}
]}
}
{ "name": "SnapshotId",           "dataType": "STRING"},
{ "name": "OwnerInformation",   "dataType": "STRING"},
{ "name": "InstalledCount",      "dataType": "NUMBER"},
{ "name": "InstalledOtherCount", "dataType": "NUMBER"},
{ "name": "NotApplicableCount",  "dataType": "NUMBER"},
{ "name": "MissingCount",        "dataType": "NUMBER"},
{ "name": "FailedCount",         "dataType": "NUMBER"},
{ "name": "OperationType",       "dataType": "STRING"},
{ "name": "OperationStartTime",  "dataType": "STRING"},
{ "name": "OperationEndTime",    "dataType": "STRING"}
]
},
{
"typeName": "AWS:ComplianceItem",
"version": "1.0",
"attributes": [
{ "name": "ComplianceType",    "dataType": "STRING"},
{ "name": "ExecutionId",        "dataType": "STRING"},
{ "name": "ExecutionType",      "dataType": "STRING"},
{ "name": "ExecutionTime",      "dataType": "STRING"},
{ "name": "Id",                 "dataType": "STRING"},
{ "name": "Title",              "dataType": "STRING"},
{ "name": "Status",             "dataType": "STRING"},
{ "name": "Severity",           "dataType": "STRING"},
{ "name": "DocumentName",       "dataType": "STRING"},
{ "name": "DocumentVersion",    "dataType": "STRING"},
{ "name": "Classification",     "dataType": "STRING"},
{ "name": "PatchBaselineId",    "dataType": "STRING"},
{ "name": "PatchSeverity",      "dataType": "STRING"},
{ "name": "PatchState",         "dataType": "STRING"},
{ "name": "PatchGroup",         "dataType": "STRING"},
{ "name": "InstalledTime",      "dataType": "STRING"}
]
},
{
"typeName": "AWS:ComplianceSummary",
"version": "1.0",
"attributes": [
{ "name": "ComplianceType",    "dataType": "STRING"},
{ "name": "PatchGroup",         "dataType": "STRING"},
{ "name": "PatchBaselineId",    "dataType": "STRING"},
{ "name": "Status",             "dataType": "STRING"},
{ "name": "OverallSeverity",    "dataType": "STRING"},
{ "name": "ExecutionId",        "dataType": "STRING"},
{ "name": "ExecutionType",      "dataType": "STRING"},
{ "name": "ExecutionTime",      "dataType": "STRING"},
{ "name": "CompliantCriticalCount", "dataType": "NUMBER"},
{ "name": "CompliantHighCount", "dataType": "NUMBER"},
{ "name": "CompliantMediumCount", "dataType": "NUMBER"},
{ "name": "CompliantLowCount",  "dataType": "NUMBER"},
{ "name": "CompliantInformationalCount", "dataType": "NUMBER"},
{ "name": "CompliantUnspecifiedCount", "dataType": "NUMBER"},
{ "name": "NonCompliantCriticalCount", "dataType": "NUMBER"},
{ "name": "NonCompliantHighCount", "dataType": "NUMBER"},
{ "name": "NonCompliantMediumCount", "dataType": "NUMBER"},
{ "name": "NonCompliantLowCount", "dataType": "NUMBER"},
{ "name": "NonCompliantInformationalCount", "dataType": "NUMBER"},
{ "name": "NonCompliantUnspecifiedCount", "dataType": "NUMBER"}
]
},
{
"typeName": "AWS:InstanceDetailedInformation",
"version": "1.0",
"attributes": [
{ "name": "CPUModel",          "dataType": "STRING"},
{ "name": "CPUCores",          "dataType": "NUMBER"}
Note
With the release of version 2.5, RPM Package Manager replaced the Serial attribute with Epoch. The Epoch attribute is a monotonically increasing integer like Serial. When you inventory by using the AWS:Application type, note that a larger value for Epoch means a newer version. If Epoch values are the same or empty, then use the value of the Version or Release attribute to determine the newer version.

Working with File and Windows Registry Inventory

Systems Manager Inventory enables you to search and inventory files on Windows and Linux operating systems. You can also search and inventory the Windows Registry.

Files: You can collect metadata information about files, including file names, the time files were created, the time files were last modified and accessed, and file sizes, to name a few. To start collecting file
Learn More About Inventory

inventory, you specify a file path where you want to perform the inventory, one or more patterns that define the types of files you want to inventory, and if the path should be traversed recursively. Systems Manager inventories all file metadata for files in the specified path that match the pattern. File inventory uses the following parameter input.

```json
{
  "Path": string,
  "Pattern": array[string],
  "Recursive": true,
  "DirScanLimit": number // Optional
}
```

- **Path**: The directory path where you want to inventory files. For Windows, you can use environment variables like `%PROGRAMFILES%` as long as the variable maps to a single directory path. For example, if you use `%PATH%` that maps to multiple directory paths, Inventory throws an error.
- **Pattern**: An array of patterns to identify files.
- **Recursive**: A Boolean value indicating whether Inventory should recursively traverse the directories.
- **DirScanLimit**: An optional value specifying how many directories to scan. Use this parameter to minimize performance impact on your instances. By default, Inventory scans a maximum of 5,000 directories.

**Note**
Inventory collects metadata for a maximum of 500 files across all specified paths.

Here are some examples of how to specify the parameters when performing an inventory of files.

- On Linux, collect metadata of .sh files in the `/home/ec2-user` directory, excluding all subdirectories.

  ```json
  [{"Path": "/home/ec2-user", "Pattern": ["*.sh", "*.sh"], "Recursive": false}]
  ```

- On Windows, collect metadata of all `.exe` files in the Program Files folder, including subdirectories recursively.

  ```json
  [{"Path": "C:\Program Files", "Pattern": ["*.exe"], "Recursive": true}]
  ```

- On Windows, collect metadata of specific log patterns.

  ```json
  [{"Path": "C:\ProgramData\Amazon", "Pattern": ["amazon*.log"], "Recursive": true}]
  ```

- Limit the directory count when performing recursive collection.

  ```json
  [{"Path": "C:\Users", "Pattern": ["*.ps1"], "Recursive": true, "DirScanLimit": 1000}]
  ```

**Windows Registry**: You can collect Windows Registry keys and values. You can choose a key path and collect all keys and values recursively. You can also collect a specific registry key and its value for a specific path. Inventory collects the key path, name, type, and the value.

```json
{
  "Path": string,
  "Recursive": true,
  "ValueNames": array[string] // optional
}
```

- **Path**: The path to the Registry key.
• **Recursive**: A Boolean value indicating whether Inventory should recursively traverse Registry paths.

• **ValueNames**: An array of value names for performing inventory of Registry keys. If you use this parameter, Systems Manager will inventory only the specified value names for the specified path.

**Note**
Inventory collects a maximum of 250 Registry key values for all specified paths.

Here are some examples of how to specify the parameters when performing an inventory of the Windows Registry.

• Collect all keys and values recursively for a specific path.

```json
{"Path":"HKEY_LOCAL_MACHINE\SOFTWARE\Amazon","Recursive": true}
```

• Collect all keys and values for a specific path (recursive search disabled).

```json
{"Path":"HKEY_LOCAL_MACHINE\SOFTWARE\Intel\PSIS\PSIS_DECODER","Recursive": false}
```

• Collect a specific key by using the **ValueNames** option.

```json
{"Path":"HKEY_LOCAL_MACHINE\SOFTWARE\Amazon\MachineImage","ValueNames": ["AMIName"]}
```

**Related AWS Services**

Systems Manager Inventory provides a snapshot of your current inventory to help you manage software policy and improve the security posture of your entire fleet. You can extend your inventory management and migration capabilities using the following AWS services.

- **AWS Config** provides a historical record of changes to your inventory, along with the ability to create rules to generate notifications when a configuration item is changed. For more information, see, *Recording Amazon EC2 managed instance inventory* in the *AWS Config Developer Guide*.

- **AWS Application Discovery Service** is designed to collect inventory on OS type, application inventory, processes, connections, and server performance metrics from your on-premises VMs to support a successful migration to AWS. For more information, see the *Application Discovery Service User Guide*.

**Configuring Resource Data Sync for Inventory**

You can use Systems Manager Resource Data Sync to send Inventory data collected from all of your managed instances to a single Amazon S3 bucket. Resource Data Sync then automatically updates the centralized data when new Inventory data is collected. With all Inventory data stored in a target Amazon S3 bucket, you can use services like Amazon Athena and Amazon QuickSight to query and analyze the aggregated data.

For example, say that you've configured Inventory to collect data about the operating system (OS) and applications running on a fleet of 150 managed instances. Some of these instances are located in a hybrid data center, and others are running in Amazon EC2 across multiple AWS Regions. If you have not configured Resource Data Sync for Inventory, you either need to manually gather the collected inventory data for each instance, or you have to create scripts to gather this information. You would then need to port the data into an application so that you can run queries and analyze it.

With Resource Data Sync, you perform a one-time operation that synchronizes all Inventory data from all of your managed instances. After the sync is successfully created, Systems Manager creates a baseline of all Inventory data and saves it in the target Amazon S3 bucket. When new inventory data is collected,
Systems Manager automatically updates the data in the Amazon S3 bucket. You can then quickly and cost-effectively port the data to Amazon Athena and Amazon QuickSight.

Diagram 1 shows how Resource Data Sync aggregates inventory data from managed instances in Amazon EC2 and a hybrid environment to a target Amazon S3 bucket. This diagram also shows how Resource Data Sync works with multiple AWS accounts and AWS Regions.

Diagram 1: Resource Data Sync with Multiple AWS Accounts and AWS Regions

If you delete a managed instance, Resource Data Sync preserves the Inventory file for the deleted instance. For running instances, however, Resource Data Sync automatically overwrites old inventory files when new files are created and written to the Amazon S3 bucket. If you want to track inventory changes over time, you can use the AWS Config service to track the `SSM::ManagedInstanceInventory` resource type. For more information, see Getting Started with AWS Config.

Create a Resource Data Sync for Inventory

Use the following procedure to create a Resource Data Sync for Inventory by using the Amazon S3 and AWS Systems Manager consoles. You can also use AWS CloudFormation to create or delete a Resource Data Sync. To use AWS CloudFormation, add the `AWS::SSM::ResourceDataSync` resource to your AWS CloudFormation template. For information, see one of the following documentation resources:

- AWS CloudFormation resource for Resource Data Sync in AWS Systems Manager (blog)
- Working with AWS CloudFormation Templates in the AWS CloudFormation User Guide

**Note**

You can use AWS Key Management Service (AWS KMS) to encrypt Inventory data in the Amazon S3 bucket. For an example of how to create an encrypted sync by using the AWS CLI and how to work with the centralized data in Amazon Athena and Amazon QuickSight, see Walkthrough: Use Resource Data Sync to Aggregate Inventory Data (p. 556).

To create and configure an Amazon S3 Bucket for Resource Data Sync

1. Open the Amazon S3 console at [https://console.aws.amazon.com/s3/](https://console.aws.amazon.com/s3/).
2. Create a bucket to store your aggregated Inventory data. For more information, see Create a Bucket in the Amazon Simple Storage Service Getting Started Guide. Make a note of the bucket name and the AWS Region where you created it.

3. Choose the Permissions tab, and then choose Bucket Policy.

4. Copy and paste the following bucket policy into the policy editor. Replace bucket-name and account-id with the name of the Amazon S3 bucket you created and a valid AWS account ID.

To enable multiple AWS accounts to send inventory data to the central Amazon S3 bucket, specify each account in the policy as shown in the following Resource sample:

```
```

Optionally, replace bucket-prefix with the name of an Amazon S3 prefix (subdirectory). If you didn't create a prefix, remove bucket-prefix/ from the ARN in the following policy.

**Note**
For information about viewing your AWS account ID, see Your AWS Account ID and Its Alias in the IAM User Guide.

5. To create a Resource Data Sync

2. In the navigation pane, choose **Managed Instances**.

-or-

If the AWS Systems Manager home page opens first, choose the menu icon (☰) to open the navigation pane, and then choose **Managed Instances**.

3. Choose **Resource Data Syncs**, and then choose **Create resource data sync**.

4. In the **Sync name** field, type a name for the sync configuration.

5. In the **Bucket name** field, type the name of the Amazon S3 bucket you created at the start of this procedure.

6. (Optional) In the **Bucket prefix** field, type the name of an Amazon S3 bucket prefix (subdirectory).

7. In the **Bucket region** field, choose **This region** if the Amazon S3 bucket you created is located in the current AWS Region. If the bucket is located in a different AWS Region, choose **Another region**, and type the name of the Region.

   **Note**

   If the sync and the target Amazon S3 bucket are located in different regions, you may be subject to data transfer pricing. For more information, see Amazon S3 Pricing.

8. In the **KMS Key ARN** field, type or paste a KMS Key ARN to encrypt inventory data in Amazon S3.

9. Choose **Create**.

To synchronize inventory data from multiple AWS Regions, you must create a Resource Data Sync in each Region. Repeat this procedure in each AWS Region where you want to collect inventory data and send it to the central Amazon S3 bucket. When you create the sync in each Region, specify the central Amazon S3 bucket in the **Bucket name** field. Then use the **Bucket region** option to choose the Region where you created the central Amazon S3 bucket, as shown in the following screen shot. The next time the association runs to collect inventory data, Systems Manager stores the data in the central Amazon S3 bucket.

### Configuring Inventory Collection

This section describes how to configure inventory collection on one or more managed instances by using the Systems Manager console. For an example of how to configure inventory collection by using the AWS CLI, see **Systems Manager Inventory Walkthroughs** (p. 552).
When you configure inventory collection, you start by creating a Systems Manager State Manager association. Systems Manager collects the inventory data when the association is run. If you don't create the association first, and attempt to invoke the aws:softwareInventory plugin by using, for example, Run Command, the system returns the following error:

```
The aws:softwareInventory plugin can only be invoked via ssm-associate.
```

Also note that an instance can have only have one Inventory association configured at a time. If you configure an instance with two or more associations, the Inventory association doesn't run and no inventory data is collected.

**Before You Begin**

Before you configure inventory collection, complete the following tasks.

- Update SSM Agent on the instances you want to inventory. By running the latest version of SSM Agent, you ensure that you can collect metadata for all supported inventory types. For information about how to update SSM Agent by using State Manager, see [Automatically Update SSM Agent (CLI)](p. 684).
- Verify that your instances meet Systems Manager prerequisites. For more information, see [Systems Manager Prerequisites](p. 12).
- (Optional) Create a Resource Data Sync to centrally store Inventory data in an Amazon S3 bucket. Resource Data Sync then automatically updates the centralized data when new Inventory data is collected. For more information, see [Configuring Resource Data Sync for Inventory](p. 520).
- (Optional) Create a JSON file to collect custom inventory. For more information, see [Working with Custom Inventory](p. 541).

**Inventory All Managed Instances in Your AWS Account**

You can easily inventory all managed instances in your AWS account by creating a global inventory association. A global inventory association performs the following actions:

- Automatically applies the global inventory configuration (association) to all existing managed instances in your AWS account. Instances that already have an inventory association are skipped when the global inventory association is applied and runs. When an instance is skipped, the detailed status message states *Overridden By Explicit Inventory Association*. Those instances are skipped by the global association, but they will still report inventory when they run their assigned inventory association.
- Automatically adds new instances created in your AWS account to the global inventory association.

**Note**

- If an instance is configured for the global inventory association, and you assign a specific association to that instance, then Systems Manager Inventory deprioritizes the global association and applies the specific association.
- Global inventory associations are available in SSM Agent version 2.0.790.0 or later. For information about how to update SSM Agent on your instances, see [Update SSM Agent by using Run Command](p. 623).

**Configuring Inventory Collection with One Click (Console)**

Use the following procedure to configure all managed instances in your AWS account and in a single AWS Region for Inventory with one click from the Systems Manager console.
To configure all of your managed instances in the current Region for Systems Manager Inventory

2. In the navigation pane, choose Inventory.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Inventory in the navigation pane.
3. In the Managed instances with inventory enabled card, choose Click here to enable inventory on all instances.

If successful, the console displays the following message.

Depending on the number of managed instances in your account, it can take several minutes for the global inventory association to be applied. Wait a few minutes and then refresh the page. Verify that the graphic changes to reflect that inventory is configured on all of your managed instances.

Configuring Collection by Using the Console

This section includes information about how to configure Systems Manager Inventory to collect metadata from your managed instances by using the Systems Manager console. You can quickly collect metadata from all instances in a specific AWS account (and any future instances that might be created in that account) or you can selectively collect Inventory data by using tags or instance IDs.

To configure inventory collection

2. In the navigation pane, choose Inventory.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Inventory in the navigation pane.
3. Choose Setup Inventory.
4. In the Targets section, identify the instances where you want to run this operation by choosing one of the following.
   - Selecting all managed instances in this account - This option selects all managed instances for which there is no existing inventory association. If you choose this option, instances that already
had inventory associations are skipped during inventory collection, and shown with a status of **Skipped** in inventory results. For more information, see Inventory All Managed Instances in Your AWS Account (p. 524).

- **Specifying a tag** - This option lets you specify a single tag to identify instances in your account from which you want to collect inventory. If you use a tag, any instances created in the future with the same tag will also report inventory. If there is an existing inventory association with all instances, using a tag to select specific instances as a target for a different inventory overrides instance membership in the **All managed instances** target group. Instances with the specified tag are skipped on future inventory collection from **All managed instances**.

- **Manually selecting instances** - This option lets you choose specific managed instances in your account. Explicitly choosing specific instances by using this option overrides inventory associations on the **All managed instances** target. The instance is skipped on future inventory collection from **All managed instances**.

5. In the **Schedule** section, choose how often you want the system to collect inventory metadata from your instances.

6. In the **Parameters** section, use the lists to enable or disable different types of inventory collection. See the following samples if you want to create an inventory search for **Files** or the **Windows Registry**.

**Files**

- On Linux, collect metadata of .sh files in the `/home/ec2-user` directory, excluding all subdirectories.

```json
{ "Path": "/home/ec2-user", "Pattern": [".*.sh", ".*.sh"], "Recursive": false }
```

- On Windows, collect metadata of all `.exe` files in the Program Files folder, including subdirectories recursively.

```json
{ "Path": "C:\Program Files", "Pattern": ["*.exe"], "Recursive": true }
```

- On Windows, collect metadata of specific log patterns.

```json
{ "Path": "C:\ProgramData\Amazon", "Pattern": ["*amazon*.log"], "Recursive": true }
```

- Limit the directory count when performing recursive collection.

```json
{ "Path": "C:\Users", "Pattern": ["*.ps1"], "Recursive": true, "DirScanLimit": 1000 }
```

**Windows Registry**

- Collect all keys and values recursively for a specific path.

```json
{ "Path": "HKEY_LOCAL_MACHINE\SOFTWARE\Amazon", "Recursive": true }
```

- Collect all keys and values for a specific path (recursive search disabled).

```json
{ "Path": "HKEY_LOCAL_MACHINE\SOFTWARE\Intel\PSIS\PSIS_DECODER", "Recursive": false }
```

- Collect a specific key by using the `ValueNames` option.

```json
{ "Path": "HKEY_LOCAL_MACHINE\SOFTWARE\Amazon\MachineImage", "ValueNames": ["AMIName"] }
```
For more information about collecting File and Windows Registry inventory, see Working with File and Windows Registry Inventory (p. 518).

7. In the Advanced section, choose Sync inventory execution logs to an S3 bucket if you want to store the association execution status in an Amazon S3 bucket.

8. Choose Setup Inventory. Systems Manager creates a State Manager association and immediately runs Inventory on the instances.

9. In the navigation pane, choose State Manager. Verify that a new association was created that uses the AWS-GatherSoftwareInventory document. Also, verify that the Status field shows Success. If you chose the option to Sync inventory execution logs to an S3 bucket, then you can view the log data in Amazon S3 after a few minutes. If you want to view inventory data for a specific instance, then choose Managed Instances in the navigation pane.

10. Choose an instance, and then choose View details.

11. On the instance details page, choose Inventory. Use the Inventory type lists to filter the inventory.

Working with Systems Manager Inventory Data

This section includes topics that describe how to query and aggregate Inventory data.

Topics
- Querying Inventory Data from Multiple Regions and Accounts (p. 527)
- Querying an Inventory Collection by Using Filters (p. 532)
- Aggregating Inventory Data (p. 532)

Querying Inventory Data from Multiple Regions and Accounts

AWS Systems Manager Inventory integrates with Amazon Athena to help you query inventory data from multiple AWS Regions and accounts. Athena integration uses Resource Data Sync so that you can view inventory data from all of your managed instances on the Inventory Detail View page in the AWS Systems Manager console.

Important
This feature uses AWS Glue to crawl the data in your Amazon Simple Storage Service (Amazon S3) bucket, and Amazon Athena to query the data. Depending on how much data is crawled and queried, you can be charged for using these services. With AWS Glue, you pay an hourly rate, billed by the second, for crawlers (discovering data) and ETL jobs (processing and loading data). With Athena, you are charged based on the amount of data scanned by each query. We encourage you to view the pricing guidelines for these services before you use Amazon Athena integration with Systems Manager Inventory. For more information, see Amazon Athena pricing and AWS Glue pricing.

You can view inventory data on the Inventory Detail View page in all AWS Regions where Amazon Athena is available.

Before you begin

Athena integration uses Resource Data Sync. You must set up and configure Resource Data Sync to use this feature. For more information, see Configuring Resource Data Sync for Inventory (p. 520).

Also, be aware that the Inventory Detail View page displays inventory data for the owner of the central Amazon S3 bucket used by Resource Data Sync. If you are not the owner of the central Amazon S3 bucket, then you won’t see inventory data on the Inventory Detail View page.
Configuring Access

Before you can query and view data from multiple accounts and Regions on the **Inventory Detail View** page in the Systems Manager console, you must configure your AWS Identity and Access Management (IAM) user account. The following procedure describes how to use the IAM console to configure your IAM user account so that you can view inventory data on the **Inventory Detail View** page.

**To configure access to the Inventory Detail View page**

2. In the navigation pane, choose **Users**, and then choose the user account you want to configure. The **Summary** page opens.
3. On the **Permissions** tab, choose **Add permissions**.
4. On the **Grant permissions** page, choose **Attach existing policies directly**.
5. In the Search field, search for **AWSQuicksightAthenaAccess**.
6. Choose the option next to this policy, and then choose **Next: Review**.
7. Choose **Add permissions**.
8. Choose the user name again to return to the **Summary** page.
9. Now add an inline policy so that AWS Glue can crawl your inventory data. On the **Permissions** tab, at the right side of the page, choose **Add inline policy**. The **Create policy** page opens.
10. Choose the **JSON** tab.
11. Delete the existing JSON text in the editor, and then copy and paste the following policy into the JSON editor.

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "VisualEditor0",
            "Effect": "Allow",
            "Action": [
                "glue:GetCrawlers",
                "glue:GetCrawler",
                "glue:GetTables",
                "glue:StartCrawler",
                "glue:CreateCrawler"
            ],
            "Resource": "*"
        },
        {
            "Sid": "VisualEditor1",
            "Effect": "Allow",
            "Action": [
                "iam:PassRole",
                "iam:CreateRole",
                "iam:AttachRolePolicy"
            ],
            "Resource": [
                "arn:aws:iam::account_ID:role/*"
            ]
        },
        {
            "Sid": "VisualEditor2",
            "Effect": "Allow",
            "Action": [
                "iam:CreatePolicy"
            ],
            "Resource": [
```
12. On the **Review Policy** page, enter a name in the **Name** field.
13. Choose **Create policy**.

**Important**

When you choose a Resource Data Sync on the **Inventory Detail View** page, Systems Manager automatically creates the **Amazon-GlueServicePolicyForSSM** role. This role enables AWS Glue to access the Amazon S3 bucket for Resource Data Sync. Systems Manager automatically attaches the following policies to the role:

- **Amazon-GlueServicePolicyForSSM-{Amazon S3 bucket name}**: This policy enables communication between AWS Glue and Systems Manager Inventory.
- **AWSGlueServiceRole**: This is an AWS managed policy that enables access to AWS Glue.

If a policy with the name **Amazon-GlueServicePolicyForSSM-{Amazon S3 bucket name}** already exists in your IAM user account, and this policy is not attached to the **Amazon-GlueServiceRoleForSSM** role, then the system returns an error. To resolve this issue, use the IAM console to verify that the contents of the **Amazon-GlueServicePolicyForSSM-{Amazon S3 bucket name}** policy match the inline policy in this procedure. Then attach the policy to the **Amazon-GlueServiceRoleForSSM** role.

**Querying Data on the Detailed Inventory View Page**

Use the following procedure to view inventory data from multiple AWS Regions and accounts on the **Detailed Inventory View** page.

**Important**

The Inventory **Detailed View** page is only available in AWS Regions that offer Amazon Athena. If the following tabs are not displayed on the Inventory page, it means Athena is not available in the Region and you can't use the **Detailed View** to query data.

To view inventory data from multiple Regions and accounts in the AWS Systems Manager console

2. In the navigation pane, choose **Inventory**.

   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Inventory** in the navigation pane.
3. Choose the **Detailed View** tab.
4. Choose the Resource Data Sync for which you want to query data.

5. In the **Inventory Type** list, choose the type of inventory data that you want to query, and then press **Enter**.

6. To filter the data, choose the Filter bar, and then choose a filter option.

The following example shows AWSComponent inventory data filtered on the us-east-2 Region.
You can use the **Export to CSV** button to view the current query set in a spreadsheet application such as Microsoft Excel. You can also use the **Query History** and **Run Advanced Queries** buttons to view history details and interact with your data in Amazon Athena.

### Editing the AWS Glue Crawler Schedule

AWS Glue crawls the Systems Manager Inventory data in the central Amazon S3 bucket twice daily, by default. If you frequently change the types of data to collect on your instances then you might want to crawl the data more frequently, as described in the following procedure.

**Important**

AWS Glue charges your account based on an hourly rate, billed by the second, for crawlers (discovering data) and ETL jobs (processing and loading data). Before you change the crawler schedule, view the [AWS Glue pricing page](https://aws.amazon.com/glue/pricing/).

**To change the inventory data crawler schedule**

2. In the navigation pane, choose **Crawlers**.
3. In the crawlers list, choose the option next to the Systems Manager Inventory data crawler. The crawler name uses the following format:

   `AWSSystemsManager-Resource_Data_Sync_bucket_name-Region-AWS_account_ID`

4. Choose **Action**, and then choose **Edit crawler**.
5. In the navigation pane, choose **Schedule**.
6. In the **Cron expression** field, specify a new schedule by using a cron format. For more information about the cron format, see [Time-Based Schedules for Jobs and Crawlers](https://docs.aws.amazon.com/glue/latest/dg/monitoring-schedules.html) in the *AWS Glue Developer Guide*. 

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**AWS Systems Manager User Guide**

**Working with Inventory Data**

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Important
You can pause the crawler to stop incurring charges from AWS Glue. If you pause the crawler, or if you change the frequency so that the data is crawled less often, then the Detailed Inventory View might display data that is not current.

Querying an Inventory Collection by Using Filters

After you collect inventory data, you can use the filter capabilities in Systems Manager to query a list of managed instances that meet certain filter criteria.

To query instances based on inventory filters

2. In the navigation pane, choose Inventory.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (Ξ) to open the navigation pane, and then choose Inventory in the navigation pane.
3. In the Filter by resource groups, tags or inventory types section, choose the filter box. A list of predefined filters appears.
4. Choose an attribute to filter on. For example, choose AWS:Application. If prompted, choose a secondary attribute to filter. For example, choose AWS:Application.Name.
5. Choose a delimiter from the list. For example, choose Begin with. A text box appears in the filter.
6. Type a value in the text box. For example, type Amazon (SSM Agent is named Amazon SSM Agent).
7. Press Enter. The system returns a list of managed instances that include an application name that begins with the word Amazon.

Note
You can combine multiple filters to refine your search.

Aggregating Inventory Data

After you configure your managed instances for AWS Systems Manager Inventory, you can view aggregated counts of Inventory data. For example, say you configured dozens or hundreds of managed instances to collect the AWS:Application Inventory type. By using the information in this section, you can see an exact count of how many instances are configured to collect this data.

You can also see specific Inventory details by aggregating on a data type. For example, the AWS:InstanceInformation Inventory type collects operating system platform information with the Platform data type. By aggregating data on the Platform data type, you can quickly see how many instances are running Windows and how many are running Linux.

The procedures in this section describe how to view aggregated counts of Inventory data by using the AWS CLI. You can also view pre-configured aggregated counts in the AWS Systems Manager console on the Inventory page. These pre-configured dashboards are called Inventory Insights and they offer one-click remediation of your Inventory configuration issues.

Note the following important details about aggregation counts of Inventory data:

- Systems Manager Inventory stores Inventory data for 30 days. This means that aggregated counts of Inventory include all data collected during the last 30 days.
- Inventory shows data that has been sent by an instance over the course of its lifetime. If an instance was previously configured to report a specific Inventory data type, for example AWS:Network, and later you change the configuration to stop collecting that type, aggregation counts still show AWS:Network data until the instance has been terminated.
• If an instance was previously configured to collect Inventory data, and you terminate that instance, Inventory counts still show data for the deleted instance for 30 days.

For information about how to quickly configure and collect Inventory data from all instances in a specific AWS account (and any future instances that might be created in that account) see Configuring Collection by Using the Console (p. 525).

Topics
• Aggregating Inventory Data to See Counts of Instances that Collect Specific Types of Data (p. 533)
• Aggregating Inventory Data with Groups to See Which Instances Are and Aren’t Configured to Collect an Inventory Type (p. 537)

Aggregating Inventory Data to See Counts of Instances that Collect Specific Types of Data

You can use the GetInventory API action to view aggregated counts of instances that collect one or more Inventory types and data types. For example, the AWS:InstanceInformation Inventory type enables you to view an aggregate of operating systems by using the GetInventory API action with the AWS:InstanceInformation.PlatformType data type. Here is an example AWS CLI command and output:

```
aws ssm get-inventory --aggregators "Expression=AWS:InstanceInformation.PlatformType"
```

The system returns information like the following.

```
{
  "Entities": [
    {
      "Data": {
        "AWS:InstanceInformation": {
          "Content": [
            {
              "Count": "7",
              "PlatformType": "windows"
            },
            {
              "Count": "5",
              "PlatformType": "linux"
            }
          ]
        }
      }
    }
  ]
}
```

Getting started

Determine the Inventory types and data types for which you want to view counts. You can view a list of Inventory types and data types that support aggregation by running the following command in the AWS CLI:

```
aws ssm get-inventory-schema --aggregator
```

The command returns a JSON list of Inventory types and data types that support aggregation. The TypeName field shows supported Inventory types. And the Name field shows each data type. For
example, in the following list, the AWS:Application Inventory type includes data types for Name and Version.

```
{
  "Schemas": [
    {
      "TypeName": "AWS:Application",
      "Version": "1.1",
      "DisplayName": "Application",
      "Attributes": [
        {
          "DataType": "STRING",
          "Name": "Name"
        },
        {
          "DataType": "STRING",
          "Name": "Version"
        }
      ]
    },
    {
      "TypeName": "AWS:InstanceInformation",
      "Version": "1.0",
      "DisplayName": "Platform",
      "Attributes": [
        {
          "DataType": "STRING",
          "Name": "PlatformName"
        },
        {
          "DataType": "STRING",
          "Name": "PlatformType"
        },
        {
          "DataType": "STRING",
          "Name": "PlatformVersion"
        }
      ]
    },
    {
      "TypeName": "AWS:ResourceGroup",
      "Version": "1.0",
      "DisplayName": "ResourceGroup",
      "Attributes": [
        {
          "DataType": "STRING",
          "Name": "Name"
        }
      ]
    },
    {
      "TypeName": "AWS:Service",
      "Version": "1.0",
      "DisplayName": "Service",
      "Attributes": [
        {
          "DataType": "STRING",
          "Name": "Name"
        },
        {
          "DataType": "STRING",
          "Name": "DisplayName"
        },
        {
          "DataType": "STRING",
          "Name": "Version"
        }
      ]
    }
  ]
}
```
You can aggregate data for any of the listed Inventory types by creating a command that uses the following syntax:

```bash
code
aws ssm get-inventory --aggregators "Expression=InventoryType.DataType"
```

Here are some examples.

**Example 1**

This example aggregates a count of the Windows roles used by your instances.

```bash
code
aws ssm get-inventory --aggregators "Expression=AWS:WindowsRole.Name"
```

**Example 2**

This example aggregates a count of the applications installed on your instances.

```bash
code
aws ssm get-inventory --aggregators "Expression=AWS:Application.Name"
```

**Combining Multiple Aggregators**

You can also combine multiple Inventory types and data types in one command to help you better understand the data. Here are some examples.
Example 1

This example aggregates a count of the operating system types used by your instances. It also returns the specific name of the operating systems.

```
aws ssm get-inventory --aggregators '[["Expression": "AWS:InstanceInformation.PlatformType", "Aggregators":[{"Expression": "AWS:InstanceInformation.PlatformName"}]]]
```

Example 2

This example aggregates a count of the applications running on your instances and the specific version of each application.

```
```

If you prefer, you can create an aggregation expression with one or more Inventory types and data types in a JSON file and call the file from the AWS CLI. The JSON in the file must use the following syntax:

```
[  
  {  
    "Expression": "string",
    "Aggregators": [
      
      
    ]
  }
]
```

You must save the file with the .json file extension.

Here is an example that uses multiple Inventory types and data types.

```
[  
  {  
    "Expression": "AWS:Application.Name",
    "Aggregators": [
      
      
      
      
    ]
  }
]
```

Use the following command to call the file from the AWS CLI.

```
aws ssm get-inventory --aggregators file://file_name.json
```

The command returns information like the following:

```
{"Entities": [  
]}
```
Aggregating Inventory Data with Groups to See Which Instances Are and Aren't Configured to Collect an Inventory Type

Groups enable you to quickly see a count of which managed instances are and aren't configured to collect one or more Inventory types. With groups, you specify one or more Inventory types and a filter that uses the exists operator.

For example, say that you have four managed instances configured to collect the following Inventory types:

- Instance 1: AWS:Application
- Instance 2: AWS:File
- Instance 3: AWS:Application, AWS:File
- Instance 4: AWS:Network

You can run the following command from the AWS CLI to see how many instances are configured to collect both the AWS:Application and AWS:File Inventory types. The response also returns a count of how many instance aren't configured to collect both of these Inventory types.

```
aws ssm get-inventory --aggregators
'Groups=[
{Name=ApplicationAndFile,Filters=[
{Key=TypeName,Values=[AWS:Application],Type=Exists},
{Key=TypeName,Values=[AWS:File],Type=Exists}
]}]
'
```

The command response shows that only one managed instance is configured to collect both the AWS:Application and AWS:File Inventory types.
Groups don't return data type counts. Also, you can't drill-down into the results to see the instances IDs that are or aren't configured to collect the inventory type.

If you prefer, you can create an aggregation expression with one or more inventory types in a JSON file and call the file from the AWS CLI. The JSON in the file must use the following syntax:

```json
{
    "Aggregators": [
        {
            "Groups": [
                {
                    "Name": "Name",
                    "Filters": [
                        {
                            "Key": "TypeName",
                            "Values": [
                                "Inventory_type",
                                "Inventory_type"
                            ],
                            "Type": "Exists"
                        }
                    ]
                }
            ]
        }
    ]
}
```

You must save the file with the .json file extension.

Use the following command to call the file from the AWS CLI.

```bash
aws ssm get-inventory --cli-input-json file://file_name.json
```

**Additional examples**
The following examples show you how to aggregate Inventory data to see which managed instances are and aren't configured to collect the specified Inventory types. These examples use the AWS CLI. Each example includes a full command with filters that you can run from the command line and a sample input.json file if you prefer to enter the information in a file.

**Example 1**

This example aggregates a count of instances that are and aren't configured to collect either the AWS:Application or the AWS:File Inventory types.

Run the following command from the AWS CLI.

```
aws ssm get-inventory --aggregators 'Groups=[{Name=ApplicationORFile,Filters=[{Key=TypeName,Values=[AWS:Application, AWS:File],Type=Exists}]}]
```

If you prefer to use a file, copy and paste the following sample into a file and save it as input.json.

```
{
  "Aggregators":
  {
    "Groups":
    {
      "Name":"ApplicationORFile",
      "Filters":
      {
        "Key":"TypeName",
        "Values":
        {
          "AWS:Application",
          "AWS:File"
        },
        "Type":"Exists"
      }
    }
  }
}
```

Run the following command from the AWS CLI.

```
aws ssm get-inventory --cli-input-json file://input.json
```

The command returns information like the following:

```
{
  "Entities":
  {
    "Data":
    "ApplicationORFile":
    {
      "Content":
      {
        "notMatchingCount":"1",
      },
      "matchingCount":"3"
    }
  }
}
```
Example 2

This example aggregates a count of instances that are and aren't configured to collect the
AWS:Application, AWS:File, and AWS:Network inventory types.

Run the following command from the AWS CLI.

```
aws ssm get-inventory --aggregators
'Groups=[
{Name=Application, Filters=[
{Key=TypeName, Values=[AWS:Application], Type=Exists}]
},
{Name=File, Filters=[
{Key=TypeName, Values=[AWS:File], Type=Exists}]
},
{Name=Network, Filters=[
{Key=TypeName, Values=[AWS:Network], Type=Exists}]
}]
'
```

If you prefer to use a file, copy and paste the following sample into a file and save it as input.json.

```
{
  "Aggregators":[
    {
      "Groups":[
        {
          "Name": "Application",
          "Filters": [
            {
              "Key": "TypeName",
              "Values": [
                "AWS:Application"
              ],
              "Type": "Exists"
            }
          ]
        },
        {
          "Name": "File",
          "Filters": [
            {
              "Key": "TypeName",
              "Values": [
                "AWS:File"
              ],
              "Type": "Exists"
            }
          ]
        },
        {
          "Name": "Network",
          "Filters": [
            {
              "Key": "TypeName",
              "Values": [
                "AWS:Network"
              ],
              "Type": "Exists"
            }
          ]
        }
      ]
    }
  ]
}
```
Run the following command from the AWS CLI.

```bash
aws ssm get-inventory --cli-input-json file://input.json
```

The command returns information like the following:

```json
{
  "Entities": [
    {
      "Data": {
        "Application": {
          "Content": [
            {
              "notMatchingCount": "2"
            },
            {
              "matchingCount": "2"
            }
          ]
        },
        "File": {
          "Content": [
            {
              "notMatchingCount": "2"
            },
            {
              "matchingCount": "2"
            }
          ]
        },
        "Network": {
          "Content": [
            {
              "notMatchingCount": "3"
            },
            {
              "matchingCount": "1"
            }
          ]
        }
      }
    }
  ]
}
```

**Working with Custom Inventory**

You can assign any metadata you want to your instances by creating custom inventory. For example, let's say you manage a large number of servers in racks in your data center, and these servers have been configured as Systems Manager managed instances. Currently, you store information about server rack location in a spreadsheet. With custom inventory, you can specify the rack location of each instance as metadata on the instance. When you collect inventory by using Systems Manager, the metadata is collected with other inventory metadata. You can then port all inventory metadata to a central Amazon S3 bucket by using Resource Data Sync and query the data.

**Note**

Systems Manager supports a maximum of 20 custom inventory types per AWS account.
To assign custom inventory to an instance, you can either use the Systems Manager `PutInventory` API action, as described in *Walkthrough: Assign Custom Inventory Metadata to an Instance* (p. 553). Or, you can create a custom inventory JSON file and upload it to the instance. This section describes how to create the JSON file.

The following example JSON file with custom inventory specifies rack information about an on-premises server. This example specifies one type of custom inventory data (`"TypeName": "Custom:RackInformation"`), with multiple entries under `Content` that describe the data.

```json
{
    "SchemaVersion": "1.0",
    "TypeName": "Custom:RackInformation",
    "Content": {
        "Location": "US-EAST-02.CMH.RACK1",
        "InstalledTime": "2016-01-01T01:01:01Z",
        "vendor": "DELL",
        "Zone": "BJS12",
        "TimeZone": "UTC-8"
    }
}
```

You can also specify distinct entries in the `Content` section, as shown in the following example.

```json
{
    "SchemaVersion": "1.0",
    "TypeName": "Custom:PuppetModuleInfo",
    "Content": [{
        "Name": "puppetlabs/aws",
        "Version": "1.0"
    },
    { "Name": "puppetlabs/dsc",
        "Version": "2.0"
    }
]
}
```

The JSON schema for custom inventory requires `SchemaVersion`, `TypeName`, and `Content` sections, but you can define the information in those sections.

```json
{
    "SchemaVersion": "user_defined",
    "TypeName": "Custom:user_defined",
    "Content": {
        "user_defined_attribute1": "user_defined_value1",
        "user_defined_attribute2": "user_defined_value2",
        "user_defined_attribute3": "user_defined_value3",
        "user_defined_attribute4": "user_defined_value4"
    }
}
```

TypeName is limited to 100 characters. Also, the `TypeName` section must start with Custom. For example, `Custom:PuppetModuleInfo`. Both Custom and the `Data` you specify must begin with a capital letter. The following examples would cause an exception: "CUSTOM:RackInformation", "custom:rackinformation".

The `Content` section includes attributes and `data`. These items are not case-sensitive. However, if you define an attribute (for example: "Vendor": "DELL"), then you must consistently reference this attribute in your custom inventory files. If you specify "Vendor": "DELL" (using a capital "V" in vendor) in one file, and
then you specify "vendor": "DELL" (using a lowercase "v" in vendor) in another file, the system returns an error.

Note
You must save the file with a .json extension.

After you create the file, you must save it on the instance. The following table shows the location where custom inventory JSON files must be stored on the instance:

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>%SystemDrive%\ProgramData\Amazon\SSM\InstanceData&lt;instance-id&gt;\inventory\custom</td>
</tr>
<tr>
<td>Linux</td>
<td>/var/lib/amazon/ssm/&lt;instance-id&gt;/inventory/custom</td>
</tr>
</tbody>
</table>

For an example of how to use custom inventory, see Get Disk Utilization of Your Fleet Using EC2 Systems Manager Custom Inventory Types.

Deleting Custom Inventory

You can use the DeleteInventory API action to delete a custom inventory type and the data associated with that type. You call the delete-inventory command by using the AWS CLI to delete all data for an inventory type. You call the delete-inventory command with the SchemaDeleteOption to delete a custom inventory type.

Note
An inventory type is also called an inventory schema.

The SchemaDeleteOption parameter includes the following options:

- **DeleteSchema**: This option deletes the specified custom type and all data associated with it. You can recreate the schema later, if you want.
- **DisableSchema**: If you choose this option, the system disables the current version, deletes all data for it, and ignores all new data if the version is less than or equal to the disabled version. You can enable this inventory type again by calling the PutInventory action for a version greater than the disabled version.

To delete or disable custom inventory by using the AWS CLI

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to use the dry-run option to see which data will be deleted from the system. This command doesn't delete any data.

   ```bash
   aws ssm delete-inventory --type-name "Custom:custom_type_name" --dry-run
   ```

   The system returns information like the following.

   ```json
   {
     "DeletionSummary": {
       "RemainingCount": 3,
       "SummaryItems": [
         {
           "Count": 2,
           "Count": 3
         }
       ]
     }
   }```
For information about how to understand the delete inventory summary, see Understanding the Delete Inventory Summary (p. 547).

3. Run the following command to delete all data for a custom inventory type.

```
aws ssm delete-inventory --type-name "Custom:custom_type_name"
```

**Note**

The output of this command doesn't show the deletion progress. For this reason, TotalCount and Remaining Count are always the same because the system has not deleted anything yet. You can use the describe-inventory-deletions command to show the deletion progress, as described later in this topic.

The system returns information like the following.

```json
{
    "DeletionId": "system_generated_deletion_ID",
    "DeletionSummary":{
        "RemainingCount":3,
        "SummaryItems":[
            {
                "Count":2,
                "RemainingCount":2,
                "Version":"1.0"
            },
            {
                "Count":1,
                "RemainingCount":1,
                "Version":"2.0"
            }
        ],
        "TotalCount":3
    },
    "TypeName":"custom_type_name"
}
```

The system deletes all data for the specified custom inventory type from the Systems Manager Inventory service.

4. Run the following command. The command performs the following actions for the current version of the inventory type: disables the current version, deletes all data for it, and ignores all new data if the version is less than or equal to the disabled version.

```
aws ssm delete-inventory --type-name "Custom:custom_type_name" --schema-delete-option "DisableSchema"
```

The system returns information like the following.
You can view a disabled inventory type by using the following command.

```
aws ssm get-inventory-schema --type-name Custom:custom_type_name
```

5. Run the following command to delete an inventory type.

```
aws ssm delete-inventory --type-name "Custom:custom_type_name" --schema-delete-option "DeleteSchema"
```

The system deletes the schema and all inventory data for the specified custom type.

The system returns information like the following.

```json
{
  "DeletionId": "system_generated_deletion_ID",
  "DeletionSummary": {
    "RemainingCount": 3,
    "SummaryItems": [
      {
        "Count": 2,
        "RemainingCount": 2,
        "Version": "1.0"
      },
      {
        "Count": 1,
        "RemainingCount": 1,
        "Version": "2.0"
      }
    ],
    "TotalCount": 3
  },
  "TypeName": "Custom:custom_type_name"
}
```
Viewing the Deletion Status

You can check the status of a delete operation by using the describe-inventory-deletions AWS CLI command. You can specify a deletion ID to view the status of a specific delete operation. Or, you can omit the deletion ID to view a list of all deletions run in the last 30 days.

1. Run the following command to view the status of a deletion operation. The system returned the deletion ID in the delete-inventory summary.

   ```bash
   aws ssm describe-inventory-deletions --deletion-id system_generated_deletion_ID
   ```

   The system returns the latest status. The delete operation might not be finished yet. The system returns information like the following.

   ```json
   {"InventoryDeletions": [
   {"DeletionId": "system_generated_deletion_ID",
   "DeletionStartTime": 15217444844,
   "DeletionSummary": {
   "RemainingCount": 1,
   "SummaryItems": [
   {"Count": 1,
   "RemainingCount": 1,
   "Version": "1.0"}
   ],
   "TotalCount": 1},
   "LastStatus": "InProgress",
   "LastStatusMessage": "The Delete is in progress",
   "LastStatusUpdateTime": 15217444844,
   "TypeName": "Custom:custom_type_name"}
   ]
   }
   ```

   If the delete operation is successful, the LastStatusMessage states: Deletion is successful.

   ```json
   {"InventoryDeletions": [
   {"DeletionId": "system_generated_deletion_ID",
   "DeletionStartTime": 15217444844,
   "DeletionSummary": {
   "RemainingCount": 0,
   "SummaryItems": [
   {"Count": 1,
   "RemainingCount": 0,
   "Version": "1.0"}
   ],
   "TotalCount": 1},
   "LastStatus": "Complete",
   "LastStatusMessage": "Deletion is successful",
   "LastStatusUpdateTime": 1521745253,
   "TypeName": "Custom:custom_type_name"}
   ]
   }
   ```

2. Run the following command to view a list of all deletions run in the last 30 days.

   ```bash
   aws ssm describe-inventory-deletions --max-results a number
   ```
Understanding the Delete Inventory Summary

To help you understand the contents of the delete inventory summary, consider the following example. A user assigned Custom:RackSpace inventory to three instances. Inventory items 1 and 2 use custom type version 1.0 ("SchemaVersion":"1.0"). Inventory item 3 uses custom type version 2.0 ("SchemaVersion":"2.0").

RackSpace custom inventory 1

```json
{}
```
RackSpace custom inventory 2

```json
{
  "TypeName":"CustomType:RackSpace",
  "InstanceId":"i-1234567891",
  "SchemaVersion":"1.0"  "Content":
  {
    content of custom type omitted
  }
}
```

RackSpace custom inventory 3

```json
{
  "TypeName":"CustomType:RackSpace",
  "InstanceId":"i-1234567892",
  "SchemaVersion":"2.0"  "Content":
  {
    content of custom type omitted
  }
}
```

The user runs the following command to preview which data will be deleted.

```
aws ssm delete-inventory --type-name "Custom:RackSpace" --dry-run
```

The system returns information like the following.

```json
{
  "DeletionId":"1111-2222-333-444-66666",
  "DeletionSummary":{
    "RemainingCount":3,
    "TotalCount":3,
    TotalCount and RemainingCount are the number of items that would be deleted if this was not a dry run. These numbers are the same because the system didn't delete anything.
    "SummaryItems":[
      {
        "Count":2,
        Neither item was deleted.
        "RemainingCount":2,
        "Version":"1.0"
      },
      {
        "Count":1,
        This item was not deleted.
        "RemainingCount":1,
      }
  }
}
```

The system found two items that use SchemaVersion 1.0.
The system found one item that uses SchemaVersion 1.0.
The user runs the following command to delete the Custom:RackSpace inventory.

**Note**
The output of this command doesn't show the deletion progress. For this reason, TotalCount and Remaining Count are always the same because the system has not deleted anything yet. You can use the describe-inventory-deletions command to show the deletion progress.

```shell
aws ssm delete-inventory --type-name "Custom:RackSpace"
```

The system returns information like the following.

```json
{
    "DeletionId":"1111-2222-333-444-7777777",
    "DeletionSummary":{
        "RemainingCount":3,
        "SummaryItems":[
            {
                "Count":2,
                "RemainingCount":2,
                "Version":"1.0"
            },
            {
                "Count":1,
                "RemainingCount":1,
                "Version":"2.0"
            }
        ]
    },
    "TotalCount":3
},
"TypeName":"RackSpace"
}
```

**Viewing Inventory Delete Actions in CloudWatch Events**

You can configure Amazon CloudWatch Events to create an event anytime a user deletes custom inventory. CloudWatch Events offers three types of events for custom inventory delete operations:

- **Delete action for an instance**: If the custom inventory for a specific managed instance was successfully deleted or not.
- **Delete action summary**: A summary of the delete action.
- **Warning for disabled custom inventory type**: A warning event if a user called the PutInventory API action for a custom inventory type version that was previously-disabled.

Here are examples of each event:

**Delete action for an instance**

```json
{
    "version":0,
    "id":"998c9cde-56c0-b38b-707f-0411b3ff9d11",
    "detail-type":"Inventory Resource State Change",
    "source":"aws.ssm",
```
Delete action summary

```

```

Warning for disabled custom inventory type

```

```

```
Use the following procedure to create a CloudWatch Events rule for custom inventory delete operations. This procedure shows you how to create a rule that sends notifications for custom inventory delete operations to an Amazon SNS topic. Before you begin, verify that you have an Amazon SNS topic, or create a new one. For more information, see Getting Started in the Amazon Simple Notification Service Developer Guide.

To configure CloudWatch Events for delete inventory operations

1. Sign in to the AWS Management Console and open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. In the left navigation pane, choose Events, and then choose Create rule.
3. Under Event Source, verify that Event Pattern is selected.
4. In the Service Name field, choose EC2 Simple Systems Manager (SSM).
5. In the Event Type field, choose Inventory.
6. Verify that Any detail type is selected, and then choose Add targets.
7. In the Select target type list, choose SNS topic, and then choose your topic from the list.
8. In the Configure input list, verify that Matched event is selected.
10. Specify a name and a description, and then choose Create rule.

Viewing Inventory History and Change Tracking

You can view Inventory history and change tracking for all of your managed instances by using AWS Config. AWS Config provides a detailed view of the configuration of AWS resources in your AWS account. This includes how the resources are related to one another and how they were configured in the past so that you can see how the configurations and relationships change over time. To view Inventory history and change tracking, you must enable the following resources in AWS Config.

- SSM:ManagedInstanceInventory
- SSM:PatchCompliance
- SSM:AssociationCompliance

Note
By enabling SSM:PatchCompliance and SSM:AssociationCompliance, you can view Patch Manager patching and State Manager association compliance history and change tracking. For more information about compliance management for these resources, see Working With Configuration Compliance (p. 507).

The following procedure describes how to enable Inventory history and change-track recording in AWS Config by using the AWS CLI. For more information about how to choose and configure these resources in AWS Config, see Selecting Which Resources AWS Config Records in the AWS Config Developer Guide. For information about AWS Config pricing, see Pricing.

Before You Begin
AWS Config requires AWS Identity and Access Management (IAM) permissions to get configuration details about Systems Manager resources. In the following procedure, you must specify an Amazon Resource Name (ARN) for an IAM role that gives AWS Config permission to Systems Manager resources. You can attach the AWSConfigRole managed policy to the IAM role that you assign to AWS Config. For information about how to create an IAM role and assign the AWSConfigRole managed policy to that role, see Creating a Role to Delegate Permissions to an AWS Service in the IAM User Guide.
To enable Inventory history and change-track recording in AWS Config

1. Install and configure the AWS CLI, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58).

2. Copy and paste the following JSON sample into a simple text file and save it as recordingGroup.json.

   ```json
   {
     "allSupported":false,
     "includeGlobalResourceTypes":false,
     "resourceTypes":[
       "AWS::SSM::AssociationCompliance",
       "AWS::SSM::PatchCompliance",
       "AWS::SSM::ManagedInstanceInventory"
     ]
   }
   ```

3. Run the following command to load the recordingGroup.json file into AWS Config.

   ```bash
   aws configservice put-configuration-recorder --configuration-recorder
   name=myRecorder,roleARN=arn:aws:iam::123456789012:role/myConfigRole
   --recording-group file://recordingGroup.json
   ```

4. Run the following command to start recording Inventory history and change tracking.

   ```bash
   aws configservice start-configuration-recorder --configuration-recorder-name myRecorder
   ```

After you configure history and change tracking, you can drill down into the history for a specific managed instance by choosing the AWS Config button in the Systems Manager console.

You can access the AWS Config button from either the Managed Instances page or the Inventory page. Depending on your monitor size, you might need to scroll to the right side of the page to see the button.

**Systems Manager Inventory Walkthroughs**

Use the following walkthroughs to collect and manage Inventory data. We recommend that you initially perform these walkthroughs with managed instances in a test environment.

**Before You Begin**

Before you start these walkthroughs, complete the following tasks.

- Update SSM Agent on the instances you want to inventory. By running the latest version of SSM Agent, you ensure that you can collect metadata for all supported inventory types. For information about how to update SSM Agent by using State Manager, see Automatically Update SSM Agent (CLI) (p. 684).
- Verify that your instances meet Systems Manager prerequisites. For more information, see Systems Manager Prerequisites (p. 12).
- (Optional) Create a JSON file to collect custom inventory. For more information, see Working with Custom Inventory (p. 541).

**Contents**

- Walkthrough: Assign Custom Inventory Metadata to an Instance (p. 553)
- Walkthrough: Configure Your Managed Instances for Inventory by Using the CLI (p. 554)
Walkthrough: Assign Custom Inventory Metadata to an Instance

The following procedure walks you through the process of using the `PutInventory` API action to assign custom Inventory metadata to a managed instance. This example assigns rack location information to an instance. For more information about custom Inventory, see Working with Custom Inventory (p. 541).

**To assign custom Inventory metadata to an instance**

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to assign rack location information to an instance.
   ```bash
   aws ssm put-inventory --instance-id "ID" --items '[
   "CaptureTime": "2016-08-22T10:01:01Z",
   "TypeName": "Custom:RackInfo",
   "Content": [
   "RackLocation": "Bay B/Row C/Rack D/Shelf E"
   ],
   "SchemaVersion": "1.0"
   ]'
   ``
3. Run the following command to view custom inventory entries for this instance.
   ```bash
   aws ssm list-inventory-entries --instance-id "ID" --type-name "Custom:RackInfo"
   ``
   The system responds with information like the following.
   ```json
   {
     "InstanceId": "ID",
     "TypeName": "Custom:RackInfo",
     "Entries": [
       {
         "RackLocation": "Bay B/Row C/Rack D/Shelf E"
       },
     ],
     "SchemaVersion": "1.0",
     "CaptureTime": "2016-08-22T10:01:01Z"
   }
   ``
4. Run the following command to view the custom inventory schema.
   ```bash
   aws ssm get-inventory-schema --type-name Custom:RackInfo
   ``
   The system responds with information like the following.
   ```json
   {
     "Schemas": [
       {
         "TypeName": "Custom:RackInfo",
         "Version": "1.0",
         "Attributes": [
           {
             "DataType": "STRING",
             "Name": "RackLocation"
           }
         ]
       }
     ]
   }
   ```
Walkthrough: Configure Your Managed Instances for Inventory by Using the CLI

The following procedures walk you through the process of configuring Inventory to collect metadata from your managed instances. When you configure Inventory collection, you start by creating a Systems Manager State Manager association. Systems Manager collects the Inventory data when the association is run. If you don't create the association first, and attempt to invoke the aws:softwareInventory plugin by using, for example, Run Command, the system returns the following error:

The aws:softwareInventory plugin can only be invoked via ssm-associate.

**Note**
An instance can have only one Inventory association configured at a time. If you configure an instance with two or more Inventory associations, the association doesn't run and no inventory data is collected.

Quickly Configure All of Your Managed Instances for Inventory (CLI)

You can quickly configure all managed instances in your AWS account and in the current Region to collect inventory data. This is called creating a global inventory association. To create a global inventory association by using the AWS CLI, use the wildcard option for the `instanceIds` value, as shown in the following procedure.

**To configure inventory for all managed instances in your AWS account and in the current Region (CLI)**

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command.

   ```bash
   aws ssm create-association --name AWS-GatherSoftwareInventory --targets
   Key=InstanceIds,Values=* --schedule-expression "rate(1 day)" --parameters
   applications=Enabled,awsComponents=Enabled,customInventory=Enabled,instanceDetailedInformation=Enabled,networkConfig=Enabled,services=Enabled,windowsRoles=Enabled,windowsUpdates=Enabled
   ```

   **Note**
   This command does not enable inventory of file or Windows Registry metadata. To inventory these datatypes, use the next procedure.

Manually Configuring Inventory on Your Managed Instances (CLI)

Use the following procedure to manually configure Inventory on your managed instances by using instance IDs or tags.

**To manually configure your managed instances for inventory (CLI)**

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to create a State Manager association that runs Inventory on the instance. This command configures the service to run every six hours and to collect network configuration, Windows Update, and application metadata from an instance.

   ```bash
   aws ssm create-association --name "AWS-GatherSoftwareInventory" --targets
   "Key=instanceIds,Values=an instance ID" --schedule-expression "cron(0 0/30 * 1/1 * ? *)" --output-location "{ "S3Location": { "OutputS3Region": "region-id" }, "OutputS3Region": "region-id" },
   ```

   **Note**
   This command does not enable inventory of file or Windows Registry metadata. To inventory these datatypes, use the next procedure.
"OutputS3BucketName": "Test bucket", "OutputS3KeyPrefix": "Test\" } }" --
parameters "networkConfig=Enabled, windowsUpdates=Enabled, applications=Enabled"

region-id represents the AWS Region where the instance is located, such as us-east-2 for the US
East (Ohio) Region.

The system responds with information like the following.

You can target large groups of instances by using the Targets parameter with EC2 tags. For
example:

```
aws ssm create-association --name "AWS-GatherSoftwareInventory" --targets
"Key=tag:Environment,Values=Production" --schedule-expression "cron(0 0/30 * 1/1
* ? *)" --output-location "{ "S3Location": { "OutputS3Region": "us-east-2", "OutputS3BucketName": "Test bucket", "OutputS3KeyPrefix": "Test\" } }" --
parameters "networkConfig=Enabled, windowsUpdates=Enabled, applications=Enabled"
```

You can also inventory files and Windows Registry keys on a Windows instance by using the files
and windowsRegistry inventory types with expressions. For more information about these
inventory types, see Working with File and Windows Registry Inventory (p. 518).
aws ssm create-association --name "AWS-GatherSoftwareInventory" --targets "Key=instanceids,Values=i-0704358e3a3da9eb1" --schedule-expression "cron(0 0/30 * 1/1 * ? *)" --parameters '{"files": [{"Path": "C:\Program Files", "Pattern": ["*.exe"], "Recursive": true}], "windowsRegistry": [{"Path": "HKEY_LOCAL_MACHINE\Software\Amazon", "Recursive": true}]}' --profile dev-pdx

3. Run the following command to view the association status.

aws ssm describe-instance-associations-status --instance-id an instance ID

The system responds with information like the following.

```json
{
  "InstanceAssociationStatusInfos": [
    {
      "Status": "Pending",
      "DetailedStatus": "Associated",
      "Name": "reInvent2016PolicyDocumentTest",
      "InstanceId": "i-1a2b3c4d5e6f7g",
      "AssociationId": "1a2b3c4d5e6f7g-1a2b3c-1a2b3c-1a2b3c-1a2b3c4d5e6f7g",
      "DocumentVersion": "1"
    }
  ]
}
```

Walkthrough: Use Resource Data Sync to Aggregate Inventory Data

The following walkthrough describes how to create a Resource Data Sync configuration by using the AWS CLI. A Resource Data Sync automatically ports Inventory data from all of your managed instances to a central Amazon S3 bucket. The sync automatically updates the data in the central Amazon S3 bucket whenever new Inventory data is discovered. This walkthrough also describes how to use Amazon Athena and Amazon QuickSight to query and analyze the aggregated data. For information about creating a Resource Data Sync by using the Amazon EC2 console, see Configuring Resource Data Sync for Inventory (p. 520).

**Note**
This walkthrough includes information about how to encrypt the sync by using AWS Key Management Service (AWS KMS). Inventory does not collect any user-specific, proprietary, or sensitive data so encryption is optional. For more information about AWS KMS, see AWS Key Management Service Developer Guide.

**Before You Begin**

Before you start this walkthrough, you must collect Inventory metadata from your managed instances. For the purpose of the Amazon Athena and Amazon QuickSight sections in this walkthrough, we recommend that you collect Application metadata. For more information about how to collect Inventory data, see Walkthrough: Configure Your Managed Instances for Inventory by Using the CLI (p. 554).

(Optional) If you want to encrypt the sync by using AWS KMS, then you must either create a new key that includes the following policy, or you must update an existing key and add this policy to it.

```json
{
  "Version": "2012-10-17",
  "Id": "ssm-access-policy",
  "Statement": [
```
To create a Resource Data Sync for Inventory

1. Open the Amazon S3 console at https://console.aws.amazon.com/s3/.
2. Create a bucket to store your aggregated Inventory data. For more information, see Create a Bucket in the Amazon Simple Storage Service Getting Started Guide. Make a note of the bucket name and the AWS Region where you created it.
3. After you create the bucket, choose the Permissions tab, and then choose Bucket Policy.
4. Copy and paste the following bucket policy into the policy editor. Replace `bucket-name` and `account-id` with the name of the Amazon S3 bucket you created and a valid AWS account ID. Optionally, replace `bucket-prefix` with the name of an Amazon S3 prefix (subdirectory). If you did not create a prefix, remove `bucket-prefix/` from the ARN in the policy.

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "SSMBucketPermissionsCheck",
            "Effect": "Allow",
            "Principal": {
                "Service": "ssm.amazonaws.com"
            },
            "Action": "s3:GetBucketAcl",
            "Resource": "arn:aws:s3:::bucket-name"
        },
        {
            "Sid": "SSMBucketDelivery",
            "Effect": "Allow",
            "Principal": {
                "Service": "ssm.amazonaws.com"
            },
            "Action": "s3:PutObject",
            "Resource": "arn:aws:s3:::bucket-name/bucket-prefix/*",
            "Condition": {
                "StringEquals": {
                    "s3:x-amz-acl": "bucket-owner-full-control"
                }
            }
        }
    ]
}
```

5. (Optional) If you want to encrypt the sync, then you must add the following policy to the bucket. Repeat the previous step to add the following policy to the bucket.

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "ssm-access-policy-statement",
            "Action": [
                "kms:GenerateDataKey"
            ],
            "Effect": "Allow",
            "Principal": {
                "Service": "ssm.amazonaws.com"
            },
            "Resource": "arn:aws:kms:region:AWS-account-ID:key/KMS-key-id"
        }
    ]
}
```
6. Install and configure the AWS CLI, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58).

7. (Optional) If you want to encrypt the sync, run the following command to verify that the bucket policy is enforcing the KMS key requirement.

   ```bash
   aws s3 cp ./A file in the bucket s3://bucket-name/prefix/ --sse aws:kms --sse-kms-key-id "arn:aws:kms:region:AWS-account-ID:key/KMS-key-ID" --region region
   ```

8. Run the following command to create a Resource Data Sync configuration with the Amazon S3 bucket you created at the start of this procedure. This command creates a sync from the AWS Region you are currently logged into.

   **Note**

   If the sync and the target Amazon S3 bucket are located in different regions, you may be subject to data transfer pricing. For more information, see Amazon S3 Pricing.

   ```bash
   aws ssm create-resource-data-sync --sync-name a name --s3-destination "BucketName=the name of the S3 bucket,Prefix=the name of the prefix, if specified,SyncFormat=JsonSerDe,Region=the region where the S3 bucket was created"
   ```

   You can use the region parameter to specify where the sync configuration should be created. In the following example, Inventory data from the us-west-1 Region, will be synchronized in the Amazon S3 bucket in the us-west-2 Region.

   ```bash
   aws ssm create-resource-data-sync --sync-name InventoryDataWest --s3-destination "BucketName=InventoryData,Prefix=HybridEnv,SyncFormat=JsonSerDe,Region=us-west-2" --region us-west-1
   ```

   (Optional) If you want to encrypt the sync by using AWS KMS, run the following command to create the sync. If you encrypt the sync, then the AWS KMS key and the Amazon S3 bucket must be in the same Region.

   ```bash
   aws ssm create-resource-data-sync --sync-name sync-name --s3-destination "BucketName=bucket-name,Prefix=prefix,SyncFormat=JsonSerDe,AWSKMSKeyARN=arn:aws:kms:region:AWS-account-ID:key/KMS-key-id,Region=bucket-region" --region region
   ```

9. Run the following command to view the status of sync configuration.

   ```bash
   aws ssm list-resource-data-sync
   ```
If you created the sync configuration in a different Region, then you must specify the region parameter, as shown in the following example.

```bash
aws ssm list-resource-data-sync --region us-west-1
```

10. After the sync configuration is created successfully, browse the target bucket in Amazon S3. Inventory data should appear within a few minutes.

**Working with the Data in Amazon Athena**

The following section describes how to view and query the data in Amazon Athena. Before you begin, we recommend that you learn about Athena. For more information, see What is Amazon Athena? and Working with Data in the *Amazon Athena User Guide*.

**To view and query the data in Amazon Athena**

2. Copy and paste the following statement into the query editor and then choose Run Query.

   ```sql
   CREATE DATABASE ssminventory
   ```

   The system creates a database called ssminventory.

3. Copy and paste the following statement into the query editor and then choose Run Query. Replace `bucket-name` and `bucket-prefix` with the name and prefix of the Amazon S3 target.

   ```sql
   CREATE EXTERNAL TABLE IF NOT EXISTS ssminventory.AWS_Application (
   Name string,
   ApplicationType string,
   Publisher string,
   Version string,
   InstalledTime string,
   Architecture string,
   URL string,
   Summary string,
   PackageId string
   )
   PARTITIONED BY (AccountId string, Region string, ResourceType string)
   ROW FORMAT SERDE 'org.openx.data.jsonserde.JsonSerDe'
   WITH SERDEPROPERTIES ( 'serialization.format' = '1'
   ) LOCATION 's3://bucket-name/bucket-prefix/AWS:Application/
   ```

4. Copy and paste the following statement into the query editor and then choose Run Query.

   ```sql
   MSCK REPAIR TABLE ssminventory.AWS_Application
   ```

   The system partitions the table.

   **Note**
   If you create Resource Data Syncs from additional AWS Regions or accounts, then you must run this command again to update the partitions. You may also need to update your Amazon S3 bucket policy.

5. To preview your data, choose the view icon next to the AWS_Application table.
6. Copy and paste the following statement into the query editor and then choose **Run Query**.

```sql
SELECT a.name, a.version, count(a.version) frequency
from aws_application a where
a.name = 'aws-cfn-bootstrap'
group by a.name, a.version
order by frequency desc
```

The query returns a count of different versions of aws-cfn-bootstrap, which is an AWS application present on Amazon EC2 Linux and Windows instances.

7. Individually copy and paste the following statements into the query editor, replace `bucket-name` and `bucket-prefix` with information for Amazon S3, and then choose **Run Query**. These statements set up additional Inventory tables in Athena.

```sql
CREATE EXTERNAL TABLE IF NOT EXISTS ssminventory.AWS_AWSComponent (
`ResourceId` string,
`Name` string,
`ApplicationType` string,
`Publisher` string,
`Version` string,
`InstalledTime` string,
`Architecture` string,
`URL` string
) PARTITIONED BY (AccountId string, Region string, ResourceType string)
ROW FORMAT SERDE 'org.openx.data.jsonserde.JsonSerDe'
WITH SERDEPROPERTIES (
'serialization.format' = '1'
) LOCATION 's3://bucket-name/bucket-prefix/AWS:AWSComponent/'
MSCK REPAIR TABLE ssminventory.AWS_AWSComponent

CREATE EXTERNAL TABLE IF NOT EXISTS ssminventory.AWS_WindowsUpdate (
`ResourceId` string,
`HotFixId` string,
`Description` string,
`InstalledTime` string,
`InstalledBy` string
) PARTITIONED BY (AccountId string, Region string, ResourceType string)
ROW FORMAT SERDE 'org.openx.data.jsonserde.JsonSerDe'
WITH SERDEPROPERTIES (
'serialization.format' = '1'
) LOCATION 's3://bucket-name/bucket-prefix/AWS:WindowsUpdate/'
MSCK REPAIR TABLE ssminventory.AWS_WindowsUpdate

CREATE EXTERNAL TABLE IF NOT EXISTS ssminventory.AWS_InstanceInformation (
`AgentType` string,
`AgentVersion` string,
`ComputerName` string,
`IamRole` string,
`InstanceId` string,
`IpAddress` string,
`PlatformName` string
) PARTITIONED BY (AccountId string, Region string, ResourceType string)
ROW FORMAT SERDE 'org.openx.data.jsonserde.JsonSerDe'
WITH SERDEPROPERTIES (
'serialization.format' = '1'
) LOCATION 's3://bucket-name/bucket-prefix/AWS:InstanceInformation/'
MSCK REPAIR TABLE ssminventory.AWS_InstanceInformation
```
`PlatformType` string,
`PlatformVersion` string
)
PARTITIONED BY (AccountId string, Region string, ResourceType string)
ROW FORMAT SERDE 'org.openx.data.jsonserde.JsonSerDe'
WITH SERDEPROPERTIES (
   'serialization.format' = '1'
) LOCATION 's3://bucket-name/bucket-prefix/AWS:InstanceInformation/

MSCK REPAIR TABLE ssminventory.AWS_InstanceInformation

CREATE EXTERNAL TABLE IF NOT EXISTS ssminventory.AWS_Network (  
`ResourceId` string,
`Name` string,
`SubnetMask` string,
`Gateway` string,
`DHCPServer` string,
`DNSServer` string,
`MacAddress` string,
`IPV4` string,
`IPV6` string
)
PARTITIONED BY (AccountId string, Region string, ResourceType string)
ROW FORMAT SERDE 'org.openx.data.jsonserde.JsonSerDe'
WITH SERDEPROPERTIES (
   'serialization.format' = '1'
) LOCATION 's3://bucket-name/bucket-prefix/AWS:Network/

MSCK REPAIR TABLE ssminventory.AWS_Network

CREATE EXTERNAL TABLE IF NOT EXISTS ssminventory.AWS_PatchSummary (  
`ResourceId` string,
`PatchGroup` string,
`BaselineId` string,
`SnapshotId` string,
`OwnerInformation` string,
`InstalledCount` int,
`InstalledOtherCount` int,
`NotApplicableCount` int,
`MissingCount` int,
`FailedCount` int,
`OperationType` string,
`OperationStartTime` string,
`OperationEndTime` string
)
PARTITIONED BY (AccountId string, Region string, ResourceType string)
ROW FORMAT SERDE 'org.openx.data.jsonserde.JsonSerDe'
WITH SERDEPROPERTIES (
   'serialization.format' = '1'
) LOCATION 's3://bucket-name/bucket-prefix/AWS:PatchSummary/

MSCK REPAIR TABLE ssminventory.AWS_PatchSummary

Working with the Data in Amazon QuickSight

The following section provides an overview with links for building a visualization in Amazon QuickSight.

To build a visualization in Amazon QuickSight

1. Sign up for Amazon QuickSight and then log in to the QuickSight console.
2. Create a data set from the AWS_Application table and any other tables you created. For more information, see Creating a Data Set Using Amazon Athena Data.

3. Join tables. For example, you could join the instanceid column from AWS_InstanceInformation because it matches the resourceid column in other inventory tables. For more information about joining tables, see Joining Tables.

4. Build a visualization. For more information, see Working with Amazon QuickSight Visuals.

Troubleshooting Problems with Systems Manager Inventory

This topic includes information about how to troubleshoot common errors or problems with Systems Manager Inventory.

Console doesn’t display Inventory Dashboard | Detailed View | Settings tabs

The Inventory Detailed View page is only available in AWS Regions that offer Amazon Athena. If the following tabs are not displayed on the Inventory page, it means Athena is not available in the Region and you can’t use the Detailed View to query data.

UnsupportedAgent

If the detailed status of an inventory association shows UnsupportedAgent, and the Association status shows Failed, then the version of SSM Agent on the instance is not correct. To create a global inventory association (to inventory all instances in your AWS account) for example, you must use SSM Agent version 2.0.790.0 or later. You can view the agent version running on each of your instances on the Managed Instances page in the Agent version column. For information about how to update SSM Agent on your instances, see Update SSM Agent by using Run Command (p. 623).

Skipped

If the status of the inventory association for an instance shows Skipped, this means that you created a global inventory association, but the skipped instance already had an inventory association assigned to it. The global inventory association was not assigned to this instance, and no inventory was collected by the global inventory association. However, the instance will still report inventory data when the specific inventory association runs.

Failed

If the status of the inventory association for an instance shows Failed, this could mean that the instance has multiple inventory associations assigned to it. An instance can only have one inventory association assigned at a time. An inventory association uses the AWS-GatherSoftwareInventory SSM document. You can run the following command by using the AWS CLI to view a list of associations for an instance.
AWS Systems Manager Managed Instances

A managed instance is any machine configured for AWS Systems Manager. You can configure Amazon EC2 instances or on-premises machines in a hybrid environment as managed instances. Systems Manager supports various distributions of Linux, including Raspberry Pi devices, and Microsoft Windows Server.

Note
In the AWS Management Console, any machine prefixed with "mi-" is an on-premises server or virtual machine (VM) managed instance.

AWS Systems Manager offers a standard-instances tier and an advanced-instances tier for servers and VMs in your hybrid environment. The standard-instances tier enables you to register a maximum of 1,000 servers or VMs per AWS account per AWS Region. If you need to register more than 1,000 servers or VMs in a single account and Region, then use the advanced-instances tier. You can create as many instances as you like in the advanced-instances tier, but all instances configured for Systems Manager are priced on a pay-per-use basis. For more information about enabling advanced instances, see (Optional) Enable the Advanced-Instances Tier (p. 53). For more information about pricing, see AWS Systems Manager Pricing.

Note
- Advanced instances also enable you to connect to your hybrid machines by using AWS Systems Manager Session Manager. Session Manager provides interactive shell access to your instances. For more information, see AWS Systems Manager Session Manager (p. 567).
- The standard-instances limit also applies to Amazon EC2 instances that use a Systems Manager on-premises activation (which is not a common scenario).
- Microsoft application patching is only available on Amazon EC2 instances and in the advanced-instances tier. To patch Microsoft applications on on-premises servers and VMs, you must enable the advanced-instances tier. For more information, see About Patching Applications on Windows Server (p. 722).

If you don't see your managed instances listed in the console, then do the following:

1. Verify that the console is open in the AWS Region where you created your managed instances. You can switch Regions by using the list in the top, right corner of the console.
2. Verify that your instances meet Systems Manager requirements. For information, see Systems Manager Prerequisites (p. 12).
3. For servers and VMs in a hybrid environment, verify that you completed the activation process. For more information, see Setting Up AWS Systems Manager for Hybrid Environments (p. 41).

Note
Systems Manager requires accurate time references in order to perform its operations. If your instance's date and time are not set correctly, they may not match the signature date of your API requests. For more information, see Use Cases and Best Practices (p. 945).

Verify Systems Manager support on an instance

AWS Config provides AWS Managed Rules, which are predefined, customizable rules that AWS Config uses to evaluate whether your AWS resource configurations comply with common best practices. AWS Config Managed Rules include the ec2-instance-managed-by-systems-manager rule. This rule checks whether the Amazon EC2 instances in your account are managed by Systems Manager. For more information, see AWS Config Managed Rules.
Verify Systems Manager Prerequisites

For information about Systems Manager prerequisites, see Systems Manager Prerequisites (p. 12). For information about configuring on-premises servers and VMs as managed instances, see Setting Up AWS Systems Manager for Hybrid Environments (p. 41).

Increase security posture on managed instances

For more information increasing your security posture against unauthorized root-level commands on your instances, see Restrict Access to Root-Level Commands Through SSM Agent (p. 85)

Reset the password on a managed instance

If you forget or want to change the password to one of your managed instances, you can reset it using the AWS Systems Manager Managed Instances console or the AWS CLI. For more information, see Resetting Passwords on Managed Instances (p. 564).

Resetting Passwords on Managed Instances

You can reset the password for any user on a managed instance. This includes Amazon EC2 instances, on-premises servers, and virtual machines (VMs) that are managed by AWS Systems Manager. The password reset functionality is built on the AWS Systems Manager Session Manager capability. You can use this functionality to connect to instances without opening inbound ports, maintaining bastion hosts, or managing SSH keys.

This makes the password reset option useful when a user has forgotten a password, or when you want to quickly update a password without making an RDP or SSH connection to the instance.

Prerequisites

Before you can reset the password on an instance, the following requirements must be met:

- The instance you want to change a password on must be a Systems Manager managed instance. This means that SSM Agent is installed on the instance. (SSM Agent Version 2.3.668.0 or later is required for changing passwords.) For information about installing or updating SSM Agent, see Working with SSM Agent (p. 64).
- The password reset functionality uses the AWS Session Manager configuration that is set up for your account to connect to the instance. Therefore, the prerequisites for using Session Manager must have been completed for your account in the current Region. For more information, see Getting Started with Session Manager (p. 571).

  **Note**
  Session Manager support for on-premises servers is provided for the advanced-instances tier only. For information, see (Optional) Enable the Advanced-Instances Tier (p. 53).
- The AWS user who is changing the password must have the ssm:SendCommand permission for the instance. For information, see Restricting Run Command Access Based on Instance Tags (p. 619).

Restricting Access

You can limit a user's ability to reset passwords to specific instances. This is done by using identity-based policies for the Session Manager ssm:StartSession action with the AWS-PasswordReset SSM document. For more information, see Control User Session Access to Instances (p. 579).

Encrypting Data

You must enable AWS Key Management Service (AWS KMS) end-to-end encryption for Session Manager data to use the password reset option for managed instances. For more information, see Enable AWS KMS Key Encryption of Session Data (Console) (p. 592).
**Reset a Password on a Managed Instance**

You can reset a password on a Systems Manager managed instance using the AWS Systems Manager Managed Instances console or the AWS CLI.

**To change the password on a managed instance (console)**

2. In the navigation pane, choose Managed Instances.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Managed Instances.
3. Choose the button next to the instance that needs a new password.
4. In the Actions menu, choose Reset password.
5. For User name, type the name of the user for which you are changing the password. This can be any user name that has an account on the instance.
6. Choose Submit.
7. Follow the prompts in the Enter new password command window to specify the new password.

   **Note**
   If the version of SSM Agent on the instance doesn't support password resets, you are prompted to install a supported version using Run Command.

**To reset the password on a managed instance (CLI)**

1. To reset the password for a user on a managed instance, run the following command.
   
   ```
   aws ssm start-session --target instance-id --document-name "AWS-PasswordReset" --parameters "{"username": "user-name"}"
   ```
   
   `instance-id` represents the ID of an instance configured for use with Systems Manager and its Session Manager capability.

   `user-name` represents the name of the user you want to reset password for on the instance.
2. Follow the prompts in the Enter new password command window to specify the new password.

**Troubleshoot Password Resets on Managed Instances**

Many password reset issues can be resolved by ensuring that you have completed the Password Reset Prerequisites (p. 564). For other problems, use the following information to help you troubleshoot password reset issues.

**Topics**
- Instance not available (p. 566)
- SSM Agent not up-to-date (console) (p. 566)
- Password reset options do not appear (CLI) (p. 566)
- No authorization to run ssm:SendCommand (p. 566)
Instance not available

Problem: You want to reset the password for an Amazon EC2 instance on the Managed instances console page, but the instance is not in the list.

Solution: The instance you want to connect to might not be configured to use with the AWS Systems Manager service. To use an Amazon EC2 instance with Systems Manager, an IAM instance profile that gives Systems Manager permission to perform actions on your instances must be attached to the instance. For information, see Create an IAM Instance Profile for Systems Manager (p. 29). To use an on-premises server or virtual machine (VM) that you have activated for use with Systems Manager, you must create an IAM service role that gives Systems Manager permission to perform actions on your machines. For information, see Create an IAM Service Role for a Hybrid Environment (p. 42). (Session Manager support for on-premises servers and VMs is provided for the advanced-instances tier only. For information, see (Optional) Enable the Advanced-Instances Tier (p. 53).)“SSM Agent not up-to-date (console)

Problem: A message reports that the version of SSM Agent doesn't support password reset functionality.

Solution: Version 2.3.668.0 or later of SSM Agent is required to perform password resets. In the console, you can begin the process of updating the agent on the instance by choosing Update SSM Agent.

An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

Password reset options do not appear (CLI)

Problem: You connect successfully to an instance using the AWS CLI start-session command. You specified the SSM Document AWS-PasswordReset and provided a valid user name, but prompts to change the password do not appear.

Solution: The version of SSM Agent on the instance is not up-to-date. Version 2.3.668.0 or later is required to perform password resets.

An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

No authorization to run ssm:SendCommand

Problem: You attempt to connect to an instance to change its password but receive an error message saying that you aren't authorized to run ssm:SendCommand on the instance.

Solution: Your IAM user policy must include permission to run the ssm:SendCommand command. For information, see Restricting Run Command Access Based on Instance Tags (p. 619).
Session Manager error message

Problem: You receive an error message related to Session Manager.

Solution: Password reset support requires that Session Manager is configured correctly. For information, see Getting Started with Session Manager (p. 571) and Troubleshooting Session Manager (p. 613).

Related Content

- For information about increasing your security posture against unauthorized root-level commands on your instances, see Restrict Access to Root-Level Commands Through SSM Agent (p. 85)
- AWS Config provides AWS Managed Rules, which are predefined, customizable rules that AWS Config uses to evaluate whether your AWS resource configurations comply with common best practices. AWS Config Managed Rules include the ec2-instance-managed-by-systems-manager rule. This rule checks whether the Amazon EC2 instances in your account are managed by Systems Manager. For more information, see AWS Config Managed Rules.

AWS Systems Manager Activations

To set up servers and virtual machines (VMs) in your hybrid environment as managed instances, you create a managed-instance activation. After you complete the activation, you receive an activation code and ID. This code/ID combination functions like an Amazon EC2 access ID and secret key to provide secure access to the Systems Manager service from your managed instances.

For information about configuring on-premises servers and VMs as managed instances, see Setting Up AWS Systems Manager for Hybrid Environments (p. 41).

About AWS Systems Manager Instances Tiers

AWS Systems Manager offers a standard-instances tier and an advanced-instances tier for servers and VMs in your hybrid environment. The standard-instances tier enables you to register a maximum of 1,000 servers or VMs per AWS account per AWS Region. If you need to register more than 1,000 servers or VMs in a single account and Region, then use the advanced-instances tier. You can create as many instances as you like in the advanced-instances tier, but all instances configured for Systems Manager are priced on a pay-per-use basis. For more information about enabling advanced instances, see (Optional) Enable the Advanced-Instances Tier (p. 53). For more information about pricing, see AWS Systems Manager Pricing.

Note

- Advanced instances also enable you to connect to your hybrid machines by using AWS Systems Manager Session Manager. Session Manager provides interactive shell access to your instances. For more information, see AWS Systems Manager Session Manager (p. 567).
- The standard-instances limit also applies to Amazon EC2 instances that use a Systems Manager on-premises activation (which is not a common scenario).
- Microsoft application patching is only available on Amazon EC2 instances and in the advanced-instances tier. To patch Microsoft applications on on-premises servers and VMs, you must enable the advanced-instances tier. For more information, see About Patching Applications on Windows Server (p. 722).

AWS Systems Manager Session Manager

Session Manager is a fully managed AWS Systems Manager capability that lets you manage your Amazon EC2 instances through an interactive one-click browser-based shell or through the AWS CLI. Session
Manager provides secure and auditable instance management without the need to open inbound ports, maintain bastion hosts, or manage SSH keys. Session Manager also makes it easy to comply with corporate policies that require controlled access to instances, strict security practices, and fully auditable logs with instance access details, while still providing end users with simple one-click cross-platform access to your Amazon EC2 instances.

How can Session Manager benefit my organization?

Session Manager offers these benefits:

- **Centralized access control to instances using IAM policies**
  
  Administrators have a single place to grant and revoke access to instances. Using only AWS Identity and Access Management (IAM) policies, you can control which individual users or groups in your organization can use Session Manager and which instances they can access.

- **No open inbound ports and no need to manage bastion hosts or SSH keys**
  
  Leaving inbound SSH ports and remote PowerShell ports open on your instances greatly increases the risk of entities running unauthorized or malicious commands on the instances. Session Manager helps you improve your security posture by letting you close these inbound ports, freeing you from managing SSH keys and certificates, bastion hosts, and jump boxes.

- **One-click access to instances from the console and CLI**
  
  Using the AWS Systems Manager console, you can start a session with a single click. Using the AWS CLI, you can also start a session that runs a single command or a sequence of commands. Because permissions to instances are provided through IAM policies instead of SSH keys or other mechanisms, the connection time is greatly reduced.

- **Port forwarding**
  
  Redirect any port inside your remote instance to a local port on a client. After that, connect to the local port and access the server application that is running inside the instance.

- **Cross-platform support for both Windows and Linux**
  
  Session Manager provides both Windows and Linux support from a single tool. For example, you don't need to use an SSH client for Linux instances and an RDP connection for Windows instances.

- **Logging and auditing session activity**
  
  To meet operational or security requirements in your organization, you might need to provide a record of the connections made to your instances and the commands that were run on them. You can also receive notifications when a user in your organization starts or ends session activity.

Logging and auditing capabilities are provided through integration with the following AWS services:

- **AWS CloudTrail** – AWS CloudTrail captures information about Session Manager API calls made in your AWS account and writes it to log files that are stored in an Amazon S3 bucket you specify. One bucket is used for all CloudTrail logs for your account. For more information, see [Logging AWS Systems Manager API Calls with AWS CloudTrail](p. 892).

- **Amazon Simple Storage Service** – You can choose to store session log data in an Amazon S3 bucket of your choice for auditing purposes. Log data can be sent to your S3 bucket with or without encryption using your AWS Key Management Service (AWS KMS) key. For more information, see [Logging Session Data Using Amazon S3 (Console)](p. 611).

- **Amazon CloudWatch Logs** – CloudWatch Logs lets you monitor, store, and access log files from various AWS services. You can send session log data to a CloudWatch Logs log group for auditing purposes. Log data can be sent to your log group with or without AWS KMS encryption using your AWS KMS key. For more information, see [Logging Session Data Using Amazon CloudWatch Logs (Console)](p. 612).
Who Should Use Session Manager?

• Any AWS customer who wants to improve their security and audit posture, reduce operational overhead by centralizing access control on instances, and reduce inbound instance access.

• Information Security experts who want to monitor and track instance access and activity, close down inbound ports on instances, or enable connections to instances that do not have a public IP address.

• Administrators who want to grant and revoke access from a single location, and who want to provide one solution to users for both Windows and Linux instances.

• End users who want to connect to an instance with just one click from the browser or CLI without having to provide SSH keys.

What Are the Main Features of Session Manager?

• Support for both Windows and Linux instances

Session Manager lets you establish secure connections to your Amazon Elastic Compute Cloud (Amazon EC2) instances. For a list of supported Windows and Linux operating system types, see Getting Started with Session Manager (p. 571).

  Note
  Session Manager support for on-premises servers is provided for the advanced-instances tier only. For information, see (Optional) Enable the Advanced-Instances Tier (p. 53).

• Console, CLI, and SDK access to Session Manager capabilities

You can work with Session Manager in the following ways:

The AWS Systems Manager console includes access to all the Session Manager capabilities for both administrators and end-users. You can perform any task that’s related to your sessions by using the Systems Manager console.

The AWS CLI includes access to Session Manager capabilities for end users. You can start a session, view a list of sessions, and permanently end a session by using the AWS CLI.

  Note
  To use the AWS CLI to run session commands, you must be using version 1.16.12 of the CLI (or later), and you must have installed the Session Manager plugin on your local machine. For information, see (Optional) Install the Session Manager Plugin for the AWS CLI (p. 601).

The Session Manager SDK consists of libraries and sample code that enables application developers to build frontend applications, such as custom shells or self-service portals for internal users that natively use Session Manager to connect to instances. Developers and partners can integrate Session Manager into their client-side tooling or Automation workflows using the Session Manager APIs. You can even build custom solutions.

• IAM access control

Through the use of IAM policies, you can control which members of your organization can initiate sessions to instances and which instances they can access. You can also provide temporary access
to your instances. For example, you might want to give an on-call engineer (or a group of on-call engineers) access to production servers only for the duration of their rotation.

- **Logging and auditing capability support**

  Session Manager provides you with options for auditing and logging session histories in your AWS account through integration with a number of other AWS services. For more information, see Auditing and Logging Session Activity (p. 610).

- **Customer key data encryption support**

  You can configure Session Manager to encrypt the session data logs that you send to an Amazon S3 bucket or stream to a CloudWatch Logs log group. You can also configure Session Manager to further encrypt the data transmitted between client machines and your instances during your sessions. For information, see Auditing and Logging Session Activity (p. 610) and Configure Session Preferences (p. 589).

- **AWS PrivateLink support for instances without public IP addresses**

  You can also set up VPC Endpoints for Systems Manager using AWS PrivateLink to further secure your sessions. PrivateLink limits all network traffic between your managed instances, Systems Manager, and Amazon EC2 to the Amazon network. For more information, see (Optional) Create a Virtual Private Cloud Endpoint (p. 36).

- **Tunneling**

  In a session, use a Session-type SSM document to tunnel traffic, such as http or a custom protocol, between a local port on a client machine and a remote port on an instance.

- **Interactive Commands**

  Create a Session-type SSM document that uses a session to interactively run a single command, giving you a way to manage what users can do on an instance.

### What Is a Session?

A session is a connection made to an instance using Session Manager. Sessions are based on a secure bi-directional communication channel between the client (you) and the remote managed instance that streams inputs and outputs for commands. Traffic between a client and a managed instance is encrypted using TLS 1.2, and requests to create the connection are signed using Sigv4. This two-way communication enables interactive bash and PowerShell access to instances. You can also use an AWS Key Management Service (AWS KMS) key to further encrypt data beyond the default TLS encryption.

For example, say that John is an on-call engineer in your IT department. He receives notification of an issue that requires him to remotely connect to an instance, such as a failure that requires troubleshooting or a directive to change a simple configuration option on an instance. Using the AWS Systems Manager console or the AWS CLI, John starts a session connecting him to the instance, runs commands on the instance needed to complete the task, and then ends the session.

When John sends that first command to start the session, the Session Manager service authenticates his ID, verifies the permissions granted to him by an IAM policy, checks configuration settings (such as verifying allowed limits for the sessions), and sends a message to SSM Agent to open the two-way connection. After the connection is established and John types the next command, the command output from SSM Agent is uploaded to this communication channel and sent back to his local machine.

### Topics

- [Getting Started with Session Manager (p. 571)]
- [Working with Session Manager (p. 601)]
- [Auditing and Logging Session Activity (p. 610)]
- [Troubleshooting Session Manager (p. 613)]
Getting Started with Session Manager

Before you use Session Manager to connect to the Amazon EC2 instances in your account, complete the steps in the following topics.

Topics
- Step 1: Complete Session Manager Prerequisites (p. 571)
- Step 2: Verify or Create an IAM Instance Profile with Session Manager Permissions (p. 573)
- Step 3: Control User Session Access to Instances (p. 579)
- Step 4: Configure Session Preferences (p. 589)
- Step 5: (Optional) Use PrivateLink to Set Up a VPC Endpoint for Session Manager (p. 597)
- Step 6: (Optional) Disable or Enable ssm-user Account Administrative Permissions (p. 597)
- Step 7: (Optional) Enable SSH Connections Through Session Manager (p. 599)

Step 1: Complete Session Manager Prerequisites

Before using Session Manager, make sure your environment meets the following requirements.

Session Manager Prerequisites

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supported Operating Systems</strong></td>
<td>AWS Session Manager supports the following operating system versions:</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>Session Manager supports Amazon EC2 instances, as well as servers or virtual machines (VMs) in your hybrid environment that use the &lt;em&gt;advanced-instances&lt;/em&gt; tier. For more information about advanced instances, see (Optional) Enable the Advanced-Instances Tier (p. 53).</td>
</tr>
<tr>
<td><strong>Linux</strong></td>
<td>Session Manager supports all the versions of Linux that are supported for AWS Systems Manager as a whole. For information, see Systems Manager Prerequisites (p. 12).</td>
</tr>
<tr>
<td><strong>Windows</strong></td>
<td>Session Manager supports Windows Server 2008 R2 through Windows Server 2016.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>Microsoft Windows Server 2016 Nano is not supported.</td>
</tr>
<tr>
<td><strong>SSM Agent</strong></td>
<td>SSM Agent version 2.3.68.0 or later must be installed on the instances you want to connect to through sessions. To use the option to encrypt session data using a customer master key (CMK) created in AWS Key Management Service (AWS</td>
</tr>
</tbody>
</table>
### Requirement | Description
--- | ---

KMS), version 2.3.539.0 or later of SSM Agent must be installed.

To install or update SSM Agent, see Working with SSM Agent (p. 64).

**About the ssm-user account**

Starting with version 2.3.50.0 of SSM Agent, the agent creates a user account on the instance, with root or administrator privileges, called `ssm-user`. (On versions before 2.3.612.0, the account is created when SSM Agent starts or restarts. On version 2.3.612.0 and later, `ssm-user` is created the first time a session starts on the instance.) Sessions are launched using the administrative credentials of this user account. For information about restricting administrative control for this account, see Step 6: (Optional) Disable or Enable ssm-user Account Administrative Permissions (p. 597).

**ssm-user on Windows Server domain controllers**

Beginning with SSM Agent version 2.3.612.0, the `ssm-user` account is not created automatically on managed instances that are used as Windows Server domain controllers. To use Session Manager on a Windows Server machine being used as a domain controller, you must create the `ssm-user` account manually if it isn't already present. On Windows Server, SSM Agent sets a new password for the `ssm-user` account each time a session starts, so you do not need to specify a password when you create the account.
### Requirement Table

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWS CLI</td>
<td>(Optional) If you use the AWS CLI to start your sessions (instead of using the AWS Systems Manager console), version 1.16.12 or later of the CLI must be installed on your local machine. You can call <code>aws --version</code> to check the version. If you need to install or upgrade the CLI, see <a href="https://docs.aws.amazon.com/cli/latest/userguide/cli-commands.html">Installing the AWS Command Line Interface</a> in the AWS Command Line Interface User Guide. <strong>Important</strong> An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see <a href="https://docs.aws.amazon.com/systems-manager/latest/userguide/automate-updates-to-ssm-agent.html">Automate Updates to SSM Agent</a> (p. 86). To be notified about SSM Agent updates, subscribe to the <a href="https://github.com/aws-solutions/SSM-Agent-Release-Notes">SSM Agent Release Notes</a> page on GitHub. In addition, to use the CLI to manage your instances with Session Manager, you must first install the Session Manager plugin on your local machine. For information, see <a href="https://docs.aws.amazon.com/systems-manager/latest/userguide/ssm-cli-plugins-install.html">Optional) Install the Session Manager Plugin for the AWS CLI</a> (p. 601).</td>
</tr>
</tbody>
</table>

### Step 2: Verify or Create an IAM Instance Profile with Session Manager Permissions

By default, AWS Systems Manager doesn't have permission to perform actions on your instances. You must grant access by using an IAM instance profile. An instance profile is a container that passes IAM role information to an Amazon EC2 instance at launch. This requirement applies to permissions for all AWS Systems Manager capabilities, not only those specific to Session Manager.

If you already use other Systems Manager capabilities, such as Run Command or Parameter Store, an instance profile with the required basic permissions for Session Manager might already be attached to your instances. If an instance profile that contains the AWS managed policy [AmazonSSMManagedInstanceCore](https://docs.aws.amazon.com/systems-manager/latest/userguide/iam-permissions-for-ssm.html) is already attached to your instances, the required permissions for Session Manager are already provided.

However, in some cases, you might need to modify the permissions attached to your instance profile. For example, you want to provide a narrower set of instance permissions, you have created a custom policy for your instance profile, or you want to use Amazon S3 encryption or AWS KMS encryption options for securing session data. For these cases, do one of the following to allow Session Manager actions to be performed on your instances:

- **Embed permissions for Session Manager actions in a custom instance profile**
To add permissions for Session Manager actions to an existing IAM instance profile that does not rely on the AWS-provided default policy `AmazonSSMManagedInstanceCore`, follow the steps in Adding Session Manager Permissions to an Existing Instance Profile (p. 574).

- **Create a custom IAM instance profile with Session Manager permissions only**

To create an IAM instance profile that contains permissions only for Session Manager actions, follow the steps in Create a Custom IAM Instance Profile for Session Manager (p. 575).

- **Create and use a new instance profile with permissions for all Systems Manager actions**

To create an IAM instance profile for Systems Manager managed instances that uses a default policy supplied by AWS to grant all Systems Manager permissions, follow the steps in Create an IAM Instance Profile for Systems Manager (p. 29).

**Note**

You can attach an IAM instance profile to an Amazon EC2 instance as you launch it or to a previously launched instance. For more information, see Instance Profiles.

**Topics**

- Adding Session Manager Permissions to an Existing Instance Profile (p. 574)
- Create a Custom IAM Instance Profile for Session Manager (p. 575)

**Adding Session Manager Permissions to an Existing Instance Profile**

Follow these steps to embed Session Manager permissions in an existing IAM instance profile that does not rely on the AWS-provided default policy `AmazonSSMManagedInstanceCore` for instance permissions. Note that this procedure assumes that your existing profile already includes other Systems Manager `ssm` permissions for actions you want to allow access to. This policy alone is not enough to use Session Manager.

**To add Session Manager permissions to an existing instance profile (console)**

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles.
3. Choose the name of the role to embed a policy in.
4. Choose the Permissions tab.
5. Scroll to the bottom of the page and choose Add inline policy.
6. Choose the JSON tab.
7. Replace the default content with the following:

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ssmmessages:CreateControlChannel",
                "ssmmessages:CreateDataChannel",
                "ssmmessages:OpenControlChannel",
                "ssmmessages:OpenDataChannel"
            ],
            "Resource": "*"
        }
    ]
}
```
About 'ssmmessages'

For information about ssmmessages, see Reference: ec2messages, ssmmessages, and Other API Calls (p. 944).

About 'kms:Decrypt'

In this policy, the kms:Decrypt permission enables customer key encryption and decryption for session data. If you will use AWS Key Management Service (AWS KMS) encryption for your session data, replace key-name with the ARN of the customer master key (CMK) you want to use, in the format arn:aws:kms:us-west-2:111122223333:key/1234abcd-12ab-34cd-56ef-12345EXAMPLE.

If you will not use AWS KMS encryption for your session data, you can remove the following content from the policy:

```
, {
  "Effect": "Allow",
  "Action": [
    "kms:Decrypt"
  ],
  "Resource": "key-name"
```

For information about using AWS KMS and a CMK to encrypt session data, see Enable AWS KMS Key Encryption of Session Data (Console) (p. 592).

9. On the Review policy page, for Name, enter a name for the inline policy, such as SessionManagerPermissions.
10. Choose Create policy.

Create a Custom IAM Instance Profile for Session Manager

You can create a custom IAM instance profile that provides permissions for only Session Manager actions on your instances. You can also create a policy to provide the permissions needed for logs of session activity to be sent to Amazon S3 and CloudWatch Logs.

After you create an instance profile, see Attaching an IAM Role to an Instance and Attach or Replace an Instance Profile for information about how to attach the instance profile to an instance. For more information about IAM instance profiles and roles, see Using Instance Profile and IAM Roles for Amazon EC2 in the IAM User Guide.
Creating an Instance Profile with Minimal Session Manager Permissions (Console)

Use the following procedure to create a custom IAM instance profile with a policy that provides permissions for only Session Manager actions on your instances.

To create an instance profile with minimal Session Manager permissions (console)

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Policies, and then choose Create policy. (If a Get Started button appears, choose it, and then choose Create Policy.)
3. Choose the JSON tab.
4. Replace the default content with the following:

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ssm:UpdateInstanceInformation",
                "ssmmessages:CreateControlChannel",
                "ssmmessages:CreateDataChannel",
                "ssmmessages:OpenControlChannel",
                "ssmmessages:OpenDataChannel"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "s3:GetEncryptionConfiguration"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "kms:Decrypt"
            ],
            "Resource": "key-name"
        }
    ]
}
```

About 'ssmmessages'

For information about ssmmessages, see Reference: ec2messages, ssmmessages, and Other API Calls (p. 944).

About 'kms:Decrypt'

In this policy, the kms:Decrypt permission enables customer key encryption and decryption for session data. If you will use AWS Key Management Service (AWS
KMS) encryption for your session data, replace key-name with the ARN of the customer master key (CMK) you want to use, in the format arn:aws:kms:us-west-2:111122223333:key/1234abcd-12ab-34cd-56ef-12345EXAMPLE.

If you will not use AWS KMS encryption for your session data, you can remove the following content from the policy:

```json

`{,
   "Effect": "Allow",
   "Action": [
     "kms:Decrypt"
   ],
   "Resource": "key-name"
}
```

For information about using AWS KMS and a CMK to encrypt session data, see Enable AWS KMS Key Encryption of Session Data (Console) (p. 592).

5. Choose Review policy.
6. On the Review policy page, for Name, enter a name for the inline policy, such as SessionManagerPermissions.
7. (Optional) For Description, enter a description for the policy.
8. Choose Create policy.
9. In the navigation pane, choose Roles, and then choose Create role.
10. On the Create role page, choose AWS service, and from the Choose the service that will use this role list, choose EC2.
11. Choose Next: Permissions.
12. On the Attached permissions policy page, select the check box to the left of name of the policy you just created, such as SessionManagerPermissions.
13. Choose Next: Review.
14. On the Review page, for Role name, enter a name for the IAM instance profile, such as MySessionManagerInstanceProfile.
15. (Optional) For Role description, enter a description for the instance profile.
16. Choose Create role.

Creating an Instance Profile with Permissions for Session Manager and Amazon S3 and CloudWatch Logs (Console)

Use the following procedure to create a custom IAM instance profile with a policy that provides permissions for Session Manager actions on your instances. The policy also provides the permissions needed for session logs to be stored in Amazon S3 buckets and CloudWatch Logs log groups.

For information about specifying preferences for storing session logs, see Auditing and Logging Session Activity (p. 610).

To create an instance profile with permissions for Session Manager and Amazon S3 and CloudWatch Logs (console)

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Policies, and then choose Create policy. (If a Get Started button appears, choose it, and then choose Create Policy.)
3. Choose the JSON tab.
4. Replace the default content with the following. Be sure to replace `s3-bucket-name` and `s3-bucket-prefix` with the names for your bucket and its prefix (if any). For information about `ssmmessages` in the following policy, see Reference: ec2messages, ssmmessages, and Other API Calls (p. 944).

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ssmmessages:CreateControlChannel",
                "ssmmessages:CreateDataChannel",
                "ssmmessages:OpenControlChannel",
                "ssmmessages:OpenDataChannel",
                "ssm:UpdateInstanceInformation"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "logs:CreateLogStream",
                "logs:PutLogEvents",
                "logs:DescribeLogGroups",
                "logs:DescribeLogStreams"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "s3:PutObject"
            ],
            "Resource": "arn:aws:s3:::s3-bucket-name/s3-bucket-prefix"
        },
        {
            "Effect": "Allow",
            "Action": [
                "s3:GetEncryptionConfiguration"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": "kms:GenerateDataKey",
            "Resource": "*"
        }
    ]
}
```

**Important**

To output session logs to an Amazon S3 bucket owned by a different AWS account, you must add the IAM `s3:PutObjectAcl` permission to this policy. If this permission isn’t added, the account that owns the S3 bucket cannot access the session output logs.

5. Choose **Review policy**.

6. On the **Review policy** page, for **Name**, enter a name for the inline policy, such as **SessionManagerPermissions**.

7. (Optional) For **Description**, enter a description for the policy.

8. Choose **Create policy**.

9. In the navigation pane, choose **Roles**, and then choose **Create role**.
10. On the Create role page, choose AWS service, and from the Choose the service that will use this role list, choose EC2.

11. Choose Next: Permissions.

12. On the Attached permissions policy page, select the check box to the left of name of the policy you just created, such as SessionManagerPermissions.

13. Choose Next: Review.

14. On the Review page, for Role name, enter a name for the IAM instance profile, such as MySessionManagerInstanceProfile.

15. (Optional) For Role description, enter a description for the instance profile.

16. Choose Create role.

### Step 3: Control User Session Access to Instances

Session Manager allows you to centrally grant and revoke user access to instances. Using IAM policies, you control which instances specific users or groups can connect to, and you control what Session Manager API actions they can perform on the instances they are given access to.

**About Session ID ARN Formats**

IAM policies for Session Manager access use variables for user names as part of session IDs. Session IDs in turn are used in session Amazon Resource Names (ARNs) to control access. Session ARNs have the following format:

```
arn:aws:ssm:region-id:account-id:session/session-id
```

For example:

```
arn:aws:ssm:us-east-2:123456789012:session/JohnDoe-1a2b3c4d5eEXAMPLE
```

You can use a pair of default IAM policies supplied by AWS, one for end users and one for administrators, to supply permissions for Session Manager activities. Or you can create custom IAM policies for different permissions requirements you might have.

For more information about using variables in IAM policies, see IAM Policy Elements: Variables.

For information about how to create policies and attach them to IAM users or groups, see Creating IAM Policies and Adding and Removing IAM Policies in the IAM User Guide.

### Topics

- Enforce Document Permission Check for Default CLI Scenario (p. 579)
- Quickstart Default IAM Policies for Session Manager (p. 581)
- Additional Sample IAM Policies for Session Manager (p. 584)

### Enforce Document Permission Check for Default CLI Scenario

When you configure Session Manager for your account, the system creates an SSM document named SSM-SessionManagerRunShell. This SSM document stores your requirements for whether session data is saved in an Amazon S3 bucket or Amazon CloudWatch Logs log group, whether session data is encrypted using AWS Key Management Service, and whether Run As support is enabled for your sessions. The following is an example.

```
By default, if a user in your account has been granted permission in their IAM user policy to start sessions, that user has access to this SSM document. This means that when they use the AWS CLI to run the `start-session` command, and they do not specify a configuration document, the system uses `SSM-SessionManagerRunShell` and launches the full interactive shell. The session starts even if the user's IAM policy doesn't grant explicit permission to access the `SSM-SessionManagerRunShell` document.

For example, the following command doesn't specify a Session Manager configuration document.

```plaintext
aws ssm start-session --target i-02573cafcfEXAMPLE
```

The following example does specify the default Session Manager configuration document.

```plaintext
aws ssm start-session --document-name SSM-SessionManagerRunShell --target i-02573cafcfEXAMPLE
```

For cases where the user doesn't specify a document name in the `start-session` CLI command, you can ensure that the user has been granted explicit access to this default configuration document. You do this by adding the following condition element to the IAM policy that controls the user's access to sessions:

```json
"Condition": {
  "BoolIfExists": {
    "ssm:SessionDocumentAccessCheck": "true"
  }
}
```

With this condition element set to true in the user's associated IAM policy, explicit access to `SSM-SessionManagerRunShell` must be granted in the IAM policy. The following is an example.

```json
{
  "Effect": "Allow",
  "Action": [
    "ssm:StartSession"
  ],
}
```

This condition element applies only to the default `SSM-SessionManagerRunShell` configuration document, and only when a user doesn't specify a configuration document name in an CLI `start-session` command. In other words, it ensures that the user has been granted access to `SSM-SessionManagerRunShell` when they run the following command:
For an example of specifying a Session Manager configuration document in a user's IAM policy, see Quickstart End User Policy for Session Manager (p. 581).

**Other Scenarios**

Using the default SSM-SessionManagerRunShell configuration document is the only case when a document name can be omitted from the `start-session` CLI command. In other cases, the document name must be specified, and the system checks whether the user has been granted explicit access to the configuration document they specify.

For example, if a user specifies the name of a custom configuration document you have created, the user's IAM policy must grant them permission to access that document.

If a user runs a command to start a session using SSH, the user's policy must grant them access to the AWS-StartSSHSession configuration document.

**Note**
In order to start a session using SSH, configuration steps must be completed on both the target instance and the user's local machine. For information, see (Optional) Enable SSH Connections Through Session Manager (p. 599).

**Quickstart Default IAM Policies for Session Manager**

Use the following samples to help you create IAM policies that provide the most commonly needed permissions for Session Manager access.

**Note**
You can also use an AWS KMS key policy to control which IAM users, IAM roles, and AWS accounts are given access to your CMK. For information, see Overview of Managing Access to Your AWS KMS Resources and Using Key Policies in AWS KMS in the AWS Key Management Service Developer Guide.

**Topics**
- Quickstart End User Policy for Session Manager (p. 581)
- Quickstart Administrator Policy for Session Manager (p. 583)

**Quickstart End User Policy for Session Manager**

Use the following example to create an IAM end user policy for Session Manager. It provides end users the ability start a session to a particular instance and the ability to end only their own sessions. Refer to Additional Sample IAM Policies for Session Manager (p. 584) for examples of customizations you might want to make to the policy.

Replace `instance-id` with the ID of the instance you want to grant access to, in the format `i-02573cafcfEXAMPLE`. Replace `region` and `account-id` with your AWS Region and AWS Account ID, such as `us-east-2` and `111122223333`.

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "ssm:StartSession"
      ],
      "Resource": [
        "arn:aws:ec2:*":*:instance/instance-id"
      ]
    }
  ]
}
```
SSM-SessionManagerRunShell is the default name of the SSM document that Session Manager creates to store your session configuration preferences. You can create a custom configuration document and specify it in this policy instead. You can also specify the AWS-provided document AWS-StartSSHSession for users who are starting sessions using SSH. For information about configuration steps needed to support sessions using SSH, see (Optional) Enable SSH Connections Through Session Manager (p. 599).

If you specify the condition element ssm:SessionDocumentAccessCheck as true, the system checks that a user was granted explicit access to the configuration document SSM-SessionManagerRunShell before allowing a session to start. For more information, see Enforce Document Permission Check for Default CLI Scenario (p. 579).

**About `kms:GenerateDataKey`**

The kms:GenerateDataKey permission enables the creation of a data encryption key that will be used to encrypt session data. If you will use AWS Key Management Service (AWS KMS) encryption for your session data, replace key-name with the ARN.
of the customer master key (CMK) you want to use, in the format arn:aws:kms:us-west-2:111122223333:key/1234abcd-12ab-34cd-56ef-12345EXAMPLE.

If you will not use AWS KMS key encryption for your session data, remove the following content from the policy:

```
{
  "Effect": "Allow",
  "Action": [
    "kms:GenerateDataKey"
  ],
  "Resource": "key-name"
}
```

For information about AWS KMS and CMKs for encrypting session data, see Enable AWS KMS Key Encryption of Session Data (Console) (p. 592).

**Quickstart Administrator Policy for Session Manager**

Use the following example to create an IAM administrator policy for Session Manager. It provides administrators the ability to start a session to instances that are tagged with Key=Finance,Value=WebServers, permission to create, update and delete preferences, and permission to end only their own sessions. Refer to Additional Sample IAM Policies for Session Manager (p. 584) for examples of customizations you might want to make to the policy.

**Note**

Update the tag/value pair Key=Finance,Value=WebServers with the tags applied to your instances. Replace region and account-id with your AWS Region and AWS Account ID, such as us-east-2 and 111122223333.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "ssm:StartSession"
      ],
      "Resource": [
        "arn:aws:ec2:*:*:instance/*"
      ],
      "Condition": {
        "StringLike": {
          "ssm:resourceTag/Finance": ["WebServers"
        ]
      }
    },
    {
      "Effect": "Allow",
      "Action": [
        "ssm:DescribeSessions",
        "ssm:GetConnectionStatus",
        "ssm:DescribeInstanceProperties",
        "ec2:DescribeInstances"
      ],
      "Resource": "*
    },
    {
      "Effect": "Allow",
      "Action": [
```

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"ssm:CreateDocument",
"ssm:UpdateDocument",
"ssm:GetDocument"
],
}
{
  "Effect": "Allow",
  "Action": [  
    "ssm:TerminateSession"
  ],
  "Resource": [  
    "arn:aws:ssm:*:*:session/${aws:username}-*"
  ]
}

Additional Sample IAM Policies for Session Manager

Refer to the following example policies to help you create a custom IAM policy for any Session Manager user access scenarios you want to support.

Topics

- Example 1: Restrict Access to Specific Instances (p. 584)
- Example 2: Restrict Access Based on Instance Tags (p. 585)
- Example 3: Allow a User to End Only Sessions They Started (p. 586)
- Example 4: Allow Full (Administrative) Access to All Sessions (p. 589)

Example 1: Restrict Access to Specific Instances

You can restrict access to specific instances by creating an IAM user policy that includes the IDs of the instances. In the following example, the user is allowed Session Manager access to three specific instances only, and allowed to end only their sessions on those instances. If the user sends a command to any other instance or tries to end any other session, the command result will include AccessDenied.

```json
{
  "Version": "2012-10-17",
  "Statement": [  
    {  
      "Effect": "Allow",
      "Action": [  
        "ssm:StartSession"
      ],
      "Resource": [  
        "arn:aws:ec2:us-east-2:123456789012:instance/i-0e9d8c7b6aEXAMPLE"
      ]
    },
    {  
      "Effect": "Allow",
      "Action": [  
        "ssm:TerminateSession"
      ],
      "Resource": [  
        "arn:aws:ssm:*:*:session/${aws:username}-*"
      ]
    }
  ]
}
```
Example 2: Restrict Access Based on Instance Tags

You can restrict access to instances based on specific Amazon EC2 tags. In the following example, the user is allowed to start sessions (Effect: Allow, Action: ssm:StartSession) on any instance (Resource: arn:aws:ec2:*:*:instance/*) with the condition that the instance is a Finance WebServer (ssm:resourceTag/Finance: WebServer). If the user sends a command to an instance that is not tagged or that has any tag other than Finance: WebServer, the command result will include AccessDenied.

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": ["ssm:StartSession"],
         "Resource": ["arn:aws:ec2:*:*:instance/*"],
         "Condition": {
            "StringLike": {
               "ssm:resourceTag/Finance": ["WebServers"]
            }
         }
      },
      {
         "Effect": "Allow",
         "Action": ["ssm:TerminateSession"],
         "Resource": ["arn:aws:ssm:*:*:session/${aws:username}-*"],
         "Condition":{
            "StringLike":{
               "ssm:resourceTag/Finance": ["WebServers"]
            }
         }
      }
   ]
}
```

You can create IAM policies that enable a user to start sessions to instances that are tagged with multiple tags. The following policy enables the user to start sessions to instances that have of both the specified tags applied to them. If a user sends a command to an instance that is not tagged with both of these tags, the command result will include AccessDenied.

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": ["ssm:StartSession"],
         "Resource": ["*"],
         "Condition":{
            "StringLike":{
               "ssm:resourceTag/tag_key1": [
                  "tag_value1"
               ],
               "ssm:resourceTag/tag_key2": [
                  "tag_value2"
               ]
            }
         }
      }
   ]
}
```
Example 3: Allow a User to End Only Sessions They Started

Session Manager provides two methods to control which sessions a user in your AWS account is allowed to end.

- Use the variable \{aws:username\} in an AWS Identity and Access Management (IAM) permissions policy. Users can end only sessions they started. This method does not work for accounts that use federated IDs to grant access to AWS. Federated IDs use the variable \{aws:userid\} instead of \{aws:username\}.
- Use tags supplied by AWS tags in an IAM permissions policy. In the policy, you include a condition that allows users to end only sessions that are tagged with specific tags that have been provided by AWS. This method works for all accounts, including those that use federated IDs to grant access to AWS.

Method 1: Grant TerminateSession Privileges Using the Variable \{aws:username\}

The following IAM policy lets a user view the IDs of all sessions in your account. However, users can interact with instances only through sessions they started. A user who is assigned the following policy can't connect to or end other users' sessions. The policy uses the variable \(\text{aws:username}\) to achieve this.

\[
\text{Note} \\
\text{This method does not work for accounts that grant access to AWS using federated IDs.}
\]

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Action": [
            "ssm:DescribeSessions"
         ],
         "Effect": "Allow",
         "Resource": [
            "*
         ]
      },
      {
         "Action": [
            "ssm:TerminateSession"
         ],
         "Effect": "Allow",
         "Resource": [
            "arn:aws:ssm:*:*:session/${aws:username}-*"
         ]
      }
   ]
}
```
Method 2: Grant TerminateSession Privileges Using Tags Supplied by AWS

You can control which sessions a user can end by using a condition with specific tag key variables in an IAM user policy. The condition specifies that the user can only end sessions that are tagged with one or both of these specific tag key variables and a specified value.

When a user in your AWS account starts a session, Session Manager applies two resource tags to the session. The first resource tag is `aws:ssmmessages:target-id`, with which you specify the ID of the target the user is allowed to end. The other resource tag is `aws:ssmmessages:session-id`, with a value in the format of `role-id:caller-specified-role-name`.

**Note**
Session Manager doesn't support custom tags for this IAM access control policy. You must use the resource tags supplied by AWS, described below.

/aws:ssmmessages:target-id

With this tag key, you include the instance ID as the value in policy. In the following policy block, the condition statement lets a user end only the instance i-02573cafEX:

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": [
            "ssm:TerminateSession"
         ],
         "Resource": "",
         "Condition": {
            "StringLike": {
               "ssm:resourceTag/aws:ssmmessages:target-id": [
                  "i-02573cafEX"
               ]
            }
         }
      }
   ]
}
```

If the user tries to end a session for which they haven't been granted this `TerminateSession` permission, they receive an `AccessDeniedException` error.

/aws:ssmmessages:session-id

This tag key includes a variable for the session ID as the value in the request to start a session.

The following example demonstrates a policy for cases where the caller type is User. The value you supply for `aws:ssmmessages:session-id` is the ID of the user. In this example, AIDIODR4TAW7CSEX represents the ID of a user in your AWS account. To retrieve the ID for a user in your AWS account, use the IAM command, `get-user`. For information, see `get-user` in the AWS Identity and Access Management section of the IAM User Guide.

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": [
            "ssm:TerminateSession"
         ],
         "Resource": "",
         "Condition": {
```

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The following example demonstrates a policy for cases where the caller type is AssumedRole. The value you supply for `aws:ssmmessages:session-id` must be in the format `role-id:caller-specified-role-name`. In this example, `AIDIODR4TAW7CSEXAMPLE:MyRole` represents the role ID of a user in your AWS account.

**Important**
In order for system tags to be applied, the role ID you supply can contain the following characters only: Unicode letters, 0-9, space, _, :, /, =, +, -, @, and \.

To retrieve the role ID for a role in your AWS account, use the IAM command, `get-role`. For information, see `get-role` in the IAM section of the IAM User Guide.

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ssm:TerminateSession"
            ],
            "Resource": "",
            "Condition": {
                "StringLike": {
                    "ssm:resourceTag/aws:ssmmessages:session-id": [ "AIDIODR4TAW7CSEXAMPLE" ]
                }
            }
        }
    ]
}
```

If a user tries to end a session for which they haven’t been granted this `TerminateSession` permission, they receive an `AccessDeniedException` error.

**aws:ssmmessages:target-id** and **aws:ssmmessages:session-id**

You can also create IAM policies that enable a user to end sessions that are tagged with both system tags, as shown in this example.

```json
{
    "Version": "2012-10-17",
    "Statement": [  
        {
            "Effect": "Allow",
            "Action": [ "ssm:TerminateSession" ],
            "Resource": "*",
            "Condition": {
                "StringLike": {
                    "ssm:resourceTag/aws:ssmmessages:session-id": [ "AIDIODR4TAW7CSEXAMPLE:MyRole" ]
                }
            }
        }
    ]
}
```

```json
{
    "Version": "2012-10-17",
    "Statement": [ 
        {
            "Effect": "Allow",
            "Action": [ "ssm:TerminateSession" ],
            "Resource": "*",
            "Condition": {
                "StringLike": {
                    "ssm:resourceTag/aws:ssmmessages:target-id": [ "instance-id" ]
                }
            }
        }
    ]
}
```
Example 4: Allow Full (Administrative) Access to All Sessions

The following IAM policy allows a user to fully interact with all instances and all sessions created by all users for all instances. It should be granted only to an Administrator who needs full control over your organization's Session Manager activities.

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": [
                "ssm:StartSession",
                "ssm:TerminateSession",
                "ssm:ResumeSession",
                "ssm:DescribeSessions",
                "ssm:GetConnectionStatus"
            ],
            "Effect": "Allow",
            "Resource": [
                "*"
            ]
        }
    ]
}
```

Step 4: Configure Session Preferences

An IAM user with administrator permissions can do the following:

- Enable Run As support for Linux instances. This makes it possible to start sessions using the credentials of a specified operating system user instead of the credentials of a system-generated `ssm-user` account that Session Manager can create on a managed instance.
- Configure Session Manager to use AWS KMS key encryption to provide additional protection to the data transmitted between client machines and managed instances.
- Configure Session Manager to create and send session history logs to an Amazon Simple Storage Service (Amazon S3) bucket or an Amazon CloudWatch Logs log group. The stored log data can then be used to audit or report on the session connections made to your instances and the commands run on them during the sessions.

**Note**

Before a user can update Session Manager preferences, they must have been granted the specific permissions that will let them make these updates, if they do not possess them already. Without these permissions, the user can't configure logging options or set other session preferences for your account.

**Topics**

- [Grant or Deny a User Permissions to Update Session Manager Preferences (p. 590)]
• Enable Run As Support for Linux Instances (p. 591)
• Enable AWS KMS Key Encryption of Session Data (Console) (p. 592)
• Create Session Manager Preferences (AWS CLI) (p. 593)
• Update Session Manager Preferences (AWS CLI) (p. 595)

For information about using the Systems Manager console to configure options for logging session data, see the following topics.

• Logging Session Data Using Amazon S3 (Console) (p. 611)
• Logging Session Data Using Amazon CloudWatch Logs (Console) (p. 612)

Grant or Deny a User Permissions to Update Session Manager Preferences

Account preferences are stored as SSM documents for each AWS Region. Before a user can update account preferences for sessions in your account, they must be granted the necessary permissions to access the type of SSM document where these preferences are stored. These permissions are granted through an IAM policy.

Administrator policy to allow preferences to be created and updated

An administrator can have the following policy to create and update preferences at any time. The following policy allows permission to access and update the SSM-SessionManagerRunShell document in the us-east-2 account 123456789012.

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Action": [
            "ssm:CreateDocument",
            "ssm:UpdateDocument",
            "ssm:DeleteDocument"
         ],
         "Effect": "Allow",
         "Resource": [
         ]
      }
   ]
}
```

User policy to prevent preferences from being updated

Use the following policy to prevent end users in your account from updating or overriding any Session Manager preferences.

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Action": [
            "ssm:CreateDocument",
            "ssm:UpdateDocument",
            "ssm:DeleteDocument"
         ],
         "Effect": "Deny",
         "Resource": [
         ]
      }
   ]
}
```
Enable Run As Support for Linux Instances

By default, sessions are launched using the credentials of a system-generated `ssm-user` account that is created on a managed instance. (On Linux machines, this account is added to `/etc/sudoers/`.) You can instead launch sessions using the credentials of an operating system account. Session Manager provides two methods for specifying the operating system account to use.

Method 1: Tag an IAM user or role (recommended)

You can specify the operating system user account that is used to start sessions by tagging an IAM user or associated role with the AWS-provided key name `SSMSessionRunAs`, and specifying the OS user name as its value. For example, if the OS user account name is `DevRoleLogin`, the corresponding tag to use is `SSMSessionRunAs = DevRoleLogin`.

Using this method, you could specify a different OS account name for each IAM user or role you tag, or use the same OS user name for them all.

For more information about tagging IAM entities, see the following topics:

- Tagging IAM Entities in the IAM User Guide
- Add Tags to Manage Your AWS IAM Users and Roles on the AWS Security Blog

Method 2: Specify an OS user name in Session Manager preferences

When you configure Session Manager preferences in the console or by using the AWS CLI, you can specify the operating system user name to start sessions with.

Using this method, all sessions are run by the same OS user for all the IAM users in your account who connect to the instance using Session Manager.

How It Works

If you enable Run As support for sessions, the system checks for access permissions as follows:

1. For the user who is starting the session, has their IAM user account or role been tagged with `SSMSessionRunAs = os-user-account-name`?

   If Yes, does the user name exist on the instance? If it does, start the session. If it does not, do not allow a session to start.

   If the IAM user's account or role has not been tagged with `SSMSessionRunAs = os-user-account-name`, continue to step 2.

2. If the IAM user's account or role hasn't been tagged with `SSMSessionRunAs = os-user-account-name`, has an OS user name been specified in the AWS account's Session Manager preferences?

   If Yes, does the user name exist on the instance? If it does, start the session. If it does not, do not allow a session to start.

   At this point, Session Manager does not fall back on the default `ssm-user` account. In other words, enabling Run As support prevents sessions from being started using an `ssm-user` account on an instance.

To enable Run As support for Linux instances

2. In the navigation pane, choose **Session Manager**.
3. Choose the **Preferences** tab, and then choose **Edit**.
4. Select the check box next to **Enable Run As support for Linux instances**.
5. Do one of the following:
   - Choose the **IAM console** link. In the navigation pane, choose either **Users** or **Roles**. Choose the entity (user or role) to add tags to, and then choose the **Tags** tab. Enter `SSMSessionRunAs` for the key name. Enter the name of a user account on your target instance for the key value. Choose **Save changes**.
   - For **(Optional) Enter an operating system user name for starting sessions**, enter the name of the operating system user account on the target instance that you want to use to start sessions.

6. Choose **Save**.

**Enable AWS KMS Key Encryption of Session Data (Console)**

Use AWS Key Management Service (AWS KMS) to create and manage keys. With AWS KMS, you can control the use of encryption across a wide range of AWS services and in your applications. You can specify that session data transmitted between your Amazon EC2 instances and the local machines of users in your AWS account is encrypted using AWS KMS key encryption. (This is in addition to the TLS 1.2 encryption that AWS already provides by default.) AWS KMS key encryption for sessions is accomplished using a customer master key (CMK) that is created in AWS KMS.

**Note**

You must enable AWS KMS encryption in order to reset passwords on your managed instances from the Systems Manager console. For more information, see **Reset a Password on a Managed Instance** (p. 565).

You can use a key that you created in your AWS account. You can also use a key that was created in a different AWS account. The creator of the key in a different AWS account must provide you with the permissions needed to use the key.

After you enable AWS KMS key encryption for your session data, both the users who start sessions and the instances that they connect to must have permission to use the key. You provide permission to use the CMK with Session Manager through IAM policies. For information, see the following topics:

- **Add CMK permissions for users in your account**: Quickstart Default IAM Policies for Session Manager (p. 581).
- **Add CMK permissions for instances in your account**: Step 2: Verify or Create an IAM Instance Profile with Session Manager Permissions (p. 573).
For more information about creating and managing AWS KMS keys, see the AWS Key Management Service Developer Guide.

For information about using the AWS CLI to enable AWS KMS key encryption of session data in your account, see Create Session Manager Preferences (AWS CLI) (p. 593) or Update Session Manager Preferences (AWS CLI) (p. 595).

Note
There is a charge to use CMKs. For information, see AWS Key Management Service pricing.

To enable AWS KMS key encryption of session data (console)
2. In the navigation pane, choose Session Manager.
3. Choose the Preferences tab, and then choose Edit.
4. Select the check box next to Key Management Service (KMS).
5. Do one of the following:
   - Choose the button next to Select an AWS KMS key in my current account, then select a key from the list.
   - or-
   Choose the button next to Enter a KMS key alias or KMS key ARN. Manually enter an AWS KMS key alias for a key created in your current account, or enter the key ARN for a key in another account. The following are examples.
     - Key alias: alias/my-kms-key-alias
     - Key ARN: arn:aws:kms:us-west-2:111122223333:key/1234abcd-12ab-34cd-56ef-12345EXAMPLE
     - or-
     Choose Create new key to create a new CMK in your account. After you create the new key, return to the Preferences tab and select the key for encrypting session data in your account.

   For more information about sharing keys, see Allowing External AWS Accounts to Access a CMK in the AWS Key Management Service Developer Guide.
6. Choose Save.

Create Session Manager Preferences (AWS CLI)
The following procedure describes how to use the AWS CLI and the create-document command to create Session Manager preferences for your account in the selected AWS Region. Use Session Manager preferences to specify options for logging session data in an Amazon S3 bucket or Amazon CloudWatch Logs log group. You can also use Session Manager preferences to encrypt your session data.

For information about using the CLI to update existing Session Manager preferences, see Update Session Manager Preferences (AWS CLI) (p. 595).

To create Session Manager preferences (AWS CLI)
1. Create a JSON file on your local machine with a name such as SessionManagerRunShell.json, and then paste the following content into it:

   ```json
   {
     "schemaVersion": "1.0",
   }
   ```
2. Specify where you want to send session data. You can specify an S3 bucket name (with an optional prefix) or a CloudWatch Logs log group name. If you want to further encrypt data between local client and EC2 instances, provide the AWS KMS key to use for encryption. The following is an example.

```json
{
  "schemaVersion": "1.0",
  "description": "Document to hold regional settings for Session Manager",
  "sessionType": "Standard_Stream",
  "inputs": {
    "s3BucketName": "MyBucketName",
    "s3KeyPrefix": "MyBucketPrefix",
    "s3EncryptionEnabled": true,
    "cloudWatchLogGroupName": "MyLogGroupName",
    "cloudWatchEncryptionEnabled": true,
    "kmsKeyId": "MyKMSKeyID",
    "runAsEnabled": true,
    "runAsDefaultUser": "MyDefaultRunAsUser"
  }
}
```

**Note**
If you do not want to encrypt the session log data, change "true" to "false" for `s3EncryptionEnabled`. If you aren't sending logs to either an S3 bucket or a CloudWatch Logs log group, don't want to encrypt active session data, or don't want to enable Run As support for the sessions in your account, you can delete the lines for those options. Make sure the last line in the "inputs" section does not end with a comma.

If you add a AWS KMS key ID to encrypt your session data, both the users who start sessions and the instances that they connect to must have permission to use the key. You provide permission to use the CMK with Session Manager through IAM policies. For information, see the following topics:

- Add CMK permissions for users in your account: Quickstart Default IAM Policies for Session Manager (p. 581).
- Add CMK permissions for instances in your account: Step 2: Verify or Create an IAM Instance Profile with Session Manager Permissions (p. 573).

3. Save the file.

4. In the directory where you created the JSON file, run the following command:

   ```bash
   aws ssm create-document --name SSM-SessionManagerRunShell --content "file://SessionManagerRunShell.json" --document-type "Session" --document-format JSON
   ```

   **Important**
   Be sure to include `file://` before the file name. It is required in this command.

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If successful, the command returns output similar to the following:

```
{
   "DocumentDescription": {
      "Status": "Creating",
      "Hash": "ce4fd0a2ab9b0f6ae759004ba603174c3ec2231f21a81db8690a33eb66EXAMPLE",
      "Name": "SSM-SessionManagerRunShell",
      "Tags": [],
      "DocumentType": "Session",
      "PlatformTypes": [
         "Windows",
         "Linux"
      ],
      "DocumentVersion": "1",
      "HashType": "Sha256",
      "CreatedDate": 1547750660.918,
      "Owner": "111122223333",
      "SchemaVersion": "1.0",
      "DefaultVersion": "1",
      "DocumentFormat": "JSON",
      "LatestVersion": "1"
   }
}
```

**Update Session Manager Preferences (AWS CLI)**

The following procedure describes how to use the AWS CLI and the `update-document` command to make changes to the Session Manager preferences for your account in the selected AWS Region. Use Session Manager preferences to specify options for logging session data in an Amazon S3 bucket or Amazon CloudWatch Logs log group. You can also use Session Manager preferences to encrypt your session data.

**To update Session Manager preferences (AWS CLI)**

1. Create a JSON file on your local machine with a name such as `SessionManagerRunShell.json`, and then paste the following content into it:

   ```json
   {
      "schemaVersion": "1.0",
      "description": "Document to hold regional settings for Session Manager",
      "sessionType": "Standard_Stream",
      "inputs": {
         "s3BucketName": "",
         "s3KeyPrefix": "",
         "s3EncryptionEnabled": true,
         "cloudWatchLogGroupName": "",
         "cloudWatchEncryptionEnabled": true,
         "kmsKeyId": "",
         "runAsEnabled": "",
         "runAsDefaultUser": ""
      }
   }
   ```

2. Specify where you want to send session data. You can specify an S3 bucket name (with an optional prefix) or a CloudWatch Logs log group name. If you want to further encrypt data between local client and EC2 instances, provide the AWS KMS key to use for encryption. The following is an example.

   ```json
   {
      "schemaVersion": "1.0",
   }
   ```
"description": "Document to hold regional settings for Session Manager",
"sessionType": "Standard_Stream",
"inputs": {
  "s3BucketName": "MyBucketName",
  "s3KeyPrefix": "MyBucketPrefix",
  "s3EncryptionEnabled": true,
  "cloudWatchLogGroupName": "MyLogGroupName",
  "cloudWatchEncryptionEnabled": true,
  "kmsKeyId": "MyKMSKeyID",
  "runAsEnabled": true,
  "runAsDefaultUser": "MyDefaultRunAsUser"
}

Note
If you do not want to encrypt the session log data, change "true" to "false" for
s3EncryptionEnabled.
If you aren't sending logs to either an S3 bucket or a CloudWatch Logs log group, don't
want to encrypt active session data, or don't want to enable Run As support for the sessions
in your account, you can delete the lines for those options. Make sure the last line in the
"inputs" section does not end with a comma.
If you add a AWS KMS key ID to encrypt your session data, both the users who start sessions
and the instances that they connect to must have permission to use the key. You provide
permission to use the CMK with Session Manager through IAM policies. For information, see
the following topics:

- Add CMK permissions for users in your account: Quickstart Default IAM Policies for
  Session Manager (p. 581).
- Add CMK permissions for instances in your account: Step 2: Verify or Create an IAM
  Instance Profile with Session Manager Permissions (p. 573).

3. Save the file.
4. In the directory where you created the JSON file, run the following command:

aws ssm update-document --name "SSM-SessionManagerRunShell" --content "file://
SessionManagerRunShell.json" --document-version "$LATEST"

Important
Be sure to include file:// before the file name. It is required in this command.

If successful, the command returns output similar to the following:

```json
{
  "DocumentDescription": {
    "Status": "Updating",
    "Hash": "ce4f0a2ab9b0f8e8759004ba603174c3ec2231f21a81db8690a33eb66EXAMPLE",
    "Name": "SSM-SessionManagerRunShell",
    "Tags": [],
    "DocumentType": "Session",
    "PlatformTypes": [
      "Windows",
      "Linux"
    ],
    "DocumentVersion": "2",
    "HashType": "Sha256",
    "CreatedDate": 1537206341.565,
    "Owner": "111122223333",
    "SchemaVersion": "1.0",
    "DefaultVersion": "1",
    "DocumentFormat": "JSON",
```
Step 5: (Optional) Use PrivateLink to Set Up a VPC Endpoint for Session Manager

You can further improve the security posture of your managed instances by configuring AWS Systems Manager to use an interface VPC endpoint. Interface endpoints are powered by AWS PrivateLink, a technology that enables you to privately access Amazon EC2 and Systems Manager APIs by using private IP addresses.

PrivateLink restricts all network traffic between your managed instances, Systems Manager, and Amazon EC2 to the Amazon network. (Managed instances don't have access to the internet.) Also, you don't need an internet gateway, a NAT device, or a virtual private gateway.

In addition to the three endpoints required to use PrivateLink with Systems Manager, you can create a fourth, com.amazonaws.region.ssmmessages, for use with Session Manager.

For more information, see (Optional) Create a Virtual Private Cloud Endpoint (p. 36).

Step 6: (Optional) Disable or Enable ssm-user Account Administrative Permissions

When a version of SSM Agent that supports Session Manager starts on an instance, it creates a user account with root or administrator privileges called ssm-user. On Linux machines, the account is added to /etc/sudoers. On Windows machines, it is added to the Administrators group. Sessions are launched using the credentials of this user account.

If you want to prevent Session Manager users from running administrative commands on an instance, you can update its ssm-user permissions. You can also restore these permissions after they have been removed.

Topics
- Managing ssm-user sudo Account Permissions on Linux (p. 597)
- Managing ssm-user Administrator Account Permissions on Windows Server (p. 598)

Managing ssm-user sudo Account Permissions on Linux

Use one of the following procedures to disable or enable the ssm-user account sudo permissions on Linux instances:

Use Run Command to modify ssm-user sudo permissions (console)

- Use the procedure in Running Commands from the Console (p. 622) with the following values:
  - For Command document, choose AWS-RunShellScript.
  - To remove sudo access, in the Command parameters area, paste the following in the Commands box:

    ```
    cd /etc/sudoers.d
    echo "##User rules for ssm-user" > ssm-agent-users
    ```
To restore sudo access, in the Command parameters area, paste the following in the Commands box:

```
cd /etc/sudoers.d
echo "ssm-user ALL=(ALL) NOPASSWD:ALL" > ssm-agent-users
```

Use the command line to modify ssm-user sudo permissions (AWS CLI)

1. Connect to the instance and run the following command:

```
sudo -s
```

2. Change the working directory using the following command:

```
cd /etc/sudoers.d
```

3. Open the file named ssm-agent-users for editing.

4. To remove sudo access, delete the following line:

```
ssm-user ALL=(ALL) NOPASSWD:ALL
```

-or-

To restore sudo access, add the following line:

```
ssm-user ALL=(ALL) NOPASSWD:ALL
```

5. Save the file.

Managing ssm-user Administrator Account Permissions on Windows Server

Use one of the following procedures to disable or enable the ssm-user account Administrator permissions on Windows Server instances:

Use Run Command to modify Administrator permissions (console)

- Use the procedure in Running Commands from the Console (p. 622) with the following values:

  For Command document, choose AWS-RunPowerShellScript.

  To remove administrative access, in the Command parameters area, paste the following in the Commands box:

```
net localgroup "Administrators" "ssm-user" /delete
```

-or-

To restore administrative access, in the Command parameters area, paste the following in the Commands box:

```
net localgroup "Administrators" "ssm-user" /add
```
Use the PowerShell or Command Prompt window to modify Administrator permissions

1. Connect to the instance and open the PowerShell or Command Prompt window.
2. To remove administrative access, run the following command:

   ```bash
   net localgroup "Administrators" "ssm-user" /delete
   -or-
   net localgroup "Administrators" "ssm-user" /add
   ```

   To restore administrative access, run the following command:

Use the Windows console to modify Administrator permissions

1. Connect to the instance and open the PowerShell or Command Prompt window.
2. From the command line, run `lsrmgr.msc` to open the Local Users and Groups console.
3. Open the Users directory, and then open ssm-user.
4. On the Member Of tab, do one of the following:
   - To remove administrative access, select Administrators, and then choose Remove.
   -or-
   To restore administrative access, type Administrators in the text box, and then choose Add.
5. Choose OK.

Step 7: (Optional) Enable SSH Connections Through Session Manager

You can enable users in your AWS account to use the AWS CLI to establish Secure Shell (SSH) connections to instances using Session Manager. Users who connect using SSH can also copy files between their local machines and managed instances using Secure Copy Protocol (SCP). You can use this functionality to connect to instances without opening inbound ports or maintaining bastion hosts. You can also choose to explicitly disable SSH connections to your instances through Session Manager.

To enable SSH connections through Session Manager

1. On the managed instance to which you want to enable SSH connections, do the following:
   - Ensure that SSH is running on the instance. (You can close inbound ports on the instance.)
   - Ensure that SSM Agent version 2.3.672.0 or later is installed on the instance.

   For information about installing or updating SSM Agent on an instance, see the following topics:
   - Installing and Configuring SSM Agent on Windows Instances (p. 65).
   - Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68)
   - Install SSM Agent for a Hybrid Environment (Windows) (p. 48)
   - Install SSM Agent for a Hybrid Environment (Linux) (p. 50)

   Note
   To use Session Manager with on-premises servers and virtual machines (VMs) that you activated as managed instances, you must use the Advanced-Instances Tier. For more
information about advanced instances, see (Optional) Enable the Advanced-Instances Tier (p. 53).

2. On the local machine from which you want to connect to a managed instance using SSH, do the following:

   • Ensure that version 1.1.23.0 or later of the Session Manager plugin is installed.

     For information about installing the Session Manager plugin, see (Optional) Install the Session Manager Plugin for the AWS CLI (p. 601).

   • Update the SSH configuration file to enable running a proxy command that starts a Session Manager session and transfer all data through the connection.

   **Linux**

     **Tip**

     The SSH configuration file is typically located at `~/.ssh/config`.

     Add the following to the configuration file on the local machine:

     ```
     # SSH over Session Manager
     host i-* mi-*
     ProxyCommand sh -c "aws ssm start-session --target %h --document-name AWS-StartSSHSession --parameters 'portNumber=%p'"
     ```

   **Windows**

     **Tip**

     The SSH configuration file is typically located at `C:\Users\username\.ssh\config`.

     Add the following to the configuration file on the local machine:

     ```
     # SSH over Session Manager
     host i-* mi-*
     ProxyCommand C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe "aws ssm start-session --target %h --document-name AWS-StartSSHSession --parameters portNumber=%p"
     ```

   • Create or verify that you have a Privacy Enhanced Mail Certificate (a PEM file), or at minimum a public key, to use when establishing connections to managed instances. (You specify the path to the certificate or key as part of the command to start a session. For information about starting a session using SSH, see Starting a Session (SSH) (p. 607).)

**To disable SSH connections through Session Manager**

   • Option 1: Open the IAM console at https://console.aws.amazon.com/iam/. In the navigation pane, choose **Policies**, and then update the permissions policy for the user or role to block from starting Session Manager sessions. For example, prepare to modify the user quickstart policy you created in Quickstart End User Policy for Session Manager (p. 581). Add the following element to the policy, or replace any permissions that allow a user to start a session:

     ```json
     {
     "Version": "2012-10-17",
     "Statement": [
       {
         "Sid": "VisualEditor1",
         "Effect": "Deny",
         "Action": "ssm:StartSession",
         "Resource": "arn:aws:ssm:*:*:document/AWS-StartSSHSession"
       }
     ]
     ```
Option 2: Attach an inline policy to a user policy by using the AWS Management Console, the AWS CLI, or the AWS API.

Using the method of your choice, attach the policy statement in Option 1 to the policy for an AWS user, group, or role.

For information, see Adding and Removing IAM Identity Permissions in the IAM User Guide.

Working with Session Manager

You can use the AWS Systems Manager console or the AWS CLI to start sessions that connect you to the Amazon EC2 instances your system administrator has granted you access to using AWS Identity and Access Management (IAM) policies. Depending on your permissions, you can also view information about sessions, resume inactive sessions that have not timed out, and end sessions.

For more information about sessions, see What Is a Session? (p. 570)

Topics

- (Optional) Install the Session Manager Plugin for the AWS CLI (p. 601)
- Start a Session (p. 606)
- Terminate a Session (p. 609)
- View Session History (p. 609)

(Optional) Install the Session Manager Plugin for the AWS CLI

If you want to use the AWS CLI to start and end sessions that connect you to your managed instances, you must first install the Session Manager plugin on your local machine. The plugin can be installed on supported versions of Microsoft Windows, macOS, Linux, and Ubuntu Server.

Use the Latest Version of the Session Manager Plugin

The plugin is updated occasionally with enhanced functionality. We recommend that you regularly ensure you are using the latest version of the plugin. For more information, see Session Manager Plugin Latest Version and Release History (p. 606).

Installation Prerequisite

AWS CLI version 1.16.12 or later must be installed on your local machine in order to use the Session Manager plugin.

Topics

- Install the Session Manager Plugin on Windows (p. 602)
- Install and Uninstall the Session Manager Plugin on macOS (p. 602)
- Install Session Manager Plugin on Linux (p. 603)
- Install the Session Manager Plugin on Ubuntu Server (p. 604)
- Verify the Session Manager Plugin Installation (p. 604)
- (Optional) Enable Session Manager Plugin Logging (p. 604)
- Session Manager Plugin Latest Version and Release History (p. 606)
Install the Session Manager Plugin on Windows

You can install the Session Manager plugin on Microsoft Windows Vista or later using the standalone installer.

When updates are released, you must repeat the installation process to get the latest version of the Session Manager plugin.

**Note**
For best results, we recommend starting sessions on Windows clients using the Windows PowerShell application version 5 or later. On Microsoft Windows 10, the Command Prompt also provides reliable support for Session Manager operations.

**To install the Session Manager plugin using the EXE installer**

1. Download the installer using the following URL:

   https://s3.amazonaws.com/session-manager-downloads/plugin/latest/windows/SessionManagerPluginSetup.exe

2. Run the downloaded installer and follow the on-screen the instructions.

   Leave the install location box blank to install the plugin to the default directory:
   
   C:\%PROGRAMFILES%\Amazon\SessionManagerPlugin\bin\

3. Verify that the installation was successful. For information, see Verify the Session Manager Plugin Installation (p. 604).

   **Note**
   If Windows is unable to find the executable, you might need to re-open the command prompt or add the installation directory to your PATH environment variable manually. For information, see the troubleshooting topic Session Manager Plugin Not Automatically Added to Command Line Path (Windows) (p. 615).

Install and Uninstall the Session Manager Plugin on macOS

You can install the Session Manager plugin on macOS using the bundled installer.

**Important**
The bundled installer does not support installing to paths that contain spaces.

**To install the Session Manager plugin using the bundled installer (macOS)**

1. Download the bundled installer:


2. Unzip the package:

   unzip sessionmanager-bundle.zip

3. Run the install command:

   sudo ./sessionmanager-bundle/install -i /usr/local/sessionmanagerplugin -b /usr/local/bin/session-manager-plugin
Note
The plugin requires Python 2.6.5 or later or Python 3.3. By default, the install script runs under the system default version of Python. If you have installed an alternative version of Python and want to use that to install the Session Manager plugin, run the install script with that version by absolute path to the Python executable. The following is an example.

```
sudo /usr/local/bin/python3.6 sessionmanager-bundle/install -i /usr/local/sessionmanagerplugin -b /usr/local/bin/session-manager-plugin
```

The installer installs the Session Manager plugin at /usr/local/sessionmanagerplugin and creates the symlink session-manager-plugin in the /usr/local/bin directory. This eliminates the need to specify the install directory in the user's $PATH variable.

To see an explanation of the -i and -b options, use the -h option:

```
./sessionmanager-bundle/install -h
```

4. Verify that the installation was successful. For information, see Verify the Session Manager Plugin Installation (p. 604).

Note
If you ever want to uninstall the plugin, run the following two commands, one at a time:

```
sudo rm -rf /usr/local/sessionmanagerplugin
```

```
sudo rm /usr/local/bin/session-manager-plugin
```

Install Session Manager Plugin on Linux

1. Download the Session Manager plugin RPM package:
   - 64-bit:
     
     ```
     curl "https://s3.amazonaws.com/session-manager-downloads/plugin/latest/linux_64bit/session-manager-plugin.rpm" -o "session-manager-plugin.rpm"
     ```
   
   - 32-bit:
     
     ```
     ```

2. Run the install command:

   ```
   sudo yum install -y session-manager-plugin.rpm
   ```

3. Verify that the installation was successful. For information, see Verify the Session Manager Plugin Installation (p. 604).

Note
If you ever want to uninstall the plugin, run `sudo yum erase session-manager-plugin -y`
Install the Session Manager Plugin on Ubuntu Server

1. Download the Session Manager plugin deb package:
   - 64-bit:
     ```
     curl "https://s3.amazonaws.com/session-manager-downloads/plugin/latest/ubuntu_64bit/session-manager-plugin.deb" -o "session-manager-plugin.deb"
     ```
   - 32-bit:
     ```
     ```

2. Run the install command:
   ```
   sudo dpkg -i session-manager-plugin.deb
   ```

3. Verify that the installation was successful. For information, see Verify the Session Manager Plugin Installation (p. 604).

   **Note**
   If you ever want to uninstall the plugin, run `sudo dpkg -r session-manager-plugin`

Verify the Session Manager Plugin Installation

Run the following commands to verify that the Session Manager plugin installed successfully:

```session-manager-plugin```

If the installation was successful, the following message is returned:

```
The Session Manager plugin is installed successfully. Use the AWS CLI to start a session.
```

You can also test the installation by running the following command in the AWS CLI:

```
Note
This command will work only if your Session Manager administrator has granted you the necessary IAM permissions to access the target instance using Session Manager.
```

```aws ssm start-session --target id-of-an-instance-you-have-permissions-to-access```

(Optional) Enable Session Manager Plugin Logging

The Session Manager plugin includes an option to enable logging for sessions that you run. By default, logging is disabled.

If you enable logging, the Session Manager plugin creates log files for both application activity (`session-manager-plugin.log`) and errors (`errors.log`) on your local machine.

**Topics**

- Enable Logging for the Session Manager Plugin (Windows) (p. 605)
- Enable Logging for the Session Manager Plugin (Linux and macOS) (p. 605)
Enable Logging for the Session Manager Plugin (Windows)

1. Locate the seelog.xml.template file for the plugin.
   
   The default location is C:\%PROGRAMDATA%\Amazon\SessionManagerPlugin\seelog.xml.template.
2. Change the name of the file to seelog.xml.
3. Open the file and change minlevel="off" to minlevel="info" or minlevel="debug".
   
   Note
   By default, log entries about opening a data channel and reconnecting sessions are recorded at the INFO level. Data flow (packets and acknowledgement) entries are recorded at the DEBUG level.
4. Change other configuration options you want to modify. Options you can change include:
   
   • **Debug level**: You can change the debug level from formatid="fmtinfo" to outputs formatid="fmtdebug".
   
   • **Log file options**: You can make changes to the log file options, including where the logs are stored, with the exception of the log file names.
     
     Important
     Do not change the file names or logging will not work correctly.

   ```xml
   <rollingfile type="size" filename="C:\%PROGRAMDATA%\Amazon\SessionManagerPlugin\Logs\session-manager-plugin.log" maxsize="30000000" maxrolls="5"/>
   <filter levels="error,critical" formatid="fmterror">
   <rollingfile type="size" filename="C:\%PROGRAMDATA%\Amazon\SessionManagerPlugin\Logs\errors.log" maxsize="10000000" maxrolls="5"/>
   ```
5. Save the file.

Enable Logging for the Session Manager Plugin (Linux and macOS)

1. Locate the seelog.xml.template file for the plugin.
   
   The default location is /usr/local/sessionmanagerplugin/seelog.xml.template.
2. Change the name of the file to seelog.xml.
3. Open the file and change minlevel="off" to minlevel="info" or minlevel="debug".
   
   Note
   By default, log entries about opening data channels and reconnecting sessions are recorded at the INFO level. Data flow (packets and acknowledgement) entries are recorded at the DEBUG level.
4. Change other configuration options you want to modify. Options you can change include:
   
   • **Debug level**: You can change the debug level from formatid="fmtinfo" to outputs formatid="fmtdebug".
   
   • **Log file options**: You can make changes to the log file options, including where the logs are stored, with the exception of the log file names.
     
     Important
     Do not change the file names or logging will not work correctly.

   ```xml
   <rollingfile type="size" filename="/usr/local/sessionmanagerplugin/logs/session-manager-plugin.log" maxsize="30000000" maxrolls="5"/>
   <filter levels="error,critical" formatid="fmterror">
   ```
Important
If you use the specified default directory for storing logs, you must either run session commands using `sudo` or give the directory where the plugin is installed full read and write permissions. To bypass these restrictions, change the location where logs are stored.

5. Save the file.

Session Manager Plugin Latest Version and Release History

Your local machine must be running a supported version of the Session Manager plugin. If you are running an earlier version, your Session Manager operations might not succeed.

The current minimum supported version is 1.1.17.0.

The latest release is version 1.1.33.0.

To see if you have the latest version, run the following command in the AWS CLI:

```
Note
The command returns results only if the plugin is located in the default installation directory for your operating system type. You can also check the version in the contents of the VERSION file in the directory where you have installed the plugin.
```

The following table lists all releases of the Session Manager plugin and the features and enhancements included with each version.

<table>
<thead>
<tr>
<th>Version</th>
<th>Release date</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.33.0</td>
<td>September 26, 2019</td>
<td>Enhancement: (Port forwarding sessions only) Send a disconnect signal to the server when the client drops the TCP connection.</td>
</tr>
<tr>
<td>1.1.31.0</td>
<td>September 6, 2019</td>
<td>Enhancement: Update to keep port forwarding session open until remote server closes the connection.</td>
</tr>
<tr>
<td>1.1.26.0</td>
<td>July 30, 2019</td>
<td>Enhancement: Limit the rate of data transfer during a session.</td>
</tr>
<tr>
<td>1.1.23.0</td>
<td>July 9, 2019</td>
<td>Enhancement: Add support for running SSH sessions using Session Manager.</td>
</tr>
<tr>
<td>1.1.17.0</td>
<td>April 4, 2019</td>
<td>Enhancement: Add support for further encryption of session data using AWS Key Management Service (AWS KMS).</td>
</tr>
<tr>
<td>1.0.0.0</td>
<td>September 11, 2018</td>
<td>Initial release of the Session Manager plugin.</td>
</tr>
</tbody>
</table>

Start a Session

You can use the AWS Systems Manager console, the AWS CLI, or SSH to start a session.

Topics

- Starting a Session (Console) (p. 607)
Starting a Session (Console)

You can use the AWS Systems Manager console to start a session with an instance in your account.

To start a session (console)

2. In the navigation pane, choose Session Manager.

   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Session Manager in the navigation pane.
3. Choose Start session.
4. For Target instances, choose the option button to the left of the instance you want to connect to.

   If an instance you want to connect to is not in the list, or is listed but an error message reports, "The instance you selected is not configured to use Session Manager," see Instance Not Available or Not Configured for Session Manager (p. 614) for troubleshooting steps.
5. Choose Start session.

After the connection is made, you can run bash commands (Linux) or PowerShell commands (Windows) as you would through any other connection type.

Starting a Session (AWS CLI)

To start a session using the AWS CLI, run the following command:

```
aws ssm start-session --target instance-id
```

*instance-id* represents the ID of an instance configured for use with AWS Systems Manager and its Session Manager capability, such as i-02573cafcfEXAMPLE.

For information about other options you can use with the start-session command, see start-session in the AWS Systems Manager section of the AWS CLI Command Reference.

Starting a Session (SSH)

To start a session using SSH, run the following command:

```
Note
```

To start a session using SSH, your target instance must be configured to support SSH connections. For more information, see (Optional) Enable SSH Connections Through Session Manager (p. 599).
ssh -i /path/my-key-pair.pem username@instance-id

/\path/my-key-pair.pem represents the path to your Privacy Enhanced Mail (PEM) certificate.

username@instance-id represents the user name you use to connect to the instance, and the instance ID, such as JaneDoe@i-02573cafcfEXAMPLE.

**Tip**
When you start a session using SSH, you can copy local files to the target instance using the following command format.

scp -i /path/my-key-pair.pem /path/SampleFile.txt username@instance-id:~

For information about other options you can use with the `start-session` command, see `start-session` in the AWS Systems Manager section of the AWS CLI Command Reference.

### Starting a Session (Port Forwarding)

To start a port forwarding session, run the following command from the CLI:

```
aws ssm start-session --target instance-id --document-name AWS-StartPortForwardingSession --parameters '{"portNumber":["80"], "localPortNumber":["56789"]}'
```

instance-id represents the ID of an instance configured for use with AWS Systems Manager and its Session Manager capability, such as i-02573cafcfEXAMPLE.

portNumber represents the remote port on the instance where traffic should be redirected to, such as 3389. If this parameter is not specified, Session Manager assumes 80 as the default remote port.

localPortNumber represents the local port on the client where traffic should be redirected to, such as 56789.

For information about other options you can use with the `start-session` command, see `start-session` in the AWS Systems Manager section of the AWS CLI Command Reference.

### Starting a Session (Interactive Commands)

To start an Interactive Command session, run the following command:

```
aws ssm start-session --target instance-id --document-name TestInteractiveCommandSessionDocument --parameters '{"logpath": ["/var/log/amazon/ssm/amazon-ssm-agent.log"]}'
```

instance-id represents the ID of an instance configured for use with AWS Systems Manager and its Session Manager capability, such as i-02573cafcfEXAMPLE.
For information about other options you can use with the `start-session` command, see `start-session` in the AWS Systems Manager section of the AWS CLI Command Reference.

**Related Content**

Port Forwarding Using AWS Systems Manager Session Manager on the *AWS News Blog*.

**Terminate a Session**

You can use the AWS Systems Manager console or the AWS CLI to end a session that you started to connect to an instance in your account. If there is no user activity after 20 minutes, a session is ended. After a session is ended, it can't be resumed.

**Topics**

- Terminating a Session (Console) (p. 609)
- Terminating a Session (AWS CLI) (p. 609)

**Terminating a Session (Console)**

You can use the AWS Systems Manager console to end a session with an instance in your account.

**To end a session (console)**

2. In the navigation pane, choose **Session Manager**.
3. For **Sessions**, choose the option button to the left of the session you want to end.
4. Choose **Terminate**.

**Terminating a Session (AWS CLI)**

To end a session using the AWS CLI, run the following command:

```
aws ssm terminate-session --session-id session-id
```

`session-id` represents the ID of an active Session Manager session that you want to end permanently.

For more information about the `terminate-session` command, see `terminate-session` in the AWS Systems Manager section of the AWS CLI Command Reference.

**View Session History**

You can use the AWS Systems Manager console or the AWS CLI to view information about sessions in your account. In the console, you can view session details such the following:

- The ID of the session
- Which user connected to an instance through a session
• The ID of the instance
• When the session began and ended
• The status of the session
• The location specified for storing session logs (if enabled)

Using the AWS CLI, you can view a list of sessions in your account, but not the additional details that are available in the console.

For information about auditing and logging session history information, see Auditing and Logging Session Activity (p. 610).

Topics
• Viewing Session History (Console) (p. 610)
• Viewing Session History (AWS CLI) (p. 610)

Viewing Session History (Console)

You can use the AWS Systems Manager console to view details about the sessions in your account.

To view session history (console)
2. In the navigation pane, choose Session Manager.
3. Choose Start session.
4. Choose the Session history tab.

Viewing Session History (AWS CLI)

To view a list of sessions in your account using the AWS CLI, run the following command:

```
aws ssm describe-sessions --state History
```

For information about other options you can use with the describe-sessions command, see describe-sessions in the AWS Systems Manager section of the AWS CLI Command Reference.

Auditing and Logging Session Activity

In addition to providing information about current and completed sessions in the Systems Manager console, Session Manager provides you with options for auditing and logging session activity in your AWS account. This allows you to do the following:

• Create and store session logs for archival purposes.
• Generate a report showing details of every connection made to your instances using Session Manager over the past 30 days.
• Generate notifications of session activity in your AWS account, such as Amazon Simple Notification Service (Amazon SNS) notifications.
• Automatically initiate another action on an AWS resource as the result of session activity, such as running an AWS Lambda function, starting an AWS CodePipeline pipeline, or running an AWS Systems Manager Run Command document.
Note
If you are using Windows Server 2012 or earlier, the data in your logs might not be formatted optimally. We recommend using Windows Server 2012 R2 and later for optimal log formats. If you are using Linux instances, ensure that the screen utility is installed. If it is not, your log data might be truncated. On Amazon Linux, Amazon Linux 2, and Ubuntu Server, the screen utility is installed by default. To install screen manually, depending on your version of Linux, run either `sudo yum install screen` or `sudo apt-get install screen`.

Refer to the following topics for more information about auditing and logging options for Session Manager.

Audit Session Activity Using AWS CloudTrail

AWS CloudTrail captures session API calls through the Systems Manager console, the AWS CLI, and the Systems Manager SDK. The information can be viewed on the CloudTrail console or stored in a specified Amazon S3 bucket. One bucket is used for all CloudTrail logs for your account.

For more information, see Logging AWS Systems Manager API Calls with AWS CloudTrail (p. 892).

Logging Session Data Using Amazon S3 (Console)

You can choose to store session log data in a specified Amazon S3 bucket for auditing purposes. The default option is for logs to be sent to an encrypted S3 bucket. Encryption is performed using the key specified for the bucket, either an AWS Key Management Service (AWS KMS) key or an Amazon S3 Server-Side Encryption (SSE) key (AES-256).

Important
When you use virtual hosted–style buckets with Secure Sockets Layer (SSL), the SSL wildcard certificate only matches buckets that don’t contain periods. To work around this, use HTTP or write your own certificate verification logic. We recommend that you do not use periods (".") in bucket names when using virtual hosted–style buckets.

S3 Bucket Encryption

In order to send logs to your S3 bucket with encryption, encryption must be enabled on the bucket. For more information about S3 bucket encryption, see Amazon S3 Default Encryption for S3 Buckets.

Customer-managed CMK

If you are using an AWS KMS customer master key (CMK) that you manage yourself (a customer-managed CMK) to encrypt your bucket, then the IAM instance profile attached to your instances must have explicit permissions to read the CMK. If you use an AWS-managed CMK, the instance does not require this explicit permission. For more information about providing the instance profile with access to use the CMK, see Allows Key Users to Use the CMK in the AWS Key Management Service Developer Guide.

Follow these steps to configure Session Manager to store session logs in an Amazon S3 bucket.

Note
You can also use the AWS CLI to specify or change the S3 bucket that session data is sent to. For information, see Update Session Manager Preferences (AWS CLI) (p. 595).

To log session data using Amazon S3 (console)

2. In the navigation pane, choose Session Manager.
3. Choose the Preferences tab, and then choose Edit.
4. Select the check box next to S3 bucket.
5. (Optional) If you do not want to encrypt the log data that is sent to the S3 bucket, clear the check box next to Encrypt log data. Otherwise, log data is encrypted using the server-side encryption key specified for the bucket. You must also clear the check box if encryption is not enabled on the bucket.

6. For S3 bucket name, select one of the following:

   **Note**
   We recommend that you do not use periods (".") in bucket names when using virtual hosted-style buckets. For more information about S3 bucket-naming conventions, see Bucket Restrictions and Limitations in the Amazon Simple Storage Service Developer Guide.

   - **Choose a bucket name from the list**: Select an S3 bucket that has already been created in your account to store session log data.
   - **Enter a bucket name in the text box**: Enter the name of an S3 bucket that has already been created in your account to store session log data.

7. (Optional) For S3 key prefix, enter the name of an existing or new folder to store logs in the selected bucket.

8. Choose Save.

For more information about working with Amazon S3 and S3 buckets, see the Amazon Simple Storage Service Getting Started Guide and the Amazon Simple Storage Service Console User Guide.

### Logging Session Data Using Amazon CloudWatch Logs (Console)

Amazon CloudWatch Logs lets you monitor, store, and access log files from various AWS services. You can stream session log data to a CloudWatch Logs log group for auditing purposes. The default option is for log data to be sent with encryption using your AWS KMS key, but you can stream the data to your log group with or without encryption.

Follow these steps to configure Session Manager to stream session log data to a CloudWatch Logs log group.

   **Note**
   You can also use the AWS CLI to specify or change the CloudWatch Logs log group that session data is sent to. For information, see Update Session Manager Preferences (AWS CLI) (p. 595).

### To log session data using Amazon CloudWatch Logs (console)

2. In the navigation pane, choose Session Manager.
3. Choose the Preferences tab, and then choose Edit.
4. Select the check box next to CloudWatch logs.
5. (Optional) If you do not want to encrypt the log data that is sent to CloudWatch Logs, clear the check box next to Encrypt log data. Otherwise, log data is encrypted using the server-side encryption key specified for the log group. You must also clear the check box if encryption is not enabled on the log group.
6. For CloudWatch logs, to specify the existing CloudWatch Logs log group in your AWS account to upload session logs to, select one of the following:

   - **Choose a log group from the list**: Select a log group that has already been created in your account to store session log data.
   - **Enter a log group name in the text box**: Enter the name of a log group that has already been created in your account to store session log data.

7. Choose Save.
For more information about working with CloudWatch Logs, see the Amazon CloudWatch Logs User Guide.

Monitoring Session Activity Using Amazon CloudWatch Events (Console)

CloudWatch Events lets you set up rules to detect when changes happen to AWS resources. You can create a rule to detect when a user in your organization starts or ends a session, and then, for example, receive a notification through Amazon SNS about the event.

CloudWatch Events support for Session Manager relies on records of API actions that were recorded by CloudTrail. (You can use CloudTrail integration with CloudWatch Events to respond to most AWS Systems Manager events.)

The following steps outline how to trigger notifications through Amazon Simple Notification Service (Amazon SNS) when a Session Manager API event occurs, such as StartSession.

To monitor session activity using Amazon CloudWatch Events (console)

1. Create an Amazon SNS topic to use for sending notifications when the Session Manager event occurs that you want to track.
   
   For more information, see Create a Topic in the Amazon Simple Notification Service Developer Guide.

2. Create a CloudWatch Events rule to invoke the Amazon SNS target for the type of Session Manager event you want to track.

   For information about how to create the rule, see Creating a CloudWatch Events Rule That Triggers on an Event in the Amazon CloudWatch Events User Guide.

   As you follow the steps to create the rule, make the following selections:

   • For Service Name, choose EC2 Simple Systems Manager (SSM).

   • For Event Type, choose AWS API Call via CloudTrail.

   • Choose Specific operation(s), and then enter the Session Manager command or commands (one at a time) you want to receive notifications for. You can choose StartSession, ResumeSession, and TerminateSession. (CloudWatch Events doesn't support Get*, List*, and Describe* commands.)

   • For Targets, choose SNS topic. For Topic, choose the name of the Amazon SNS topic you created in Step 1.

For more information, see the Amazon CloudWatch Events User Guide and the Amazon Simple Notification Service Getting Started Guide.

Troubleshooting Session Manager

Use the following information to help you troubleshoot problems with Session Manager.

Topics

• No Permission to Start a Session (p. 614)

• No Permission to Change Session Preferences (p. 614)

• Instance Not Available or Not Configured for Session Manager (p. 614)

• Session Manager Plugin Not Found (p. 615)

• Session Manager Plugin Not Automatically Added to Command Line Path (Windows) (p. 615)
No Permission to Start a Session

**Problem**: You try to start a session, but the system tells you that you do not have the necessary permissions.

- **Solution**: A system administrator has not granted you IAM policy permissions for starting Session Manager sessions. For information, see Control User Session Access to Instances (p. 579).

No Permission to Change Session Preferences

**Problem**: You try to update global session preferences for your organization, but the system tells you that you do not have the necessary permissions.

- **Solution**: A system administrator has not granted you IAM policy permissions for setting Session Manager preferences. For information, see Grant or Deny a User Permissions to Update Session Manager Preferences (p. 590).

Instance Not Available or Not Configured for Session Manager

**Problem 1**: You want to start a session on the Start a session console page, but an instance is not in the list.

- **Solution**: The instance you want to connect to might not have been configured to use with the AWS Systems Manager service. To use an instance with Systems Manager, an IAM instance profile that gives Systems Manager permission to perform actions on your instances must be attached to the instance. For information, see Create an IAM Instance Profile for Systems Manager (p. 29).

  **Note**
  If SSM Agent is already running on an instance when you attach the IAM instance profile, you might need to restart the agent before the instance is listed on the Start a session console page.

**Problem 2**: An instance you want to connect is in the list on the Start a session console page, but the page reports that "The instance you selected is not configured to use Session Manager."

- **Solution A**: The instance has been configured for use with the AWS Systems Manager service, but the IAM instance profile attached to the instance might not include permissions for the Session Manager capability. For information, see Verify or Create an IAM Instance Profile with Session Manager Permissions (p. 573).

- **Solution B**: The instance is not running a version of SSM Agent that supports Session Manager. Update SSM Agent on the instance to version 2.3.68.0 or later.

  Update SSM Agent manually on an instance by following the steps in Install and Configure SSM Agent on Amazon EC2 Windows Instances (p. 66) or Manually Install SSM Agent on Amazon EC2 Linux Instances (p. 69), depending on the operating system.

  Alternatively, use the Run Command document `AWS-UpdateSSMAgent` to update the agent version on one or more instances at a time. For information, see Update SSM Agent by using Run Command (p. 623).

  **Tip**
  To always keep your agent up-to-date, we recommend updating SSM Agent to the latest version on an automated schedule that you define using either of the following methods:

  - Run `AWS-UpdateSSMAgent` as part of a State Manager association. For information, see Automatically Update SSM Agent (CLI) (p. 684).
• Run `AWS-UpdateSSMAgent` as part of a maintenance window. For information about working with maintenance windows, see Working with Maintenance Windows (Console) (p. 455) and Tutorial: Create and Configure a Maintenance Window (AWS CLI) (p. 463).

### Session Manager Plugin Not Found

To use the AWS CLI to run session commands, the Session Manager plugin must also be installed on your local machine. For information, see (Optional) Install the Session Manager Plugin for the AWS CLI (p. 601).

### Session Manager Plugin Not Automatically Added to Command Line Path (Windows)

When you install the Session Manager plugin on Windows, the `session-manager-plugin` executable should be automatically added to your operating system's PATH environment variable. If the command failed after you ran it to check whether the Session Manager plugin installed correctly (`aws ssm start-session --target instance-id`), you might need to set it manually using the following procedure.

**To modify your PATH variable (Windows)**

1. Press the Windows key and enter `environment variables`.
2. Choose `Edit environment variables for your account`.
3. Choose `PATH` and then choose `Edit`.
4. Add paths to the `Variable value` field, separated by semicolons, as shown in this example: `C:\existing\path;C:\new\path`

   * `C:\existing\path` represents the value already in the field. `C:\new\path` represents the path you want to add, as shown in these examples.

   - **64-bit machines**: `C:\Program Files\Amazon\SessionManagerPlugin\bin`
   - **32-bit machines**: `C:\Program Files (x86)\Amazon\SessionManagerPlugin\bin`
5. Choose `OK` twice to apply the new settings.
6. Close any running command prompts and re-open.

## AWS Systems Manager Run Command

AWS Systems Manager Run Command lets you remotely and securely manage the configuration of your managed instances. A *managed instance* is any Amazon EC2 instance or on-premises machine in your hybrid environment that has been configured for Systems Manager. Run Command enables you to automate common administrative tasks and perform ad hoc configuration changes at scale. You can use Run Command from the AWS console, the AWS Command Line Interface, AWS Tools for Windows PowerShell, or the AWS SDKs. Run Command is offered at no additional cost.

Administrators use Run Command to perform the following types of tasks on their managed instances: install or bootstrap applications, build a deployment pipeline, capture log files when an instance is terminated from an Auto Scaling group, and join instances to a Windows domain, to name a few.

### Getting Started

The following table includes information to help you get started with Run Command.
Before you can manage instances by using Run Command, you must configure an AWS Identity and Access Management (IAM) user policy for any user who will run commands, and an IAM instance profile role for any instance that will process commands. For more information, see Setting Up AWS Systems Manager (p. 23).

This section also includes recommended tasks for monitoring command executions and restricting command access to tagged instances. The tasks in this section are not required, but they can help minimize the security posture and day-to-day management of your instances. For this reason, we highly recommend you complete the tasks in this section.

### Topics
- Configuring Amazon CloudWatch Logs for Run Command (p. 616)
- Configuring CloudWatch Events for Run Command (p. 618)
- Restricting Run Command Access Based on Instance Tags (p. 619)

### Configuring Amazon CloudWatch Logs for Run Command

When you send a command by using Run Command, you can specify where you want to send the command output. By default, Systems Manager returns only the first 2,500 characters of the command output.
output. If you want to view the full details of the command output, you can specify an Amazon Simple Storage Service (Amazon S3) bucket. Or you can specify Amazon CloudWatch Logs. If you specify CloudWatch Logs, Run Command periodically sends all command output and error logs to CloudWatch Logs. You can monitor output logs in near-real-time, search for specific phrases, values, or patterns, and create alarms based on the search.

If you configured your instance or on-premises hybrid machine to use the AWS Identity and Access Management (IAM) managed policies `AmazonSSMManagedInstanceCore` and `CloudWatchAgentServerPolicy`, then your instance requires no additional configuration to send output to CloudWatch Logs. You simply need to choose this option if sending commands from the console, or add the `cloud-watch-output-config` section and `CloudWatchOutputEnabled` parameter if using the AWS CLI, Tools for Windows PowerShell, or an API action. The `cloud-watch-output-config` section and `CloudWatchOutputEnabled` parameter are described in more detail later in this topic.

For information about adding policies to an instance profile for Amazon EC2 instances, see Create an IAM Instance Profile for Systems Manager (p. 29). For information about adding policies to a service role for on-premises instances and virtual machines that you plan to use as managed instances, see Create an IAM Service Role for a Hybrid Environment (p. 42).

For information about updating an existing instance profile, see Add Permissions to a Systems Manager Instance Profile (Console) (p. 32).

If you are using a custom policy on your instances, then you must update the policy on each instance to allow Systems Manager to send output and logs to CloudWatch Logs. Add the following policy objects to your custom policy. For more information, about updating an IAM policy, see Editing IAM Policies in the IAM User Guide.

```
{
    "Effect":"Allow",
    "Action":[
        "logs:CreateLogGroup",
        "logs:CreateLogStream",
        "logs:DescribeLogGroups",
        "logs:DescribeLogStreams",
        "logs:PutLogEvents"
    ],
    "Resource": "*"
}
```

Specifying CloudWatch Logs When You Send Commands

To specify CloudWatch Logs as the output when you send a command from the AWS Management Console, choose CloudWatch Output in the Output options section. Optionally, you can specify the name of CloudWatch Logs group where you want to send command output. If you don’t specify a group name, Systems Manager automatically creates a log group for you. The log group uses the following naming format: `aws/ssm/SystemsManagerDocumentName`.

If you run commands by using the AWS CLI, then you must specify the `cloud-watch-output-config` section in your command. This section enables you to specify the `CloudWatchOutputEnabled` parameter, and optionally, the `CloudWatchLogGroupName` parameter. Here is an example:

```
aws ssm send-command --document-name "AWS-RunPowerShellScript" --parameters commands=["echo helloWorld"] --targets "Key=instanceids,Values=an instance ID" --cloud-watch-output-config '{"CloudWatchLogGroupName":"log group name","CloudWatchOutputEnabled":true}'
```

Viewing Command Output in CloudWatch Logs

As soon as the command starts to run, Systems Manager sends output to CloudWatch Logs in near real-time. The output in CloudWatch Logs uses the following format:
Output from the execution is uploaded every 30 seconds or when the buffer exceeds 200 KB, whichever happens first.

**Note**

Log Streams are only created when output data is available. For example, if there is no error data for an execution, the stderr stream isn't created.

Here is an example of the command output as it appears in CloudWatch Logs.

```
Group - /aws/ssm/AWS-RunShellScript
Streams -
1234-567-8910/i-abcd-efg-hijk/AWS-RunPowerShellScript/stdout
24/1234-567-8910/i-abcd-efg-hijk/AWS-RunPowerShellScript/stderr
```

### Configuring CloudWatch Events for Run Command

Use Amazon CloudWatch Events to log command execution status changes. You can create a rule that runs whenever there is a state transition, or when there is a transition to one or more states that are of interest.

You can also specify Run Command as a target action when a CloudWatch event occurs. For example, say a CloudWatch event is triggered that an instance in an Auto Scaling group is about to terminate. You can configure CloudWatch so the target of that event is a Run Command script that captures the log files from the instance before it is terminated. You can also configure a Run Command action when a new instance is created in an Auto Scaling group. For example, when CloudWatch receives the instance-created event, Run Command could enable the web server role or install software on the instance.

- Configuring CloudWatch Events for Run Command (p. 618)
- Configure Run Command as a CloudWatch Events Target (p. 619)

### Configuring CloudWatch Events for Run Command

You can configure CloudWatch Events to notify you of Run Command status changes, or a status change for a specific command invocation. Use the following procedure to configure CloudWatch Events to send notification about Run Command.

**To configure CloudWatch Events for Run Command**

2. In the left navigation pane, choose **Events**, and then choose **Create rule**.
3. Under **Event Source**, verify that **Event Pattern** is selected.
4. In the **Service Name** field, choose **EC2 Simple Systems Manager (SSM)**
5. In the **Event Type** field, choose **Run Command**.
6. Choose the detail types and statuses for which you want to receive notifications, and then choose **Add targets**.
7. In the **Select target type** list, choose a target type. For information about the different types of targets, see the corresponding AWS Help documentation.
8. Choose **Configure details**.
9. Specify the rule details, and then choose **Create rule**.

### Configure Run Command as a CloudWatch Events Target

Use the following procedure to configure a Run Command action as the target of a CloudWatch event.

**To configure Run Command as a target of a CloudWatch event**

1. Sign in to the AWS Management Console and open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. In the left navigation pane, choose **Events**, and then either choose to create a new rule or edit an existing rule.
3. After specifying or verifying the details of the rule, choose **Add target**.
4. In the **Select target type** list, choose **SSM Run Command**.
5. In the **Document** list, choose an SSM document. The document determines the type of actions Run Command can perform on your instances.
   
   **Note**
   
   Verify that the document you choose can run on the instance operating system. Some documents run only on Windows or only on Linux operating systems. For more information about SSM Documents, see AWS Systems Manager Documents (p. 778).
6. In the **Target key** field, specify either InstanceIds or tag:EC2_tag_name. Here are some examples of a **Target key** that uses an EC2 tag: tag:production and tag:server-role.
7. In the **Target value(s)** field, if you chose InstanceIds in the previous step, specify one or more instance IDs separated by commas. If you chose tag:EC2_tag_name in the previous step, specify one or more tag values. After you type the value, for example web-server or database, choose **Add**.
8. In the **Configure parameter(s)** section, choose an option and then complete any fields populated by your choice. Use the hover text for more information about the options. For more information about the parameter fields for your document, see Running Commands Using Systems Manager Run Command (p. 622) and choose the procedure for your document.
9. In the permissions section, choose **Create a new role for this specific resource** to create a new role with the required instance profile role for Run Command. Or, choose **Use existing role**. For more information about roles required for Run Command, see Setting Up AWS Systems Manager (p. 23).
10. Choose **Configure details** and complete the wizard.

### Restricting Run Command Access Based on Instance Tags

You can further restrict command execution to specific instances by creating an IAM user policy that includes a condition that the user can only run commands on instances that are tagged with specific Amazon EC2 tags. In the following example, the user is allowed to use Run Command (Effect: Allow, Action: ssm:SendCommand) by using any SSM document (Resource: arn:aws:ssm:*:*:document/*) on any instance (Resource: arn:aws:ec2:*:*:instance/*) with the condition that the instance is a Finance WebServer (ssm:resourceTag/Finance: WebServer). If the user sends a command to an instance that is not tagged or that has any tag other than Finance: WebServer, the execution results show AccessDenied.

```json
{
    "Version":"2012-10-17",
    "Statement": [
        {
            "Effect":"Allow",
            "Action": [
                "ssm:SendCommand"
            ],
```
You can create IAM policies that enable a user to run commands on instances that are tagged with multiple tags. The following policy enables the user to run commands on instances that have two tags. If a user sends a command to an instance that is not tagged with both of these tags, the execution results show `AccessDenied`.

```
{
    "Version":"2012-10-17",
    "Statement":[
        {
            "Effect":"Allow",
            "Action": [
                "ssm:SendCommand"
            ],
            "Resource": "*",
            "Condition": {
                "StringLike": {
                    "ssm:resourceTag/tag_key1": ["tag_value1"],
                    "ssm:resourceTag/tag_key2": ["tag_value2"
                }
            }
        },
        {
            "Effect": "Allow",
            "Action": [
                "ssm:SendCommand"
            ],
            "Resource": ["arn:aws:ssm:us-west-1::document/AWS-*",
                         "arn:aws:ssm:us-east-2::document/AWS-**"]
        },
        {
            "Effect": "Allow",
            "Action": [
                "ssm:UpdateInstanceInformation",
                "ssm:ListCommands",
                "ssm:ListCommandInvocations",
```
You can also create IAM policies that enable a user to run commands on multiple groups of tagged instances. The following policy enables the user to run commands on either group of tagged instances, or both groups.

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ssm:SendCommand"
            ],
            "Resource": "*",
            "Condition": {
                "StringLike": {
                    "ssm:resourceTag/tag_key1": [
                        "tag_value1"
                    ]
                }
            }
        },
        {
            "Effect": "Allow",
            "Action": [
                "ssm:SendCommand"
            ],
            "Resource": "*",
            "Condition": {
                "StringLike": {
                    "ssm:resourceTag/tag_key2": [
                        "tag_value2"
                    ]
                }
            }
        },
        {
            "Effect": "Allow",
            "Action": [
                "ssm:UpdateInstanceInformation",
                "ssm:ListCommands",
                "ssm:ListCommandInvocations",
                "ssm:GetDocument"
            ],
            "Resource": "*"
        }
    ]
}
```
Running Commands Using Systems Manager Run Command

This section includes information about how to send commands from the AWS Systems Manager console, and how to send commands to a fleet of instances by using the Targets parameter with EC2 tags. This section also includes information about how to cancel a command.

For information about how to send commands using Windows PowerShell, see Walkthrough: Use the AWS Tools for Windows PowerShell with Run Command (p. 637) or the examples in the AWS Systems Manager section of the AWS Tools for PowerShell Cmdlet Reference. For information about how to send commands using the AWS CLI, see the Walkthrough: Use the AWS CLI with Run Command (p. 634) or the examples in the SSM CLI Reference.

Important
If this is your first time using Run Command, we recommend executing commands against a test instance or an instance that is not being used in a production environment.

Contents
• Running Commands from the Console (p. 622)
• Sending Commands that Use the Document Version Parameter (p. 624)
• Using Targets and Rate Controls to Send Commands to a Fleet (p. 625)
• Rebooting Managed Instance from Scripts (p. 628)
• Canceling a Command (p. 629)

Running Commands from the Console

You can use Run Command from the console to configure instances without having to login to each instance. This topic includes an example that shows how to update SSM Agent (p. 623) on an instance by using Run Command.

Before You Begin

Before you send a command using Run Command, verify that your instances meet Systems Manager requirements (p. 12).

To send a command using Run Command

2. In the navigation pane, choose Run Command.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Run Command.
3. In the Command document list, choose a Systems Manager document.
4. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.

Note
If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.
5. In the **Command parameters** section, specify values for required parameters.

6. For **Other parameters**:  
   - For **Comment**, type information about this command.
   - For **Timeout (seconds)**, specify the number of seconds for the system to wait before failing the overall command execution.

7. (Optional) For **Rate control**:
   - For **Concurrency**, specify either a number or a percentage of instances on which to run the command at the same time.
     
     **Note**  
     If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.
   - For **Error threshold**, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

8. In the **Output options** section, if you want to save the command output to a file, select the **Write command output to an Amazon S3 bucket**. Type the bucket and prefix (folder) names in the boxes.

     **Note**  
     The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see [Create an IAM Instance Profile for Systems Manager](p. 29).

9. In the **SNS Notifications** section, if you want notifications sent about the status of the command execution, select the **Enable SNS notifications** check box.

   For more information about configuring Amazon SNS notifications for Run Command, see [Configuring Amazon SNS Notifications for AWS Systems Manager](p. 896).

10. Choose **Run**.

**Update SSM Agent by using Run Command**

The following procedure describes how to quickly update SSM Agent running on your Windows and Linux instances. You can update to either the latest version or downgrade to an older version. When you run the command, the system downloads the version from AWS, installs it, and then uninstalls the version that existed before the command was run. If an error occurs during this process, the system rolls back to the version on the server before the command was run and the command status shows that the command failed.

**Note**  
To be notified about SSM Agent updates, subscribe to the [SSM Agent Release Notes](GitHub) page on GitHub.

**To update SSM Agent using Run Command**

2. In the navigation pane, choose **Run Command**.

   -or-
If the AWS Systems Manager home page opens first, choose the menu icon (Ξ) to open the navigation pane, and then choose Run Command.

3. In the Command document list, choose AWS-UpdateSSMAgent.

4. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.

   **Note**
   If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.

5. In the Command parameters section, specify values for the following parameters, if you want:

   a. (Optional) For Version, type the version of SSM Agent to install. You can install older versions of the agent. If you do not specify a version, the service installs the latest version.

   b. (Optional) For Allow Downgrade, choose true to install an earlier version of SSM Agent. If you choose this option, you must specify the earlier version number. Choose false to install only the newest version of the service.

6. For Other parameters:

   a. For Comment, type information about this command.
   b. For Timeout (seconds), specify the number of seconds for the system to wait before failing the overall command execution.

7. (Optional) For Rate control:

   a. For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.

      **Note**
      If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.

   b. For Error threshold, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

8. In the Output options section, if you want to save the command output to a file, select the Write command output to an Amazon S3 bucket. Type the bucket and prefix (folder) names in the boxes.

    **Note**
    The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

9. In the SNS Notifications section, if you want notifications sent about the status of the command execution, select the Enable SNS notifications check box.

   For more information about configuring Amazon SNS notifications for Run Command, see Configuring Amazon SNS Notifications for AWS Systems Manager (p. 896).


### Sending Commands that Use the Document Version Parameter

You can use the document-version parameter to specify which version of an SSM document to use when the command runs. You can specify one of the following options for this parameter:

- $DEFAULT
If you run commands by using the AWS CLI, then you must escape the first two options by using a backslash. If you specify a version number, then you don't need to use the backslash. For example:

```
--document-version "\$DEFAULT"
--document-version "\$LATEST"
--document-version "3"
```

Use the following procedure to run a command by using the AWS CLI that uses the document-version parameter.

**To run commands using the AWS CLI**

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. List all available documents
   This command lists all of the documents available for your account based on IAM permissions. The command returns a list of Linux and Windows documents.
   ```
   aws ssm list-documents
   ```
3. Use the following command to view the different versions of a document.
   ```
   aws ssm list-document-versions --name "document name"
   ```
4. Use the following command to run a command that uses an SSM document version.
   ```
   aws ssm send-command --document-name "AWS-RunShellScript" --parameters commands="echo Hello",executionTimeout=3600 --instance-ids instance-ID --endpoint-url "https://us-east-2.amazonaws.com" --region "us-east-2" --document-version "\$DEFAULT, \$LATEST, or a version number"
   ```

**Using Targets and Rate Controls to Send Commands to a Fleet**

You can send commands to tens, hundreds, or thousands of instances by using the `targets` parameter (the **Select Targets by Specifying a Tag** option in the Amazon EC2 console). The `targets` parameter accepts a `Key,Value` combination based on Amazon EC2 tags that you specified for your instances. When you run the command, the system locates and attempts to run the command on all instances that match the specified tags. For more information about Amazon EC2 tags, see *Tagging Your Amazon EC2 Resources* in the *Amazon EC2 User Guide* (content applies to Windows and Linux instances). You can also send commands to instances that belong to an AWS resource group. For more information about resource groups, see *What are Resource Groups?* in the *AWS Resource Groups User Guide*.

**Note**

You can also use the `targets` parameter to target a list of specific instance IDs, as described in the next section.

To control command execution across hundreds or thousands of instances, Run Command also includes parameters for restricting how many instances can simultaneously process a request and how many errors can be thrown by a command before the command is terminated.
Targeting Multiple Instances
You can run a command and target instances by specifying tags applied to managed instances, AWS resource group names, or instance IDs.

Note
Sample commands in this section are truncated using [...].

For use with the AWS CLI `send-command` command, the `targets` parameter supports the syntax demonstrated in the following examples:

Example 1: Targeting Tags
`aws ssm send-command --document-name name --targets Key=tag:tag_name,Values=tag_value [...]`

Example 2: Targeting an AWS Resource Group
You can specify a maximum of one resource group name per command. When you create a resource group, we recommend including `AWS::SSM:ManagedInstance` and `AWS::EC2::Instance` as resource types in your grouping criteria.

Note
In order to send commands that target a resource group, you must have been granted IAM permissions to list, or view, the resources that belong to that group. For more information, see Set Up Permissions in the AWS Resource Groups User Guide.

`aws ssm send-command --document-name --targets Key=resource-groups:name,Values=resource-group-name [...]`

Example 3: Targeting Instance IDs
`aws ssm send-command --document-name name --targets Key=instanceids,Values=ID1,ID2,ID3 [...]`

If you tagged instances for different environments using a Key named Environment and Values of Development, Test, Pre-production and Production, then you could send a command to all of the instances in one of these environments by using the targets parameter with the following syntax:

`aws ssm send-command --document-name name --targets Key=tag:Environment,Values=Development [...]`

You could target additional instances in other environments by adding to the Values list. Separate items using commas.

`aws ssm send-command --document-name name --targets Key=tag:Environment,Values=Development,Test,Pre-production [...]`

Example: Refining your targets using multiple Key criteria
You can refine the number of targets for your command by including multiple Key criteria. If you include more than one Key criteria, the system targets instances that meet all of the criteria. The following
command targets all instances tagged for the Finance Department and tagged for the database server role.

```
aws ssm send-command --document-name name --targets Key=tag:Department,Values=Finance
Key=tag:ServerRole,Values=Database [...]
```

Example: Using multiple Key and Value criteria

Expanding on the previous example, you can target multiple departments and multiple server roles by including additional items in the Values criteria.

```
aws ssm send-command --document-name name --targets
Key=tag:Department,Values=Finance,Marketing
Key=tag:ServerRole,Values=WebServer,Database
[...]
```

Example: Targeting tagged instances using multiple Values criteria

If you tagged instances for different environments using a Key named Department and Values of Sales and Finance, then you could send a command to all of the instances in these environments by using the targets parameter with the following syntax:

```
aws ssm send-command --document-name name --targets Key=tag:Department,Values=Sales,Finance
[...]
```

Note
You can specify a maximum of 5 keys, and 5 values for each key.

If either a tag key (the tag name) or a tag value includes spaces, then you must enclose the tag key or the value in quotation marks, as show in the following examples.

Example 1: Spaces in Value tag.

```
aws ssm send-command --document-name name --targets Key=tag:OS,Values="Windows Server 2016 Nano"
[...]
```

Example 2: Spaces in tag key and Value.

```
aws ssm send-command --document-name name --targets Key="tag:Operating System",Values="Windows Server 2016 Nano"
[...]
```

Example 3: Spaces in one item in a list of Values.

```
aws ssm send-command --document-name name --targets
Key=tag:Department,Values="Sales","Finance","Systems Mgmt"
[...]
```

Using Concurrency Controls

You can control how many servers run the command at the same time by using the max-concurrency parameter (the Execute on field in the Amazon EC2 console). You can specify either an absolute number of instances, for example 10, or a percentage of the target set, for example 10%. The queueing system delivers the command to a single instance and waits until the initial invocation completes before sending the command to two more instances. The system exponentially sends commands to more instances until the value of max-concurrency is met. The default for value max-concurrency is 50. The following examples show you how to specify values for the max-concurrency parameter:

```
aws ssm send-command --document-name name --max-concurrency 10 --targets
Key=tag:Environment,Values=Development
[...]
```
Using Error Controls

You can also control the execution of a command to hundreds or thousands of instances by setting an error limit using the `max-errors` parameter (the `Stop after __ errors` field in the Amazon EC2 console). The parameter specifies how many errors are allowed before the system stops sending the command to additional instances. You can specify either an absolute number of errors, for example 10, or a percentage of the target set, for example 10%. If you specify 3, for example, the system stops sending the command when the fourth error is received. If you specify 0, then the system stops sending the command to additional instances after the first error result is returned. If you send a command to 50 instances and set `max-errors` to 10%, then the system stops sending the command to additional instances when the sixth error is received.

Invocations that are already running a command when `max-errors` is reached are allowed to complete, but some of these invocations may fail as well. If you need to ensure that there won’t be more than `max-errors` failed invocations, set `max-concurrency` to 1 so the invocations proceed one at a time. The default for `max-errors` is 0. The following examples show you how to specify values for the `max-errors` parameter:

```bash
aws ssm send-command --document-name name --max-errors 10 --targets Key=tag:Department,Values=Finance,Marketing Key=tag:ServerRole,Values=WebServer,Database [...]
```

```bash
aws ssm send-command --document-name name --max-errors 10% --targets Key=tag:Environment,Values=Development [...]
```

Rebooting Managed Instance from Scripts

If the scripts that you run by using Run Command reboot managed instances, then you must specify an exit code in your script. If you attempt to reboot an instance from a script by using some other mechanism, the script execution status might not be updated correctly, even if the reboot is the last step in your script. For Windows managed instances, you specify `exit 3010` in your script. For Linux managed instances, you specify `exit 194`. The exit code instructs SSM Agent to reboot the managed instance, and then restart the script after the reboot completed. Before starting the reboot, SSM Agent informs the Systems Manager service in the cloud that communication will be disrupted during the server reboot.

Create idempotent scripts

When developing scripts that reboot managed instances, make the scripts idempotent so the script execution continues where it left off after the reboot. Idempotent scripts manage state and validate if the action was performed or not. This prevents a step from running multiple times when it is only intended to run once.

Here is an outline example of an idempotent script the reboots the instance multiple times.

```bash
#name = Get current computer name
If ($name -ne $desiredName)
{
  Rename computer
  exit 3010
}
```
The following script samples use exit codes to restart instances. The Windows example installs the Hyper-V application on the instance, and then restarts the instance. The Linux example installs package updates on Amazon Linux, and then restarts the instance.

**Windows example**

```powershell
#domain = Get current domain name
If ($domain -ne $desiredDomain)
{
    Join domain
    exit 3010
}

If (desired package not installed)
{
    Install package
    exit 3010
}
```

**Amazon Linux example**

```bash
#!/bin/bash
yum -y update
needs-restarting -r
if [ $? -eq 1 ]
then
    exit 194
else
    exit 0
fi
```

### Canceling a Command

You can attempt to cancel a command as long as the service shows that it is in either a Pending or Executing state. However, even if a command is still in one of these states, we cannot guarantee that the command will be terminated and the underlying process stopped.

**To cancel a command using the console**

2. In the navigation pane, choose **Run Command**.
   - or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Run Command**.
3. Select the command invocation that you want to cancel.
4. Choose **Cancel command**.

**To cancel a command using the AWS CLI**
Use the following command.

```
aws ssm cancel-command --command-id "command ID" --instance-ids "instance ID"
```

For information about the status of a cancelled command, see Understanding Command Statuses (p. 630).

**Understanding Command Statuses**

Systems Manager Run Command reports detailed status information about the different states a command experiences during processing and for each instance that processed the command. You can monitor command statuses using the following methods.

- Click the **Refresh** icon on the **Run Command** page in the Amazon EC2 console.
- Call `list-commands` or `list-command-invocations` using the AWS CLI. Or call `Get-SSMCommand` or `Get-SSMCommandInvocation` using AWS Tools for Windows PowerShell.
- Configure CloudWatch Events to log status changes.
- Configure Amazon SNS to send notifications for all status changes or specific statuses like Failed or TimedOut.

**Run Command Status**

Run Command reports status details for three areas: plugins, invocations, and an overall command status. A **plugin** is a code-execution block that is defined in your command's Systems Manager document. The AWS-* documents include only one plugin, but you can create your own documents that use multiple plugins. For more information about plugins, see SSM Document Plugin Reference (p. 803).

When you send a command to multiple instances at the same time, each copy of the command targeting each instance is a **command invocation**. For example, if you use the AWS-RunShellScript document and send an `ifconfig` command to 20 instances, that command has 20 invocations. Each command invocation individually reports status. The plugins for a given command invocation individually report status as well.

Lastly, Run Command includes an aggregated command status for all plugins and invocations. The aggregated command status can be different than the status reported by plugins or invocations, as noted in the following tables.

**Note**

If you run commands to large numbers of instances using the `max-concurrency` or `max-errors` parameters, command status reflects the limits imposed by those parameters, as described in the following tables. For more information about these parameters, see Using Targets and Rate Controls to Send Commands to a Fleet (p. 625).

**Detailed Status for Command Plugins and Invocations**

<table>
<thead>
<tr>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pending</td>
<td>The command was not yet received by the agent on the instance. If the command is not received by the agent before the value specified by the Timeout (seconds) parameter is reached, then the status changes to Delivery Timed Out.</td>
</tr>
<tr>
<td>In Progress</td>
<td>The command was received by the agent, or the command started executing on the instance. Depending on the result of all command plugins, the status will change to Success, Failed, or</td>
</tr>
</tbody>
</table>
### Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execution Timed Out</td>
<td>If the agent is not available on the instance, the command status will show In Progress until the agent is available again. The status will then change to a terminal state.</td>
</tr>
<tr>
<td>Delayed</td>
<td>The system attempted to send the command to the instance but was not successful. The system will retry again.</td>
</tr>
<tr>
<td>Success</td>
<td>The command was received by SSM Agent on the instance and returned an exit code of zero. This status does not mean the command was successfully processed on the instance. This is a terminal state.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td>To troubleshoot errors or get more information about the command execution, send a command that handles errors or exceptions by returning appropriate exit codes (non-zero exit codes for command failure).</td>
</tr>
<tr>
<td>Delivery Timed Out</td>
<td>The command was not delivered to the instance before the delivery timeout expired. Delivery timeouts do not count against the parent command's max-errors limit, but they do contribute to whether the parent command status is Success or Incomplete. This is a terminal state.</td>
</tr>
<tr>
<td>Execution Timed Out</td>
<td>Command execution started on the instance, but the execution was not complete before the execution timeout expired. Execution timeouts count against the max-errors limit of the parent command. This is a terminal state. When the timeout is reached, Systems Manager stops the command execution.</td>
</tr>
<tr>
<td>Failed</td>
<td>The command was not successful on the instance. For a plugin, this indicates that the result code was not zero. For a command invocation, this indicates that the result code for one or more plugins was not zero. Invocation failures count against the max-errors limit of the parent command. This is a terminal state.</td>
</tr>
<tr>
<td>Canceled</td>
<td>The command was terminated before it was completed. This is a terminal state.</td>
</tr>
</tbody>
</table>
### Understanding Command Statuses

<table>
<thead>
<tr>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undeliverable</td>
<td>The command can't be delivered to the instance. The instance might not exist or it might not be responding. Undeliverable invocations don't count against the parent command's <code>max-errors</code> limit, and they don't contribute to whether the parent command status is <code>Success</code> or <code>Incomplete</code>. This is a terminal state.</td>
</tr>
<tr>
<td>Terminated</td>
<td>The parent command exceeded its <code>max-errors</code> limit and subsequent command invocations were canceled by the system. This is a terminal state.</td>
</tr>
<tr>
<td>Invalid Platform</td>
<td>The command was sent to an instance that did not match the required platforms specified by the chosen document. InvalidPlatform does not count against the parent command's <code>max-errors</code> limit, and does not contribute to whether the parent command status is <code>Success</code> or <code>Failed</code>. This is a terminal state.</td>
</tr>
<tr>
<td>Access Denied</td>
<td>The IAM user or role initiating the command does not have access to the targeted managed instance. AccessDenied does not count against the parent command's <code>max-errors</code> limit, but does contribute to whether the parent command status is <code>Success</code> or <code>Failed</code>. (For example, if all invocations in a command have the status AccessDenied, then the command status returned is Failed. However, if a command has 5 invocations, 4 of which return the status AccessDenied and 1 of which returns the status Success, then the parent command's status is Success.) This is a terminal state.</td>
</tr>
</tbody>
</table>

#### Detailed Status for a Command

<table>
<thead>
<tr>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pending</td>
<td>The command was not yet received by an agent on any instances.</td>
</tr>
<tr>
<td>In Progress</td>
<td>The command has been sent to at least one instance but has not reached a final state on all instances.</td>
</tr>
<tr>
<td>Delayed</td>
<td>The system attempted to send the command to the instance but was not successful. The system will retry again.</td>
</tr>
<tr>
<td>Success</td>
<td>The command was received by SSM Agent on all specified or targeted instances and returned an exit code of zero. All command invocations have reached a terminal state, and the value of <code>max-errors</code> was not reached. This status does not mean the command was successfully processed</td>
</tr>
</tbody>
</table>
### Statuses and Details

<table>
<thead>
<tr>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
<td><strong>Details</strong></td>
</tr>
<tr>
<td>on all specified or targeted instances. This is a terminal state.</td>
<td><strong>Note</strong> To troubleshoot errors or get more information about the command execution, send a command that handles errors or exceptions by returning appropriate exit codes (non-zero exit codes for command failure).</td>
</tr>
<tr>
<td>Delivery Timed Out</td>
<td>The command was not delivered to the instance before the delivery timeout expired. The value of <code>max-errors</code> or more command invocations shows a status of <strong>Delivery Timed Out</strong>. This is a terminal state.</td>
</tr>
<tr>
<td>Execution Timed Out</td>
<td>Command execution started on the instance, but the execution was not complete before the execution timeout expired. The value of <code>max-errors</code> or more command invocations shows a status of <strong>Execution Timed Out</strong>. This is a terminal state.</td>
</tr>
<tr>
<td>Failed</td>
<td>The command was not successful on the instance. The value of <code>max-errors</code> or more command invocations shows a status of <strong>Failed</strong>. This is a terminal state.</td>
</tr>
<tr>
<td>Incomplete</td>
<td>The command was attempted on all instances and one or more of the invocations does not have a value of <strong>Success</strong>. However, not enough invocations failed for the status to be <strong>Failed</strong>. This is a terminal state.</td>
</tr>
<tr>
<td>Canceled</td>
<td>The command was terminated before it was completed. This is a terminal state.</td>
</tr>
<tr>
<td>Rate Exceeded</td>
<td>The number of instances targeted by the command exceeded the account limit for pending invocations. The system has canceled the command before executing it on any instance. This is a terminal state.</td>
</tr>
<tr>
<td>Access Denied</td>
<td>The IAM user or role initiating the command does not have access to the targeted resource group. <strong>AccessDenied</strong> does not count against the parent command's <code>max-errors</code> limit, but does contribute to whether the parent command status is <strong>Success</strong> or <strong>Failed</strong>. (For example, if all invocations in a command have the status <strong>AccessDenied</strong>, then the command status returned is <strong>Failed</strong>. However, if a command has 5 invocations, 4 of which return the status <strong>AccessDenied</strong> and 1 of which returns the status <strong>Success</strong>, then the parent command's status is <strong>Success</strong>.) This is a terminal state.</td>
</tr>
</tbody>
</table>
Run Command Walkthroughs

The walkthroughs in this section show you how to run commands with Run Command using either the AWS Command Line Interface or AWS Tools for Windows PowerShell.

Contents

- Walkthrough: Use the AWS CLI with Run Command (p. 634)
- Walkthrough: Use the AWS Tools for Windows PowerShell with Run Command (p. 637)

You can also view sample commands in the following references.

- Systems Manager AWS CLI Reference
- Systems Manager AWS Tools for Windows PowerShell Reference

Walkthrough: Use the AWS CLI with Run Command

The following sample walkthrough shows you how to use the AWS CLI to view information about commands and command parameters, how to run commands, and how to view the status of those commands.

**Important**

Only trusted administrators should be allowed to use Systems Manager pre-configured documents shown in this topic. The commands or scripts specified in Systems Manager documents run with administrative privilege on your instances. If a user has permission to run any of the pre-defined Systems Manager documents (any document that begins with AWS), then that user also has administrator access to the instance. For all other users, you should create restrictive documents and share them with specific users. For more information about restricting access to Run Command, see Create Non-Admin IAM Users and Groups for Systems Manager (p. 25).

Topics

- Step 1: Getting Started (p. 634)
- Step 2: Run Shell Scripts (p. 635)
- Step 3: Send a Command Using the AWS-RunShellScript document - Example 1 (p. 635)
- Step 4: Send a Command Using the AWS-RunShellScript document - Example 2 (p. 636)
- Additional Examples (p. 636)

Step 1: Getting Started

You must either have administrator privileges on the instances you want to configure or you must have been granted the appropriate permission in IAM. Also note, this example uses the US East (Ohio) Region (us-east-2). Run Command is currently available in the AWS Regions listed in AWS Systems Manager in the Amazon Web Services General Reference. For more information, see Systems Manager Prerequisites (p. 12).
To run commands using the AWS CLI

1. Install and configure the AWS CLI, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58).

2. List all available documents
   
   This command lists all of the documents available for your account based on IAM permissions. The command returns a list of Linux and Windows documents.

   ```bash
   aws ssm list-documents
   ```

3. Verify that an instance is ready to receive commands
   
   The output of the following command shows if instances are online.

   ```bash
   aws ssm describe-instance-information --output text --query "InstanceInformationList[*]"
   ```

4. Use the following command to view details about a particular instance.
   
   **Note**
   
   To run the commands in this walkthrough, you must replace the instance and command IDs. The command ID is returned as a response of the `send-command`. The instance ID is available from the Amazon EC2 console.

   ```bash
   aws ssm describe-instance-information --instance-information-filter-list key=InstanceIds,valueSet=instance ID
   ```

---

**Step 2: Run Shell Scripts**

Using Run Command and the AWS-RunShellScript document, you can run any command or script on an EC2 instance as if you were logged on locally.

**To view the description and available parameters**

- Use the following command to view a description of the Systems Manager JSON document.

  ```bash
  aws ssm describe-document --name "AWS-RunShellScript" --query "[Document.Name,Document.Description]"
  ```

- Use the following command to view the available parameters and details about those parameters.

  ```bash
  aws ssm describe-document --name "AWS-RunShellScript" --query "Document.Parameters[*]"
  ```

---

**Step 3: Send a Command Using the AWS-RunShellScript document - Example 1**

Use the following command to get IP information for an instance.

```bash
aws ssm send-command --instance-ids "instance ID" --document-name "AWS-RunShellScript" --comment "IP config" --parameters commands=ifconfig --output text
```
command completed. If the command execution shows "Pending" or "InProgress" you will need to run this command again to see the response data.

```
aws ssm list-command-invocations --command-id "$sh_command_id" --details
```

Step 4: Send a Command Using the AWS-RunShellScript document - Example 2

The following command displays the default user account running the commands.

```
sh_command_id=$(aws ssm send-command --instance-ids "instance ID" --document-name "AWS-RunShellScript" --comment "Demo run shell script on Linux Instance" --parameters commands=whoami --output text --query "Command.CommandId")
```

Get command status

The following command uses the Command ID to get the status of the command execution on the instance. This example uses the Command ID that was returned in the previous command.

```
aws ssm list-commands --command-id "$command_ID"
```

Get command details

The following command uses the Command ID from the previous command to get the status of the command execution on a per instance basis.

```
aws ssm list-command-invocations --command-id "$command_ID" --details
```

Get command information with response data for a specific instance

The following command returns the output of the original aws ssm send-command for a specific instance.

```
aws ssm list-command-invocations --instance-id instance ID --command-id "$command_ID" --details
```

Additional Examples

The following command returns the version of Python running on an instance.

```
sh_command_id=$(aws ssm send-command --instance-ids "instance ID" --document-name "AWS-RunShellScript" --comment "Demo run shell script on Linux Instances" --parameters commands='python -V' --output text --query "Command.CommandId") sh -c 
'aws ssm list-command-invocations --command-id "$sh_command_id" --details --query "CommandInvocations[].CommandPlugins[].{Status:Status,Output:Output}"'
```

The following command runs a Python script using Run Command.

```
sh_command_id=$(aws ssm send-command --instance-ids "instance ID" --document-name "AWS-RunShellScript" --comment "Demo run shell script on Linux Instances" --parameters '{"commands": ["#!/usr/bin/python","print "Hello world from python!""]}' --output text --query "Command.CommandId") sh -c 'aws ssm list-command-invocations --command-id "$sh_command_id" --details --query "CommandInvocations[].CommandPlugins[].{Status:Status,Output:Output}"'
```
Walkthrough: Use the AWS Tools for Windows PowerShell with Run Command

The following examples show how to use the Tools for Windows PowerShell to view information about commands and command parameters, how to run commands, and how to view the status of those commands. This walkthrough includes an example for each of the pre-defined Systems Manager documents.

**Important**

Only trusted administrators should be allowed to use Systems Manager pre-configured documents shown in this topic. The commands or scripts specified in Systems Manager documents run with administrative privilege on your instances. If a user has permission to run any of the pre-defined Systems Manager documents (any document that begins with AWS), then that user also has administrator access to the instance. For all other users, you should create restrictive documents and share them with specific users. For more information about restricting access to Run Command, see  Create Non-Admin IAM Users and Groups for Systems Manager (p. 25).

Topics

- Configure AWS Tools for Windows PowerShell Session Settings (p. 637)
- List all Available Documents (p. 638)
- Run PowerShell Commands or Scripts (p. 638)
- Install an Application Using the AWS-InstallApplication Document (p. 639)
- Install a PowerShell Module Using the AWS-InstallPowerShellModule JSON Document (p. 640)
- Join an Instance to a Domain Using the AWS-JoinDirectoryServiceDomain JSON Document (p. 640)
- Send Windows Metrics to Amazon CloudWatch using the AWS-ConfigureCloudWatch document (p. 641)
- Update EC2Config Using the AWS-UpdateEC2Config Document (p. 642)
- Enable/Disable Windows Automatic Update Using the AWS-ConfigureWindowsUpdate document (p. 643)
- Manage Windows Updates Using Run Command (p. 644)

Configure AWS Tools for Windows PowerShell Session Settings

Specify your credentials

Open AWS Tools for Windows PowerShell on your local computer and run the following command to specify your credentials. You must either have administrator privileges on the instances you want to configure or you must have been granted the appropriate permission in IAM. For more information, see Systems Manager Prerequisites (p. 12).

```
Set-AWSCredentials -AccessKey key_name -SecretKey key_name
```

Set a default AWS Region

Run the following command to set the region for your PowerShell session. The example uses the US East (Ohio) Region (us-east-2). Run Command is currently available in the AWS Regions listed in AWS Systems Manager in the Amazon Web Services General Reference.

```
Set-DefaultAWSRegion -Region us-east-2
```
**List all Available Documents**

This command lists all of the documents available for your account:

```
Get-SSMDocumentList
```

**Run PowerShell Commands or Scripts**

Using Run Command and the AWS-RunPowerShell document, you can run any command or script on an EC2 instance as if you were logged onto the instance using Remote Desktop. You can issue commands or type in a path to a local script to run the command.

**Note**

For information about rebooting servers and instances when using Run Command to call scripts, see [Rebooting Managed Instance from Scripts (p. 628)](#).

**View the description and available parameters**

```
Get-SSMDocumentDescription -Name "AWS-RunPowerShellScript"
```

**View more information about parameters**

```
Get-SSMDocumentDescription -Name "AWS-RunPowerShellScript" | select -ExpandProperty Parameters
```

**Send a command using the AWS-RunPowerShellScript document**

The following command shows the contents of the C:\Users directory and the contents of the C:\ directory on two instances.

```
$runPSCommand=Send-SSMCommand -InstanceId @('Instance-ID', 'Instance-ID') -DocumentName AWS-RunPowerShellScript -Comment 'Demo AWS-RunPowerShellScript with two instances' -Parameter @{'commands'=@('dir C:\Users', 'dir C:\')}
```

**Get command request details**

The following command uses the Command ID to get the status of the command execution on both instances. This example uses the Command ID that was returned in the previous command.

```
Get-SSMCommand -CommandId $runPSCommand.CommandId
```

The status of the command in this example can be Success, Pending, or InProgress.

**Get command information per instance**

The following command uses the command ID from the previous command to get the status of the command execution on a per instance basis.

```
Get-SSMCommandInvocation -CommandId $runPSCommand.CommandId
```

**Get command information with response data for a specific instance**

The following command returns the output of the original Send-SSMCommand for a specific instance.
Cancel a command

The following command cancels the Send-SSMCommand for the AWS-RunPowerShellScript document.

```
$canceledCommandResponse = Send-SSMCommand -InstanceId @('Instance-ID', 'Instance-ID') -DocumentName AWS-RunPowerShellScript -Comment 'Demo AWS-RunPowerShellScript with two instances' -Parameter @('commands'='Start-Sleep -Seconds 120; dir C:\')
Stop-SSMCommand -CommandId $canceledCommandResponse.CommandId
```

Check the command status

The following command checks the status of the Cancel command.

```
Get-SSMCommand -CommandId $canceledCommandResponse.CommandId
```

Install an Application Using the AWS-InstallApplication Document

Using Run Command and the AWS-InstallApplication document, you can install, repair, or uninstall applications on instances. The command requires the path or address to an MSI.

**Note**

For information about rebooting servers and instances when using Run Command to call scripts, see Rebooting Managed Instance from Scripts (p. 628).

View the description and available parameters

```
Get-SSMDocumentDescription -Name "AWS-InstallApplication"
```

View more information about parameters

```
Get-SSMDocumentDescription -Name "AWS-InstallApplication" | select -ExpandProperty Parameters
```

Send a command using the AWS-InstallApplication document

The following command installs a version of Python on your instance in unattended mode, and logs the output to a local text file on your C: drive.

```
$installAppCommand = Send-SSMCommand -InstanceId $runPSCommand.CommandId -DocumentName AWS-InstallApplication -Parameter @('source'='https://www.python.org/ftp/python/2.7.9/python-2.7.9.msi'; 'parameters'='/norestart /quiet /log c:\pythoninstall.txt')
```

Get command information per instance

The following command uses the Command ID to get the status of the command execution

```
Get-SSMCommandInvocation -CommandId $installAppCommand.CommandId -Details $true
```

Get command information with response data for a specific instance

```
Get-SSMCommandInvocation -CommandId $runPSCommand.CommandId -Details $true -InstanceId Instance-ID | select -ExpandProperty CommandPlugins
```
The following command returns the results of the Python installation.

```
Get-SSMCommandInvocation -CommandId $installAppCommand.CommandId -Details $true -InstanceID Instance-ID | select -ExpandProperty CommandPlugins
```

### Install a PowerShell Module Using the AWS-InstallPowerShellModule JSON Document

You can use Run Command to install PowerShell modules on an EC2 instance. For more information about PowerShell modules, see Windows PowerShell Modules.

**View the description and available parameters**

```
Get-SSMDocumentDescription -Name "AWS-InstallPowerShellModule"
```

**View more information about parameters**

```
Get-SSMDocumentDescription -Name "AWS-InstallPowerShellModule" | select -ExpandProperty Parameters
```

**Install a PowerShell module**

The following command downloads the EZOut.zip file, installs it, and then runs an additional command to install XPS viewer. Lastly, the output of this command is uploaded to an Amazon S3 bucket named demo-ssm-output-bucket.

```
$installPSCommand = Send-SSMCommand -InstanceId Instance-ID -DocumentName AWS-InstallPowerShellModule -Parameter @{'source'='https://gallery.technet.microsoft.com/EZOut-33ae0fb7/file/110351/1/EZOut.zip';'commands'=@('Add-WindowsFeature -name XPS-Viewer -restart')} -OutputS3BucketName demo-ssm-output-bucket
```

**Get command information per instance**

The following command uses the Command ID to get the status of the command execution.

```
Get-SSMCommandInvocation -CommandId $installPSCommand.CommandId -Details $true
```

**Get command information with response data for the instance**

The following command returns the output of the original Send-SSMCommand for the specific command ID.

```
Get-SSMCommandInvocation -CommandId $installPSCommand.CommandId -Details $true | select -ExpandProperty CommandPlugins
```

### Join an Instance to a Domain Using the AWS-JoinDirectoryServiceDomain JSON Document

Using Run Command, you can quickly join an instance to an AWS Directory Service domain. Before executing this command you must create a directory. We also recommend that you learn more about the AWS Directory Service. For more information, see What Is AWS Directory Service?.

Currently you can only join an instance to a domain. You cannot remove an instance from a domain.
**Note**
For information about rebooting servers and instances when using Run Command to call scripts, see Rebooting Managed Instance from Scripts (p. 628).

**View the description and available parameters**

```
Get-SSMDocumentDescription -Name "AWS-JoinDirectoryServiceDomain"
```

**View more information about parameters**

```
Get-SSMDocumentDescription -Name "AWS-JoinDirectoryServiceDomain" | select -ExpandProperty Parameters
```

**Join an instance to a domain**

The following command joins the instance to the given AWS Directory Service domain and uploads any generated output to the Amazon S3 bucket.

```
#domainJoinCommand=Send-SSMCommand -InstanceId Instance-ID -DocumentName AWS-JoinDirectoryServiceDomain -Parameter @{'directoryId'='d-9067386b64'; 'directoryName'='ssm.test.amazon.com'; 'dnsIpAddresses'=@('172.31.38.48', '172.31.55.243')} -OutputS3BucketName demo-ssm-output-bucket
```

**Get command information per instance**

The following command uses the Command ID to get the status of the command execution.

```
Get-SSMCommandInvocation -CommandId $domainJoinCommand.CommandId -Details $true
```

**Get command information with response data for the instance**

This command returns the output of the original Send-SSMCommand for the specific command ID.

```
Get-SSMCommandInvocation -CommandId $domainJoinCommand.CommandId -Details $true | select -ExpandProperty CommandPlugins
```

**Send Windows Metrics to Amazon CloudWatch using the AWS-ConfigureCloudWatch document**

You can send Windows Server messages in the application, system, security, and Event Tracing for Windows (ETW) logs to Amazon CloudWatch Logs. When you enable logging for the first time, Systems Manager sends all logs generated within one (1) minute from the time that you start uploading logs for the application, system, security, and ETW logs. Logs that occurred before this time are not included. If you disable logging and then later re-enable logging, Systems Manager sends logs from the time it left off. For any custom log files and Internet Information Services (IIS) logs, Systems Manager reads the log files from the beginning. In addition, Systems Manager can also send performance counter data to Amazon CloudWatch.

If you previously enabled CloudWatch integration in EC2Config, the Systems Manager settings override any settings stored locally on the instance in the C:\Program Files\Amazon\EC2ConfigService\Settings\AWS.EC2.Windows.CloudWatch.json file. For more information about using EC2Config to manage performance counters and logs on single instance, see Sending Performance Counters to CloudWatch and Logs to CloudWatch Logs.

**View the description and available parameters**

641
Get-SSMDocumentDescription -Name "AWS-ConfigureCloudWatch"

View more information about parameters

Get-SSMDocumentDescription -Name "AWS-ConfigureCloudWatch" | select -ExpandProperty Parameters

Send Application Logs to CloudWatch

The following command configures the instance and moves Windows Applications logs to CloudWatch.

```powershell
```

Get command information per instance

The following command uses the Command ID to get the status of the command execution.

```powershell
Get-SSMCommandInvocation -CommandId $cloudWatchCommand.CommandId -Details $true
```

Get command information with response data for a specific instance

The following command returns the results of the Amazon CloudWatch configuration.

```powershell
Get-SSMCommandInvocation -CommandId $cloudWatchCommand.CommandId -Details $true -InstanceId Instance-ID | select -ExpandProperty CommandPlugins
```

Send Performance Counters to CloudWatch Using the AWS-ConfigureCloudWatch document

The following demonstration command uploads performance counters to CloudWatch. For more information, see the Amazon CloudWatch User Guide.

```powershell
```

Update EC2Config Using the AWS-UpdateEC2Config Document

Using Run Command and the AWS-EC2ConfigUpdate document, you can update the EC2Config service running on your Windows instances. This command can update the EC2Config service to the latest version or a version you specify.

View the description and available parameters
Get-SSMDocumentDescription -Name "AWS-UpdateEC2Config"

View more information about parameters
Get-SSMDocumentDescription -Name "AWS-UpdateEC2Config" | select -ExpandProperty Parameters

Update EC2Config to the latest version
Send-SSMCommand -InstanceId Instance-ID -DocumentName "AWS-UpdateEC2Config"

Get command information with response data for the instance
This command returns the output of the specified command from the previous Send-SSMCommand:
Get-SSMCommandInvocation -CommandId ID -Details $true -InstanceId Instance-ID | select -ExpandProperty CommandPlugins

Update EC2Config to a specific version
The following command will downgrade EC2Config to an older version:
Send-SSMCommand -InstanceId Instance-ID -DocumentName "AWS-UpdateEC2Config" -Parameter @{'version'='3.8.354'; 'allowDowngrade'='true'}

Enable/Disable Windows Automatic Update Using the AWS-ConfigureWindowsUpdate document
Using Run Command and the AWS-ConfigureWindowsUpdate document, you can enable or disable automatic Windows updates on your Windows instances. This command configures the Windows update agent to download and install Windows updates on the day and hour that you specify. If an update requires a reboot, the computer reboots automatically 15 minutes after updates have been installed. With this command you can also configure Windows update to check for updates but not install them. The AWS-ConfigureWindowsUpdate document is compatible with Windows Server 2008, 2008 R2, 2012, 2012 R2, and 2016.

View the description and available parameters
Get-SSMDocumentDescription -Name "AWS-ConfigureWindowsUpdate"

View more information about parameters
Get-SSMDocumentDescription -Name "AWS-ConfigureWindowsUpdate" | select -ExpandProperty Parameters

Enable Windows automatic update
The following command configures Windows Update to automatically download and install updates daily at 10:00 pm.

#configureWindowsUpdateCommand = Send-SSMCommand -InstanceId Instance-ID -DocumentName 'AWS-ConfigureWindowsUpdate' -Parameters @{'updateLevel'='InstallUpdatesAutomatically'; 'scheduledInstallDay'='Daily'; 'scheduledInstallTime'='22:00'}
View command status for enabling Windows automatic update

The following command uses the Command ID to get the status of the command execution for enabling Windows Automatic Update.

```powershell
Get-SSMCommandInvocation -Details $true -CommandId $configureWindowsUpdateCommand.CommandId | select -ExpandProperty CommandPlugins
```

Disable Windows automatic update

The following command lowers the Windows Update notification level so the system checks for updates but does not automatically update the instance.

```powershell
#configureWindowsUpdateCommand = Send-SSMCommand -InstanceId Instance-ID -DocumentName 'AWS-ConfigureWindowsUpdate' -Parameters @{'updateLevel'='NeverCheckForUpdates'}
```

View command status for disabling Windows automatic update

The following command uses the Command ID to get the status of the command execution for disabling Windows automatic update.

```powershell
Get-SSMCommandInvocation -Details $true -CommandId $configureWindowsUpdateCommand.CommandId | select -ExpandProperty CommandPlugins
```

Manage Windows Updates Using Run Command

Using Run Command and the AWS-InstallWindowsUpdates document, you can manage updates for Amazon EC2 Windows instances. This command scans for or installs missing updates on your EC2 Windows instances and optionally reboots following installation. You can also specify the appropriate classifications and severity levels for updates to install in your environment.

**Note**

For information about rebooting servers and instances when using Run Command to call scripts, see Rebooting Managed Instance from Scripts (p. 628).

The following examples demonstrate how to perform the specified Windows Update management tasks.

**Search for all missing Windows updates**

```powershell
Send-SSMCommand ` `-InstanceId Instance-ID ` `-DocumentName 'AWS-InstallWindowsUpdates' ` `-Parameters @{'Action'='Scan'}
```

**Install specific Windows updates**

```powershell
Send-SSMCommand ` `-InstanceId Instance-ID ` `-DocumentName 'AWS-InstallWindowsUpdates' ` `-Parameters @({'Action'='Install';'IncludeKbs'='KB4503308,KB890830,KB4507419';'AllowReboot'='True'})
```

**Install important missing Windows updates**

```powershell
Send-SSMCommand `
Install missing Windows updates with specific exclusions

Send-SSMCommand
-InstanceId i-047e6c6dcb97b18da
-DocumentName 'AWS-InstallWindowsUpdates'
-Parameters @{'Action'='Install';'ExcludeKbs'='KB2267602,KB4052623';'AllowReboot'='True'}

Troubleshooting Systems Manager Run Command

Run Command provides status details with each command execution. For more information about the details of command statuses, see Understanding Command Statuses (p. 630). You can also use the information in this topic to help troubleshoot problems with Run Command.

Topics
- Where Are My Instances? (p. 645)
- Getting Status Information on Windows Instances (p. 645)
- Getting Status Information on Linux Instances (p. 646)
- Troubleshooting SSM Agent (p. 646)

Where Are My Instances?

In the Run a command page, after you choose an SSM document to run and select Manually selecting instances in the Targets section, a list is displayed of instances you can choose to run the command on. If an instance you expect to see is not listed, check the following requirements:

- **SSM Agent**: Make sure the latest version of SSM Agent is installed on the instance. Only Amazon EC2 Windows Amazon Machine Images (AMIs) and some Linux AMIs are pre-configured with SSM Agent. For information about installing or reinstalling SSM Agent on an instance, see Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68) or Installing and Configuring SSM Agent on Windows Instances (p. 65).

- **IAM instance role**: Verify that the instance is configured with an AWS Identity and Access Management (IAM) role that enables the instance to communicate with the Systems Manager API. Also verify that your user account has an IAM user trust policy that enables your account to communicate with the Systems Manager API. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

- **Target operating system type**: Double-check that you have selected an SSM document that supports the type of instance you want to update. Most SSM documents support both Windows and Linux instances, but some do not. For example, if you select the SSM document AWS–InstallPowerShellModule, which applies only to Windows instances, you will not see Linux instances in the target instances list.

Getting Status Information on Windows Instances

Use the following command to get status details about one or more instances:

```
Get-SSMInstanceInformation -InstanceInformationFilterList
@{Key="InstanceIds";ValueSet="instance-ID","instance-ID"}
```
Use the following command with no filters to see all instances registered to your account that are currently reporting an online status. Substitute the ValueSet="Online" with "ConnectionLost" or "Inactive" to view those statuses:

```
Get-SSMInstanceInformation -InstanceInformationFilterList
@{Key="PingStatus";ValueSet="Online"}
```

Use the following command to see which instances are running the latest version of the EC2Config service. Substitute ValueSet="LATEST" with a specific version (for example, 3.0.54 or 3.10) to view those details:

```
Get-SSMInstanceInformation -InstanceInformationFilterList
@{Key="AgentVersion";ValueSet="LATEST"}
```

**Getting Status Information on Linux Instances**

Use the following command to get status details about one or more instances:

```
aws ssm describe-instance-information --instance-information-filter-list
key=InstanceIds,valueSet=instance-ID
```

Use the following command with no filters to see all instances registered to your account that are currently reporting an online status. Substitute the ValueSet="Online" with "ConnectionLost" or "Inactive" to view those statuses:

```
aws ssm describe-instance-information --instance-information-filter-list
key=PingStatus,valueSet=Online
```

Use the following command to see which instances are running the latest version of SSM Agent. Substitute ValueSet="LATEST" with a specific version (for example, 1.0.145 or 1.0) to view those details:

```
aws ssm describe-instance-information --instance-information-filter-list
key=AgentVersion,valueSet=LATEST
```

If the describe-instance-information API operation returns an AgentStatus of Online, then your instance is ready to be managed using Run Command. If the status is Inactive, the instance has one or more of the following problems.

- SSM Agent is not installed.
- The instance does not have outbound internet connectivity.
- The instance was not launched with an IAM role that enables it to communicate with the SSM API, or the permissions for the IAM role are not correct for Run Command. For more information, see [Create an IAM Instance Profile for Systems Manager (p. 29)](#).

**Troubleshooting SSM Agent**

If you experience problems executing commands using Run Command, there might be a problem with SSM Agent. Use the following information to help you view SSM Agent log files and troubleshoot the agent.

**Topics**

- [View SSM Agent Log Files (p. 647)](#)
- [Enable SSM Agent Debug Logging (p. 647)](#)
View SSM Agent Log Files

SSM Agent logs information in the following files. The information in these files can help you troubleshoot problems.

**Note**
If you choose to view these logs by using Windows File Explorer, be sure to enable the viewing of hidden files and system files in Folder Options.

**On Windows**

- `%%PROGRAMDATA%%\Amazon\SSM\Logs\amazon-ssm-agent.log`
- `%%PROGRAMDATA%%\Amazon\SSM\Logs\errors.log`

**On Linux**

- `/var/log/amazon/ssm/amazon-ssm-agent.log`
- `/var/log/amazon/ssm/errors.log`

Enable SSM Agent Debug Logging

Use the following procedure to enable SSM Agent debug logging on Windows Server and Linux managed instances.

1. Either use Systems Manager Session Manager to connect to the instance where you want to enable debug logging, or log on to the managed instance. For more information, see Working with Session Manager (p. 601).
2. Make a copy of the `seelog.xml.template` file. Change the name of the copy to `seelog.xml`. The file is located in the following directory:
   - **Windows Server**: `%PROGRAMFILES%\Amazon\SSM\seelog.xml.template`
   - **Linux**: `/etc/amazon/ssm/seelog.xml.template`
3. Edit the `seelog.xml` file to change the default logging behavior. Change the value of `minlevel` from `info` to `debug`, as shown in the following example.

   ```xml
   <seelog type="adaptive" mininterval="2000000" maxinterval="100000000"
    critmsgcount="500" minlevel="debug">
   ```
4. **Windows only**: Locate the following entry:

   ```xml
   filename="{(LOCALAPPDATA)}\Amazon\SSM\Logs\amazon-ssm-agent.log"
   ```
   Change this entry to use the following path:

   ```xml
   filename="C:\ProgramData\Amazon\SSM\Logs\amazon-ssm-agent.log"
   ```
5. **Windows only**: Locate the following entry:

   ```xml
   filename="{(LOCALAPPDATA)}\Amazon\SSM\Logs\errors.log"
   ```
   Change this entry to use the following path:

   ```xml
   filename="C:\ProgramData\Amazon\SSM\Logs\errors.log"
   ```
6. Restart SSM Agent.
   • **Windows Server**: Use Windows Services Manager to restart the Amazon SSM Agent.
   • **Linux**: Run the following command:
     ```bash
     sudo restart amazon-ssm-agent
     ```

**AWS Systems Manager State Manager**

AWS Systems Manager State Manager is a secure and scalable configuration management service that automates the process of keeping your Amazon EC2 and hybrid infrastructure in a state that you define.

The following list describes the types of tasks you can perform with State Manager.

- Bootstrap instances with specific software at start-up
- Download and update agents on a defined schedule, including SSM Agent
- Configure network settings
- Join instances to a Windows domain (Windows instances only)
- Patch instances with software updates throughout their lifecycle
- Run scripts on Linux and Windows managed instances throughout their lifecycle

State Manager integrates with AWS CloudTrail to provide a record of all executions that you can audit, and Amazon CloudWatch Events to track state changes. You can also choose to store and view detailed command output in Amazon S3. For more information, see the following topics:

- Logging AWS Systems Manager API Calls with AWS CloudTrail (p. 892)
- Monitoring Systems Manager Events with Amazon CloudWatch Events (p. 894)
- (Optional) Set Up Integrations with Other AWS Services (p. 40)

**Getting Started with State Manager**

Complete the following tasks to get started with State Manager.

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<td>Create an Association (p. 650)</td>
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**Related Content**

See the following blog posts for additional examples of how to use State Manager:

- Combating Configuration Drift Using Amazon EC2 Systems Manager and Windows PowerShell DSC
- Configure Amazon EC2 Instances in an Auto Scaling Group Using State Manager

**Topics**
About State Manager

AWS Systems Manager State Manager is a secure and scalable service that automates the process of keeping your Amazon EC2 and hybrid infrastructure in a state that you define.

Here’s how it works:

1. **Determine the state you want to apply to your managed instances.**

   Do you want to ensure that your managed instance are configured with specific applications, such as anti-virus or malware applications? Do you want to automate the process of updating the SSM Agent or other AWS packages such as AWSPVDriver? Do you need to ensure that specific ports are closed or open? To get started with State Manager, determine the state that you want to apply to your managed instances. The state that you want to apply will determine which SSM document you use to create a State Manager association.

   A State Manager **association** is a configuration that is assigned to your managed instances. The configuration defines the state that you want to maintain on your instances. For example, an association can specify that anti-virus software must be installed and running on your instances, or that certain ports must be closed. The association specifies a schedule for when the configuration is reapplied. The association also specifies actions to take when applying the configuration. For example, an association for anti-virus software might run once a day. If the software is not installed, then State Manager installs it. If the software is installed, but the service is not running, then the association might instruct State Manager to start the service.

2. **Determine if a preconfigured SSM document can help you create the State Manager association.**

   State Manager uses SSM documents to create an association. Systems Manager includes dozens of preconfigured SSM documents that you can use to create an association. Preconfigured documents are ready to perform common tasks like installing applications, configuring Amazon CloudWatch, running Systems Manager Automations, running PowerShell and Shell scripts, and joining a Directory Service domain for Active Directory, to name a few. You simply need to specify the name of the document and information for the required parameters, and then run the command to create the association. You can view all SSM documents in the Systems Manager console.

   You can then choose the name of a document to learn more about each one. Here are two examples: **AWS-ConfigureAWSPackage** and **AWS-InstallApplication**.

3. **Create the association.**

   You can create the association by using the AWS Systems Manager console, the AWS CLI, AWS Tools for Windows PowerShell, or the Systems Manager API. When you create the association, you specify the following information:

   1. The parameters for the SSM document (for example, the path to the application to install or the script to run on the instances).
   2. A schedule for when or how often to apply the state. You can specify a cron or rate expression. For more information about creating schedules by using cron and rate expressions, see **Cron and Rate Expressions for Associations**.
   3. Targets for the association. You can target managed instances by individually specifying IDs, or you can target large groups of managed instances by specifying Amazon EC2 tags. You can also target all managed instances in the current AWS Region and AWS account.

   When you run the command to create the association, Systems Manager binds the information you specified (schedule, targets, SSM document, and parameters) to the managed instances. The
status of the association initially shows "Pending" as the system attempts to reach all targets and immediately apply the state specified in the association.

Note
If you create a new association that is scheduled to run while an earlier association is still running, the earlier association is timed out and the new association runs.

Systems Manager reports the status of the request to create associations on the managed instances. You can view status details in the console or by using the DescribeInstanceAssociationsStatus API action. If you choose to write the output of the command to Amazon S3 when you create an association, you can also view the output in the Amazon S3 bucket you specify.

For more information, see Create an Association (p. 650).


After you create the association, State Manager reapplies the configuration according to the schedule that you defined in the association. You can view the status of your associations on the State Manager page in the console or by directly calling the association ID generated by Systems Manager when you created the association. For more information, see Viewing Association Histories (p. 663). You can update your association documents and reapply them as necessary. You can also create multiple versions of an association. For more information, see Edit and Create a New Version of an Association (p. 659).

Working with Associations in Systems Manager

A State Manager association is a configuration that is assigned to your managed instances. The configuration defines the state that you want to maintain on your instances. For example, an association can specify that anti-virus software must be installed and running on your instances, or that certain ports must be closed. The association specifies a schedule for when the configuration is reapplied. The association also specifies actions to take when applying the configuration. For example, an association for anti-virus software might run once a day. If the software is not installed, then State Manager installs it. If the software is installed, but the service is not running, then the association might instruct State Manager to start the service.

Use the following topics to help you create and manage State Manager associations.

Topics
- Create an Association (p. 650)
- Using Targets and Rate Controls with State Manager Associations (p. 654)
- Edit and Create a New Version of an Association (p. 659)
- Viewing Association Histories (p. 663)

Create an Association

The following procedures describe how to create a State Manager association by using the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), and AWS Tools for Windows PowerShell.

Important
The following procedures are intended for creating an association with a Command or Policy document. For information on creating an association that uses an Automation document, see Running Automation Workflows with Triggers Using State Manager (p. 182).

When a State Manager association is created, the association immediately runs on the specified instances or targets. After the initial execution, the association runs in intervals according to the schedule that you defined and according to the following rules:
• Associations are only run on instances that are online when the interval starts. Offline instances are skipped.
• State Manager attempts to run the association on all configured instances during an interval.
• If an association is not run during an interval (because, for example, a concurrency value limited the number of instances that could process the association at one time), then State Manager attempts to run the association during the next interval.
• State Manager records history for all skipped intervals. You can view the history on the Execution History tab.

Create an Association (Console)

The following procedure describes how to use the Systems Manager console to create a State Manager association.

To create a State Manager association

2. In the navigation pane, choose State Manager, and then choose Create association.
3. In the Name field, specify a name. This is optional, but recommended. A name helps you remember the purpose of the association. For example, you could specify Automatically_update_AWSPVDrivers_on_us-west-2_instances for an association with that purpose. Spaces aren't allowed in the name.
4. In the Document list, choose the option next to a document name. You can use the numbers to the right of the Search bar to view more documents.
5. For Parameters, specify the required input parameters.
6. For Targets, choose an option. For information about using targets, see Using Targets and Rate Controls with State Manager Associations (p. 654).

   Note
   If you use tags to create an association on one or more target instances, and then you remove the tags from an instance, that instance no longer runs the association. The instance is disassociated from the State Manager document.
7. In the Specify schedule section, choose either On Schedule or No schedule. If you choose On Schedule, then use the buttons provided to create a cron or rate schedule for the association.
8. In the Advanced options section:
   • In Compliance severity, choose a severity level for the association. Compliance reporting indicates whether the association state is compliant or noncompliant, along with the severity level you indicate here. For more information, see About State Manager Association Compliance (p. 508).
9. In the Rate control section, configure options to run State Manager associations across a fleet of managed instances. For information about using rate controls, see Using Targets and Rate Controls with State Manager Associations (p. 654).

   In the Concurrency section, choose an option:
   • Choose targets to enter an absolute number of targets that can run the association simultaneously.
   • Choose percentage to enter a percentage of the target set that can run the association simultaneously.

   In the Error threshold section, choose an option:
   • Choose errors to enter an absolute number of errors that are allowed before State Manager stops running associations on additional targets.
• Choose **percentage** to enter a percentage of errors that are allowed before State Manager stops running associations on additional targets.

10. In the **Output options** section, choose **Enable writing output to S3** if you want to write the output of the command to create the associations to an Amazon S3 bucket.

11. Choose **Create Association**.

**Create an Association (Command Line)**

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to create an association.

**To create a State Manager association**

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).

2. Use the following format to create a command that creates a State Manager association.

   **Linux**
   ```bash
   aws ssm create-association \
   --targets Key=tag:TagKey,Values=TagValue \ 
   --name document_name \ 
   --schedule "cron_or_rate_expression" \ 
   --parameters (if any)
   ```

   **Note**
   If you create an association by using the AWS CLI, use the `--Targets` parameter to target instances for the association. Don't use the `--InstanceID` parameter. The `--InstanceID` parameter is a legacy parameter.

   **Windows**
   ```bash
   aws ssm create-association ^
   --targets Key=tag:TagKey,Values=TagValue ^
   --name document_name ^
   --schedule "cron_or_rate_expression" ^
   --parameters (if any)
   ```

   **Note**
   If you create an association by using the AWS CLI, use the `--Targets` parameter to target instances for the association. Don't use the `--InstanceID` parameter. The `--InstanceID` parameter is a legacy parameter.

   **PowerShell**
   ```powershell
   New-SSMAssociation ` 
   -AssociationName document_name ` 
   -Target Targets ` 
   -ScheduleExpression "cron_or_rate_expression" ` 
   -Parameters (if any)
   ```

   **Note**
   If you create an association by using AWS Tools for Windows PowerShell, use the `-Target` parameter to target instances for the association. Don't use the `-InstanceID` parameter. The `-InstanceID` parameter is a legacy parameter.
The following example creates an association on instances tagged with "Environment,Linux". The association uses the AWS-UpdateSSMAgent document to update SSM Agent on the targeted instances at 2:00 every Sunday morning. For compliance reporting, this association is assigned a severity level of Medium.

Linux

aws ssm create-association \
  --association-name Update_SSM_Agent_Linux \
  --targets Key=tag:Environment,Values=Linux \
  --name AWS-UpdateSSMAgent \
  --compliance-severity "MEDIUM" \
  --schedule "cron(0 2 ? * SUN *)"

Windows

aws ssm create-association ^ 
  --association-name Update_SSM_Agent_Linux ^ 
  --targets Key=tag:Environment,Values=Linux ^ 
  --name AWS-UpdateSSMAgent ^ 
  --compliance-severity "MEDIUM" ^ 
  --schedule "cron(0 2 ? * SUN *)"

PowerShell

New-SSMAssociation ` 
  -AssociationName Update_SSM_Agent_Linux ` 
  -Name AWS-UpdateSSMAgent ` 
  -Target @{ 
      "Key"="tag:Environment" 
      "Values"="Linux" 
  } ` 
  -ScheduleExpression "cron(0 2 ? * SUN *)" ` 
  -ComplianceSeverity MEDIUM

The following example targets instance IDs by specifying a wildcard value (*). This enables Systems Manager to create an association on all instances in the current account and AWS Region.

Linux

aws ssm create-association \
  --association-name Update_SSM_Agent_Linux \
  --name "AWS-UpdateSSMAgent" \
  --targets "Key=instanceids,Values=*" \
  --compliance-severity "MEDIUM" \
  --schedule "cron(0 2 ? * SUN *)"

Windows

aws ssm create-association ^ 
  --association-name Update_SSM_Agent_Linux ^ 
  --name "AWS-UpdateSSMAgent" ^ 
  --targets "Key=instanceids,Values=*" ^ 
  --compliance-severity "MEDIUM" ^ 
  --schedule "cron(0 2 ? * SUN *)"
Using Targets and Rate Controls with State Manager Associations

AWS Systems Manager enables you to create State Manager associations on a fleet of managed instances by using targets. Additionally, you can control the execution of these associations across your fleet by specifying a concurrency value and an error threshold. The concurrency value specifies how many resources are allowed to run the association simultaneously. An error threshold specifies how many association executions can fail before Systems Manager sends a command to each instance configured with that association. The command stops the association from running until the next scheduled execution. The concurrency and error threshold features are collectively called rate controls.

Concurrency

Concurrency helps to limit the impact on your fleet by allowing you to specify that only a certain number of instances can process an association at one time. You can specify either an absolute number of instances, for example 20, or a percentage of the target set of instances, for example 10%.

State Manager concurrency has the following restrictions and limitations:

- If you choose to create an association by using targets, but you don't specify a concurrency value, then State Manager automatically enforces a maximum concurrency of 50 instances.
- If new instances that match the target criteria come online while an association that uses concurrency is running, then the new instances run the association if the concurrency value is not exceeded. If the concurrency value is exceeded, then the instances are ignored during the current association execution interval. The instances run the association during the next scheduled interval while conforming to the concurrency requirements.
- If you update an association that uses concurrency, and one or more instances are processing that association when it is updated, then any instance that is running the association is allowed to complete. Those associations that haven't started are stopped. After running associations complete, all target instances immediately run the association again because it was updated. When the association runs again, the concurrency value is enforced.

Error Thresholds

An error threshold specifies how many association executions are allowed to fail before Systems Manager sends a command to each instance configured with that association. The command stops the association...
from running until the next scheduled execution. You can specify either an absolute number of errors, for example 10, or a percentage of the target set, for example 10%.

If you specify an absolute number of three errors, for example, State Manager sends the stop command when the fourth error is returned. If you specify 0, then State Manager sends the stop command after the first error result is returned.

If you specify an error threshold of 10% for 50 associations, then State Manager sends the stop command when the sixth error is returned. Associations that are already running when an error threshold is reached are allowed to complete, but some of these associations might fail. To ensure that there aren't more errors than the number specified for the error threshold, set the Concurrency value to 1 so that associations proceed one at a time.

State Manager error thresholds have the following restrictions and limitations:

- Error thresholds are enforced for the current interval.
- Information about each error, including step-level details, is recorded in the association history.
- If you choose to create an association by using targets, but you don't specify an error threshold, then State Manager automatically enforces a threshold of 100% failures.

Targets

You can create associations on tens, hundreds, or thousands of instances by using the targets parameter. The targets parameter accepts a Key, Value combination based on resource tags that you specified for your instances. When you run the request to create the association, the system locates and attempts to create the association on all instances that match the specified criteria. After the association is created and assigned to the instance or to a target set of instances, then State Manager immediately runs the association.

Note

When you create an association, you specify when the schedule runs. You must specify the schedule by using a cron or rate expression. There are many tools on the internet to help you create these expressions. For more information about cron and rate expressions, see Cron and Rate Expressions for Associations (p. 940).

Create an Association That Uses Targets and Rate Controls (Console)

The following procedure describes how to use the Systems Manager console to create a State Manager association that uses targets and rate controls.

Important

The following procedure is intended for creating an association with a Command or Policy document. For information on creating an association that uses an Automation document, see Running Automation Workflows with Triggers Using State Manager (p. 182).

To create a State Manager association that uses targets and rate controls

2. In the navigation pane, choose State Manager, and then choose Create association.
3. In the Name field, specify a name. This is optional, but recommended. A name helps you remember the purpose of the association when you created it. For example, you could specify **Automatically_update_AWSPVDrivers_on_us-west-2_instances** for an association with that purpose. Spaces aren't allowed in the name.
4. In the Document list, choose the option next to a document name. You can use the numbers to the right of the Search bar to view more documents.
5. For Parameters, specify the required input parameters.
6. In the Targets section, choose either **Selecting all managed instances in this region under this account** or **Specifying tags**. If you choose to target tags, then enter a tag key and a tag value.
Note
If you use tags to create an association on one or more target instances, and then you remove the tags from an instance, that instance no longer runs the association. The instance is disassociated from the State Manager document.

7. In the **Specify schedule** section, choose either **On Schedule** or **No schedule**. If you choose **On Schedule**, then use the buttons provided to create a cron or rate schedule for the association.

8. In the **Advanced options** section:
   - In **Compliance severity**, choose a severity level for the association. Compliance reporting indicates whether the association state is compliant or noncompliant, along with the severity level you indicate here. For more information, see About State Manager Association Compliance (p. 508).

9. In the **Rate control** section, configure options to run State Manager associations across a fleet of managed instances.
    - In the **Concurrency** section, choose an option:
      - Choose **targets** to enter an absolute number of targets that can run the association simultaneously.
      - Choose **percentage** to enter a percentage of the target set that can run the association simultaneously.
    - In the **Error threshold** section, choose an option:
      - Choose **errors** to enter an absolute number of errors that are allowed before State Manager stops running associations on additional targets.
      - Choose **percentage** to enter a percentage of errors that are allowed before State Manager stops running associations on additional targets.

10. In the **Output options** section, choose **Enable writing output to S3** if you want to write the output of the command to create the associations to an Amazon S3 bucket.

11. Choose **Create Association**.

Create an Association That Uses Targets and Rate Controls (Command Line)

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to create a State Manager association that uses targets and rate controls.

**To create an association with targets and rate controls**

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.
   - For information, see **Install or Upgrade the AWS CLI** (p. 58) or **Install or Upgrade the AWS Tools for PowerShell** (p. 59).

2. Use the following format to create a command that creates a State Manager association that uses targets and rate controls.
   - **Linux**
     ```
     aws ssm create-association \
     --targets Key=tag:TagKey,Values=TagValue \
     --name document_name \
     --schedule "cron_or_rate_expression" \
     --parameters (if any) \
     --max-concurrency a_number_of_instances_or_a_percentage_of_target_set \
     --max-errors a_number_of_errors_or_a_percentage_of_target_set
     ```
The following example creates an association on instances tagged with "Environment,Linux". The association uses the AWS-UpdateSSMAgent document to update SSM Agent on the targeted instances at 2:00 every Sunday morning. This association runs simultaneously on 10 instances maximum at any given time. Also, this association stops running on more instances for a particular execution interval if the error count exceeds 5. For compliance reporting, this association is assigned a severity level of Medium.
The following example targets instance IDs by specifying a wildcard value (*). This enables Systems Manager to create an association on all instances in the current account and AWS Region. This association runs simultaneously on 10 instances maximum at any given time. Also, this association stops running on more instances for a particular execution interval if the error count exceeds 5. For compliance reporting, this association is assigned a severity level of Medium.

Linux

```bash
aws ssm create-association
    --association-name Update_SSM_Agent_Linux
    --name "AWS-UpdateSSMAgent"
    --targets "Key=instanceids,Values=*"
    --compliance-severity "MEDIUM"
    --schedule "cron(0 2 ? * SUN *)"
    --max-errors "5"
    --max-concurrency "10"
```

Windows

```bash
aws ssm create-association
    --association-name Update_SSM_Agent_Linux
    --name "AWS-UpdateSSMAgent"
    --targets "Key=instanceids,Values=*"
    --compliance-severity "MEDIUM"
    --schedule "cron(0 2 ? * SUN *)"
    --max-errors "5"
    --max-concurrency "10"
```

PowerShell

```powershell
New-SSMAssociation
    -AssociationName Update_SSM_Agent_All
    -Name AWS-UpdateSSMAgent
    -Target @{
        "Key"="InstanceIds"
        "Values"="*"
    }
    -ScheduleExpression "cron(0 2 ? * SUN *)"
    -MaxConcurrency 10
    -MaxError 5
    -ComplianceSeverity MEDIUM
```

**Note**

If you use tags to create an association on one or more target instances, and then you remove the tags from an instance, that instance no longer runs the association. The instance is disassociated from the State Manager document.
Edit and Create a New Version of an Association

You can edit an association to specify a new name, schedule, severity level, or targets. You can also choose to write the output of the command to an Amazon S3 bucket. After you edit an association, Systems Manager creates a new version. You can view different versions after editing, as described in the following procedures.

The following procedures describe how to edit and create a new version of an association using the AWS Systems Manager console, AWS Command Line Interface (AWS CLI), and AWS Tools for PowerShell.

Edit and Create a New Version of an Association (Console)

The following procedure describes how to use the Systems Manager console to edit and create a new version of an association.

**Note**
This procedure requires that you have write access to an existing S3 bucket. If you have not used Amazon S3 before, be aware that you will incur charges for using Amazon S3. For information about how to create a bucket, see Create a Bucket.

**To edit a State Manager association**

2. In the navigation pane, choose State Manager.
3. Choose the association you created in the previous procedure, and then choose Edit.
4. In the Name field, type a new name. For example, type TestHostnameAssociation2.
5. In the Specify schedule section, choose a new option. For example, choose CRON schedule builder, and then choose Every 1 hour.
6. (Optional) To write the command output to an Amazon S3 bucket, do the following in the Output options section:
   - Choose Enable writing output to S3.
   - In the S3 bucket name field, type the name of an S3 bucket you have write access to.
   - (Optional) To write output to a folder in the bucket, type its name in the S3 key prefix field. If no folder exists with the name you specify, State Manager creates it for you.
7. Choose Edit association.
8. In the Associations page, choose the name of the association you just edited, and then choose the Versions tab. The system lists each version of the association you created and edited.
9. Open the Amazon S3 console at https://console.aws.amazon.com/s3/.
10. Choose the name of the S3 bucket you specified for storing command output, and then choose the folder named with the ID of the instance that ran the association. (If you chose to store output in a folder in the bucket, open it first.)
11. Drill down several levels, through the awsrunPowerShell folder, to the stdout file.
12. Choose Open or Download to view the host name.

Edit and Create a New Version of an Association (Command Line)

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to edit and create a new version of an association.
To edit a State Manager association

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).

2. Use the following format to create a command to edit and create a new version of an existing State Manager association.

   **Linux**
   ```bash
   aws ssm update-association
   --association-id b85ccafe-9f02-4812-9b81-01234EXAMPLE
   --association-name association_name
   --parameters (if any)
   --output-location S3Location='{OutputS3Region=region,OutputS3BucketName=bucketname,OutputS3KeyPrefix=keyprefix}'
   --scheduleexpression "cron_or_rate_expression"
   ```

   **Important**
   To retain existing parameter values of your association, such as association name or compliance severity, you must specify these values when you update the association. If you don't specify these parameter values when you update an association, the new association version uses no values. For example, if your existing association has a cron schedule but you don't specify `--schedule-expression` when updating, the new association version will not have a schedule expression.

   **Windows**
   ```bash
   aws ssm update-association ^
   --association-id b85ccafe-9f02-4812-9b81-01234EXAMPLE ^
   --association-name association_name ^
   --parameters (if any) ^
   --output-location S3Location='{OutputS3Region=region,OutputS3BucketName=bucketname,OutputS3KeyPrefix=keyprefix}' ^
   --scheduleexpression "cron_or_rate_expression"
   ```

   **Important**
   To retain existing parameter values of your association, such as association name or compliance severity, you must specify these values when you update the association. If you don't specify these parameters when you update an association, the new association version uses the default values (none). For example, if your existing association has a cron schedule but you don't specify `--schedule-expression` when updating, the new association version will not have a schedule expression.

   **PowerShell**
   ```powershell
   Update-SSMAssociation \
   -AssociationId b85ccafe-9f02-4812-9b81-01234EXAMPLE \
   -AssociationName document_name \
   -Parameter (if any) \
   -S3Location_OutputS3BucketName bucket_name \
   -S3Location_OutputS3KeyPrefix key_prefix \
   -S3Location_OutputS3Region region \
   -ScheduleExpression "cron_or_rate_expression"
   ```
Important
To retain existing parameter values of your association, such as association name or compliance severity, you must specify these values when you update the association. If you don’t specify these parameters when you update an association, the new association version uses no values. For example, if your existing association has a cron schedule but you don’t specify --ScheduleExpression when updating, the new association version will not have a schedule expression.

The following example updates an existing association to change the name to TestHostnameAssociation2. The new association version runs every hour and writes the output of commands to the specified Amazon S3 bucket.

Linux

```bash
aws ssm update-association
    --association-id 8dfe3659-4309-493a-8755-01234EXAMPLE
    --association-name TestHostnameAssociation2
    --parameters commands="echo Association"
    --output-location S3Location='{OutputS3Region=us-east-1,OutputS3BucketName=statemanager,OutputS3KeyPrefix=logs}"
    --schedule-expression "cron(0 */1 * * ? *)"
```

Windows

```bash
aws ssm update-association
    --association-id 8dfe3659-4309-493a-8755-01234EXAMPLE
    --association-name TestHostnameAssociation2
    --parameters commands="echo Association"
    --output-location S3Location='{OutputS3Region=us-east-1,OutputS3BucketName=statemanager,OutputS3KeyPrefix=logs}"
    --schedule-expression "cron(0 */1 * * ? *)"
```

PowerShell

```powershell
Update-SSMAssociation
    -AssociationId b85ccafe-9f02-4812-9b81-01234EXAMPLE
    -AssociationName TestHostnameAssociation2
    -Parameter @("commands"="echo Association")
    -S3Location_OutputS3BucketName statemanager
    -S3Location_OutputS3KeyPrefix logs
    -S3Location_OutputS3Region us-east-1
    -ScheduleExpression "cron(0 */1 * * ? *)"
```

3. To view the new version of the association, run the following command.

Linux

```bash
aws ssm describe-association
    --association-id b85ccafe-9f02-4812-9b81-01234EXAMPLE
```

Windows

```bash
aws ssm describe-association
    --association-id b85ccafe-9f02-4812-9b81-01234EXAMPLE
```
PowerShell

Get-SSMAssociation
-AssociationId b85ccafe-9f02-4812-9b81-01234EXAMPLE | Select-Object *

The system returns information like the following.

Linux

```json
{
  "AssociationDescription": {
    "ScheduleExpression": "cron(0 */1 * * ? *)",
    "OutputLocation": {
      "S3Location": {
        "OutputS3KeyPrefix": "logs",
        "OutputS3BucketName": "statemanager",
        "OutputS3Region": "us-east-1"
      }
    },
    "Name": "AWS-RunPowerShellScript",
    "Parameters": {
      "commands": [
        "echo Association"
      ],
    },
    "LastExecutionDate": 1559316400.338,
    "Overview": {
      "Status": "Success",
      "DetailedStatus": "Success",
      "AssociationStatusAggregatedCount": {}
    },
    "AssociationId": "b85ccafe-9f02-4812-9b81-01234EXAMPLE",
    "DocumentVersion": "$DEFAULT",
    "LastSuccessfulExecutionDate": 1559316400.338,
    "LastUpdateAssociationDate": 1559316389.753,
    "Date": 1559314038.532,
    "AssociationVersion": "2",
    "AssociationName": "TestHostnameAssociation2",
    "Targets": [
      {
        "Values": [
          "Windows"
        ],
        "Key": "tag:Environment"
      }
    ]
  }
}
```

Windows

```json
{
  "AssociationDescription": {
    "ScheduleExpression": "cron(0 */1 * * ? *)",
    "OutputLocation": {
      "S3Location": {
        "OutputS3KeyPrefix": "logs",
        "OutputS3BucketName": "statemanager",
        "OutputS3Region": "us-east-1"
      }
    }
}
```
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PowerShell

AssociationId : b85ccafe-9f02-4812-9b81-01234EXAMPLE
AssociationName : TestHostnameAssociation2
AssociationVersion : 2
AutomationTargetParameterName :
ComplianceSeverity :
Date : 5/31/2019 2:47:18 PM
DocumentVersion : $DEFAULT
InstanceId :
LastExecutionDate : 5/31/2019 3:26:40 PM
LastSuccessfulExecutionDate : 5/31/2019 3:26:40 PM
LastUpdateAssociationDate : 5/31/2019 3:26:29 PM
MaxConcurrency :
MaxErrors :
Name : AWS-RunPowerShellScript
OutputLocation :
Overview :
Parameters : {
    "commands": ["echo Association"
]
}
ScheduleExpression : cron(0 */1 * * ? *)
Status :
Targets : {"tag:Environment"}

Viewing Association Histories

You can view all executions for a specific association ID by using the DescribeAssociationExecutions API action. This action allows you to quickly see the status, detailed status, results, last execution time, and more information for a State Manager association. This API action also includes filters to help you
quickly locate associations according to the criteria you specify. For example, you can specify an exact date and time, and use a GREATER_THAN filter to view only those executions that were processed after the specified date and time.

If, for example, an association execution failed, you can drill down into the details of a specific execution by using the DescribeAssociationExecutionTargets API action. This action shows you the resources, such as instance IDs, where the association ran and the various association statuses. You can then quickly see which resource or instance failed to run an association. With the resource ID you can then view the command execution details to see exactly which step in a command failed.

The examples in this section also include information about how to use the StartAssociationsOnce API action to run an association immediately and only one time. You can use this API action when you investigate failed association executions. If you see that an association failed, you can make a change on the resource, and then immediately run the association to see if the change on the resource allows the association to run successfully.

**Viewing Association Histories (Console)**

Use the following procedure to view the execution history for a specific association ID and then view execution details for one or more resources.

**To view execution history for a specific association ID**

2. Choose State Manager.
3. In the Association id field, choose an association for which you want to view the history.
4. Choose the View details button.
5. Choose the Execution history tab.
6. Choose an association for which you want to view resource-level execution details. For example, choose an association that shows a status of Failed. You can then view the execution details for the instances that failed to run the association.

   **Note**

   Use the search box filters to locate the execution for which you want to view details.

7. Choose an execution ID. The Association execution targets page opens. This page shows all of the resources that ran the association.
8. Choose a resource ID to view specific information about that resource.

   **Note**

   Use the search box filters to locate the resource for which you want to view details.

9. If you are investigating an association that failed to run, you can use the Apply association now button to run an association immediately and only one time. After you made changes on the resource where the association failed to run, choose the Association ID link in the navigation breadcrumb.
10. Choose the Apply association now button. After the execution is complete, verify that the association execution succeeded.

**Viewing Association Histories (Command Line)**

The following procedure describes how to use the AWS CLI (on Linux or Windows) or AWS Tools for PowerShell to view the execution history for a specific association ID. Following this, the procedure describes how to view execution details for one or more resources.
To view execution history for a specific association ID

1. Install and configure the AWS CLI or the AWS Tools for PowerShell, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58) or Install or Upgrade the AWS Tools for PowerShell (p. 59).

2. Run the following command to view a list of executions for a specific association ID.

   Linux
   
   ```bash
   aws ssm describe-association-executions \
   --association-id ID \
   --filters Key=CreatedTime,Value="2018-04-10T19:15:38.372Z",Type=GREATER_THAN
   ```

   **Note**
   
   This command includes a filter to limit the results to only those executions that occurred after a specific date and time. If you want to view all executions for a specific association ID, remove the `--filters` parameter and `Key=CreatedTime,Value="2018-04-10T19:15:38.372Z",Type=GREATER_THAN` value.

   Windows
   
   ```bash
   aws ssm describe-association-executions ^
   --association-id ID ^
   --filters Key=CreatedTime,Value="2018-04-10T19:15:38.372Z",Type=GREATER_THAN
   ```

   **Note**
   
   This command includes a filter to limit the results to only those executions that occurred after a specific date and time. If you want to view all executions for a specific association ID, remove the `--filters` parameter and `Key=CreatedTime,Value="2018-04-10T19:15:38.372Z",Type=GREATER_THAN` value.

   PowerShell
   
   ```powershell
   Get-SSMAssociationExecution `\n   -AssociationId ID `\n   -Filter @{"Key"="CreatedTime";"Value"="2019-06-01T19:15:38.372Z";"Type"="GREATER_THAN"}
   ```

   **Note**
   
   This command includes a filter to limit the results to only those executions that occurred after a specific date and time. If you want to view all executions for a specific association ID, remove the `-Filter` parameter and `@{"Key"="CreatedTime";"Value"="2019-06-01T19:15:38.372Z";"Type"="GREATER_THAN"}` value.

The system returns information like the following.

   Linux
   
   ```json
   {
   "AssociationExecutions":[
   {
   "Status":"Success",
   "DetailedStatus":"Success",
   "AssociationId":"c336d2ab-09de-44ba-8f6a-6136cEXAMPLE",
   ```

   ```json
   ```
"ExecutionId": "76a5a04f-caf6-490c-b448-92c02EXAMPLE",
"AssociationId": "c336d2ab-09de-44ba-8f6a-6136cEXAMPLE",
"ExecutionId": "76a5a04f-caf6-490c-b448-92c02EXAMPLE",
"CreatedTime": 1523986028.219,
"AssociationVersion": "1"
},
{
"Status": "Success",
"DetailedStatus": "Success",
"AssociationId": "c336d2ab-09de-44ba-8f6a-6136cEXAMPLE",
"ExecutionId": "791b72e0-f0da-4021-8b35-f95dfEXAMPLE",
"CreatedTime": 1523984226.074,
"AssociationVersion": "1"
},
{
"Status": "Success",
"DetailedStatus": "Success",
"AssociationId": "c336d2ab-09de-44ba-8f6a-6136cEXAMPLE",
"ExecutionId": "ecec60fa-6bb0-4d26-98c7-140308EXAMPLE",
"CreatedTime": 1523982404.013,
"AssociationVersion": "1"
}]

Windows

{
"AssociationExecutions": [
{
"Status": "Success",
"DetailedStatus": "Success",
"AssociationId": "c336d2ab-09de-44ba-8f6a-6136cEXAMPLE",
"ExecutionId": "76a5a04f-caf6-490c-b448-92c02EXAMPLE",
"CreatedTime": 1523986028.219,
"AssociationVersion": "1"
},
{
"Status": "Success",
"DetailedStatus": "Success",
"AssociationId": "c336d2ab-09de-44ba-8f6a-6136cEXAMPLE",
"ExecutionId": "791b72e0-f0da-4021-8b35-f95dfEXAMPLE",
"CreatedTime": 1523984226.074,
"AssociationVersion": "1"
},
{
"Status": "Success",
"DetailedStatus": "Success",
"AssociationId": "c336d2ab-09de-44ba-8f6a-6136cEXAMPLE",
"ExecutionId": "ecec60fa-6bb0-4d26-98c7-140308EXAMPLE",
"CreatedTime": 1523982404.013,
"AssociationVersion": "1"
}
}

PowerShell

AssociationId : c336d2ab-09de-44ba-8f6a-6136cEXAMPLE
AssociationVersion : 1
CreatedTime : 8/18/2019 2:00:50 AM
DetailedStatus : Success
ExecutionId : 76a5a04f-caf6-490c-b448-92c02EXAMPLE
LastExecutionDate : 1/1/0001 12:00:00 AM
ResourceCountByStatus : {Success=1}
You can limit the results by using one or more filters. The following example returns all associations that were run before a specific date and time.

Linux

```bash
aws ssm describe-association-executions \
   --association-id ID \
   --filters Key=CreatedTime,Value="2018-04-10T19:15:38.372Z",Type=LESS_THAN
```

Windows

```bash
aws ssm describe-association-executions ^
   --association-id ID ^
   --filters Key=CreatedTime,Value="2018-04-10T19:15:38.372Z",Type=LESS_THAN
```

PowerShell

```
Get-SSMAssociationExecution `  
   -AssociationId 14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE `  
   -Filter @{"Key"="CreatedTime";"Value"="2019-06-01T19:15:38.372Z";"Type"="LESS_THAN"}
```

The following returns all associations that were *successfully* run after a specific date and time.

Linux

```bash
aws ssm describe-association-executions \
   --association-id ID \
   --filters Key=CreatedTime,Value="2018-04-10T19:15:38.372Z",Type=GREATER_THAN \
   Key=Status,Value=Success,Type=EQUAL
```

Windows

```bash
aws ssm describe-association-executions ^
   --association-id ID ^
```
--filters Key=CreatedTime,Value="2018-04-10T19:15:38.372Z",Type=GREATERTHAN
Key=Status,Value=Success,Type=EQUAL

PowerShell

Get-SSMAssociationExecution
-AssociationId 14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE
-Filter @{
  "Key"="CreatedTime";
  "Value"="2019-06-01T19:15:38.372Z";
  "Type"="GREATERTHAN"
},
@{
  "Key"="Status";
  "Value"="Success";
  "Type"="EQUAL"
}

3. Run the following command to view all targets where the specific execution ran.

Linux

aws ssm describe-association-execution-targets
  --association-id ID
  --execution-id ID

Windows

aws ssm describe-association-execution-targets
  --association-id ID
  --execution-id ID

PowerShell

Get-SSMAssociationExecutionTarget
-AssociationId 14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE
-ExecutionId 76a5a04f-caf6-490c-b448-92c02EXAMPLE

You can limit the results by using one or more filters. The following example returns information about all targets where the specific association failed to run.

Linux

aws ssm describe-association-execution-targets
  --association-id ID
  --execution-id ID
  --filters Key=Status,Value="Failed"

Windows

aws ssm describe-association-execution-targets
  --association-id ID
  --execution-id ID
  --filters Key=Status,Value="Failed"
PowerShell

```powershell
Get-SSMAssociationExecutionTarget `-AssociationId 14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE `-ExecutionId 7605a04f-caf6-490c-b448-92c02EXAMPLE `-Filter @{
    "Key"="Status";
    "Value"="Failed"
}
```

The following example returns information about a specific managed instance where an association failed to run.

Linux

```bash
aws ssm describe-association-execution-targets \
    --association-id ID \
    --execution-id ID \
    --filters Key=Status,Value=Failed Key=ResourceId,Value="i-02573cafcfEXAMPLE" Key=ResourceType,Value=ManagedInstance
```

Windows

```bash
aws ssm describe-association-execution-targets ^ \
    --association-id ID ^ \
    --execution-id ID ^ \
    --filters Key=Status,Value=Failed Key=ResourceId,Value="i-02573cafcfEXAMPLE" Key=ResourceType,Value=ManagedInstance
```

PowerShell

```powershell
Get-SSMAssociationExecutionTarget `-AssociationId 14bea65d-5ccc-462d-a2f3-e99c8EXAMPLE `-ExecutionId 7605a04f-caf6-490c-b448-92c02EXAMPLE `-Filter @{
    "Key"="Status";
    "Value"="Success"
}, @{
    "Key"="ResourceId";
    "Value"="i-02573cafcfEXAMPLE"
}, @{
    "Key"="ResourceType";
    "Value"="ManagedInstance"
}
```

4. If you are investigating an association that failed to run, you can use the `StartAssociationsOnce` API action to run an association immediately and only one time. After you change the resource where the association failed to run, run the following command to run the association immediately and only one time.

Linux

```bash
aws ssm start-associations-once \
    --association-id ID
```
Creating Associations that Run MOF Files

You can run Managed Object Format (MOF) files to enforce a desired state on Windows Server managed instances with State Manager by using the AWS-ApplyDSCMofs SSM document. The AWS-ApplyDSCMofs document has two execution modes. With the first mode, you can configure the association to scan and report if the managed instances are currently in the desired state defined in the specified MOF files. In the second mode, you can run the MOF files and change the configuration of your instances based on the resources and their values defined in the MOF files. The AWS-ApplyDSCMofs document enables you to download and run MOF configuration files from Amazon Simple Storage Service (Amazon S3), a local share, or from a secure web site with an HTTPS domain.

State Manager logs and reports the status of each MOF file execution during each association run. State Manager also reports the output of each MOF file execution as a compliance event which you can view on the AWS Systems Manager Compliance page.

MOF file execution is built on Windows PowerShell Desired State Configuration (PowerShell DSC). PowerShell DSC is a declarative platform used for configuration, deployment, and management of Windows systems. PowerShell DSC allows administrators to describe, in simple text documents called DSC configurations, how they want a server to be configured. A PowerShell DSC configuration is a specialized PowerShell script that states what to do, but not how to do it. Running the configuration produces a MOF file. The MOF file can be applied to one or more servers to achieve the desired configuration for those servers. PowerShell DSC resources do the actual work of enforcing configuration. For more information, see Windows PowerShell Desired State Configuration Overview.

Topics
- Using Amazon S3 to Store Artifacts (p. 671)
- Resolving Credentials in MOF Files (p. 671)
- Using Tokens in MOF Files (p. 672)
- Prerequisites (p. 673)
- Creating an Association that Runs MOF Files (p. 673)
Using Amazon S3 to Store Artifacts

If you are using Amazon S3 to store PowerShell modules, MOF files, compliance reports, or status reports, then the IAM role used by SSM Agent must have `GetObject` and `ListBucket` permissions on the bucket. If you don’t provide these permissions, the system returns an `Access Denied` error. Also note the following important information about storing artifacts in Amazon S3.

- If the bucket is in a different AWS account, then you must create a bucket resource policy that grants the account (or the IAM role) `GetObject` and `ListBucket` permissions.
- If you want to use custom DSC resources, you can download these resources from an Amazon S3 bucket. You can also install them automatically from the PowerShell gallery.
- If you are using Amazon S3 as a module source, then you need to upload the module as a Zip file in the following case-sensitive format: `ModuleName_ModuleVersion.zip`. For example: `MyModule_1.0.0.zip`.
- All files must be in the bucket root. Folder structures are not supported.

Resolving Credentials in MOF Files

Credentials are resolved by using AWS Secrets Manager or AWS Systems Manager Parameter Store (p. 828). This allows you to set up automatic credential rotation. This also enables DSC to automatically propagate credentials to your servers without redeploying MOFs.

To use a Secrets Manager secret in a configuration, create a PSCredential object where the Username is the SecretId or SecretARN of the secret containing the credential. You can specify any value for the password. The value is ignored. Here is an example:

```powershell
Configuration MyConfig
{
    $ss = ConvertTo-SecureString -String 'a_string' -AsPlaintext -Force
    $credential = New-Object PSCredential('a_secret_or_ARN', $ss)

    Node localhost
    {
        File file_name
        {
            DestinationPath = 'C:\MyFile.txt'
            SourcePath = '\\FileServer\Share\MyFile.txt'
            Credential = $credential
        }
    }
}
```

You must then compile your MOF using the `PsAllowPlaintextPassword` setting in configuration data. This is OK because the credential only contains a label.

In Secrets Manager, ensure that the instance has `GetSecretValue` access in an IAM Managed Policy, and optionally in the Secret Resource Policy if one exists. In order to work with DSC, the secret must be in the following format:

```json
{
    'Username': 'a_name',
    'Password': 'a_password'
}
```

The secret can have other properties (for example, properties used for rotation), but it must at least have the username and password properties.
We recommended that you use a multi-user rotation method, where you have two different usernames and passwords, and the rotation AWS Lambda function flips between them. This method allows you to have multiple active accounts while eliminating the risk of locking out a user during rotation.

Using Tokens in MOF Files

Tokens give you the ability to modify resource property values after the MOF has been compiled. This enables you to reuse common MOF files on multiple servers that require very similar configurations.

Token substitution only works for Resource Properties of type String. However, if your resource has a nested CIM instance property, it will also resolve tokens from String properties in that CIM instance. You can't use token substitution for numerals or arrays.

For example, consider a scenario where you're using the xComputerManagement resource and you want to rename the computer using DSC. Normally you would need a dedicated MOF file for that machine. However, with token support, you can create a single MOF file and apply it to all of your instances. In the ComputerName property, instead of hard coding the computer name into the MOF, you can use an Instance Tag type token. The value is resolved during MOF parsing. For example:

```plaintext
Configuration MyConfig
{
    xComputer Computer
    {
        ComputerName = '{tag:ComputerName}'
    }
}
```

You then set a tag on either the managed instance in the AWS Systems Manager console, or an Amazon EC2 tag in the EC2 console. When you run the document, the script substitutes the {tag:ComputerName} token for the value of the instance tag.

You can also combine multiple tags into a single property, for example:

```plaintext
Configuration MyConfig
{
    File MyFile
    {
        DestinationPath = '{env:TMP}\{tag:ComputerName}'
        Type = 'Directory'
    }
}
```

There are 5 different types of tokens you can use:

- **tag**: Amazon EC2 or managed instance tags
- **tagb64**: This is the same as tag, but the system use base64 to decode the value. This allows you to use special characters in tag values.
- **env**: Resolves Environment variables.
- **ssm**: Systems Manager Parameter Store values. Only String and Secure String types are supported.
- **tagssm**: This is the same as tag, but if the tag is not set on the instance, the system tries to resolve the value from an SSM Parameter with the same name. This is useful in situations when you want a 'default global value' but you want to be able to override it on a single instance (for example, one-box deployments).

Here is Parameter Store example that uses the ssm token type.

```plaintext
File MyFile
{
```
Tokens play an important role in reducing redundant code by making MOF files generic and reusable. If you can avoid server-specific MOF file, then there’s no need for a MOF building service. A MOF building service increases costs, slows provisioning time, and increases the risk of configuration drift between grouped instances due to differing module versions being installed on the build server when their MOFs were compiled.

Prerequisites

Before you create an association that runs MOF files, verify that your managed instances have the following prerequisites installed:

- Windows PowerShell version 5.0 or later. For more information, see Windows PowerShell System Requirements on Microsoft.com.
- AWS Tools for Windows PowerShell version 3.3.261.0 or later.
- SSM Agent version 2.2 or later.

Creating an Association that Runs MOF Files

To create an association that runs MOF files

2. In the navigation pane, choose State Manager, and then choose Create association.
3. In the Name field, specify a name. This is optional, but recommended. A name can help you understand the purpose of the association when you created it. Spaces aren’t allowed in the name.
4. In the Document list, choose AWS-ApplyDSCMofs.
5. In the Parameters section, specify your choices for the required and optional input parameters.

   a. Mofs To Apply: Specify one or more MOF files to run when this association runs. Use commas to separate a list of MOF files. You can specify the following options for locating MOF file.

      - An Amazon S3 bucket name. Bucket names must use lowercase letters. Specify this information by using the following format:

        ```
        s3:bucket_name:MOF_file_name.mof
        ```

        If you want to specify an AWS Region, then use the following format:

        ```
        s3:bucket_region:bucket_name:MOF_file_name.mof
        ```

      - A secure web site. Specify this information by using the following format:

        ```
        https://domain_name/MOF_file_name.mof
        ```

        Here is an example:

        ```
        https://AWS.Amazon.com/TestMOF.mof
        ```

      - A file system on a local share. Specify this information by using the following format:

        ```
        \server_name\shared_folder_name\MOF_file_name.mof
        ```
Here is an example:

```plaintext
\StateManagerAssociationsBox\MOFs_folder\MyMof.mof
```

b. **Service Path**: (Optional) A service path is either an Amazon S3 bucket prefix where you want to write reports and status information. Or, a service path is a path for Parameter Store parameter-based tags. When resolving parameter-based tags, the system uses `{ssm:%servicePath %/parameter_name}` to inject the servicePath value into the parameter name. For example, if your service path is "WebServers/Production" then the system resolves the parameter as: `WebServers/Production/parameter_name`. This is useful when you are running multiple environments in the same account.

c. **Report Bucket Name**: (Optional) Enter the name of an Amazon S3 bucket where you want to write compliance data. Reports are saved in this bucket in JSON format.

   **Note**
   You can prefix the bucket name with a Region where the bucket is located. Here's an example: `us-west-2:MyMOFBucket`. If you are using a proxy for Amazon S3 endpoints in a specific region that does not include `us-east-1`, then you must prefix the bucket name with a region. If the bucket name is not prefixed, it will automatically discover the bucket region using the `us-east-1` endpoint.

d. **Mof Operation Mode**: Choose State Manager behavior when running the `AWS-ApplyDSCMofs` association:
   - **Apply**: Correct instance configurations that aren't compliant.
   - **ReportOnly**: Don't correct instance configurations, but instead log all compliance data and report instances that aren't compliant.

e. **Status Bucket Name**: (Optional) Enter the name of an Amazon S3 bucket where you want to write MOF execution status information. These status reports are singleton summaries of the most recent compliance run of an instance. This means that the report is overwritten the next time the association runs MOF files.

   **Note**
   You can prefix the bucket name with a Region where the bucket is located. Here's an example: `us-west-2:MyMOFBucket`. If you are using a proxy for Amazon S3 endpoints in a specific region that does not include `us-east-1`, then you must prefix the bucket name with a region. If the bucket name is not prefixed, it will automatically discover the bucket region using the `us-east-1` endpoint.

f. **Module Source Bucket Name**: (Optional) Enter the name of an Amazon S3 bucket that contains PowerShell module files. If you specify `None`, then you must choose `True` for the next option, **Allow PS Gallery Module Source**.

   **Note**
   You can prefix the bucket name with a Region where the bucket is located. Here's an example: `us-west-2:MyMOFBucket`. If you are using a proxy for Amazon S3 endpoints in a specific region that does not include `us-east-1`, then you must prefix the bucket name with a region. If the bucket name is not prefixed, it will automatically discover the bucket region using the `us-east-1` endpoint.

g. **Allow PS Gallery Module Source**: (Optional) Choose `True` to download PowerShell modules from [https://www.powershellgallery.com/](https://www.powershellgallery.com/). If you choose `False`, then you must specify a source for the previous option, **ModuleSourceBucketName**.

h. **Proxy Uri**: (Optional) Use this option to download MOF files from a proxy server.

i. **Reboot Behavior**: (Optional) Specify one of the following reboot behaviors if your MOF file execution requires rebooting:
   - **AfterMof**: Reboots the instance after all MOF executions are complete. Even if multiple MOF executions request reboots, the system waits until all MOF executions are complete to reboot.
- **Immediately**: Reboots the instance whenever a MOF execution requests it. If running multiple MOF files that request reboots, then the instance will be rebooted multiple times.

- **Never**: Instances are not rebooted, even if the MOF execution explicitly requests a reboot.

j. **Use Computer Name For Reporting**: (Optional) Enable this option to use the name of the computer when reporting compliance information. The default value is `false`, which means that the system uses the instance ID when reporting compliance information.

k. **Enable Verbose Logging**: (Optional) We recommend that you enable verbose logging when deploying MOF files for the first time.

   **Important**
   When enabled, verbose logging writes more data to your Amazon S3 bucket than standard association execution logging. This can result in slower performance and possibly higher storage charges for Amazon S3. To mitigate storage size issues, we recommend that you enable lifecycle policies on your Amazon S3 bucket. For more information, see [How Do I Create a Lifecycle Policy for an S3 Bucket?](https://docs.aws.amazon.com/AmazonS3/latest/user-guide/lifecycle.html) in the *Amazon Simple Storage Service Console User Guide*.

l. **Enable Debug Logging**: (Optional) We recommend that you enable debug logging if you need to troubleshoot MOF failures. We also recommend that you disable this option for normal use.

   **Important**
   When enabled, debug logging writes more data to your Amazon S3 bucket than standard association execution logging. This can result in slower performance and possibly higher storage charges for Amazon S3. To mitigate storage size issues, we recommend that you enable lifecycle policies on your Amazon S3 bucket. For more information, see [How Do I Create a Lifecycle Policy for an S3 Bucket?](https://docs.aws.amazon.com/AmazonS3/latest/user-guide/lifecycle.html) in the *Amazon Simple Storage Service Console User Guide*.

m. **Compliance Type**: (Optional) Specify the compliance type to use when reporting compliance information. The default compliance type is `Custom:DSC`. If you create multiple associations that run MOF files, then be sure to specify a different compliance type for each association. If you don't, each additional association that uses `Custom:DSC` will overwrite the existing compliance data.

n. **Pre Reboot Script**: (Optional) Specify a script to run if the configuration has indicated that a reboot is necessary. The script runs before the reboot. The script must be a single line. If you need to add additional lines, separate lines by using semicolons.

6. In the **Targets** section, choose either **Specifying tags** or **Manually Selecting Instance**. If you choose to target resources by using tags, then enter a tag key and a tag value in the fields provided. For more information about using targets, see *Using Targets and Rate Controls with State Manager Associations* (p. 654).

7. In the **Specify schedule** section, choose either **On Schedule** or **No schedule**. If you choose **On Schedule**, then use the buttons provided to create a cron or rate schedule for the association.

8. In the **Advanced options** section:

   - **Compliance severity**, choose a severity level for the association. Compliance reporting will indicate whether the association state is compliant or non-compliant, along with the severity level you indicate here. For more information, see *About State Manager Association Compliance* (p. 508).

9. In the **Rate control** section, configure options for running State Manager associations across of fleet of managed instances. For more information about these options, see *Using Targets and Rate Controls with State Manager Associations* (p. 654).

In the **Concurrency** section, choose an option:

- **Choose targets** to enter an absolute number of targets that can run the association simultaneously.
• Choose **percentage** to enter a percentage of the target set that can run the association simultaneously.

In the **Error threshold** section, choose an option:

• Choose **errors** to enter an absolute number of errors allowed before State Manager stops running associations on additional targets.
• Choose **percentage** to enter a percentage of errors allowed before State Manager stops running associations on additional targets.

10. In the **Output options** section, choose **Enable writing output to S3** if you want to write the output of the command to create the associations to an Amazon S3 bucket.

11. Choose **Create Association**.

State Manager creates and immediately runs the association on the specified instances or targets. After the initial execution, the association runs in intervals according to the schedule that you defined and according to the following rules:

• Associations are only run on instances that are online when the interval starts. Offline instances are skipped.
• State Manager attempts to run the association on all configured instances during an interval.
• If an association is not run during an interval (because, for example, a concurrency value limited the number of instances that could process the association at one time), then State Manager attempts to run the association during the next interval.
• State Manager records history for all skipped intervals. You can view the history on the **Execution History** tab.

**Note**
The AWS-ApplyDSCMofs is a Systems Manager command document. This means that you can also run this document by using Run Command. For more information, see **Running Commands Using Systems Manager Run Command** (p. 622).

**Troubleshooting**

This section includes information to help you troubleshoot issues creating associations that run MOF files.

**Enable Enhanced Logging**

As a first step to troubleshooting, enable enhanced logging. More specifically, do the following:

• Verify that the association is configured to write command output to either Amazon S3 or Amazon CloudWatch Logs.
• Set the **Enable Verbose Logging** parameter to True.
• Set the **Enable Debug Logging** parameter to True.

With verbose and debug logging enabled, the **Stdout** output file includes details about the script execution. This output file can help you identify where the script failed. The **Stderr** output file contains errors that occurred during the script execution.

**Common Problems**

This section includes information about common problems that can occur when creating associations that run MOF files and steps to troubleshoot these issues.
**My MOF was not applied**

If State Manager failed to apply the association to your instances, then start by reviewing the `Stderr` output file. This file can help you understand the root cause of the issue. Also, verify the following:

- The instance has the required access permissions to all MOF-related Amazon S3 buckets. Specifically:
  - **s3:GetObject permissions**: This is required for MOF files in private Amazon S3 buckets as well as custom modules in Amazon S3 buckets.
  - **s3:PutObject permission**: This is required to write compliance reports and compliance status to Amazon S3 buckets.
- If you are using tags, then ensure that the instance has the required IAM policy. Using tags requires the instance IAM role to have a policy allowing the `ec2:DescribeInstances` and `ssm:ListTagsForResource` actions.
- Ensure that the instance has the expected tags or SSM parameters assigned.
- Ensure that the tags or SSM parameters aren't misspelled.
- Try applying the MOF locally on the instance to make sure there isn't an issue with the MOF file itself.

**My MOF seemed to fail, but the Systems Manager execution was successful**

If the `AWS-ApplyDSCMofs` document successfully ran, then the Systems Manager execution status shows **Success**. This status does not reflect the compliance status of your instance against the configuration requirements in the MOF file. To view the compliance status of your instances, view the compliance reports. You can view a JSON report in the Amazon S3 Report Bucket. This applies to Run Command and State Manager executions. Also, for State Manager, you can view compliance details on the Systems Manager Compliance page.

**Stderr states: Name resolution failure attempting to reach service**

This error indicates that the script can't reach a remote service. Most likely, the script can't reach Amazon S3. This issue most often occurs when the script attempts to write compliance reports or compliance status to the Amazon S3 bucket supplied in the document parameters. Typically, this error occurs when a computing environment uses a firewall or transparent proxy that includes a whitelist. To resolve this issue:

- Use region-specific bucket syntax for all Amazon S3 bucket parameters. For example, the `Mofs to Apply` parameter should be formatted as follows:
  
  $$s3:bucket-region:bucket-name:mof-file-name.mof.$$  

  Here is an example: `s3:us-west-2:my-bucket:my-mof.mof`

  The Report, Status, and Module Source bucket names should be formatted as follows:

  $$bucket-region:bucket-name.$$  

  Here is an example: `us-west-1:my-bucket`

- If region-specific syntax does not fix the problem, then make sure that the targeted instance(s) can access Amazon S3 in the desired region. To verify this:
  1. Find the endpoint name for Amazon S3 in the desired Region.
  2. Log on to the target instance and run the following ping command:

  ```
  ping s3.s3-region.amazonaws.com
  ```

  If the ping failed, it means that either Amazon S3 is down, or a firewall/transparent proxy is blocking access to the Amazon S3 region, or the instance can't access the internet.
Viewing DSC Resource Compliance Details

Systems Manager captures compliance information about DSC resource failures in the Amazon Simple Storage Service (Amazon S3) Status Bucket you specified when you ran the AWS-ApplyDSCMofs document. Searching for information about DSC resource failures in an Amazon S3 bucket can be time consuming. Instead, you can quickly view this information in the Systems Manager Compliance page.

The Compliance resources summary section displays a count of resources that failed. In the following example, the ComplianceType is Custom:DSC and one resource is non-compliant.

**Note**
Custom:DSC is the default ComplianceType value in the AWS-ApplyDSCMofs document. This value is customizable.

The Details overview for resources section displays information about the AWS resource with the non-compliant DSC resource. This section also includes the MOF name, script execution steps, and (when applicable) a View output link to view detailed status information.

The View output link displays the last 4,000 characters of the detailed status. Systems Manager starts with the exception as the first element, and then scans back through the verbose messages and prepends as many as it can until it reaches the 4000 character limit. This process displays the log messages that were output prior to the exception being thrown, which are the most relevant messages for troubleshooting.
For information about how to view compliance information, see AWS Systems Manager Configuration Compliance (p. 504).

Situations that Affect Compliance Reporting

If the State Manager association fails, then no compliance data is reported. More specifically, if a MOF fails to process, then Systems Manager doesn't report any compliance items because the associations fail. For example, if Systems Manager attempts to download a MOF from an Amazon S3 bucket that the instance doesn't have permission to access, then the association fails and no compliance data is reported.

If a resource in a second MOF fails, then Systems Manager does report compliance data. For example, if a MOF tries to create a file on a drive that doesn't exist, then Systems Manager reports compliance because the AWS-ApplyDSCMofs document is able to process completely, which means the association successfully runs.

Creating Associations that Run Ansible Playbooks

You can create State Manager associations that run Ansible playbooks by using the AWS-ApplyAnsiblePlaybooks document. This document offers the following benefits for running playbooks:

- Support for running complex playbooks
- Support for downloading playbooks from GitHub and Amazon Simple Storage Service (Amazon S3)
- Support for compressed playbook structure
- Enhanced logging
- Ability to specify which playbook to run when playbooks are bundled
**Note**

Systems Manager includes two SSM documents that enable you to create State Manager associations that run Ansible playbooks: `AWS-RunAnsiblePlaybook` and `AWS-ApplyAnsiblePlaybooks`. The `AWS-RunAnsiblePlaybook` document is deprecated. It remains available in Systems Manager for legacy purposes. We recommend that you use the `AWS-ApplyAnsiblePlaybooks` document because of the enhancements described here.

**Support for running complex playbooks**

The `AWS-ApplyAnsiblePlaybooks` document supports bundled, complex playbooks because it copies the entire file structure to a local directory before executing the specified main playbook. You can provide source playbooks in Zip files or in a directory structure. The Zip file or directory can be stored in GitHub or Amazon S3.

**Support for downloading playbooks from GitHub**

The `AWS-ApplyAnsiblePlaybooks` document uses the `aws:downloadContent` plugin to download playbook files. Files can be stored in GitHub in a single file or as a combined set of playbook files. To download content from GitHub, you must specify information about your GitHub repository in JSON format. Here is an example:

```json
{
    "owner": "TestUser",
    "repository": "GitHubTest",
    "path": "scripts/python/test-script",
    "getOptions": "branch:master",
    "tokenInfo": "{"ssm-secure:secure-string-token}""
}
```

**Support for downloading playbooks from Amazon S3**

You can also store and download Ansible playbooks in Amazon S3 as either a single .zip file or a directory structure. To download content from Amazon S3, you must specify the path to the file. Here are two examples:

**Example 1: Download a specific playbook file**

```json
{
    "path": "https://s3.amazonaws.com/aws-execute-ansible-test/ansible/playbook.yml"
}
```

**Example 2: Download the contents of a directory**

```json
{
    "path": "https://s3.amazonaws.com/aws-execute-ansible-test/ansible/webservers/"
}
```

**Important**

If you specify Amazon S3, then the AWS Identity and Access Management (IAM) instance profile on your managed instances must be configured with the `AmazonS3ReadOnlyAccess` policy. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

**Support for compressed playbook structure**

The `AWS-ApplyAnsiblePlaybooks` document enables you to run compressed .zip files in the downloaded bundle. The document checks if the downloaded files contain a compressed file in .zip format. If a .zip is found, the document automatically decompresses the file and then runs the specified Ansible automation.

**Enhanced logging**
The **AWS-ApplyAnsiblePlaybooks** document includes an optional parameter for specifying different levels of logging. Specify `-v` for low verbosity, `-vv` or `-vvv` for medium verbosity, and `-vvvv` for debug level logging. These options directly map to Ansible verbosity options.

### Ability to specify which playbook to run when playbooks are bundled

The **AWS-ApplyAnsiblePlaybooks** document includes a required parameter for specifying which playbook to run when multiple playbooks are bundled. This option provides flexibility for running playbooks to support different use cases.

### Installed Dependencies

If you specify `True` for the **InstallDependencies** parameter, then Systems Manager verifies that the following dependencies are installed on your instances. If one or more of these dependencies are not found, then Systems Manager automatically installs them.

- **Ubuntu/Debian**: Apt-get (Package Management), Python 3, Ansible, Unzip
- **Amazon Linux**: Ansible
- **RHEL**: Python 3, Ansible, Unzip

### Create an Association that Runs Ansible Playbooks (Console)

The following procedure describes how to use the Systems Manager console to create a State Manager association that runs Ansible playbooks by using the **AWS-ApplyAnsiblePlaybooks** document.

#### To create an association that runs Ansible playbooks (Console)

2. In the navigation pane, choose **State Manager**, and then choose **Create association**.
3. For **Name**, specify a name that helps you remember the purpose of the association.
4. In the **Document** list, choose **AWS-ApplyAnsiblePlaybooks**.
5. In the **Parameters** section, for **Source Type**, choose either **GitHub** or **S3**.
6. For **Install Dependencies**, choose an option.
7. (Optional) For **Playbook File**, enter a file name. If the playbook is contained in a Zip file, then you must specify a relative path to the Zip file.
8. (Optional) For **Extra Variables**, enter variables that you want State Manager to send to Ansible at runtime.

9. (Optional) For **Check**, choose an option.

10. (Optional) For **Verbose**, choose an option.

11. For **Targets**, choose an option. For information about using targets, see Use Targets and Rate Controls with State Manager Associations (p. 654).

12. In the **Specify schedule** section, choose either **On schedule** or **No schedule**. If you choose **On schedule**, then use the buttons provided to create a cron or rate schedule for the association.

13. In the **Advanced options** section, for **Compliance severity**, choose a severity level for the association. Compliance reporting indicates whether the association state is compliant or noncompliant, along with the severity level you indicate here. For more information, see About State Manager Association Compliance (p. 508).

14. In the **Rate control** section, configure options to run State Manager associations across a fleet of managed instances. For information about using rate controls, see Use Targets and Rate Controls with State Manager Associations (p. 654).

In the **Concurrency** section, choose an option:

- Choose **targets** to enter an absolute number of targets that can run the association simultaneously.
- Choose **percentage** to enter a percentage of the target set that can run the association simultaneously.

In the **Error threshold** section, choose an option:

- Choose **errors** to enter an absolute number of errors that are allowed before State Manager stops running associations on additional targets.
- Choose **percentage** to enter a percentage of errors that are allowed before State Manager stops running associations on additional targets.

15. In the **Output options** section, choose **Enable writing output to S3** if you want to write the output of the command to create the associations to an Amazon S3 bucket.

16. Choose **Create Association**.

**Note**
If you use tags to create an association on one or more target instances, and then you remove the tags from an instance, that instance no longer runs the association. The instance is disassociated from the State Manager document.

Create an Association that Runs Ansible Playbooks (CLI)

The following procedure describes how to use the AWS CLI to create a State Manager association that runs Ansible playbooks by using the AWS-ApplyAnsiblePlaybooks document.

**To create an association that runs Ansible playbooks (CLI)**

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).

2. Run one of the following commands to create an association that runs Ansible playbooks by targeting instances using Amazon EC2 tags. Command (A) specifies GitHub as the source type. Command (B) specifies Amazon S3 as the source type.

   **(A) GitHub source**
**Linux**

```bash
aws ssm create-association --name "AWS-ApplyAnsiblePlaybooks" \
--targets Key=tag:TagKey,Values=TagValue \
--parameters '{"SourceType": ["GitHub"], "SourceInfo": \
{"owner": "owner_name", "repository": "name"}, \n"getOptions": ["branch:master"]}, "InstallDependencies": \
["True_or_False"], "PlaybookFile": ["file_name.yml"], "ExtraVariables": ["key/ 
value_pairs_separated_by_a_space"], "Check": ["True_or_False"], "Verbose": ["-v, -vv, 
vvv, or -vvvv"]}' \
--association-name "name" --schedule-expression "cron_or_rate_expression"
```

**Windows**

```bash
aws ssm create-association --name "AWS-ApplyAnsiblePlaybooks" ^ 
--targets Key=tag:TagKey,Values=TagValue ^ 
--parameters '{"SourceType": ["GitHub"], "SourceInfo": \
{"owner": "owner_name", "repository": "name"}, \n"getOptions": ["branch:master"]}, "InstallDependencies": \
["True_or_False"], "PlaybookFile": ["file_name.yml"], "ExtraVariables": ["key/ 
value_pairs_separated_by_a_space"], "Check": ["True_or_False"], "Verbose": ["-v, -vv, 
vvv, or -vvvv"]}' ^ 
--association-name "name" --schedule-expression "cron_or_rate_expression"
```

Here is an example:

```bash
aws ssm create-association --name "AWS-ApplyAnsiblePlaybooks" \
--targets Key=tag:OS,Values=Linux \
--parameters '{"SourceType": ["GitHub"], "SourceInfo": ["{"owner": "ansibleDocumentTest","repository": "Ansible","getOptions": ["branch:master"]}], "InstallDependencies": ["True"], "PlaybookFile": ["hello-world-playbook.yml"], "ExtraVariables": ["SSM=True"], "Check": ["False"], "Verbose": ["-v"]}' \
--association-name "AnsibleAssociation" --schedule-expression "cron(0 2 ? * SUN *)"
```

**(B) S3 source**

**Linux**

```bash
aws ssm create-association --name "AWS-ApplyAnsiblePlaybooks" \
--targets Key=tag:TagKey,Values=TagValue \
--parameters '{"SourceType": ["S3"], "SourceInfo": ["{"path": "https://s3.amazonaws.com/path_to_S3_bucket_or_folder_or_playbook_to_download"}"]}, "InstallDependencies": ["True_or_False"], "PlaybookFile": ["file_name.yml"], "ExtraVariables": ["key/value_pairs_separated_by_a_space"], "Check": ["True_or_False"], "Verbose": ["-v, -vv, -vvv, or -vvvv"]}' \
--association-name "name" --schedule-expression "cron_or_rate_expression"
```

**Windows**

```bash
aws ssm create-association --name "AWS-ApplyAnsiblePlaybooks" ^ 
--targets Key=tag:TagKey,Values=TagValue ^ 
--parameters '{"SourceType": ["S3"], "SourceInfo": ["{"path": "https://s3.amazonaws.com/path_to_S3_bucket_or_folder_or_playbook_to_download"}"]}, "InstallDependencies": ["True_or_False"], "PlaybookFile": ["file_name.yml"], "ExtraVariables": ["key/value_pairs_separated_by_a_space"], "Check": ["True_or_False"], "Verbose": ["-v, -vv, -vvv, or -vvvv"]}' ^
```
Here is an example:

```bash
aws ssm create-association --name "AWS-ApplyAnsiblePlaybooks" \
--targets "Key=tag:OS,Values=Windows" \
--parameters '{"SourceType": ["S3"], "SourceInfo": ["{\"path\": \"https://s3.amazonaws.com/myTestBucket/playbook.yml\"}", "InstallDependencies": ["True"], "PlaybookFile": ["playbook.yml"], "ExtraVariables": ["SSM=True"], "Check": ["False"], "Verbose": ["-v"]}' \
--association-name "AnsibleAssociation" --schedule-expression "cron(0 2 ? * SUN *)"
```

**Note**
State Manager associations do not support all cron and rate expressions. For more information about creating cron and rate expressions for associations, see Reference: Cron and Rate Expressions for Systems Manager (p. 936).

The system attempts to create the association on the instances and immediately apply the state.

3. Run the following command to view an updated status of the association you just created.

```bash
aws ssm describe-association --association-id "ID"
```

### Automatically Update SSM Agent (CLI)

The following procedure walks you through the process of creating a State Manager association using the AWS Command Line Interface (AWS CLI). The association automatically updates the SSM Agent according to a schedule that you specify. For more information about the SSM Agent, see Working with SSM Agent (p. 64).

**Note**
To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

**Before You Begin**

Before you complete the following procedure, verify that you have at least one running Amazon EC2 instance (Linux or Windows) that is configured for Systems Manager. For more information, see Systems Manager Prerequisites (p. 12).

**Note**
If you create an association by using either the AWS CLI or AWS Tools for Windows PowerShell, use the --Targets parameter to target instances, as shown in the following example. Don't use the --InstanceID parameter. The --InstanceID parameter is a legacy parameter.

**To create an association for automatically updating SSM Agent**

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to create an association by targeting instances using Amazon EC2 tags. The Schedule parameter sets a schedule to run the association every Sunday morning at 2:00 a.m. (UTC).

```bash
aws ssm create-association --targets Key=tag:TagKey,Values=TagValue --name AWS-UpdateSSMAgent --schedule-expression "cron(0 2 ? * SUN *)"
```
Note
State Manager associations do not support all cron and rate expressions. For more information about creating cron and rate expressions for associations, see Reference: Cron and Rate Expressions for Systems Manager (p. 936).

If you want, you can also target multiple instances by specifying instances IDs in a comma-separated list.

```bash
aws ssm create-association --targets
  Key=instanceids,Values=InstanceID,InstanceID,InstanceID
  --name your document name
  --schedule-expression "cron(0 2 ? * SUN *)"
```

The system returns information like the following.

```
{
  "AssociationDescription": {
    "ScheduleExpression": "cron(0 2 ? * SUN *)",
    "Name": "AWS-UpdateSSMAgent",
    "Overview": {
      "Status": "Pending",
      "DetailedStatus": "Creating"
    },
    "AssociationId": "123..............",
    "DocumentVersion": "$DEFAULT",
    "LastUpdateAssociationDate": 1504034257.98,
    "Date": 1504034257.98,
    "AssociationVersion": "1",
    "Targets": [
      {
        "Values": [
          "TagValue"
        ],
        "Key": "tag:TagKey"
      }
    ]
  }
}
```

The system attempts to create the association on the instance(s) and immediately apply the state. The association status shows Pending.

3. Run the following command to view an updated status of the association you just created.

```bash
aws ssm list-associations
```

Note
If your instances are currently running the most recent version of the SSM Agent, the status shows Failed. This is expected behavior. When a new version of SSM Agent is published, the association automatically installs the new agent, and the status shows Success.

Walkthrough: Automatically Update PV Drivers on EC2 Windows Instances (Console)

Amazon Windows AMIs contain a set of drivers to permit access to virtualized hardware. These drivers are used by Amazon EC2 to map instance store and Amazon EBS volumes to their devices. We recommend that you install the latest drivers to improve stability and performance of your EC2 Windows instances. For more information about PV drivers, see AWS PV Drivers.
The following walkthrough shows you how to configure a State Manager association to automatically download and install new AWS PV drivers when the drivers become available.

**Before You Begin**

Before you complete the following procedure, verify that you have at least one Amazon EC2 Windows instance running that is configured for Systems Manager. For more information, see Systems Manager Prerequisites (p. 12).

**To create a State Manager association that automatically updates PV drivers**

1. Open the Amazon EC2 console, expand Systems Manager Services in the navigation pane, and then choose State Manager.
2. Choose Create Association.
3. In the Association Name field, type a descriptive name.
4. In the Select Document list, choose AWS-ConfigureAWSPackage.
5. In the Select Targets by section, choose an option.
   
   **Note**
   
   If you choose to target instances by using tags, and you specify tags that map to Linux instances, the association succeeds on the Windows instance, but fails on the Linux instances. The overall status of the association shows Failed.

6. In the Schedule section, choose an option. Updated PV drivers are only released a few times a year, so you can schedule the association to run once a month, if you want.
7. In the Parameters section, choose Install from the Action list.
8. For Name list, enter AWSPVDriver. You can leave the Version field empty.
9. In the Advanced section, choose Write to S3 if you want to write association details to an Amazon S3 bucket.
10. Disregard the S3Region field. This field is deprecated. Specify the name of your bucket in the S3Bucket Name field. If want to write output to a sub-folder, specify the sub-folder name in the S3Key Prefix field.
11. Choose Create Association, and then choose Close. The system attempts to create the association on the instance(s) and immediately apply the state. The association status shows Pending.
12. In the right corner of the Association page, choose the refresh button. If you created the association on one or more EC2 Windows instances, the status changes to Success. If your instances are not properly configured for Systems Manager, or if you inadvertently targeted Linux instances, the status shows Failed.
13. If the status is Failed, choose the Instances tab and verify that the association was successfully created on your EC2 Windows instances. If Windows instances show a status of Failed, verify that SSM Agent is running on the instance, and verify that the instance is configured with an IAM role for Systems Manager. For more information, see Systems Manager Prerequisites (p. 12).

**AWS Systems Manager Patch Manager**

AWS Systems Manager Patch Manager automates the process of patching managed instances with both security related and other types of updates. You can use Patch Manager to apply patches for both operating systems and applications. (On Windows Server, application support is limited to updates for Microsoft applications.) You can patch fleets of Amazon EC2 instances or your on-premises servers and virtual machines (VMs) by operating system type. This includes supported versions of Windows Server, Ubuntu Server, Red Hat Enterprise Linux (RHEL), SUSE Linux Enterprise Server (SLES), CentOS, Amazon Linux, and Amazon Linux 2. You can scan instances to see only a report of missing patches, or you can scan and automatically install all missing patches.
Important
AWS does not test patches for Windows or Linux before making them available in Patch Manager.

Patch Manager uses patch baselines, which include rules for auto-approving patches within days of their release, as well as a list of approved and rejected patches. You can install patches on a regular basis by scheduling patching to run as a Systems Manager maintenance window task. You can also install patches individually or to large groups of instances by using Amazon EC2 tags. (Tags are keys that help identify and sort your resources within your organization.) You can add tags to your patch baselines themselves when you create or update them.

Patch Manager integrates with AWS Identity and Access Management (IAM), AWS CloudTrail, and Amazon CloudWatch Events to provide a secure patching experience that includes event notifications and the ability to audit usage.

For information about using CloudTrail to monitor Systems Manager actions, see Logging AWS Systems Manager API Calls with AWS CloudTrail (p. 892).

For information about using CloudWatch Events to monitor Systems Manager events, see Monitoring Systems Manager Events with Amazon CloudWatch Events (p. 894).

Getting Started with Patch Manager
To get started with Patch Manager, complete the tasks described in the following table.

<table>
<thead>
<tr>
<th>Task</th>
<th>For More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify Systems Manager prerequisites</td>
<td>Systems Manager Prerequisites (p. 12)</td>
</tr>
<tr>
<td>Learn how to set up and configure patching</td>
<td>Working with Patch Manager (Console) (p. 723)</td>
</tr>
<tr>
<td>Configure permissions for Maintenance Windows (Required if you intend to use this feature when patching.)</td>
<td>Controlling Access to Maintenance Windows (p. 445)</td>
</tr>
<tr>
<td>Create patch baselines, patch groups, and a maintenance window to run patching in a test environment</td>
<td>Working with Patch Manager (Console) (p. 723)</td>
</tr>
</tbody>
</table>

Topics
- Patch Manager Prerequisites (p. 687)
- How Patch Manager Operations Work (p. 688)
- About Patching Operations (p. 702)
- About Patch Baselines (p. 712)
- Working with Patch Manager (Console) (p. 723)
- Tutorial: Patch a Server Environment (AWS CLI) (p. 735)
- AWS CLI Commands for Patch Manager (p. 740)

Patch Manager Prerequisites
SSM Agent Version
Version 2.0.834.0 or later of SSM Agent be running on the instances you want to manage with Patch Manager.
Note
An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

Supported Operating Systems
The Patch Manager capability does not support all the same operating systems versions that are supported by other AWS Systems Manager capabilities. For example, Patch Manager does not support CentOS 6.3, Raspbian Stretch, or Windows Server 2003. (For the full list of Systems Manager-supported operating systems, see Systems Manager Prerequisites (p. 12).) Therefore, ensure that the instances you want to use with Patch Manager are running one of the operating systems listed in the following table.

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Details</th>
</tr>
</thead>
</table>
| Linux            | • Amazon Linux 2012.03 - 2018.03  
                  | • Amazon Linux 2 2 - 2.0    
                  | • CentOS 6.5 - 7.6    
                  | • Red Hat Enterprise Linux (RHEL) 6.5 - 7.6  
                  | • SUSE Linux Enterprise Server (SLES) 12.0 and later 12.x versions  
                  | • Ubuntu Server 14.04 LTS, 16.04 LTS, and 18.04 LTS  |

Note
Instances created from an Amazon Linux AMI that are using a proxy must be running a current version of the Python requests module in order to support Patch Manager operations. For more information, see Upgrade the Python Requests Module on Amazon Linux Instances That Use a Proxy Server (p. 84).

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Details</th>
</tr>
</thead>
</table>

How Patch Manager Operations Work
This section provides technical details that explain how Patch Manager determines which patches to install and how it installs them on each supported operating system. For Linux operating systems, it also provides information about specifying a source repository, in a custom patch baseline, for patches other than the default configured on an instance. This section also provides details about how patch baseline rules work on different distributions of the Linux operating system.

Topics
- How Security Patches Are Selected (p. 689)
- How to Specify an Alternative Patch Source Repository (Linux) (p. 691)
- How Patches Are Installed (p. 693)
- How Patch Baseline Rules Work on Linux-Based Systems (p. 696)
How Security Patches Are Selected

The primary focus of Patch Manager is on installing operating systems security-related updates on instances. By default, Patch Manager doesn't install all available patches, but rather a smaller set of patches focused on security.

**Note**
On all Linux-based systems supported by Patch Manager, you can choose a different source repository configured for the instance, typically to install nonsecurity updates. For information, see How to Specify an Alternative Patch Source Repository (Linux) (p. 691).

The remainder of this section explains how Patch Manager selects security patches for the different supported operating systems.

**Windows**

On Microsoft Windows operating systems, Patch Manager retrieves a list of available updates that Microsoft publishes through its update services, such as Microsoft Update and Windows Server Update Services (WSUS). Patch Manager continuously monitors for new updates in every AWS Region. The list of available updates is refreshed in each Region at least once per day. When the patch information from Microsoft is processed, Patch Manager removes updates that have been replaced by later updates from its patch list. Therefore, only the most recent update is displayed and made available for installation. For example, if KB4012214 replaces KB3135456, only KB4012214 is made available as an update in Patch Manager.

**Note**
Patch Manager only makes available patches for Windows Server operating system versions that are supported for Patch Manager. For example, Patch Manager can't be used to patch Windows Server 2003 or Windows RT.

**Amazon Linux and Amazon Linux 2**

On Amazon Linux and Amazon Linux 2, the Systems Manager patch baseline service uses preconfigured repositories on the instance. There are usually two preconfigured repositories (repos) on an instance:

- **Repo ID**: amzn-main/latest
- **Repo name**: amzn-main-Base
- **Repo ID**: amzn-updates/latest
- **Repo name**: amzn-updates-Base

**Note**
All updates are downloaded from the remote repos configured on the instance. Therefore, the instance must be able to connect to the repos so the patching can be performed.

Amazon Linux and Amazon Linux 2 instances use Yum as the package manager, and Yum uses the concept of an update notice as a file named `updateinfo.xml`. An update notice is simply a collection of packages that fix specific problems. All packages that are in an update notice are considered Security by Patch Manager. Individual packages are not assigned classifications or severity levels. For this reason, Patch Manager assigns the attributes of an update notice to the related packages.

**Note**
If you select the Approved patches include non-security updates check box in the Create patch baseline page, then packages that are not classified in an `updateinfo.xml` file (or...
a package that contains a file without properly formatted Classification, Severity, and Date values) can be included in the prefiltered list of patches. However, in order for a patch to be applied, the patch must still meet the user-specified patch baseline rules.

RHEL

On Red Hat Enterprise Linux, the Systems Manager patch baseline service uses preconfigured repositories (repos) on the instance. There are usually three preconfigured repos on an instance:

- **Repo ID:** rhui-REGION-client-config-server-7/x86_64
  **Repo name:** Red Hat Update Infrastructure 2.0 Client Configuration Server 7
- **Repo ID:** rhui-REGION-rhel-server-releases/7Server/x86_64
  **Repo name:** Red Hat Enterprise Linux Server 7 (RPMs)
- **Repo ID:** rhui-REGION-rhel-server-rh-common/7Server/x86_64
  **Repo name:** Red Hat Enterprise Linux Server 7 RH Common (RPMs)

**Note**

All updates are downloaded from the remote repos configured on the instance. Therefore, the instance must be able to connect to the repos so the patching can be performed.

Red Hat Enterprise Linux instances use Yum as the package manager, and Yum uses the concept of an update notice as a file named `updateinfo.xml`. An update notice is simply a collection of packages that fix specific problems. All packages that are in an update notice are considered Security by Patch Manager. Individual packages are not assigned classifications or severity levels. For this reason, Patch Manager assigns the attributes of an update notice to the related packages.

**Note**

If you select the Approved patches include non-security updates check box in the Create patch baseline page, then packages that are not classified in an `updateinfo.xml` file (or a package that contains a file without properly formatted Classification, Severity, and Date values) can be included in the prefiltered list of patches. However, in order for a patch to be applied, the patch must still meet the user-specified patch baseline rules.

Ubuntu

On Ubuntu Server, the Systems Manager patch baseline service uses preconfigured repositories (repos) on the instance. These preconfigured repos are used to pull an updated list of available package upgrades. For this, Systems Manager performs the equivalent of a `sudo apt-get update` command.

Packages are then filtered from `codename-security` repos, where the codename is something like `trusty` or `xenial`. For example, on Ubuntu Server 14, Patch Manager only identifies upgrades that are part of `trusty-security`. On Ubuntu Server 16, only upgrades that are part of `xenial-security` are identified.

SLES

On SUSE Linux Enterprise Server (SLES) instances, the ZYPP library gets the list of available patches (a collection of packages) from the following locations:

- List of repositories: `/etc/zypp/repos.d/*`
- Package information: `/var/cache/zypp/raw/*`

SLES instances use Zypper as the package manager, and Zypper uses the concept of a patch. A patch is simply a collection of packages that fix a specific problem. Patch Manager handles all packages
referenced in a patch as security-related. Because individual packages aren’t given classifications or severity, Patch Manager assigns the packages the attributes of the patch that they belong to.

CentOS

On CentOS, the Systems Manager patch baseline service uses preconfigured repositories (repos) on the instance. Here are some examples from a CentOS 6.9 Amazon Machine Image (AMI):

- **Repo ID**: ultra-centos-6.9-base  
  **Repo name**: UltraServe CentOS-6.9 - Base
- **Repo ID**: ultra-centos-6.9-extras  
  **Repo name**: UltraServe CentOS-6.9 - Extras
- **Repo ID**: ultra-centos-6.9-updates  
  **Repo name**: UltraServe CentOS-6.9 - Updates
- **Repo ID**: ultra-centos-6.x-glusterfs  
  **Repo name**: UltraServe CentOS-6.x - GlusterFS
- **Repo ID**: ultra-centos-6.x-ultrarepo  
  **Repo name**: UltraServe CentOS-6.x – UltraServe Repo Packages

**Note**

All updates are downloaded from the remote repos configured on the instance. Therefore, the instance must be able to connect to the repos so the patching can be performed.

CentOS instances use Yum as the package manager, and Yum uses the concept of an update notice. An update notice is simply a collection of packages that fix specific problems. All packages that are in an update notice are considered Security packages by Patch Manager.

However, CentOS default repos aren’t configured with an update notice. This means that Patch Manager does not detect packages on a default CentOS repo. To enable Patch Manager to process packages that aren’t contained in an update notice, you must enable the `EnableNonSecurity` flag in the patch baseline rules.

**Note**

CentOS update notices are supported. Repos with update notices can be downloaded after launch.

**How to Specify an Alternative Patch Source Repository (Linux)**

When you use the default repositories configured on an instance for patching operations, Patch Manager scans for or installs security-related patches. This is the default behavior for Patch Manager. For complete information on how Patch Manager selects and installs security patches, see How Security Patches Are Selected (p. 689).

On Linux systems, however, you can also use Patch Manager to install patches that are not related to security, or that are in a different source repository than the default one configured on the instance. You can specify alternative patch source repositories when you create a custom patch baseline. In each custom patch baseline, you can specify patch source configurations for up to 20 versions of a supported Linux operating system.

For example, suppose that your Ubuntu Server fleet includes both Ubuntu Server 14.04 and Ubuntu Server 16.04 instances. In this case, you can specify alternate repositories for each version in the same
custom patch baseline. For each version, you provide a name, specify the operating system version type (product), and provide a repository configuration. You can also specify a single alternative source repository that applies to all versions of a supported operating system.

For a list of example scenarios for using this option, see Sample Uses for Alternative Patch Source Repositories (p. 693) later in this topic.

For information about default and custom patch baselines, see About Predefined and Custom Patch Baselines (p. 712).

Note
Running a custom patch baseline that specifies alternative patch repositories on an instance doesn’t change the default repository configured for the instance.

Using the Console

To specify alternative patch source repositories when you are working in the AWS Systems Manager console, use the Patch sources section on the Create patch baseline page. For information about using the Patch sources options, see Create a Custom Patch Baseline (p. 724).

Using Other Tools to Create Patch Baselines

Use the sources option with other tools when you create a patch baseline.

- AWS CLI: create-patch-baseline
- Systems Manager API: API_CreatePatchBaseline
- Systems Manager AWS Tools for Windows PowerShell: New-SSMPatchBaseline

For an example of using the --sources option with the CLI, see Create a patch baseline with custom repositories for different OS versions (p. 741).

Topics
- Important Considerations for Alternative Repositories (p. 692)
- Sample Uses for Alternative Patch Source Repositories (p. 693)

Important Considerations for Alternative Repositories

Keep in mind the following points as you plan your patching strategy using alternative patch repositories.

Only specified repositories are used for patching

Specifying alternative repositories doesn’t mean specifying additional repositories. You can choose to specify repositories other than those configured as defaults on an instance. However, you must also specify the default repositories as part of the alternative patch source configuration if you want their updates to be applied.

For example, on Amazon Linux 2 instances, the default repositories are amzn-main and amzn-update. If you want to include the Extra Packages for Enterprise Linux (EPEL) repository in your patching operations, you must specify all three repositories as alternative repositories.

Note
Running a custom patch baseline that specifies alternative patch repositories on an instance doesn’t change the default repository configured for the instance.

Patching behavior for YUM-based distributions depends on the updateinfo.xml manifest
When you specify alternative patch repositories for YUM-based distributions, such as Amazon Linux or Amazon Linux 2, Red Hat Enterprise Linux, or CentOS, patching behavior depends on whether the repository includes an update manifest in the form of a complete and correctly formatted `updateinfo.xml` file. This file specifies the release date, classifications, and severities of the various packages. Any of the following will affect the patching behavior:

- If you filter on **Classification** and **Severity**, but they aren't specified in `updateinfo.xml`, the package will not be included by the filter. This also means that packages without an `updateinfo.xml` file won't be included in patching.
- If you filter on **ApprovalAfterDays**, but the package release date isn't in Unix Epoch format (or has no release date specified), the package will not be included by the filter.
- There is an exception if you select the **Approved patches include non-security updates** check box in the **Create patch baseline** page. In this case, packages without an `updateinfo.xml` file (or that contains this file without properly formatted **Classification**, **Severity**, and **Date** values) will be included in the prefiltered list of patches. (They must still meet the other patch baseline rule requirements in order to be installed.)

**Sample Uses for Alternative Patch Source Repositories**

**Example 1 – Nonsecurity Updates for Ubuntu Server**

You are already using Patch Manager to install security patches on a fleet of Ubuntu Server instances using the AWS-provided predefined patch baseline **AWS-UbuntuDefaultPatchBaseline**. You can create a new patch baseline that is based on this default, but specify in the approval rules that you want nonsecurity related updates that are part of the default distribution to be installed as well. When this patch baseline is run against your instances, patches for both security and nonsecurity issues are applied. You can also choose to approve nonsecurity patches in the patch exceptions you specify for a baseline.

**Example 2 - Personal Package Archives (PPA) for Ubuntu Server**

Your Ubuntu Server instances are running software that is distributed through a Personal Package Archives (PPA) for Ubuntu. In this case, you create a patch baseline that specifies a PPA repository that you have configured on the instance as the source repository for the patching operation. Then use Run Command to run the patch baseline document on the instances.

**Example 3 – Internal Corporate Applications on Amazon Linux**

You need to run some applications needed for industry regulatory compliance on your Amazon Linux instances. You can configure a repository for these applications on the instances, use YUM to initially install the applications, and then update or create a new patch baseline to include this new corporate repository. After this you can use Run Command to run the **AWS-RunPatchBaseline** document with the `Scan` option to see if the corporate package is listed among the installed packages and is up to date on the instance. If it isn't up to date, you can run the document again using the `Install` option to update the applications.

**How Patches Are Installed**

Patch Manager uses the appropriate built-in mechanism for an operating system type to install updates on an instance. For example, on Windows, the Windows Update API is used, and on Amazon Linux the `yum` package manager is used.

The remainder of this section explains how Patch Manager installs patches on an operating system.

**Windows**

 When a patching operation is performed on a Windows instance, the instance requests a snapshot of the appropriate patch baseline from Systems Manager. This snapshot contains the list of all updates.
available in the patch baseline that have been approved for deployment. This list of updates is sent to the Windows Update API, which determines which of the updates are applicable to the instance and installs them as needed. If any updates are installed, the instance is rebooted afterwards, as many times as necessary to complete all necessary patching. The summary of the patching operation can be found in the output of the Run Command request. Additional logs can be found on the instance in the %PROGRAMDATA%\Amazon\PatchBaselineOperations\Logs folder.

Because the Windows Update API is used to download and install patches, all Group Policy settings for Windows Update are respected. No Group Policy settings are required to use Patch Manager, but any settings that you have defined will be applied, such as to direct instances to a Windows Server Update Services (WSUS) server.

**Note**

By default, Windows downloads all patches from Microsoft’s Windows Update site because Patch Manager uses the Windows Update API to drive the download and installation of patches. As a result, the instance must be able to reach the Microsoft Windows Update site or patching will fail. Alternatively, you can configure a WSUS server to serve as a patch repository and configure your instances to target that WSUS server instead using Group Policies.

Amazon Linux and Amazon Linux 2

On Amazon Linux and Amazon Linux 2 instances, the patch installation workflow is as follows:

1. Apply **GlobalFilters** as specified in the patch baseline, keeping only the qualified packages for further processing.
2. Apply **ApprovalRules** as specified in the patch baseline. Each approval rule can define a package as approved.
3. Apply **ApprovedPatches** as specified in the patch baseline. The approved patches are approved for update even if they are discarded by **GlobalFilters** or if no approval rule specified in **ApprovalRules** grants it approval.
4. Apply **RejectedPatches** as specified in the patch baseline. The rejected patches are removed from the list of approved patches and will not be applied.
5. If multiple versions of a patch are approved, the latest version is applied.
6. The YUM update API is applied to approved patches as follows:
   - For predefined default patch baselines provided by AWS, and for custom patch baselines where the Approved patches include non-security updates check box is not selected, only patches specified in updateinfo.xml are applied (security updates only).
   - The equivalent yum command for this workflow is:

     ```
     sudo yum update-minimal --sec-severity=critical,important --bugfix
     ```
   - For custom patch baselines where the Approved patches include non-security updates is selected, both patches in updateinfo.xml and those not in updateinfo.xml are applied (security and nonsecurity updates).
   - The equivalent yum command for this workflow is:

     ```
     sudo yum update --security --bugfix
     ```
7. The instance is rebooted if any updates were installed.

**RHEL**

On Red Hat Enterprise Linux instances, the patch installation workflow is as follows:
1. Apply GlobalFilters as specified in the patch baseline, keeping only the qualified packages for further processing.

2. Apply ApprovalRules as specified in the patch baseline. Each approval rule can define a package as approved.

3. Apply ApprovedPatches as specified in the patch baseline. The approved patches are approved for update even if they are discarded by GlobalFilters or if no approval rule specified in ApprovalRules grants it approval.

4. Apply RejectedPatches as specified in the patch baseline. The rejected patches are removed from the list of approved patches and will not be applied.

5. If multiple versions of a patch are approved, the latest version is applied.

6. The YUM update API is applied to approved patches as follows:
   - For predefined default patch baselines provided by AWS, and for custom patch baselines where the Approved patches include non-security updates check box is not selected, only patches specified in updateinfo.xml are applied (security updates only).

   The equivalent yum command for this workflow is:
   
   ```
sudo yum update-minimal --sec-severity=critical,important --bugfix
   ```

   - For custom patch baselines where the Approved patches include non-security updates is selected, both patches in updateinfo.xml and those not in updateinfo.xml are applied (security and nonsecurity updates).

   The equivalent yum command for this workflow is:
   
   ```
sudo yum update --security --bugfix
   ```

7. The instance is rebooted if any updates were installed.

Ubuntu

On Ubuntu Server instances, the patch installation workflow is as follows:

1. Apply GlobalFilters as specified in the patch baseline, keeping only the qualified packages for further processing.

2. Apply ApprovalRules as specified in the patch baseline. Each approval rule can define a package as approved. In addition, an implicit rule is applied in order to select only packages with upgrades in security repos. For each package, the candidate version of the package (which is typically the latest version) must be part of a security repo.

3. Apply ApprovedPatches as specified in the patch baseline. The approved patches are approved for update even if they are discarded by GlobalFilters or if no approval rule specified in ApprovalRules grants it approval.

4. Apply RejectedPatches as specified in the patch baseline. The rejected patches are removed from the list of approved patches and will not be applied.

5. The APT library is used to upgrade packages.

6. The instance is rebooted if any updates were installed.

SLES

On SUSE Linux Enterprise Server (SLES) instances, the patch installation workflow is as follows:

1. Apply GlobalFilters as specified in the patch baseline, keeping only the qualified packages for further processing.
2. Apply `ApprovalRules` as specified in the patch baseline. Each approval rule can define a package as approved.

3. Apply `ApprovedPatches` as specified in the patch baseline. The approved patches are approved for update even if they are discarded by `GlobalFilters` or if no approval rule specified in `ApprovalRules` grants it approval.

4. Apply `RejectedPatches` as specified in the patch baseline. The rejected patches are removed from the list of approved patches and won't be applied.

5. If multiple versions of a patch are approved, the latest version is applied.

6. The Zypper update API is applied to approved patches.

7. The instance is rebooted if any updates were installed.

**CentOS**

On CentOS instances, the patch installation workflow is as follows:

1. Apply `GlobalFilters` as specified in the patch baseline, keeping only the qualified packages for further processing.

2. Apply `ApprovalRules` as specified in the patch baseline. Each approval rule can define a package as approved.

3. Apply `ApprovedPatches` as specified in the patch baseline. The approved patches are approved for update even if they are discarded by `GlobalFilters` or if no approval rule specified in `ApprovalRules` grants it approval.

4. Apply `RejectedPatches` as specified in the patch baseline. The rejected patches are removed from the list of approved patches and will not be applied.

5. If multiple versions of a patch are approved, the latest version is applied.

6. The YUM update API is applied to approved patches.

7. The instance is rebooted if any updates were installed.

**How Patch Baseline Rules Work on Linux-Based Systems**

The rules in a patch baseline for Linux distributions operate differently based on the distribution type. Unlike patch updates on Windows instances, rules are evaluated on each instance to take the configured repos on the instance into consideration. Patch Manager uses the native package manager to drive the installation of patches approved by the patch baseline.

**Topics**

- How Patch Baseline Rules Work on Amazon Linux and Amazon Linux 2 (p. 696)
- How Patch Baseline Rules Work on RHEL (p. 698)
- How Patch Baseline Rules Work on Ubuntu Server (p. 700)
- How Patch Baseline Rules Work on SUSE Linux Enterprise Server (p. 700)

**How Patch Baseline Rules Work on Amazon Linux and Amazon Linux 2**

On Amazon Linux and Amazon Linux 2, the patch selection process is as follows:

1. On the instance, the YUM library accesses the `updateinfo.xml` file for each configured repo.

   **Note**
   If no `updateinfo.xml` file is found, no patch will be applied.

2. Each update notice in `updateinfo.xml` includes several attributes that denote the properties of the packages in the notice, as described in the following table.
### Update Notice Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>Corresponds to the value of the Classification key attribute in the patch baseline's <code>PatchFilter</code> data type. Denotes the type of package included in the update notice. You can view the list of supported values by using the AWS CLI command <code>describe-patch-properties</code> or the API action <code>DescribePatchProperties</code>. You can also view the list in the Approval rules area of the Create patch baseline page or Edit patch baseline page in the Systems Manager console.</td>
</tr>
<tr>
<td>severity</td>
<td>Corresponds to the value of the Severity key attribute patch baseline's <code>PatchFilter</code> data type. Denotes the severity of the packages included in the update notice. Usually only applicable for Security update notices. You can view the list of supported values by using the AWS CLI command <code>describe-patch-properties</code> or the API action <code>DescribePatchProperties</code>. You can also view the list in the Approval rules area of the Create patch baseline page or Edit patch baseline page in the Systems Manager console.</td>
</tr>
<tr>
<td>update_id</td>
<td>Denotes the advisory ID, such as <code>ALAS-2017-867</code>. The advisory ID can be used in the ApprovedPatches or RejectedPatches attribute in the patch baseline.</td>
</tr>
<tr>
<td>references</td>
<td>Contains additional information about the update notice, such as a CVE ID (format: <code>CVE-2017-1234567</code>). The CVE ID can be used in the ApprovedPatches or RejectedPatches attribute in the patch baseline.</td>
</tr>
<tr>
<td>updated</td>
<td>Corresponds to ApproveAfterDays in the patch baseline. Denotes the released date (updated date) of the packages included in the update notice. A comparison between the current timestamp and the value of this attribute plus the ApproveAfterDays is used to determine if the patch is approved for deployment.</td>
</tr>
</tbody>
</table>

**Note**
For information about accepted formats for lists of approved patches and rejected patches, see About Package Name Formats for Approved and Rejected Patch Lists (p. 715).

3. The product of the instance is determined by SSM Agent. This attribute corresponds to the value of the Product key attribute in the patch baseline’s `PatchFilter` data type.

4. Packages are selected for the update according to the follow guidelines:
Security option | Patch selection
--- | ---
Pre-defined default patch baselines provided by AWS and custom patch baselines where the Approved patches include non-security updates is not selected | For each update notice in updateinfo.xml, the patch baseline is used as a filter, allowing only the qualified packages to be included in the update. If multiple packages are applicable after applying the patch baseline definition, the latest version is used.

The equivalent yum command for this workflow is:

```
sudo yum update-minimal --sec-severity=critical,important --bugfix
```

Custom patch baselines where the Approved patches include non-security updates is selected | In addition to applying the security updates that have been selected from updateinfo.xml, Patch Manager will apply nonsecurity updates that otherwise meet the patch filtering rules.

The equivalent yum command for this workflow is:

```
sudo yum update --security --bugfix
```

For information about patch compliance status values, see About Patch Compliance States (p. 711).

How Patch Baseline Rules Work on RHEL

On Red Hat Enterprise Linux, the patch selection process is as follows:

1. On the instance, the YUM library accesses the updateinfo.xml file for each configured repo.

   **Note**
   The updateinfo.xml file might not be available if the repo is not one managed by Red Hat.
   If there is no updateinfo.xml found, no patch will be applied.

2. Each update notice in updateinfo.xml includes several attributes that denote the properties of the packages in the notice, as described in the following table.

**Update Notice Attributes**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>Corresponds to the value of the Classification key attribute in the patch baseline's PatchFilter data type. Denotes the type of package included in the update notice.</td>
</tr>
</tbody>
</table>

You can view the list of supported values by using the AWS CLI command `describe-patch-properties` or the API action `DescribePatchProperties`. You can also view the list in the Approval rules area of the Create...
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>patch baseline</td>
<td>Pages or Edit patch baseline page in the Systems Manager console.</td>
</tr>
<tr>
<td>severity</td>
<td>Corresponds to the value of the Severity key attribute in the patch baseline's PatchFilter data type. Denotes the severity of the packages included in the update notice. Usually only applicable for Security update notices.</td>
</tr>
<tr>
<td></td>
<td>You can view the list of supported values by using the AWS CLI command describe-patch-properties or the API action DescribePatchProperties. You can also view the list in the Approval rules area of the Create patch baseline page or Edit patch baseline page in the Systems Manager console.</td>
</tr>
<tr>
<td>update_id</td>
<td>Denotes the advisory ID, such as RHSA-2017:0864. The advisory ID can be used in the ApprovedPatches or RejectedPatches attribute in the patch baseline.</td>
</tr>
<tr>
<td>references</td>
<td>Contains additional information about the update notice, such as a CVE ID (format: CVE-2017-1000371) or a Bugzilla ID (format: 1463241). The CVE ID and Bugzilla ID can be used in the ApprovedPatches or RejectedPatches attribute in the patch baseline.</td>
</tr>
<tr>
<td>updated</td>
<td>Corresponds to ApproveAfterDays in the patch baseline. Denotes the released date (updated date) of the packages included in the update notice. A comparison between the current timestamp and the value of this attribute plus the ApproveAfterDays is used to determine if the patch is approved for deployment.</td>
</tr>
</tbody>
</table>

**Note**

For information about accepted formats for lists of approved patches and rejected patches, see About Package Name Formats for Approved and Rejected Patch Lists (p. 715).

3. The product of the instance is determined by SSM Agent. This attribute corresponds to the value of the Product key attribute in the patch baseline's PatchFilter data type.

4. Packages are selected for the update according to the following guidelines:

<table>
<thead>
<tr>
<th>Security option</th>
<th>Patch selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-defined default patch baselines provided by AWS and custom patch baselines where the Approved patches include non-security updates is not selected</td>
<td>For each update notice in updateinfo.xml, the patch baseline is used as a filter, allowing only the qualified packages to be included in the update. If multiple packages are applicable after applying the patch baseline definition, the latest version is used.</td>
</tr>
</tbody>
</table>
### Security option

<table>
<thead>
<tr>
<th>Patch selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>The equivalent yum command for this workflow is:</td>
</tr>
<tr>
<td><code>sudo yum update-minimal --sec-severity=critical,important --bugfix</code></td>
</tr>
</tbody>
</table>

**Custom patch baselines where the Approved patches include non-security updates is selected**

<table>
<thead>
<tr>
<th>Patch selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>In addition to applying the security updates that have been selected from <code>updateinfo.xml</code>, Patch Manager will apply nonsecurity updates that otherwise meet the patch filtering rules.</td>
</tr>
<tr>
<td>The equivalent yum command for this workflow is:</td>
</tr>
<tr>
<td><code>sudo yum update --security --bugfix</code></td>
</tr>
</tbody>
</table>

For information about patch compliance status values, see [About Patch Compliance States (p. 711)](#).

### How Patch Baseline Rules Work on Ubuntu Server

On Ubuntu Server, the patch baseline service offers filtering on the **Priority** and **Section** fields. These fields are typically present for all Ubuntu Server packages. To determine whether a patch is selected by the patch baseline, Patch Manager does the following:

1. On Ubuntu systems, the equivalent of `sudo apt-get update` is run to refresh the list of available packages. Repos are not configured and the data is pulled from repos configured in a `sources` list.
2. Next, the **GlobalFilters**, **ApprovalRules**, **ApprovedPatches** and **RejectedPatches** lists are applied. Only packages with candidate versions appearing in the distribution security repo (archive) are selected. For Ubuntu Server 14 this is repo is `trusty-security`. For Ubuntu Server 16, it is `xenial-security`.

   **Note**
   For information about accepted formats for lists of approved patches and rejected patches, see [About Package Name Formats for Approved and Rejected Patch Lists (p. 715)](#).

To view the contents of the **Priority** and **Section** fields, run the following `aptitude` command:

**Note**
You may need to first install Aptitude on Ubuntu Server 16 systems.

```
aptitude search -F '%p %P %s %t %V#' '~U'
```

In the response to this command, all upgradable packages are reported in this format:

```
name, priority, section, archive, candidate version
```

For information about patch compliance status values, see [About Patch Compliance States (p. 711)](#).

### How Patch Baseline Rules Work on SUSE Linux Enterprise Server

On SLES, each patch includes the following attributes that denote the properties of the packages in the patch:
• **Category:** Corresponds to the value of the **Classification** key attribute in the patch baseline's **PatchFilter** data type. Denotes the type of patch included in the update notice.

You can view the list of supported values by using the AWS CLI command `describe-patch-properties` or the API action **DescribePatchProperties**. You can also view the list in the **Approval rules** area of the **Create patch baseline** page or **Edit patch baseline** page in the Systems Manager console.

• **Severity:** Corresponds to the value of the **Severity** key attribute patch baseline's **PatchFilter** data type. Denotes the severity of the patches.

You can view the list of supported values by using the AWS CLI command `describe-patch-properties` or the API action **DescribePatchProperties**. You can also view the list in the **Approval rules** area of the **Create patch baseline** page or **Edit patch baseline** page in the Systems Manager console.

The product of the instance is determined by SSM Agent. This attribute corresponds to the value of the **Product** key attribute in the patch baseline's **PatchFilter** data type.

For each patch, the patch baseline is used as a filter, allowing only the qualified packages to be included in the update. If multiple packages are applicable after applying the patch baseline definition, the latest version is used.

**Note**
For information about accepted formats for lists of approved patches and rejected patches, see About Package Name Formats for Approved and Rejected Patch Lists (p. 715).

### Key Differences Between Linux and Windows Patching

The following table describes important differences between Linux and Windows patching.

**Note**
To patch Linux instances, your instances must be running SSM Agent version 2.0.834.0 or later. An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

<table>
<thead>
<tr>
<th>Difference</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patch evaluation</td>
<td><strong>Linux</strong></td>
</tr>
</tbody>
</table>

For Linux patching, Systems Manager evaluates patch baseline rules and the list of approved and rejected patches on each managed instance. Systems Manager must evaluate patching on each instance because the service retrieves the list of known patches and updates from the repositories that are configured on the instance.

**Windows**

Patch Manager uses different processes on Windows managed instances and Linux managed instances in order to evaluate which patches should be present. For Windows patching, Systems Manager evaluates patch baseline rules and the list of approved and rejected patches **directly in the service**. It can do this because
### About Patching Operations

The topics in this section provide information to help you understand how the Patch Manager service works.

**Difference** | **Details**
---|---
Windows patches are pulled from a single repository (Windows Update). | 

**Not Applicable patches** | Due to the large number of available packages for Linux operating systems, Systems Manager does not report details about patches in the *Not Applicable* state. A *Not Applicable* patch is, for example, a patch for Apache software when the instance does not have Apache installed. Systems Manager does report the number of *Not Applicable* patches in the summary, but if you call the `DescribeInstancePatches` API for an instance, the returned data does not include patches with a state of *Not Applicable*. This behavior is different from Windows.

**SSM document support** | The `AWS-ApplyPatchBaseline` SSM document doesn’t support Linux instances. For applying patch baselines to both Windows and Linux instances, the recommended SSM document is `AWS-RunPatchBaseline`. For more information, see About SSM Documents for Patching Instances (p. 703) and About the SSM Document AWS-RunPatchBaseline (p. 706).

**Application patches** | Patch Manager’s primary focus is applying patches to operating systems. However, you can also use Patch Manager to apply patches to some applications on your instances.

**Linux**

On Linux operating systems, Patch Manager uses the configured repositories for updates, and does not differentiate between operating systems and application patches. You can use Patch Manager to define which repositories to fetch updates from. For more information, see How to Specify an Alternative Patch Source Repository (Linux) (p. 691).

**Windows**

On Windows Server instances, you can apply approval rules, as well as *Approved* and *Rejected* patch exceptions, for applications released by Microsoft, such as Microsoft Word 2011 and Microsoft Exchange Server 2016. For more information, see Create a Custom Patch Baseline (p. 724).
About Patching Operations

Topics
- About Patching Configurations (p. 703)
- About SSM Documents for Patching Instances (p. 703)
- About Patch Compliance States (p. 711)

About Patching Configurations

A patching configuration defines a unique patching operation. The configuration specifies the instances for patching, which patch baseline is to be applied, the schedule for patching, and typically, the maintenance window that the configuration is to be associated with.

To create a patching configuration, use the Configure patching page. This page lets you associate a patching configuration with an existing maintenance window, create a new maintenance window for the configuration, or run a one-time manual patching operation on a set of instances. For more information, see Create a Patching Configuration (Console) (p. 732).

About SSM Documents for Patching Instances

This topic describes the seven SSM documents currently available to help you keep your managed instances patched with the latest security-related updates.

We currently recommend using just three of these documents in your patching operations. Together, these three SSM documents provide you with a full range of patching options using AWS Systems Manager. Two of these documents were released later than the four legacy SSM documents they replace and represent expansions or consolidations of functionality.

The three recommended SSM documents include:
- AWS-ConfigureWindowsUpdate
- AWS-InstallWindowsUpdates
- AWS-RunPatchBaseline

The four legacy SSM documents that are still available for use in some AWS Regions, but might be deprecated in the future, include:
- AWS-ApplyPatchBaseline
- AWS-FindWindowsUpdates
- AWS-InstallMissingWindowsUpdates
- AWS-InstallSpecificWindowsUpdates

Refer to the following sections for more information about using these SSM documents in your patching operations.

Topics
- SSM Documents Recommended for Patching Instances (p. 703)
- Legacy SSM Documents for Patching Instances (p. 705)
- About the SSM Document AWS-RunPatchBaseline (p. 706)

SSM Documents Recommended for Patching Instances

The following three SSM documents are recommended for use in your managed instance patching operations.
**Recommended SSM Documents**

- **AWS-ConfigureWindowsUpdate** (p. 704)
- **AWS-InstallWindowsUpdates** (p. 704)
- **AWS-RunPatchBaseline** (p. 704)

**AWS-ConfigureWindowsUpdate**

Supports configuring basic Windows Update functions and using them to install updates automatically (or to disable automatic updates). Available in all AWS Regions.

This SSM document prompts Windows Update to download and install the specified updates and reboot instances as needed. Use this document with State Manager to ensure Windows Update maintains its configuration. You can also run it manually using Run Command to change the Windows Update configuration.

The available parameters in this document support specifying a category of updates to install (or whether to disable automatic updates), as well as specifying the day of the week and time of day to run patching operations. This SSM document is most useful if you don't need strict control over Windows updates and don't need to collect compliance information.

**Replaces legacy SSM documents:**

- None

**AWS-InstallWindowsUpdates**

Installs updates on a Windows instance. Available in all AWS Regions.

This SSM document provides basic patching functionality in cases where you either want to install a specific update (using the Include Kbs parameter), or want to install patches with specific classifications or categories but don't need patch compliance information.

**Replaces legacy SSM documents:**

- **AWS-FindWindowsUpdates**
- **AWS-InstallMissingWindowsUpdates**
- **AWS-InstallSpecificWindowsUpdates**

The three legacy documents perform different functions, but you can achieve the same results by using different parameter settings with the newer SSM document **AWS-InstallWindowsUpdates**. These parameter settings are described in Legacy SSM Documents for Patching Instances (p. 705).

**AWS-RunPatchBaseline**

Installs patches on your instances or scans instances to determine whether any qualified patches are missing. Available in all AWS Regions.

**AWS-RunPatchBaseline** enables you to control patch approvals using patch baselines. Reports patch compliance information that you can view using the Systems Manager Compliance tools. These tools provide you with insights on the patch compliance state of your instances, such as which instances are missing patches and what those patches are. For Linux operating systems, compliance information is provided for patches from both the default source repository configured on an instance and from any alternative source repositories you specify in a custom patch baseline. For more information about alternative source repositories, see How to Specify an Alternative Patch Source Repository (Linux) (p. 691). For more information about the Systems Manager Compliance tools, see AWS Systems Manager Configuration Compliance (p. 504).
Replaces legacy documents:

- AWS-ApplyPatchBaseline

The legacy document AWS-ApplyPatchBaseline applies only to Windows instances, and does not provide support for application patching. The newer AWS-RunPatchBaseline provides the same support for both Windows and Linux systems. Version 2.0.834.0 or later of SSM Agent is required in order to use the AWS-RunPatchBaseline document.

For more information about the AWS-RunPatchBaseline SSM document, see About the SSM Document AWS-RunPatchBaseline (p. 706).

Legacy SSM Documents for Patching Instances

The following four SSM documents are still available for use in your patching operations in some AWS Regions. However, they might be deprecated in the future, so we do not recommend their use. Instead, use the documents described in SSM Documents Recommended for Patching Instances (p. 703).

Legacy SSM Documents

- AWS-ApplyPatchBaseline (p. 705)
- AWS-FindWindowsUpdates (p. 705)
- AWS-InstallMissingWindowsUpdates (p. 705)
- AWS-InstallSpecificWindowsUpdates (p. 706)

AWS-ApplyPatchBaseline

Supports only Windows instances, but does not include support for patching applications that is found in its replacement, AWS-RunPatchBaseline. Not available in AWS Regions launched after August 2017.

Note

The replacement for this SSM document, AWS-RunPatchBaseline, requires version 2.0.834.0 or a later version of SSM Agent. You can use the AWS-UpdateSSMAgent document to update your instances to the latest version of the agent.

AWS-FindWindowsUpdates

Replaced by AWS-InstallWindowsUpdates, which can perform all the same actions. Not available in AWS Regions launched after April 2017.

To achieve the same result that you would from this legacy SSM document, use the following parameter configuration with the recommended replacement document, AWS-InstallWindowsUpdates:

- Action = Scan
- Allow Reboot = False

AWS-InstallMissingWindowsUpdates

Replaced by AWS-InstallWindowsUpdates, which can perform all the same actions. Not available in any AWS Regions launched after April 2017.

To achieve the same result that you would from this legacy SSM document, use the following parameter configuration with the recommended replacement document, AWS-InstallWindowsUpdates:

- Action = Install
- Allow Reboot = True
AWS Systems Manager User Guide
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AWS-InstallSpecificWindowsUpdates

Replaced by AWS-InstallWindowsUpdates, which can perform all the same actions. Not available in any AWS Regions launched after April 2017.

To achieve the same result that you would from this legacy SSM document, use the following parameter configuration with the recommended replacement document, AWS-InstallWindowsUpdates:

• Action = Install
• Allow Reboot = True
• Include Kbs = comma-separated list of KB articles

About the SSM Document AWS-RunPatchBaseline

AWS Systems Manager supports an SSM document for Patch Manager, AWS-RunPatchBaseline, which performs patching operations on instances for both security related and other types of updates. You can use the document AWS-RunPatchBaseline to apply patches for both operating systems and applications. (On Windows Server, application support is limited to updates for Microsoft applications.)

This document supports both Linux and Windows instances, so it can be reliably run on either type of instance when managed by Systems Manager. The document will perform the appropriate actions for each platform.

Note
Patch Manager also supports the legacy SSM document AWS-ApplyPatchBaseline. However, this document supports patching on Windows instances only. We encourage you to use AWS-RunPatchBaseline instead because it supports patching on both Linux and Windows instances. Version 2.0.834.0 or later of SSM Agent is required in order to use the AWS-RunPatchBaseline document.

On Windows systems:

On Windows instances, the AWS-RunPatchBaseline document downloads and invokes a PowerShell module, which in turn downloads a snapshot of the patch baseline that applies to the instance. This patch baseline snapshot is passed to the Windows Update API, which controls downloading and installing the approved patches as appropriate.

On Linux systems:

On Linux instances, the AWS-RunPatchBaseline document invokes a Python module, which in turn downloads a snapshot of the patch baseline that applies to the instance. This patch baseline snapshot uses the defined rules and lists of approved and blocked patches to drive the appropriate package manager for each instance type:

• Amazon Linux, Amazon Linux 2, CentOS, and RHEL instances use YUM. For YUM operations, Patch Manager requires Python 2.6 or later.
• Ubuntu Server instances use APT. For APT operations, Patch Manager requires Python 3.
• SUSE Linux Enterprise Server instances use Zypper. For Zypper operations, Patch Manager requires Python 2.6 or later.

After all approved and applicable updates have been installed, with reboots performed as necessary, patch compliance information is generated on an instance and reported back to Patch Manager. For information about viewing patch compliance data, see About Patch Compliance (p. 508).

AWS-RunPatchBaseline Parameters

AWS-RunPatchBaseline supports three parameters. The Operation parameter is required. The InstallOverrideList parameter is optional. Snapshot-ID is technically optional, but we
recommend that you supply a custom value for it when you run **AWS-RunPatchBaseline** outside of a maintenance window, and let Patch Manager supply the value automatically when the document is run as part of a maintenance window operation.

**Parameters**

- **Parameter name: Operation** (p. 707)
- **Parameter name: InstallOverrideList** (p. 707)
- **Parameter name: Snapshot ID** (p. 710)

**Parameter name: Operation**

**Usage**: Required.

**Options**: Scan | Install.

**Scan**

When you choose the Scan option, **AWS-RunPatchBaseline** determines the patch compliance state of the instance and reports this information back to Patch Manager. Scan does not prompt updates to be installed or instances to be rebooted. Instead, the operation identifies where updates are missing that are approved and applicable to the instance.

**Install**

When you choose the Install option, **AWS-RunPatchBaseline** attempts to install the approved and applicable updates that are missing from the instance. Patch compliance information generated as part of an Install operation does not list any missing updates, but might report updates that are in a failed state if the installation of the update did not succeed for any reason. Whenever an update is installed on an instance, the instance is rebooted to ensure the update is both installed and active.

**Parameter name: InstallOverrideList**

**Usage**: Optional.

InstallOverrideList lets you specify an https URL or an Amazon Simple Storage Service (Amazon S3) path-style URL to a list of patches to be installed. This patch installation list, which you maintain in YAML format, overrides the patches specified by the current default patch baseline. This provides you with more granular control over which patches are installed on your instances.

Be aware that compliance reports reflect patch states according to what's specified in the patch baseline, not what you specify in an InstallOverrideList list of patches. In other words, Scan operations ignore the InstallOverrideList parameter. This is to ensure that compliance reports consistently reflect patch states according to policy rather than what was approved for a specific patching operation.

**Valid URL formats**

- **https URL format**:

  ```
  https://s3.amazonaws.com/my-patch-approval-lists-bucket/my-windows-override-list.yaml
  ```

- **Amazon S3 path-style URL**:

  ```
  s3://my-patch-approval-lists-bucket/my-windows-override-list.yaml
  ```

**Valid YAML content formats**
The formats you use to specify patches in your list depends on the operating system of your instance. The general format, however, is as follows:

```
patches:
  - id: '{patch-d}'
    title: '{patch-title}'
    {additional-fields}: {values}
```

Although you can provide additional fields in your YAML file, they are ignored during patch operations.

In addition, we recommend verifying that the format of your YAML file is valid before adding or updating the list in your S3 bucket. For more information about the YAML format, see yam.org. For validation tool options, perform a web search for "yaml format validators".

- **Microsoft Windows**
  
  **id**
  
  The id field is required. Use it to specify patches using Microsoft Knowledge Base IDs (for example, KB2736693) and Microsoft Security Bulletin IDs (for example, MS17-023).

  Any other fields you want to provide in a patch list for Windows are optional and are for your own informational use only. You can use additional fields such as title, classification, severity, or anything else for providing more detailed information about the specified patches.

- **Linux**

  **id**
  
  The id field is required. Use it to specify patches using the package name and architecture. For example: `dhclient.x86_64`. You can use wildcards in id to indicate multiple packages. For example: `dhcp*` and `dhcp*1.*`.

  **title**
  
  The title field is optional, but on Linux systems it does provide additional filtering capabilities. If you use title, it should contain the package version information in the one of the following formats:

  **YUM/SUSE Linux Enterprise Server (SLES):**

  `{name}.{architecture}:{epoch}:{version}-{release}`

  **APT**

  `{name}.{architecture}:{version}`

  For Linux patch titles, you can use one or more wildcards in any position to expand the number of package matches. For example: `*32:9.8.2-0.*.rc1.57.amzn1`.

  For example:
  
  - apt package version 1.2.25 is currently installed on your instance, but version 1.2.27 is now available.
  
  You add apt.amd64 version 1.2.27 to the patch list. It depends on apt-utils.amd64 version 1.2.27, but apt-utils.amd64 version 1.2.25 is specified in the list.

  In this case, apt version 1.2.27 will be blocked from installation and reported as “Failed-NonCompliant.”
Other fields

Any other fields you want to provide in a patch list for Linux are optional and are for your own informational use only. You can use additional fields such as classification, severity, or anything else for providing more detailed information about the specified patches.

Sample patch lists

- **Windows**

```json
patches:
- id: 'KB4284819'
  title: '2018-06 Cumulative Update for Windows Server 2016 (1709) for x64-based Systems (KB4284819)'
- id: 'KB4284833'
- id: 'KB4284835'
  title: '2018-06 Cumulative Update for Windows Server 2016 (1803) for x64-based Systems (KB4284835)'
- id: 'KB4284880'
- id: 'KB4338814'
```

- **APT**

```json
patches:
- id: 'apparmor.amd64'
  title: '2.10.95-0ubuntu2.9'
- id: 'cryptsetup.amd64'
  title: '*2:1.6.6-5ubuntu2.1'
- id: 'cryptsetup-bin.*'
  title: '*2:1.6.6-5ubuntu2.1'
- id: 'apt.amd64'
  title: '*1.2.27'
- id: 'apt-utils.amd64'
  title: '*1.2.25'
```

- **Amazon Linux**

```json
patches:
- id: 'kernel.x86_64'
- id: 'bind*.x86_64'
  title: '32:9.8.2-0.62.rcl1.57.amzn1'
- id: 'glibc*'
- id: 'dhclient*'
  title: '*12:4.1.1-53.P1.28.amzn1'
- id: 'dhcp*'
```

- **Red Hat Enterprise Linux (RHEL)**

---

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patches:
  - id: 'NetworkManager.x86_64'
    title: '*1:1.10.2-14.el7_5'
  - id: 'NetworkManager-*.x86_64'
    title: '*1:1.10.2-14.el7_5'
  - id: 'audit.x86_64'
    title: '*0:2.8.1-3.el7'
  - id: 'dhclient.x86_64'
    title: '*el7_5.1'
  - id: 'dhcp*.x86_64'
    title: '*12:5.2.5-68.el7'

• SUSE Linux Enterprise Server (SLES)

patches:
  - id: 'amazon-ssm-agent.x86_64'
  - id: 'binutils'
    title: '*0:2.26.1-9.12.1'
  - id: 'glibc*.x86_64'
    title: '*2.19*'
  - id: 'dhcp*'
    title: '0:4.3.3-9.1'
  - id: 'lib*'

Parameter name: Snapshot ID

Usage: Optional.

Snapshot ID is a unique ID (GUID) used by Patch Manager to ensure that a set of instances that are patched in a single operation all have the exact same set of approved patches. Although the parameter is defined as optional, our best practice recommendation depends on whether or not you are running AWS-RunPatchBaseline in a maintenance window, as described in the following table.

AWS-RunPatchBaseline Best Practices

<table>
<thead>
<tr>
<th>Mode</th>
<th>Best Practice</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running AWS-RunPatchBaseline inside a maintenance window</td>
<td>Do not supply a Snapshot ID. Patch Manager will supply it for you.</td>
<td>If you use a maintenance window to run AWS-RunPatchBaseline, you should not provide your own generated Snapshot ID. In this scenario, Systems Manager provides a GUID value based on the maintenance window execution ID. This ensures that a correct ID is used for all the invocations of AWS-RunPatchBaseline in that maintenance window.</td>
</tr>
</tbody>
</table>
## About Patch Compliances States

After using Systems Manager Patch Manager to install patches on your instances, compliance status information is immediately available to you in the console or in response to AWS CLI commands or corresponding Systems Manager API actions.

**Note**

If you want to assign a specific patch compliance status to an instance, you can use the `put-compliance-items` CLI command or the `PutComplianceItems` API action. Assigning compliance status is not supported in the console.

---

### Mode  |
**Running AWS-RunPatchBaseline outside of a maintenance window**

**Best Practice**
Generate and specify a custom GUID value for the Snapshot ID.¹

**Details**
When you are not using a maintenance window to run `AWS-RunPatchBaseline`, we recommend that you generate and specify a unique Snapshot ID for each patch baseline, particularly if you are running the `AWS-RunPatchBaseline` document on multiple instances in the same operation. If you do not specify an ID in this scenario, Systems Manager generates a different Snapshot ID for each instance the command is sent to. This might result in varying sets of patches being specified among the instances.

For instance, say that you are running the `AWS-RunPatchBaseline` document directly via Run Command and targeting a group of 50 instances. Specifying a custom Snapshot ID results in the generation of a single baseline snapshot that is used to evaluate and patch all the instances, ensuring that they end up in a consistent state.

---

¹ You can use any tool capable of generating a GUID to generate a value for the Snapshot ID parameter. For example, in PowerShell, you can use the `New-Guid` cmdlet to generate a GUID in the format of `12345699-9405-4f69-bc5e-9315aEXAMPLE`. 

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### About Patching Operations

If you do specify a value in this scenario, note that the snapshot of the patch baseline might not remain in place for more than 24 hours. After that, a new snapshot will be generated even if you specify the same ID after the snapshot expires.
Patch Compliance States

For all operating systems, the system reports one of the following compliance states for each patch:

- **INSTALLED**: Either the patch was already installed, or Patch Manager installed it when the `AWS-RunPatchBaseline` document was run on the instance.
- **INSTALLED_OTHER**: The patch is not in the baseline, but it is installed on the instance. An individual might have installed it manually.
- **INSTALLED_REJECTED**: The patch is installed on the instance but is specified in a rejected patches list. This typically means the patch was installed before it was added to a list of rejected patches.
- **MISSING**: The patch is approved in the baseline, but it's not installed on the instance. If you configure the `AWS-RunPatchBaseline` document task to scan (instead of install) the system reports this status for patches that were located during the scan, but have not been installed.
- **NOT_APPLICABLE**: The patch is approved in the baseline, but the service or feature that uses the patch is not installed on the instance. For example, a patch for Internet Information Services (IIS) would show `NOT_APPLICABLE` if it was approved in the baseline, but IIS is not installed on the instance.

**Note**

This compliance state is only reported on Windows operating systems.

- **FAILED**: The patch is approved in the baseline, but it could not be installed. To troubleshoot this situation, review the command output for information that might help you understand the problem.

About Patch Baselines

The topics in this section provide information about how patch baselines work.

**Topics**

- About Predefined and Custom Patch Baselines (p. 712)
- About Package Name Formats for Approved and Rejected Patch Lists (p. 715)
- About Patch Groups (p. 717)
- About Patching Schedules Using Maintenance Windows (p. 720)
- About Patch Compliance (p. 721)
- About Patching Applications on Windows Server (p. 722)

About Predefined and Custom Patch Baselines

A patch baseline defines which patches are approved for installation on your instances. You can specify approved or rejected patches one by one. You can also create auto-approval rules to specify that certain types of updates (for example, critical updates) should be automatically approved. The rejected list overrides both the rules and the approve list.

To use a list of approved patches to install specific packages, you first remove all auto-approval rules. If you explicitly identify a patch as rejected, it will not be approved or installed, even if it matches all of the criteria in an auto-approval rule. Also, a patch is installed on an instance only if it applies to the software on the instance, even if the patch has otherwise been approved for the instance.

Patch Manager provides predefined patch baselines for each of the operating systems supported by Patch Manager. You can use these baselines as they are currently configured (you can’t customize them) or you can create your own patch baselines if you want greater control over which patches are approved or rejected for your environment.

**Topics**
About Predefined Baselines

The following table describes the predefined patch baselines provided with Patch Manager.

For information about which versions of each operating system Patch Manager supports, see Patch Manager Prerequisites (p. 687).

<table>
<thead>
<tr>
<th>Name</th>
<th>Supported Operating System</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWS-AmazonLinuxDefaultPatchBaseline</td>
<td>Amazon Linux</td>
<td>Approves all operating system patches that are classified as &quot;Security&quot; and that have a severity level of &quot;Critical&quot; or &quot;Important&quot;. Patches are auto-approved seven days after release. Also auto-approves all patches with a classification of &quot;Bugfix&quot; seven days after release.</td>
</tr>
<tr>
<td>AWS-AmazonLinux2DefaultPatchBaseline</td>
<td>Amazon Linux 2</td>
<td>Approves all operating system patches that are classified as &quot;Security&quot; and that have a severity level of &quot;Critical&quot; or &quot;Important&quot;. Patches are auto-approved seven days after release. Also approves all patches with a classification of &quot;Bugfix&quot; seven days after release.</td>
</tr>
<tr>
<td>AWS-CentOSDefaultPatchBaseline</td>
<td>CentOS</td>
<td>Approves all updates seven days after they become available, including nonsecurity updates.</td>
</tr>
<tr>
<td>AWS-RedHatDefaultPatchBaseline</td>
<td>Red Hat Enterprise Linux (RHEL)</td>
<td>Approves all operating system patches that are classified as &quot;Security&quot; and that have a severity level of &quot;Critical&quot; or &quot;Important&quot;. Patches are auto-approved seven days after release. Also approves all patches that are classified as &quot;Bugfix&quot; seven days after release.</td>
</tr>
<tr>
<td>AWS-SuseDefaultPatchBaseline</td>
<td>SUSE Linux Enterprise Server (SLES)</td>
<td>Approves all operating system patches that are classified as &quot;Security&quot; and with a severity of &quot;Critical&quot; or &quot;Important&quot;. Patches are auto-approved seven days after release.</td>
</tr>
<tr>
<td>AWS-UbuntuDefaultPatchBaseline</td>
<td>Ubuntu Server</td>
<td>Immediately approves all operating system security-related patches that have a priority of &quot;Required&quot;,</td>
</tr>
</tbody>
</table>

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About Custom Baselines

If you create your own patch baseline, you can choose which patches to auto-approve by using the following categories.

- Operating system: Windows, Amazon Linux, Ubuntu Server, and so on.
- Product name (for operating systems): For example, RHEL 6.5, Amazon Linux 2014.09, Windows Server 2012, Windows Server 2012 R2, and so on.
- Product name (for Microsoft applications on Windows Server only): For example, Word 2016, BizTalk Server, and so on.
- Classification: For example, critical updates, security updates, and so on.
- Severity: For example, critical, important, and so on.

For each auto-approval rule that you create, you can specify an auto-approval delay. This delay is the number of days to wait after the patch was released, before the patch is automatically approved for patching. For example, if you create a rule using the Critical Updates classification and configure it for...
seven days auto-approval delay, then a new critical patch released on January 7 will automatically be approved on January 14.

**Note**
If a Linux repository doesn’t provide release date information for packages, Systems Manager uses the build time of the package as the auto-approval delay for Amazon Linux, Amazon Linux 2, RHEL, and CentOS. If the system isn’t able to find the build time of the package, Systems Manager treats the auto-approval delay as having a value of zero.

You can also specify a compliance severity level. If an approved patch is reported as missing, **Compliance Level** is the severity of the compliance violation.

By using multiple patch baselines with different auto-approval delays, you can deploy patches at different rates to different instances. For example, you can create separate patch baselines and auto-approval delays for development and production environments. This enables you to test patches in your development environment before they get deployed in your production environment.

Keep the following in mind when you create a patch baseline:

- Patch Manager provides one predefined patch baseline for each supported operating system. These predefined patch baselines are used as the default patch baselines for each operating system type unless you create your own patch baseline and designate it as the default for the corresponding operating system type.
  
  **Note**
  For Windows Server, two predefined patch baselines are provided. The patch baseline `AWS-WindowsPredefinedPatchBaseline-OS` supports only operating system updates on the Windows operating system itself. It is used as the default patch baseline for Windows instances unless you specify a different patch baseline. The other predefined Windows patch baseline, `AWS-WindowsPredefinedPatchBaseline-OS-Applications`, can be used to apply patches to both the Windows Server operating system and supported Microsoft applications.

- For on-premises or non-Amazon EC2 instances, Patch Manager attempts to use your custom default patch baseline. If no custom default patch baseline exists, the system uses the predefined patch baseline for the corresponding operating system.

- If a patch is listed as both approved and rejected in the same patch baseline, the patch is rejected.

- An instance can have only one patch baseline defined for it.

- The formats of package names you can add to lists of approved patches and rejected patches for a patch baseline depend on the type of operating system you are patching.

  For information about accepted formats for lists of approved patches and rejected patches, see About Package Name Formats for Approved and Rejected Patch Lists (p. 715).

  For information about creating a patch baseline, see Create a Custom Patch Baseline (p. 724) and Tutorial: Patch a Server Environment (AWS CLI) (p. 735).

**About Package Name Formats for Approved and Rejected Patch Lists**

The formats of package names you can add to lists of approved patches and rejected patches depend on the type of operating system you are patching.

**Package Name Formats for Windows Operating Systems**

For Windows operating systems, specify patches using Microsoft Knowledge Base IDs and Microsoft Security Bulletin IDs; for example:
Package Name Formats for Linux Operating Systems

The formats you can specify for approved and rejected patches in your patch baseline vary by Linux type. More specifically, the formats that are supported depend on the package manager used by the type of Linux operating system.

Topics
- Amazon Linux, Amazon Linux 2, Red Hat Enterprise Linux (RHEL), and CentOS (p. 716)
- Ubuntu Server (p. 716)
- SUSE Linux Enterprise Server (SLES) (p. 717)

Amazon Linux, Amazon Linux 2, Red Hat Enterprise Linux (RHEL), and CentOS

Package manager: YUM

Approved patches: For approved patches, you can specify any of the following:
- Bugzilla IDs, in the format 1234567 (The system processes numbers-only strings as Bugzilla IDs.)
- CVE IDs, in the format CVE-2018-1234567
- Advisory IDs, in formats such as RHSA-2017:0864 and ALAS-2018-123
- Full package names, in formats such as:
  - example-pkg-0.710.10-2.7.abcd.x86_64
  - pkg-example-EE-20180914-2.2.amzn1.noarch
- Package-names with a single wildcard, in formats such as:
  - example-pkg-*.abcd.x86_64
  - example-pkg-*-20180914-2.2.amzn1.noarch
  - example-pkg-EE-2018*.amzn1.noarch

Rejected patches: For rejected patches, you can specify any of the following:
- Full package names, in formats such as:
  - example-pkg-0.710.10-2.7.abcd.x86_64
  - pkg-example-EE-20180914-2.2.amzn1.noarch
- Package-names with a single wildcard, in formats such as:
  - example-pkg-*.abcd.x86_64
  - example-pkg-*-20180914-2.2.amzn1.noarch
  - example-pkg-EE-2018*.amzn1.noarch

Ubuntu Server

Package manager: APT

Approved patches and rejected patches: For both approved and rejected patches, specify the following:
- Package names, in the format ExamplePkg33

Note
For Ubuntu Server lists, do not include elements such as architecture or versions. For example, you specify the package name ExamplePkg33 to include all the following in a patch list:
About Patch Baselines

- ExamplePkg33.x86.1
- ExamplePkg33.x86.2
- ExamplePkg33.x64.1
- ExamplePkg33.3.2.5-364.noarch

SUSE Linux Enterprise Server (SLES)

Package manager: Zypper

Approved patches and rejected patches: For both approved and rejected patch lists, you can specify any of the following:

- Full package names, in formats such as:
  - SUSE-SLE-Example-Package-12-2018-123
  - example-pkg-2018.11.4-46.17.1.x86_64.rpm
- Package names with a single wildcard, such as:
  - SUSE-SLE-Example-Package-12-2018- *
  - example-pkg-2018.11.4-46.17.1.*.rpm

About Patch Groups

You can use a patch group to associate instances with a specific patch baseline. Patch groups help ensure that you are deploying the appropriate patches, based on the associated patch baseline rules, to the correct set of instances. Patch groups can also help you avoid deploying patches before they have been adequately tested. For example, you can create patch groups for different environments (such as Development, Test, and Production) and register each patch group to an appropriate patch baseline.

Note
A patch group can only be registered with one patch baseline.

When you run AWS-RunPatchBaseline, you can target managed instances using their instance ID or tags. SSM Agent and Patch Manager then evaluate which patch baseline to use based on the patch group value that you added to the instance.

You create a patch group by using Amazon EC2 tags. Unlike other tagging scenarios across Systems Manager, a patch group must be defined with the tag key: Patch Group. Note that the key is case-sensitive. You can specify any value, for example “web servers,” but the key must be Patch Group.

Note
An instance can only be in one patch group.

After you create a patch group and tag instances, you can register the patch group with a patch baseline. Registering the patch group with a patch baseline ensures that the instances within the patch group use the rules defined in the associated patch baseline. For more information on how to create a patch group and associate the patch group to a patch baseline, see Create a Patch Group (p. 728) and Add a Patch Group to a Patch Baseline (p. 730).

To view an example of creating a patch baseline and patch groups by using the AWS CLI, see Tutorial: Patch a Server Environment (AWS CLI) (p. 735). For more information about Amazon EC2 tags, see Tagging Your Amazon EC2 Resources in the Amazon EC2 User Guide.

How It Works

When the system runs the task to apply a patch baseline to an instance, SSM Agent verifies that a patch group value is defined for the instance. If the instance is assigned to a patch group, Patch Manager then
verifies which patch baseline is registered to that group. If a patch baseline is found for that group, Patch Manager notifies SSM Agent to use the associated patch baseline. If an instance isn't configured for a patch group, Patch Manager automatically notifies SSM Agent to use the currently configured default patch baseline.

The following diagram shows a general example of the processes that Systems Manager performs when sending a Run Command task to your fleet of servers to patch using Patch Manager. A similar process is used when a maintenance window is configured to send a command to patch using Patch Manager.

In this example, we have three groups of Windows EC2 instances with the following tags applied:

<table>
<thead>
<tr>
<th>EC2 Instances Group</th>
<th>Tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>key=OS,value=Windows</td>
</tr>
<tr>
<td></td>
<td>key=Patch Group,value=DEV</td>
</tr>
<tr>
<td>Group 2</td>
<td>key=OS,value=Windows</td>
</tr>
<tr>
<td>Group 3</td>
<td>key=OS,value=Windows</td>
</tr>
<tr>
<td></td>
<td>key=Patch Group,value=QA</td>
</tr>
</tbody>
</table>

For this example, we also have these two Windows patch baselines:

<table>
<thead>
<tr>
<th>Patch Baseline ID</th>
<th>Default</th>
<th>Associated Patch Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>pb-0123456789abcdef0</td>
<td>Yes</td>
<td>Default</td>
</tr>
<tr>
<td>pb-9876543210abcdef0</td>
<td>No</td>
<td>DEV</td>
</tr>
</tbody>
</table>

Diagram 1: General Example of Patching Operations Process Flow
About Patch Baselines

The general process to scan or install patches using Run Command and Patch Manager is as follows:

1. **Send a command to patch**: Use the Systems Manager console, SDK, AWS CLI, or AWS Tools for Windows PowerShell to send a Run Command task using the document AWS-RunPatchBaseline. The diagram shows a Run Command task to patch managed instances by targeting the tag key=OS,value=Windows.

2. **Patch baseline determination**: SSM Agent verifies the patch group tags applied to the EC2 instance and queries Patch Manager for the corresponding patch baseline.
   - **Matching patch group value associated with patch baseline**:
     1. SSM Agent, which is installed on EC2 instances in group one, receives the command issued in Step 1 to begin a patching operation. SSM Agent validates that the EC2 instances have the patch group tag-value DEV applied and queries Patch Manager for an associated patch baseline.
2. Patch Manager verifies that patch baseline pb-9876543210abcdef0 has the patch group DEV associated and notifies SSM Agent.

3. SSM Agent retrieves a patch baseline snapshot from Patch Manager based on the approval rules and exceptions configured in pb-9876543210abcdef0 and proceeds to the next step.

- **No patch group tag added to instance:**

1. SSM Agent, which is installed on EC2 instances in group two, receives the command issued in Step 1 to begin a patching operation. SSM Agent validates that the EC2 instances don't have a Patch Group tag applied and as a result, SSM Agent queries Patch Manager for the default Windows patch baseline.

2. Patch Manager verifies that the default Windows patch baseline is pb-0123456789abcdef0 and notifies SSM Agent.

3. SSM Agent retrieves a patch baseline snapshot from Patch Manager based on the approval rules and exceptions configured in the default patch baseline pb-0123456789abcdef0 and proceeds to the next step.

- **No matching patch group value associated with a patch baseline:**

1. SSM Agent, which is installed on EC2 instances in group three, receives the command issued in Step 1 to begin a patching operation. SSM Agent validates that the EC2 instances have the patch group tag-value QA applied and queries Patch Manager for an associated patch baseline.

2. Patch Manager does not find a patch baseline that has the patch group QA associated.

3. Patch Manager notifies SSM Agent to use the default Windows patch baseline pb-0123456789abcdef0.

4. SSM Agent retrieves a patch baseline snapshot from Patch Manager based on the approval rules and exceptions configured in the default patch baseline pb-0123456789abcdef0 and proceeds to the next step.

3. **Patch scan or install:** After determining the appropriate patch baseline to use, SSM Agent begins either scanning for or installing patches based on the operation value specified in Step 1. The patches that are scanned for or installed are determined by the approval rules and patch exceptions defined in the patch baseline snapshot provided by Patch Manager.

**Related Content**

About Patch Compliance States (p. 711)

**About Patching Schedules Using Maintenance Windows**

After you configure a patch baseline (and optionally a patch group), you can apply patches to your instance by using a maintenance window. A maintenance window can reduce the impact on server availability by letting you specify a time to perform the patching process that doesn't interrupt business operations. A maintenance window works like this:

1. Create a maintenance window with a schedule for your patching operations.

2. Choose the targets for the maintenance window by specifying the Patch Group tag for the tag name, and any value for which you have defined Amazon EC2 tags, for example, "production servers".

3. Create a new maintenance window task, and specify the AWS-RunPatchBaseline document.

When you configure the task, you can choose to either scan instances or scan and install patches on the instances. If you choose to scan instances, Patch Manager scans each instance and generates a list of missing patches for you to review.

If you choose to scan and install patches, Patch Manager scans each instance and compares the list of installed patches against the list of approved patches in the baseline. Patch Manager identifies missing patches, and then downloads and installs all missing and approved patches.
If you want to perform a one-time scan or install to fix an issue, you can use Run Command to call the `AWS-RunPatchBaseline` document directly.

**Important**
After installing patches, Systems Manager reboots each instance. The reboot is required to make sure that patches are installed correctly and to ensure that the system did not leave the instance in a potentially bad state.

### About Patch Compliance

After you use Systems Manager Patch Manager to install patches on your instances, compliance status information is immediately available to you in the console or in response to AWS CLI commands or corresponding Systems Manager API actions.

**Note**
If you want to assign a specific patch compliance status to an instance, you can use the `put-compliance-items` CLI command or the `PutComplianceItems` API action. Assigning compliance status is not supported in the console.

#### Patch Compliance Values for Ubuntu Server

For Ubuntu Server, the rules for package classification into the different compliance states are as follows:

- **Installed**: Packages that are filtered through the patch baseline, with the candidate version appearing in `trusty-security` (Ubuntu Server 14) or `xenial-security` (Ubuntu Server 16), and are not upgradable.

- **Missing**: Packages that are filtered through the baseline, with the candidate version appearing in `trusty-security` (Ubuntu Server 14) or `xenial-security` (Ubuntu Server 16), and are upgradable.

- **Installed Other**: Packages that are not filtered through the baseline, with the candidate version appearing in `trusty-security` (Ubuntu Server 14) or `xenial-security` (Ubuntu Server 16), and are not upgradable. The compliance level for these packages is set to `UNSPECIFIED`.

- **NotApplicable**: Packages that are included in `ApprovedPatches` but are not installed on the system.

- **Failed**: Packages that failed to install during the patch operation.

#### Patch Compliance Values for Other Operating Systems

For each patch, the system reports one of the following compliance status values:

- **INSTALLED**: Either the patch was already installed, or Patch Manager installed it when the `AWS-RunPatchBaseline` document was run on the instance.

- **INSTALLED_OTHER**: The patch is not in the baseline, but it is installed on the instance. An individual might have installed it manually.

- **INSTALLED_REJECTED**: The patch is installed on the instance but is specified in a rejected patches list. This typically means the patch was installed before it was added to a list of rejected patches.

- **MISSING**: The patch is approved in the baseline, but it's not installed on the instance. If you configure the `AWS-RunPatchBaseline` document task to scan (instead of install) the system reports this status for patches that were located during the scan, but have not been installed.

- **NOT_APPLICABLE**: The patch is approved in the baseline, but the service or feature that uses the patch is not installed on the instance. For example, a patch for a web server service would show `NOT_APPLICABLE` if it was approved in the baseline, but the web service is not installed on the instance.

- **FAILED**: The patch is approved in the baseline, but it could not be installed. To troubleshoot this situation, review the command output for information that might help you understand the problem.
About Patching Applications on Windows Server

For Windows Server, two predefined patch baselines are provided. The patch baseline `AWS-WindowsPredefinedPatchBaseline-OS` supports only operating system updates on the Windows operating system itself. It is used as the default patch baseline for Windows instances unless you specify a different patch baseline. The other predefined Windows patch baseline, `AWS-WindowsPredefinedPatchBaseline-OS-Applications`, can be used to apply patches to both the Windows Server operating system and supported Microsoft applications.

You can also create a custom patch baseline to update Microsoft applications on Windows Server machines.

To include Microsoft applications in your custom patch baseline, you must, at a minimum, specify the product that you want to patch. The following AWS CLI command demonstrates the minimal requirements to patch a product, such as Office 2016:

```
aws ssm create-patch-baseline --name "My-Windows-App-Baseline" --approval-rules "PatchRules=[{PatchFilterGroup={PatchFilters=[[Key=PRODUCT,Values='Office 2016'],[Key=PATCH_SET,Values='APPLICATION']},ApproveAfterDays=5}]"
```

If you specify the Microsoft application product family, each product you specify must be a supported member of the selected product family. For example, to patch the product "Active Directory Rights Management Services Client 2.0," you must specify its product family as "Active Directory" and not, for example, "Office" or "SQL Server." The following AWS CLI command demonstrates a match pairing of product family and product:

```
aws ssm create-patch-baseline --name "My-Windows-App-Baseline" --approval-rules "PatchRules=[{PatchFilterGroup={PatchFilters=[[Key=PRODUCT_FAMILY,Values='Active Directory'],[Key=PRODUCT,Values='Active Directory Rights Management Services Client 2.0'],[Key=PATCH_SET,Values='APPLICATION']},ApproveAfterDays=5}]"
```

Troubleshooting Mismatched Product Family/Product Pairs

When you create a patch baseline in the console, you specify a product family and a product. For example, you might choose:

- **Product family:** Office
  - **Product:** Office 2016

If you attempt to create a patch baseline with a mismatched product family/product pair, an error message is displayed. The following are reasons this can occur:

- You selected a valid product family/product pair, but then removed the product family selection.
- You chose a product from the Obsolete or mismatched options sublist instead of the Available and matching options sublist.

Items in the product Obsolete or mismatched options sublist might have been entered in error through an SDK or AWS CLI `create-patch-baseline` command. This could mean a typo was introduced or a product was assigned to the wrong product family. A product also appears in the Obsolete or mismatched options sublist if it was specified for a previous patch baseline but currently has no patches available from Microsoft.

To avoid this issue in the console, always choose options from the Currently available options sublists.

You can also view the products that have currently available patches by using the `describe-patch-properties` command in the AWS CLI or the DescribePatchProperties API command.
Working with Patch Manager (Console)

To use Patch Manager, complete the following tasks. These tasks are described in more detail in this section.

1. Verify that the AWS predefined patch baseline for each operating system type that you use meets your needs. If it does not, create a patch baseline that defines a standard set of patches for that instance type and set it as the default instead.
2. Organize instances into patch groups by using Amazon EC2 tags (optional, but recommended).
3. Schedule patching by using a maintenance window that defines which instances to patch and when to patch them.
4. Monitor patching to verify compliance and investigate failures.

Related Content

- To view an example of how to create a patch baseline, patch groups, and a maintenance window using the AWS CLI, see Tutorial: Patch a Server Environment (AWS CLI) (p. 735).
- For more information about maintenance windows, see AWS Systems Manager Maintenance Windows (p. 444).
- For information about monitoring patch compliance, see About Patch Compliance (p. 508).

Topics

- View AWS Predefined Patch Baselines (p. 723)
- Create a Custom Patch Baseline (p. 724)
- Set an Existing Patch Baseline as the Default (p. 728)
- Create a Patch Group (p. 728)
- Add a Patch Group to a Patch Baseline (p. 730)
- Create a Maintenance Window for Patching (p. 730)
- Create a Patching Configuration (Console) (p. 732)
- Update or Delete a Patch Baseline (Console) (p. 734)

View AWS Predefined Patch Baselines

Patch Manager includes a predefined patch baseline for each operating system supported by Patch Manager. You can use these patch baselines (you can't customize them), or you can create your own. The following procedure describes how to view a predefined patch baseline to see if it meets your needs. To learn more about patch baselines, see About Predefined and Custom Patch Baselines (p. 712).

To view AWS predefined patch baselines

2. In the navigation pane, choose Patch Manager.
3. In the patch baselines list, choose the baseline ID of one of the predefined patch baselines.

Note

For Windows Server, two predefined patch baselines are provided. The patch baseline AWS-WindowsPredefinedPatchBaseline-OS supports only operating system updates on
the Windows operating system itself. It is used as the default patch baseline for Windows
instances unless you specify a different patch baseline. The other predefined Windows
patch baseline, AWS-WindowsPredefinedPatchBaseline-OS-Applications, can
be used to apply patches to both the Windows Server operating system and supported
Microsoft applications.
For more information, see Set an Existing Patch Baseline as the Default (p. 728).
4. Choose the Approval rules tab and review the patch baseline configuration.
5. If the configuration is acceptable for your instances, you can skip ahead to the procedure Create a
Patch Group (p. 728).
-or-
To create your own default patch baseline, continue to the topic Create a Custom Patch
Baseline (p. 724).

Create a Custom Patch Baseline

Patch Manager includes a predefined patch baseline for each operating system supported by Patch
Manager. You can use these patch baselines (you can’t customize them), or you can create your own. The
following procedure describes how to create your own custom patch baseline. To learn more about patch
baselines, see About Predefined and Custom Patch Baselines (p. 712).

Depending on the type of operating system you are using, Windows or Linux, use one of the following
procedures.

Note
You can also create a patch baseline using the Amazon EC2 Systems Manager console. However,
this older version of Systems Manager lacks many current features and will be deprecated in the
future.

To create a custom patch baseline (Windows)

2. In the navigation pane, choose Patch Manager.
-or-
If the AWS Systems Manager home page opens first, choose the menu icon (folder) to open the
navigation pane, and then choose Patch Manager.
3. Choose Create patch baseline.
4. For Name, enter a name for your new patch baseline, for example, MyWindowsPatchBaseline.
5. (Optional) Enter a description for this patch baseline.
6. For Operating system, choose Windows.
7. If you want to begin using this patch baseline as the default for Windows as soon as you create it,
select Make this the default patch baseline for Windows Server.
If you choose not to set this patch baseline for use now, you can do so later. For information, see Set
an Existing Patch Baseline as the Default (p. 728).
8. In the Approval rules for Windows Server section, use the fields to create one or more auto-
approval rules.
   • Product: The version of the operating systems the approval rule applies to, such as
   WindowsServer2008. The default selection is All.
   • Classification: The type of patches the approval rule applies to, such as CriticalUpdates. The
default selection is All.
• **Severity**: The severity value of patches the rule is to apply to, such as Critical. The default selection is All.

• **Auto approval delay**: The number of days to wait after a patch is released before a patch is automatically approved. You can enter any integer from zero (0) to 100.

• (Optional) **Compliance level**: The severity level you want to assign to patches approved by the baseline, such as High.

  **Note**
  If an approved patch is reported as missing, the option you choose in **Compliance level**, such as Critical or Medium, determines the severity of the compliance violation.

9. In the **Approval rules for Microsoft applications** section, use the fields to create one or more auto-approval rules.

• **Product family**: The general Microsoft product family for which you want to specify a rule, such as Office or Exchange Server.

• **Product**: The version of the application the approval rule applies to, such as Office 2016 or Active Directory Rights Management Services Client 2.0 2016. The default selection is All.

• **Classification**: The type of patches the approval rule applies to, such as CriticalUpdates. The default selection is All.

• **Severity**: The severity value of patches the rule applies to, such as Critical. The default selection is All.

• **Auto approval delay**: The number of days to wait after a patch is released before a patch is automatically approved. You can enter any integer from zero (0) to 100.

• (Optional) **Compliance level**: The severity level you want to assign to patches approved by the baseline, such as High.

  **Note**
  If an approved patch is reported as missing, the option you choose in **Compliance level**, such as Critical or Medium, determines the severity of the compliance violation.

10. If you want to explicitly approve any patches in addition to those meeting your approval rules, do the following in the **Patch exceptions** section:

• For **Approved patches**, enter a comma-separated list of the patches you want to approve.

  **Note**
  For information about accepted formats for lists of approved patches and rejected patches, see About Package Name Formats for Approved and Rejected Patch Lists (p. 715).

• (Optional) For **Approved patches compliance level**, assign a compliance level to the patches in the list.

11. If you want to explicitly reject any patches that otherwise meet your approval rules, do the following in the **Patch exceptions** section:

• For **Rejected patches**, enter a comma-separated list of the patches you want to reject.

  **Note**
  For information about accepted formats for lists of approved patches and rejected patches, see About Package Name Formats for Approved and Rejected Patch Lists (p. 715).

• For **Rejected patches action**, select the action for Patch Manager to take on patches included in the **Rejected patches** list.

  • **Allow as dependency**: A package in the **Rejected patches** list is installed only if it is a dependency of another package. It is considered compliant with the patch baseline and its status is reported as InstalledOther. This is the default action if no option is specified.

  • **Block**: Packages in the **Rejected patches** list, and packages that include them as dependencies, are not installed under any circumstances. If a package was installed before it was added to the
Rejected patches list, it is considered noncompliant with the patch baseline and its status is reported as InstalledRejected.

To create a custom patch baseline (Linux)

2. In the navigation pane, choose Patch Manager.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Patch Manager.
3. In the list of patch baselines, choose the name of a predefined patch baseline for the operating system you want to patch.
4. Choose the Approval rules tab.

   If the auto-approval rules are acceptable for your instances, then you can skip to the next procedure, Create a Patch Group (p. 728).
   -or-
   To create a custom patch baseline, in the navigation pane, choose Patch Manager, and then choose Create patch baseline.
5. For Name, enter a name for your new patch baseline, for example, MyRHELPatchBaseline.
6. (Optional) Enter a description for this patch baseline.
7. For Operating system, choose an operating system, for example, Red Hat Enterprise Linux.
8. If you want to begin using this patch baseline as the default for the selected operating system as soon as you create it, check the Make this the default patch baseline for the selected operating system box.

   For information about setting an existing patch baseline as the default, see Set an Existing Patch Baseline as the Default (p. 728).
9. In the Approval rules for operating-system section, use the fields to create one or more auto-approval rules.

   - Product: The version of the operating systems the approval rule applies to, such as RedhatEnterpriseLinux7.4. The default selection is All.
   - Classification: The type of patches the approval rule applies to, such as Security. The default selection is All.
   - Severity: The severity value of patches the rule is to apply to, such as Critical. The default selection is All.
   - Auto approval delay: The number of days to wait after a patch is released before a patch is automatically approved. You can enter any integer from zero (0) to 100.
   - (Optional) Compliance level: The severity level you want to assign to patches approved by the baseline, such as High.

   **Note**
   If an approved patch is reported as missing, the option you choose in Compliance level, such as Critical or Medium, determines the severity of the compliance violation.

   - Include non-security updates: Select the check box to install nonsecurity Linux operating system patches made available in the source repository, in addition to the security-related patches.

   **Note**
   For SUSE Linux Enterprise Server, (SLES) it isn't necessary to select the check box because patches for security and nonsecurity issues are installed by default on SLES.
For more information, see the content for SLES in How Security Patches Are Selected (p. 689).

For more information about working with approval rules in a custom patch baseline, see About Custom Baselines (p. 714).

10. If you want to explicitly approve any patches in addition to those meeting your approval rules, do the following in the Patch exceptions section:

• For **Approved patches**, enter a comma-separated list of the patches you want to approve.

  **Note**
  For information about accepted formats for lists of approved patches and rejected patches, see About Package Name Formats for Approved and Rejected Patch Lists (p. 715).

• (Optional) For **Approved patches compliance level**, assign a compliance level to the patches in the list.

• If any approved patches you specify aren't related to security, select the **Approved patches include non-security updates** box for these patches to be installed on your Linux operating system as well.

11. If you want to explicitly reject any patches that otherwise meet your approval rules, do the following in the Patch exceptions section:

• For **Rejected patches**, enter a comma-separated list of the patches you want to reject.

  **Note**
  For information about accepted formats for lists of approved patches and rejected patches, see About Package Name Formats for Approved and Rejected Patch Lists (p. 715).

• For **Rejected patches action**, select the action for Patch Manager to take on patches included in the Rejected patches list.

  • **Allow as dependency**: A package in the Rejected patches list is installed only if it is a dependency of another package. It is considered compliant with the patch baseline and its status is reported as InstalledOther. This is the default action if no option is specified.

  • **Block**: Packages in the Rejected patches list, and packages that include them as dependencies, are not installed under any circumstances. If a package was installed before it was added to the Rejected patches list, it is considered noncompliant with the patch baseline and its status is reported as InstalledRejected.

12. (Optional) If you want to specify alternative patch repositories for different versions of an operating system, such as AmazonLinux2016.03 and AmazonLinux2017.09, do the following for each product in the Patch sources section:

• In **Name**, enter a name to help you identify the source configuration.

• In **Product**, select the version of the operating systems the patch source repository is for, such as RedhatEnterpriseLinux7.4.

• In **Configuration**, enter the value of the yum repository configuration to use. For example:

```
[main]
cachedir=/var/cache/yum/$basesearch$releasever
keepcache=0
debuglevel=2
```

Choose **Add another source** to specify a source repository for each additional operating system version, up to a maximum of 20.
For more information about alternative source patch repositories, see How to Specify an Alternative Patch Source Repository (Linux) (p. 691).

13. (Optional) For Manage tags, apply one or more tag key name/value pairs to the patch baseline.

Tags are optional metadata that you assign to a resource. Tags enable you to categorize a resource in different ways, such as by purpose, owner, or environment. For example, you might want to tag a patch baseline to identify the severity level of patches it specifies and the operating system family it applies to. In this case, you could specify tags similar to the following key name/value pairs:

- Key=PatchSeverity,Value=Critical
- Key=OS,Value=Windows

14. Choose Create patch baseline.

Set an Existing Patch Baseline as the Default

When you create a custom patch baseline, you can set the baseline as the default for the associated operating system type as soon as you create it. For information, see Create a Custom Patch Baseline (p. 724).

You can also set an existing patch baseline as the default for an operating system type.

To set a patch baseline as the default

2. In the navigation pane, choose Patch Manager.

- or-

If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Patch Manager.
3. In the patch baselines list, choose the button of a patch baseline that is not currently set as the default for an operating system type.

   Tip
   The Default baseline column indicates which baselines are currently set as the defaults.

4. In the Actions menu, choose Set default patch baseline.
5. In the confirmation dialog box, choose Set default.

Create a Patch Group

To help you organize your patching efforts, we recommend that you add instances to patch groups by using tags. Patch groups require use of the tag key Patch Group. You can specify any value, but the tag key must be Patch Group. For more information about patch groups, see About Patch Groups (p. 717).

After you group your instances using tags, you must add the patch group value to a patch baseline. By registering the patch group with a patch baseline, you ensure that the correct patches are installed during the patching operation. For more information, see the next procedure Add a Patch Group to a Patch Baseline (p. 730).

Add EC2 Instances to a Patch Group Using Tags

For EC2 instances, you can add tags by using the AWS Systems Manager console, the Amazon EC2 console, the AWS CLI command create-tags, or the API action CreateTags.
To add EC2 instances to a patch group (AWS Systems Manager console)

2. In the navigation pane, choose Managed Instances.
3. In the Managed instances list, choose a managed EC2 instance that you want to configure for patching.
4. Choose View details.
5. Select the Tags tab, then choose Edit.
6. In the left column, type Patch Group.
7. In the right column, enter a value that helps you understand which instances will be patched.
8. Choose Save.
9. Repeat this procedure to add other managed instances to the same patch group.

To add EC2 instances to a patch group (Amazon EC2 console)

1. Open the Amazon EC2 console, and then choose Instances in the navigation pane.
2. In the list of instances, choose an instance that you want to configure for patching.
3. In the Actions menu, choose Instance Settings, Add/Edit Tags.
4. If the instance already has one or more tags applied, choose Create Tag.
5. For Key, type Patch Group.
6. For Value, enter a value that helps you understand which instances will be patched.
7. Choose Save.
8. Repeat this procedure to add other instances to the same patch group.

To add EC2 instances to a patch group (AWS CLI)

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to add the Patch Group tag to an EC2 instance.

   ```bash
   aws ec2 create-tags --resources "i-1234567890abcdef0" --tags "Key=Patch Group,Value=GroupValue"
   ```

Add Managed Instances to a Patch Group Using Tags

For hybrid managed instances (mi-*), you can add tags by using the AWS Systems Manager console, the AWS CLI command add-tags-to-resource, or the API action AddTagsToResource. You cannot add tags for hybrid managed instances using the Amazon EC2 console.

To add managed instances to a patch group (AWS Systems Manager console)

2. In the navigation pane, choose Managed Instances.
3. In the Managed instances list, choose a managed instance that you want to configure for patching.
4. Choose View details.
5. Select the Tags tab, then choose Edit.
6. In the left column, type Patch Group.
7. In the right column, enter a value that helps you understand which instances will be patched.
8. Choose Save.
9. Repeat this procedure to add other managed instances to the same patch group.

To add managed instances to a patch group (AWS CLI)

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to add the Patch Group tag to a managed instance.

   ```bash
   aws ssm add-tags-to-resource --resource-type "ManagedInstance" --resource-id "mi-0123456789abcdefg" --tags "Key=Patch Group,Value=GroupValue"
   ```

Add a Patch Group to a Patch Baseline

To associate a specific patch baseline with your instances, you must add the patch group value to the patch baseline. By registering the patch group with a patch baseline, you can ensure that the correct patches are installed during a patching operation. For more information about patch groups, see About Patch Groups (p. 717).

To add a patch group to a patch baseline (Console)

2. In the navigation pane, choose Patch Manager.
3. In the Patch Baselines list, choose the patch baseline you want to configure for your patch group.
4. Choose Actions, then Modify patch groups.
5. Enter the tag value you added to your managed instances in the previous section, then choose Add.

To add a patch group to a patch baseline (AWS CLI)

1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to associate a Patch Group tag value to the specified patch baseline.

   ```bash
   aws ssm register-patch-baseline-for-patch-group --baseline-id "pb-0123456789abcdef0" --patch-group "Development"
   ```

   The system returns information like the following:

   ```json
   {
     "PatchGroup": "Development",
     "BaselineId": "pb-0123456789abcdef0"
   }
   ```

Create a Maintenance Window for Patching

**Important**
You can continue to use this legacy topic to create a maintenance window for patching. However, we recommend using the Configure patching page instead. For more information, see Create a Patching Configuration (Console) (p. 732).
To minimize the impact on your server availability, we recommend that you configure a maintenance window to run patching during times that won’t interrupt your business operations. For more information about maintenance windows, see AWS Systems Manager Maintenance Windows (p. 444).

You must configure roles and permissions for Maintenance Windows before beginning this procedure. For more information, see Controlling Access to Maintenance Windows (p. 445).

To create a maintenance window for patching

2. In the navigation pane, choose Maintenance Windows.
   - or -
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Maintenance Windows.
3. Choose Create maintenance window.
4. For Name, enter a name that designates this as a maintenance window for patching critical and important updates.
5. In the top of the Schedule section, choose the schedule options you want.
6. For Duration, type the number of hours you want the maintenance window to be active.
7. For Stop initiating tasks, type the number of hours before the maintenance window duration ends that you want the system to stop initiating new tasks.
8. Choose Create maintenance window.
9. In the maintenance windows list, choose the maintenance window you just created, and then choose Actions, Register targets.
10. (Optional) In the Maintenance window target details section, provide a name, a description, and owner information (your name or alias) for this target.
11. For Targets, choose Specifying tags.
12. For Tag, enter a tag key and a tag value to identify the instances to register with the maintenance window.
13. Choose Register target. The system creates a maintenance window target.
14. In the details page of the maintenance window you created, choose Actions, Register run command task.
15. (Optional) For Maintenance window task details, provide a name and description for this task.
16. For Command document, choose AWS-RunPatchBaseline.
17. For Task priority, choose a priority. One is the highest priority.
18. For Targets, under Target by, choose the maintenance window target you created earlier in this procedure.
19. (Optional) For Rate control:
   - For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.
   
   **Note**
   If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.
   - For Error threshold, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then
Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

20. For **Role**, enter the ARN of an IAM role to which the `AmazonSSMMaintenanceWindowRole` is attached. For more information, see Controlling Access to Maintenance Windows (p. 445).

21. In the **Output options** section, if you want to save the command output to a file, select the **Write command output to an Amazon S3 bucket**. Type the bucket and prefix (folder) names in the boxes.

   **Note**
   The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

22. In the **SNS Notifications** section, if you want notifications sent about the status of the command execution, select the **Enable SNS notifications** check box.

   For more information about configuring Amazon SNS notifications for Run Command, see Configuring Amazon SNS Notifications for AWS Systems Manager (p. 896).

23. For **Parameters**:
   - For **Operation**, choose **Scan** to scan for missing patches, or choose **Install** to scan for and install missing patches.

      **Note**
      The **Install** operation causes the instance to reboot (if patches are installed). The **Scan** operations does not cause a reboot.

   - You don’t need to enter anything in the **Snapshot Id** field. This system automatically generates and provides this parameter.

   - (Optional) For **Comment**, enter a tracking note or reminder about this command.

   - For **Timeout (seconds)**, enter the number of seconds the system should wait for the operation to finish before it is considered unsuccessful.

24. Choose **Register run command task**.

After the maintenance window task completes, you can view patch compliance details in the Amazon EC2 console on the **Managed Instances** page. In the filter bar, use the **AWS:PatchSummary** and **AWS:ComplianceItem** filters.

   **Note**
   You can save your query by bookmarking the URL after you specify the filters.

You can also drill down on a specific instance by choosing the instance in the **Managed Instances** page, and then choose the **Patch** tab. You can also use the *DescribePatchGroupState* and *DescribeInstancePatchStatesForPatchGroup* APIs to view compliance details. For information about patch compliance data, see About Patch Compliance (p. 508).

### Create a Patching Configuration (Console)

A patching configuration defines a unique patching operation. The configuration specifies the instances for patching, which patch baseline is to be applied, the schedule for patching, and the maintenance window that the configuration is to be associated with.

**Note**
Most patching use cases benefit from patching instances on a schedule with a maintenance window, but you can also run a one-time patching operation manually without a maintenance window.

To minimize the impact on your server availability, we recommend that you configure a maintenance window to run patching during times that won’t interrupt your business operations. For more information about maintenance windows, see AWS Systems Manager Maintenance Windows (p. 444).
If you plan to add the patching configuration to a maintenance window, you must first configure roles and permissions for Maintenance Windows before beginning this procedure. For more information, see Controlling Access to Maintenance Windows (p. 445).

To create a patching configuration (console)

2. In the navigation pane, choose Patch Manager.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (Ξ) to open the navigation pane, and then choose Patch Manager.
3. Choose Configure patching.
4. In the Instances to patch section, choose one of the following:
   - **Enter instance tags**: Enter a tag key and optional tag value to specify the tagged instance to patch. Click Add to include additional tagged instances.
   - **Select a patch group**: Choose the name of an existing patch group that includes the instances you want to patch.

   **Note**
   The Select a patch group list displays only those patch groups that are attached to, or registered with, a patch baseline. You can register a patch group with a patch baseline in one of two ways. You can use the register-patch-baseline-for-patch-group CLI command, or you can view a patch baseline in the Systems Manager console and select Modify patch groups from the Actions menu.
   Alternatively, to specify an existing patch group that is not registered with the patch baseline, choose Enter instance tag, type Patch Group as the tag key and the patch group's name as the tag value.
   - **Select instances manually**: Select the check box next to the name of each instance you want to patch.
5. In the Patching schedule section, choose one of the following:
   - **Select an existing maintenance window**: From the list, select a maintenance window you have already created, and then continue to step 7.
   - **Schedule in a new maintenance window**: Create a new maintenance window to associate with this patching configuration.
   - **Skip scheduling and patch now**: Run a one-time manual patching operation without a schedule or maintenance window. Continue to step 7.
6. If you chose Schedule in a new maintenance window in step 5, then under How do you want to specify a patching schedule?, do the following:
   - **Under How do you want to specify a maintenance window schedule?**, choose a schedule builder or expression option.
   - **Under maintenance window run frequency**, specify how frequently the maintenance window runs. If you are specifying a CRON/Rate expression, see Reference: Cron and Rate Expressions for Systems Manager (p. 936) for more information.
   - **For Maintenance window duration**, specify the number of hours the maintenance window is permitted to run before timing out.
   - **For Maintenance window name**, enter a name to identify the maintenance window.
7. In the Patching operation area, choose whether to scan instances for missing patches and apply them as needed, or to scan only and generate a list of missing patches.
8. (Optional) In the **Additional settings** area, if any target instances you selected belong to a patch group, you can change the patch baseline that is associated with the patch group. To do so, follow these steps:

1. Choose the button next to the name of the associated patch baseline.
2. Choose **Change patch baseline registration**.
3. Choose the patch baselines you want to specify for this configuration by clearing and selecting check boxes next to the patch baseline names.
4. Choose **Close**.

**Note**
For any target instances you selected that are not part of a patch group, Patch Manager instead uses the default patch baseline for the operating system type of the instance.

9. Choose **Configure patching**.

If you created a new maintenance window for this patching configuration, you can add to it or make patching configuration changes in the **Maintenance Windows** area of Systems Manager. For more information, see Update or Delete a Maintenance Window (Console) (p. 460).

**Update or Delete a Patch Baseline (Console)**

You can update or delete a custom patch baseline that you have created. When you update a patch baseline, you can change its name or description, its approval rules, and its exceptions for approved and rejected patches. You can also update the tags that are applied to the patch baseline. You can't change the operating system type that a patch baseline has been created for, and you can't make changes to a predefined patch baseline provided by AWS.

**Update or Delete a Patch Baseline (Console)**

Follow these steps to update or delete a patch baseline.

**To update or delete a patch baseline (console)**

2. In the navigation pane, choose **Patch Manager**.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (☰) to open the navigation pane, and then choose **Patch Manager**.
3. Choose the patch baseline that you want to update or delete, and then do one of the following:

   - To remove the patch baseline from your account, choose **Delete**. The system prompts you to confirm your actions.
   - To make changes to the patch baseline name or description, approval rules, or patch exceptions, choose **Edit**. On the **Edit patch baseline** page, change the values and options that you want, and then choose **Save changes**.
   - To add, change, or delete tags applied to the patch baseline, choose the **Tags** tab, and then choose **Edit tags**. On the **Edit patch baseline tags** page, make updates to the patch baseline tags, and then choose **Save changes**.

For information about the configuration choices you can make, see Create a Custom Patch Baseline (p. 724).
Tutorial: Patch a Server Environment (AWS CLI)

The following procedure illustrates how a user might patch a server environment by using a custom patch baseline, patch groups, and a maintenance window.

**Note**

You must configure roles and permissions for the Maintenance Windows capability before you begin. For more information, see Controlling Access to Maintenance Windows (p. 445).

For a sample of other AWS CLI commands you might use for your Patch Manager configuration tasks, see AWS CLI Commands for Patch Manager (p. 740).

**Before You Begin**

Install or update the SSM Agent on your instances. To patch Linux instances, your instances must be running SSM Agent version 2.0.834.0 or later. For information about updating the agent, see the section titled Example: Update the SSM Agent in Running Commands from the Console (p. 622).

In addition, the following walkthrough runs patching during a maintenance window. You must configure roles and permissions for the Maintenance Windows capability before you begin. For more information, see Controlling Access to Maintenance Windows (p. 445).

**To configure Patch Manager and patch instances (AWS CLI)**

1. Install and configure the AWS CLI, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58).

2. **(Windows)** Run the following command to create a patch baseline named "Production-Baseline" that approves patches for a production environment seven days after they are released. In addition, the patch baseline has been tagged to indicate that it is for a production environment.

   ```bash
   aws ssm create-patch-baseline --name "Production-Baseline" --operating-system "WINDOWS" --tags "Key=Environment,Value=Production" --approval-rules "PatchRules=[{PatchFilterGroup={PatchFilters=[{Key=MSRC_SEVERITY,Values=[Critical,Important]}, {Key=CLASSIFICATION,Values=[SecurityUpdates,Updates,UpdateRollups,CriticalUpdates]}],ApproveAfterDays=7}]",ApproveAfterDays=7,EnableNonSecurity=true"
   --description "Baseline containing all updates approved for production systems"
   ```

   (Linux) Run the following command to create a patch baseline named "Production-Baseline" that approves patches for a production environment seven days after they are released, including both security and nonsecurity patches included in the source repository. In addition, the patch baseline has been tagged to indicate that it is for a production environment.

   ```bash
   aws ssm create-patch-baseline --name "Production-Baseline" --operating-system "AMAZON_LINUX_2" --tags "Key=Environment,Value=Production" --approval-rules "PatchRules=[{PatchFilterGroup={PatchFilters=[{Key=PRODUCT,Values=[AmazonLinux2,AmazonLinux2.0]}, {Key=SEVERITY,Values=[Critical,Important]}],},ApproveAfterDays=7,EnableNonSecurity=true}]",ApproveAfterDays=7,EnableNonSecurity=true"
   --description "Baseline containing all updates approved for production systems"
   ```

   The system returns information like the following.

   ```json
   {
   "BaselineId" : "pb-0c10e65780EXAMPLE"
   }
   ```

3. Run the following commands to register the "Production-Baseline" patch baseline for three patch groups named "Production," "Database Servers," and "Front-End Patch Group."
aws ssm register-patch-baseline-for-patch-group --baseline-id pb-0c10e65780EXAMPLE --patch-group "Production"

The system returns information like the following.

```json
{
  "PatchGroup":"Production",
  "BaselineId":"pb-0c10e65780EXAMPLE"
}
```

aws ssm register-patch-baseline-for-patch-group --baseline-id pb-0c10e65780EXAMPLE --patch-group "Database Servers"

The system returns information like the following.

```json
{
  "PatchGroup":"Database Servers",
  "BaselineId":"pb-0c10e65780EXAMPLE"
}
```

4. Run the following commands to create two maintenance windows for the production servers. The first window run every Tuesday at 10 PM. The second window runs every Saturday at 10 PM. In addition, the maintenance window has been tagged to indicate that it is for a production environment.

```bash
aws ssm create-maintenance-window --name "Production-Tuesdays" --tags "Key=Environment,Value=Production" --schedule "cron(0 0 22 ? * TUE *)" --duration 1 --cutoff 0 --no-allow-unassociated-targets
```

The system returns information like the following.

```json
{
  "WindowId":"mw-0c66948c711a3b5bd"
}
```

```bash
aws ssm create-maintenance-window --name "Production-Saturdays" --tags "Key=Environment,Value=Production" --schedule "cron(0 0 22 ? * SAT *)" --duration 2 --cutoff 0 --no-allow-unassociated-targets
```

The system returns information like the following.

```json
{
  "WindowId":"mw-09e2a75baadd84e85"
}
```

5. Run the following commands to register the Production servers with the two production maintenance windows.

```bash
aws ssm register-target-with-maintenance-window --window-id mw-0c66948c711a3b5bd --targets "Key=tag:Patch Group,Values=Production" --owner-information "Production servers" --resource-type "INSTANCE"
```

The system returns information like the following.

```json
```
aws ssm register-target-with-maintenance-window --window-id mw-0c66948c711a3b5bd --targets "Key=tag:Patch Group,Values=Database Servers" --owner-information "Database servers" --resource-type "INSTANCE"

The system returns information like the following.

```json
{
  "WindowTargetId": "557e7b3a-bc2f-48dd-ae05-e282b5b20760"
}
```

aws ssm register-target-with-maintenance-window --window-id mw-09e2a75baadd84e85 --targets "Key=tag:Patch Group,Values=Production" --owner-information "Production servers" --resource-type "INSTANCE"

The system returns information like the following.

```json
{
  "WindowTargetId": "767b6508-f4ac-445e-b6fe-758cc912e55c"
}
```

aws ssm register-target-with-maintenance-window --window-id mw-09e2a75baadd84e85 --targets "Key=tag:Patch Group,Values=Database Servers" --owner-information "Database servers" --resource-type "INSTANCE"

The system returns information like the following.

```json
{
  "WindowTargetId": "faa01c41-1d57-496c-ba77-ff9cadba4b7d"
}
```

aws ssm register-task-with-maintenance-window --window-id mw-0c66948c711a3b5bd --targets "Key=WindowTargetIds,Values=557e7b3a-bc2f-48dd-ae05-e282b5b20760" --task-arn "AWS-RunPatchBaseline" --service-role-arn "arn:aws:iam::12345678:role/MW-Role" --task-type "RUN_COMMAND" --max-concurrency 2 --max-errors 1 --priority 1 --task-parameters '{"Operation":{"Values":["Scan"]}

The system returns information like the following.

```json
{
  "WindowTaskId": "968e3b17-8591-4fb2-932a-b62389d6f635"
}
```

aws ssm register-task-with-maintenance-window --window-id mw-0c66948c711a3b5bd --targets "Key=WindowTargetIds,Values=767b6508-f4ac-445e-b6fe-758cc912e55c" --task-arn "AWS-RunPatchBaseline" --service-role-arn "arn:aws:iam::12345678:role/MW-Role" --task-
type "RUN_COMMAND" --max-concurrency 2 --max-errors 1 --priority 5 --task-parameters '{"Operation":{"Values":[]}}'

The system returns information like the following.

```
{
  "WindowTaskId":"09f2e873-a3a7-443f-ba0a-05cf4de5a1c7"
}
```

7. Run the following commands to register a patch task that installs missing updates on the productions servers in the second maintenance window.

```
aws ssm register-task-with-maintenance-window --window-id mw-09e2a75baadd84e85 --targets "Key=WindowTargetIds,Values=557e7b3a-bc2f-48dd-ae05-e282b5b20760" --task-arn "AWS-RunPatchBaseline" --service-role-arn "arn:aws:iam::12345678:role/MW-Role" --task-type "RUN_COMMAND" --max-concurrency 2 --max-errors 1 --priority 1 --task-parameters '{"Operation":{"Values":[]}}'
```

The system returns information like the following.

```
{
  "WindowTaskId":"968e3b17-8591-4fb2-932a-b62389d6f635"
}
```

```
aws ssm register-task-with-maintenance-window --window-id mw-09e2a75baadd84e85 --targets "Key=WindowTargetIds,Values=767b6508-f4ac-445e-b6fe-758cc91e55c" --task-arn "AWS-RunPatchBaseline" --service-role-arn "arn:aws:iam::12345678:role/MW-Role" --task-type "RUN_COMMAND" --max-concurrency 2 --max-errors 1 --priority 5 --task-parameters '{"Operation":{"Values":[]}}'
```

The system returns information like the following.

```
{
  "WindowTaskId":"09f2e873-a3a7-443f-ba0a-05cf4de5a1c7"
}
```

The high-level patch compliance summary gives you the number of instances with patches in the following states for a patch group: "NotApplicable," "Missing," "Failed," "InstalledOther," and "Installed."

```
aws ssm describe-patch-group-state --patch-group "Production"
```

The system returns information like the following.

```
{
  "InstancesWithNotApplicablePatches":0,
  "InstancesWithMissingPatches":0,
  "InstancesWithFailedPatches":1,
  "InstancesWithInstalledOtherPatches":4,
  "Instances":4,
  "InstancesWithInstalledPatches":3
}
```

8. Run the following command to get patch summary states per-instance for a patch group. The per-instance summary gives you a number of patches in the following states per instance for a patch group: "NotApplicable," "Missing," "Failed," "InstalledOther," and "Installed."

```
aws ssm describe-patch-group-state --patch-group "Production"
```

The system returns information like the following.

```
{
  "InstancesWithNotApplicablePatches":0,
  "InstancesWithMissingPatches":0,
  "InstancesWithFailedPatches":1,
  "InstancesWithInstalledOtherPatches":4,
  "Instances":4,
  "InstancesWithInstalledPatches":3
}
```

9. Run the following command to get patch summary states per-instance for a patch group. The per-instance summary gives you a number of patches in the following states per instance for a patch group: "NotApplicable," "Missing," "Failed," "InstalledOther," and "Installed."
aws ssm describe-instance-patch-states-for-patch-group --patch-group "Production"

The system returns information like the following.

```
{
  "InstancePatchStates": [
    {
      "OperationStartTime": 1481259600.0,
      "FailedCount": 0,
      "InstanceId": "i-08ee91c0b17045407",
      "OwnerInformation": "",
      "NotApplicableCount": 2077,
      "OperationEndTime": 1481259757.0,
      "PatchGroup": "Production",
      "InstalledOtherCount": 106,
      "MissingCount": 7,
      "SnapshotId": "b0e65479-79be-4288-9f88-81c96bc3ed5e",
      "Operation": "Scan",
      "InstalledCount": 72
    },
    {
      "OperationStartTime": 1481259602.0,
      "FailedCount": 0,
      "InstanceId": "i-0fff3aab684d01b23",
      "OwnerInformation": "",
      "NotApplicableCount": 2692,
      "OperationEndTime": 1481259613.0,
      "PatchGroup": "Production",
      "InstalledOtherCount": 3,
      "MissingCount": 1,
      "SnapshotId": "b0e65479-79be-4288-9f88-81c96bc3ed5e",
      "Operation": "Scan",
      "InstalledCount": 1
    },
    {
      "OperationStartTime": 1481259547.0,
      "FailedCount": 0,
      "InstanceId": "i-0a00def7faa94f1dc",
      "OwnerInformation": "",
      "NotApplicableCount": 1859,
      "OperationEndTime": 1481259592.0,
      "PatchGroup": "Production",
      "InstalledOtherCount": 116,
      "MissingCount": 1,
      "SnapshotId": "b0e65479-79be-4288-9f88-81c96bc3ed5e",
      "Operation": "Scan",
      "InstalledCount": 110
    },
    {
      "OperationStartTime": 1481259549.0,
      "FailedCount": 0,
      "InstanceId": "i-09a618aec652973a9",
      "OwnerInformation": "",
      "NotApplicableCount": 1637,
      "OperationEndTime": 1481259837.0,
      "PatchGroup": "Production",
      "InstalledOtherCount": 108,
      "MissingCount": 2,
      "SnapshotId": "b0e65479-79be-4288-9f88-81c96bc3ed5e",
      "Operation": "Scan",
      "InstalledCount": 141
    }
  ]
}
```
AWS CLI Commands for Patch Manager

The section includes examples of CLI commands that you can use to perform Patch Manager configuration tasks.

For an illustration of using the AWS CLI to patch a server environment by using a custom patch baseline, see Tutorial: Patch a Server Environment (AWS CLI) (p. 735).

For more information about using the CLI for AWS Systems Manager tasks, see the AWS Systems Manager section of the AWS CLI Command Reference.

Sample commands

- Create a patch baseline (p. 740)
- Create a patch baseline with custom repositories for different OS versions (p. 741)
- Update a patch baseline (p. 742)
- Rename a patch baseline (p. 743)
- Delete a patch baseline (p. 744)
- List all patch baselines (p. 744)
- List all AWS-provided patch baselines (p. 745)
- List my patch baselines (p. 745)
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- Get all patches for Windows Server 2012 that have a MSRC severity of Critical (p. 749)
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- Get patch compliance details for an instance (p. 752)

Create a patch baseline

The following command creates a patch baseline that approves all critical and important security updates for Windows Server 2012 R2 five days after they are released. In addition, the patch baseline has been tagged to indicate that it is for a production environment.

```
aws ssm create-patch-baseline --name "Windows-Server-2012R2"
--tags "Key=Environment,Value=Production" --approval-rules
"PatchRules=[{PatchFilterGroup={PatchFilters=[{Key=MSRC_SEVERITY,Values=[Important,Critical]},
{Key=CLASSIFICATION,Values=SecurityUpdates}]}},
```

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Create a patch baseline with custom repositories for different OS versions

Applies to Linux instances only. The following command shows how to specify the patch repository to use for a particular version of the Amazon Linux operating system. This sample uses a source repository enabled by default on Amazon Linux 2017.09, but could be adapted to a different source repository that you have configured for an instance.

**Note**

To better demonstrate this more complex command, we are using the `--cli-input-json` option with additional options stored an external JSON file.

1. Create a JSON file with a name like `my-patch-repository.json` and add the following content to it:

```json
{
    "Description": "My patch repository for Amazon Linux 2017.09",
    "Name": "Amazon-Linux-2017.09",
    "OperatingSystem": "AMAZON_LINUX",
    "ApprovalRules": {
        "PatchRules": [
            {
                "ApproveAfterDays": 7,
                "EnableNonSecurity": true,
                "PatchFilterGroup": {
                    "PatchFilters": [
                        {"Key": "SEVERITY",
                            "Values": ["Important", "Critical"]},
                        {"Key": "CLASSIFICATION",
                            "Values": ["Security", "Bugfix"]},
                        {"Key": "PRODUCT",
                            "Values": ["AmazonLinux2017.09"]}
                    ]
                }
            }
        ],
        "Sources": [null]
    }
}
```
In the directory where you saved the file, run the following command:

```
aws ssm create-patch-baseline --cli-input-json file://my-patch-repository.json
```

The system returns information like the following:

```
{
    "BaselineId": "pb-12343b962ba63wxya"
}
```

**Update a patch baseline**

The following command adds two patches as rejected and one patch as approved to an existing patch baseline.

**Note**

For information about accepted formats for lists of approved patches and rejected patches, see About Package Name Formats for Approved and Rejected Patch Lists (p. 715).

```
aws ssm update-patch-baseline --baseline-id pb-0c10e65780EXAMPLE --rejected-patches "KB2032276" "MS10-048" --approved-patches "KB2124261"
```

The system returns information like the following:

```
{
    "BaselineId":"pb-0c10e65780EXAMPLE",
    "Name":"Windows-Server-2012R2",
    "RejectedPatches": ["KB2032276", "MS10-048"],
    "GlobalFilters":{ "PatchFilters":[] },
    "ApprovalRules":{ "PatchRules":[]
        { "PatchFilterGroup":{ "PatchFilters":[]
            { "Values": ["Important", "Critical"]
```

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Rename a patch baseline

```bash
aws ssm update-patch-baseline --baseline-id pb-0c10e65780EXAMPLE --name "Windows-Server-2012-R2-Important-and-Critical-Security-Updates"
```

The system returns information like the following.

```json
{
   "BaselineId":"pb-0c10e65780EXAMPLE",
   "Name":"Windows-Server-2012-R2-Important-and-Critical-Security-Updates",
   "RejectedPatches":[
      "KB2032276",
      "MS10-048"
   ],
   "GlobalFilters":{
      "PatchFilters":[]
   },
   "ApprovalRules":{
      "PatchRules":{
         "PatchFilterGroup":{
            "PatchFilters":{
               "Values":[
                  "Important",
                  "Critical"
               ],
               "Key":"MSRC_SEVERITY"
            },
            "Values":[
               "SecurityUpdates"
            ]
         }
      }
   }
}
```
Delete a patch baseline

aws ssm delete-patch-baseline --baseline-id "pb-0c10e65780EXAMPLE"

The system returns information like the following.

```
{
    "BaselineId":"pb-0c10e65780EXAMPLE"
}
```

List all patch baselines

aws ssm describe-patch-baselines

The system returns information like the following.

```
{
    "BaselineIdentities":[
        {
            "BaselineName":"AWS-DefaultPatchBaseline",
            "DefaultBaseline":true,
            "BaselineDescription":"Default Patch Baseline Provided by AWS.",
            "BaselineId":"arn:aws:ssm:us-east-2:111122223333:patchbaseline/pb-0c10e65780EXAMPLE"
        },
        {
            "BaselineName":"Windows-Server-2012R2",
            "DefaultBaseline":false,
            "BaselineDescription":"Windows Server 2012 R2, Important and Critical security updates",
            "BaselineId":"pb-0c10e65780EXAMPLE"
        }
    ]
}
```

Here is another command that lists all patch baselines in a Region.
aws ssm describe-patch-baselines --region us-east-2 --filters "Key=OWNER,Values=[All]"

The system returns information like the following.

```
{
  "BaselineIdentities": [
    {
      "BaselineName": "AWS-DefaultPatchBaseline",
      "DefaultBaseline": true,
      "BaselineDescription": "Default Patch Baseline Provided by AWS.",
      "BaselineId": "arn:aws:ssm:us-east-2:111122223333:patchbaseline/pb-0c10e65780EXAMPLE"
    },
    {
      "BaselineName": "Windows-Server-2012R2",
      "DefaultBaseline": false,
      "BaselineDescription": "Windows Server 2012 R2, Important and Critical security updates",
      "BaselineId": "pb-0c10e65780EXAMPLE"
    }
  ]
}
```

List all AWS-provided patch baselines

aws ssm describe-patch-baselines --region us-east-2 --filters "Key=OWNER,Values=[AWS]"

The system returns information like the following.

```
{
  "BaselineIdentities": [
    {
      "BaselineName": "AWS-DefaultPatchBaseline",
      "DefaultBaseline": true,
      "BaselineDescription": "Default Patch Baseline Provided by AWS.",
      "BaselineId": "arn:aws:ssm:us-east-2:111122223333:patchbaseline/pb-0c10e65780EXAMPLE"
    }
  ]
}
```

List my patch baselines

aws ssm describe-patch-baselines --region us-east-2 --filters "Key=OWNER,Values=[Self]"

The system returns information like the following.

```
{
  "BaselineIdentities": [
    {
      "BaselineName": "Windows-Server-2012R2",
      "DefaultBaseline": false,
      "BaselineDescription": "Windows Server 2012 R2, Important and Critical security updates",
      "BaselineId": "pb-0c10e65780EXAMPLE"
    }
  ]
}
```
Display a patch baseline

`aws ssm get-patch-baseline --baseline-id pb-0c10e65780EXAMPLE`

**Note**
For custom patch baselines, you can specify either the patch baseline ID or the full ARN. For AWS-provided patch baseline, you must specify the full ARN. For example, `arn:aws:ssm:us-east-1:075727635805:patchbaseline/pb-03e3f588ec25344c`.

The system returns information like the following.

```json
{
  "BaselineId":"pb-0c10e65780EXAMPLE",
  "Name":"Windows-Server-2012R2",
  "PatchGroups": [
    "Web Servers"
  ],
  "RejectedPatches": [
  ],
  "GlobalFilters": {
    "PatchFilters": [
    ]
  },
  "ApprovalRules": {
    "PatchRules": [
      {
        "PatchFilterGroup": {
          "PatchFilters": [
            {
              "Values": [
                "Important",
                "Critical"
              ],
              "Key": "MSRC_SEVERITY"
            },
            {
              "Values": [
                "SecurityUpdates"
              ],
              "Key": "CLASSIFICATION"
            },
            {
              "Values": [
                "WindowsServer2012R2"
              ],
              "Key": "PRODUCT"
            }
          ]
        },
        "ApproveAfterDays": 5
      }
    ],
    "ModifiedDate": 1480997823.81,
    "CreatedDate": 1480997823.81,
    "ApprovedPatches": [
    ],
    "Description": "Windows Server 2012 R2, Important and Critical security updates"
  }
}
```
Get the default patch baseline

```bash
aws ssm get-default-patch-baseline --region us-east-2
```

The system returns information like the following.

```json
{
  "BaselineId": "arn:aws:ssm:us-east-2:111122223333:patchbaseline/pb-0c10e65780EXAMPLE"
}
```

Set the default patch baseline

```bash
aws ssm register-default-patch-baseline --region us-east-2 --baseline-id "pb-0c10e65780EXAMPLE"
```

The system returns information like the following:

```json
{
  "BaselineId": "pb-0c10e65780EXAMPLE"
}
```

Register a patch group "Web Servers" with a patch baseline

```bash
aws ssm register-patch-baseline-for-patch-group --baseline-id "pb-0c10e65780EXAMPLE" --patch-group "Web Servers"
```

The system returns information like the following.

```json
{
  "PatchGroup": "Web Servers",
  "BaselineId": "pb-0c10e65780EXAMPLE"
}
```

Register a patch group "Backend" with the AWS-provided patch baseline

```bash
aws ssm register-patch-baseline-for-patch-group --region us-east-2 --baseline-id "arn:aws:ssm:us-east-2:111122223333:patchbaseline/pb-0c10e65780EXAMPLE" --patch-group "Backend"
```

The system returns information like the following.

```json
{
  "PatchGroup": "Backend",
  "BaselineId": "arn:aws:ssm:us-east-2:111122223333:patchbaseline/pb-0c10e65780EXAMPLE"
}
```

Display patch group registrations

```bash
aws ssm describe-patch-groups --region us-east-2
```

The system returns information like the following.
Deregister a patch group from a patch baseline

```bash
aws ssm deregister-patch-baseline-for-patch-group --region us-east-2 --patch-group "Production" --baseline-id "arn:aws:ssm:us-east-2:111122223333:patchbaseline/ pb-0c10e65780EXAMPLE"
```

The system returns information like the following.

```json
{
  "PatchGroup":"Production",
  "BaselineId":"arn:aws:ssm:us-east-2:111122223333:patchbaseline/pb-0c10e65780EXAMPLE"
}
```

Get all patches defined by a patch baseline

```bash
aws ssm describe-effective-patches-for-patch-baseline --region us-east-2 --baseline-id "pb-0c10e65780EXAMPLE"
```

The system returns information like the following.

```json
{
  "NextToken":"--token string truncated--",
  "EffectivePatches":[
    {
      "PatchStatus":{
        "ApprovalDate":1384711200.0,
        "DeploymentStatus":"APPROVED"
      },
      "Patch":{
        "ContentUrl":"https://support.microsoft.com/en-us/kb/2876331",
        "ProductFamily":"Windows",
        "Product":"WindowsServer2012R2",
        "Vendor":"Microsoft",
        "Description":"A security issue has been identified in a Microsoft software product that could affect your system. You can help protect your system by installing"
      }
    }
  ]
}
```
Get all patches for Windows Server 2012 that have a MSRC severity of Critical

```bash
aws ssm describe-available-patches --region us-east-2 --filters
Key=PRODUCT,Values=WindowsServer2012
Key=MSRC_SEVERITY,Values=Critical
```

The system returns information like the following.

```json
{
  "Patches": [
    {
      "ContentUrl": "https://support.microsoft.com/en-us/kb/2727528",
      "ProductFamily": "Windows",
      "Product": "WindowsServer2012",
      "Vendor": "Microsoft",
      "Description": "A security issue has been identified that could allow an unauthenticated remote attacker to compromise your system and gain control over it. You can help protect your system by installing this update from Microsoft. After you install this update, you may have to restart your system.",
      "Classification": "SecurityUpdates",
      "Title": "Security Update for Windows Server 2012 (KB2727528)"
    }
  ]
}---output truncated---
```
Get all available patches

aws ssm describe-available-patches --region us-east-2

The system returns information like the following.

```json
{
    "NextToken": "--token string truncated--",
    "Patches": [
        {
            "ContentUrl": "https://support.microsoft.com/en-us/kb/2032276",
            "ProductFamily": "Windows",
            "Product": "WindowsServer2008R2",
            "Vendor": "Microsoft",
            "Description": "A security issue has been identified that could allow an unauthenticated remote attacker to compromise your system and gain control over it. You can help protect your system by installing this update from Microsoft. After you install this update, you may have to restart your system."
        },
        {
            "ContentUrl": "https://support.microsoft.com/en-us/kb/2124261",
            "ProductFamily": "Windows",
            "Product": "Windows7",
            "Vendor": "Microsoft",
            "Description": "A security issue has been identified that could allow an unauthenticated remote attacker to compromise your system and gain control over it. You can help protect your system by installing this update from Microsoft. After you install this update, you may have to restart your system."
        }
    ]
}
```
Tag a patch baseline

```bash
aws ssm add-tags-to-resource --resource-type "PatchBaseline" --resource-id "pb-0c10e65780EXAMPLE" --tags "Key=Project,Value=Testing"
```

List the tags for a patch baseline

```bash
aws ssm list-tags-for-resource --resource-type "PatchBaseline" --resource-id "pb-0c10e65780EXAMPLE"
```

Remove a tag from a patch baseline

```bash
aws ssm remove-tags-from-resource --resource-type "PatchBaseline" --resource-id "pb-0c10e65780EXAMPLE" --tag-keys "Project"
```

Get patch summary states per-instance

The per-instance summary gives you a number of patches in the following states per instance: "NotApplicable", "Missing", "Failed", "InstalledOther" and "Installed".

```bash
aws ssm describe-instance-patch-states --instance-ids i-08ee91c0b17045407 i-09a618aec652973a9 i-0a00def7faa94f1c i-0fff3aab684d01b23
```

The system returns information like the following.

```json
{
    "InstancePatchStates": [
        {
            "OperationStartTime": "2016-12-09T05:00:00Z",
            "FailedCount": 0,
            "InstanceId": "i-08ee91c0b17045407",
            "OwnerInformation": "",
            "NotApplicableCount": 2077,
            "OperationEndTime": "2016-12-09T05:02:37Z",
            "PatchGroup": "Production",
            "InstalledOtherCount": 186,
            "MissingCount": 7,
            "SnapshotId": "b0e65479-79be-4288-9f88-81c96bc3ed5e",
            "Operation": "Scan",
            "InstalledCount": 72
        },
        {
            "OperationStartTime": "2016-12-09T04:59:09Z",
            "FailedCount": 0,
```
Get patch compliance details for an instance

aws ssm describe-instance-patches --instance-id i-08ee91c0b17045407

The system returns information like the following.

```json
{
    "NextToken": "--token string truncated--",
    "Patches": [
        {
            "KBId": "KB2919355",
            "Severity": "Critical",
            "Classification": "SecurityUpdates",
            "Title": "Windows 8.1 Update for x64-based Systems (KB2919355)",
            "State": "Installed",
            "InstalledTime": "2014-03-18T12:00:00Z"
        },
        {
            "KBId": "KB2977765",
            "Severity": "Important",
            "Classification": "SecurityUpdates",
            "Title": "Security Update for Microsoft .NET Framework 4.5.1 and 4.5.2 on Windows 8.1 and Windows Server 2012 R2 x64-based Systems (KB2977765)",
            "State": "Installed",
            "InstalledTime": "2014-10-15T12:00:00Z"
        },
        {
            "KBId": "KB2978126",
            "Severity": "Important",
            "Classification": "SecurityUpdates",
            "Title": "Security Update for Microsoft .NET Framework 4.5.1 and 4.5.2 on Windows 8.1 (KB2978126)",
            "State": "Installed",
            "InstalledTime": "2014-11-18T12:00:00Z"
        }
    ]
}
```

---output truncated---
After you create a package in Distributor, which creates an AWS Systems Manager document, you can install the package in one of the following ways.

- One time by using AWS Systems Manager Run Command (p. 615).
- On a schedule by using AWS Systems Manager State Manager (p. 648).

How Can Distributor Benefit my Organization?

Distributor offers these benefits:

- **One package, many platforms**
  
  One document can have attached ZIP files that are installed on different operating systems (such as Windows, Ubuntu Server, Debian, or Red Hat Enterprise Linux). For more information about supported platforms, see Supported Package Platforms and Architectures (p. 754).

- **Control package access across groups of managed instances**
  
  You can use Run Command or State Manager to control which of your managed instances get a package and which version of that package. Managed instances can be grouped by instance IDs, AWS account numbers, tags, or AWS Regions. You can use State Manager associations to deliver different versions of a package to different groups of instances.

- **Many AWS agent packages included and ready to use**
  
  Distributor includes many AWS agent packages that are ready for you to deploy to managed instances. Look for packages in the Distributor Packages list page that are published by Amazon. Examples include AmazonCloudWatchAgent and AmazonEC2HibernateAgent.

- **Automate deployment**
  
  To keep your environment current, use State Manager to schedule packages for automatic deployment on target instances when those instances are first launched.

Who Should Use Distributor?

- Any AWS customer who wants to create new or deploy existing software packages, including AWS-published packages, to multiple AWS Systems Manager managed instances at one time.
- Software developers who create software packages.
- Administrators who are responsible for keeping AWS Systems Manager managed instances current with the most up-to-date software packages.

What Are the Features of Distributor?

- **Deployment of packages to both Windows and Linux instances**
  
  Distributor lets you deploy software packages to Amazon EC2 Windows and Linux instances. For a list of supported instance operating system types, see the section called “Supported Package Platforms and Architectures” (p. 754).

- **Deploy packages one time, or on an automated schedule**
  
  You can choose to deploy packages one time, on a regular schedule, or whenever the default package version is changed to a different version.

- **Console, CLI, PowerShell, and SDK access to Distributor capabilities**
You can work with Distributor by using the AWS Systems Manager console, AWS CLI, AWS Tools for PowerShell, or the AWS SDK of your choice.

- **IAM access control**

  By using IAM policies, you can control which members of your organization can create, update, deploy, or delete packages or package versions. For example, you might want to give an administrator permissions to deploy packages, but not to change packages or create new package versions.

- **Logging and auditing capability support**

  You can audit and log Distributor user actions in your AWS account through integration with other AWS services. For more information, see Auditing and Logging Distributor Activity (p. 776).

### What Is a Package?

A *package* is a collection of installable software or assets that includes the following.

- A ZIP file of software per target operating system platform. Each ZIP file must include the following.
  - An **install** and an **uninstall** script. Windows-based instances require PowerShell scripts (scripts named `install.ps1` and `uninstall.ps1`). Linux-based instances require shell scripts (scripts named `install.sh` and `uninstall.sh`). SSM Agent reads and carries out the instructions in the **install** and **uninstall** scripts.
  - An executable file. SSM Agent must find this executable to install the package on target instances.
  - A JSON-formatted manifest file that describes the package contents. The manifest is not included in the ZIP file, but it is stored in the same Amazon S3 bucket as the ZIP files that form the package. The manifest identifies the package version and maps the ZIP files in the package to target instance attributes, such as operating system version or architecture. For information about how to create the manifest, see Step 2: Create the JSON Package Manifest (p. 760).

When you choose **Simple** package creation in the Distributor console, Distributor generates the installation and uninstallation scripts, file hashes, and the JSON package manifest for you, based on the software executable file name and target platforms and architectures.

### Supported Package Platforms and Architectures

Distributor supports package distribution to any release version of the following platforms that is supported as a Systems Manager managed instance. A version value must match the exact release version of the operating system AMI that you are targeting. For more information about determining this version, see step 4 of Step 2: Create the JSON Package Manifest (p. 760).

<table>
<thead>
<tr>
<th>Platform</th>
<th>Code Value in Manifest File</th>
<th>Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server</td>
<td>windows</td>
<td>x86_64 or 386</td>
</tr>
<tr>
<td>Debian</td>
<td>debian</td>
<td>x86_64 or 386</td>
</tr>
<tr>
<td>Ubuntu Server</td>
<td>ubuntu</td>
<td>x86_64 or 386</td>
</tr>
<tr>
<td></td>
<td></td>
<td>arm64 (Ubuntu Server 16 and later, A1 instance types)</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux (RHEL)</td>
<td>redhat</td>
<td>x86_64 or 386</td>
</tr>
<tr>
<td></td>
<td></td>
<td>arm64 (RHEL 7.6 and later, A1 instance types)</td>
</tr>
</tbody>
</table>
### Getting Started with Distributor

Before you use Distributor to create, manage, and deploy software packages, follow these steps.

#### Topics
- Getting Started with Distributor (p. 755)
- Working with Distributor (p. 757)
- Auditing and Logging Distributor Activity (p. 776)
- Troubleshooting AWS Systems Manager Distributor (p. 776)

#### Step 1: Complete Distributor Prerequisites

Before you use Distributor, be sure your environment meets the following requirements.

#### Distributor Prerequisites

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSM Agent</td>
<td>SSM Agent version 2.3.274.0 or later must be installed on the instances to which you want to deploy or from which you want to remove packages. To install or update SSM Agent, see Working with SSM Agent (p. 64).</td>
</tr>
<tr>
<td>AWS CLI</td>
<td>(Optional) To use the AWS CLI instead of the AWS Systems Manager console to create and manage packages, install the newest release of the AWS CLI on your local computer.</td>
</tr>
</tbody>
</table>
For more information about how to install or upgrade the CLI, see Installing the AWS Command Line Interface in the AWS Command Line Interface User Guide.

AWS Tools for PowerShell

(Optional) To use the Tools for PowerShell instead of the AWS Systems Manager console to create and manage packages, install the newest release of Tools for PowerShell on your local computer.

For more information about how to install or upgrade the Tools for PowerShell, see Setting Up the AWS Tools for Windows PowerShell or AWS Tools for PowerShell Core in the AWS Tools for PowerShell User Guide.

### Step 2: Verify or Create an IAM Instance Profile with Distributor Permissions

By default, AWS Systems Manager doesn't have permission to perform actions on your instances. You must grant access by using an IAM instance profile. An instance profile is a container that passes IAM role information to an Amazon EC2 instance at launch. This requirement applies to permissions for all AWS Systems Manager capabilities, not just Distributor.

If you already use other Systems Manager capabilities, such as Run Command and State Manager, an instance profile with the required permissions for Distributor is already attached to your instances. The simplest way to ensure that you have permissions to perform Distributor tasks is to attach the AmazonSSMManagedInstanceCore policy to your instance profile. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

### Step 3: Control User Access to Packages

Using IAM policies, you can control who can create, deploy, and manage packages. You also control which Run Command and State Manager API actions they can perform on managed instances.

#### ARN Format

User-defined packages are associated with document ARNs and have the following format:

```
```

The following is an example.

```
```

You can use a pair of AWS-supplied default IAM policies, one for end users and one for administrators, to grant permissions for Distributor activities. Or you can create custom IAM policies appropriate for your permissions requirements.

For more information about using variables in IAM policies, see IAM Policy Elements: Variables.

For information about how to create policies and attach them to IAM users or groups, see Creating IAM Policies and Adding and Removing IAM Policies in the IAM User Guide.
Step 4: Create or Choose an Amazon S3 Bucket

When you create a package by using the Simple workflow in the console, you choose an existing S3 bucket to which Distributor uploads your software. In the Advanced workflow, you must upload ZIP files of your software or assets to an S3 bucket before you begin. Whether you create a package by using the Simple or Advanced workflows in the console, or by using the API, you must have an S3 bucket before you start creating your package. As part of the package creation process, Distributor copies your installable software and assets from this bucket to an internal AWS Systems Manager store. Because the assets are copied to an internal store, you can delete or repurpose your S3 bucket when package creation is finished.

For more information about how to create a bucket, see Create a Bucket in the Amazon Simple Storage Service Getting Started Guide. For more information about how to run an AWS CLI command to create a bucket, see mb in the AWS CLI Command Reference.

Working with Distributor

You can use the AWS Systems Manager console, AWS CLI, or AWS Tools for PowerShell to add, manage, or deploy packages in Distributor. Before you add a package to Distributor:

- Create and zip installable assets.
- (Optional) Create a JSON manifest file for the package. This is not required to use the Simple package creation process in the Distributor console. Simple package creation generates a JSON manifest file for you.

You can use the AWS Systems Manager console or a text or JSON editor to create the manifest file.

- Have an Amazon S3 bucket ready to store your installable assets or software. If you are using the Advanced package creation process, upload your assets to the S3 bucket before you begin.

  **Note**
  You can delete or repurpose this bucket after you finish creating your package because Distributor moves the package contents to an internal Systems Manager bucket as part of the package creation process.

AWS-published packages are already packaged and ready for deployment. To deploy an AWS-published package to managed instances, see Install Packages (p. 771).

Topics

- Create a Package (p. 757)
- Edit Package Permissions (Console) (p. 767)
- Edit Package Tags (Console) (p. 767)
- Add a Package Version to Distributor (p. 768)
- Install Packages (p. 771)
- Uninstall a Package (p. 774)
- Delete a Package (p. 775)

Create a Package

To create a package, prepare your installable software or assets, one file per operating system platform. At least one file is required to create a package.

Different platforms might sometimes use the same file, but all files that you attach to your package must be listed in the Files section of the manifest. If you are creating a package by using the simple
workflow in the console, the manifest is generated for you. The maximum number of files that you can attach to a single document is 20. The maximum size of each file is 1 GB. For more information about supported platforms, see Supported Package Platforms and Architectures (p. 754).

When you create a package, you are adding a new SSM document (p. 778). The document lets you deploy the package to managed instances.

An example package, ExamplePackage.zip, is available for you to download from our website. The example package includes a completed JSON manifest and three ZIP files. Although you must zip each software installable and scripts into a ZIP file to create a package in the Advanced workflow, you do not zip installable assets in the Simple workflow.

Topics
- Create a Package (Simple) (p. 758)
- Create a Package (Advanced) (p. 759)

Create a Package (Simple)

This section describes how to create a package in Distributor by choosing the Simple package creation workflow in the Distributor console. To create a package, prepare your installable assets, one file per operating system platform. At least one file is required to create a package. The Simple package creation process generates installation and uninstallation scripts, file hashes, and a JSON-formatted manifest for you. The Simple workflow handles the process of uploading and zipping your installable files, and creating a new package and associated SSM document (p. 778). For more information about supported platforms, see Supported Package Platforms and Architectures (p. 754).

To create a package (simple)

2. In the navigation pane, choose Distributor.
3. On the Distributor home page, choose Create package, and then choose Simple.
4. On the Create package page, enter a name for your package. Package names can contain letters, numbers, periods, dashes, and underscores. The name should be generic enough to apply to all versions of the package attachments, but specific enough to identify the purpose of the package.
5. In Version name, enter a version name. Version names can be a maximum of 512 characters, and cannot contain special characters.
6. For S3 bucket name, choose an existing S3 bucket from the list.
7. In S3 key prefix, enter the subfolder of the bucket where your installable assets are stored.
8. In Upload software, browse for installable software files with a suffix of .rpm, .msi, or .deb. You can upload more than one software file in a single action.
9. For Target platform, verify that the target operating system platform shown for each installable file is correct. If the operating system shown is not correct, choose the correct operating system from the drop-down list.

In the Simple package creation workflow, because you upload each installable file only once, extra steps are required to instruct Distributor to target a single file at multiple operating systems. For example, if you upload an installable software file named Logtool_v1.1.1.rpm, you must change some defaults in the Simple workflow to target the same software at both Amazon Linux and Ubuntu operating systems. You can do one of the following to work around this limitation.

- Use the Advanced workflow instead, zip each installable file into a ZIP file before you begin, and manually author the manifest so that one installable file can be targeted at multiple operating system platforms or versions. For more information, see Create a Package (Advanced) (p. 759).
• Manually edit the manifest file in the Simple workflow so that your ZIP file is targeted at multiple operating system platforms or versions. For more information about how to do this, see the end of step 4 in Step 2: Create the JSON Package Manifest (p. 760).

10. For Platform version, verify that the operating system platform version shown is either _any_, or the exact, specific operating system release version to which you want your software to apply. For more information about specifying an operating system platform version, see step 4 in Step 2: Create the JSON Package Manifest (p. 760).

11. For Architecture, choose the correct processor architecture for each installable file from the drop-down list. For more information about supported processor architectures, see Supported Package Platforms and Architectures (p. 754).

12. (Optional) Expand Installation and uninstallation scripts, and review the scripts that Distributor generates for your installable software.

13. To add more installable software files, choose Add software. Otherwise, go to the next step.

14. (Optional) Expand Manifest, and review the JSON package manifest that Distributor generates for your installable software. If you changed any information about your software since you began this procedure, such as platform version or target platform, choose Generate manifest to show the updated package manifest.

You can edit the manifest manually if you want to target a software installable at more than one operating system, as described in step 8. For more information about editing the manifest, see Step 2: Create the JSON Package Manifest (p. 760).

15. When you finish adding software and reviewing target operating system platform, version, and processor architecture data, choose Upload software and create package.

16. Wait for Distributor to finish uploading your software and creating your package. Distributor shows upload status for each installable file. Depending on the number and size of packages you are adding, this can take a few minutes. Distributor automatically redirects you to the Package details page for the new package, but you can choose to open this page yourself after the software is uploaded. The Package details page does not show all information about your package until Distributor finishes the package creation process. To stop the upload and package creation process, choose Cancel.

17. If Distributor cannot upload any of the software installable files, it displays an Upload failed message. To retry the upload, choose Retry upload. For more information about how to troubleshoot package creation failures, see Troubleshooting AWS Systems Manager Distributor (p. 776).

Create a Package (Advanced)

In this section, learn about how advanced users can create a package in Distributor after uploading installable assets zipped with installation and uninstallation scripts, and a JSON manifest file, to an Amazon S3 bucket.

To create a package, prepare your ZIP files of installable assets, one ZIP file per operating system platform. At least one ZIP file is required to create a package. Next, create a JSON manifest. The manifest includes pointers to your package code files. When you have your required code files added to a folder, and the manifest is populated with correct values, upload your package to an Amazon S3 bucket.

An example package, ExamplePackage.zip, is available for you to download from our website. The example package includes a completed JSON manifest and three ZIP files.

Topics

• Step 1: Create the ZIP Files (p. 760)
• Step 2: Create the JSON Package Manifest (p. 760)
• Step 3: Upload the Package and Manifest to an Amazon S3 Bucket (p. 765)
Step 1: Create the ZIP Files

The foundation of your package is at least one ZIP file of software or installable assets. A package includes one ZIP file per operating system that you want to support, unless one ZIP file can be installed on multiple operating systems. For example, Red Hat Enterprise Linux and Amazon Linux instances can typically run the same .RPM executable files, so you need to attach only one ZIP file to your package to support both operating systems.

The following items are required in each ZIP file:

- An **install** and an **uninstall** script. Windows-based instances require PowerShell scripts (scripts named `install.ps1` and `uninstall.ps1`). Linux-based instances require shell scripts (scripts named `install.sh` and `uninstall.sh`). SSM Agent runs the instructions in the **install** and **uninstall** scripts.

  For example, your installation scripts might run an installer, like an RPM or MSI, they might copy files, or set configuration settings.

- An executable file, installer packages (RPM, DEB, MSI, etc.), other scripts, or configuration files, etc.

For examples of ZIP files, including sample **install** and **uninstall** scripts, download the example package, ExamplePackage.zip.

Step 2: Create the JSON Package Manifest

After you prepare and zip your installable files, create a JSON manifest. The following is a template. The parts of the manifest template are described in the procedure in this section. You can use a JSON editor to create this manifest in a separate file. Alternatively, you can author the manifest in the AWS Systems Manager console when you create a package.

```json
{
    "schemaVersion": "2.0",
    "version": "your-version",
    "publisher": "optional-publisher-name",
    "packages": {
        "platform": {
            "platform-version": {
                "architecture": {
                    "file": "ZIP-file-name-1.zip"
                }
            }
        },
        "another-platform": {
            "platform-version": {
                "architecture": {
                    "file": "ZIP-file-name-2.zip"
                }
            }
        },
        "another-platform": {
            "platform-version": {
                "architecture": {
                    "file": "ZIP-file-name-3.zip"
                }
            }
        }
    },
    "files": {
```
To create a JSON package manifest

1. Add the schema version to your manifest. In this release, the schema version is always 2.0.

   ```json
   { "schemaVersion": "2.0",
   
   2. Add a user-defined package version to your manifest. This is also the value of Version name that you specify when you add your package to Distributor. It becomes part of the AWS Systems Manager document that Distributor creates when you add your package. You also provide this value as an input in the AWS-ConfigureAWSPackage document to install a version of the package other than the latest. A version value can contain letters, numbers, underscores, hyphens, and periods, and be a maximum of 128 characters in length. We recommend that you use a human-readable package version to make it easier for you and other administrators to specify exact package versions when you deploy. The following is an example.

   "version": "1.0.1",
   
   3. (Optional) Add a publisher name. The following is an example.

   "publisher": "MyOrganization",
   
   4. Add packages. The "packages" section describes the platforms, release versions, and architectures supported by the ZIP files in your package. For more information, see Supported Package Platforms and Architectures (p. 754).

   The platform-version can be the wildcard value, _any. Use it to indicate that a ZIP file supports any release of the platform. However, a platform-version value must match the exact release version of the operating system AMI that you are targeting. The following are suggested resources for getting the correct value of the operating system.

   • On a Windows-based instance, the release version is available as Windows Management Instrumentation (WMI) data. You can run the following Command Prompt command on a Windows-based instance to get version information, then parse the results for version. This command does not show the version for Windows Server Nano; the version value for Windows Server Nano is nano.

   ```bash
   wmic OS get /format:list
   ```

   • On a Linux-based instance, get the version by first scanning for operating system release (the following command). Look for the value of VERSION_ID.

   ```bash
   cat /etc/os-release
   ```

   If that does not return the results that you need, run the following command to get LSB release information from the /etc/lsb-release file, and look for the value of DISTRIB_RELEASE.
lsb_release -a

If these methods fail, you can usually find the release based on the distribution. For example, on Debian, you can scan the /etc/debian_version file, or on Red Hat Enterprise Linux, the /etc/redhat-release file.

hostnamectl

```
"packages": {
   "platform": {
      "platform-version": {
         "architecture": {
            "file": "ZIP-file-name-1.zip"
         }
      },
   },
   "another-platform": {
      "platform-version": {
         "architecture": {
            "file": "ZIP-file-name-2.zip"
         }
      },
   },
   "another-platform": {
      "platform-version": {
         "architecture": {
            "file": "ZIP-file-name-3.zip"
         }
      }
   }
}
```

The following is an example. In this example, the operating system platform is `amazon`, the supported release version is `2016.09`, the architecture is `x86_64`, and the ZIP file that supports this platform is `test.zip`.

```
{
   "amazon": {
      "2016.09": {
         "x86_64": {
            "file": "test.zip"
         }
      }
   }
}
```

You can add the `_any` wildcard value to indicate that the package supports all versions of the parent element. For example, to indicate that the package is supported on any release version of Amazon Linux, your package statement should be similar to the following. You can use the `_any` wildcard at the version or architecture levels to support all versions of a platform, or all architectures in a version, or all versions and all architectures of a platform.

```
{
   "amazon": {
      "_any": {
         "x86_64": {
            "file": "test.zip"
         }
      }
   }
}
```
The following example adds _any to show that the first package, data1.zip, is supported for all architectures of Amazon Linux 2016.09. The second package, data2.zip, is supported for all releases of Amazon Linux, but only for instances with x86_64 architecture. Both the 2016.09 and _any versions are entries under amazon. There is one platform (Amazon Linux), but different supported versions, architectures, and associated ZIP files.

```
"amazon": {
  "2016.09": {
    "_any": {
      "file": "data1.zip"
    },
    "_any": {
      "x86_64": {
        "file": "data2.zip"
      }
    }
  }
}
```

You can refer to a ZIP file more than once in the "packages" section of the manifest, if the ZIP file supports more than one platform. For example, if you have a ZIP file that supports both Red Hat Enterprise Linux and Amazon Linux, you have two entries in the "packages" section that point to the same ZIP file, as shown in the following example.

```
{"amazon": {
  "2018.03": {
    "x86_64": {
      "file": "test.zip"
    }
  }
},
"redhat": {
  "_any": {
    "x86_64": {
      "file": "test.zip"
    }
  }
}
```

5. Add the list of ZIP files that are part of this package from step 4. Each file entry requires the file name and sha256 hash value checksum. Checksum values in the manifest must match the sha256 hash value in the zipped assets to prevent the package installation from failing.

To get the exact checksum from your installables, you can run the following commands. On Linux, run cat file-name.zip | openssl dgst -sha256. On Windows, run the Get-FileHash -Path path-to-ZIP-file cmdlet in PowerShell.

The "files" section of the manifest includes one reference to each of the ZIP files in your package.

```
"files": {
  "test-agent-x86.deb.zip": {
```


"checksums": {
  "sha256": "EXAMPLE2706213c7616ca9fb28863a233b38e5a23a8c326bb4ae241dcEXAMPLE",
  "test-agent-x86_64.deb.zip": {
    "checksums": {
      "sha256": "EXAMPLE572a74584618c491045f25ee6aee8a66307ea9bfff0e9d1052EXAMPLE"
    }
  },
  "test-agent-x86_64.nano.zip": {
    "checksums": {
      "sha256": "EXAMPLE63ccb86e830b63defe46995af6b32b3c52ce72241b5e80c995EXAMPLE"
    }
  },
  "test-agent-rhel5-x86.nano.zip": {
    "checksums": {
      "sha256": "EXAMPLE13df60a3219bf117638167e5bae0a55467e947a363fff0a51EXAMPLE"
    }
  },
  "test-agent-x86.msi.zip": {
    "checksums": {
      "sha256": "EXAMPLE12a4abb10315aa6b8a7384cc9b5ca8ad8e9ced8ef1bf0e5478EXAMPLE"
    }
  },
  "test-agent-x86_64.msi.zip": {
    "checksums": {
      "sha256": "EXAMPLE63ccb86e830b63defe46995af6b32b3c52ce72241b5e80c995EXAMPLE"
    }
  },
  "test-agent-rhel5-x86.rpm.zip": {
    "checksums": {
      "sha256": "EXAMPLE13df60a3219bf117638167e5bae0a55467e947a363fff0a51EXAMPLE"
    }
  },
  "test-agent-rhel5-x86_64.rpm.zip": {
    "checksums": {
      "sha256": "EXAMPLE7ce8a2c471a23b5c90761a180fd157ec0469e12ed38a7094d1EXAMPLE"
    }
  }
}

6. After you add your package information, save and close the manifest file.

The following is an example of a completed manifest. In this example, you have a ZIP file, NewPackage_LINUX.zip, that supports more than one platform, but is referenced in the "files" section only once.

```json
{
  "schemaVersion": "2.0",
  "version": "1.7.1",
  "publisher": "Amazon Web Services",
  "packages": {
    "windows": {
      "_any": {
        "x86_64": {
          "file": "NewPackage_WINDOWS.zip"
        }
      }
    }
  }
}```
Package Example

An example package, ExamplePackage.zip, is available for you to download from our website. The example package includes a completed JSON manifest and three ZIP files.

Step 3: Upload the Package and Manifest to an Amazon S3 Bucket

Prepare your package by copying or moving all ZIP files into a folder or directory. A valid package requires the manifest that you created in Step 2: Create the JSON Package Manifest (p. 760) and all ZIP files identified in the manifest file list.

To upload the package and manifest to Amazon S3

1. Copy or move all ZIP archive files that you specified in the manifest to a folder or directory.
2. Create a bucket or choose an existing bucket. For more information, see Create a Bucket in the Amazon Simple Storage Service Getting Started Guide. For more information about how to run an AWS CLI command to create a bucket, see mb in the AWS CLI Command Reference.
3. Upload the folder to the bucket. For more information, see Add an Object to a Bucket in the Amazon Simple Storage Service Getting Started Guide. If you plan to paste your JSON manifest into the AWS Systems Manager console, do not upload the manifest. For more information about how to run an AWS CLI command to upload files to a bucket, see mv in the AWS CLI Command Reference.
4. On the bucket's home page, choose the folder that you uploaded. If you uploaded your files to a subfolder in a bucket, be sure to note the subfolder (also known as a prefix). You need the prefix to add your package to Distributor.
Step 4: Add a Package to Distributor

You can use the AWS Systems Manager console or the AWS CLI to add a new package to AWS Systems Manager Distributor. When you add a package, you are adding a new SSM document (p. 778). The document lets you deploy the package to managed instances.

Topics
- Adding a Package (Console) (p. 766)
- Adding a Package (AWS CLI) (p. 766)

Adding a Package (Console)

You can use the AWS Systems Manager console to create a package. Have ready the name of the bucket to which you uploaded your package in Step 3: Upload the Package and Manifest to an Amazon S3 Bucket (p. 765).

To add a package to Distributor (console)

2. In the navigation pane, choose Distributor.
3. On the Distributor home page, choose Create package, and then choose Advanced.
4. On the Create package page, enter a name for your package. Package names can contain letters, numbers, periods, dashes, and underscores. The name should be generic enough to apply to all versions of the package attachments, but specific enough to identify the purpose of the package.
5. In Version name, enter the exact value of the version entry in your manifest file.
6. For S3 bucket name, choose the name of the bucket to which you uploaded your ZIP files and manifest in the section called “Step 3: Upload the Package and Manifest to an Amazon S3 Bucket” (p. 765).
7. In S3 key prefix, enter the subfolder of the bucket where your ZIP files and manifest are stored.
8. In Manifest, choose Extract from package to use a manifest that you have uploaded to the S3 bucket with your ZIP files.

(Optional) If you did not upload your JSON manifest to the S3 bucket where you stored your ZIP files, choose New manifest. You can author or paste the entire manifest in the JSON editor field. For more information about how to create the JSON manifest, see Step 2: Create the JSON Package Manifest (p. 760).
9. When you are finished with the manifest, choose Create package.
10. Wait for Distributor to create your package from your ZIP files and manifest. Depending on the number and size of packages you are adding, this can take a few minutes. Distributor automatically redirects you to the Package details page for the new package, but you can choose to open this page yourself after the software is uploaded. The Package details page does not show all information about your package until Distributor finishes the package creation process. To stop the upload and package creation process, choose Cancel.

Adding a Package (AWS CLI)

You can use the AWS CLI to create a package. Have the URL ready from the bucket to which you uploaded your package in Step 3: Upload the Package and Manifest to an Amazon S3 Bucket (p. 765).

To add a package to Amazon S3 (AWS CLI)

1. To use the AWS CLI to create a package, run the following command, replacing package-name with the name of your package and S3-bucket-URL-to-manifest-file with the URL of the JSON manifest that you copied in Step 3: Upload the Package and Manifest to an Amazon S3 Bucket.
Bucket (p. 765). The URL of the S3 bucket where the entire package is stored. When you run the create-document command in Distributor, you specify the Package value for --document-type.

If you did not add your manifest file to the S3 bucket, the --content parameter value is the entire content of the JSON manifest file, in quotations.

```bash
aws ssm create-document --name "package-name" --content "S3-bucket-URL-to-manifest-file" --attachments Key="SourceUrl",Values="S3-bucket-URL-of-package" --version-name version-value-from-manifest --document-type Package
```

The following is an example.

```bash
```

2. Verify that your package was added and show the package manifest by running the following command, replacing package-name with the name of your package. To get a specific version of the document (not the same as the version of a package), you can add the --document-version parameter.

```bash
aws ssm get-document --name "package-name"
```

For information about other options you can use with the create-document command, see create-document in the AWS Systems Manager section of the AWS CLI Command Reference. For information about other options you can use with the get-document command, see get-document.

### Edit Package Permissions (Console)

After you have added a package to AWS Systems Manager Distributor, you can edit the package’s permissions in the AWS Systems Manager console. You can add other AWS accounts to a package’s permissions. By default, packages are set to Private, meaning only those with access to the package creator's AWS account can view package information and update or delete the package. If Private permissions are acceptable, you can skip this procedure.

To edit package permissions (console)

2. In the navigation pane, choose Distributor.
3. On the Packages page, choose the package for which you want to edit permissions.
4. On the Package details tab, choose Edit permissions to change permissions.
5. In Edit permissions, choose Shared with specific accounts.
6. Under Shared with specific accounts, add AWS account numbers, one at a time. When you are finished, choose Save.

**Note**

You cannot share packages with all accounts.

### Edit Package Tags (Console)

After you have added a package to AWS Systems Manager Distributor, you can edit the package’s tags in the AWS Systems Manager console. These tags are applied to the package, and are not connected to tags on the instances to which you want to deploy the package. Tags are case sensitive key and value pairs.
that can help you group and filter your packages by criteria that are relevant to your organization. If you do not want to add tags, you are ready to install your package or add a new version.

To edit package tags (console)

2. In the navigation pane, choose Distributor.
3. On the Packages page, choose the package for which you want to edit tags.
5. In Add tags, enter a tag key, or a tag key and value pair, and then choose Add. Repeat if you want to add more tags. To delete tags, choose X on the tag at the bottom of the window.
6. When you are finished adding tags to your package, choose Save.

Add a Package Version to Distributor

To add a package version, create a package (p. 757), and then use Distributor to add a package version by adding an entry to the SSM document that already exists for older versions. To save time, update the manifest for an older version of the package, change the value of the version entry in the manifest (for example, from Test_1.0 to Test_2.0) and save it as the manifest for the new version. The simple Add version workflow in the Distributor console updates the manifest file for you.

A new package version can:

- Replace at least one of the installable files attached to the current version.
- Add new installable files to support additional platforms.
- Delete files to discontinue support for specific platforms.

A newer version can use the same S3 bucket, but must have a URL with a different file name shown at the end. You can use the AWS Systems Manager console or the AWS CLI to add the new version. Uploading an installable file with the exact name as an existing installable file in the S3 bucket overwrites the existing file. No installable files are copied over from the older version to the new version; you must upload installable files from the older version to have them be part of a new version. After Distributor is finished creating your new package version, you can delete or repurpose the S3 bucket, because Distributor copies your software to an internal Systems Manager bucket as part of the versioning process.

**Note**

Each package is limited to a maximum of 25 versions. You can delete versions that are no longer required.

Topics

- Adding a Package Version (Console) (p. 768)
- Adding a Package Version (AWS CLI) (p. 771)

Adding a Package Version (Console)

Before you perform these steps, follow the instructions in Create a Package (p. 757) to create a new package for the version. Then, use the AWS Systems Manager console to add a new package version to Distributor.

Adding a Package Version (Simple)

To add a package version by using the Simple workflow, prepare updated installable files or add installables to support more platforms and architectures. Then, use Distributor to upload new and
updated installable files and add a package version. The simplified Add version workflow in the Distributor console updates the manifest file and associated SSM document for you.

To add a package version (simple)

2. In the navigation pane, choose Distributor.
3. On the Distributor home page, choose the package to which you want to add another version.
4. On the Add version page, choose Simple.
5. In Version name, enter a version name. The version name for the new version must be different from older version names. Version names can be a maximum of 512 characters, and cannot contain special characters.
6. For S3 bucket name, choose an existing S3 bucket from the list. This can be the same bucket that you used to store installable files for older versions, but the installable file names must be different to avoid overwriting existing installable files in the bucket.
7. In S3 key prefix, enter the subfolder of the bucket where your installable assets are stored.
8. In Upload software, browse for the installable software files that you want to attach to the new version. Installable files from existing versions are not automatically copied over to a new version; you must upload any installable files from older versions of the package if you want any of the same installable files to be part of the new version. You can upload more than one software file in a single action.
9. For Target platform, verify that the target operating system platform shown for each installable file is correct. If the operating system shown is not correct, choose the correct operating system from the drop-down list.

In the Simple versioning workflow, because you upload each installable file only once, extra steps are required to target a single file at multiple operating systems. For example, if you upload an installable software file named Logtool_v1.1.1.rpm, you must change some defaults in the Simple workflow to instruct Distributor to target the same software at both Amazon Linux and Ubuntu operating systems. You can do one of the following to work around this limitation.

- Use the Advanced versioning workflow instead, zip each installable file into a ZIP file before you begin, and manually author the manifest so that one installable file can be targeted at multiple operating system platforms or versions. For more information, see Adding a Package Version (Advanced) (p. 770).
- Manually edit the manifest file in the Simple workflow so that your ZIP file is targeted at multiple operating system platforms or versions. For more information about how to do this, see the end of step 4 in Step 2: Create the JSON Package Manifest (p. 760).
10. For Platform version, verify that the operating system platform version shown is either _any, or the exact, specific operating system release version to which you want your software to apply. For more information about specifying a platform version, see step 4 in Step 2: Create the JSON Package Manifest (p. 760).
11. For Architecture, choose the correct processor architecture for each installable file from the drop-down list. For more information about supported architectures, see Supported Package Platforms and Architectures (p. 754).
12. (Optional) Expand Installation and uninstallation scripts, and review the installation and uninstallation scripts that Distributor generates for your installable software.
13. To add more installable software files to the new version, choose Add software. Otherwise, go to the next step.
14. (Optional) Expand Manifest, and review the JSON package manifest that Distributor generates for your installable software. If you changed any information about your installable software since you began this procedure, such as platform version or target platform, choose Generate manifest to show the updated package manifest.
You can edit the manifest manually if you want to target a software installable at more than one operating system, as described in step 9. For more information about editing the manifest, see Step 2: Create the JSON Package Manifest (p. 760).

15. When you finish adding software and reviewing the target platform, version, and architecture data, choose Add version.

16. Wait for Distributor to finish uploading your software and creating the new package version. Distributor shows upload status for each installable file. Depending on the number and size of packages you are adding, this can take a few minutes. Distributor automatically redirects you to the Package details page for the package, but you can choose to open this page yourself after the software is uploaded. The Package details page does not show all information about your package until Distributor finishes creating the new package version. To stop the upload and package version creation, choose Stop upload.

17. If Distributor cannot upload any of the software installable files, it displays an Upload failed message. To retry the upload, choose Retry upload. For more information about how to troubleshoot package version creation failures, see Troubleshooting AWS Systems Manager Distributor (p. 776).

18. When Distributor is finished creating the new package version, on the package's Details page, on the Versions tab, view the new version in the list of available package versions. Set a default version of the package by choosing a version, and then choosing Set default version.

If you do not set a default version, the newest package version is the default version.

Adding a Package Version (Advanced)

To add a package version, create a package (p. 757), and then use Distributor to add a package version by adding an entry to the SSM document that exists for older versions. To save time, update the manifest for an older version of the package, change the value of the version entry in the manifest (for example, from Test_1.0 to Test_2.0) and save it as the manifest for the new version. You must have an updated manifest to add a new package version by using the Advanced workflow.

To add a package version (advanced)

2. In the navigation pane, choose Distributor.
3. On the Distributor home page, choose the package to which you want to add another version, and then choose Add version.
4. In Version name, enter the exact value that is in the version entry of your manifest file.
5. For S3 bucket name, choose an existing S3 bucket from the list. This can be the same bucket that you used to store installable files for older versions, but the installable file names must be different to avoid overwriting existing installable files in the bucket.
6. In S3 key prefix, enter the subfolder of the bucket where your installable assets are stored.
7. In Manifest, choose Extract from package to use a manifest that you uploaded to the S3 bucket with your ZIP files.

(Optional) If you did not upload your revised JSON manifest to the S3 bucket where you stored your ZIP files, choose New manifest. You can author or paste the entire manifest in the JSON editor field. For more information about how to create the JSON manifest, see Step 2: Create the JSON Package Manifest (p. 760).

8. When you are finished with the manifest, choose Add package version.
9. On the package's Details page, on the Versions tab, view the new version in the list of available package versions. Set a default version of the package by choosing a version, and then choosing Set default version.
If you do not set a default version, the newest package version is the default version.

**Adding a Package Version (AWS CLI)**

You can use the AWS CLI to add a new package version to Distributor. Before you run these commands, you must create a new package version and upload it to S3, as described at the start of this topic.

**To add a package version (AWS CLI)**

1. Run the following command to edit the AWS Systems Manager document with an entry for a new package version. Replace `document-name` with the name of your document. Replace `S3-bucket-URL-to-manifest-file` with the URL of the JSON manifest that you copied in Step 3: Upload the Package and Manifest to an Amazon S3 Bucket (p. 765). `S3-bucket-URL-of-package` is the URL of the S3 bucket where the entire package is stored. Replace `version-name-from-updated-manifest` with the value of `version` in the manifest. Set the `--document-version` parameter to `$LATEST` to make the document associated with this package version the latest version of the document.

   ```bash
   ```

   The following is an example.

   ```bash
   ```

2. Run the following command to verify that your package was updated and show the package manifest. Replace `package-name` with the name of your package, and optionally, `document-version` with the version number of the document (not the same as the package version) that you updated. If this package version is associated with the latest version of the document, you can specify `$LATEST` for the value of the optional `--document-version` parameter.

   ```bash
   aws ssm get-document --name "package-name" --document-version "document-version"
   ```

   For information about other options you can use with the `update-document` command, see `update-document` in the AWS Systems Manager section of the AWS CLI Command Reference.

**Install Packages**

You can use the AWS Management Console or the AWS CLI to deploy packages to your AWS Systems Manager managed instances by using AWS Systems Manager Distributor. You can currently deploy one version of one package per command. You can choose to deploy a specific version or choose to always deploy the latest version of a package for deployment.

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Topics
- Installing a Package One Time (Console) (p. 772)
- Scheduling a Package Installation (Console) (p. 773)
- Installing a Package One Time (AWS CLI) (p. 773)
- Scheduling a Package Installation (AWS CLI) (p. 774)

Installing a Package One Time (Console)

You can use the AWS Systems Manager console to install a package one time. When you configure a one-time installation, Distributor uses AWS Systems Manager Run Command (p. 615) to perform the installation.

To install a package one time (console)

2. In the navigation pane, choose Distributor.
3. On the Distributor home page, choose the package that you want to install.
4. To install the default package version, you can choose Install package from the package details page. To install another version, choose the Versions tab, choose the version you want to install, and then choose Install package.
5. In Install package, choose Install one time.

This command opens Systems Manager Run Command with the command document AWS-ConfigureAWSPackage and your Distributor package already selected.
6. Keep Install as the value of Action. For Name, enter the name of the package that you want to install.
7. For Version, enter the Version name value of the package. If you leave this field blank, Run Command installs the default version that you selected in Distributor.
8. In Targets, choose target managed instances by specifying a tag key and values that are shared by the managed instances, or specify instances by any of seven attributes, including instance ID, platform, and SSM Agent version.
9. You can use the advanced options to add comments about the installation, change Concurrency and Error threshold values in Rate control, specify output options, or configure Amazon Simple
Notification Service (Amazon SNS) notifications. For more information, see Running Commands from the Console in this guide.

10. When you are ready to install the package, choose Run, and then choose View results.

11. In the commands list, choose the AWS-ConfigureAWSpackage command that you ran. If the command is still in progress, choose the refresh icon in the top-right corner of the console.

12. When the Status column shows Success or Failed, choose the Output tab.

13. Choose View output. The command output page shows the results of your command execution.

Scheduling a Package Installation (Console)

You can use the AWS Systems Manager console to schedule the installation of a package. When you schedule package installation, Distributor uses AWS Systems Manager State Manager (p. 648) to perform the installation.

To schedule a package installation (console)

2. In the navigation pane, choose Distributor.
3. On the Distributor home page, choose the package that you want to install.
4. To install the default package version, you can choose Install package from the package details page. To install another version, choose the Versions tab, choose the version you want to install, and then choose Install package. If you do not choose a version, Systems Manager installs the default version.
5. In Install package, choose Install on a schedule. This command opens Systems Manager State Manager to a new association that is created for you.
6. In Name, enter a name (for example, Deploy-test-agent-package). This is optional, but recommended. Spaces aren't allowed in the name.
7. In the Command document list, the document name AWS-ConfigureAWSPackage is already selected. Verify that the Package value is set to the name of your package. Verify that in Parameters, for Operation, Install is already selected.
8. For Targets, choose Selecting all managed instances in this account, Specifying tags, or Manually Selecting Instance. If you target resources by using tags, enter a tag key and a tag value in the fields provided.
9. For Specify schedule, choose On Schedule to run the association on a regular schedule, or No Schedule to run the association once. For more information about these options, see Create an Association (p. 650) in this guide. Use the controls to create a cron or rate schedule for the association.
10. For more information about advanced options, such as compliance severity, rate control, and output options, see Create an Association (p. 650) in this guide. When you are finished editing your association, choose Save Changes.
11. On the association's home page, choose Apply association now.

State Manager creates and immediately runs the association on the specified instances or targets. For more information about the results of running associations, see Create an Association (p. 650) in this guide.

Installing a Package One Time (AWS CLI)

You can run send-command in the AWS CLI to install a Distributor package one time.
To install a package one time (AWS CLI)

- Run the following command in the AWS CLI.

```
aws ssm send-command --document-name "AWS-ConfigureAWSPackage" --instance-ids "instance-IDs" --parameters '{"action": ["Install"], "name": ["package-name (in same account) or package-ARN (shared from different account)"]}
```

The following is an example.

```
aws ssm send-command --document-name "AWS-ConfigureAWSPackage" --instance-ids "i-00000000000000" --parameters '{"action": ["Install"], "name": ["ExamplePackage"]}
```

For information about other options you can use with the send-command command, see send-command in the AWS Systems Manager section of the AWS CLI Command Reference.

Scheduling a Package Installation (AWS CLI)

You can run create-association in the AWS CLI to install a Distributor package on a schedule. The value of --name, the document name, is always AWS-ConfigureAWSPackage. The following command uses the key InstanceIds to specify target instances.

```
aws ssm create-association --name "AWS-ConfigureAWSPackage" --parameters '{"action": ["Install"], "name": ["package-name (in same account) or package-ARN (shared from different account)"]}' --targets [{"Key": "InstanceIds", "Values": ["instance-ID1", "instance-ID2"]}]
```

The following is an example.

```
aws ssm create-association --name "AWS-ConfigureAWSPackage" --parameters '{"action": ["Install"], "name": ["Test-ConfigureAWSPackage"]}' --targets [{"Key": "InstanceIds", "Values": ["i-00010001000001", "i-02010001000001"]}]
```

For information about other options you can use with the create-association command, see create-association in the AWS Systems Manager section of the AWS CLI Command Reference.

Uninstall a Package

You can use the AWS Management Console or the AWS CLI to uninstall Distributor packages from your AWS Systems Manager managed instances by using Run Command. In this release, you can uninstall one version of one package per command. You can uninstall a specific version or the default version.

Topics

- Uninstalling a Package (Console) (p. 774)
- Uninstalling a Package (AWS CLI) (p. 775)

Uninstalling a Package (Console)

You can use Run Command in the AWS Systems Manager console to uninstall a package one time. Distributor uses AWS Systems Manager Run Command (p. 615) to uninstall packages.

To uninstall a package (console)

2. In the navigation pane, choose **Run Command**.
3. On the Run Command home page, choose **Run command**.
4. Choose the **AWS-ConfigureAWSPackage** command document.
5. From **Action**, choose **Uninstall**
6. For **Name**, enter the name of the package that you want to uninstall.
7. In **Targets**, choose target managed instances by specifying a tag key and values that are shared by the managed instances, or specify instances by any of seven attributes, including instance ID, platform, and SSM Agent version.
8. You can use the advanced options to add comments about the operation, change **Concurrency** and **Error threshold** values in **Rate control**, specify output options, or configure Amazon SNS notifications. For more information, see Running Commands from the Console in this guide.
9. When you are ready to uninstall the package, choose **Run**, and then choose **View results**.
10. In the commands list, choose the **AWS-ConfigureAWSPackage** command that you ran. If the command is still in progress, choose the refresh icon in the top-right corner of the console.
11. When the **Status** column shows **Success** or **Failed**, choose the **Output** tab.
12. Choose **View output**. The command output page shows the results of your command execution.

### Uninstalling a Package (AWS CLI)

You can use the AWS CLI to uninstall a Distributor package from managed instances by using Run Command.

**To uninstall a package (AWS CLI)**

- Run the following command in the AWS CLI.

```bash
aws ssm send-command --document-name "AWS-ConfigureAWSPackage" --instance-ids "instance-IDs" --parameters "{"action":["Uninstall"],"name":"package-name (in same account) or package-ARN (shared from different account)"}
```

The following is an example.

```bash
aws ssm send-command --document-name "AWS-ConfigureAWSPackage" --instance-ids "i-00000000000000" --parameters "{"action":["Uninstall"],"name":"Test-ConfigureAWSPackage"}"
```

For information about other options you can use with the **send-command** command, see **send-command** in the AWS Systems Manager section of the AWS CLI Command Reference.

### Delete a Package

**Deleting a Package (Console)**

You can use the AWS Systems Manager console to delete a package from Distributor. Deleting a package deletes all versions of a package from Distributor.

**To delete a package (console)**

2. In the navigation pane, choose **Distributor**.
3. On the **Distributor** home page, choose the package that you want to delete.
4. On the package's details page, choose **Delete package**.
5. When you are prompted to confirm the deletion, choose **Delete package**.

### Deleting a Package (AWS CLI)

You can use the AWS CLI to delete a package from Distributor.

**To delete a package (AWS CLI)**

1. Run the following command to list documents for specific packages. In the results of this command, look for the package that you want to delete.

   ```bash
   aws ssm list-documents --filters [{"Key":"Name","Values": ["package-name", "another-package-name"]}]
   ```

2. Run the following command to delete a package version. Replace `package-name` with the package name.

   ```bash
   aws ssm delete-document --name "package-name"
   ```

3. Run the `list-documents` command again to verify that the package version was deleted. The package version that you deleted should no longer be found.

   ```bash
   aws ssm list-documents --filters [{"Key":"Name","Values": ["package-name", "another-package-name"]}]
   ```

For information about other options you can use with the `list-documents` command, see `list-documents` in the *AWS Systems Manager section of the AWS CLI Command Reference*. For information about other options you can use with the `delete-document` command, see `delete-document`.

---

**Auditing and Logging Distributor Activity**

For more information about auditing and logging options for AWS Systems Manager, see *Monitoring AWS Systems Manager (p. 885)*.

### Audit Distributor Activity Using AWS CloudTrail

AWS CloudTrail captures API calls made in the Systems Manager console, the AWS CLI, and the Systems Manager SDK. The information can be viewed in the CloudTrail console or stored in an Amazon S3 bucket. One bucket is used for all CloudTrail logs for your account.

Logs of Run Command and State Manager actions show document creation, package installation, and package uninstallation activity. For more information about viewing and using CloudTrail logs of Systems Manager activity, see *Logging AWS Systems Manager API Calls with AWS CloudTrail (p. 892)*.

### Troubleshooting AWS Systems Manager Distributor

The following information can help you troubleshoot problems that might occur when you use Distributor.

**Topics**

- **Wrong Package with the Same Name Is Installed (p. 777)**
- **Error: Failed to Retrieve Manifest: Could not find latest version of package (p. 777)**
- **Error: Failed to Retrieve Manifest: Validation exception (p. 777)**

---

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Wrong Package with the Same Name Is Installed

**Problem:** You've installed a package, but AWS Systems Manager Distributor installed a different package instead.

**Cause:** During installation, AWS Systems Manager finds AWS-published packages as results before user-defined external packages. If your user-defined package name is the same as an AWS-published package name, the AWS package is installed instead of your package.

**Solution:** To avoid this problem, name your package something different from the name for an AWS-published package.

**Error: Failed to Retrieve Manifest: Could not find latest version of package**

**Problem:** You received an error like the following:

```
Failed to retrieve manifest: ResourceNotFoundException: Could not find the latest version of package
arn:aws:ssm:::package/package-name status code: 400, request id: guid
```

**Cause:** You are using a version of SSM Agent with Systems Manager Distributor that is earlier than version 2.3.274.0.

**Solution:** Update the version of SSM Agent to version 2.3.274.0 or later. For more information, see Update SSM Agent by using Run Command (p. 623) or Automatically Update SSM Agent (CLI) (p. 684).

**Error: Failed to Retrieve Manifest: Validation exception**

**Problem:** You received an error like the following:

```
Failed to retrieve manifest: ValidationException: 1 validation error detected: Value 'documentArn' at 'packageName' failed to satisfy constraint: Member must satisfy regular expression pattern: arn:aws:ssm:region-id:account-id:package/package-name
```

**Cause:** You are using a version of SSM Agent with Systems Manager Distributor that is earlier than version 2.3.274.0.

**Solution:** Update the version of SSM Agent to version 2.3.274.0 or later. For more information, see Update SSM Agent by using Run Command (p. 623) or Automatically Update SSM Agent (CLI) (p. 684).
AWS Systems Manager Shared Resources

Systems Manager uses the following shared resources for managing and configuring your AWS resources.

Topics
- AWS Systems Manager Documents (p. 778)
- AWS Systems Manager Parameter Store (p. 828)

AWS Systems Manager Documents

An AWS Systems Manager document (SSM document) defines the actions that Systems Manager performs on your managed instances. Systems Manager includes more than a dozen pre-configured documents that you can use by specifying parameters at runtime. Documents use JavaScript Object Notation (JSON) or YAML, and they include steps and parameters that you specify.

Types of SSM Documents

The following table describes the different types of SSM documents.

<table>
<thead>
<tr>
<th>Type</th>
<th>Use with</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command document</td>
<td>Run Command (p. 615)</td>
<td>Run Command uses command documents to run commands. State Manager uses command documents to apply a configuration. These actions can be run on one or more targets at any point during the lifecycle of an instance. Maintenance Windows uses command documents to apply a configuration based on the specified schedule.</td>
</tr>
<tr>
<td></td>
<td>State Manager (p. 648)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance Windows (p. 444)</td>
<td></td>
</tr>
<tr>
<td>Automation document</td>
<td>Automation (p. 142)</td>
<td>Use automation documents when performing common maintenance and deployment tasks such as creating or updating an Amazon Machine Image (AMI). State Manager uses automation documents to apply a configuration. These actions can be run on one or more targets at any point during the lifecycle of an instance.</td>
</tr>
<tr>
<td></td>
<td>State Manager (p. 648)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance Windows (p. 444)</td>
<td></td>
</tr>
</tbody>
</table>
Maintenance Windows uses automation documents to perform common maintenance and deployment tasks based on the specified schedule.

In Distributor, a package is represented by a Systems Manager document. A package document includes attached ZIP archive files that contain software or assets to install on managed instances. Creating a package in Distributor creates the package document.

Session Manager uses session documents to determine which type of session to start, such as a port forwarding session, a session to run an interactive command, or a session to create an SSH tunnel.

Systems Manager Inventory uses the AWS-GatherSoftwareInventory policy document with a State Manager association to collect inventory data from managed instances. When creating your own SSM documents, Automation documents and Run Command documents are the preferred method for enforcing a policy on a managed instance.

SSM Document Versions and Execution

You can create and save different versions of documents. You can then specify a default version for each document. The default version of a document can be updated to a newer version or reverted to an older version of the document. When you change the content of a document, Systems Manager automatically increments the version of the document. You can retrieve and use previous versions of a document.

Customizing a Document

If you want to customize the steps and actions in a document, you can create your own. The first time you use a document to perform an action on an instance, the system stores the document with your AWS account. For more information about how to create a Systems Manager document, see Creating Systems Manager Documents (p. 787).

Tagging a Document

You can tag your documents to help you quickly identify one or more documents based on the tags you've assigned to them. For example, you can tag documents for specific environments, departments, users, groups, or periods. You can also restrict access to documents by creating an IAM policy that
specifies the tags that a user or group can access. For more information, see Tagging Systems Manager Documents (p. 790).

Sharing a Document

You can make your documents public or share them with specific AWS accounts. Sharing documents between accounts can be useful if, for example, you want all of the Amazon EC2 instances that you supply to customers or employees to have the same configuration. In addition to keeping applications or patches on the instances up-to-date, you might want to restrict customer instances from certain activities. Or you might want to ensure that the instances used by employee accounts throughout your organization are granted access to specific internal resources. For more information, see Sharing Systems Manager Documents (p. 793).

SSM Document Limits

For information about SSM document limits, see AWS Systems Manager Limits.

Topics

- Systems Manager Pre-Defined Documents (p. 780)
- SSM Document Schemas and Features (p. 781)
- SSM Document Syntax (p. 782)
- Creating Systems Manager Documents (p. 787)
- Tagging Systems Manager Documents (p. 790)
- Sharing Systems Manager Documents (p. 793)
- Creating Composite Documents (p. 799)
- Running Documents from Remote Locations (p. 800)
- SSM Document Plugin Reference (p. 803)

Systems Manager Pre-Defined Documents

To help you get started quickly, Systems Manager provides pre-defined documents. To view these documents in the AWS Systems Manager console, in the left navigation, choose Documents. After you choose a document, choose View details to view information about the document you selected.

To view these documents in the Amazon EC2 console, expand Systems Manager Shared Resources, and then choose Documents. After you choose a document, use the tabs in the lower pane to view information about the document you selected.

You can also use the AWS CLI and Tools for Windows PowerShell commands to view a list of documents and get descriptions about those documents.

To view information about documents using the AWS CLI, run the following commands:

```
aws ssm list-documents
```

```
aws ssm describe-document --name "document_name"
```

To view information about documents using the Tools for Windows PowerShell, run the following commands:

```
Get-SSMDocumentList
```
SSM Document Schemas and Features

Systems Manager documents currently use the following schema versions.

- Documents of type **Command** can use schema version 1.2, 2.0, and 2.2. If you are currently using schema 1.2 documents, we recommend that you create documents that use schema version 2.2.
- Documents of type **Policy** must use schema version 2.0 or later.
- Documents of type **Automation** must use schema version 0.3.
- You can create documents in JSON or YAML.

By using the latest schema version for **Command** and **Policy** documents, you can take advantage of the following features.

**Schema Version 2.2 Document Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document editing</td>
<td>Documents can now be updated. With version 1.2, any update to a document required that you save it with a different name.</td>
</tr>
<tr>
<td>Automatic versioning</td>
<td>Any update to a document creates a new version. This is not a schema version, but a version of the document.</td>
</tr>
<tr>
<td>Default version</td>
<td>If you have multiple versions of a document, you can specify which version is the default document.</td>
</tr>
<tr>
<td>Sequencing</td>
<td>Plugins or steps in a document run in the order that you specified.</td>
</tr>
<tr>
<td>Cross-platform support</td>
<td>Cross-platform support enables you to specify different operating systems for different plugins within the same SSM document. Cross-platform support uses the precondition parameter within a step.</td>
</tr>
</tbody>
</table>

**Note**

You must keep SSM Agent on your instances updated with the latest version to use new Systems Manager features and SSM document features. For more information, see Update SSM Agent by using Run Command (p. 623).

The following table lists the differences between major schema versions.

<table>
<thead>
<tr>
<th>Version 1.2</th>
<th>Version 2.2 (latest version)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>runtimeConfig</td>
<td>mainSteps</td>
<td>In version 2.2, the mainSteps section replaces runtimeConfig. The mainSteps section enables Systems Manager to run steps in sequence.</td>
</tr>
</tbody>
</table>
Version 1.2 | Version 2.2 (latest version) | Details
--- | --- | ---
properties | inputs | In version 2.2, the inputs section replaces the properties section. The inputs section accepts parameters for steps.
commands | runCommand | In version 2.2, the inputs section takes the runCommand parameter instead of the commands parameter.
id | action | In version 2.2, Action replaces ID. This is just a name change.
not applicable | name | In version 2.2, name is any user-defined name for a step.

**Using the Precondition Parameter**

With schema version 2.2 or later, you can use the precondition parameter to specify the target operating system for each plugin. The precondition parameter supports `platformType` and a value of either Windows or Linux.

For documents that use schema version 2.2 or later, if `precondition` is not specified, each plugin is either run or skipped based on the plugin's compatibility with the operating system. For documents that use schema 2.0 or earlier, incompatible plugins throw an error.

For example, in a schema version 2.2 document, if `precondition` is not specified and the `aws:runShellScript` plugin is listed, then the step runs on Linux instances, but the system skips it on Windows instances because the `aws:runShellScript` is not compatible with Windows instances. However, for a schema version 2.0 document, if you specify the `aws:runShellScript` plugin, and then run the document on a Windows instance, the execution fails. You can see an example of the precondition parameter in an SSM document later in this section.

**SSM Document Syntax**

The syntax of your document is defined by the schema version used to create it. We recommended that you use schema version 2.2 or later. Documents that use this schema version include the following top-level elements. For information about the properties that you can specify in these elements, see Top-level Elements (p. 804).

- **schemaVersion**: The schema version to use.
- **Description**: Information you provide to describe the purpose of the document.
- **Parameters**: The parameters the document accepts. For parameters that you reference often, we recommend that you store those parameters in Systems Manager Parameter Store and then reference them. You can reference String and StringList Systems Manager parameters in this section of a document. You can’t reference Secure String Systems Manager parameters in this section of a document. For more information, see AWS Systems Manager Parameter Store (p. 828).
- **mainSteps**: An object that can include multiple steps (plugins). Steps include one or more actions, an optional precondition, a unique name of the action, and inputs (parameters) for those actions. For a list of supported plugins and plugin properties, see SSM Document Plugin Reference (p. 803).

**Important**

The name of the action can’t include a space. If a name includes a space, you will receive an InvalidDocumentContent error.
Topics

- Schema Version 2.2 (p. 783)
- Schema Version 1.2 (p. 786)

Schema Version 2.2

The following example shows the top-level elements of a schema version 2.2 document in JSON.

```
{
  "schemaVersion": "2.2",
  "description": "A description of the document.",
  "parameters": {
    "parameter 1": {
      "one or more parameter properties"
    },
    "parameter 2": {
      "one or more parameter properties"
    },
    "parameter 3": {
      "one or more parameter properties"
    }
  },
  "mainSteps": [
    {
      "action": "plugin 1",
      "name": "A name for this action."
    },
    "inputs": {
      "runCommand": {
        "name": "{{ input 1 }}",
        "name": "{{ input 2 }}",
        "name": "{{ input 3 }}"
      }
    }
  ]
}
```

YAML Schema Version 2.2 Example

You can use the following YAML document with Run Command to return the hostname of one or more instances.

```yaml
---
schemaVersion: '2.2'
description: Sample document
mainSteps:
  - action: aws:runPowerShellScript
    name: runPowerShellScript
    inputs:
      runCommand:
        - hostname
```

Schema Version 2.2 Precondition Parameter Example

Schema version 2.2 provides cross-platform support. This means that within a single SSM document you can specify different operating systems for different plugins. Cross-platform support uses the precondition parameter within a step, as shown in the following example.

```
{
  "schemaVersion": "2.2",
  "description": "cross-platform sample",
}
```
"mainSteps": [
    {
        "action": "aws:runPowerShellScript",
        "name": "PatchWindows",
        "precondition": {
            "StringEquals": [
                "platformType",
                "Windows"
            ]
        },
        "inputs": {
            "runCommand": [
                "cmds"
            ]
        }
    },
    {
        "action": "aws:runShellScript",
        "name": "PatchLinux",
        "precondition": {
            "StringEquals": [
                "platformType",
                "Linux"
            ]
        },
        "inputs": {
            "runCommand": [
                "cmds"
            ]
        }
    }
]

**Schema Version Examples 2.2**

You can use the following YAML document with State Manager to download and install the ClamAV antivirus software. State Manager enforces a specific configuration, which means that each time the State Manager association is run, the system checks to see if the ClamAV software is installed. If not, State Manager reruns this document.

```yaml
---
schemaVersion: '2.2'
description: State Manager Bootstrap Example
parameters: {}
mainSteps:
  - action: aws:runShellScript
    name: configureServer
    inputs:
      runCommand:
        - sudo yum install -y httpd24
        - sudo yum --enablerepo=epel install -y clamav
```

**Schema Version 2.2 YAML Inventory Example**

You can use the following YAML document with State Manager to collect inventory metadata about your instances.

```yaml
---
schemaVersion: '2.2'
description: Software Inventory Policy Document.
parameters:
```
applications:
  type: String
  default: Enabled
  description: "(Optional) Collect data for installed applications."
  allowedValues:
  - Enabled
  - Disabled
awsComponents:
  type: String
  default: Enabled
  description: "(Optional) Collect data for AWS Components like amazon-ssm-agent."
  allowedValues:
  - Enabled
  - Disabled
networkConfig:
  type: String
  default: Enabled
  description: "(Optional) Collect data for Network configurations."
  allowedValues:
  - Enabled
  - Disabled
windowsUpdates:
  type: String
  default: Enabled
  description: "(Optional) Collect data for all Windows Updates."
  allowedValues:
  - Enabled
  - Disabled
instanceDetailedInformation:
  type: String
  default: Enabled
  description: "(Optional) Collect additional information about the instance, including the CPU model, speed, and the number of cores, to name a few."
  allowedValues:
  - Enabled
  - Disabled
customInventory:
  type: String
  default: Enabled
  description: "(Optional) Collect data for custom inventory."
  allowedValues:
  - Enabled
  - Disabled
mainSteps:
- action: aws:softwareInventory
  name: collectSoftwareInventoryItems
  inputs:
    applications: "{{ applications }}"
    awsComponents: "{{ awsComponents }}"
    networkConfig: "{{ networkConfig }}"
    windowsUpdates: "{{ windowsUpdates }}"
    instanceDetailedInformation: "{{ instanceDetailedInformation }}"
    customInventory: "{{ customInventory }}"

Schema Version 2.2 AWS-ConfigureAWSPackage Example

The following example shows the AWS-ConfigureAWSPackage document. The mainSteps section includes the aws:configurePackage plugin in the action step.

Note
On Linux operating systems, only the AmazonCloudWatchAgent and AWSSupportEC2Rescue packages are supported.
"schemaVersion": "2.2",
"description": "Install or uninstall the latest version or specified version of an AWS package.
Available packages include the following: AWSPVDriver,
AwsEnaNetworkDriver, IntelSriovDriver,
AwsVssComponents, and AmazonCloudWatchAgent, and AWSSupport-EC2Rescue.",
"parameters": {
  "action": {
    "description": "(Required) Specify whether or not to install or uninstall the package.",
    "type": "String",
    "allowedValues": [
      "Install",
      "Uninstall"
    ]
  },
  "name": {
    "description": "(Required) The package to install/uninstall.",
    "type": "String",
    "allowedPattern": "^arn:[a-z0-9][-a-z0-9]{0,62}:[a-z0-9][-a-z0-9]{0,62}:[a-z0-9][-a-z0-9]{0,62}:package\/[a-zA-Z][a-zA-Z0-9\-_]{0,39}$|^\[a-zA-Z][a-zA-Z0-9\-_]{0,39}$",
    "version": {
      "description": "(Optional) A specific version of the package to install or uninstall. If installing,
the system installs the latest published version, by default. If uninstalling, the
system uninstalls
the currently installed version, by default. If no installed version is found, the
latest published
version is downloaded, and the uninstall action is run.",
      "type": "String",
      "default": "latest"
    }
  }
},
"mainSteps": [{
  "action": "aws:configurePackage",
  "name": "configurePackage",
  "inputs": {
    "name": "{{ name }}",
    "action": "{{ action }}",
    "version": "{{ version }}"
  }
}]

**Schema Version 1.2**

The following example shows the top-level elements of a schema version 1.2 document.

```json
{
  "schemaVersion": "1.2",
  "description": "A description of the Systems Manager document.",
  "parameters": {
    "parameter 1": {
      "one or more parameter properties"
    },
    "parameter 2": {
      "one or more parameter properties"
    },
    "parameter 3": {
      "one or more parameter properties"
    }
  }
}
```
"runtimeConfig":{
  "plugin 1":{
    "properties":[
      {
        "one or more plugin properties"
      }
    ]
  }
}
}

Schema Version 1.2 Example

The following example shows the AWS-RunShellScript Systems Manager document. The runtimeConfig section includes the aws:runShellScript plugin.

```
{
  "schemaVersion":"1.2",
  "description":"Run a shell script or specify the commands to run.",&
  "parameters":{
    "commands":{
      "type":"StringList",
      "description":"(Required) Specify a shell script or a command to run.",&
      "minItems":1,
      "displayType":"textarea"
    },
    "workingDirectory":{
      "type":"String",
      "default":"
    },
    "executionTimeout":{
      "type":"String",
      "default":"3600",
      "description":"(Optional) The time in seconds for a command to complete before it is considered to have failed. Default is 3600 (1 hour). Maximum is 172800 (48 hours).",&
      "allowedPattern":"([1-9][0-9]{0,3})|(1[0-9]{1,4})|(2[0-7][0-9]{1,3})|(28[0-7][0-9]{1,2})|(28800)"
    },
    "runtimeConfig":{
      "aws:runShellScript":{
        "properties":[
          {
            "id":"0.aws:runShellScript",
            "runCommand": "{ { commands } }"}],
      "workingDirectory": "{ { workingDirectory } }",
      "timeoutSeconds": "{ { executionTimeout } }"
    }
  }
}
```

Creating Systems Manager Documents

If the Systems Manager public documents limit the actions you want to perform on your managed instances, you can create your own documents. When creating a new document, we recommend that you use schema version 2.2 or later.

Before You Begin
Before you create an SSM document, we recommend that you read about the different schemas, features, and syntax available for SSM documents. For more information, see AWS Systems Manager Documents (p. 778).

**Note**
If you plan to create an SSM document for State Manager, be aware of the following details:

- You can assign multiple documents to a target by creating different State Manager associations that use different documents.
- If you create a document with conflicting plugins (e.g., domain join and remove from domain), the last plugin run will be the final state. State Manager does not validate the logical sequence or rationality of the commands or plugins in your document.
- When processing documents, instance associations are applied first, and next tagged group associations are applied. If an instance is part of multiple tagged groups, then the documents that are part of the tagged group will not be run in any particular order. If an instance is directly targeted through multiple documents by its instance ID, there is no particular order of execution.
- If you change the default version of an SSM Policy document for State Manager, any association that uses the document will start using the new default version the next time Systems Manager applies the association to the instance.
- If you create an association using an SSM document that was shared with you, and then the owner stops sharing the document with you, your associations no longer have access to that document. However, if the owner shares the same SSM document with you again later, your associations automatically remap to it.

If you create an SSM document for State Manager, you must associate the document with your managed instances after you add it to the system. For more information, see Create an Association (p. 650).

**Topics**
- Copy a Document (p. 788)
- Add a Systems Manager Document (Console) (p. 789)
- Create an SSM Document (AWS CLI) (p. 789)
- Create an SSM Document (Tools for Windows PowerShell) (p. 789)

**Copy a Document**

When you create a document, you specify the contents of the document in JSON or YAML. The easiest way to get started creating SSM documents is to copy an existing sample from one of the Systems Manager public documents. The following example shows you how to copy a JSON sample.

**To copy a Systems Manager document**

2. In the navigation pane, choose **Documents**.
   - or -
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Documents** in the navigation pane.
3. Choose a document.
4. Choose **View details**.
5. Choose the **Content** tab.
6. Copy the JSON to a text editor and specify the details for your custom document.
7. Save the file with a .json file extension.

After you author the content of the document, you can add it to Systems Manager using any one of the following procedures:

- Add a Systems Manager Document (Console) (p. 789)
- Create an SSM Document (AWS CLI) (p. 789)
- Create an SSM Document (Tools for Windows PowerShell) (p. 789)

### Add a Systems Manager Document (Console)

**Add a Systems Manager Document**

2. In the navigation pane, choose Documents.
   - or -
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Documents in the navigation pane.
3. Choose Create document.
4. Type a descriptive name for the document.
5. In the Document type list, choose the type of document you want to create.
6. Delete the brackets in the Content field, and then paste the document you created earlier.
7. Choose Create document to save the document.

### Create an SSM Document (AWS CLI)

1. Copy and customize an existing document, as described in Copy a Document (p. 788).
2. Add the document using the AWS CLI.

```
aws ssm create-document --content file://path to your file\your file --name "document name" --document-type "Command"
```

**Windows example**

```
aws ssm create-document --content file://c:\temp\PowershellScript.json --name "PowerShellScript" --document-type "Command"
```

**Linux example**

```
aws ssm create-document --content file:///home/ec2-user/RunShellScript.json --name "RunShellScript" --document-type "Command"
```

### Create an SSM Document (Tools for Windows PowerShell)

1. Copy and customize an existing document, as described in Copy a Document (p. 788).
Tagging Systems Manager Documents

You can use the Systems Manager console, the AWS CLI, the AWS Tools for Windows, or the AddTagsToResource API to add tags to Systems Manager resources, including documents, managed instances, maintenance windows, Parameter Store parameters, and patch baselines.

Tagging is useful when you have many resources of the same type — you can quickly identify a specific resource based on the tags you’ve assigned to it. Each tag consists of a key and an optional value, both of which you define.

For example, you can tag documents for specific environments, departments, users, groups, or periods. After you tag a document, you can restrict access to it by creating an IAM policy that specifies the tags that a user can access. For more information about restricting access to documents by using tags, see Controlling Access to Documents Using Tags (p. 791).

Topics
- Tag a Document (AWS CLI) (p. 790)
- Tag a Document (AWS Tools for Windows) (p. 791)
- Tag a Document (Console) (p. 791)
- Controlling Access to Documents Using Tags (p. 791)

Tag a Document (AWS CLI)

1. At a terminal (Linux, macOS, or Unix) or command prompt (Windows), run the list-documents command to list the documents that you can tag.

   ```
   aws ssm list-documents
   ```

   Note the name of a document that you want to tag.

2. Run the following command to tag a document.

   ```
   aws ssm add-tags-to-resource --resource-type "Document" --resource-id "document-name" --tags "Key=key,Value=value"
   ```

   `document-name` the name of the Systems Manager document you want to tag.

   `key` is the name of a custom key you supply. For example, region or quarter.

   `value` is the custom content for the value you want to supply for that key. For example, west or Q318.

   If successful, the command has no output.

3. Run the following command to verify the document tags.

   ```
   aws ssm list-tags-for-resource --resource-type "Document" --resource-id "document-name"
   ```

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Tag a Document (AWS Tools for Windows)

1. Open AWS Tools for Windows PowerShell and run the following command to list documents that you can tag:

   ```
   Get-SSMDocumentList
   ```

2. Run the following commands one at a time to tag a document:

   ```
   $tag1 = New-Object Amazon.SimpleSystemsManagement.Model.Tag
   $tag1.Key = "key"
   $tag1.Value = "value"
   Add-SSMResourceTag -ResourceType "Document" -ResourceId "document-name" -Tag $tag1
   ```

   - `document-name` is the name of the Systems Manager document you want to tag.
   - `key` is the name of a custom key you supply. For example, `region` or `quarter`.
   - `value` is the custom content for the value you want to supply for that key. For example, `west` or `Q318`.

   If successful, the command has no output.

3. Run the following command to verify the document tags:

   ```
   Get-SSMResourceTag -ResourceType "Document" -ResourceId "document-name"
   ```

Tag a Document (Console)


2. In the left navigation, choose **Documents**.

3. Choose the name of an existing document, and then choose the **Tags** tab.

4. In the first box, enter a key for the tag, such as **Region**.

5. In the second box, enter a value for the tag, such as **West**.

6. Choose **Save**.

Controlling Access to Documents Using Tags

After you tag a document, you can restrict access to it by creating an IAM policy that specifies the tags the user can access. When a user attempts to use a document, the system checks the IAM policy and the tags specified for the document. If the user does not have access to the tags assigned to the document, the user receives an access denied error. Use the following procedure to create an IAM policy that restricts access to documents by using tags.

**Before You Begin**

Create and tag documents. For more information, see Tagging Systems Manager Documents (p. 790).

**To restrict a user's access to documents by using tags**

2. In the navigation pane, choose **Policies**, and then choose **Create policy**.
3. Choose the **JSON** tab.

4. Copy the following sample policy and paste it into the text field, replacing the sample text. Replace `tag_key` and `tag_value` with the key-value pair for your tag.

   ```json
   {
   "Version":"2012-10-17",
   "Statement":[
   {
   "Effect":"Allow",
   "Action":[
   "ssm:GetDocument"
   ],
   "Resource": "*",
   "Condition":{
   "StringLike":{
   "ssm:resourceTag/tag_key": ["tag_value"]
   }
   }
   }
   ]
   }
   }
   ``

   You can specify multiple keys in the policy by using the following **Condition** format. Specifying multiple keys creates an **AND** relationship for the keys.

   ```json
   "Condition":{
   "StringLike":{
   "ssm:resourceTag/tag_key1": ["tag_value1"],
   "ssm:resourceTag/tag_key2": ["tag_value2"]
   }
   }
   }
   ```

   You can specify multiple values in the policy by using the following **Condition** format. **ForAnyValue** establishes an **OR** relationship for the values. You can also specify **ForAllValues** to establish an **AND** relationship.

   ```json
   "Condition":{
   "ForAnyValue:StringLike":{
   "ssm:resourceTag/tag_key1": ["tag_value1!", "tag_value2!"],
   "tag_value2"]
   }
   }
   ```

5. Choose **Review policy**.

6. In the **Name** field, specify a name that identifies this as a user policy for tagged documents.

7. Enter a description.

8. Verify details of the policy in the **Summary** section.

9. Choose **Create policy**.

10. Assign the policy to IAM users or groups. For more information, see Changing Permissions for an IAM User and Attaching a Policy to an IAM Group in the *IAM User Guide*. 

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After you attach the policy to the IAM user or group account, if a user tries to use a document and the user's policy does not allow the user to access a tag for the document (call the GetDocument API), the system returns an error. The error is similar to the following:

"User: user_name is not authorized to perform: ssm:GetDocument on resource: document-name with the following command."

If a document has multiple tags, the user will still receive the Access Denied error if the user does not have permission to access any one of those tags.

Sharing Systems Manager Documents

You can share Systems Manager documents privately or publicly. To privately share a document, you modify the document permissions and allow specific individuals to access it according to their Amazon Web Services (AWS) ID. To publicly share a Systems Manager document, you modify the document permissions and specify All.

Warning
Use shared Systems Manager documents only from trusted sources. When using any shared document, carefully review the contents of the document before using it so that you understand how it will change the configuration of your instance. For more information about shared document best practices, see Guidelines for Sharing and Using Shared Systems Manager Documents (p. 793).

Limitations

As you begin working with Systems Manager documents, be aware of the following limitations.

- Only the owner can share a document.
- You must stop sharing a document before you can delete it. For more information, see Modify Permissions for a Shared Document (p. 796).
- You can share a document with a maximum of 1000 AWS accounts. You can request an increase to this limit in the AWS Support Center. For Limit type, choose EC2 Systems Manager and describe your reason for the request.
- You can publicly share a maximum of five Systems Manager documents. You can request an increase to this limit in the AWS Support Center. For Limit type, choose EC2 Systems Manager and describe your reason for the request.

For more information about Systems Manager limits, see AWS Systems Manager Limits.

Contents

- Guidelines for Sharing and Using Shared Systems Manager Documents (p. 793)
- Share a Systems Manager Document (p. 794)
- Modify Permissions for a Shared Document (p. 796)
- Use a Shared Systems Manager Document (p. 797)

Guidelines for Sharing and Using Shared Systems Manager Documents

Review the following guidelines before you share or use a shared document.

Remove Sensitive Information

Review your Systems Manager document carefully and remove any sensitive information. For example, verify that the document does not include your AWS credentials. If you share a document
with specific individuals, those users can view the information in the document. If you share a document publicly, anyone can view the information in the document.

**Limit Run Command Actions Using an IAM User Trust Policy**

Create a restrictive AWS Identity and Access Management (IAM) user policy for users who will have access to the document. The IAM policy determines which Systems Manager documents a user can see in either the Amazon EC2 console or by calling `ListDocuments` using the AWS CLI or AWS Tools for Windows PowerShell. The policy also limits the actions the user can perform with Systems Manager document. You can create a restrictive policy so that a user can only use specific documents. For more information, see [Create Non-Admin IAM Users and Groups for Systems Manager (p. 25)](https://docs.aws.amazon.com/systems-manager/latest/userguide/creating-iam-users-groups.html) and [Customer Managed Policy Examples (p. 919)](https://docs.aws.amazon.com/systems-manager/latest/userguide/creating-iam-users-groups.html).

**Review the Contents of a Shared Document Before Using It**

Review the contents of every document that is shared with you, especially public documents, to understand the commands that will be run on your instances. A document could intentionally or unintentionally have negative repercussions after it is run. If the document references an external network, review the external source before you use the document.

**Send Commands Using the Document Hash**

When you share a document, the system creates a Sha-256 hash and assigns it to the document. The system also saves a snapshot of the document content. When you send a command using a shared document, you can specify the hash in your command to ensure that the following conditions are true:

- You are running a command from the correct Systems Manager document
- The content of the document has not changed since it was shared with you.

If the hash does not match the specified document or if the content of the shared document has changed, the command returns an `InvalidDocument` exception. Note: The hash cannot verify document content from external locations.

**Share a Systems Manager Document**

You can share Systems Manager document by using the Amazon EC2 console, the AWS Systems Manager console, or by programmatically calling the `ModifyDocumentPermission` API operation using the AWS CLI, AWS Tools for Windows PowerShell, or the AWS SDK. Before you share a document, get the AWS account IDs of the people with whom you want to share. You will specify these account IDs when you share the document.

**Topics**

- Share a Document (Console) (p. 794)
- Share a Document (AWS CLI) (p. 795)
- Share a Document (AWS Tools for Windows PowerShell) (p. 796)

**Share a Document (Console)**

**Share a document**

2. In the navigation pane, choose **Documents**.

   - or -

   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Documents** in the navigation pane.
3. In the documents list, choose the document you want to share, and then choose View details. On the Permissions tab, verify that you are the document owner. Only a document owner can share a document.

4. Choose Edit.

5. To share the command publicly, choose Public and then choose Save. To share the command privately, choose Private, enter the AWS account ID, choose Add permission, and then choose Save.

Share a Document (AWS CLI)

The following procedure requires that you specify a region for your CLI session. Run Command is currently available in the following Systems Manager regions.

1. Open the AWS CLI on your local computer and run the following command to specify your credentials.

```bash
aws config

AWS Access Key ID: [your key]
AWS Secret Access Key: [your key]
Default region name: region
Default output format [None]:
```

*region* represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as us-east-2 for the US East (Ohio) Region. For a list of supported *region* values, see the Region column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

2. Use the following command to list all of the Systems Manager documents that are available for you. The list includes documents that you created and documents that were shared with you.

```bash
aws ssm list-documents --document-filter-list key=Owner,value=all
```

3. Use the following command to get a specific document.

```bash
aws ssm get-document --name document name
```

4. Use the following command to get a description of the document.

```bash
aws ssm describe-document --name document name
```

5. Use the following command to view the permissions for the document.

```bash
aws ssm describe-document-permission --name document name --permission-type Share
```

6. Use the following command to modify the permissions for the document and share it. You must be the owner of the document to edit the permissions. This command privately shares the document with a specific individual, based on that person’s AWS account ID.

```bash
aws ssm modify-document-permission --name document name --permission-type Share --account-ids-to-add AWS account ID
```

Use the following command to share a document publicly.

```bash
aws ssm modify-document-permission --name document name --permission-type Share --account-ids-to-add 'all'
```
Share a Document (AWS Tools for Windows PowerShell)

The following procedure requires that you specify a region for your PowerShell session. Run Command is currently available in the following Systems Manager regions.

1. Open AWS Tools for Windows PowerShell on your local computer and run the following command to specify your credentials.

   ```powershell
   Set-AWSCredentials -AccessKey your key -SecretKey your key
   ```

2. Use the following command to set the region for your PowerShell session. The example uses the us-west-2 region.

   ```powershell
   Set-DefaultAWSRegion -Region us-west-2
   ```

3. Use the following command to list all of the Systems Manager documents available for you. The list includes documents that you created and documents that were shared with you.

   ```powershell
   Get-SSMDocumentList -DocumentFilterList (@{"key"="Owner";"value"="All"})
   ```

4. Use the following command to get a specific document.

   ```powershell
   Get-SSMDocument -Name document name
   ```

5. Use the following command to get a description of the document.

   ```powershell
   Get-SSMDocumentDescription -Name document name
   ```

6. Use the following command to view the permissions of the document.

   ```powershell
   Get-SSMDocumentPermission -Name document name -PermissionType Share
   ```

7. Use the following command to modify the permissions for the document and share it. You must be the owner of the document to edit the permissions. This command privately shares the document with a specific individual, based on that person's AWS account ID.

   ```powershell
   Edit-SSMDocumentPermission -Name document name -PermissionType Share -AccountIdsToAdd AWS account ID
   ```

   Use the following command to share a document publicly.

   ```powershell
   Edit-SSMDocumentPermission -Name document name -AccountIdsToAdd ('all') -PermissionType Share
   ```

Modify Permissions for a Shared Document

If you share a command, users can view and use that command until you either remove access to the Systems Manager document or delete the Systems Manager document. However, you cannot delete a document as long as it is shared. You must stop sharing it first and then delete it.

Topics

- Stop Sharing a Document (Console) (p. 797)
- Stop Sharing a Document (AWS CLI) (p. 797)
- Stop Sharing a Document (AWS Tools for Windows PowerShell) (p. 797)
Stop Sharing a Document (Console)

Stop sharing a document

2. In the navigation pane, choose Documents.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon to open the navigation pane, and then choose Documents in the navigation pane.
3. In the documents list, choose the document you want to stop sharing, and then choose View details. On the Permissions tab, verify that you are the document owner. Only a document owner can stop sharing a document.
4. Choose Edit.
5. Choose X to delete the AWS account ID that should no longer have access to the command, and then choose Save.

Stop Sharing a Document (AWS CLI)

Open the AWS CLI on your local computer and run the following command to stop sharing a command.

```
aws ssm modify-document-permission --name document name --permission-type Share --account-ids-to-remove 'AWS account ID'
```

Stop Sharing a Document (AWS Tools for Windows PowerShell)

Open AWS Tools for Windows PowerShell on your local computer and run the following command to stop sharing a command.

```
Edit-SSMDocumentPermission -Name document name -AccountIdsToRemove AWS account ID -PermissionType Share
```

Use a Shared Systems Manager Document

When you share a Systems Manager document, the system generates an Amazon Resource Name (ARN) and assigns it to the command. If you select and run a shared document from the Amazon EC2 console, you do not see the ARN. However, if you want to run a shared Systems Manager document from a command line application, you must specify a full ARN. You are shown the full ARN for a Systems Manager document when you run the command to list documents.

**Note**
You are not required to specify ARNs for AWS public documents (documents that begin with AWS-*) or commands that you own.

**Topics**
- Use a Shared Systems Manager Document (AWS CLI) (p. 797)
- Use a Shared Systems Manager Document (AWS Tools for Windows PowerShell) (p. 798)

Use a Shared Systems Manager Document (AWS CLI)

To list all public Systems Manager documents
aws ssm list-documents --document-filter-list key=Owner,value=Public

To list private Systems Manager documents that have been shared with you

aws ssm list-documents --document-filter-list key=Owner,value=Private

To list all Systems Manager documents available to you

aws ssm list-documents --document-filter-list key=Owner,value=All

Run a command from a shared Systems Manager document using a full ARN

aws ssm send-command --document-name FullARN/name

For example:


Use a Shared Systems Manager Document (AWS Tools for Windows PowerShell)

To list all public Systems Manager documents


To list private Systems Manager documents that have been shared with you


To get information about a Systems Manager document that has been shared with you

Get-SSMDocument -Name FullARN/name

For example:


To get a description of a Systems Manager document that has been shared with you

Get-SSMDocumentDescription -Name FullARN/name

For example:

To run a command from a shared Systems Manager document using a full ARN

```
Send-SSMCommand -DocumentName FullARN/name -InstanceId ID
```

For example:

```
Send-SSMCommand -DocumentName arn:aws:ssm:us-east-2:555450671542:document/highAvailabilityServerSetup -InstanceId @"i-273d4e9e"
```

Creating Composite Documents

A composite SSM document is a custom document that performs a series of actions by running one or more secondary SSM documents. Composite documents promote infrastructure as code by enabling you to create a standard set of SSM documents for common tasks such as boot-strapping software or domain-joining instances. You can then share these documents across AWS accounts to reduce SSM document maintenance and ensure consistency.

For example, you can create a composite document that performs the following actions:

1. Updates SSM Agent to the latest version.
2. Installs all whitelisted patches.
3. Installs antivirus software.
4. Downloads scripts from GitHub and runs them.

In this example, your custom SSM document includes the following plugins to perform these actions:

1. The `aws:runDocument` plugin to run the `AWS-UpdateSSMAgent` document, which updates SSM Agent to the latest version.
2. The `aws:runDocument` plugin to run the legacy `AWS-ApplyPatchBaseline` document, which installs all whitelisted patches.
3. The `aws:runDocument` plugin to run the `AWS-InstallApplication` document, which installs the antivirus software.
4. The `aws:downloadContent` plugin to download scripts from GitHub and run them.

Composite and secondary documents can be stored in Systems Manager, GitHub (public and private repositories), or Amazon S3. Composite documents and secondary documents can be created in JSON or YAML.

**Note**

Composite documents can only run to a maximum depth of three documents. This means that a composite document can call a child document; and that child document can call one last document.

Create a Composite Document

To create a composite document, add the `aws:runDocument` (p. 821) plugin in a custom SSM document and specify the required inputs. The following is an example of a composite document that performs the following actions:

1. Runs the `aws:downloadContent` (p. 816) plugin to download an SSM document from a GitHub public repository to a local directory called bootstrap. The SSM document is called `StateManagerBootstrap.yml` (a YAML document).
2. Runs the `aws:runDocument` plugin to run the `StateManagerBootstrap.yml` document. No parameters are specified.

3. Runs the `aws:runDocument` plugin to run the AWS-ConfigureDocker pre-defined SSM document. The specified parameters install Docker on the instance.

```json
{
  "schemaVersion": "2.2",
  "description": "My composite document for bootstrapping software and installing Docker.",
  "parameters": {},
  "mainSteps": [
    {
      "action": "aws:downloadContent",
      "name": "downloadContent",
      "inputs": {
        "sourceType": "GitHub",
        "sourceInfo": "{"owner":"TestUser1","repository":"TestPublic","path":"documents/bootstrap/StateManagerBootstrap.yml"",
        "destinationPath": "bootstrap"
      }
    },
    {
      "action": "aws:runDocument",
      "name": "runDocument",
      "inputs": {
        "documentType": "LocalPath",
        "documentPath": "bootstrap",
        "documentParameters": "{}"
      }
    },
    {
      "action": "aws:runDocument",
      "name": "configureDocker",
      "inputs": {
        "documentType": "SSMDocument",
        "documentPath": "AWS-ConfigureDocker",
        "documentParameters": "{\"action\":\"Install\"}"
      }
    }
  ]
}
```

**Related Topics**

- For information about rebooting servers and instances when using Run Command to call scripts, see [Rebooting Managed Instance from Scripts (p. 628)].
- For more information about creating an SSM document, see [Creating Systems Manager Documents (p. 787)].
- For more information about the plugins you can add to a custom SSM document, see [SSM Document Plugin Reference (p. 803)].
- If you simply want to run a document from a remote location (without creating a composite document), see [Running Documents from Remote Locations (p. 800)].

**Running Documents from Remote Locations**

You can run SSM documents from remote locations by using the `AWS-RunDocument` pre-defined SSM document. This document currently supports the following remote locations:
• GitHub repositories (public and private)
• Amazon S3
• Documents saved in Systems Manager

The following procedure describes how to run remote SSM documents by using the console. This procedure shows how to run the remote document by using Run Command, but you can also run remote documents by using State Manager or Automation.

Before You Begin

Before you run a remote document, you must complete the following tasks.

• Create an SSM document and save it in a remote location. For more information, see Creating Systems Manager Documents (p. 787)
• If you plan to run a remote document that is stored in a private GitHub repository, then you must create a Systems Manager SecureString parameter for your GitHub security access token. You can’t access a remote document in a private GitHub repository by manually passing your token over SSH. The access token must be passed as a Systems Manager SecureString parameter. For more information about creating a SecureString parameter, see Creating Systems Manager Parameters (p. 850).

Run a Remote Document (Console)

To run a remote document

2. In the navigation pane, choose Run Command.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Run Command.
3. Choose Run command.
5. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.
   Note
   If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.
6. (Optional) For Rate control:
   • For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.
     Note
     If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.
   • For Error threshold, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.
7. In the **Source Type** list, choose an option.

   - If you choose **GitHub**, specify **Source Info** information in the following format:

     ```json
     {"owner":"owner_name", "repository": "repository_name", "path": "path_to_document", "tokenInfo": "{{ssm-secure:SecureString_parameter_name}}" }
     ```

     For example:

     ```json
     {"owner":"TestUser1", "repository": "SSMTestDocsRepo", "path": "SSMDocs/mySSMdoc.yml", "tokenInfo": "{{ssm-secure:myAccessTokenParam}}" }
     ```

   - If you choose **S3**, specify **Source Info** information in the following format:

     ```json
     {"path": "URL_to_document_in_S3"}
     ```

     For example:

     ```json
     {"path": "https://s3.amazonaws.com/aws-executecommand-test/scripts/ruby/mySSMdoc.json"}
     ```

   - If you choose **SSMDocument**, specify **Source Info** information in the following format:

     ```json
     {"name": "document_name"}
     ```

     For example:

     ```json
     {"name": "mySSMdoc"}
     ```

8. In the **Document Parameters** field, type parameters for the remote SSM document. For example, if you run the AWS-RunPowerShell document, you could specify:

   ```json
   {"commands": ["date", "echo \"Hello World\""]}
   ```

   If you run the AWS-ConfigureAWSPack document, you could specify:

   ```json
   { "action": "Install", "name": "AWSPVDriver" }
   ```

9. For **Other parameters**:

   - For **Comment**, type information about this command.
   - For **Timeout (seconds)**, specify the number of seconds for the system to wait before failing the overall command execution.

10. (Optional) For **Rate control**:

    - For **Concurrent**, specify either a number or a percentage of instances on which to run the command at the same time.

    **Note**

    If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.
• For **Error threshold**, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

11. In the **Output options** section, if you want to save the command output to a file, select the **Write command output to an Amazon S3 bucket**. Type the bucket and prefix (folder) names in the boxes.

   **Note**
   The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

12. In the **SNS Notifications** section, if you want notifications sent about the status of the command execution, select the **Enable SNS notifications** check box.

   For more information about configuring Amazon SNS notifications for Run Command, see Configuring Amazon SNS Notifications for AWS Systems Manager (p. 896).

13. Choose **Run**.

   **Note**
   For information about rebooting servers and instances when using Run Command to call scripts, see Rebooting Managed Instance from Scripts (p. 628).

**SSM Document Plugin Reference**

This reference describes the actions, or plugins, that you can specify in an AWS Systems Manager (SSM) document. This reference does not include information about AWS Systems Manager Automation document plugins. For information about Automation document plugins, see Systems Manager Automation Actions Reference (p. 241).

Systems Manager determines the actions to perform on a managed instance by reading the contents of a Systems Manager document. Each document includes a code-execution section. Depending on the schema version of your document, this code-execution section can include one or more plugins or steps. For the purpose of this Help topic, plugins and steps are called **plugins**. This section includes information about each of the Systems Manager plugins. For more information about documents, including information about creating documents and the differences between schema versions, see AWS Systems Manager Documents (p. 778).

   **Note**
   Some of the plugins described here run only on either Windows Server instances or Linux instances. Platform dependencies are noted for each plugin.

**Contents**

- Top-level Elements (p. 804)
- type Examples (p. 805)
- aws:applications (p. 806)
- aws:cloudWatch (p. 807)
- aws:configureDocker (p. 813)
- aws:configurePackage (p. 814)
- aws:domainJoin (p. 815)
- aws:downloadContent (p. 816)
- aws:psModule (p. 818)
- aws:refreshAssociation (p. 819)
Top-level Elements

The top-level elements are common for all Systems Manager documents. Top-level elements provide the structure of the Systems Manager document.

Properties

schemaVersion

The version of the schema.

Type: Version

Required: Yes

description

A description of the configuration.

Type: String

Required: No

parameters

parameters is a structure that contains one or more parameters to run when processing the document. You can specify parameters at runtime, in a document, or by using Systems Manager Parameter Store. For more information, see AWS Systems Manager Parameter Store (p. 828).

Type: Structure

The parameters structure accepts the following fields and values:

- type: (Required) Allowed values include the following: String, StringList, Boolean, Integer, MapList, and StringMap. To view examples of each type, see type Examples (p. 805) in the next section.
- description: (Optional) A description of the parameter.
- default: (Optional) The default value of the parameter or a reference to a parameter in Parameter Store.
- allowedValues: (Optional) Allowed values for the parameter.
- allowedPattern: (Optional) The regular expression the parameter must match.
- displayType: (Optional) Used to display either a textfield or a textarea in the AWS console. textfield is a single-line text box. textarea is a multi-line text area.
- minItems: (Optional) The minimum number of items allowed.
- maxItems: (Optional) The maximum number of items allowed.
- minChars: (Optional) The minimum number of parameter characters allowed.
- maxChars: (Optional) The maximum number of parameter characters allowed.

**runtimeConfig**

(Schema version 1.2 only) The configuration for the instance as applied by one or more Systems Manager plugins. Plugins are not guaranteed to run in sequence.

Type: Dictionary<string,PluginConfiguration>

Required: No

**mainSteps**

(Schema version 0.3, 2.0, and 2.2 only) The configuration for the instance as applied by one or more Systems Manager plugins. Plugins are organized as actions within steps. Steps run in sequential order as listed in the document.

Type: Dictionary<string,PluginConfiguration>

Required: No

### type Examples

This section includes examples of each parameter type.

<table>
<thead>
<tr>
<th>type</th>
<th>Description</th>
<th>Example</th>
<th>Example use case</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>A sequence of zero or more Unicode characters wrapped in double quotes. Use backslashes to escape.</td>
<td>&quot;i-1234567890abcdef0&quot;</td>
<td>&quot;InstanceId&quot;:{ &quot;type&quot;: &quot;String&quot;, &quot;description&quot;: &quot;(Required) The target EC2 instance ID.&quot; }</td>
</tr>
<tr>
<td>StringList</td>
<td>A list of String items separated by commas</td>
<td>[&quot;cd ~&quot;, &quot;pwd&quot;]</td>
<td>&quot;commands&quot;:{ &quot;type&quot;: &quot;StringList&quot;, &quot;description&quot;: &quot;(Required) Specify a shell script or a command to run.&quot;, &quot;minItems&quot;:1, &quot;displayType&quot;: &quot;textarea&quot; },</td>
</tr>
<tr>
<td>Boolean</td>
<td>Accepts only true or false. Does not accept &quot;true&quot; or 0.</td>
<td>true</td>
<td>&quot;canRun&quot;: { &quot;type&quot;: &quot;Boolean&quot;, &quot;description&quot;: &quot;&quot;, &quot;default&quot;: true, }</td>
</tr>
<tr>
<td>Integer</td>
<td>Integral numbers. Doesn't accept decimal numbers, for example 3.14159, or numbers wrapped in double quotes, for example &quot;3&quot;.</td>
<td>39 or -5</td>
<td>&quot;timeout&quot;: { &quot;type&quot;: &quot;Integer&quot;, &quot;description&quot;: &quot;The type of action to perform.&quot;, &quot;default&quot;: 100 }</td>
</tr>
<tr>
<td>type</td>
<td>Description</td>
<td>Example</td>
<td>Example use case</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>StringMap</td>
<td>A mapping of keys to values. A key can only be a string. For example: {&quot;type&quot;: &quot;object&quot;}</td>
<td>{ &quot;NotificationType&quot;: &quot;Command&quot;, &quot;NotificationEvents&quot;: [ &quot;Failed&quot; ], &quot;NotificationArn&quot;: &quot;$dependency.topicArn&quot; }</td>
<td>&quot;notificationConfig&quot;: { &quot;type&quot;: &quot;StringMap&quot;, &quot;description&quot;: &quot;The configuration for events to be notified about&quot;, &quot;default&quot;: { &quot;NotificationType&quot;: &quot;Command&quot;, &quot;NotificationEvents&quot;: [ &quot;Failed&quot; ], &quot;NotificationArn&quot;: &quot;$dependency.topicArn&quot; }, &quot;maxChars&quot;: 150 }</td>
</tr>
<tr>
<td>MapList</td>
<td>A list of StringMap items.</td>
<td>[ { &quot;DeviceName&quot;: &quot;/dev/sda1&quot;, &quot;Ebs&quot;: { &quot;VolumeSize&quot;: &quot;50&quot; } }, { &quot;DeviceName&quot;: &quot;/dev/sdm&quot;, &quot;Ebs&quot;: { &quot;VolumeSize&quot;: &quot;100&quot; } } ]</td>
<td>&quot;blockDeviceMappings&quot;: { &quot;type&quot;: &quot;MapList&quot;, &quot;description&quot;: &quot;The mappings for the create image inputs&quot;, &quot;default&quot;: [{&quot;DeviceName&quot;:&quot;/ dev/sda1&quot;,&quot;Ebs&quot;: {&quot;VolumeSize&quot;:&quot;50&quot;}},{&quot;DeviceName&quot;:&quot;/ dev/sdm&quot;,&quot;Ebs&quot;: { &quot;VolumeSize&quot;:&quot;100&quot;}]}, &quot;maxItems&quot;: 2 }</td>
</tr>
</tbody>
</table>

aws:applications

Install, repair, or uninstall applications on an EC2 instance. This plugin only runs on Microsoft Windows Server operating systems. For more information, see AWS Systems Manager Documents (p. 778).

Syntax

```
"runtimeConfig":{
    "aws:applications":{
        "properties":[
            {
                "id": "0.aws:applications",
                "action": "{{ action }}",
                "parameters": "{{ parameters }}",
                "source": "{{ source }}",
                "sourceHash": "{{ sourceHash }}"
            }
        ]
    }
}
```
Properties

action

The action to take.

Type: Enum

Valid values: Install | Repair | Uninstall

Required: Yes

parameters

The parameters for the installer.

Type: String

Required: No

source

The URL of the .msi file for the application.

Type: String

Required: Yes

sourceHash

The SHA256 hash of the .msi file.

Type: String

Required: No

aws:cloudWatch

Export data from Windows Server to Amazon CloudWatch or Amazon CloudWatch Logs and monitor the data using CloudWatch metrics. This plugin only runs on Microsoft Windows Server operating systems. For more information about configuring CloudWatch integration with Amazon EC2, see Sending Logs, Events, and Performance Counters to Amazon CloudWatch. For more information about documents, see AWS Systems Manager Documents (p. 778).

Important

The unified CloudWatch agent has replaced SSM Agent as the tool for sending log data to Amazon CloudWatch Logs. Support for using SSM Agent to send log data will be deprecated in the near future. We recommend using only the unified CloudWatch agent for your log collection processes. For more information, see the following topics:

- Sending Logs to CloudWatch Logs (CloudWatch agent) (p. 887)
- Migrate Windows Server Instance Log Collection to the CloudWatch agent (p. 887)
- Collect Metrics from Amazon Elastic Compute Cloud Instances and On-Premises Servers with the CloudWatch agent in the Amazon CloudWatch User Guide

You can export and monitor the following data types:
**ApplicationEventLog**

Sends application event log data to CloudWatch Logs.

**CustomLogs**

Sends any text-based log file to CloudWatch Logs. The CloudWatch plugin creates a fingerprint for log files. The system then associates a data offset with each fingerprint. The plugin uploads files when there are changes, records the offset, and associates the offset with a fingerprint. This method is used to avoid a situation where a user enables the plugin, associates the service with a directory that contains a large number of files, and the system uploads all of the files.

**Warning**

Be aware that if your application truncates or attempts to clean logs during polling, any logs specified for `LogDirectoryPath` can lose entries. If, for example, you want to limit log file size, create a new log file when that limit is reached, and then continue writing data to the new file.

**ETW**

Sends Event Tracing for Windows (ETW) data to CloudWatch Logs. Microsoft Windows Server 2003 is not supported.

**IIS**

Sends IIS log data to CloudWatch Logs.

**PerformanceCounter**

Sends Windows performance counters to CloudWatch. You can select different categories to upload to CloudWatch as metrics. For each performance counter that you want to upload, create a `PerformanceCounter` section with a unique ID (for example, "PerformanceCounter2", "PerformanceCounter3", and so on) and configure its properties.

**Note**

If the SSM Agent or the CloudWatch plugin is stopped, performance counter data is not logged in CloudWatch. This behavior is different than custom logs or Windows Event logs. Custom logs and Windows Event logs preserve performance counter data and upload it to CloudWatch after SSM Agent or the CloudWatch plugin is available.

**SecurityEventLog**

Sends security event log data to CloudWatch Logs.

**SystemEventLog**

Sends system event log data to CloudWatch Logs.

You can define the following destinations for the data:

**CloudWatch**

The destination where your performance counter metric data is sent. You can add more sections with unique IDs (for example, "CloudWatch2", "CloudWatch3", and so on), and specify a different Region for each new ID to send the same data to different locations.

**CloudWatchLogs**

The destination where your log data is sent. You can add more sections with unique IDs (for example, "CloudWatchLogs2", "CloudWatchLogs3", and so on), and specify a different Region for each new ID to send the same data to different locations.

**Syntax**

```
"runtimeConfig":{
```
"aws:cloudWatch":{
    "settings":{
        "startType":"{{ status }}",
        "properties":"{{ properties }}"
    }
}

Settings and Properties

AccessKey

Your access key ID. This property is required unless you launched your instance using an IAM role. This property cannot be used with SSM.

Type: String
Required: No

CategoryName

The performance counter category from Performance Monitor.

Type: String
Required: Yes

CounterName

The name of the performance counter from Performance Monitor.

Type: String
Required: Yes

CultureName

The locale where the timestamp is logged. If CultureName is blank, it defaults to the same locale currently used by your Windows Server instance.

Type: String
Valid values: For a list of supported values, see National Language Support (NLS) on the Microsoft website. Note that the div, div-MV, hu, and hu-HU values are not supported.
Required: No

DimensionName

A dimension for your Amazon CloudWatch metric. If you specify DimensionName, you must specify DimensionValue. These parameters provide another view when listing metrics. You can use the same dimension for multiple metrics so that you can view all metrics belonging to a specific dimension.

Type: String
Required: No

DimensionValue

A dimension value for your Amazon CloudWatch metric.

Type: String
Required: No
Encoding

The file encoding to use (for example, UTF-8). Use the encoding name, not the display name.

Type: String

Valid values: For a list of supported values, see Encoding Class in the MSDN Library.

Required: Yes

Filter

The prefix of log names. Leave this parameter blank to monitor all files.

Type: String

Valid values: For a list of supported values, see the FileSystemWatcherFilter Property in the MSDN Library.

Required: No

Flows

Each data type to upload, along with the destination for the data (CloudWatch or CloudWatch Logs). For example, to send a performance counter defined under "Id": "PerformanceCounter" to the CloudWatch destination defined under "Id": "CloudWatch", enter "PerformanceCounter,CloudWatch". Similarly, to send the custom log, ETW log, and system log to the CloudWatch Logs destination defined under "Id": "ETW", enter "(ETW),CloudWatchLogs". In addition, you can send the same performance counter or log file to more than one destination. For example, to send the application log to two different destinations that you defined under "Id": "CloudWatchLogs" and "Id": "CloudWatchLogs2", enter "ApplicationEventLog,(CloudWatchLogs, CloudWatchLogs2)".

Type: String

Valid values (source): ApplicationEventLog | CustomLogs | ETW | PerformanceCounter | SystemEventLog | SecurityEventLog

Valid values (destination): CloudWatch | CloudWatchLogs | CloudWatchn | CloudWatchLogs

Required: Yes

FullName

The full name of the component.

Type: String

Required: Yes

Id

Identifies the data source or destination. This identifier must be unique within the configuration file.

Type: String

Required: Yes

InstanceName

The name of the performance counter instance. Do not use an asterisk (*) to indicate all instances because each performance counter component only supports one metric. You can, however use _Total.

Type: String
Levels

The types of messages to send to Amazon CloudWatch.

Type: String

Valid values:
- 1 - Only error messages uploaded.
- 2 - Only warning messages uploaded.
- 4 - Only information messages uploaded.

Note that you can add values together to include more than one type of message. For example, 3 means that error messages (1) and warning messages (2) are included. A value of 7 means that error messages (1), warning messages (2), and informational messages (4) are included.

Required: Yes

Note
Windows Security Logs should set Levels to 7.

LineCount

The number of lines in the header to identify the log file. For example, IIS log files have virtually identical headers. You could enter 3, which would read the first three lines of the log file’s header to identify it. In IIS log files, the third line is the date and time stamp, which is different between log files.

Type: Integer

Required: No

LogDirectoryPath

For CustomLogs, the path where logs are stored on your Amazon EC2 instance. For IIS logs, the folder where IIS logs are stored for an individual site (for example, C:\inetpub\logs\LogFiles\W3SVCn). For IIS logs, only W3C log format is supported. IIS, NCSA, and Custom formats are not supported.

Type: String

Required: Yes

LogGroup

The name for your log group. This name is displayed on the Log Groups screen in the CloudWatch console.

Type: String

Required: Yes

LogName

The name of the log file.

1. To find the name of the log, in Event Viewer, in the navigation pane, click Applications and Services Logs.
2. In the list of logs, right-click the log you want to upload (for example, Microsoft>Windows>Backup>Operational), and then click Create Custom View.
3. In the Create Custom View dialog box, click the XML tab. The LogName is in the <Select Path=> tag (for example, Microsoft-Windows-Backup). Copy this text into the LogName parameter.
Type: String

Valid values: Application | Security | System | Microsoft-Windows-WinInet/Analytic

Required: Yes

LogStream

The destination log stream. If you use \{instance_id\}, the default, the instance ID of this instance is used as the log stream name.

Type: String

Valid values: \{instance_id\} | \{hostname\} | \{ip_address\} <log_stream_name>

If you enter a log stream name that doesn't already exist, CloudWatch Logs automatically creates it for you. You can use a literal string or predefined variables (\{instance_id\}, \{hostname\}, \{ip_address\}, or a combination of all three to define a log stream name.

The log stream name specified in this parameter appears on the Log Groups > Streams for \<YourLogStream> screen in the CloudWatch console.

Required: Yes

MetricName

The CloudWatch metric that you want performance data to appear under.

Note

Don't use special characters in the name. If you do, the metric and associated alarms might not work.

Type: String

Required: Yes

NameSpace

The metric namespace where you want performance counter data to be written.

Type: String

Required: Yes

PollInterval

How many seconds must elapse before new performance counter and log data is uploaded.

Type: Integer

Valid values: Set this to 5 or more seconds. Fifteen seconds (00:00:15) is recommended.

Required: Yes

Region

The AWS Region where you want to send log data. Although you can send performance counters to a different Region from where you send your log data, we recommend that you set this parameter to the same Region where your instance is running.

Type: String

Valid values: Regions IDs of the AWS Regions supported by both Systems Manager and CloudWatch Logs, such as \us-east-2, \eu-west-1, and \ap-southeast-1. For lists of AWS Regions supported by each service, see AWS Systems Manager and Amazon CloudWatch Logs in the AWS General Reference.
Required: Yes

**SecretKey**

Your secret access key. This property is required unless you launched your instance using an IAM role.

Type: String

Required: No

**startType**

Enable or disable CloudWatch on the instance.

Type: String

Valid values: Enabled | Disabled

Required: Yes

**TimestampFormat**

The timestamp format you want to use. For a list of supported values, see Custom Date and Time Format Strings in the MSDN Library.

Type: String

Required: Yes

**TimeZoneKind**

Provides time zone information when no time zone information is included in your log's timestamp. If this parameter is left blank and if your timestamp doesn't include time zone information, CloudWatch Logs defaults to the local time zone. This parameter is ignored if your timestamp already contains time zone information.

Type: String

Valid values: Local | UTC

Required: No

**Unit**

The appropriate unit of measure for the metric.

Type: String


Required: Yes

**aws:configureDocker**

(Schema version 2.0 or later) Configure an instance to work with containers and Docker. This plugin runs only on Microsoft Windows Server operating systems. For more information, see AWS Systems Manager Documents (p. 778).

**Syntax**

```
"mainSteps": [
```
["action": "aws:configureDocker",
"name": "ConfigureDocker",
"inputs": {
  "action": "{{ action }}"
}]
}

**Inputs**

**action**

The type of action to perform.

Type: Enum

Valid values: Install | Uninstall

Required: Yes

**aws:configurePackage**

(Schema version 2.0 or later) Install or uninstall an AWS package. This plugin runs on Microsoft Windows Server and Linux operating systems, but not all the available packages are supported on Linux operating systems.

Available packages for Microsoft Windows Server include the following: AWSPVDriver, AwsEnaNetworkDriver, IntelSriovDriver, AwsVssComponents, AmazonCloudWatchAgent, and AWSSupport-EC2Rescue.

Available packages for Linux operating systems include the following: AmazonCloudWatchAgent and AWSSupport-EC2Rescue.

For more information, see AWS Systems Manager Documents (p. 778).

**Syntax**

"mainSteps": [
  {
    "action": "aws:configurePackage",
    "name": "configurePackage",
    "inputs": {
      "name": "{{ name }}",
      "action": "{{ action }}",
      "version": "{{ version }}"
    }
  }
]

**Inputs**

**name**

The name of the AWS package to install or uninstall. Available packages include the following: AWSPVDriver, AwsEnaNetworkDriver, IntelSriovDriver, AwsVssComponents, and AmazonCloudWatchAgent.

Type: String
**Passed: Yes**

**action**

Install or uninstall a package.

Type: Enum

Valid values: Install | Uninstall

Required: Yes

**version**

A specific version of the package to install or uninstall. If installing, the system installs the latest published version, by default. If uninstalling, the system uninstalls the currently installed version, by default. If no installed version is found, the latest published version is downloaded, and the uninstall action is run.

Type: String

Required: No

**aws:domainJoin**

Join an Amazon EC2 instance to a domain. This plugin only runs on Microsoft Windows Server operating systems. For more information, see AWS Systems Manager Documents (p. 778).

**Syntax**

```
"runtimeConfig":{
  "aws:domainJoin":{
    "properties":{
      "directoryId": "{{ directoryId }}",
      "directoryName": "{{ directoryName }}",
      "directoryOU": "{{ directoryOU }}",
      "dnsIpAddresses": "{{ dnsIpAddresses }}"
    }
  }
}
```

**Properties**

**directoryId**

The ID of the directory.

Type: String

Required: Yes

Example: "directoryId": "d-1234567890"

**directoryName**

The name of the domain.

Type: String

Required: Yes

Example: "directoryName": "example.com"
directoryOU

The organizational unit (OU).

Type: String

Required: No

Example: "directoryOU": "OU=test,DC=example,DC=com"

dnsIpAddresses

The IP addresses of the DNS servers.

Type: Array

Required: No

Example: "dnsIpAddresses": ["198.51.100.1","198.51.100.2"]

Examples

For examples, see Joining a Windows Server Instance to an AWS Directory Service Domain in the Amazon EC2 User Guide for Windows Instances.

aws:downloadContent

(Schema version 2.0 or later) Download SSM documents and scripts from remote locations. This plugin is supported on Linux and Windows Server operating systems.

Syntax

```json
"mainSteps": [
  {
    "action":"aws:downloadContent",
    "name":"downloadContent",
    "inputs":{
      "sourceType": "{{ sourceType }}",
      "sourceInfo": "{{ sourceInfo }}",
      "destinationPath": "{{ destinationPath }}"
    }
  }
]
```

Inputs

sourceType

The download source. Systems Manager currently supports the following source types for downloading scripts and SSM documents: GitHub, S3, and SSMDocument.

Type: String

Required: Yes

eourceInfo

The information required to retrieve the content from the required source.

Type: StringMap
Required: Yes

For sourceType GitHub, specify the following:

- owner: The repository owner.
- repository: The name of the repository.
- path: The path to the file or directory you want to download.
- getOptions: Extra options to retrieve content from a different branch or a different commit. This parameter uses the following format:
  - branch: `branch_name`
    
    The default is `master`.
  - commitID: `commitID`
    
    The default is `head`.
  - tokenInfo: The Systems Manager parameter (a SecureString parameter) where you store your access token information, in the format `{{ssm-secure:secure-string-token}}`.

Note

This tokenInfo field is the only SSM document plugin field that supports a SecureString parameter. SecureString parameters are not supported for any other fields, nor for any other SSM document plugins.

Example syntax:

```
{
  "owner": "TestUser",
  "repository": "GitHubTest",
  "path": "scripts/python/test-script",
  "getOptions": "branch:master",
  "tokenInfo": "{{ssm-secure:secure-string-token}}"
}
```

For sourceType S3, specify the following:

- path: The URL to the file or directory you want to download from Amazon S3.

Example syntax:

```
{
  "path": "https://s3.amazonaws.com/aws-executecommand-test/powershell/helloPowershell.ps1"
}
```

For sourceType SSMDocument, specify one of the following:

- name: The name and version of the document in the following format: `name:version`. Version is optional.

Example syntax:

```
{
  "name": "Example-RunPowerShellScript:3"
}
```

- name: The ARN for the document in the following format:

Example syntax:

```
{
}
```
destinationPath

An optional local path on the instance where you want to download the file. If you don't specify a path, the content is downloaded to a path relative to your command ID.

Type: String
Required: No

aws:psModule

Install PowerShell modules on an EC2 instance. This plugin only runs on Microsoft Windows Server operating systems. For more information, see AWS Systems Manager Documents (p. 778).

Syntax

```
"runtimeConfig":{
    "aws:psModule":{
        "properties":[
            {
                "id":"0.aws:psModule",
                "runCommand":"{{ commands }}",
                "source":"{{ source }}",
                "sourceHash":"{{ sourceHash }}",
                "workingDirectory":"{{ workingDirectory }}",
                "timeoutSeconds":"{{ executionTimeout }}"
            }
        ]
    }
}
```

Properties

runCommand

The PowerShell command to run after the module is installed.

Type: List or Array
Required: No

source

The URL or local path on the instance to the application .zip file.

Type: String
Required: No

sourceHash

The SHA256 hash of the .zip file.

Type: String
Required: No

timeoutSeconds

The time in seconds for a command to be completed before it is considered to have failed.

Type: String
Required: No
workingDirectory

The path to the working directory on your instance.

Type: String

Required: No

aws:refreshAssociation

(Schema version 2.0 or later) Refresh (force apply) an association on demand. This action will change the system state based on what is defined in the selected association or all associations bound to the targets. This plugin runs on Linux and Microsoft Windows Server operating systems. For more information, see AWS Systems Manager Documents (p. 778).

Syntax

```
"action": "aws:refreshAssociation",
"name": "refreshAssociation",
"inputs": {
    "associationIds": "{{ associationIds }}"
}
```

Inputs

associationIds

List of association IDs. If empty, all associations bound to the specified target are applied.

Type: StringList

Required: No

aws:runDockerAction

(Schema version 2.0 or later) Run Docker actions on containers. This plugin runs on Linux and Microsoft Windows Server operating systems. For more information, see AWS Systems Manager Documents (p. 778).

Syntax

```
"mainSteps": [
    {
        "action": "aws:runDockerAction",
        "name": "RunDockerAction",
        "inputs": {
            "action": "{{ action }}",
            "container": "{{ container }}",
            "image": "{{ image }}",
            "memory": "{{ memory }}",
            "cpuShares": "{{ cpuShares }}",
            "volume": "{{ volume }}",
            "cmd": "{{ cmd }}",
            "env": "{{ env }}",
            "user": "{{ user }}",
            "publish": "{{ publish }}"
        }
    }
]```
**Inputs**

**action**
- The type of action to perform.
  - Type: String
  - Required: Yes

**container**
- The Docker container ID.
  - Type: String
  - Required: No

**image**
- The Docker image name.
  - Type: String
  - Required: No

**cmd**
- The container command.
  - Type: String
  - Required: No

**memory**
- The container memory limit.
  - Type: String
  - Required: No

**cpuShares**
- The container CPU shares (relative weight).
  - Type: String
  - Required: No

**volume**
- The container volume mounts.
  - Type: StringList
  - Required: No

**env**
- The container environment variables.
  - Type: String
  - Required: No
**user**

The container user name.

Type: String

Required: No

**publish**

The container published ports.

Type: String

Required: No

### `aws:runDocument`

(Schema version 2.0 or later) Runs SSM documents stored in Systems Manager or on a local share. You can use this plugin with the `aws:downloadContent` plugin to download an SSM document from a remote location to a local share, and then run it. This plugin is supported on Linux and Windows Server operating systems.

**Syntax**

```json
"mainSteps": [
  {  
    "action":"aws:runDocument",  
    "name":"runDocument",  
    "inputs":{
      "documentType":"{{ documentType }}",  
      "documentPath":"{{ documentPath }}",  
      "documentParameters":"{{ documentParameters }}"
    }
  }
]
```

**Inputs**

**documentType**

The document type to run. You can run local documents (`LocalPath`) or documents stored in Systems Manager (`SSMDocument`).

Type: String

Required: Yes

**documentPath**

The path to the document. If `documentType` is `LocalPath`, then specify the path to the document on the local share. If `documentType` is `SSMDocument`, then specify the name of the document.

Type: String

Required: No

**documentParameters**

Parameters for the document.

Type: StringMap
Required: No

**aws:runPowerShellScript**

Run PowerShell scripts or specify the path to a script to run. This plugin runs on Microsoft Windows and Linux operating systems. For more information, see AWS Systems Manager Documents (p. 778).

**Syntax**

**Syntax for 1.2 SSM document**

```
"runtimeConfig": {
  "aws:runPowerShellScript": {
    "properties": {
      "id": "0.aws:runPowerShellScript",
      "runCommand": "{{ commands }}",
      "workingDirectory": "{{ workingDirectory }}",
      "timeoutSeconds": "{{ executionTimeout }}"
    }
  }
}
```

**Syntax for 2.2 SSM document**

```
"mainSteps": [
  {
    "action": "aws:runPowerShellScript",
    "name": "step name",
    "inputs": {
      "timeoutSeconds": "Timeout in seconds",
      "runCommand": "[Command to run]"
    }
  }
]
```

Here is a schemaVersion 2.2 example:

```
{
  "schemaVersion": "2.2",
  "description": "Simple test document using the aws:runPowerShellScript plugin.",
  "parameters": {
    "Salutation": {
      "type": "String",
      "description": "(Optional) This is an optional parameter that will be displayed in the output of the command if specified.",
      "allowedPattern": "[a-zA-Z]\",
      "default": "World"
    }
  },
  "mainSteps": [
    {
      "action": "aws:runPowerShellScript",
      "name": "DisplaySalutation",
      "inputs": {
        "timeoutSeconds": "60",
        "runCommand": {
          "$salutation = '{{ Salutation }}'",
          ",",
          "if ( [String]::IsNullOrWhitespace( $salutation ) )",
          "{",
```

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Properties

runCommand

Specify the commands to run or the path to an existing script on the instance.

Type: List or Array
Required: Yes

timeoutSeconds

The time in seconds for a command to be completed before it is considered to have failed. When the timeout is reached, Systems Manager stops the command execution.

Type: String
Required: No

workingDirectory

The path to the working directory on your instance.

Type: String
Required: No

aws:runShellScript

Run Linux shell scripts or specify the path to a script to run. This plugin only runs on Linux operating systems. For more information, see AWS Systems Manager Documents (p. 778).

Syntax

Syntax for 1.2 SSM document

```
"runtimeConfig":{
  "aws:runShellScript":{
    "properties":[
      {
        "id":"0.aws:runShellScript",
        "runCommand":"{{ commands }}",
        "workingDirectory":"{{ workingDirectory }}",
        "timeoutSeconds":"{{ executionTimeout }}"
      }
    ]
  }
}
```

Syntax for 2.2 SSM document

```
"mainSteps": [
Here is a schemaVersion 2.2 example:

```json
{
  "schemaVersion": "2.2",
  "description": "Simple test document using the aws:runShellScript plugin.",
  "parameters": {
    "salutation": {
      "type": "String",
      "description": "(Optional) This is an optional parameter that will be displayed in the output of the command if specified.",
      "default": "Hello World"
    }
  },
  "mainSteps": [
    {
      "action": "aws:runShellScript",
      "name": "DisplaySalutation",
      "inputs": {
        "timeoutSeconds": 60,
        "runCommand": [{
          "command": "echo {{ salutation }}"
        }]
      }
    }
  ]
}
```

**Properties**

**runCommand**

Specify the commands to run or the path to an existing script on the instance.

- **Type:** List or Array
- **Required:** Yes

**timeoutSeconds**

The time in seconds for a command to be completed before it is considered to have failed. When the timeout is reached, Systems Manager stops the command execution.

- **Type:** String
- **Required:** No

**workingDirectory**

The path to the working directory on your instance.

- **Type:** String
- **Required:** No
aws:softwareInventory

(Schema version 2.0 or later) Gather metadata about applications, files, and configurations on your managed instances. This plugin runs on Linux and Microsoft Windows Server operating systems. For more information about collecting inventory, see AWS Systems Manager Inventory (p. 512).

Syntax

```
"mainSteps": [
    {
        "action": "aws:softwareInventory",
        "name": "collectSoftwareInventoryItems",
        "inputs": {
            "applications": "{applications }",
            "awsComponents": "{awsComponents }",
            "networkConfig": "{networkConfig }",
            "files": "{files }",
            "services": "{services }",
            "windowsRoles": "{windowsRoles }",
            "windowsRegistry": "{windowsRegistry }",
            "windowsUpdates": "{windowsUpdates }",
            "instanceDetailedInformation": "{instanceDetailedInformation }",
            "customInventory": "{customInventory }"
        }
    }
]
```

Inputs

**applications**

(Optional) Collect metadata for installed applications.

Type: String

Required: No

**awsComponents**

(Optional) Collect metadata for AWS components like amazon-ssm-agent.

Type: String

Required: No

**files**

(Optional, requires SSM Agent version 2.2.64.0 or later) Collect metadata for files, including file names, the time files were created, the time files were last modified and accessed, and file sizes, to name a few. For more information about collecting file inventory, see Working with File and Windows Registry Inventory (p. 518).

Type: String

Required: No

**networkConfig**

(Optional) Collect metadata for network configurations.

Type: String

Required: No
**windowsUpdates**

(Optional) Collect metadata for all Windows updates.

Type: String

Required: No

**instanceDetailedInformation**

(Optional) Collect more instance information than is provided by the default inventory plugin (aws:instanceInformation), including CPU model, speed, and the number of cores, to name a few.

Type: String

Required: No

**services**

(Optional, Windows OS only, requires SSM Agent version 2.2.64.0 or later) Collect metadata for service configurations.

Type: String

Required: No

**windowsRegistry**

(Optional, Windows OS only, requires SSM Agent version 2.2.64.0 or later) Collect Windows Registry keys and values. You can choose a key path and collect all keys and values recursively. You can also collect a specific registry key and its value for a specific path. Inventory collects the key path, name, type, and the value. For more information about collecting Windows Registry inventory, see Working with File and Windows Registry Inventory (p. 518).

Type: String

Required: No

**windowsRoles**

(Optional, Windows OS only, requires SSM Agent version 2.2.64.0 or later) Collect metadata for Microsoft Windows role configurations.

Type: String

Required: No

**customInventory**

(Optional) Collect custom inventory data. For more information about custom inventory, see Working with Custom Inventory (p. 541)

Type: String

Required: No

**aws:updateAgent**

Update the EC2Config service to the latest version or specify an older version. This plugin only runs on Microsoft Windows Server operating systems. For more information about the EC2Config service, see Configuring a Windows Instance Using the EC2Config Service. For more information about documents, see AWS Systems Manager Documents (p. 778).
Syntax

```
"runtimeConfig": {
    "aws:updateAgent": {
        "properties": {
            "agentName": "Ec2Config",
            "source": "https://s3.region.amazonaws.com/aws-ssm-region/manifest.json",
            "allowDowngrade": "{{ allowDowngrade }}",
            "targetVersion": "{{ version }}"
        }
    }
}
```

Properties

**agentName**

EC2Config. This is the name of the agent that runs the EC2Config service.

- Type: String
- Required: Yes

**allowDowngrade**

Allow the EC2Config service to be downgraded to an earlier version. If set to false, the service can be upgraded to newer versions only (default). If set to true, specify the earlier version.

- Type: Boolean
- Required: No

**source**

The location where Systems Manager copies the version of EC2Config to install. You can’t change this location.

- Type: String
- Required: Yes

**targetVersion**

A specific version of the EC2Config service to install. If not specified, the service will be updated to the latest version.

- Type: String
- Required: No

**aws:updateSSMAgent**

Update SSM Agent to the latest version or specify an older version. This plugin runs on Linux and Windows Server operating systems. For more information, see Working with SSM Agent (p. 64). For more information about documents, see AWS Systems Manager Documents (p. 778).

Syntax

```
"runtimeConfig": {
    "aws:updateSSMAgent": {
        "properties": [
```

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**Properties**

**agentName**

amazon-ssm-agent. This is the name of the Systems Manager agent that processes requests and runs commands on the instance.

Type: String  
Required: Yes

**allowDowngrade**

Allow SSM Agent to be downgraded to an earlier version. If set to false, the agent can be upgraded to newer versions only (default). If set to true, specify the earlier version.

Type: Boolean  
Required: No

**source**

The location where Systems Manager copies the SSM Agent version to install. You can't change this location.

Type: String  
Required: Yes

**targetVersion**

A specific version of SSM Agent to install. If not specified, the agent will be updated to the latest version.

Type: String  
Required: No

---

**AWS Systems Manager Parameter Store**

AWS Systems Manager Parameter Store provides secure, hierarchical storage for configuration data management and secrets management. You can store data such as passwords, database strings, and license codes as parameter values. You can store values as plain text or encrypted data. You can then reference values by using the unique name that you specified when you created the parameter. Highly scalable, available, and durable, Parameter Store is backed by the AWS Cloud.

Parameter Store offers the following benefits and features.

- Use a secure, scalable, hosted secrets management service with no servers to manage.
- Improve your security posture by separating your data from your code.
- Store configuration data and secure strings in hierarchies and track versions.
- Control and audit access at granular levels.
- Configure change notifications and trigger automated actions for both parameters and parameter policies.
- Tag parameters individually, and then secure access from different levels, including operational, parameter, Amazon EC2 tag, and path levels.
- Reference AWS Secrets Manager secrets by using Parameter Store parameters.
- Use Parameter Store parameters with other Systems Manager capabilities and AWS services to retrieve secrets and configuration data from a central store. The growing list of AWS services that support Parameter Store parameters includes the following:
  - Amazon Elastic Compute Cloud (Amazon EC2)
  - Amazon Elastic Container Service (Amazon ECS)
  - AWS Lambda
  - AWS CloudFormation
  - AWS CodeBuild
  - AWS CodeDeploy
- Configure integration with the following AWS services for encryption, notification, monitoring, and auditing:
  - AWS Key Management Service (AWS KMS)
  - Amazon Simple Notification Service (Amazon SNS)
  - Amazon CloudWatch
  - AWS CloudTrail

### Getting Started with Parameter Store

To get started with Systems Manager Parameters, refer to the following sections:

<table>
<thead>
<tr>
<th>Task</th>
<th>For More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn about different types of Systems Manager parameters.</td>
<td>Learn More About Parameters (p. 830)</td>
</tr>
<tr>
<td>Configure parameter access and notifications.</td>
<td>Setting Up Parameter Store (p. 835)</td>
</tr>
<tr>
<td>Learn how to organize, create, and tag parameters.</td>
<td>Working with Parameters (p. 842)</td>
</tr>
<tr>
<td>Learn about creating and using Systems Manager parameters in a test environment.</td>
<td>Parameter Store Walkthroughs (p. 878)</td>
</tr>
<tr>
<td>Learn how Parameter Store uses AWS Key Management Service (KMS) to manage secure string parameters.</td>
<td>How AWS Systems Manager Parameter Store Uses AWS KMS</td>
</tr>
<tr>
<td>Learn about the benefits of the advanced-parameter tier.</td>
<td>About Advanced Parameters (p. 834)</td>
</tr>
<tr>
<td>Learn how to increase the number of transactions per second that Parameter Store can process.</td>
<td>Increasing Parameter Store Throughput (p. 869)</td>
</tr>
</tbody>
</table>

**Related Content**
The following resources provide more information about Parameter Store and how to use this capability with other AWS services.

- AWS Systems Manager Limits in the Amazon Web Services General Reference.
- Referencing AWS Secrets Manager Secrets from Parameter Store Parameters (p. 90)
- Managing Secrets for Amazon ECS Applications Using Parameter Store and IAM Roles for Tasks
- Use Parameter Store to Securely Access Secrets and Config Data in AWS CodeDeploy
- Interesting Articles on EC2 Systems Manager Parameter Store

Learn More About Parameters

AWS Systems Manager Parameter Store provides secure, hierarchical storage for configuration data management and secrets management.

You can store data such as passwords, database strings, and license codes as parameter values. You can store values as plain text or encrypted data. You can reference Systems Manager parameters in your scripts, commands, SSM documents, and configuration and automation workflows.

Parameters work with Systems Manager capabilities such as Run Command, State Manager, and Automation. You can also reference parameters in a number of other AWS services.

Topics
- About Parameters (p. 830)
- About Advanced Parameters (p. 834)

About Parameters

A Parameter Store parameter is any piece of configuration data, such as a password or license key, that is saved in Parameter Store. You can centrally and securely reference this data in your scripts, commands, and SSM documents. Parameter Store provides support for three types of parameters: String, String List, and Secure String. When you reference a parameter, you specify the parameter name by using the following convention:

ssm:parameter-name

The following is an example of a Systems Manager parameter named DNS-IP. The value of this parameter is simply the IP address of an instance. This example uses an AWS CLI command to echo the parameter value.

```
aws ssm send-command --document-name "AWS-RunPowerShellScript" --document-version "1" --targets "Key=instanceids,Values=i-02573cafcfEXAMPLE" --parameters "commands='echo {{ssm:DNS-IP}}'" --timeout-seconds 600 --max-concurrency "50" --max-errors "0" --region us-east-2
```

The next example parameter uses a secure string parameter named SecurePassword. The command `commands=['$secure = (Get-SSMParameterValue -Names SecurePassword -WithDecryption $True).Parameters[0].Value','net user administrator $secure']` retrieves and decrypts the value of the Secure String parameter, and then resets the local administrator password without having to pass the password in clear text.

```
aws ssm send-command --document-name "AWS-RunPowerShellScript" --document-version "1" --targets "Key=instanceids,Values=i-02573cafcfEXAMPLE" --parameters "commands=['$secure = (Get-SSMParameterValue -Names SecurePassword -WithDecryption $True).Parameters[0].Value','net user administrator $secure']"
```
You can also reference Systems Manager parameters in the Parameters section of an SSM document, as shown in the following example.

```json
{
    "schemaVersion":"2.0",
    "description":"Sample version 2.0 document v2",
    "parameters":{
        "commands" : {
            "type": "StringList",
            "default": ["{{ssm:parameter_name}}"]
        }
    },
    "mainSteps":[
        {
            "action":"aws:runShellScript",
            "name":"runShellScript",
            "inputs":{
                "runCommand": "{{commands}}"
            }
        }
    ]
}
```

**Note**

The runtimeConfig section of SSM documents use similar syntax for local parameters. A local parameter isn’t the same as a Systems Manager parameter. You can distinguish local parameters from Systems Manager parameters by the absence of the `ssm:` prefix.

```
"runtimeConfig":{
    "aws:runShellScript":{
        "properties":{
            "id":"0.aws:runShellScript",
            "runCommand":"{{ commands }}",
            "workingDirectory":"{{ workingDirectory }}",
            "timeoutSeconds":"{{ executionTimeout }}"
        }
    }
}
```

SSM documents currently don’t support references to secure string parameters. This means that to use secure string parameters with, for example, Run Command, you have to retrieve the parameter value before passing it to Run Command, as shown in the following examples:

**AWS CLI**

```bash
value=$(aws ssm get-parameters --names parameter_name --with-decryption)
aws ssm send-command –name AWS-JoinDomain –parameters password=$value –instance-id instance-id
```

**Tools for Windows PowerShell**

```powershell
$secure = (Get-SSMParameterValue -Names parameter_name -WithDecryption $True).Parameters[0].Value | ConvertTo-SecureString –AsPlainText –Force
$cred = New-Object System.Management.Automation.PSCredential -argumentlist user_name, $secure
```
About Secure String Parameters

A secure string parameter is any sensitive data that needs to be stored and referenced in a secure manner. If you have data that you don't want users to alter or reference in plain text, such as passwords or license keys, create those parameters using the SecureString datatype. We recommend using secure string parameters for the following scenarios.

- You want to use data/parameters across AWS services without exposing the values as plain text in commands, functions, agent logs, or AWS CloudTrail logs.
- You want to control who has access to sensitive data.
- You want to be able to audit when sensitive data is accessed (AWS CloudTrail).
- You want to encrypt your sensitive data and you want to bring your own encryption keys to manage access.

If you choose the SecureString datatype when you create a parameter, then Parameter Store uses an AWS Key Management Service (KMS) customer master key (CMK) to encrypt the parameter value. KMS uses either a customer managed CMK or an AWS-managed CMK when encrypting the parameter value. For more information about AWS managed and customer managed CMKs, see AWS Key Management Service Concepts in the AWS Key Management Service Developer Guide. For more information about Parameter Store and AWS KMS encryption, see How AWS Systems Manager Parameter Store Uses AWS KMS.

**Note**
To view a CMK, use the AWS KMS DescribeKey operation. This AWS CLI example uses DescribeKey to view an AWS-managed CMK.

```
aws kms describe-key --key-id alias/aws/ssm
```

**Important**
Only the value of a secure string parameter is encrypted. Parameter names, descriptions, and other properties are not encrypted.

Create a Secure String Parameter Using a KMS Customer Master Key

If you create a secure string parameter by using the AWS-managed CMK in your account and Region, then you don't have to provide a value for the --key-id parameter.

The following AWS CLI example shows the command to create a new secure string parameter in Parameter Store without the --key-id parameter:

```
aws ssm put-parameter --name parameter_name --value "parameter value" --type SecureString
```

Create a Secure String Parameter Using a Customer Managed CMK

To use a customer managed CMK instead of the AWS-managed CMK assigned to your account, you must specify the key by using the --key-id parameter. The parameter supports the following KMS parameter formats.

- Key ARN example:
  
  arn:aws:kms:us-east-2:123456789012:key/12345678-1234-1234-1234-123456789012

- Alias ARN example:
  
  arn:aws:kms:us-east-2:123456789012:alias/MyAliasName

- Key ID example:
  
  12345678-1234-1234-1234-123456789012
• Alias Name example:

    alias/\textit{MyAliasName}

You can create a customer managed CMK by using the AWS Management Console or the AWS KMS API. The following AWS CLI commands create a customer managed key in the current Region of your AWS account.

```
aws kms create-key
```

Use a command in the following format to create a secure string parameter using the key you just created.

```
aws ssm put-parameter --name \textit{parameter\_name} --value "\textit{parameter\_value}" --type SecureString --key-id arn:aws:kms:us-east-2:123456789012:key/1a2b3c4d-1a2b-1a2b-1a2b-1a2b3c4d5e
```

\textbf{Note}

You can manually create a parameter with an encrypted value. In this case, because the value is already encrypted, you don't have to choose the \texttt{SecureString} data type. If you do choose \texttt{SecureString}, your parameter will be doubly encrypted.

By default, all secure string values are displayed as cipher-text. To decrypt a secure string value, a user must have permission to call the KMS Decrypt API action. For information about configuring KMS access control, see \textit{Authentication and Access Control for AWS KMS} in the \textit{AWS Key Management Service Developer Guide}.

\textbf{Using Secure String Parameters With Other AWS Services}

You can also use secure string parameters with other AWS services. In the following example, the AWS Lambda function retrieves a secure string parameter by using the \texttt{GetParameters} API.

```
from __future__ import print_function
import json
import boto3
ssm = boto3.client('ssm', 'us-east-2')

def get_parameters():
    response = ssm.get_parameters(
        Names=['LambdaSecureString'],WithDecryption=True
    )
    for parameter in response['Parameters']:
        return parameter['Value']

def lambda_handler(event, context):
    value = get_parameters()
    print("value1 = " + value)
    return value  # Echo back the first key value
```

\textbf{Related topics}

For an example of how to create and use a secure string parameter, see \textit{Walkthrough: Create a Secure String Parameter and Join an Instance to a Domain (PowerShell)} (p. 881). For more information about using Systems Manager parameters with other AWS services, see the following blog posts.

- Managing Secrets for Amazon ECS Applications Using Parameter Store and IAM Roles for Tasks
- Use Parameter Store to Securely Access Secrets and Config Data in CodeDeploy
- Interesting Articles on Amazon EC2 Systems Manager Parameter Store
About Advanced Parameters

AWS Systems Manager Parameter Store includes standard parameters and advanced parameters. You individually configure parameters to use either the standard-parameter tier (the default tier) or the advanced-parameter tier.

You can change a standard parameter to an advanced parameter at any time, but you can’t revert an advanced parameter to a standard parameter. Reverting an advanced parameter to a standard parameter would result in data loss because the system would truncate the size of the parameter from 8 KB to 4 KB. Reverting would also remove any policies attached to the parameter. Also, advanced parameters use a different form of encryption than standard parameters. For more information, see How AWS Systems Manager Parameter Store Uses AWS KMS in the AWS Key Management Service Developer Guide.

If you no longer need an advanced parameter, or if you no longer want to incur charges for an advanced parameter, you must delete it and recreate it as a new standard parameter.

The following table describes the differences between the tiers.

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of parameters allowed (per AWS account and Region)</td>
<td>10,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Maximum size of a parameter value</td>
<td>4 KB</td>
<td>8 KB</td>
</tr>
<tr>
<td>Parameter policies available</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Cost</td>
<td>No additional charge</td>
<td>Charges apply</td>
</tr>
</tbody>
</table>

For more information, see Working with Parameter Policies (p. 844).

Change a Standard Parameter to an Advanced Parameter

Use the following procedure to change an existing standard parameter to an advanced parameter. For information about how to create a new advanced parameter, see Creating Systems Manager Parameters (p. 850).

**To change a standard parameter to an advanced parameter**

2. In the navigation pane, choose Parameter Store.
3. Choose a parameter, and then choose Edit.
4. For Description, enter information about this parameter.
5. Choose Advanced.
6. For Value, enter the value of this parameter. Advanced parameters have a maximum value limit of 8 KB.
7. Choose Save changes.
Setting Up Parameter Store

To set up parameters in Systems Manager Parameter Store, you first configure AWS Identity and Access Management (IAM) policies that provide users in your account with permission to perform the actions you specify.

This section includes information about how to manually configure these policies using the IAM console, and how to assign them to users and user groups. You can also create and assign policies to control which parameter actions can be run on an instance.

This section also include information about how to create Amazon CloudWatch Events rules that let you receive notifications about changes to Systems Manager parameters. You can also use CloudWatch Events rules to trigger other actions in AWS based on changes in Parameter Store.

Contents

- Control Access to Systems Manager Parameters (p. 835)
- Set Up Notifications or Trigger Actions Based on Parameter Store Events (p. 839)

Control Access to Systems Manager Parameters

You control access to Systems Manager Parameters by using AWS Identity and Access Management (IAM). More specifically, you create IAM policies that restrict access to the following API operations:

- DeleteParameter
- DeleteParameters
- DescribeParameters
- GetParameter
- GetParameters
- GetParameterHistory
- GetParametersByPath
- PutParameter

We recommend that you control access to Systems Manager parameters by creating restrictive IAM policies. For example, the following policy allows a user to call the DescribeParameters and GetParameters API operations for a limited set of resources. This means that the user can get information about and use all parameters that begin with prod-*.  

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": ["ssm:DescribeParameters"],
         "Resource": "*
      },
      {
         "Effect": "Allow",
         "Action": ["ssm:GetParameters"],
      }
   ]
}
```
For trusted administrators, you can provide access to all Systems Manager parameter API operations by using a policy similar to the following example. This policy gives the user full access to all production parameters that begin with `dbserver-prod-*`.

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "VisualEditor0",
      "Effect": "Allow",
      "Action": [
        "ssm:PutParameter",
        "ssm:DeleteParameter",
        "ssm:GetParameterHistory",
        "ssm:GetParametersByPath",
        "ssm:GetParameters",
        "ssm:GetParameter",
        "ssm:DeleteParameters"
      ],
    },
    {
      "Sid": "VisualEditor1",
      "Effect": "Allow",
      "Action": "ssm:DescribeParameters",
      "Resource": "*"
    }
  ]
}
```

Topics
- Allowing Only Specific Parameters to Run on Instances (p. 836)
- Controlling Access to Parameters Using Tags (p. 837)

Allowing Only Specific Parameters to Run on Instances
You can control access so that instances can run only parameters that you specify.

If you choose the `SecureString` data type when you create your parameter, Systems Manager uses AWS Key Management Service (KMS) to encrypt the parameter value. AWS KMS encrypts the value by using either an AWS-managed customer master key (CMK) or a customer managed CMK. For more information about AWS KMS and CMKs, see the AWS Key Management Service Developer Guide.

You can view the AWS-managed CMK by running the following command from the AWS CLI:

```
aws kms describe-key --key-id alias/aws/ssm
```

The following example enables instances to get a parameter value only for parameters that begin with "prod-". If the parameter is a secure string, then the instance decrypts the string using AWS KMS.

**Note**
Instance policies, like in the following example, are assigned to the instance role in IAM. For more information about configuring access to Systems Manager features, including how to assign policies to users and instances, see Setting Up AWS Systems Manager (p. 23).

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "VisualEditor2",
      "Effect": "Allow",
      "Action": [
        "ssm:GetParameter",
        "ssm:GetParameters"
      ],
    }
  ]
}
```
"Statement":[
  {
    "Effect":"Allow",
    "Action":[
      "ssm:GetParameters"
    ],
    "Resource":[
      "arn:aws:ssm:region:account-id:parameter/prod-**"
    ]
  },
  {
    "Effect":"Allow",
    "Action":[
      "kms:Decrypt"
    ],
    "Resource":[
      "arn:aws:kms:region:account-id:key/CMK"
    ]
  }
]

Controlling Access to Parameters Using Tags

After you tag a parameter, you can restrict access to it by creating an IAM policy that specifies the tags the user can access. When a user attempts to use a parameter, the system checks the IAM policy and the tags specified for the parameter. If the user does not have access to the tags assigned to the parameter, the user receives an *Access Denied* error.

Currently, you can restrict access to the following *Get* parameter-related API actions:

- GetParameter
- GetParameters
- GetParameterHistory

Use the following procedure to create an IAM policy that restricts access to parameters by using tags.

**Before You Begin**

Create and tag parameters. For more information, see Setting Up Parameter Store (p. 835).

**To restrict a user's access to parameters by using tags**

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Policies, and then choose Create policy.
3. Choose the JSON tab.
4. Copy the following sample policy and paste it into the text field, replacing the sample text. Replace *tag_key* and *tag_value* with the key-value pair for your tag.

```json
{
  "Version":"2012-10-17",
  "Statement":[
    {
      "Effect":"Allow",
      "Action":[
        "ssm:GetParameters"
      ],
      "Resource":"
    },
    {
      "Effect":"Allow",
      "Action":[
        "kms:Decrypt"
      ],
      "Resource":[
        "arn:aws:kms:region:account-id:key/CMK"
      ]
    }
  ]
}
```
This sample policy restricts access to only the GetParameters API action. You can restrict access to multiple API actions by using the following format in the Action block:

```
"Action": [
  "ssm:GetParameters",
  "ssm:GetParameter",
  "ssm:GetParameterHistory",
],
```

You can specify multiple keys in the policy by using the following Condition format. Specifying multiple keys creates an AND relationship for the keys.

```
"Condition": {
  "StringLike": {
    "ssm:resourceTag/tag_key1": [
      "tag_value1"
    ],
    "ssm:resourceTag/tag_key2": [
      "tag_value2"
    ]
  }
}
```

You can specify multiple values in the policy by using the following Condition format. ForAnyValue establishes an OR relationship for the values. You can also specify ForAllValues to establish an AND relationship.

```
"Condition": {
  "ForAnyValue:StringLike": {
    "ssm:resourceTag/tag_key1": [
      "tag_value1",
      "tag_value2"
    ]
  }
}
```

5. Choose Review policy.
6. For Name, specify a name that identifies this as a user policy for tagged parameters.
7. (Optional) For Description, enter a description.
8. Verify details of the policy in the Summary section.
9. Choose Create policy.
10. Assign the policy to IAM users or groups. For more information, see Changing Permissions for an IAM User and Attaching a Policy to an IAM Group in the IAM User Guide.

After you attach the policy to the IAM user or group account, if a user tries to use a parameter and the user's policy does not allow the user to access a tag for the parameter (call the GetParameters API action), the system returns an error. The error is similar to the following:
User: user-name isn't authorized to perform: ssm:GetParameters on resource: parameter-ARN with the following command.

If a parameter has multiple tags, the user will still receive the Access Denied error if the user does not have permission to access any one of those tags.

**Set Up Notifications or Trigger Actions Based on Parameter Store Events**

The topics in this section explain how to use Amazon CloudWatch Events and Amazon Simple Notification Service (Amazon SNS) to notify you about changes to Systems Manager parameters. You can create a CloudWatch rule to notify you when a parameter or a parameter label version is created, updated, or deleted. You can be notified about changes or status related to parameter policies, such as when a parameter expires, is going to expire, or hasn't changed for a specified period of time.

**Note**

Parameter policies are available for parameters that use the advanced parameters tier. Charges apply. For more information, see *Working with Parameter Policies (p. 844)* and *About Advanced Parameters (p. 834)*.

The topics below also explain how to trigger other actions on a target for specific parameter events. For example, you can run an AWS Lambda function to recreate a parameter automatically when it expires or is deleted. You can set up a notification to trigger a Lambda function when your database password is updated. The Lambda function can force your database connections to reset or reconnect with the new password. CloudWatch Events also supports running Run Command commands and Automations executions, and actions in many other AWS services. For more information, see the *Amazon CloudWatch Events User Guide*.

**Before You Begin**

Create any resources you need to specify the target action for the rule you create. For example, if the rule you create is for sending a notification, first create an Amazon SNS topic. For more information, see *Getting Started with Amazon SNS* in the *Amazon Simple Notification Service Developer Guide*.

**Topics**

- Configure CloudWatch Events for Parameters (p. 839)
- Configure CloudWatch Events for Parameter Policies (p. 840)

**Configure CloudWatch Events for Parameters**

This topic explains how to create a CloudWatch Events rule that invokes a target based on events that happen to one or more parameters in your AWS account.

**To configure CloudWatch Events for Systems Manager parameters**

1. Sign in to the AWS Management Console and open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. In the left navigation pane, choose Events, and then choose Create rule.
3. Under Event Source, verify that Event Pattern is selected.
4. Above the Event Pattern Preview field, choose Edit.

   **Note**

   You are modifying sample code we provide instead of using the event pattern builder fields.

5. Replace the content in the edit box with the following:
6. Modify the contents for the parameters and the operations you want to take action on.

For example, the following content means an action is taken when either of the parameters named /Oncall and /Project/Teamlead are updated:

```
{
  "source": [
    "aws.ssm"
  ],
  "detail-type": [
    "Parameter Store Change"
  ],
  "detail": {
    "name": [
      "/parameter-1-name",
      "/parameter-2-name/level-2",
      "/parameter-3-name/level-2/level-3"
    ],
    "operation": [
      "Create",
      "Update",
      "Delete",
      "LabelParameterVersion"
    ]
  }
}
```

7. Choose Save.

8. For Targets, choose Add targets.

9. In the Targets list, choose a target type. For example, choose Lambda function or SNS topic.

10. Expand Configure input and choose an option. Then provide any other configuration details required by the target type you selected.

11. Scroll to the bottom of the page, if necessary, and then choose Configure details.

12. Provide a name and (optional) description for the CloudWatch Events rule. Leave the Enabled box selected to make the rule active immediately.

13. Choose Create rule.

**Configure CloudWatch Events for Parameter Policies**

This topic explains how to create CloudWatch Events rules that invoke targets based on events that happen to one or more parameter policies in your AWS account. When you create an advanced
parameter, you specify when a parameter expires, when to receive notification before a parameter expires, and how long to wait before notification should be sent that a parameter hasn't changed. You set up notification for these events using the following procedure. For more information, see Working with Parameter Policies (p. 844) and About Advanced Parameters (p. 834).

To configure CloudWatch Events for Systems Manager parameter policies

1. Sign in to the AWS Management Console and open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. In the left navigation pane, choose Events, and then choose Create rule.
3. Under Event Source, verify that Event Pattern is selected.
4. Above the Event Pattern Preview field, choose Edit.

   **Note**
   You are modifying sample code we provide instead of using the event pattern builder fields.

5. Replace the content in the edit box with the following:

   ```json
   {
   "source": [ 
   "aws.ssm"
   ],
   "detail-type": [ 
   "Parameter Store Policy Action"
   ],
   "detail": {
   "name": [ 
   "/parameter-1-name",
   "/parameter-2-name/level-2",
   "/parameter-3-name/level-2/level-3"
   ],
   "policy-type": [ 
   "Expiration",
   "ExpirationNotification",
   "NoChangeNotification"
   ]
   }
   }
   

6. Modify the contents for the parameters and the policy types you want to take action on. For example, the following content means an action is taken whenever the parameter named /OncallDuties expires and is deleted:

   ```json
   {
   "source": [ 
   "aws.ssm"
   ],
   "detail-type": [ 
   "Parameter Store Policy Action"
   ],
   "detail": {
   "name": [ 
   "/OncallDuties"
   ],
   "policy-type": [ 
   "Expiration"
   ]
   }
   }
   

7. Choose Save.
8. For Targets, choose Add targets.
9. In the **Targets** list, choose a target type. For example, choose **Lambda function** or **SNS topic**.

10. Expand **Configure input** and choose an option. Then provide any other configuration details required by the target type you selected.

11. Scroll to the bottom of the page, if necessary, and then choose **Configure details**.

12. Provide a name and (optional) description for the CloudWatch Events rule. Leave the **Enabled** box selected to make the rule active immediately.

13. Choose **Create rule**.

**Related Information**

- (Blog post) Use parameter labels for easy configuration update across environments
- Tutorial: Use CloudWatch Events to Relay Events to AWS Systems Manager Run Command in the *Amazon CloudWatch Events User Guide*
- Tutorial: Set AWS Systems Manager Automation as a CloudWatch Events Target in the *Amazon CloudWatch Events User Guide*

**Working with Parameters**

This section describes how to organize, create, and tag parameters, and how to create different versions of parameters.

**Topics**

- Organizing Parameters into Hierarchies (p. 842)
- Working with Parameter Policies (p. 844)
- Requirements and Constraints for Parameter Names (p. 849)
- Creating Systems Manager Parameters (p. 850)
- Tagging Systems Manager Parameters (p. 855)
- Working with Parameter Versions (p. 857)
- Labeling Parameters (p. 858)

**Organizing Parameters into Hierarchies**

Managing dozens or hundreds of parameters as a flat list is time consuming and prone to errors. It can also be difficult to identify the correct parameter for a task. This means you might accidentally use the wrong parameter, or you might create multiple parameters that use the same configuration data.

You can use parameter hierarchies to help you organize and manage parameters. A hierarchy is a parameter name that includes a path that you define by using forward slashes (/).

The following example uses three hierarchy levels in the name to identify the following:

```
/Environment/Type of computer/Application/Data
/Dev/DBServer/MySQL/db-string13
```

You can create a hierarchy with a maximum of 15 levels. We suggest that you create hierarchies that reflect an existing hierarchical structure in your environment, as shown in the following examples:

- Your **Continuous integration** and **Continuous delivery** environment (CI/CD workflows)

```
/Dev/DBServer/MySQL/db-string
/Dev/DBServer/MySQL/db-string
```

```
/Staging/DBServer/MySQL/db-string
```

842
Parameter hierarchies standardize the way you create parameters and make it easier to manage parameters over time. A parameter hierarchy can also help you identify the correct parameter for a configuration task. This helps you to avoid creating multiple parameters with the same configuration data.

You can create a hierarchy that allows you to share parameters across different environments, as shown in the following examples that use passwords in development and staging environment.

/DevTest/MyApp/database/my-password

You could then create a unique password for your production environment, as shown in the following example:

/prod/MyApp/database/my-password

You are not required to specify a parameter hierarchy. You can create parameters at level one. These are called root parameters. For backward compatibility, all parameters created in Parameter Store before hierarchies were released are root parameters. The systems treats both of the following parameters as root parameters.

/parameter-name

For an example of how to work with parameter hierarchies, see Walkthrough: Manage Parameters Using Hierarchies (AWS CLI) (p. 883).

**Querying Parameters in a Hierarchy**

Another benefit of using hierarchies is the ability to query for all parameters within a hierarchy by using the GetParametersByPath API action. For example, if you run the following command from the AWS CLI, the system returns all parameters in the IIS level.

/aws ssm get-parameters-by-path --path /Dev/Web/IIS

To view decrypted secure string parameters in a hierarchy, you specify the path and the --with-decryption parameter, as shown in the following example.

/aws ssm get-parameters-by-path --path /Prod/ERP/SAP --with-decryption

**Restricting IAM Permissions Using Hierarchies**

Using hierarchies and AWS Identity and Access Management (IAM) policies for Parameter Store API actions, you can provide or restrict access to all parameters in one level of a hierarchy. The following example policy allows all Parameter Store operations on all parameters for the AWS account
123456789012 in the US East (Ohio) Region (us-east-2). The user can't create parameters because the PutParameter action is explicitly denied. This policy also forbids the user from calling the GetParametersByPath action.

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [ "ssm:*" ],
    },
    {
      "Effect": "Deny",
      "Action": [ "ssm:GetParametersByPath" ],
      "Condition": {
        "StringEquals": {
          "ssm:Recursive": [ "true" ]
        }
      },
    },
    {
      "Effect": "Deny",
      "Action": [ "ssm:PutParameter" ],
      "Condition": {
        "StringEquals": {
          "ssm:Overwrite": [ "false" ]
        }
      },
    }
  ]
}
```

**Important**

If a user has access to a path, then the user can access all levels of that path. For example, if a user has permission to access path /a, then the user can also access /a/b. Even if a user has explicitly been denied access in IAM for parameter /b, they can still call the GetParametersByPath API action recursively and view /a/b.

**Working with Parameter Policies**

Parameter policies help you manage a growing set of parameters by enabling you to assign specific criteria to a parameter such as an expiration date or time to live. Parameter policies are especially helpful in forcing you to update or delete passwords and configuration data stored in Parameter Store. Parameter Store offers the following types of policies: Expiration, ExpirationNotification, and NoChangeNotification. The policies are described in more detail in this section.

Parameter Store enforces parameter policies by using asynchronous, periodic scans. After you create a policy, you don't need to perform additional actions to enforce the policy. Parameter Store independently performs the action defined by the policy according to the criteria you specified.
**Note**
Parameter policies are available for parameters that use the advanced parameters tier. For more information, see About Advanced Parameters (p. 834).

A parameter policy is a JSON array, as shown in the following table. You can assign a policy when you create a new advanced parameter, or you can apply a policy by updating a parameter. Parameter Store supports the following types of parameter policies.

<table>
<thead>
<tr>
<th>Policy</th>
<th>Details</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expiration</strong></td>
<td>This policy deletes the parameter. You can specify a specific date and</td>
<td>{</td>
</tr>
<tr>
<td></td>
<td>time by using either the ISO_INSTANT format or the ISO_OFFSET_DATE_TIME</td>
<td>&quot;Type&quot;:&quot;Expiration&quot;, &quot;Version&quot;:&quot;1.0&quot;, &quot;Attributes&quot;:{</td>
</tr>
<tr>
<td></td>
<td>format. To change when you want the parameter to be deleted, you must</td>
<td>&quot;Timestamp&quot;:&quot;2018-12-02T21:34:33.000Z&quot;</td>
</tr>
<tr>
<td></td>
<td>update the policy. Updating a parameter does not affect the expiration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>date or time of the policy attached to it. When the expiration date and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>time is reached, Parameter Store deletes the parameter.</td>
<td></td>
</tr>
<tr>
<td><strong>ExpirationNotification</strong></td>
<td>This policy triggers an event in Amazon CloudWatch Events that notifies you about the expiration. By using this policy, you can receive notifications before the expiration time is reached, in units of days or hours.</td>
<td>{</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Type&quot;:&quot;ExpirationNotification&quot;, &quot;Version&quot;:&quot;1.0&quot;,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Attributes&quot;:{</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Before&quot;:&quot;15&quot;, &quot;Unit&quot;:&quot;Days&quot;</td>
</tr>
<tr>
<td><strong>NoChangeNotification</strong></td>
<td>This policy triggers an event in CloudWatch if a parameter has not been modified for a specified period of time. This policy type is useful when, for example, a password needs to be changed within a period of time.</td>
<td>{</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Type&quot;:&quot;NoChangeNotification&quot;, &quot;Version&quot;:&quot;1.0&quot;,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Attributes&quot;:{</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;After&quot;:&quot;20&quot;, &quot;Unit&quot;:&quot;Days&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>}</td>
</tr>
</tbody>
</table>
This policy determines when to send a notification by reading the LastModifiedTime attribute of the parameter. If you change or edit a parameter, the system resets the notification time period based on the new value of LastModifiedTime.

You can assign multiple policies to a parameter. For example, you can assign Expiration and ExpirationNotification policies so that the system triggers a CloudWatch Events event to notify you about the impending deletion of a parameter. You can assign a maximum of ten (10) policies to a parameter.

The following example shows a `PutParameter` API request that assigns four policies to a new Secure String parameter named `ProdDB3`.

```
PutParameterRequest
{
  "Name":"ProdDB3",
  "Description":"Parameter with policies",
  "Value":"P@ssW*rd21",
  "Type":"SecureString",
  "Overwrite":"True",
  "Policies":[
    {
      "Type":"Expiration",
      "Version":"1.0",
      "Attributes":{
        "Timestamp":"2018-12-02T21:34:33.000Z"
      }
    },
    {
      "Type":"ExpirationNotification",
      "Version":"1.0",
      "Attributes":{
        "Before":"30",
        "Unit":"Days"
      }
    },
    {
      "Type":"ExpirationNotification",
      "Version":"1.0",
      "Attributes":{
        "Before":"15",
        "Unit":"Days"
      }
    },
    {
      "Type":"NoChangeNotification",
      "Version":"1.0",
      "Attributes":{
        "After":"20",
        "Unit":"Days"
      }
    }
  ]
}
```
Adding Policies to an Existing Parameter

This section includes information about how to add policies to an existing parameter by using the AWS Systems Manager console, the AWS CLI, and AWS Tools for Windows PowerShell. For information about how to create a new parameter that includes policies, see Creating Systems Manager Parameters (p. 850).

Topics
- Add Policies to an Existing Parameter (Console) (p. 847)
- Add Policies to an Existing Parameter (AWS CLI) (p. 847)
- Add Policies to an Existing Parameter by Using the Tools for Windows PowerShell (p. 848)

Add Policies to an Existing Parameter (Console)

Use the following procedure to add policies to an existing parameter by using the Systems Manager console.

To add policies to an existing parameter
2. In the navigation pane, choose Parameter Store.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Parameter Store.
3. Choose the option next to the parameter that you want to update to include policies, and then choose Edit.
4. Choose Advanced.
5. (Optional) In the Parameter policies section, choose Enabled. You can specify an expiration date and one or more notification policies for this parameter.
6. Choose Save changes.

Important
- Parameter Store preserves policies on a parameter until you either overwrite the policies with new policies or remove the policies.
- To remove all policies from an existing parameter, edit the parameter and apply an empty policy by using brackets and curly braces, as follows: [{}]
- If you add a new policy to a parameter that already has policies, then Systems Manager overwrites the policies attached to the parameter. The existing policies are deleted. If you want to add a new policy to a parameter that already has one or more policies, then you must copy and paste the original policies, type the new policy, and then save your changes.

Add Policies to an Existing Parameter (AWS CLI)

Use the following procedure to add policies to an existing parameter by using the AWS CLI.

To add policies to an existing parameter
1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to add policies to an existing parameter.
Here is an example that includes an expiration policy that deletes the parameter after 15 days. The example also includes a notification policy that generates a CloudWatch Events event five (5) days before the parameter is deleted. Last, it includes a NoChangeNotification policy if no changes are made to this parameter after 60 days. The example uses an obfuscated name (elixir3131) for a password and an AWS Key Management Service (KMS) customer master key (CMK). For more information about CMKs, see AWS Key Management Service Concepts in the AWS Key Management Service Developer Guide.

```
aws ssm put-parameter --name "/Finance/Payroll/elixir3131" --value "P@ssSwW)rd" --type "SecureString" --policies "[{"Type":"Expiration","Version":"1.0","Attributes":{{"Timestamp":"2018-05-13T00:00:00.000Z"}},{"Type":"ExpirationNotification","Version":"1.0","Attributes":{{"Before":"5","Unit":"Days"}}},{"Type":"NoChangeNotification","Version":"1.0","Attributes":{{"After":"60","Unit":"Days"}}}]" --overwrite
```

3. Run the following command to verify the details of the parameter.

```
aws ssm describe-parameters  --parameter-filters "Key=Name,Values=Name of the parameter"
```

**Important**

- Parameter Store retains policies for a parameter until you either overwrite the policies with new policies or remove the policies.
- To remove all policies from an existing parameter, edit the parameter and apply an empty policy of brackets and curly braces. For example:

```
aws ssm put-parameter --name parameter_name --type type --value 'value' --policies "[{}]"
```

- If you add a new policy to a parameter that already has policies, then Systems Manager overwrites the policies attached to the parameter. The existing policies are deleted. If you want to add a new policy to a parameter that already has one or more policies, then you must copy and paste the original policies, type the new policy, and then save your changes.

## Add Policies to an Existing Parameter by Using the Tools for Windows PowerShell

Use the following procedure to add policies to an existing parameter by using Tools for Windows PowerShell.

### To add policies to an existing parameter

1. Open AWS Tools for Windows PowerShell and run the following command to specify your credentials. You must either have administrator privileges in Amazon EC2, or you must have been granted the appropriate permission in IAM. For more information, see Systems Manager Prerequisites (p. 12).

```
Set-AWSCredentials -AccessKey key_name -SecretKey key_name
```

2. Run the following command to set the Region for your PowerShell session. The example uses the US East (Ohio) Region (us-east-2).
3. Run the following command to add policies to an existing parameter.

```
Write-SSMParameter -Name "a name" -Value "a value" -Type "parameter type" -Policies "["policies enclosed in brackets and curly braces"]]" -Overwrite
```

Here is an example that includes an expiration policy that deletes the parameter at midnight (GMT) on May 13, 2020. The example also includes a notification policy that generates a CloudWatch Events event five (5) days before the parameter is deleted. Last, it includes a NoChangeNotification policy if no changes are made to this parameter after 60 days. The example uses an obfuscated name (elixir3131) for a password and an AWS-managed customer master key (CMK).

```
Write-SSMParameter -Name "/Finance/Payroll/elixir3131" -Value "P@SwW)rd" -Type "SecureString" -Policies 
{"Type":"Expiration","Version":"1.0","Attributes 
":{"Timestamp":"2018-05-13T00:00:00.000Z"}},{"Type":"ExpirationNotification 
","Version":"1.0","Attributes":{"Before":"5","Unit":"Days"}},{"Type": 
"NoChangeNotification","Version":"1.0","Attributes":{"After":"60","Unit": 
"Days"}}]" -Overwrite
```

4. Run the following command to verify the details of the parameter.

```
(Get-SSMParameterValue -Name "the name you specified").Parameters
```

**Important**

- Parameter Store preserves policies on a parameter until you either overwrite the policies with new policies or remove the policies.
- To remove all policies from an existing parameter, edit the parameter and apply an empty policy of brackets and curly braces. For example:

```
Write-SSMParameter -Name "a name" -Value "a value" -Type "parameter type" -Policies "["""]
```

- If you add a new policy to a parameter that already has policies, then Systems Manager overwrites the policies attached to the parameter. The existing policies are deleted. If you want to add a new policy to a parameter that already has one or more policies, then you must copy and paste the original policies, type the new policy, and then save your changes.

**Requirements and Constraints for Parameter Names**

Use the information in this topic to help you specify valid values for parameter names when you create a parameter.

This information supplements the details in the topic [PutParameter](#) in the [AWS Systems Manager API Reference](#), which also provides information about the values `AllowedPattern`, `Description`, `KeyId`, `Overwrite`, `Type`, and `Value`.

The requirements and constraints for parameter names include the following:

- **Case sensitivity**: Parameter names are case sensitive.
- **Spaces**: Parameter names can't include spaces.
• **Valid characters:** Parameter names can consist of the following symbols and letters only: a-zA-Z0-9_.-/

• **Length:** The maximum length for the fully qualified parameter name you specify is 1011 characters. (The maximum storage length for the parameter name field in the system is 2048 characters. However, this length includes capacity for additional system attributes that are not part of the name.)

• **Prefixes:** A parameter name cannot be prefixed with "aws" or "ssm" (case-insensitive). For example, attempts to create parameters with the following names will fail with an exception:
  - awsTestParameter
  - SSM-testparameter
  - /aws/testparam1

  **Note**
  When you specify a parameter in an SSM document, command, or script, you do include ssm as part of the syntax, as shown in the following examples. Note that there is no space between brackets.
  - Valid: {{ssm:parameter_name}} and {{ ssm:parameter_name }}, such as {{ssm:addUsers}}, and {{ssm:addUsers }}
  - Invalid: {{ssm:ssmAddUsers}}

• **Uniqueness:** A parameter name must be unique within an AWS Region. For example, Systems Manager treats the following as separate parameters, if they exist in the same Region:
  - /Test/TestParam1
  - /TestParam1

The following examples are also unique:
  - /Test/TestParam1/Logpath1
  - /Test/TestParam1

The following examples, however, if in the same Region, are not unique:
  - /TestParam1
  - TestParam1

• **Hierarchy depth:** If you specify a parameter hierarchy, the hierarchy can have a maximum depth of fifteen levels. You can define a parameter at any level of the hierarchy. Both of the following examples are structurally valid:
  - /Level-1/L2/L3/L4/L5/L6/L7/L8/L9/L10/L11/L12/L13/L14/parameter-name
  - parameter-name

Attempting to create the following parameter would fail with a HierarchyLevelLimitExceededException exception:
  - /Level-1/L2/L3/L4/L5/L6/L7/L8/L9/L10/L11/L12/L13/L14/L15/L16/parameter-name

**Important**
If a user has access to a path, then the user can access all levels of that path. For example, if a user has permission to access path /a, then the user can also access /a/b. Even if a user has explicitly been denied access in IAM for parameter /a/b, they can still call the GetParametersByPath API action recursively for /a and view /a/b.

## Creating Systems Manager Parameters

Use the information in the following topics to help you create Systems Manager parameters using the AWS Systems Manager console, the AWS CLI, or AWS Tools for Windows PowerShell.

**Topics**
- Create a Systems Manager Parameter (Console) (p. 851)
Create a Systems Manager Parameter (Console)

You can use the AWS Systems Manager console to create a Systems Manager parameter.

**Note**
Parameters are only available in the AWS Region where they were created.

**To create a parameter**

2. In the navigation pane, choose **Parameter Store**.
   - or -
   If the AWS Systems Manager home page opens first, choose the menu icon (☰) to open the navigation pane, and then choose **Parameter Store**.
3. Choose **Create parameter**.
4. For **Name**, type a hierarchy and a parameter name. For example, type `/Test/helloWorld`.
5. In the **Description** box, type a description that identifies this parameter as a test parameter.
6. For **Parameter tier** choose either **Standard** or **Advanced**. For more information about advanced parameters, see **About Advanced Parameters** (p. 834).
7. For **Type**, choose **String**, **StringList**, or **SecureString**.
   
   **Note**
   - If you choose **SecureString**, the **KMS Key ID** field appears. If you don't provide a KMS customer master key (CMK) ID, a CMK ARN, an alias name, or an alias ARN, then the system uses `alias/aws/ssm`, which is the AWS managed CMK for Systems Manager. If you don't want to use this key, then you can use a customer managed CMK. For more information about secure string parameters, see **About Secure String Parameters** (p. 832). For more information about AWS managed and customer managed CMKs, see **AWS Key Management Service Concepts** in the **AWS Key Management Service Developer Guide**. For more information about Parameter Store and KMS encryption, see **How AWS Systems Manager Parameter Store Uses AWS KMS**.
   - When creating a secure string parameter in the console by using the **key-id** parameter with either a customer managed CMK alias name or an alias ARN, you must specify the prefix `alias/` before the alias. Here is an ARN example:

   ```
   arn:aws:kms:us-east-2:123456789012:alias/MyAliasName
   ```

   Here is an alias name example:

   ```
   alias/MyAliasName
   ```

   8. In the **Value** box, type a value. For example, type `MyFirstParameter`. If you chose **Secure String**, the value is masked as you type.
9. (Optional) In the **Tags** area, apply one or more tag key-value pairs to the parameter.

   Tags are optional metadata that you assign to a resource. Tags enable you to categorize a resource in different ways, such as by purpose, owner, or environment. For example, you might want to tag a Systems Manager parameter to identify the type of resource to which it applies, the environment,
or the type of configuration data referenced by the parameter. In this case, you could specify the following key-value pairs:

- Key=Resource, Value=S3bucket
- Key=OS, Value=Windows
- Key=ParameterType, Value=LicenseKey

10. Choose **Create parameter**.
11. In the parameters list, choose the name of the parameter you just created. Verify the details on the **Overview** tab. If you created a secure string parameter, choose **Show** to view the unencrypted value.

**Note**
You can’t change an advanced parameter to a standard parameter. If you no longer need an advanced parameter, or if you no longer want to incur charges for an advanced parameter, you must delete it and recreate it as a new standard parameter.

### Create a Systems Manager Parameter (AWS CLI)

You can use the AWS CLI to create a parameter that uses the **String**, **StringList**, or **SecureString** data type.

For more information about using the AWS CLI to create parameters, see *Walkthrough: Create and Use a Parameter in a Command (AWS CLI)* (p. 879).

**Note**
Parameters are only available in the AWS Region where they were created.

**Topics**
- **Create a String or StringList Parameter (AWS CLI)** (p. 852)
- **Create a Secure String Parameter (AWS CLI)** (p. 853)

### Create a String or StringList Parameter (AWS CLI)

1. Install and configure the AWS CLI, if you have not already.
   
   For information, see *Install or Upgrade the AWS CLI* (p. 58).
2. Run the following command to create a parameter.

   ```bash
   aws ssm put-parameter --name "parameter_name" --value "a parameter value, or a comma-separated list of values" --type String or StringList
   ```

   If successful, the command returns the version number of the parameter.

   This example adds two key-value pair tags to a parameter. (Depending on the operating system type on your local machine, run one of the following commands. The version to run from a local Windows machine includes the escape characters (\") that you need to run the command from your command line tool.)

   **Windows** local machine:

   ```bash
   aws ssm put-parameter --name parameter-name --value parameter-value, or a comma-separated-list-of-values --type String --tags []{{"Key":"Region1","Value":"East1"}},{{"Key":"Environment1","Value":"Production1"}}
   ```

   **Linux** local machine:
aws ssm put-parameter --name parameter-name --value "parameter-value, or a comma-separated-list-of-values" --type "String" --tags '{["Key":"Region","Value":"East"],
{"Key":"Environment", "Value":"Production"}]

Here is an example that uses the StringList data type.

aws ssm put-parameter --name /IAD/ERP/Oracle/addUsers --value "Milana,Mariana,Mark,Miguel" --type StringList --tier Standard

Note
• Items in a StringList must be separated by a comma (,). You can't use other punctuation or special character to escape items in the list. If you have a parameter value that requires a comma, then use the String data type.

3. Run the following command to verify the details of the parameter.

aws ssm get-parameters --name "the_parameter_name_you_specified"

Here is an example that uses the name specified in the earlier example.

aws ssm get-parameters --name "/IAD/ERP/Oracle/addUsers"

Create a Secure String Parameter (AWS CLI)
Before you create a Secure String parameter, read about the requirements for this type of parameter. For more information, see About Secure String Parameters (p. 832).

1. Install and configure the AWS CLI, if you have not already.

For information, see Install or Upgrade the AWS CLI (p. 58).

2. Run the following command to create a parameter.

aws ssm put-parameter --name "parameter_name" --value "parameter value" --type SecureString --key-id "a KMS CMK ID, a KMS CMK ARN, an alias name, or an alias ARN"

Note
To use the AWS Key Management Service (KMS) customer master key (CMK) assigned to your account, remove the key-id parameter from the command. For more information about CMKs, see AWS Key Management Service Concepts in the AWS Key Management Service Developer Guide.

The following example uses an obfuscated name (elixir3131) for a password parameter and a CMK.

aws ssm put-parameter --name /Finance/Payroll/elixir3131 --value "P@sSwW)rd" --type SecureString --key-id arn:aws:kms:us-east-2:123456789012:key/1a2b3c4d-1a2b-1a2b-1a2b-1a2b3c4d5e

3. Run the following command to verify the details of the parameter.

aws ssm get-parameters --name "the_parameter_name_you_specified" --with-decryption
Note
If you don't specify the with-decryption parameter, or if you specify the no-with-decryption parameter, the command returns an encrypted GUID.

Create a Systems Manager Parameter (Tools for Windows PowerShell)

You can use Tools for Windows PowerShell to create a parameter that uses the String, StringList, or SecureString data type.

Note
Parameters are only available in the AWS Region where they were created.

Topics
• Create a String or StringList parameter (Tools for Windows PowerShell) (p. 854)
• Create a Secure String parameter (Tools for Windows PowerShell) (p. 855)

Create a String or StringList parameter (Tools for Windows PowerShell)

1. Open AWS Tools for Windows PowerShell and run the following command to specify your credentials. You must either have administrator privileges in Amazon EC2, or you must have been granted the appropriate permission in IAM. For more information, see Systems Manager Prerequisites (p. 12).

   Set-AWSCredentials -AccessKey key_name -SecretKey key_name

2. Run the following command to set the Region for your PowerShell session.

   Set-DefaultAWSRegion -Region region

   region represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as us-east-2 for the US East (Ohio) Region. For a list of supported region values, see the Region column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

3. Run the following command to create a parameter.

   Write-SSMParameter -Name "parameter_name" -Value "a parameter value, or a comma-separated list of values" -Type "String or StringList"

   If successful, the command returns the version number of the parameter.

   Note
   Items in a StringList must be separated by a comma (,). You can't use other punctuation or special character to escape items in the list. If you have a parameter value that requires a comma, then use the String data type.

   Here is an example that uses a String data type.

   Write-SSMParameter -Name "/IAD/Web/SQL/IPaddress" -Value "99.99.99.999" -Type "String"

4. Run the following command to verify the details of the parameter.

   (Get-SSMParameterValue -Name "the_parameter_name_you_specified").Parameters
Create a Secure String parameter (Tools for Windows PowerShell)

Before you create a secure string parameter, read about the requirements for this type of parameter. For more information, see About Secure String Parameters (p. 832).

1. Open AWS Tools for Windows PowerShell and run the following command to specify your credentials. You must either have administrator privileges in Amazon EC2, or you must have been granted the appropriate permission in IAM. For more information, see Systems Manager Prerequisites (p. 12).

   ```powershell
   Set-AWSCredentials -AccessKey key_name -SecretKey key_name
   ```

2. Run the following command to set the Region for your PowerShell session.

   ```powershell
   Set-DefaultAWSRegion -Region region
   ```

   *region* represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as `us-east-2` for the US East (Ohio) Region. For a list of supported *region* values, see the *Region* column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

3. Run the following command to create a parameter.

   ```powershell
   Write-SSMParameter -Name "parameter_name" -Value "a parameter value" -Type "SecureString" -KeyId "a KMS CMK ID, a KMS CMK ARN, an alias name, or an alias ARN"
   ```

   If successful, the command returns the version number of the parameter.

   **Note**
   To use the AWS-managed customer master key (CMK) assigned to your account, remove the `-KeyId` parameter from the command.

   Here is an example that uses an obfuscated name (`elixir3131`) for a password parameter and an AWS-managed customer master key (CMK).

   ```powershell
   Write-SSMParameter -Name "/Finance/Payroll/elixir3131" -Value "P@sSwW)rd" -Type "SecureString"
   ```

4. Run the following command to verify the details of the parameter.

   ```powershell
   (Get-SSMParameterValue -Name "the_parameter_name_you_specified" -WithDecryption $true).Parameters
   ```

Tagging Systems Manager Parameters

You can use the Systems Manager console, the AWS CLI, the AWS Tools for Windows, or the `AddTagsToResource` API to add tags to Systems Manager resources, including documents, managed instances, maintenance windows, Parameter Store parameters, and patch baselines.

Tags are used to organize parameters. For example, you can tag parameters for specific environments, departments, or users and groups. After you tag a parameter, you can restrict access to it by creating an IAM policy that specifies the tags that the user can access. For more information about restricting access to parameters by using tags, see Controlling Access to Parameters Using Tags (p. 837).

For information about the Regions where Systems Manager is available, see regions.
Tag a Parameter (Console) (p. 856)
Tag a Parameter (AWS CLI) (p. 856)
Tag a Parameter (AWS Tools for Windows) (p. 856)

Tag a Parameter (Console)
2. In the left navigation, choose Parameter Store.
3. Choose the name of a parameter you have already created, and then choose the Tags tab.
4. In the first box, enter a key for the tag, such as Environment.
5. In the second box, enter a value for the tag, such as Test.
6. Choose Save.

Tag a Parameter (AWS CLI)
1. Install and configure the AWS CLI, if you have not already.
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to list parameters that you can tag.
   ```bash
   aws ssm describe-parameters
   ```
   Note the name of a parameter that you want to tag.
3. Run the following command to tag a parameter.
   ```bash
   aws ssm add-tags-to-resource --resource-type "Parameter" --resource-id "the_parameter_name" --tags "Key=a key, for example Environment,Value=a value, for example TEST"
   ```
   If successful, the command has no output.
4. Run the following command to verify the parameter tags.
   ```bash
   aws ssm list-tags-for-resource --resource-type "Parameter" --resource-id "the_parameter_name"
   ```

Tag a Parameter (AWS Tools for Windows)
1. Open AWS Tools for Windows PowerShell and run the following command to specify your credentials. You must either have administrator privileges in Amazon EC2 or you must have been granted the appropriate permission in IAM. For more information, see Systems Manager Prerequisites (p. 12).
   ```powershell
   Set-AWSCredentials -AccessKey key_name -SecretKey key_name
   ```
2. Run the following command to set the Region for your PowerShell session.
   ```powershell
   Set-DefaultAWSRegion -Region region
   ```
   `region` represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as us-east-2 for the US East (Ohio) Region. For a list of supported `region` values, see the
Working with Parameters

3. Run the following command to list parameters that you can tag.

   ```bash
   Get-SSMParameterList
   ```

4. Run the following commands to tag a parameter.

   ```powershell
   $tag1 = New-Object Amazon.SimpleSystemsManagement.Model.Tag
   $tag1.Key = "Environment"
   $tag1.Value = "TEST"
   Add-SSMResourceTag -ResourceType "Parameter" -ResourceId "parameter_name" -Tag $tag1
   ```

   If successful, the command has no output.

5. Run the following command to verify the parameter tags.

   ```powershell
   Get-SSMResourceTag -ResourceType "Parameter" -ResourceId "parameter_name"
   ```

Working with Parameter Versions

When you initially create a parameter, Parameter Store assigns version 1 to that parameter. When you edit a parameter, Parameter Store automatically iterates the version number by 1. You can specify a parameter name and a specific version number in API calls and SSM documents. If you don't specify a version number, the system automatically uses the latest version.

Parameter versions provide a layer of protection in the event that a parameter is accidentally changed. You can view the details, including the values, of all versions. You can also use parameter versions to see how many times a parameter changed over a period of time.

You can reference specific parameter versions, including older versions, in commands, API calls, and SSM documents by using the following format: `{{ssm:parameter_name:version}}`. Here is an example for a parameter named RunCommand specified in an SSM document:

```json
{
   "schemaVersion":"1.2",
   "description":"Run a shell script or specify the commands to run.",
   "parameters":{
      "commands":{
         "type":"StringList",
         "description": "(Required) Specify a shell script or a command to run.",
         "minItems":1,
         "displayType":"textarea",
         "default":"{{ssm:RunCommand:2}}"
      },
      "executionTimeout":{
         "type":"String",
         "default":"3600",
         "description": "(Optional) The time in seconds for a command to complete before it is considered to have failed. Default is 3600 (1 hour). Maximum is 172800 (48 hours).",
         "allowedPattern": "([1-9][0-9]{0,3})|(1[0-9]{1,4})|(2[0-7][0-9]{1,3})|(28[0-7][0-9]*){1,2}]|([28800]"
      }
   },
   "runtimeConfig":{
      "aws:runShellScript":{
         "properties":[
            
```
Create a New Parameter Version (Console) (p. 858)

Create a New Parameter Version (Console)

You can use the Amazon EC2 console or AWS Systems Manager console to create a new version of a parameter.

To create a new parameter version

2. In the navigation pane, choose Parameter Store.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Parameter Store.
3. Choose the name of a parameter that you created earlier. For information about creating a new parameter, see Creating Systems Manager Parameters (p. 850).
   
   Note
   Parameters are only available in the Region where they were created. If you don't see a parameter that you want to update, then verify your Region.
4. Choose Edit.
5. In the Value box, type a new value, and then choose Save changes.
6. In the parameters list, choose the name of the parameter you just updated, and then view the History tab. On the Overview tab, verify that the version number incremented by 1, and verify the new value.

Labeling Parameters

A parameter label is a user-defined alias to help you manage different versions of a parameter. When you modify a parameter, Systems Manager automatically saves a new version and increments the version number by one. A label can help you remember the purpose of a parameter version when there are multiple versions.

For example, let's say you have a parameter called /MyApp/DB/ConnectionString. The value of the parameter is a connection string to a MySQL server in a local database in a test environment. After you finish updating the application, you want the parameter to use a connection string for a production database. You change the value of /MyApp/DB/ConnectionString. Systems Manager automatically creates version two with the new connection string. To help you remember the purpose of each version, you attach a label to each parameter. For version one, you attach the label Test and for version two you attach the label Production.
You can move labels from one version of a parameter to another version. For example, if you create version three of the /MyApp/DB/ConnectionString parameter with a connection string for a new production database, then you can move the Production label from parameter two to parameter three.

Parameter labels are a lightweight alternative to parameter tags. Your organization might have strict guidelines for tags that must be applied to different AWS resources. In contrast, a label is simply a text association for a specific version of a parameter.

Similar to tags, you can query parameters by using labels. You can view a list of specific parameter versions that all use the same label if you query your parameter set by using the GetParametersByPath API action, as described later in this section.

Label Requirements and Restrictions

Parameter labels have the following requirements and restrictions:

- A version of a parameter can have a maximum of 10 labels.
- You can't attach the same label to different versions of the same parameter. For example, if version 1 has the label Production, then you can't attach Production to version 2.
- You can move a label from one version of a parameter to another.
- You can't create a label when you create a new parameter. You must attach a label to a specific version of a parameter.
- You can't delete a parameter label. If you no longer want to use a parameter label, then you must move it to a different version of a parameter.
- A label can have a maximum of 100 characters.
- Labels can contain letters (case sensitive), numbers, periods (.), hyphens (-), or underscores (_).
- Labels can't begin with a number, “aws,” or “ssm” (not case sensitive). If a label fails to meet these requirements, then the label is not attached to the parameter version and the system displays it in the list of InvalidLabels.

Topics

- Working With Parameter Labels (Console) (p. 859)
- Working With Parameter Labels (AWS CLI) (p. 861)

Working With Parameter Labels (Console)

This section describes how to perform the following tasks by using the AWS Systems Manager console.

- Create a New Parameter Label (p. 859)
- View Labels Attached to a Parameter (p. 860)
- Move a Parameter Label (p. 860)

Create a New Parameter Label

The following procedure describes how to attach a label to a specific version of an existing parameter by using the Systems Manager console. You can't attach a label when you create a parameter.

To attach a label to a parameter version by using the console

2. In the navigation pane, choose Parameter Store.
-or-

If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Parameter Store.

3. Choose the name of a parameter to open the details page for that parameter.
4. Choose the History tab.
5. Choose the parameter version for which you want to attach a label.
6. Choose **Attach labels**.
7. Choose **Add another label**.
8. In the text box, enter the label. To add more labels, choose **Add another label**. You can attach a maximum of ten labels.
9. When you are finished attaching labels, choose **Confirm**.

### View Labels Attached to a Parameter

A parameter version can have a maximum of ten labels. The following procedure describes how to view all labels attached to a parameter version by using the Systems Manager console.

**To view labels attached to a parameter version by using the console**

2. In the navigation pane, choose **Parameter Store**.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Parameter Store**.
3. Choose the name of a parameter to open the details page for that parameter.
4. Choose the History tab.
5. Locate the parameter version for which you want to view all attached labels. The **Labels** column shows all labels attached to the parameter version.

### Move a Parameter Label

You can’t delete a parameter label after you create it. You can, however, move a label between versions of a parameter. The following procedure describes how to move a parameter label to a different version of the same parameter by using the Systems Manager console.

**To move a label to a different parameter version by using the console**

2. In the navigation pane, choose **Parameter Store**.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Parameter Store**.
3. Choose the name of a parameter to open the details page for that parameter.
4. Choose the History tab.
5. Choose the parameter version for which you want to move the label.
6. Choose **Attach labels**.
7. Choose **Add another label**.
8. In the text box, enter the label. The console notifies you of the label move.
9. When you are finished, choose **Confirm**.

**Working With Parameter Labels (AWS CLI)**

This section describes how to perform the following tasks by using the AWS CLI.

- Create a New Parameter Label (p. 861)
- View Labels for a Parameter (p. 862)
- View a List of Parameters that are Assigned a Label (p. 863)
- Move a Parameter Label (p. 864)

**Create a New Parameter Label**

The following procedure describes how to attach a label to a specific version of an existing parameter by using the AWS CLI. You can’t attach a label when you create a parameter.

**To create a new parameter label**

1. Install and configure the AWS CLI, if you have not already.
   
   For information, see Install or Upgrade the AWS CLI (p. 58).
2. Run the following command to view a list of parameters for which you have permission to attach a label.
   
   ```
   aws ssm describe-parameters
   ```
   
   Note the name of a parameter for which you want to attach a label.
3. Run the following command to view all versions of the parameter.
   
   ```
   aws ssm get-parameter-history --name "the_parameter_name"
   ```
   
   Note the parameter version for which you want to attach a label.
4. Run the following command to retrieve information about a parameter by version number.
   
   ```
   aws ssm get-parameters --names "the_parameter_name:the_version_number"
   ```
   
   Here is an example.
   
   ```
   aws ssm get-parameters --names "/Production/SQLConnectionString:3"
   ```
5. Run one of the following commands to attach a label to a version of a parameter. If you attach multiple labels, then you must separate label names with a space.

   **Attach a label to the latest version of a parameter**

   ```
   aws ssm label-parameter-version --name parameter_name --labels label_name
   ```
Attach a label to a specific version of a parameter

```bash
aws ssm label-parameter-version --name parameter_name --parameter-version version_number --labels label_name
```

Here are some examples:

```bash
aws ssm label-parameter-version --name /config/endpoint --labels production east-region finance

aws ssm label-parameter-version --name /config/endpoint --parameter-version 3 --labels MySQL-test
```

**Note**

If the output shows the label you created in the InvalidLabels list, then the label does not meet the requirements described earlier in this topic. Review the requirements and try again. If the InvalidLabels list is empty, then your label was successfully applied to the version of the parameter.

6. You can view the details of the parameter by using either a version number or a label name. Run the following command and specify the label you created in the previous step.

```bash
aws ssm get-parameter --name parameter_name --labels label_name --with-decryption
```

The command returns information like the following:

```json
{
    "Parameter": {
        "Version": version_number,
        "Type": parameter_type,
        "Name": parameter_name,
        "Value": parameter_value,
        "Selector": label_name
    }
}
```

**Note**

Selector in the output is either the version number or the label that you specified in the Name input field.

**View Labels for a Parameter**

You can use the GetParameterHistory API action to view the full history and all labels attached to a specified parameter. Or, you can use the GetParametersByPath API action to view a list of all parameters that are assigned a specific label.

**To view labels for a parameter by using the GetParameterHistory API action**

1. Run the following command to view a list of parameters for which you can view labels.

   ```bash
   aws ssm describe-parameters
   ```
Note the name of a parameter for which you want to move a label.

2. Run the following command to view all versions of the parameter.

```
aws ssm get-parameter-history --name parameter_name --with-decryption
```

The system returns information like the following:

```
{
   "Parameters": [
   {
      "Name": "/Config/endpoint",
      "LastModifiedDate": 1528932105.382,
      "Labels": [
         "Deprecated"
      ],
      "Value": "MyTestService-June-Release.example.com",
      "Version": 1,
      "LastModifiedUser": "arn:aws:iam::123456789012:user/test",
      "Type": "String"
   },
   {
      "Name": "/Config/endpoint",
      "LastModifiedDate": 1528932111.222,
      "Labels": [
         "Current"
      ],
      "Value": "MyTestService-July-Release.example.com",
      "Version": 2,
      "LastModifiedUser": "arn:aws:iam::123456789012:user/test",
      "Type": "String"
   }
   ]
}
```

**View a List of Parameters that are Assigned a Label**

You can use the `GetParametersByPath` API action to view a list of all parameters in a path that are assigned a specific label.

Run the following command to view a list of parameters in a path that are assigned a specific label.

```
aws ssm get-parameters-by-path --path parameter_path --parameter-filters
    Key=Label,Values=label_name,Option=Equals --max-results a_number --with-decryption --recursive
```

The system returns information like the following. For this example, the user searched under the /Config path:

```
{
   "Parameters": [
   {
      "Version": 3,
      "Type": "SecureString",
      "Name": "/Config/DBpwd",
      "Value": "MyS@perGr&pass33"
   },
   {
      "Version": 2,
```

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Move a Parameter Label

You can't delete a parameter label after you create it. You can, however, move a label between versions of a parameter. The following procedure describes how to move a parameter label to a different version of the same parameter.

To move a parameter label

1. Run the following command to view all versions of the parameter.

   ```bash
   aws ssm get-parameter-history --name "the_parameter_name"
   ```

   Note the parameter version for which you want to attach a label.

2. Run the following command to assign an existing label to a different version of a parameter.

   ```bash
   aws ssm label-parameter-version --name parameter_name --parameter-version version_number --labels name_of_existing_label
   ```

   **Note**
   If you want to move an existing label to the latest version of a parameter, then remove `--parameter-version` from the command.

Working with Public Parameters

Some AWS services publish information about common artifacts as Systems Manager public parameters. For example, the Amazon Elastic Compute Cloud (Amazon EC2) service publishes information about Amazon Machines Images (AMIs) as public parameters. You can call this information from your scripts and code by using the `GetParametersByPath`, `GetParameter`, and `GetParameters` API actions.

This topic describes how to call public parameters by using the AWS CLI.

Contents

- Calling AMI Public Parameters (p. 864)
- Calling the ECS Optimized AMI Public Parameter (p. 866)
- Calling AWS Service, Region, and Endpoint Public Parameters (p. 867)

Calling AMI Public Parameters

Amazon EC2 AMI public parameters are available from the following paths:

- /aws/service/ami-amazon-linux-latest
• /aws/service/ami-windows-latest

You can view a list of all Linux AMIs in the current AWS Region by using the following command in the AWS CLI.

```
aws ssm get-parameters-by-path --path /aws/service/ami-amazon-linux-latest --query Parameters[].Name
```

The command returns information like the following.

```
[ 
  "/aws/service/ami-amazon-linux-latest/amzn-ami-hvm-x86_64-ebs",
  "/aws/service/ami-amazon-linux-latest/amzn-ami-hvm-x86_64-gp2",
  "/aws/service/ami-amazon-linux-latest/amzn-ami-hvm-x86_64-s3",
  "/aws/service/ami-amazon-linux-latest/amzn-ami-minimal-hvm-x86_64-s3",
  "/aws/service/ami-amazon-linux-latest/amzn-ami-minimal-pv-x86_64-s3",
  "/aws/service/ami-amazon-linux-latest/amzn2-ami-hvm-arm64-gp2",
  "/aws/service/ami-amazon-linux-latest/amzn2-ami-hvm-arm64-ebs",
  "/aws/service/ami-amazon-linux-latest/amzn2-ami-hvm-x86_64-ebs",
  "/aws/service/ami-amazon-linux-latest/amzn2-ami-minimal-hvm-arm64-ebs",
  "/aws/service/ami-amazon-linux-latest/amzn2-ami-minimal-hvm-x86_64-ebs",
  "/aws/service/ami-amazon-linux-latest/amzn2-ami-minimal-pv-x86_64-ebs",
  "/aws/service/ami-amazon-linux-latest/amzn-ami-minimal-pv-x86_64-ebs",
  "/aws/service/ami-amazon-linux-latest/amzn2-ami-minimal-hvm-x86_64-ebs",
  "/aws/service/ami-amazon-linux-latest/amzn-ami-pv-x86_64-ebs",
  "/aws/service/ami-amazon-linux-latest/amzn-ami-pv-x86_64-gp2",
  "/aws/service/ami-amazon-linux-latest/amzn-ami-pv-x86_64-s3",
  "/aws/service/ami-amazon-linux-latest/amzn2-ami-pv-x86_64-gp2",
  "/aws/service/ami-amazon-linux-latest/amzn2-ami-pv-x86_64-s3",
]
```

You can view details about these AMIs, including the AMI IDs and Amazon Resource Names (ARNs), by using the following command.

```
aws ssm get-parameters-by-path --path "/aws/service/ami-amazon-linux-latest" --region Region
```

The command returns information like the following. This example output has been truncated for space.

```
{
  "Parameters": [
    {
      "Name": "/aws/service/ami-amazon-linux-latest/amzn-ami-hvm-x86_64-ebs",
      "Type": "String",
      "Value": "ami-0d75cc1d706735521",
      "Version": 7,
      "LastModifiedDate": 1543873943.358,
      "ARN": "arn:aws:ssm:us-east-2::parameter/aws/service/ami-amazon-linux-latest/amzn-ami-hvm-x86_64-ebs"
    },
    {
      "Name": "/aws/service/ami-amazon-linux-latest/amzn-ami-hvm-x86_64-gp2",
      "Type": "String",
      "Value": "ami-0cd3dfa4e37921605",
      "Version": 7,
      "LastModifiedDate": 1543873943.47,
      "ARN": "arn:aws:ssm:us-east-2::parameter/aws/service/ami-amazon-linux-latest/amzn-ami-hvm-x86_64-gp2"
    },
    {
      "Name": "/aws/service/ami-amazon-linux-latest/amzn-ami-hvm-x86_64-s3",
      "Type": "String",
      "Value": "ami-0a0e3ff8af8d19497",
      "Version": 7,
```
You can view details of a specific AMI by using the GetParameters API action with the full AMI name, including the path. Here is an example command.

```
aws ssm get-parameters --names /aws/service/ami-amazon-linux-latest/amzn2-ami-hvm-x86_64-gp2 --region us-west-2
```

The command returns the following information.

```
{
  "Parameters": [
    {
      "Name": "/aws/service/ami-amazon-linux-latest/amzn2-ami-hvm-x86_64-gp2",
      "Type": "String",
      "Value": ":ami-061392db613a6357b",
      "Version": 16,
      "LastModifiedDate": 1552519670.776,
      "ARN": "arn:aws:ssm:us-west-2::parameter/aws/service/ami-amazon-linux-latest/amzn2-ami-hvm-x86_64-gp2"
    }
  ],
  "InvalidParameters": []
}
```

### Calling the ECS Optimized AMI Public Parameter

The Amazon Elastic Container Service (Amazon ECS) service publishes the name of the latest Amazon ECS optimized AMI as a public parameter. Users are encouraged to use this AMI when creating a new Amazon EC2 cluster for Amazon ECS because the optimized AMI includes bug fixes and feature updates. Use the following command to view the name of the latest Amazon ECS optimized AMI.

```
aws ssm get-parameters --names /aws/service/ecs/optimized-ami/amazon-linux/recommended
```

The command returns information like the following.

```
{
  "Parameters": [
    {
      "Name": "/aws/service/ecs/optimized-ami/amazon-linux/recommended",
      "Type": "String",
      "Value": ":amazon-ami-2018.03.p-amazon-ecs-optimized","image_id":"ami-01a82c3f6e2c23ba58","os":"Amazon Linux","ecs_runtime_version":"Docker version 18.06.1-ce","ecs_agent_version":"1.27.0"",
      "Version": 22,
      "LastModifiedDate": 1555434745.425,
      "ARN": "arn:aws:ssm:us-west-2::parameter/aws/service/ecs/optimized-ami/amazon-linux/recommended"
    }
  ]
}
```
Calling AWS Service, Region, and Endpoint Public Parameters

You can call AWS service, Region, and endpoint public parameters by using the following path.

/aws/service/global-infrastructure

You can view a list of all active AWS Regions by using the following command in the AWS CLI.

```bash
aws ssm get-parameters-by-path --path /aws/service/global-infrastructure/regions --query Parameters[].Name
```

The command returns information like the following.

```
"/aws/service/global-infrastructure/regions/ap-northeast-1",
"/aws/service/global-infrastructure/regions/eu-central-1",
"/aws/service/global-infrastructure/regions/eu-north-1",
"/aws/service/global-infrastructure/regions/eu-west-1",
"/aws/service/global-infrastructure/regions/eu-west-3",
"/aws/service/global-infrastructure/regions/sa-east-1",
"/aws/service/global-infrastructure/regions/us-east-2",
"/aws/service/global-infrastructure/regions/us-gov-east-1",
"/aws/service/global-infrastructure/regions/us-gov-west-1",
"/aws/service/global-infrastructure/regions/us-west-1",
"/aws/service/global-infrastructure/regions/ap-northeast-2",
"/aws/service/global-infrastructure/regions/ap-northeast-3",
"/aws/service/global-infrastructure/regions/ap-south-1",
"/aws/service/global-infrastructure/regions/ap-southeast-1",
"/aws/service/global-infrastructure/regions/ap-southeast-2",
"/aws/service/global-infrastructure/regions/ca-central-1",
"/aws/service/global-infrastructure/regions/cn-north-1",
"/aws/service/global-infrastructure/regions/cn-northwest-1",
"/aws/service/global-infrastructure/regions/eu-west-2",
"/aws/service/global-infrastructure/regions/us-west-2",
"/aws/service/global-infrastructure/regions/us-east-1"
```

You can view a complete list of all available AWS services and sort them into alphabetical order by using the following command. This example output has been truncated for space.

```bash
aws ssm get-parameters-by-path --path /aws/service/global-infrastructure/services --query Parameters[].Name | sort
```

The command returns information like the following.

```
"/aws/service/global-infrastructure/services/acm-pca",
"/aws/service/global-infrastructure/services/acm",
"/aws/service/global-infrastructure/services/alexaforbusiness",
"/aws/service/global-infrastructure/services/apigateway",
"/aws/service/global-infrastructure/services/application-autoscaling",
"/aws/service/global-infrastructure/services/appmesh",
"/aws/service/global-infrastructure/services/appstream",
"/aws/service/global-infrastructure/services/appsing",
"/aws/service/global-infrastructure/services/athena",
"/aws/service/global-infrastructure/services/autoscaling-plans",
```

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You can view a list of Regions where a service is available. This example uses Systems Manager (ssm).

```bash
aws ssm get-parameters-by-path --path /aws/service/global-infrastructure/services/ssm/regions --query Parameters[].Value
```

The command returns information like the following.

```json
]
```

You can view a regional endpoint for a service by using the following command.

```bash
aws ssm get-parameter --name /aws/service/global-infrastructure/regions/us-west-1/services/ssm/endpoint --query Parameter.Value
```

The command returns information like the following.

```
"ssm.us-west-1.amazonaws.com"
```

**Related Blog Posts**

- [Query for AWS Regions, Endpoints, and More Using AWS Systems Manager Parameter Store](#)
Increasing Parameter Store Throughput

Increasing Parameter Store throughput increases the maximum number of transactions per second (TPS) that Parameter Store can process. Increased throughput enables you to operate Parameter Store at higher volumes to support applications and workloads that need concurrent access to a large number of parameters. You can increase the limit to 1,000 TPS on the Settings tab. Increasing the throughput limit incurs a charge on your AWS account. For more information, see AWS Systems Manager Pricing.

Note

The Parameter Store throughput setting applies to all transactions created by all AWS Identity and Access Management (IAM) users in the current AWS account and Region. The throughput setting applies to standard and advanced parameters.

Configuring Permissions to Increase Parameter Store Throughput

Verify that you have permission in AWS Identity and Access Management (IAM) to increase Parameter Store throughput by doing one of the following:

- Ensure that the AdministratorAccess policy is attached to your IAM user, group, or role.
- Ensure that you have permission to change the throughput service setting by using the following API actions:
  - GetServiceSetting
  - UpdateServiceSetting
  - ResetServiceSetting

Use the following procedure to add an inline IAM policy to a user account. This policy enables a user to view and change the parameter-throughput setting for parameters in their account and Region.

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Users.
3. In the list, choose the name of the user to attach a policy to.
4. Choose the Permissions tab.
5. On the right side of the page, under Permission policies, choose Add inline policy.
6. Choose the JSON tab.
7. Replace the default content with the following:

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "ssm:GetServiceSetting"
      ],
      "Resource": "*
    },
    {
      "Effect": "Deny",
      "Action": [
        "ssm:PutServiceSetting"
      ],
      "Resource": "*
    }
  ]
}
```
"Effect": "Allow",
"Action": [
    "ssm:UpdateServiceSetting"
],
}]
}

8. Choose **Review policy**.

9. On the **Review policy** page, for **Name**, enter a name for the inline policy, such as **Parameter-Store-Throughput** or another name you prefer.

10. Choose **Create policy**.

Administrators can specify read-only permission by assigning the following inline policy to the user's account.

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ssm:GetServiceSetting"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Deny",
            "Action": [
                "ssm:ResetServiceSetting",
                "ssm:UpdateServiceSetting"
            ],
            "Resource": "*"
        }
    ]
}
```

For more information about creating and editing IAM policies, see [Creating IAM Policies](#) in the [IAM User Guide](#).

**Increasing Throughput (Console)**

The following procedure shows how to use the Systems Manager console to increase the number of transactions per second that Parameter Store can process for the current AWS account and Region.

**To increase Parameter Store throughput**

2. In the navigation pane, choose **Parameter Store**.
   - or -
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Parameter Store**.
3. Choose the **Settings** tab.
4. Choose **Set limit**.

---

870
5. Review the message, and choose Accept.

If you no longer need increased throughput, or if you no longer want to incur charges, you can revert to the standard settings. To revert your settings, repeat this procedure and choose Reset limit.

Increasing Throughput (AWS CLI)

The following procedure shows how to use the AWS Command Line Interface (AWS CLI) to increase the number of transactions per second that Parameter Store can process for the current AWS account and Region.

To increase Parameter Store throughput using the AWS CLI

1. Open the AWS CLI and run the following command to increase the transactions per second that Parameter Store can process in the current AWS account and Region.

   ```bash
   aws ssm update-service-setting --setting-id arn:aws:ssm:us-east-1:123456789012:servicesetting/ssm/parameter-store/high-throughput-enabled --setting-value true
   ```

   There is no output if the command succeeds.

2. Run the following command to view the current throughput service settings for Parameter Store in the current AWS account and Region.

   ```bash
   aws ssm get-service-setting --setting-id arn:aws:ssm:us-east-1:123456789012:servicesetting/ssm/parameter-store/high-throughput-enabled
   ```

   ```json
   ```

If you no longer need increased throughput, or if you no longer want to incur charges, you can revert to the standard settings. To revert your settings, run the following command.

```bash
aws ssm reset-service-setting --setting-id arn:aws:ssm:us-east-1:123456789012:servicesetting/ssm/parameter-store/high-throughput-enabled
```
Increasing Throughput (PowerShell)

The following procedure shows how to use the AWS Tools for Windows PowerShell to increase the number of transactions per second that Parameter Store can process for the current AWS account and Region.

To increase Parameter Store throughput using PowerShell

1. Increase Parameter Store throughput in the current AWS account and Region using the AWS Tools for PowerShell.

   ```powershell
   Update-SSMServiceSetting -SettingId "arn:aws:ssm:us-east-1:123456789012:servicesetting/ssm/parameter-store/high-throughput-enabled" -SettingValue "true" -Region us-east-1
   ```

   There is no output if the command succeeds.

2. Run the following command to view the current throughput service settings for Parameter Store in the current AWS account and Region.

   ```powershell
   ```

   LastModifiedDate : 4/29/2019 3:35:44 PM
   LastModifiedUser : arn:aws:sts::123456789012:assumed-role/Administrator/Jasper
   SettingId        : /ssm/parameter-store/high-throughput-enabled
   SettingValue     : true
   Status           : Customized

If you no longer need increased throughput, or if you no longer want to incur charges, you can revert to the standard settings. To revert your settings, run the following command.

```powershell
```

Specifying a Default Parameter Tier

In requests to create or update a parameter (that is, the `PutParameter` action), you can specify the parameter tier to use in the request. The following is an example, using the AWS CLI.

```bash
aws ssm put-parameter \
  --name "default-ami" \
  --type "String" \
  --value "t2.micro"
```
Whenever you specify a tier in the request, Parameter Store creates or updates the parameter according to your request. However, if you do not explicitly specify a tier in a request, the Parameter Store default tier setting determines which tier the parameter is created in.

The default tier when you begin using Parameter Store is the standard-parameter tier. If you use the advanced-parameter tier, you can specify one of the following as the default:

- **Advanced**: With this option, Parameter Store evaluates all requests as advanced parameters.
- **Intelligent-Tiering**: With this option, Parameter Store evaluates each request to determine if the parameter is standard or advanced.

If the request doesn't include any options that require an advanced parameter, the parameter is created in the standard-parameter tier. If one or more options requiring an advanced parameter are included in the request, Parameter Store create a parameter in the advanced-parameter tier.

**Benefits of Intelligent-Tiering**

The following are reasons you might choose Intelligent-Tiering as the default tier.

**Cost control** – Intelligent-Tiering helps control your parameter-related costs by always creating standard parameters unless an advanced parameter is absolutely necessary.

**Automatic upgrade to the advanced-parameter tier** – When you make a change to your code that requires upgrading a standard parameter to an advanced parameter, Intelligent-Tiering handles the conversion for you. You do not need to change your code to handle the upgrade.

Here are some examples of automatic upgrade:

- Your AWS CloudFormation templates provision numerous parameters when they are run. When this process causes you to reach the 10,000 parameter limit in the standard-parameter tier, Intelligent-Tiering automatically upgrades you to the advanced-parameter tier, and your AWS CloudFormation processes are not interrupted.
- You store a certificate value in a parameter, rotate the certificate value regularly, and the content is less than the 4 KB limit of the standard-parameter tier. If a replacement certificate value exceeds 4 KB, Intelligent-Tiering automatically upgrades the parameter to the advanced-parameter tier.
- You want to associate numerous existing standard parameters to a parameter policy, which requires the advanced-parameter tier. Instead of your having to include the option `--tier Advanced` in all of the calls to update the parameters, Intelligent-Tiering automatically upgrades the parameters to the advanced-parameter tier. The Intelligent-Tiering option upgrades parameters from standard to advanced whenever criteria for the advanced-parameter tier are introduced.

Options that require an advanced parameter include the following:

- The content size of the parameter is more than 4 KB.
- The parameter uses a parameter policy.
- More than 10,000 parameters already exist in your AWS account in the current Region.

**Default Tier Options**

The tier options you can specify as the default include the following:

- **Standard** – The standard-parameter tier is the default tier when you begin to use Parameter Store. Using the standard-parameter tier, you can create 10,000 parameters for each Region in an AWS account. The content size of each parameter can equal a maximum of 4 KB. Standard parameters
do not support parameter policies. There is no additional charge to use the standard-parameter tier. Choosing **Standard** as the default tier means that Parameter Store always attempts to create a standard parameter for requests that don't specify a tier.

- **Advanced** – The advanced-parameter tier lets you create a maximum of 100,000 parameters for each Region in an AWS account. The content size of each parameter can equal a maximum of 8 KB. Advanced parameters support parameter policies. There is a charge to use the advanced-parameter tier. For more information, see AWS Systems Manager Pricing. Choosing **Advanced** as the default tier means that Parameter Store always attempts to create an advanced parameter for requests that don't specify a tier.

  **Note**
  When you choose the advanced-parameter tier, you must explicitly authorize AWS to charge your account for any advanced parameters you create.

- **Intelligent-Tiering** – The Intelligent-Tiering option lets Parameter Store determine whether to use the standard-parameter tier or advanced-parameter tier based on the content of the request. For example, if you run a command to create a parameter with content under 4 KB, and there are fewer than 10,000 parameters in the current Region in your AWS account, and you do not specify a parameter policy, a standard parameter is created. If you run a command to create a parameter with more than 4 KB of content, you already have more than 10,000 parameters in the current Region in your AWS account, or you specify a parameter policy, an advanced parameter is created.

  **Note**
  When you choose Intelligent-Tiering, you must explicitly authorize AWS to charge your account for any advanced parameters that are created.

You can change the Parameter Store default tier setting at any time.

### Configuring Permissions to Specify a Parameter Store Default Tier

Verify that you have permission in AWS Identity and Access Management (IAM) to change the default parameter tier in Parameter Store by doing one of the following:

- Ensure that the **AdministratorAccess** policy is attached to your IAM user, group, or role.
- Ensure that you have permission to change the default tier setting by using the following API actions:
  - **GetServiceSetting**
  - **UpdateServiceSetting**
  - **ResetServiceSetting**

Use the following procedure to add an inline IAM policy to a user account. This policy enables a user to view and change the default tier setting for parameters in a specific Region in an AWS account.

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose **Users**.
3. In the list, choose the name of the user to attach a policy to.
4. Choose the **Permissions** tab.
5. On the right side of the page, under **Permission policies**, choose **Add inline policy**.
6. Choose the **JSON** tab.
7. Replace the default content with the following:

```json
{
    "Version": "2012-10-17",
```
9. On the Review policy page, for Name, enter a name for the inline policy, such as **Parameter-Store-Default-Tier** or another name you prefer.
10. Choose **Create policy**.

Administrators can specify read-only permission by assigning the following inline policy to the user’s account.

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "ssm:GetServiceSetting"
      ],
      "Resource": "*"
    },
    {
      "Effect": "Deny",
      "Action": [
        "ssm:ResetServiceSetting",
        "ssm:UpdateServiceSetting"
      ],
      "Resource": "*"
    }
  ]
}
```

For more information about creating and editing IAM policies, see Creating IAM Policies in the IAM User Guide.

**Specifying or Changing the Parameter Store Default Tier (Console)**

The following procedure shows how to use the Systems Manager console to specify or change the default parameter tier for the current AWS account and Region.

**To specify or change the Parameter Store default tier**

2. In the navigation pane, choose **Parameter Store**.

-or-

If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose **Parameter Store**.

3. Choose the **Settings** tab.

4. Choose **Set default**.

5. Choose one of the following options.

   - **Standard**
   - **Advanced**
   - **Intelligent-Tiering**

   For information about these options, see **Specifying a Default Parameter Tier (p. 872)**.

6. Review the message, and choose **Confirm**.

If you want to change the default tier setting later, repeat this procedure and specify a different default tier option.

**Specifying or Changing the Parameter Store Default Tier (AWS CLI)**

The following procedure shows how to use the AWS Command Line Interface (AWS CLI) to change the default parameter tier setting for the current AWS account and Region.

**To specify or change the Parameter Store default tier using the AWS CLI**

1. Open the AWS CLI and run the following command to change the default parameter tier setting for a specific Region in an AWS account.

   ```bash
   ```

   *region* represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as `us-east-2` for the US East (Ohio) Region. For a list of supported *region* values, see the **Region** column in the **AWS Systems Manager Table of Regions and Endpoints** in the **AWS General Reference**.

   *tier-option* values include **Standard**, **Advanced**, and **Intelligent-Tiering**. For information about these options, see **Specifying a Default Parameter Tier (p. 872)**.

   There is no output if the command succeeds.

2. Run the following command to view the current throughput service settings for Parameter Store in the current AWS account and Region.

   ```bash
   ```

   The system returns information similar to the following:

   ```json
   {
   ```
If you want to change the default tier setting again, repeat this procedure and specify a different SettingValue option.

### Specifying or Changing the Parameter Store Default Tier (PowerShell)

The following procedure shows how to use the AWS Tools for Windows PowerShell to change the default parameter tier setting for a specific Region in an AWS account.

#### To specify or change the Parameter Store default tier using PowerShell

1. Change the Parameter Store default tier in the current AWS account and Region using the AWS Tools for PowerShell.

   ```powershell
   ```

   *region* represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as us-east-2 for the US East (Ohio) Region. For a list of supported region values, see the Region column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

   *tier-option* values include Standard, Advanced, and Intelligent-Tiering. For information about these options, see Specifying a Default Parameter Tier (p. 872).

   There is no output if the command succeeds.

2. Run the following command to view the current throughput service settings for Parameter Store in the current AWS account and Region.

   ```powershell
   ```

   *region* represents the Region identifier for an AWS Region supported by AWS Systems Manager, such as us-east-2 for the US East (Ohio) Region. For a list of supported region values, see the Region column in the AWS Systems Manager Table of Regions and Endpoints in the AWS General Reference.

   The system returns information similar to the following:

   ```plaintext
   LastModifiedDate : 4/29/2019 3:35:44 PM
   LastModifiedUser : arn:aws:sts::123456789012:assumed-role/Administrator/Jasper
   SettingId        : /ssm/parameter-store/default-parameter-tier
   ```
Parameter Store Walkthroughs

The walkthroughs in this section show you how to create, store, and run parameters with Parameter Store in a test environment. These walkthroughs show you how to use Parameter Store with other Systems Manager capabilities. You can also use Parameter Store with other AWS services. For more information, see Using Secure String Parameters With Other AWS Services (p. 833).

Contents
- Walkthrough: Create and Use a Parameter in a Command (Console) (p. 878)
- Walkthrough: Create and Use a Parameter in a Command (AWS CLI) (p. 879)
- Walkthrough: Create a Secure String Parameter and Join an Instance to a Domain (PowerShell) (p. 881)
- Walkthrough: Manage Parameters Using Hierarchies (AWS CLI) (p. 883)

Walkthrough: Create and Use a Parameter in a Command (Console)

The following procedure walks you through the process of creating a parameter in Parameter Store and then running a command that uses this parameter.

To create a parameter using Parameter Store

2. In the navigation pane, choose Parameter Store.
3. Choose Create parameter.
4. In the Name box, enter a hierarchy and a name. For example, enter /Test/helloWorld.
   For more information about parameter hierarchies, see Organizing Parameters into Hierarchies (p. 842).
5. In the Description field, enter a description that identifies this parameter as a test parameter.
6. For Type, choose String.
7. In the Value field, enter a string. For example, enter My1stParameter.
8. Choose Create parameter.
9. In the navigation pane, choose Run Command.
10. Choose Run command.
11. In the Command document list, choose AWS-RunPowershellScript (Windows) or AWS-RunShellScript (Linux).
12. Under Target instances, choose a managed instance in your account.
13. In the Commands field, enter echo {{ssm:parameter-name}}, for example, echo {{ssm:/Test/helloWorld}}.
15. Scroll to the bottom of the **Command ID** page, select the button next to an instance ID, and then choose **View output**.

**Walkthrough: Create and Use a Parameter in a Command (AWS CLI)**

The following procedure walks you through the process of creating and storing a parameter using the AWS CLI.

**To create and use a parameter in a command (AWS CLI)**

1. Install and configure the AWS CLI, if you have not already.
   
   For information, see [Install or Upgrade the AWS CLI](p. 58).

2. Run the following command to create a parameter that uses the String data type. The `--name` option supports hierarchies. For information about hierarchies, see [Organizing Parameters into Hierarchies](p. 842).

   ```bash
   aws ssm put-parameter --name "parameter_name" --value "a parameter value" --type String
   ```

   Here is an example that uses a parameter hierarchy in the name. For more information about parameter hierarchies, see [Organizing Parameters into Hierarchies](p. 842).

   ```bash
   aws ssm put-parameter --name "/Test/IAD/helloWorld" --value "My1stParameter" --type String
   ```

   The command returns the version number of the parameter.

3. Run the following command to view the parameter metadata.

   ```bash
   aws ssm describe-parameters --filters "Key=Name,Values="/Test/IAD/helloWorld"
   ```

   **Note**

   *Name* must be capitalized.

   The system returns information like the following.

   ```json
   {
   "Parameters": [
   {
   "LastModifiedUser": "arn:aws:iam::123456789012:user/User's name",
   "LastModifiedDate": 1494529763.156,
   "Type": "String",
   "Name": "helloworld"
   }
   ]
   }
   ```

4. Run the following command to change the parameter value.

   ```bash
   aws ssm put-parameter --name "/Test/IAD/helloWorld" --value "good day sunshine" --type String --overwrite
   ```

   The command returns the version number of the parameter.

5. Run the following command to view the latest parameter value.
aws ssm get-parameters --names "/Test/IAD/helloWorld"

The system returns information like the following.

```json
{
   "InvalidParameters": [],
   "Parameters": [
      {
         "Type": "String",
         "Name": "/Test/IAD/helloWorld",
         "Value": "good day sunshine"
      }
   ]
}
```

6. Run the following command to view the parameter value history.

```
aws ssm get-parameter-history --name "/Test/IAD/helloWorld"
```

7. Run the following command to use this parameter in a command.

```
aws ssm send-command --document-name "AWS-RunShellScript" --parameters '{}' --targets "Key=instanceids,Values=instance-ids"
```

Use the following procedure to create a secure string parameter. For more information about secure string parameters, see About Secure String Parameters (p. 832).

**To create a secure string parameter using the AWS CLI**

1. Run one of the following commands to create a parameter that uses the SecureString datatype.

   **Create a secure string parameter that uses a customer managed customer master key (CMK)**

   ```
   aws ssm put-parameter --name "parameter_name" --value "a value, for example P@ssW%rd#1" --type "SecureString"
   ```

   **Create a secure string parameter that uses a custom AWS KMS key**

   ```
   aws ssm put-parameter --name "parameter_name" --value "a parameter value" --type "SecureString" --key-id "your-AWS-user-account ID/the-custom-AWS KMS-key"
   ```

   Here is an example that uses a customer managed CMK.

   ```
   aws ssm put-parameter --name "my-password" --value "P@ssW%rd#1" --type "SecureString" --key-id "arn:aws:kms:us-east-2:123456789012:key/1a2b3c4d-1a2b-1a2b-1a2b-1a2b3c4d5e"
   ```

2. Run the following command to view the parameter metadata.

   ```
   aws ssm describe-parameters --filters "Key=Name,Values=the_name_that_you_specified"
   ```

3. Run the following command to change the parameter value.

   ```
   aws ssm put-parameter --name "the_name_that_you_specified" --value "new parameter value" --type "SecureString" --overwrite
   ```
Updating a secure string parameter that uses a customer managed customer master key (CMK)

```bash
aws ssm put-parameter --name "the_name_that_you_specified" --value "new parameter value" --type "SecureString" --key-id "the-CMK-ID" --overwrite
```

Updating a secure string parameter that uses a customer managed CMK

```bash
aws ssm put-parameter --name "the_name_that_you_specified" --value "new parameter value" --type "SecureString" --key-id "your-AWS-user-account-alias/the-CMK-ID" --overwrite
```

4. Run the following command to view the latest parameter value.

```bash
aws ssm get-parameters --names "the_name_that_you_specified" --with-decryption
```

5. Run the following command to view the parameter value history.

```bash
aws ssm get-parameter-history --name "the_name_that_you_specified"
```

**Important**

Only the value of a secure string parameter is encrypted. Parameter names, descriptions, and other properties are not encrypted.

**Walkthrough: Create a Secure String Parameter and Join an Instance to a Domain (PowerShell)**

This walkthrough shows how to join a Windows instance to a domain using Systems Manager secure string parameters and Run Command. The walkthrough uses typical domain parameters, such as the domain name and a domain user name. These values are passed as unencrypted string values. The domain password is encrypted using an AWS-managed customer master key (CMK) and passed as a secure string.

**Prerequisites**

This walkthrough assumes that you already specified your domain name and DNS server IP address in the DHCP option set that is associated with your Amazon VPC. For information, see Working with DHCP Options Sets in the Amazon VPC User Guide.

**To create a secure string parameter and join an instance to a domain**

1. Enter parameters into the system using AWS Tools for Windows PowerShell.

   ```bash
   Write-SSMParameter -Name "domainName" -Value "DOMAIN-NAME" -Type String
   Write-SSMParameter -Name "domainJoinUserName" -Value "DOMAIN\USERNAME" -Type String
   Write-SSMParameter -Name "domainJoinPassword" -Value "PASSWORD" -Type SecureString
   ```

   **Important**
   
   Only the value of a secure string parameter is encrypted. Parameter names, descriptions, and other properties are not encrypted.

2. Attach the following IAM policies to the IAM role permissions for your instance:

   - **AmazonSSMManagedInstanceCore** – Required. This AWS managed policy enables a managed instance to use Systems Manager service core functionality.
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- **AmazonSSMDirectoryServiceAccess** – Required. This AWS managed policy allows SSM Agent to access AWS Directory Service on your behalf for requests to join the domain by the managed instance.

- **A custom policy for Amazon S3 bucket access** – Required. SSM Agent, which is on your instance and performs Systems Manager tasks, requires access to specific Amazon-owned S3 buckets. In the custom S3 bucket policy that you create, you also provide access to S3 buckets of your own that are necessary for Systems Manager operations.

Examples: You can write output for Run Command commands or Session Manager sessions to an S3 bucket, and then use this output later for auditing or troubleshooting. You store access scripts or custom patch baseline lists in an S3 bucket, and then reference the script or list when you run a command, or when a patch baseline is applied.

For information about creating a custom policy for Amazon S3 bucket access, see Create a Custom S3 Bucket Policy for an Instance Profile (p. 30)

**Note**

Saving output log data in an S3 bucket is optional, but we recommend setting it up at the beginning of your Systems Manager configuration process if you have decided to use it. For more information, see Create a Bucket in the Amazon Simple Storage Service Getting Started Guide.

- **CloudWatchAgentServerPolicy** – Optional. This AWS managed policy allows you to run the CloudWatch agent on managed instances. This policy makes it possible to read information on an instance and write it to Amazon CloudWatch. Your instance profile needs this policy only if you will use CloudWatch features, such as CloudWatch Events or CloudWatch Logs.

**Note**

Using CloudWatch features is optional, but we recommend setting them up at the beginning of your Systems Manager configuration process if you have decided to use them. For more information, see the Amazon CloudWatch Events User Guide and the Amazon CloudWatch Logs User Guide.

3. Edit the IAM role attached to the instance and add the following policy. This policy gives the instance permissions to call the kms:Decrypt API.

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": ["kms:Decrypt"],
      "Resource": ["arn:aws:kms:region:account-id:key/key-id"]
    }
  ]
}
```

4. Copy and paste the following json sample into a simple text editor and save the file as JoinInstanceToDomain.json in the following location: c:\temp \JoinInstanceToDomain.json.

```json
{
  "schemaVersion": "2.2",
  "description": "Run a PowerShell script to securely domain-join a Windows instance",
  "mainSteps": [
    
```
5. Run the following command in AWS Tools for Windows PowerShell to create a new SSM document.

```powershell
$json = Get-Content C:\temp\JoinInstanceToDomain | Out-String
New-SSMDocument -Name JoinInstanceToDomain -Content $json -DocumentType Command
```

6. Run the following command in AWS Tools for Windows PowerShell to join the instance to the domain.

```powershell
Send-SSMCommand -InstanceId instance-id -DocumentName JoinInstanceToDomain
```

Walkthrough: Manage Parameters Using Hierarchies (AWS CLI)

This walkthrough shows how to work with parameters and parameter hierarchies by using the AWS CLI. For more information about parameter hierarchies, see Organizing Parameters into Hierarchies (p. 842).

To manage parameters using hierarchies

1. Install and configure the AWS CLI, if you have not already.

   For information, see Install or Upgrade the AWS CLI (p. 58).

2. Run the following command to create a parameter that uses the allowedPattern parameter and the String data type. The allowed pattern in this example means the value for the parameter must be between 1 and 4 digits long.

   ```shell
   aws ssm put-parameter --name "/MyService/Test/MaxConnections" --value 100 --allowed-pattern \d{1,4} --type String
   ```

   The command returns the version number of the parameter.

3. Run the following command to attempt to overwrite the parameter you just created with a new value.
aws ssm put-parameter --name "/MyService/Test/MaxConnections" --value 10,000 --type String --overwrite

The system throws the following error because the new value does not meet the requirements of the allowed pattern you specified in the previous step.

An error occurred (ParameterPatternMismatchException) when calling the PutParameter operation: Parameter value, cannot be validated against allowedPattern: \d{1,4}

4. Run the following command to create a secure string parameter that uses an AWS-managed customer master key (CMK). The allowed pattern in this example means the user can specify any character, and the value must be between 8 and 20 characters.

aws ssm put-parameter --name "/MyService/Test/my-password" --value "p#sW*rd33" --allowed-pattern ".{8,20}" --type SecureString

5. Run the following commands to create more parameters that use the hierarchy structure from the previous step.

aws ssm put-parameter --name "/MyService/Test/DBname" --value "SQLDevDb" --type String

aws ssm put-parameter --name "/MyService/Test/user" --value "SA" --type String

aws ssm put-parameter --name "/MyService/Test/userType" --value "SQLuser" --type String

6. Run the following command to get the value of two parameters.

aws ssm get-parameters --names "/MyService/Test/user" "/MyService/Test/userType"

7. Run the following command to query for all parameters within a single level.

aws ssm get-parameters-by-path --path "/MyService/Test"

8. Run the following command to delete two parameters

aws ssm delete-parameters --names "/IADRegion/Dev/user" "/IADRegion/Dev/userType"
Monitoring AWS Systems Manager

SSM Agent writes information about executions, scheduled actions, errors, and health statuses to log files on each instance. Manually connecting to an instance to view log files and troubleshoot an issue with SSM Agent is time-consuming. For more efficient instance monitoring, you can configure either SSM Agent itself or the CloudWatch agent to send this log data to Amazon CloudWatch Logs.

**Important**
The unified CloudWatch agent has replaced SSM Agent as the tool for sending log data to Amazon CloudWatch Logs. Support for using SSM Agent to send log data will be deprecated in the near future. We recommend using only the unified CloudWatch agent for your log collection processes. For more information, see the following topics:

- Sending Logs to CloudWatch Logs (CloudWatch agent) (p. 887)
- Migrate Windows Server Instance Log Collection to the CloudWatch agent (p. 887)
- Collect Metrics from Amazon Elastic Compute Cloud Instances and On-Premises Servers with the CloudWatch agent in the Amazon CloudWatch User Guide

Using CloudWatch Logs, you can monitor log data in real-time, search and filter log data by creating one or more metric filters, and archive and retrieve historical data when you need it. For more information about CloudWatch Logs, see the Amazon CloudWatch Logs User Guide.

Configuring an agent to send log data to Amazon CloudWatch Logs provides the following benefits:

- Centralized log file storage for all of your SSM Agent log files.
- Quicker access to files to investigate errors.
- Indefinite log file retention (configurable).
- Logs can be maintained and accessed regardless of the status of the instance.
- Access to other CloudWatch features such as metrics and alarms.

For information about monitoring Session Manager activity, see Auditing and Logging Session Activity (p. 610).

**Topics**

- Sending Logs to CloudWatch Logs (SSM Agent) (p. 885)
- Sending Logs to CloudWatch Logs (CloudWatch agent) (p. 887)
- Logging AWS Systems Manager API Calls with AWS CloudTrail (p. 892)
- Monitoring Systems Manager Events with Amazon CloudWatch Events (p. 894)
- Configuring Amazon SNS Notifications for AWS Systems Manager (p. 896)

**Sending Logs to CloudWatch Logs (SSM Agent)**

AWS Systems Manager Agent (SSM Agent) is Amazon software that runs on your Amazon EC2 instances and your hybrid instances that are configured for Systems Manager (hybrid instances). SSM Agent processes requests from the Systems Manager service in the cloud and configures your machine as specified in the request. For more information about SSM Agent, see Working with SSM Agent (p. 64).

In addition, following the steps below, you can configure SSM Agent to send log data to Amazon CloudWatch Logs.
Important
The unified CloudWatch agent has replaced SSM Agent as the tool for sending log data to Amazon CloudWatch Logs. Support for using SSM Agent to send log data will be deprecated in the near future. We recommend using only the unified CloudWatch agent for your log collection processes. For more information, see the following topics:

- Sending Logs to CloudWatch Logs (CloudWatch agent) (p. 887)
- Migrate Windows Server Instance Log Collection to the CloudWatch agent (p. 887)
- Collect Metrics from Amazon Elastic Compute Cloud Instances and On-Premises Servers with the CloudWatch agent in the Amazon CloudWatch User Guide

Before You Begin
Create a log group in Amazon CloudWatch Logs. For more information, see Create a Log Group in CloudWatch Logs in the Amazon CloudWatch Logs User Guide.

To configure SSM Agent to send logs to CloudWatch

1. Log into an instance and locate the following file:
   On Windows: %PROGRAMFILES%\Amazon\SSM\seelog.xml.template
   On Linux: /etc/amazon/ssm/seelog.xml.template
2. Change the file name from seelog.xml.template to seelog.xml.
3. Open the seelog.xml file in a text editor, and locate the following section:

   `<outputs formatid="fmtinfo">
   <console formatid="fmtinfo"/>
   <rollingfile type="size" maxrolls="5" maxsize="30000000"
   filename="{{LOCALAPPDATA}}\Amazon\SSM\Logs\amazon-ssm-agent.log"/>
   <filter formatid="fmterror" levels="error,critical">
   <rollingfile type="size" maxrolls="5" maxsize="10000000"
   filename="{{LOCALAPPDATA}}\Amazon\SSM\Logs\errors.log"/>
   </filter>
   </outputs>

4. Edit the file, and add the following `custom name` element after the closing `</filter>` tag, as shown in the following example.

   `<seelog minlevel="info" critmsgcount="500" maxinterval="100000000" mininterval="2000000" type="adaptive">
   <exceptions>
   <exception minlevel="error" filepattern="test*"/>
   </exceptions>
   <outputs formatid="fmtinfo">
   <console formatid="fmtinfo"/>
   <rollingfile type="size" maxrolls="5" maxsize="30000000"
   filename="{{LOCALAPPDATA}}\Amazon\SSM\Logs\amazon-ssm-agent.log"/>
   <filter formatid="fmterror" levels="error,critical">
   <rollingfile type="size" maxrolls="5" maxsize="10000000"
   filename="{{LOCALAPPDATA}}\Amazon\SSM\Logs\errors.log"/>
   </filter>
   <custom name="cloudwatch_receiver" formatid="fmtdebug" data-log-group="Your CloudWatch Log Group Name"/>
   </outputs>

5. Save your changes, and then restart SSM Agent or the instance.
7. Choose **Logs**, and then choose your log group. (The log stream for SSM Agent log file data is organized by instance ID.)

**Sending Logs to CloudWatch Logs (CloudWatch agent)**

You can configure and use the Amazon CloudWatch agent to collect metrics and logs from your instances instead of using SSM Agent for these tasks. The CloudWatch agent enables you to gather more metrics on Amazon EC2 instances than are available using SSM Agent. In addition, you can gather metrics from on-premises servers using the CloudWatch agent.

You can also store agent configuration settings in the Systems Manager Parameter Store for use with the CloudWatch agent.

**Note**
Currently, AWS Systems Manager supports migrating from SSM Agent to the CloudWatch agent for collecting logs and metrics on 64-bit versions of Windows only. For information about setting up the CloudWatch agent on other operating systems, and for complete information about using the CloudWatch agent, see Collect Metrics from Amazon Elastic Compute Cloud Instances and On-Premises Servers with the CloudWatch agent in the Amazon CloudWatch User Guide.

You can use the CloudWatch agent on other supported operating systems, but you will not be able to use Systems Manager to perform a tool migration.

**Topics**
- Migrate Windows Server Instance Log Collection to the CloudWatch agent (p. 887)
- Store CloudWatch agent Configuration Settings in Parameter Store (p. 891)
- Rolling Back to Log Collection with SSM Agent (p. 891)

**Migrate Windows Server Instance Log Collection to the CloudWatch agent**

If you are currently using SSM Agent on supported Windows Server instances to send SSM Agent log files to Amazon CloudWatch Logs, you can use Systems Manager to migrate from SSM Agent to the CloudWatch agent as your log collection tool, as well as migrate your configuration settings.

The CloudWatch agent is not supported on 32-bit versions of Windows Server.

For 64-bit Amazon EC2 Windows instances, you can perform the migration to the CloudWatch agent automatically or manually. For on-premises servers and virtual machines, the process must be performed manually.

**Note**
During the migration process, the data sent to CloudWatch may be interrupted or duplicated. Your metrics and log data will be recorded accurately again in CloudWatch after the migration is completed.

We recommend testing the migration on a limited number of instances before migrating an entire fleet to the CloudWatch agent. After migration, if you prefer log collection with SSM Agent, you can return to using it instead.

**Important**
In the following cases, you won’t be able to migrate to the CloudWatch agent using the steps described in this topic:
• The existing configuration for SSM Agent specifies multiple Regions.
• The existing configuration for SSM Agent specifies multiple sets of access/secret key credentials.

In these cases, it will be necessary to disable log collection in SSM Agent and install the CloudWatch agent without a migration process. For more information, see the following topics:

• Install the CloudWatch Agent on an Amazon EC2 Instance
• Install the CloudWatch Agent on an On-Premises Server

Before You Begin

Before you begin a migration to the CloudWatch agent for log collection, ensure that the instances on which you will perform the migration meet these requirements:

• The OS is a 64-bit version of Windows Server.
• SSM Agent 2.2.93.0 or later is installed on the instance.
• SSM Agent is configured for monitoring on the instance.

Topics

• Automatically Migrating to the CloudWatch agent (p. 888)
• Manually Migrating to the CloudWatch agent (p. 889)

Automatically Migrating to the CloudWatch agent

For Amazon EC2 Windows instances only, you can use the AWS Systems Manager console or the AWS CLI to automatically migrate to the CloudWatch agent as your log collection tool.

Note
Currently, AWS Systems Manager supports migrating from SSM Agent to the CloudWatch agent for collecting logs and metrics on 64-bit versions of Windows only. For information about setting up the CloudWatch agent on other operating systems, and for complete information about using the CloudWatch agent, see Collect Metrics from Amazon Elastic Compute Cloud Instances and On-Premises Servers with the CloudWatch agent in the Amazon CloudWatch User Guide.

You can use the CloudWatch agent on other supported operating systems, but you will not be able to use Systems Manager to perform a tool migration.

After the migration succeeds, check your results in CloudWatch to ensure you are receiving the metrics, logs, or Windows event logs you expect. If you are satisfied with the results, you can optionally Store CloudWatch agent Configuration Settings in Parameter Store (p. 891). If the migration is not successful or the results are not as expected, you can Rolling Back to Log Collection with SSM Agent (p. 891).

Note
If you want to migrate a source configuration file that includes a {hostname} entry, then be aware that the {hostname} entry can change the value of the field after the migration is complete. For example, say that the following "LogStream": "{hostname}" entry maps to a server named MyLogServer001.

```json
{
    "Id": "CloudWatchIISLogs",
    "Parameters": {
```
To automatically migrate to the CloudWatch agent (console)
2. In the navigation pane, choose Run Command, and then choose Run command.
3. In the Command document list, choose AmazonCloudWatch-MigrateCloudWatchAgent.
4. In the Targets section, choose an option and select the instances to update.
5. Choose Run.

To automatically migrate to the CloudWatch agent (AWS CLI)
- Run the following command:

```
aws ssm send-command --document-name AmazonCloudWatch-MigrateCloudWatchAgent --targets
Key=instanceids,Values=ID1,ID2,ID3
```

ID1, ID2, and ID3 represent the IDs of instances you want to update, such as i-02573cafcfEXAMPLE.

Manually Migrating to the CloudWatch agent

For on-premises Windows instances or Amazon EC2 Windows instances, follow these steps to manually migrate log collection to the Amazon CloudWatch agent.

**Note**
If you want to migrate a source configuration file that includes a {hostname} entry, then be aware that the {hostname} entry can change the value of the field after the migration is complete. For example, say that the following "LogStream": "{hostname}" entry maps to a server named MyLogServer001.

```
{
"Id": "CloudWatchIISLogs",
"Parameters": {
"AccessKey": "",
"SecretKey": "",
"Region": "us-east-1",
"LogGroup": "Production-Windows-IIS",
"LogStream": "{hostname}"
}
}
```

After the migration, this entry will map to a domain, such as ip-11-1-1-11.production.ExampleCompany.com. To retain the local hostname value, specify {local_hostname} instead of {hostname}.
One: To install the CloudWatch Agent (console)
2. In the navigation pane, choose Run Command, and then choose Run command.
3. In the Command document list, choose AWS-ConfigureAWSPackage.
4. In the Targets section, choose an option and select the instances to update.
5. In the Action list, choose Install.
6. In Name, type AmazonCloudWatchAgent.
7. In Version, type latest if it is not already provided by default.

Two: To update config data JSON format
- To update the JSON formatting of the existing config settings for the CloudWatch agent, use AWS Systems Manager Run Command or log into the instance directly with an RDP connection to run the following Windows PowerShell commands on the instance, one at a time:

```powershell
cd $(Env:ProgramFiles)\Amazon\AmazonCloudWatchAgent
.\amazon-cloudwatch-agent-config-wizard.exe --isNonInteractiveWindowsMigration
```

{Env:ProgramFiles} represents the location where the Amazon folder containing the CloudWatch agent can be found, typically C:\Program Files.

Three: To configure and start the CloudWatch Agent (console)
2. In the navigation pane, choose Run Command, and then choose Run command.
3. In the Command document list, choose AWS-RunPowerShellScript.
4. In the Targets section, choose an option and select the instances to update.
5. In the Commands box, enter the following two commands:

```powershell
cd $(Env:ProgramFiles)\Amazon\AmazonCloudWatchAgent
\amazon-cloudwatch-agent-ctl.ps1 -a fetch-config -m ec2 -c file:config.json -s
```

{Env:ProgramFiles} represents the location where the Amazon folder containing the CloudWatch agent can be found, typically C:\Program Files.


Four: To disable log collection in SSM Agent (console)
2. In the navigation pane, choose Run Command, and then choose Run command.
3. In the Command document list, choose AWS-ConfigurecloudWatch.
4. In the Targets section, choose an option and select the instances to update.
5. In the Status list, choose Disabled.
After completing these steps, check your logs in CloudWatch to ensure you are receiving the metrics, logs, or Windows event logs you expect. If you are satisfied with the results, you can optionally Store CloudWatch agent Configuration Settings in Parameter Store (p. 891). If the migration is not successful or the results are not as expected, you can Rolling Back to Log Collection with SSM Agent (p. 891).

Store CloudWatch agent Configuration Settings in Parameter Store

You can store the contents of an Amazon CloudWatch agent configuration file in Parameter Store. By maintaining this configuration data in a parameter, multiple instances can derive their configuration settings from it, and you avoid having to create or manually update configuration files on your instances. For example, you can use Run Command to write the contents of the parameter to configuration files on multiple instances, or use State Manager to help avoid configuration drift in the CloudWatch agent configuration settings across a fleet of instances.

When you run the CloudWatch agent configuration wizard, you can choose to let the wizard save your configuration settings as a new parameter in Parameter Store. For information about running the CloudWatch agent configuration wizard, see Create the CloudWatch agent Configuration File with the Wizard.

If you ran the wizard but did not choose the option to save the settings as a parameter, or you created the CloudWatch agent configuration file manually, you can retrieve the data to save as a parameter on your instance in the following file:

```
${Env:ProgramFiles}\Amazon\AmazonCloudWatchAgent\config.json
```

{Env:ProgramFiles} represents the location where the Amazon folder containing the CloudWatch agent can be found, typically C:\Program Files.

We recommend keeping a backup of the JSON in this file on a location other than the instance itself.

For information about creating a parameter, see Creating Systems Manager Parameters (p. 850).

For more information about the CloudWatch agent, see Collect Metrics from Amazon Elastic Compute Cloud Instances and On-Premises Servers with the CloudWatch Agent in the Amazon CloudWatch User Guide.

Rolling Back to Log Collection with SSM Agent

If you want to return to using SSM Agent for log collection, follow these steps.

One: To retrieve config data from SSM Agent

1. On the instance where you want to return to collecting logs with the SSM Agent, locate the contents of the SSM Agent config file. This JSON file is typically found in the following location:

```
#{Env:ProgramFiles}\\Amazon\\SSM\Plugins\awsCloudWatch\AWS.EC2.Windows.CloudWatch.json
```

{Env:ProgramFiles} represents the location where the Amazon folder can be found, typically C:\Program Files.

2. Copy this data into a text file for use in a later step.
We recommend storing a backup of the JSON on a location other than the instance itself.

Two: To uninstall the CloudWatch agent (console)
2. In the navigation pane, choose Run Command, and then choose Run command.
3. In the Command document list, choose AWS-ConfigureAWSPackage.
4. In the Targets section, choose an option and select the instances to update.
5. In the Action list, choose Uninstall.
6. In Name, type AmazonCloudWatchAgent.
7. Choose Run.

Three: To reenable log collection in SSM Agent (console)
2. In the navigation pane, choose Run Command, and then choose Run command.
3. In the Command document list, choose AWS-ConfigureCloudWatch.
4. In the Targets section, choose an option and select the instances to update.
5. In the Status list, choose Enabled.
6. In the Properties box (AWS Systems Manager console) or Parameters box (Amazon EC2 console), paste the contents of the old config data you saved to the text file.
7. Choose Run.

Logging AWS Systems Manager API Calls with AWS CloudTrail

Systems Manager is integrated with AWS CloudTrail, a service that provides a record of actions taken by a user, role, or an AWS service in Systems Manager. CloudTrail captures all API calls for Systems Manager as events, including calls from the Systems Manager console and from code calls to the Systems Manager APIs. If you create a trail, you can enable continuous delivery of CloudTrail events to an Amazon S3 bucket, including events for Systems Manager. If you don't configure a trail, you can still view the most recent events in the CloudTrail console in Event history. Using the information collected by CloudTrail, you can determine the request that was made to Systems Manager, the IP address from which the request was made, who made the request, when it was made, and additional details.

To learn more about CloudTrail, see the AWS CloudTrail User Guide.

Systems Manager Information in CloudTrail

CloudTrail is enabled on your AWS account when you create the account. When activity occurs in Systems Manager, that activity is recorded in a CloudTrail event along with other AWS service events in Event history. You can view, search, and download recent events in your AWS account. For more information, see Viewing Events with CloudTrail Event History.

For an ongoing record of events in your AWS account, including events for Systems Manager, create a trail. A trail enables CloudTrail to deliver log files to an Amazon S3 bucket. By default, when you create a trail in the console, the trail applies to all regions. The trail logs events from all regions in the AWS partition and delivers the log files to the Amazon S3 bucket that you specify. Additionally, you can
configure other AWS services to further analyze and act upon the event data collected in CloudTrail logs. For more information, see:

- Overview for Creating a Trail
- CloudTrail Supported Services and Integrations
- Configuring Amazon SNS Notifications for CloudTrail
- Receiving CloudTrail Log Files from Multiple Regions and Receiving CloudTrail Log Files from Multiple Accounts

All Systems Manager actions are logged by CloudTrail and are documented in the AWS Systems Manager API Reference. For example, calls to the `CreateMaintenanceWindows`, `PutInventory`, `SendCommand`, and `StartSession` actions generate entries in the CloudTrail log files. (For an example of setting up CloudTrail to monitor a Systems Manager API call, see Monitoring Session Activity Using Amazon CloudWatch Events (Console) (p. 613).)

Every event or log entry contains information about who generated the request. The identity information helps you determine the following:

- Whether the request was made with root or IAM user credentials.
- Whether the request was made with temporary security credentials for a role or federated user.
- Whether the request was made by another AWS service.

For more information, see the CloudTrail `userIdentity` Element.

### Understanding Systems Manager Log File Entries

A trail is a configuration that enables delivery of events as log files to an Amazon S3 bucket that you specify. CloudTrail log files contain one or more log entries. An event represents a single request from any source and includes information about the requested action, the date and time of the action, request parameters, and so on. CloudTrail log files are not an ordered stack trace of the public API calls, so they do not appear in any specific order.

The following example shows a CloudTrail log entry that demonstrates the `DeleteDocuments` action on a document named `example-Document` in the US East (Ohio) Region (us-east-2).

```json
{
    "eventVersion": "1.04",
    "userIdentity": {
        "type": "AssumedRole",
        "principalId": "AKIAI44QH8DHEXAMPLE:203.0.113.11",
        "arn": "arn:aws:sts::123456789012:assumed-role/example-role/203.0.113.11",
        "accountId": "123456789012",
        "accessKeyId": "AKIAIOSFODNN7EXAMPLE",
        "sessionContext": {
            "attributes": {
                "mfaAuthenticated": "false",
                "creationDate": "2018-03-06T20:19:16Z"
            },
            "sessionIssuer": {
                "type": "Role",
                "principalId": "AKIAI44QH8DHEXAMPLE",
                "arn": "arn:aws:iam::123456789012:role/example-role",
                "accountId": "123456789012",
                "userName": "example-role"
            }
        }
    },
    "eventTime": "2018-03-06T20:30:12Z",
    "eventSource": "aws.ssm",
    "eventBusName": "default",
    "region": "us-east-2",
    "eventID": "example-event-id",
    "requestParameters": {
        "maintenanceWindowName": "example-maintenance-window"
    },
    "responseElements": {
        "maintenanceWindow": {
            "name": "example-maintenance-window",
            "description": "This is an example maintenance window."
        }
    },
    "responseMetadata": {
    }
}
```
Monitoring Systems Manager Events with Amazon CloudWatch Events

You can configure rules in Amazon CloudWatch Events to alert you to changes in Systems Manager resources, and to direct CloudWatch Events to take actions based on the content of those events. CloudWatch Events provides support for a number of events that are emitted by various Systems Manager capabilities.

**Note**
For Systems Manager actions that aren't supported by CloudWatch Events, you can create an event rule that is based on an API call, which are recorded by AWS CloudTrail. For an example, see Monitoring Session Activity Using Amazon CloudWatch Events (Console) (p. 613).

For more information about how to get started with CloudWatch Events and set up rules, see Getting Started with CloudWatch Events in the *Amazon CloudWatch Events User Guide*.

Following are lists of the Systems Manager event types with built-in monitoring support in CloudWatch Events.

**Run Command**

Supported events include the following:
- Status change for a command (applies to one or more instances).
- Status change for a command invocation (applies to one instance only).

For more information, see Configuring CloudWatch Events for Run Command (p. 618).

**Automation**

Supported events include the following:
- Status change for an automation execution.
- Status change for a single step in an automation execution.

For more information, see Configuring CloudWatch Events for Systems Manager Automation (p. 895).

**State Manager**

Supported events include the following:
• State change for an association
• State change for an instance association.

Configuration Compliance

Supported events include the following:
• State change for association compliance.
• State change for instance patch compliance.

For more information, see Remediating Compliance Issues (p. 510).

Maintenance Window

Supported events include the following:
• State change for a maintenance window (enabled or disabled)
• Change in a maintenance window target registration.
• Change in a maintenance window task registration.
• State change for a maintenance window execution.
• State change for a maintenance window task execution.
• State change for a maintenance window task target invocation.

Parameter Store

Supported events include the following:
• A parameter is created, updated, or deleted, or a label is attached or moved from one version to another (detail-type: "Parameter Store Change").
• A parameter has expired or been deleted, its expiration date is approaching, or its value hasn't been changed for a specified period of time (detail-type: "Parameter Store Policy Action").

For more information, see Set Up Notifications or Trigger Actions Based on Parameter Store Events (p. 839).

Inventory

Supported events include the following:
• Deletion of custom inventory item on an instance.
• Availability of a delete action summary.
• A disabled custom inventory type is detected.

For more information, see Viewing Inventory Delete Actions in CloudWatch Events (p. 549).

For more information about the Systems Manager event types that are supported by CloudWatch Events, see the following topics in the Amazon CloudWatch Events User Guide:

• AWS Systems Manager Events
• AWS Systems Manager Configuration Compliance Events
• AWS Systems Manager Maintenance Windows Events
• AWS Systems Manager Parameter Store Events

Configuring CloudWatch Events for Systems Manager Automation

You can configure Amazon CloudWatch Events to notify you of Systems Manager Automation events. For example, you can configure CloudWatch Events to send notifications when an Automation step succeeds.
or fails. You can also configure CloudWatch Events to send notifications if the Automation workflow succeeds or fails. Use the following procedure to configure CloudWatch Events to send notification about Automation events.

**To configure CloudWatch Events for Automation**

2. Choose **Events** in the left navigation, and then choose **Create rule**.
3. Under **Event Source**, verify that **Event Pattern** is selected.
4. In the **Service Name** field, choose **EC2 Simple Systems Manager (SSM)**.
5. In the **Event Type** field, choose **Automation**.
6. Choose the detail types and statuses for which you want to receive notifications, and then choose **Add targets**.
7. In the **Select target type** list, choose a target type. For information about the different types of targets, see the corresponding AWS Help documentation.
8. Choose **Configure details**.
9. Specify the rule details, and then choose **Create rule**.

The next time you run Automation, CloudWatch Events sends event details to the target you specified.

---

**Configuring Amazon SNS Notifications for AWS Systems Manager**

You can configure Amazon Simple Notification Service (Amazon SNS) to send notifications about the status of commands that you send using AWS Systems Manager Run Command or AWS Systems Manager Maintenance Windows. Amazon SNS coordinates and manages sending and delivering notifications to clients or endpoints that are subscribed to Amazon SNS topics. You can receive a notification whenever a command changes to a new state or to a specific state, such as **Failed** or **Timed Out**. In cases where you send a command to multiple instances, you can receive a notification for each copy of the command sent to a specific instance. Each copy is called an **invocation**.

Amazon SNS can deliver notifications as HTTP or HTTPS POST, email (SMTP, either plaintext or in JSON format), or as a message posted to an Amazon Simple Queue Service (Amazon SQS) queue. For more information, see What Is Amazon SNS in the Amazon Simple Notification Service Developer Guide. For examples of the structure of the JSON data included in the Amazon SNS notification provided by Run Command and Maintenance Windows, see Example Amazon SNS Notifications for AWS Systems Manager (p. 902).

**Configure Amazon SNS Notifications for AWS Systems Manager**

Run Command and Run Command tasks that are registered to a maintenance window can send Amazon SNS notifications for command tasks that enter the following statuses. For information about the conditions that cause a command to enter one of these statuses, see Understanding Command Statuses (p. 630).

- In Progress
- Success
- Failed
- Timed Out
- Canceled

**Note**
Commands sent using Run Command also report Canceling and Pending status. These statuses are not captured by Amazon SNS notifications.

## Command Summary Amazon SNS Notifications

If you configure Run Command or a Run Command task in your maintenance window for Amazon SNS notifications, Amazon SNS sends summary messages that include the following information.

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>eventTime</td>
<td>String</td>
<td>The time that the event was triggered. The timestamp is important because Amazon SNS does not guarantee message delivery order. Example: 2016-04-26T13:15:30Z</td>
</tr>
<tr>
<td>documentName</td>
<td>String</td>
<td>The name of the SSM document used to run this command.</td>
</tr>
<tr>
<td>commandId</td>
<td>String</td>
<td>The ID generated by Run Command after the command was sent.</td>
</tr>
<tr>
<td>expiresAfter</td>
<td>Date</td>
<td>If this time is reached and the command has not already started executing, it will not run.</td>
</tr>
<tr>
<td>outputS3BucketName</td>
<td>String</td>
<td>The Amazon Simple Storage Service (Amazon S3) bucket where the responses to the command execution should be stored.</td>
</tr>
<tr>
<td>outputS3KeyPrefix</td>
<td>String</td>
<td>The Amazon S3 directory path inside the bucket where the responses to the command execution should be stored.</td>
</tr>
<tr>
<td>requestedDateTime</td>
<td>String</td>
<td>The time and date that the request was sent to this specific instance.</td>
</tr>
<tr>
<td>instanceIds</td>
<td>StringList</td>
<td>The instances that were targeted by the command.</td>
</tr>
</tbody>
</table>

**Note**
Instance IDs are only included in the summary message if the Run Command task
Configure Amazon SNS Notifications for AWS Systems Manager

### Field | Type | Description
--- | --- | ---
| | | targeted instance IDs directly. Instance IDs are not included in the summary message if the Run Command task was issued using tag-based targeting. |

### status | String | Command status for the command. |

#### Invocation-based Amazon SNS Notifications

If you send a command to multiple instances, Amazon SNS can send messages about each copy or invocation of the command. The messages include the following information.

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>eventTime</td>
<td>String</td>
<td>The time that the event was triggered. The timestamp is important because Amazon SNS does not guarantee message delivery order. Example: 2016-04-26T13:15:30Z</td>
</tr>
<tr>
<td>documentName</td>
<td>String</td>
<td>The name of the Systems Manager document used to run this command.</td>
</tr>
<tr>
<td>requestedDateTime</td>
<td>String</td>
<td>The time and date that the request was sent to this specific instance.</td>
</tr>
<tr>
<td>commandId</td>
<td>String</td>
<td>The ID generated by Run Command after the command was sent.</td>
</tr>
<tr>
<td>instanceId</td>
<td>String</td>
<td>The instance that was targeted by the command.</td>
</tr>
<tr>
<td>status</td>
<td>String</td>
<td>Command status for this invocation.</td>
</tr>
</tbody>
</table>

To set up Amazon SNS notifications when a command changes status, you must complete the following tasks.

**Note**

If you are not configuring Amazon SNS notifications for your maintenance window, then you can skip Task 5 below.

**Topics**

- Task 1: Create and Subscribe to an Amazon SNS Topic (p. 899)
- Task 2: Create an IAM Policy for Amazon SNS Notifications (p. 899)
- Task 3: Create an IAM Role for Amazon SNS Notifications (p. 900)
Task 1: Create and Subscribe to an Amazon SNS Topic

An Amazon SNS topic is a communication channel that Run Command and Run Command tasks that are registered to a maintenance window use to send notifications about the status of your commands. Amazon SNS supports different communication protocols, including HTTP/S, email, and other AWS services like Amazon SQS. To get started quickly, we recommend that you start with the email protocol. For information about how to create a topic, see Create a Topic in the Amazon Simple Notification Service Developer Guide.

**Note**
After you create the topic, copy or make a note of the **Topic ARN**. You specify this ARN when you send a command that is configured to return status notifications.

After you create the topic, subscribe to it by specifying an **Endpoint**. If you chose the Email protocol, the endpoint is the email address where you want to receive notifications. For more information about how to subscribe to a topic, see Subscribe to a Topic in the Amazon Simple Notification Service Developer Guide.

Amazon SNS sends a confirmation email from AWS Notifications to the email address that you specify. Open the email and choose the **Confirm subscription** link.

You will receive an acknowledgement message from AWS. Amazon SNS is now configured to receive notifications and send the notification as an email to the email address that you specified.

Task 2: Create an IAM Policy for Amazon SNS Notifications

Use the following procedure to create a custom AWS Identity and Access Management (IAM) policy that provides permissions for triggering Amazon SNS notifications.

To create a custom IAM policy for Amazon SNS notifications

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose **Policies**, and then choose **Create policy**. (If a **Get Started** button appears, choose it, and then choose **Create Policy**.)
3. Choose the **JSON** tab.
4. Replace the default content with the following:

```json
{
   "Version": "2012-10-17",
   "Statement": [  
      {
         "Effect": "Allow",
         "Action": [  
            "sns:Publish"
         ],
         "Resource": "*"
      }
   ]
}
```

5. Choose **Review policy**.
6. On the **Review policy** page, for **Name**, enter a name for the inline policy. For example: **SNSPublishPermissions**.
7. (Optional) For **Description**, enter a description for the policy.
8. Choose Create policy.

Task 3: Create an IAM Role for Amazon SNS Notifications

Use the following procedure to create an IAM role for Amazon SNS notifications. This service role is used by Systems Manager to trigger Amazon SNS notifications.

To create an IAM service role for Amazon SNS notifications

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles, and then choose Create role.
4. In the Select your use case section, choose EC2, and then choose Next: Permissions.
5. On the Attach permissions policies page, select the check box to the left of the name of the custom policy you created in Task 2. For example: SNSPublishPermissions.
6. On the Review page, type a name in the Role name box, and then type a description.
7. Choose Create role. The system returns you to the Roles page.
8. On the Roles page, choose the role you just created to open the Summary page.
9. Choose the Trust Relationships tab, and then choose Edit Trust Relationship.
10. Add, "ssm.amazonaws.com" to the existing policy, as shown in the following code snippet:

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "",
      "Effect": "Allow",
      "Principal": {
        "Service": [
          "ec2.amazonaws.com",
          "ssm.amazonaws.com"
        ]
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

Note
You must add a comma after the existing entry. In the preceding example, the entry is "ec2.amazonaws.com". Otherwise, the JSON is invalid.

11. Choose Update Trust Policy.
12. Copy or make a note of the Role ARN. This Role ARN is used when you send a command that is configured to return Amazon SNS notifications.
13. Leave the Summary page open.

Task 4: Configure User Access

If your AWS Identity and Access Management (IAM) user account, group, or role is assigned administrator permissions, then you have access to Systems Manager Run Command and Maintenance Windows. If you don't have administrator permissions, then an administrator must give you permission by assigning the AmazonSSMFullAccess managed policy, or a policy that provides comparable permissions, to your IAM account, group, or role.
Use the following procedure to configure a user account to use Run Command and Maintenance Windows. If you need to create a new user account, see Creating an IAM User in Your AWS Account in the IAM User Guide.

**To configure user access and attach the iam:PassRole policy to a user account**

1. In the IAM navigation pane, choose Users, and then choose the user account that you want to configure.
2. On the Permissions tab, in the policies list, verify that either the AmazonSSMFullAccess policy is listed or that there is a comparable policy that gives the account permissions to access Systems Manager.
3. Choose Add inline policy.
4. On the Create policy page, choose the Visual editor tab.
5. Choose Service, and then choose IAM.
6. Choose Select actions.
7. In the Filter actions text box, type PassRole, and then choose the PassRole option.
8. Choose Resources. Verify that Specific is selected, and then choose Add ARN.
9. In the Specify ARN for role field, paste the Amazon SNS role ARN that you copied at the end of Task 3. The system automatically populates the Account and Role name with path fields.
10. Choose Add.
12. On the Review Policy page, type a name and then choose Create Policy.

**Task 5: Attach the iam:PassRole Policy to Your Maintenance Window Role**

When you register a Run Command task with a maintenance window, you specify a service role Amazon Resource Name (ARN). This service role is used by Systems Manager to run tasks registered to the maintenance window. To configure Amazon SNS notifications for a registered Run Command task, you must attach an iam:PassRole policy to the maintenance window service role specified. If you do not intend to configure the registered task for Amazon SNS notifications, then this task can be skipped.

The iam:PassRole policy allows the Maintenance Windows service role to pass the SNS role created in Task 3 to the Amazon SNS service. The following procedure shows how to attach the iam:PassRole policy to the Maintenance Windows service role.

**Note**

You must use a custom service role for your maintenance window to send notifications related to the Run Command tasks registered. For information, see Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks?

If you need to create a custom service role, see one of the following topics:

- Control Access to Maintenance Windows (Console) (p. 446)
- Control Access to Maintenance Windows (AWS CLI) (p. 449)

**To attach the iam:PassRole policy to your Maintenance Windows Role**

1. Open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose Roles and select the Amazon SNS role created in Task 3.
3. Copy or make a note of the Role ARN and return to the Roles section of the IAM console.
4. Select the custom Maintenance Windows service role you created (under Role name).

5. Under Permissions, verify that either the AmazonSSMMaintenanceWindowRole policy is listed or there is a comparable policy that gives maintenance windows permission to the Systems Manager API.

6. Choose Add inline policy.

7. On the Set Permissions page, choose Policy Generator, and then choose Select.

8. Verify that Effect is set to Allow.


10. From Actions choose PassRole.

11. In the Amazon Resource Name (ARN) field, paste the ARN of the Amazon SNS IAM role created in Task 3.

12. Choose Add Statement, and then choose Next.


**Example Amazon SNS Notifications for AWS Systems Manager**

You can configure Amazon Simple Notification Service (Amazon SNS) to send notifications about the status of commands that you send using AWS Systems Manager Run Command or AWS Systems Manager Maintenance Windows.

**Note**

This guide does not address how to configure notifications for Run Command or Maintenance Windows. For information about configuring Run Command or Maintenance Windows to send Amazon SNS notifications about the status of commands, see Configure Amazon SNS Notifications for AWS Systems Manager (p. 896).

The following examples show the structure of the JSON output returned by Amazon SNS notifications when configured for Run Command or Maintenance Windows.

**Sample JSON Output for Command summary messages using instance ID targeting**

```json
{
  "commandId": "a8e7e76f-15f1-4c33-9052-0123456789ab",
  "documentName": "AWS-RunPowerShellScript",
  "instanceIds": [
    "i-1234567890abcdef0",
    "i-9876543210abcdef0"
  ],
  "requestedDateTime": "2019-04-25T17:57:09.17Z",
  "expiresAfter": "2019-04-25T19:07:09.17Z",
  "outputS3BucketName": "awss3bucketname",
  "outputS3KeyPrefix": "runcommand",
  "status": "InProgress",
  "eventTime": "2019-04-25T17:57:09.236Z"
}
```

**Sample JSON Output for Command summary messages using tag-based targeting**

```json
{
  "commandId": "9e92c686-ddc7-4827-b040-0123456789ab",
  "documentName": "AWS-RunPowerShellScript",
  "instanceIds": [],
  "requestedDateTime": "2019-04-25T18:01:03.888Z",
  "expiresAfter": "2019-04-25T19:01:03.888Z",
  "outputS3BucketName": "awss3bucketname",
  "outputS3KeyPrefix": "runcommand",
  "status": "InProgress",
  "eventTime": "2019-04-25T17:57:09.236Z"
}
```
Use Run Command to Send a Command that Returns Status Notifications

The following procedures show how to use the AWS Command Line Interface (AWS CLI) or AWS Systems Manager console to send a Run Command that is configured to return status notifications.

Sending a Run Command that Returns Notifications (Console)

Use the following procedure to send a command through Run Command that is configured to return status notifications using the Systems Manager console.

To send a command that returns notifications (Console)

2. In the navigation pane, choose Run Command.
   -or-
   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Run Command.
3. Choose Run command.
4. In the Command document list, choose a Systems Manager document.
5. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.

   Note
   If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.

6. In the Command parameters section, specify values for required parameters.
7. For Other parameters:
   - For Comment, type information about this command.
   - For Timeout (seconds), specify the number of seconds for the system to wait before failing the overall command execution.
8. (Optional) For Rate control:
   - For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.
Use Run Command to Send a Command that Returns Status Notifications

Note
If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.

- For Error threshold, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

9. In the Output options section, if you want to save the command output to a file, select the Write command output to an Amazon S3 bucket. Type the bucket and prefix (folder) names in the boxes.

Note
The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

10. In the SNS Notifications section, choose Enable SNS notifications.

11. In the IAM role field, type or paste the SNS IAM role ARN you created in Task 3 in the topic Configuring Amazon SNS Notifications for AWS Systems Manager.

12. In the SNS topic field, type or paste the Amazon SNS topic ARN to be used.

13. In the Notify me on field, choose the events for which you want to receive notifications.

14. In the Notify me for field, choose to receive notifications for each copy of a command sent to multiple instances (invocations) or the command summary.

15. Choose Run.

16. Check your email for a message from Amazon SNS and open the email. Amazon SNS can take a few minutes to send the mail.

Sending a Run Command that Returns Notifications (CLI)

Use the following procedure to send a command through Run Command that is configured to return status notifications using the AWS CLI.

To send a command that returns notifications (CLI)

1. Open the AWS CLI.

2. Specify parameters in the following command to target based on managed instance IDs:

```bash
aws ssm send-command --instance-ids "ID-1, ID-2" --document-name "Name" --parameters '{"commands":["input"]}' --service-role "SNSRoleARN" --notification-config '{"NotificationArn":"SNSTopicName","NotificationEvents": ["All"],"NotificationType":"Command"}"
```

For example:

```bash
aws ssm send-command --instance-ids "i-02573caf16ca17EXAMPLE, i-0471e04240EXAMPLE" --document-name "AWS-RunPowerShellScript" --parameters '{"commands": ["Get-Process"]}' --service-role "arn:aws:iam::111122223333:role/SNS_Role" --notification-config '{"NotificationArn":"arn:aws:sns:us-east-1:11112222333:SNSTopic","NotificationEvents": ["All"],"NotificationType": "Command"}"
```

Alternative commands

Specify parameters in the following command to target managed instances using tags:
Use a Maintenance Window to Send a Command that Returns Status Notifications

aws ssm send-command --targets "Key=tag:TagName,Values=TagKey" --document-name "Name" --parameters '{"commands":["input"]}' --service-role "SNSRoleARN" --notification-config '{"NotificationArn":"SNSTopicName","NotificationEvents": ["All"],"NotificationType":"Command"}'

For example:


3. Press Enter.
4. Check your email for a message from Amazon SNS and open the email. Amazon SNS can take a few minutes to send the mail.

For more information about configuring Run Command from the command line, see Amazon EC2 Systems Manager API Reference and the Systems Manager AWS CLI Reference.

Use a Maintenance Window to Send a Command that Returns Status Notifications

The following procedures show how to register an AWS Systems Manager Run Command task with your maintenance window using the Systems Manager console or the AWS Command Line Interface (AWS CLI). The procedures also describe how to configure the Run Command task to return status notifications.

Before You Begin

If you haven't created a maintenance window or registered targets, see Working with Maintenance Windows (Console) for steps on how to create a maintenance window and register targets.

To receive notifications from the Amazon SNS service, you must attach an iam:PassRole policy to the Maintenance Windows service role specified in the registered task. If you haven't added iam:PassRole permissions to your Maintenance Windows service role, see Task 5: Attach the iam:PassRole Policy to Your Maintenance Windows Role.

Registering a Run Command Task to a Maintenance Window that Returns Notifications (Console)

Use the following procedure to register a Run Command task that is configured to return status notifications to your maintenance window using the Systems Manager console.

To register a Run Command task with your maintenance window that returns notifications (Console)

2. In the navigation pane, choose Maintenance Windows.

   -or-

   If the AWS Systems Manager home page opens first, choose the menu icon (≡) to open the navigation pane, and then choose Maintenance Windows.

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3. Select the maintenance window for which you would like to register a Run Command task configured to send Amazon SNS notifications.

4. Choose Actions and then choose Register Run Command task.

5. In the Name field, enter a name for the task.

6. In the Description field, enter a description.

7. From the Document list, choose a Command document.

8. In the Task priority list, specify a priority for this task. 1 is the highest priority. Tasks in a maintenance window are scheduled in priority order. Tasks that have the same priority are scheduled in parallel.

9. In the Targets section, identify the instances on which you want to run this operation by specifying tags, selecting instances manually, or specifying a resource group.

   **Note**
   If you choose to select instances manually, and an instance you expect to see is not included in the list, see Where Are My Instances? (p. 645) for troubleshooting tips.

10. (Optional) For Rate control:

    - For Concurrency, specify either a number or a percentage of instances on which to run the command at the same time.

      **Note**
      If you selected targets by specifying tags applied to managed instances or by specifying AWS resource groups, and you are not certain how many instances are targeted, then limit the number of instances that can run the document at the same time by specifying a percentage.

    - For Error threshold, specify when to stop running the command on other instances after it fails on either a number or a percentage of instances. For example, if you specify three errors, then Systems Manager stops sending the command when the fourth error is received. Instances still processing the command might also send errors.

11. In the IAM service role area, choose the Maintenance Windows service role that has `iam:PassRole` permissions to the SNS role.

    **Note**
    You must add `iam:PassRole` permissions to the Maintenance Windows role to enable Systems Manager to pass the SNS role to Amazon SNS. If you haven't added `iam:PassRole` permissions, see Task 5 in the topic Configuring Amazon SNS Notifications for AWS Systems Manager.

12. In the Output options section, if you want to save the command output to a file, select the Write command output to an Amazon S3 bucket. Type the bucket and prefix (folder) names in the boxes.

    **Note**
    The S3 permissions that grant the ability to write the data to an S3 bucket are those of the instance profile assigned to the instance, not those of the IAM user performing this task. For more information, see Create an IAM Instance Profile for Systems Manager (p. 29).

13. In the SNS notifications section, choose Enable SNS Notifications.

14. In the IAM role section, choose the SNS role to trigger Amazon SNS notifications.

15. In the SNS topic section, type or paste the Amazon SNS topic ARN to be used.

16. In the Event type section, choose the events for which you want to receive notifications.

17. In the Notification type section, choose to receive notifications for each copy of a command sent to multiple instances (invocations) or the command summary.

18. In the Input Parameters section, enter the required parameters based on the Command document you chose.

19. Choose Register Run Command task.
20. After the next execution of your maintenance window, check your email for a message from Amazon SNS and open the email. Amazon SNS can take a few minutes to send the mail.

Registering a Run Command Task to a Maintenance Window that Returns Notifications (CLI)

Use the following procedure to register a Run Command task that is configured to return status notifications to your maintenance window using the AWS CLI.

To register a Run Command task with your maintenance window that returns notifications (CLI)

Note
To better manage your task options, this procedure uses the command option --cli-input-json, with option values stored in a JSON file.

1. On your local machine, create a file named RunCommandTask.json.
2. Paste the following contents into the file:

```json
{
   "Name": "Name",
   "Description": "Description",
   "WindowId": "mw-0c50858d01EXAMPLE",
   "ServiceRoleArn": "arn:aws:iam::111122223333:role/MaintenanceWindowIAMRole",
   "MaxConcurrency": "1",
   "MaxErrors": "1",
   "Priority": 3,
   "Targets": [
      {
         "Key": "WindowTargetIds",
         "Values": [
            "e32eebc2-646c-4f4b-8ed1-205fbEXAMPLE"
         ]
      }
   ],
   "TaskType": "RUN_COMMAND",
   "TaskArn": "CommandDocumentName",
   "TaskInvocationParameters": {
      "RunCommand": {
         "Comment": "Comment",
         "TimeoutSeconds": 3600,
         "NotificationConfig": {
            "NotificationArn": "arn:aws:sns:region:123456789012:SNSTopicName",
            "NotificationEvents": ["All"],
            "NotificationType": "Command"
         },
         "ServiceRoleArn": "arn:aws:iam::123456789012:role/SNSIAMRole"
      }
   }
}
```

3. Replace the example values with information about your own resources. For more information, see Required Values for the 'register-task-with-maintenance-window' Command.

   Note
   You can also restore options we have omitted from this example if you want to use them. For example, you can save command output to an S3 bucket. For more information, see Optional Values for the 'register-task-with-maintenance-window' Command.
4. Save the file.
5. In the directory on your local machine where you saved the file, run the following command:

   ```bash
   aws ssm register-task-with-maintenance-window --cli-input-json file://RunCommandTask.json
   ```

   **Important**
   Be sure to include `file://` before the file name. It is required in this command.

   If successful, the command returns information similar to the following:

   ```json
   {
     "WindowTaskId": "j2l8d5b5c-mw66-tk4d-r3g9-1d4d1EXAMPLE"
   }
   ```

6. After the next execution of your maintenance window, check your email for a message from Amazon SNS and open the email. Amazon SNS can take a few minutes to send the mail.

   For more information about registering tasks for maintenance window from the command line, see Amazon EC2 Systems Manager API Reference and the Systems Manager AWS CLI Reference.
Authentication and Access Control for AWS Systems Manager

Access to AWS Systems Manager requires credentials. Those credentials must have permissions to access AWS resources for tasks such as creating or updating documents and registering tasks and targets with maintenance windows. The following sections provide details on how you can use AWS Identity and Access Management (IAM) and Systems Manager to help secure access to your resources:

- Authentication (p. 909)
- Access Control (p. 910)

For more information about configuring access to AWS Systems Manager, see Create Non-Admin IAM Users and Groups for Systems Manager (p. 25).

For information about the Amazon Simple Storage Service (Amazon S3) buckets that resources might need to access to perform Systems Manager operations, see About Minimum S3 Bucket Permissions for SSM Agent (p. 87).

Authentication

You can access AWS as any of the following types of identities:

- **AWS account root user** – When you first create an AWS account, you begin with a single sign-in identity that has complete access to all AWS services and resources in the account. This identity is called the AWS account root user and is accessed by signing in with the email address and password that you used to create the account. We strongly recommend that you do not use the root user for your everyday tasks, even the administrative ones. Instead, adhere to the best practice of using the root user only to create your first IAM user. Then securely lock away the root user credentials and use them to perform only a few account and service management tasks.

- **IAM user** – An IAM user is an identity within your AWS account that has specific custom permissions (for example, permissions to create document in Systems Manager). You can use an IAM user name and password to sign in to secure AWS webpages like the AWS Management Console, AWS Discussion Forums, or the AWS Support Center.

  In addition to a user name and password, you can also generate access keys for each user. You can use these keys when you access AWS services programmatically, either through one of the several SDKs or by using the AWS Command Line Interface (CLI). The SDK and CLI tools use the access keys to cryptographically sign your request. If you don't use AWS tools, you must sign the request yourself. Systems Manager supports Signature Version 4, a protocol for authenticating inbound API requests. For more information about authenticating requests, see Signature Version 4 Signing Process in the AWS General Reference.

- **IAM role** – An IAM role is an IAM identity that you can create in your account that has specific permissions. An IAM role is similar to an IAM user in that it is an AWS identity with permissions policies that determine what the identity can and cannot do in AWS. However, instead of being uniquely
associated with one person, a role is intended to be assumable by anyone who needs it. Also, a role does not have standard long-term credentials such as a password or access keys associated with it. Instead, when you assume a role, it provides you with temporary security credentials for your role session. IAM roles with temporary credentials are useful in the following situations:

- **Federated user access** – Instead of creating an IAM user, you can use existing identities from AWS Directory Service, your enterprise user directory, or a web identity provider. These are known as federated users. AWS assigns a role to a federated user when access is requested through an identity provider. For more information about federated users, see Federated Users and Roles in the IAM User Guide.

- **AWS service access** – A service role is an IAM role that a service assumes to perform actions in your account on your behalf. When you set up some AWS service environments, you must define a role for the service to assume. This service role must include all the permissions that are required for the service to access the AWS resources that it needs. Service roles vary from service to service, but many allow you to choose your permissions as long as you meet the documented requirements for that service. Service roles provide access only within your account and cannot be used to grant access to services in other accounts. You can create, modify, and delete a service role from within IAM. For example, you can create a role that allows Amazon Redshift to access an Amazon S3 bucket on your behalf and then load data from that bucket into an Amazon Redshift cluster. For more information, see Creating a Role to Delegate Permissions to an AWS Service in the IAM User Guide.

- **Applications running on Amazon EC2** – You can use an IAM role to manage temporary credentials for applications that are running on an EC2 instance and making AWS CLI or AWS API requests. This is preferable to storing access keys within the EC2 instance. To assign an AWS role to an EC2 instance and make it available to all of its applications, you create an instance profile that is attached to the instance. An instance profile contains the role and enables programs that are running on the EC2 instance to get temporary credentials. For more information, see Using an IAM Role to Grant Permissions to Applications Running on Amazon EC2 Instances in the IAM User Guide.

**Access Control**

You can have valid credentials to authenticate your requests, but unless you have permissions you cannot create or access Systems Manager resources. For example, you must have permissions to create, view, or delete activations, associations, documents, and maintenance windows; to register or deregister instances and patch baselines; and so on.

The following sections describe how to manage permissions for Systems Manager. We recommend that you read the overview first.

- Overview of Managing Access Permissions to Your AWS Systems Manager Resources (p. 910)
- Using Identity-based Policies (IAM Policies) for AWS Systems Manager (p. 917)
- AWS Systems Manager Permissions Reference (p. 924)

**Overview of Managing Access Permissions to Your AWS Systems Manager Resources**

Every AWS resource is owned by an AWS account, and permissions to create or access a resource are governed by permissions policies. An account administrator can attach permissions policies to IAM
identities (that is, users, groups, and roles). Some services—such as AWS Lambda, Amazon Simple Notification Service (Amazon SNS), and Amazon Simple Storage Service (Amazon S3)—also support attaching permissions policies to resources.

**Note**

An account administrator (or administrator user) is a user with administrator privileges. For more information, see IAM Best Practices in the IAM User Guide.

When granting permissions, the account administrator decides who gets the permissions, the resources that they get permissions for, and the specific actions that you want to allow on those resources.

**Topics**

- AWS Systems Manager Resources and Operations (p. 911)
- Understanding Resource Ownership (p. 913)
- Managing Access to Resources (p. 914)
- Specifying Policy Elements: Resources, Actions, Effects, and Principals (p. 916)
- Specifying Conditions in a Policy (p. 916)

**AWS Systems Manager Resources and Operations**

Systems Manager includes several primary resources:

- Association
- Automation definition
- Automation execution
- Document
- Maintenance window
- Managed instance
- Managed instance inventory
- Parameter
- Patch baseline
- Resource data sync
- Session

For automation definitions, Systems Manager supports a second-level resource, version ID. In AWS, these second-level resources are known as subresources. Specifying a version subresource for an automation definition resource lets you provide access to certain versions of an automation definition. For example, you might want to ensure that only the latest version of an automation definition is used in your instance management.

To organize and manage parameters, you can create names for parameters with a hierarchical construction. With hierarchical construction, a parameter name can include a path that you define by using forward slashes. You can name a parameter resource with a maximum of five levels. We suggest that you create hierarchies that reflect an existing hierarchical structure in your environment. For more information, see Creating Systems Manager Parameters (p. 850).

Each resource has a unique Amazon Resource Names (ARNs). In a policy, you identify the resource that a policy applies to by using its ARN. For more information about ARNs, see Amazon Resource Names (ARN) and AWS Service Namespaces in the Amazon Web Services General Reference.

The following table shows the structure of the ARN format for each resource type in Systems Manager:
<table>
<thead>
<tr>
<th>Resource Type</th>
<th>ARN Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Association</td>
<td>arn:aws:ssm:region:account-id:association/association-id</td>
</tr>
<tr>
<td>Maintenance window</td>
<td>arn:aws:ssm:region:account-id:maintenance-window/window-id</td>
</tr>
<tr>
<td>Managed instance inventory</td>
<td>arn:aws:ssm:region:account-id:managed-instance-inventory/managed-instance-id</td>
</tr>
<tr>
<td>Parameter</td>
<td>A one-level parameter:</td>
</tr>
<tr>
<td></td>
<td>- arn:aws:ssm:region:account-id:parameter/parameter-name/</td>
</tr>
<tr>
<td></td>
<td>A parameter named with a hierarchical construction:</td>
</tr>
<tr>
<td>Patch baseline</td>
<td>arn:aws:ssm:region:account-id:patch-baseline/patch-baseline-id</td>
</tr>
<tr>
<td>Session</td>
<td>arn:aws:ssm:region:account-id:session/session-id</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td>In most cases, the session ID is constructed using the ID of the account user who started the session, plus an alphanumeric suffix. For example:</td>
</tr>
<tr>
<td></td>
<td>However, if the user ID is not available, the ARN is constructed this way instead:</td>
</tr>
<tr>
<td></td>
<td>arn:aws:ssm:region:us-east-2:111122223333:session/session-1a2b3c4sEXAMPLE</td>
</tr>
<tr>
<td>All Systems Manager resources</td>
<td>arn:aws:ssm:*</td>
</tr>
<tr>
<td>All Systems Manager resources owned by the specified account in the specified region</td>
<td>arn:aws:ssm:region:account-id:*</td>
</tr>
</tbody>
</table>
Note
Most AWS services treat a colon (:) or a forward slash (/) as the same character in ARNs. However, Systems Manager requires an exact match in resource patterns and rules. When creating event patterns, be sure to use the correct ARN characters so that they match the resource's ARN.

For example, you can indicate a specific document (myDocument) in your statement using its ARN as follows:


You can specify all documents that belong to a specific account by using the wildcard character (*) as follows:


For Parameter Store API actions, you can provide or restrict access to all parameters in one level of a hierarchy by using hierarchical names and AWS Identity and Access Management (IAM) policies as follows:


To specify all resources, or when a specific API action does not support ARNs, use the wildcard character (*) in the Resource element as follows:

"Resource": "*"

Some Systems Manager API actions accept multiple resources. To specify multiple resources in a single statement, separate their ARNs with commas as follows:

"Resource": ["arn1", "arn2"]

For a list of Systems Manager operations that work with these resource types, see AWS Systems Manager Permissions Reference (p. 924).

Understanding Resource Ownership

A resource owner is the AWS account that created the resource, regardless of who in the account created the resources. Specifically, the resource owner is the AWS account of the principal entity (the root account, an IAM user, or an IAM role) that authenticifies the resource creation request. The following examples illustrate how this works:

- If you use the root account credentials of your AWS account to create a rule, your AWS account is the owner of the Systems Manager resource.
- If you create an IAM user in your AWS account and grant permissions to create Systems Manager resources to that user, the user can create Systems Manager resources. However, your AWS account, to which the user belongs, owns the Systems Manager resources.
- If you create an IAM role in your AWS account with permissions to create Systems Manager resources, anyone who can assume the role can create Systems Manager resources. Your AWS account, to which the role belongs, owns the Systems Manager resources.
Managing Access to Resources

A permissions policy describes who has access to what. The following section explains the available options for creating permissions policies.

**Note**

This section discusses using IAM in the context of Systems Manager. It doesn't provide detailed information about the IAM service. For complete IAM documentation, see What Is IAM? in the IAM User Guide. For information about IAM policy syntax and descriptions, see IAM JSON Policy Reference in the IAM User Guide.

Policies attached to an IAM identity are referred to as identity-based policies (IAM policies). Policies attached to a resource are referred to as resource-based policies. Systems Manager supports only identity-based policies.

**Topics**

- Identity-Based Policies (IAM Policies) (p. 914)
- Resource-Based Policies (p. 915)

### Identity-Based Policies (IAM Policies)

You can attach policies to IAM identities. By creating identity-based IAM policies, you can restrict the calls and resources that users in your account have access to, and then attach those policies to IAM users. For more information about how to create IAM roles and to explore example IAM policy statements for Systems Manager, see Overview of Managing Access Permissions to Your AWS Systems Manager Resources (p. 910). For example, you can do the following:

- **Attach a permissions policy to a user or a group in your account** – To grant a user permissions to view applications, deployment groups, and other Systems Manager resources in the AWS Systems Manager console, you can attach a permissions policy to a user or a group that the user belongs to.

- **Attach a permissions policy to a role (grant cross-account permissions)** – To grant cross-account permissions, you can attach an identity-based permissions policy to an IAM role. For example, the administrator in Account A can create a role to grant cross-account permissions to another AWS account (for example, Account B) or an AWS service as follows:

1. Account A administrator creates an IAM role and attaches a permissions policy to the role that grants permissions on resources in Account A.

2. Account A administrator attaches a trust policy to the role identifying Account B as the principal who can assume the role.

3. Account B administrator can then delegate permissions to assume the role to any users in Account B. Doing this allows users in Account B to create or access resources in Account A. If you want to grant an AWS service permissions to assume the role, the principal in the trust policy can also be an AWS service principal.

For more information about using IAM to delegate permissions, see Access Management in the IAM User Guide.
The types of actions that you can control access to with resource-based policies vary depending on the resource type, as outlined in the following table:

<table>
<thead>
<tr>
<th>Resource types</th>
<th>Action types</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>View and list details about resources</td>
</tr>
<tr>
<td>Association</td>
<td>Create</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
</tr>
<tr>
<td></td>
<td>Start</td>
</tr>
<tr>
<td></td>
<td>Update</td>
</tr>
<tr>
<td>Automation definition</td>
<td>Start</td>
</tr>
<tr>
<td></td>
<td>Stop</td>
</tr>
<tr>
<td>Document</td>
<td>Create</td>
</tr>
<tr>
<td>Maintenance window</td>
<td>Delete</td>
</tr>
<tr>
<td>Parameter</td>
<td>Update</td>
</tr>
<tr>
<td>Managed instance</td>
<td>Deregister</td>
</tr>
<tr>
<td></td>
<td>Register</td>
</tr>
<tr>
<td>Managed instance inventory</td>
<td>Create</td>
</tr>
<tr>
<td></td>
<td>Update</td>
</tr>
<tr>
<td>Patch baseline</td>
<td>Create</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
</tr>
<tr>
<td></td>
<td>Deregister</td>
</tr>
<tr>
<td></td>
<td>Register</td>
</tr>
<tr>
<td></td>
<td>Update</td>
</tr>
<tr>
<td>Resource data sync</td>
<td>Create</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
</tr>
<tr>
<td>Session</td>
<td>Start</td>
</tr>
<tr>
<td></td>
<td>Terminate</td>
</tr>
</tbody>
</table>

**Resource-Based Policies**

Other AWS services, such as Amazon Simple Storage Service, also support resource-based permissions policies. For example, you can attach a permissions policy to an S3 bucket to manage access permissions to that bucket. Systems Manager doesn't support resource-based policies.
Specifying Policy Elements: Resources, Actions, Effects, and Principals

For each Systems Manager resource, Systems Manager defines a set of applicable API operations. To allow you to grant permissions for these API operations, Systems Manager defines a set of actions that you can specify in a policy. Some API operations can require permissions for more than one action. For more information about resources and API operations, see AWS Systems Manager Resources and Operations (p. 911) and AWS Systems Manager Permissions Reference (p. 924). For a list of actions, see AWS Systems Manager Resources and Operations (p. 911) Actions.

The following are the basic policy elements:

- **Resource** – You use an Amazon Resource Name (ARN) to identify the resource that the policy applies to. For Systems Manager resources, you can use the wildcard character (*) in IAM policies. For more information, see AWS Systems Manager Resources and Operations (p. 911).

- **Action** – You use action keywords to identify resource operations that you want to allow or deny. For example, the `ssm:GetDocument` permission allows the user permissions to perform the `GetDocument` operation.

- **Effect** – You specify the effect that occurs when the user requests the specific action, either allow or deny. If you don't explicitly grant access to (allow) a resource, access is implicitly denied. You can also explicitly deny access to a resource, which you might do to make sure that a user cannot access it, even if a different policy grants access.

- **Principal** – In identity-based policies (IAM policies), the user that the policy is attached to is the implicit principal. For resource-based policies, you specify the user, account, service, or other entity that you want to receive permissions. Systems Manager supports only identity-based policies.

To learn more about IAM policy syntax and descriptions, see IAM JSON Policy Reference in the IAM User Guide.

For a table showing all of the Systems Manager API actions and the resources that they apply to, see AWS Systems Manager Permissions Reference (p. 924).

Specifying Conditions in a Policy

When you grant permissions, you can use the language in the access policy to specify the conditions under which a policy should take effect. For example, you might want a policy to be applied only after a specific date. For more information about specifying conditions in a policy language, see IAM JSON Policy Elements: Condition in the IAM User Guide.

To express conditions, you use predefined condition keys.

AWS Systems Manager supports the following condition keys:

- `ssm:resourceTag/*`
- `ssm:Recursive`
- `ssm:Overwrite`

For information about using the `ssm:resourceTag/*` condition key, see the following topics:

- Restrict Access to Root-Level Commands Through SSM Agent (p. 85)
- Restricting Run Command Access Based on Instance Tags (p. 619)
- Restrict Session Access Based on Instance Tags (p. 585)
Using Identity-based Policies (IAM Policies) for AWS Systems Manager

The following examples of identity-based policies demonstrate how an account administrator can attach permissions policies to IAM identities (that is, users, groups, and roles) and thereby grant permissions to perform operations on Systems Manager resources.

Important
We recommend that you first review the introductory topics that explain the basic concepts and options available to manage access to your Systems Manager resources. For more information, see Overview of Managing Access Permissions to Your AWS Systems Manager Resources (p. 910).

Topics
- Permissions Required to Use the AWS Systems Manager Console (p. 917)
- AWS Managed Policies for AWS Systems Manager (p. 918)
- Customer Managed Policy Examples (p. 919)

The following is an example of a permissions policy that allows a user to delete documents with names that begin with `MyDocument-` in the `us-west-2` region:

```json
{
   "Version": "2012-10-17",
   "Statement" : [
      {
         "Effect" : "Allow",
         "Action" : [ "ssm:DeleteDocument" ],
      }
   ]
}
```

Permissions Required to Use the AWS Systems Manager Console

To use the AWS Systems Manager console, a user must have a minimum set of permissions that allows the user to describe other AWS resources for their AWS account. To fully use Systems Manager in the Systems Manager console, you must have permissions from the following services:

- Actions, Resources, and Condition Keys for AWS Services in the IAM User Guide
- AWS Global Condition Context Keys in the IAM User Guide

For a list of condition keys supported by each AWS service, see Actions, Resources, and Condition Keys for AWS Services in the IAM User Guide. For a list of condition keys that can be used in multiple AWS services, see AWS Global Condition Context Keys in the IAM User Guide.
You can grant the required permissions with the following policy statement:

```json
{
   "Version": "2012-10-17",
   "Statement": [
      {
         "Effect": "Allow",
         "Action": [
            "ssm:*",
            "ec2:describeInstances",
            "iam:PassRole",
            "iam:ListRoles"
         ],
         "Resource": "*"
      }
   ]
}
```

If you create an IAM policy that is more restrictive than the minimum required permissions, the console won't function as intended for users with that IAM policy. To ensure that those users can use the Systems Manager console, also attach the AmazonSSMReadOnlyAccess managed policy to the user, as described in AWS Managed Policies for AWS Systems Manager (p. 918).

You don't need to allow minimum console permissions for users that are making calls only to the AWS CLI or the Systems Manager API.

### AWS Managed Policies for AWS Systems Manager

AWS addresses many common use cases by providing standalone IAM policies that are created and administered by AWS. These AWS managed policies grant necessary permissions for common use cases so you can avoid having to investigate which permissions are needed. (You can also create your own custom IAM policies to allow permissions for Systems Manager actions and resources.) For more information, see AWS Managed Policies in the IAM User Guide.

The following AWS managed policies, which you can attach to users in your account, are specific to AWS Systems Manager:

- **AmazonSSMFullAccess** – User trust policy that grants full access to the Systems Manager API and documents.
- **AmazonSSMReadOnlyAccess** – User trust policy that grants access to Systems Manager read-only API actions, such as Get* and List*.
- **AmazonSSMAutomationApproverAccess** – User trust policy that enables access to view automation executions and send approval decisions to automation that is waiting for approval.
- **AmazonSSMAutomationRole** – Service role policy that provides permissions for the AWS Systems Manager automation service to run activities defined within automation documents. Assign this policy to administrators and trusted power users.
- **AmazonSSMMaintenanceWindowRole** – Service role policy for Systems Manager Maintenance Windows.
- **AmazonSSMDirectoryServiceAccess** – Instance trust policy that allows SSM Agent to access AWS Directory Service on behalf of the user for requests to join the domain by the managed instance.
- **AmazonSSMMangedInstanceCore** – Instance trust policy that enables an instance to use AWS Systems Manager service core functionality.
• **AmazonSSMServiceRolePolicy** – Service role policy that provides access to AWS resources managed or used by AWS Systems Manager.

• **AWSResourceAccessManagerServiceRolePolicy** – Service role policy containing read-only AWS Resource Access Manager access to the account’s AWS Organizations structure. It also contains IAM permissions to self-delete the role.

• **AmazonEC2RoleforSSM** – This policy will be deprecated soon. In its place, use the **AmazonSSMManagedInstanceCore** policy to enable AWS Systems Manager service core functionality on Amazon EC2 instances. For information, see Create an IAM Instance Profile for Systems Manager (p. 29).

**Note**
In a hybrid environment, you need an additional IAM role that allows servers and VMs to communicate with the Systems Manager service. This is the IAM service role for Systems Manager. This role grants AWS Security Token Service (AWS STS) AssumeRole trust to the Systems Manager service. The AssumeRole action returns a set of temporary security credentials (consisting of an access key ID, a secret access key, and a security token). You use these temporary credentials to access AWS resources that you might not normally have access to. For more information, see Create an IAM Service Role for a Hybrid Environment (p. 42) and AssumeRole in **AWS Security Token Service API Reference**.

### Customer Managed Policy Examples

You can create standalone policies that you administer in your own AWS account. We refer to these as **customer managed policies**. You can attach these policies to multiple principal entities in your AWS account. When you attach a policy to a principal entity, you give the entity the permissions that are defined in the policy. For more information, see Customer Managed Policies in **IAM User Guide**.

The following examples of user policies grant permissions for various AWS Systems Manager actions. Use them to limit the Systems Manager access for your IAM users and roles. These policies work when performing actions in the Systems Manager API, AWS SDKs, or the AWS CLI. For users who use the console, you need to grant additional permissions specific to the console. For more information, see Permissions Required to Use the AWS Systems Manager Console (p. 917).

**Note**
All examples use the US West (Oregon) Region (us-west-2) and contain fictitious account IDs.

**Examples**

• **Example 1: Allow a User to Perform Systems Manager Operations in a Single Region** (p. 919)

• **Example 2: Allow a User to List Documents for a Single Region** (p. 920)

### Example 1: Allow a User to Perform Systems Manager Operations in a Single Region

The following example grants permissions to perform AWS Systems Manager operations only in the us-west-2 Region:

```json
{
    "Version": "2012-10-17",
    "Statement": [
        {  
            "Effect": "Allow",
            "Action": [
                "ssm:*"
            ],
```
Example 2: Allow a User to List Documents for a Single Region

The following example grants permissions to list all document names that begin with `Update` in the `us-west-2` Region:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": ["ssm:ListDocuments"],
    }
  ]
}
```

Example 3: Allow a User to Use a Specific SSM Document to Run Commands on Specific Instances

The following example IAM policy allows a user to do the following.

- List Systems Manager documents and document versions.
- View details about documents.
- Send a command using the document specified in the policy. The name of the document is determined by this entry:


- Send a command to three instances. The instances are determined by the following entries in the second `Resource` section:

  "arn:aws:ec2:us-east-2:*:instance/i-02573cafcfEXAMPLE",
  "arn:aws:ec2:us-east-2:*:instance/i-0471e04240EXAMPLE",
  "arn:aws:ec2:us-east-2:*:instance/i-07782c72fEXAMPLE"

- View details about a command after it has been sent.
- Start and stop Automation executions.
- Get information about Automation executions.

If you want to give a user permission to use this document to send commands on any instance for which the user currently has access (as determined by their AWS user account), you could specify the following entry in the `Resource` section and remove the other instance entries.

```
"arn:aws:ec2:us-east-2:*:instance/"
```
Note that the Resource section includes an Amazon S3 ARN entry:

```
arn:aws:s3:::S3-bucket-name
```

You can also format this entry as follows:

```
arn:aws:s3:::S3-bucket-name/*
-or-
arn:aws:s3:::S3-bucket-name/S3-prefix-name
```

```
{
    "Version": "2012-10-17",
    "Statement": [
      {
        "Action": [
          "ssm:ListDocuments",
          "ssm:ListDocumentsVersions",
          "ssm:DescribeDocument",
          "ssm:GetDocument",
          "ssm:DescribeInstanceInformation",
          "ssm:DescribeDocumentParameters",
          "ssm:DescribeInstanceProperties"
        ],
        "Effect": "Allow",
        "Resource": "*"
      },
      {
        "Action": "ssm:SendCommand",
        "Effect": "Allow",
        "Resource": [
          "arn:aws:ec2:us-east-2:*:instance/i-02573cafcfEXAMPLE",
          "arn:aws:ec2:us-east-2:*:instance/i-0471e04240EXAMPLE",
          "arn:aws:ec2:us-east-2:*:instance/i-07782c72faEXAMPLE",
          "arn:aws:s3:::bucket_name",
        ]
      },
      {
        "Action": [
          "ssm:CancelCommand",
          "ssm:ListCommands",
          "ssm:ListCommandInvocations"
        ],
        "Effect": "Allow",
        "Resource": "*"
      },
      {
        "Action": "ec2:DescribeInstanceStatus",
        "Effect": "Allow",
        "Resource": "*"
      },
      {
        "Action": "ssm:StartAutomationExecution",
        "Effect": "Allow",
        "Resource": [
          "arn:aws:ssm:::automation-definition/
        ]
      },
      {
        "Action": "ssm:DescribeAutomationExecutions",
        "Effect": "Allow",
```

Using Service-Linked Roles for Systems Manager

AWS Systems Manager uses AWS Identity and Access Management (IAM) service-linked roles. A service-linked role is a unique type of IAM role that is linked directly to Systems Manager. Service-linked roles are predefined by Systems Manager and include all the permissions that the service requires to call other AWS services on your behalf.

A service-linked role makes setting up Systems Manager easier because you don't have to manually add the necessary permissions. Systems Manager defines the permissions of its service-linked roles, and unless defined otherwise, only Systems Manager can assume its roles. The defined permissions include the trust policy and the permissions policy, and that permissions policy can't be attached to any other IAM entity.

For information about other services that support service-linked roles, see AWS Services That Work with IAM and look for the services that have Yes in the Service-Linked Role column. Choose a Yes with a link to view the service-linked role documentation for that service.

Service-Linked Role Permissions for Systems Manager

Systems Manager uses the service-linked role named AWSServiceRoleForAmazonSSM – AWS Systems Manager uses this IAM service role to manage AWS resources on your behalf.

The AWSServiceRoleForAmazonSSM service-linked role trusts only ssm.amazonaws.com to assume this role.

Currently, only two Systems Manager capabilities use the service-linked role:

- Inventory requires a service-linked role. The role enables the system to collect Inventory metadata from tags and Resource Groups.
- The Maintenance Windows capability can optionally use the service-linked role. The role enables the Maintenance Windows service to run maintenance tasks on target instances. Note that the service-linked role for Systems Manager doesn't provide the permissions needed for all scenarios. For more information, see Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Window Tasks? (p. 445)

The AWSServiceRoleForAmazonSSM service-linked role permissions policy allows Systems Manager to complete the following actions on all related resources:

- `ssm:CancelCommand`
Creating a Service-Linked Role for Systems Manager

You can use the IAM console to create a service-linked role with the AWS Service Role for AWS Systems Manager use cases (Inventory and Maintenance Windows). In the IAM CLI or the IAM API, create a service-linked role with the ssm.amazonaws.com service name. For more information, see Creating a Service-Linked Role in the IAM User Guide.

For maintenance windows only, you don't need to manually create a service-linked role. When you create a maintenance window task in the AWS Management Console, the AWS CLI, or the Systems Manager API, Systems Manager creates the service-linked role for you if you choose not to provide a custom service role.

If you delete this service-linked role, and then need to create it again, you can use the same process to recreate the role in your account.

Editing a Service-Linked Role for Systems Manager

Systems Manager does not allow you to edit the AWSServiceRoleForAmazonSSM service-linked role. After you create a service-linked role, you cannot change the name of the role because various entities might reference the role. However, you can edit the description of the role because various entities might reference the role. For more information, see Editing a Service-Linked Role in the IAM User Guide.

Deleting a Service-Linked Role for Systems Manager

If you no longer need to use any feature or service that requires a service-linked role, then we recommend that you delete that role. That way you don't have an unused entity that is not actively monitored or maintained. You can use the IAM console, the IAM CLI, or the IAM API to manually delete the service-linked role. To do this, you must first manually clean up the resources for your service-linked role, and then you can manually delete it.

Because the Systems Manager service-linked role can be used by both the Inventory and Maintenance Windows capabilities, ensure that neither is using the role before attempting to delete it.
**Supported Regions for Systems Manager Service-Linked Roles**

Systems Manager supports using service-linked roles in all of the regions where the service is available. For more information, see AWS Regions and Endpoints for Systems Manager.

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**AWS Systems Manager Permissions Reference**

The following table lists the AWS Systems Manager API operations and their corresponding actions for which you can grant permissions. Use this table as a reference when setting up Access Control (p. 910) and writing permissions policies to attach to an IAM identity (identity-based policies). You specify the actions in the policy's **Action** field. To specify an action, use the `ssm:` prefix followed by the API operation name (for example, `ssm:GetDocument` and `ssm:CreateDocument`). To specify multiple actions in a single statement, separate them with commas (for example, "Action": ["ssm:action1", "ssm:action2"]). For the resource value in the policy's **Resource** field, you specify an ARN. To specify multiple actions or resources, use a wildcard character (*) in your ARN. For example, `ssm:*` specifies all of the Systems Manager actions, and `ssm:Get*` specifies all of the Systems Manager actions that begin with the word Get. The following example grants access to all documents with names that begin with West:

```
```

For more information about wildcards, see IAM Identifiers in IAM User Guide. For a list of Systems Manager resources with the ARN format, see AWS Systems Manager Resources and Operations (p. 911).

To express conditions, use AWS-wide condition keys in your Systems Manager policies. For a complete list of AWS-wide keys, see AWS Global Condition Context Keys in the IAM User Guide.
Specifying multiple actions or resources

Systems Manager API Operations and Required Permissions for Actions

**AddTagsToResource**

**Action:** `ssm:AddTagsToResource`

Required to add or overwrite tags for a specified resource.

**CancelCommand**

**Action:** `ssm:CancelCommand`

Required to attempt to cancel the command with the specified command ID.

**CancelMaintenanceWindowExecution**

**Action:** `ssm:CancelMaintenanceWindowExecution`

Required to stop a maintenance window execution that is already in progress.

**CreateActivation**

**Action:** `ssm:CreateActivation`

Required to register an on-premises server or virtual machine with Amazon EC2 so that it can be managed using Run Command.

**CreateAssociation**

**Action:** `ssm:CreateAssociation`

Required to associate a Systems Manager document with the specified instances or targets.

**CreateAssociationBatch**

**Action:** `ssm:CreateAssociationBatch`

Required to associate multiple Systems Manager documents with the specified instances or targets.

**CreateDocument**

**Action:** `ssm:CreateDocument`

Required to create a Systems Manager document.

**CreateMaintenanceWindow**

**Action:** `ssm:CreateMaintenanceWindow`

Required to create a maintenance window.

**CreateOpsItem**

**Action:** `ssm:CreateOpsItem`

Required to create an OpsItem.

**CreatePatchBaseline**

**Action:** `ssm:CreatePatchBaseline`

Required to create a patch baseline.

**CreateResourceDataSync**

**Action:** `ssm:CreateResourceDataSync`
Required to create a resource data sync configuration for a single Amazon S3 bucket.

**DeleteActivation**

**Action**: ssm:DeleteActivation

Required to delete an activation.

**DeleteAssociation**

**Action**: ssm:DeleteAssociation

Required to disassociate the specified Systems Manager document from the specified instance.

**DeleteDocument**

**Action**: ssm:DeleteDocument

Required to delete a Systems Manager document and all instance associations to the document.

**DeleteInventory**

**Action**: ssm:DeleteInventory

Required to delete a custom inventory type, or the data associated with a custom Inventory type.

**DeleteMaintenanceWindow**

**Action**: ssm:DeleteMaintenanceWindow

Required to delete a maintenance window.

**DeleteParameter**

**Action**: ssm:DeleteParameter

Required to delete a parameter from the system.

**DeleteParameters**

**Action**: ssm:DeleteParameters

Required to delete one or more parameters from the system.

**DeletePatchBaseline**

**Action**: ssm:DeletePatchBaseline

Required to delete a patch baseline.

**DeleteResourceDataSync**

**Action**: ssm:DeleteResourceDataSync

Required to delete a resource data sync configuration.

**DeregisterManagedInstance**

**Action**: ssm:DeregisterManagedInstance

Required to remove a server or virtual machine from the list of registered servers.

**DeregisterPatchBaselineForPatchGroup**

**Action**: ssm:DeregisterPatchBaselineForPatchGroup

Required to remove a patch group from a patch baseline.

**DeregisterTargetFromMaintenanceWindow**

**Action**: ssm:DeregisterTargetFromMaintenanceWindow
Required to remove a target from a maintenance window.

**DeregisterTaskFromMaintenanceWindow**

**Action:** `ssm:DeregisterTaskFromMaintenanceWindow`

Required to remove a task from a maintenance window.

**DescribeActivations**

**Action:** `ssm:DescribeActivations`

Required to view details about an activation, such as the date and time the activation was created, the expiration date, and the IAM role assigned to the instances in the activation.

**DescribeAssociation**

**Action:** `ssm:DescribeAssociation`

Required to view the associations for the specified Systems Manager document or instance.

**DescribeAssociationExecutions**

**Action:** `ssm:DescribeAssociationExecutions`

Required to view all executions for a specific association ID.

**DescribeAssociationExecutionTargets**

**Action:** `ssm:DescribeAssociationExecutionTargets`

Required to view information about a specific execution of a specific association.

**DescribeAutomationExecutions**

**Action:** `ssm:DescribeAutomationExecutions`

Required to view information about all active and terminated Automation executions.

**DescribeAutomationStepExecutions**

**Action:** `ssm:DescribeAutomationStepExecutions`

Required to view information about all active and terminated step executions in an Automation workflow.

**DescribeAvailablePatches**

**Action:** `ssm:DescribeAvailablePatches`

Required to view information about patches that could be included in a patch baseline.

**DescribeDocument**

**Action:** `ssm:DescribeDocument`

Required to view information about the specified Systems Manager document.

**DescribeDocumentPermission**

**Action:** `ssm:DescribeDocumentPermission`

Required to view the permissions for a Systems Manager document.

**DescribeEffectiveInstanceAssociations**

**Action:** `ssm:DescribeEffectiveInstanceAssociations`

Required to view information about associations for one or more instances.
DescribeEffectivePatchesForPatchBaseline

**Action:** `ssm:DescribeEffectivePatchesForPatchBaseline`

Required to view information about the current effective patches (the patch and the approval state) for the specified patch baseline. Applies only to Windows Server patch baselines.

DescribeInstanceAssociationsStatus

**Action:** `ssm:DescribeInstanceAssociationsStatus`

Required to view the status of the associations for one or more instances.

DescribeInstanceInformation

**Action:** `ssm:DescribeInstanceInformation`

Required to view information about one or more instances.

DescribeInstancePatches

**Action:** `ssm:DescribeInstancePatches`

Required to view information about the patches on a specified instance and their state relative to the patch baseline being used for the instance.

DescribeInstancePatchStates

**Action:** `ssm:DescribeInstancePatchStates`

Required to view information about the high-level patch state of one or more instances.

DescribeInstancePatchStatesForPatchGroup

**Action:** `ssm:DescribeInstancePatchStatesForPatchGroup`

Required to view the high-level patch state for the instances in a specified patch group.

DescribeInventoryDeletions

**Action:** `ssm:DescribeInventoryDeletions`

Required to describe a specific delete inventory operation.

DescribeMaintenanceWindowExecutions

**Action:** `ssm:DescribeMaintenanceWindowExecutions`

Required to view information about the execution of a maintenance window. This includes details about when the maintenance window was scheduled to be active and information about tasks registered and run with the maintenance window.

DescribeMaintenanceWindowExecutionTaskInvocations

**Action:** `ssm:DescribeMaintenanceWindowExecutionTaskInvocations`

Required to retrieve information about the individual task executions (one per target) for a particular task run as part of a maintenance window execution.

DescribeMaintenanceWindowExecutionTasks

**Action:** `ssm:DescribeMaintenanceWindowExecutionTasks`

Required to view information about the tasks that have been run for a specified maintenance window execution.

DescribeMaintenanceWindows

**Action:** `ssm:DescribeMaintenanceWindows`
Required to view information about the maintenance windows created in an AWS account.

**DescribeMaintenanceWindowSchedule**

**Action:** `ssm:DescribeMaintenanceWindowSchedule`

Required to retrieve information about upcoming executions of a maintenance window.

**DescribeMaintenanceWindowsForTarget**

**Action:** `ssm:DescribeMaintenanceWindowsForTarget`

Required to retrieve information about the maintenance window targets or tasks that an instance is associated with.

**DescribeMaintenanceWindowTargets**

**Action:** `ssm:DescribeMaintenanceWindowTargets`

Required to view information about the targets registered with a specified maintenance window.

**DescribeMaintenanceWindowTasks**

**Action:** `ssm:DescribeMaintenanceWindowTasks`

Required to view information about the tasks in a specified maintenance window.

**DescribeOpsItems**

**Action:** `ssm:DescribeOpsItems`

Required to query a set of OpsItems.

**DescribeParameters**

**Action:** `ssm:DescribeParameters`

Required to view information about one or more parameters.

**DescribePatchBaselines**

**Action:** `ssm:DescribePatchBaselines`

Required to view information about the patch baselines in an AWS account.

**DescribePatchGroups**

**Action:** `ssm:DescribePatchGroups`

Required to view information about all patch groups that have been registered with patch baselines.

**DescribePatchGroupState**

**Action:** `ssm:DescribePatchGroupState`

Required to view information about the high-level aggregated patch compliance state for a patch group.

**DescribePatchProperties**

**Action:** `ssm:DescribePatchProperties`

Required to view information about the properties of available patches.

**DescribeSessions**

**Action:** `ssm:DescribeSessions`

Required to retrieve a list of all active sessions (both connected and disconnected) or terminated Session Manager sessions.
GetAutomationExecution

**Action:** ssm:GetAutomationExecution

Required to view detailed information about a particular Automation execution.

GetCommandInvocation

**Action:** ssm:GetCommandInvocation

Required to view detailed information about command execution for an invocation or plugin.

GetConnectionStatus

**Action:** ssm:GetConnectionStatus

Required to retrieve the Session Manager connection status for an instance to determine whether it is connected and ready to receive Session Manager connections.

GetDefaultPatchBaseline

**Action:** ssm:GetDefaultPatchBaseline

Required to view information about the default patch baseline.

GetDeployablePatchSnapshotForInstance

**Action:** ssm:GetDeployablePatchSnapshotForInstance

Required to view the current snapshot for the patch baseline used by the instance. Used primarily by the AWS-RunPatchBaseline Systems Manager document.

GetDocument

**Action:** ssm:GetDocument

Required to view the contents of a specified Systems Manager document.

GetInventory

**Action:** ssm:GetInventory

Required to view information about inventory items.

GetInventorySchema

**Action:** ssm:GetInventorySchema

Required to view inventory type names for the account, or to return a list of attribute names for a specific inventory item type.

GetMaintenanceWindow

**Action:** ssm:GetMaintenanceWindow

Required to view information about a specified maintenance window.

GetMaintenanceWindowExecution

**Action:** ssm:GetMaintenanceWindowExecution

Required to view information about a specific task run as part of a maintenance window execution.

GetMaintenanceWindowExecutionTask

**Action:** ssm:GetMaintenanceWindowExecutionTask

Required to view information about a specific task run as part of a maintenance window execution.
GetMaintenanceWindowExecutionTaskInvocation

**Action**: `ssm:GetMaintenanceWindowExecutionTaskInvocation`

Required to retrieve a task invocation, which is a specific task running on a specific target.

GetMaintenanceWindowTask

**Action**: `ssm:GetMaintenanceWindowTask`

Required to list the tasks in a maintenance window.

GetOpsItem

**Action**: `ssm:GetOpsItem`

Required to view information about an OpsItem by using the ID.

GetOpsSummary

**Action**: `ssm:GetOpsSummary`

Required to view a summary of OpsItems based on specified filters and aggregators.

GetParameter

**Action**: `ssm:GetParameter`

Required to view information about a specified parameter, including the parameter name, type, and value.

GetParameterHistory

**Action**: `ssm:GetParameterHistory`

Required to view historical information about a specified parameter. In addition to parameter name, type, and value, returns the parameter description, query key ID, last modified date, and ARN of the AWS user who last modified the parameter.

GetParameters

**Action**: `ssm:GetParameters`

Required to view information about parameters.

GetParametersByPath

**Action**: `ssm:GetParametersByPath`

Required to view information about parameters in a hierarchical structure.

GetPatchBaseline

**Action**: `ssm:GetPatchBaseline`

Required to view information about a patch baseline.

GetPatchBaselineForPatchGroup

**Action**: `ssm:GetPatchBaselineForPatchGroup`

Required to view information about the patch baseline that should be used for a specified patch group.

GetServiceSetting

**Action**: `ssm:GetServiceSetting`
Required to query the current account-level setting for an AWS service. The service setting defines how a user interacts with or uses a service or a feature of a service.

**LabelParameterVersion**

**Action:** `ssm:LabelParameterVersion`

Required to attach labels to a parameter version.

**ListAssociations**

**Action:** `ssm:ListAssociations`

Required to view the associations for the specified Systems Manager document or instance.

**ListAssociationVersions**

**Action:** `ssm:ListAssociationVersions`

Required to retrieve all versions of an association for a specific association ID.

**ListCommandInvocations**

**Action:** `ssm:ListCommandInvocations`

Required to view a list of invocations, or copies of commands sent to a specific instance.

**ListCommands**

**Action:** `ssm:ListCommands`

Required to view a list of commands requested by users of the AWS account.

**ListComplianceItems**

**Action:** `ssm:ListComplianceItems`

Required to retrieve a list of compliance statuses for different resource types for a specific resource ID.

**ListComplianceSummaries**

**Action:** `ssm:ListComplianceSummaries`

Required to retrieve a summary count of compliant and non-compliant resources for a compliance type.

**ListDocuments**

**Action:** `ssm:ListDocuments`

Required to view a list of Systems Manager documents.

**ListDocumentVersions**

**Action:** `ssm:ListDocumentVersions`

Required to view information about the versions of a document.

**ListInventoryEntries**

**Action:** `ssm:ListInventoryEntries`

Required to view information about inventory items on an instance.

**ListResourceComplianceSummaries**

**Action:** `ssm:ListResourceComplianceSummaries`
Required to retrieve a resource-level summary count, including information about compliant and non-compliant statuses.

**ListResourceDataSync**

**Action:** ssm:ListResourceDataSync

Required to view information about resource data sync configurations, including when a sync last attempted to start, the last sync status, and the last time a sync completed successfully.

**ListTagsForResource**

**Action:** ssm:ListTagsForResource

Required to view a list of tags assigned to a specified resource.

**ModifyDocumentPermission**

**Action:** ssm:ModifyDocumentPermission

Required to shared a Systems Manager document publicly or privately.

**PutComplianceItems**

**Action:** ssm:PutComplianceItems

Required to register a compliance type and other compliance details on a designated resource.

**PutInventory**

**Action:** ssm:PutInventory

Required to add or update custom inventory items on one or more instances.

**PutParameter**

**Action:** ssm:PutParameter

Required to add one or more parameters to the system.

**RegisterDefaultPatchBaseline**

**Action:** ssm:RegisterDefaultPatchBaseline

Required to define the default patch baseline.

**RegisterPatchBaselineForPatchGroup**

**Action:** ssm:RegisterPatchBaselineForPatchGroup

Required to register a patch baseline for a patch group.

**RegisterTargetWithMaintenanceWindow**

**Action:** ssm:RegisterTargetWithMaintenanceWindow

Required to register a target with a maintenance window.

**RegisterTaskWithMaintenanceWindow**

**Action:** ssm:RegisterTaskWithMaintenanceWindow

Required to register a task with a maintenance window.

**RemoveTagsFromResource**

**Action:** ssm:RemoveTagsFromResource

Required to remove tags from a specified resource.
ResetServiceSetting

**Action:** ssm:ResetServiceSetting

Required to reset the service setting for the account to the default value as provisioned by the AWS service team.

ResumeSession

**Action:** ssm:ResumeSession

Required to reconnect a session to an instance after it has been disconnected. This command is for use by client machines to automatically reconnect during intermittent network issues only.

SendAutomationSignal

**Action:** ssm:SendAutomationSignal

Required to send a signal to an Automation execution to change the current behavior or status of the execution.

SendCommand

**Action:** ssm:SendCommand

Required to run commands on one or more managed instances.

StartAssociationsOnce

**Action:** ssm:StartAssociationsOnce

Required to run an association immediately and only one time, which can be helpful when troubleshooting associations.

StartAutomationExecution

**Action:** ssm:StartAutomationExecution

Required to start running an Automation document.

StartSession

**Action:** ssm:StartSession

Required to initiate a connection to a target (for example, an instance) for a Session Manager session.

StopAutomationExecution

**Action:** ssm:StopAutomationExecution

Required to stop running an Automation document.

TerminateSession

**Action:** ssm:TerminateSession

Required to permanently end a session and close the data connection between the Session Manager client and SSM Agent on the instance.

UpdateAssociation

**Action:** ssm:UpdateAssociation

Required to update an association. Updates can be made only to the document version, schedule, parameters, and Amazon S3 output of an association.
UpdateAssociationStatus

**Action:** ssm:UpdateAssociationStatus

Required to update the status of the Systems Manager document associated with a specified instance.

UpdateDocument

**Action:** ssm:UpdateDocument

Required to update the content, version, or name of a document.

UpdateDocumentDefaultVersion

**Action:** ssm:UpdateDocumentDefaultVersion

Required to set the default version of a document.

UpdateMaintenanceWindow

**Action:** ssm:UpdateMaintenanceWindow

Required to update one or more parameters in a maintenance window.

UpdateMaintenanceWindowTarget

**Action:** ssm:UpdateMaintenanceWindowTarget

Required to modify the target of an existing maintenance window.

UpdateMaintenanceWindowTask

**Action:** ssm:UpdateMaintenanceWindowTask

Required to modify the task assigned to a maintenance window.

UpdateManagedInstanceRole

**Action:** ssm:UpdateManagedInstanceRole

Required to assign an Amazon Identity and Access Management (IAM) role to a managed instance, or to change the assigned IAM role.

UpdateOpsItem

**Action:** ssm:UpdateOpsItem

Required to edit or change an OpsItem.

UpdatePatchBaseline

**Action:** ssm:UpdatePatchBaseline

Required to update one or more fields in an existing patch baseline.

UpdateServiceSetting

**Action:** ssm:UpdateServiceSetting

Required to update the service setting for the account.
AWS Systems Manager Reference

The following information and topics can help you better implement Systems Manager solutions.

Principal

In AWS Identity and Access Management (IAM), you can grant or deny a service access to resources using the Principal policy element. The Principal policy element value for Systems Manager is ssm.amazonaws.com.

Supported Regions and Endpoints

See AWS Systems Manager in the Amazon Web Services General Reference.

Service Limits

See AWS Systems Manager in the Amazon Web Services General Reference.

API Reference Guide

See AWS Systems Manager API Reference.

CLI Command Reference

See AWS Systems Manager section of the AWS CLI Command Reference.

AWS Tools for PowerShell Cmdlet Reference

See AWS Systems Manager section of the AWS Tools for PowerShell Cmdlet Reference.

SSM Agent Repository on GitHub

See aws/amazon-ssm-agent.

Ask a Question

AWS Systems Manager Developer Forum

AWS News Blog

Management Tools

More Reference Topics

- Reference: Cron and Rate Expressions for Systems Manager (p. 936)
- Reference: Maintenance Windows Scheduling and Active Period Options (p. 942)
- Reference: ec2messages, ssmmessages, and Other API Calls (p. 944)

Reference: Cron and Rate Expressions for Systems Manager

When you create an AWS Systems Manager maintenance window or a State Manager association, you specify a schedule for when the window or the association should run. You can specify a schedule in the form of either a time-based entry, called a cron expression, or a frequency-based entry, called a rate expression. For maintenance windows, you can also specify a time stamp in Coordinated Universal Time (UTC) format when you create a maintenance window so that it runs once at the specified time.

When you create either type of resource programmatically or by using a command line tool such as the AWS CLI, you must specify a schedule parameter with a valid cron or rate expression (or time stamp for maintenance windows) in the correct format.
When you use the AWS Systems Manager console to create a maintenance window or association, you can specify a schedule using a valid cron or rate expression. You can also use tools in the user interface that simplify the process of creating your schedule.

**Maintenance Window Examples**

To create maintenance windows using the AWS CLI, you include the `--schedule` parameter with a cron or rate expression or a time stamp. For example:

```bash
aws ssm create-maintenance-window --name "My-Cron-Maintenance-Window" --schedule "cron(0 16 ? * TUE *)" --schedule-timezone "America/Los_Angeles" --start-date 2019-01-01T00:00:00-08:00 --end-date 2019-06-30T00:00:00-08:00 --duration 4 --cutoff 1
```

```bash
aws ssm create-maintenance-window --name "My-Rate-Maintenance-Window" --schedule "rate(7 days)" --duration 4 --schedule-timezone "America/Los_Angeles" --cutoff 1
```

```bash
aws ssm create-maintenance-window --name "My-TimeStamp-Maintenance-Window" --schedule "at(2019-07-07T13:15:30)" --duration 4 --schedule-timezone "America/Los_Angeles" --cutoff 1
```

**Association Examples**

To create State Manager associations using the AWS CLI, you include the `--schedule-expression` parameter with a cron or rate expression. For example:

```bash
aws ssm create-association --association-name "My-Cron-Association" --schedule-expression "cron(0 0 2 ? * SUN *)" --targets Key=tag:ServerRole,Values=WebServer --name AWS-UpdateSSMAgent
```

```bash
aws ssm create-association --association-name "My-Rate-Association" --schedule-expression "rate(7 days)" --targets Key=tag:ServerRole,Values=WebServer --name AWS-UpdateSSMAgent
```

**Topics**

- General Information About Cron and Rate Expressions (p. 937)
- Cron and Rate Expressions for Associations (p. 940)
- Cron and Rate Expressions for Maintenance Windows (p. 941)

**General Information About Cron and Rate Expressions**

Cron expressions for Systems Manager have six required fields. A seventh field, the `Seconds` field (the first in a cron expression), is optional. Fields are separated by a space.

**Cron Expression Examples**

<table>
<thead>
<tr>
<th>Minutes</th>
<th>Hours</th>
<th>Day of month</th>
<th>Month</th>
<th>Day of week</th>
<th>Year</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>*</td>
<td>*</td>
<td>?</td>
<td>*</td>
<td>Run at 10:00 am (UTC) every day</td>
</tr>
</tbody>
</table>
### General Information About Cron and Rate Expressions

#### Minutes

<table>
<thead>
<tr>
<th>Minutes</th>
<th>Hours</th>
<th>Day of month</th>
<th>Month</th>
<th>Day of week</th>
<th>Year</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>12</td>
<td>*</td>
<td>*</td>
<td>?</td>
<td>*</td>
<td>Run at 12:15 PM (UTC) every day</td>
</tr>
<tr>
<td>0</td>
<td>18</td>
<td>?</td>
<td>*</td>
<td>MON-FRI</td>
<td>*</td>
<td>Run at 6:00 PM (UTC) every Monday through Friday</td>
</tr>
<tr>
<td>0</td>
<td>8</td>
<td>1</td>
<td>*</td>
<td>?</td>
<td>*</td>
<td>Run at 8:00 AM (UTC) every 1st day of the month</td>
</tr>
<tr>
<td>0/15</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>?</td>
<td>*</td>
<td>Run every 15 minutes</td>
</tr>
<tr>
<td>0/10</td>
<td>*</td>
<td>?</td>
<td>*</td>
<td>MON-FRI</td>
<td>*</td>
<td>Run every 10 minutes Monday through Friday</td>
</tr>
<tr>
<td>0/5</td>
<td>8-17</td>
<td>?</td>
<td>*</td>
<td>MON-FRI</td>
<td>*</td>
<td>Run every 5 minutes Monday through Friday between 8:00 AM and 5:55 PM (UTC)</td>
</tr>
</tbody>
</table>

#### Supported Values for Cron Expressions

The following table shows supported values for required cron entries.

**Note**
Cron expressions for associations do not support all these values. For information, see [Cron and Rate Expressions for Associations](p. 940).

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
<th>Wildcards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes</td>
<td>0-59</td>
<td>, - * /</td>
</tr>
<tr>
<td>Hours</td>
<td>0-23</td>
<td>, - * /</td>
</tr>
<tr>
<td>Day-of-month</td>
<td>1-31</td>
<td>, - * ? / L W</td>
</tr>
<tr>
<td>Month</td>
<td>1-12 or JAN-DEC</td>
<td>, - * /</td>
</tr>
</tbody>
</table>
Field | Values | Wildcards
--- | --- | ---
Day-of-week | 1-7 or SUN-SAT | , - * ? / L
Year | 1970-2199 | , - * /

**Note**
You cannot specify a value in the Day-of-month and in the Day-of-week fields in the same cron expression. If you specify a value in one of the fields, you must use a ? (question mark) in the other field.

**Wildcards**
The following table shows the wildcard values that cron expressions support.

**Supported Wildcards for Cron Expressions**

<table>
<thead>
<tr>
<th>Wildcard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>,</td>
<td>The , (comma) wildcard includes additional values. In the Month field, JAN,FEB,MAR would include January, February, and March.</td>
</tr>
<tr>
<td>-</td>
<td>The - (dash) wildcard specifies ranges. In the Day field, 1-15 would include days 1 through 15 of the specified month.</td>
</tr>
<tr>
<td>*</td>
<td>The * (asterisk) wildcard includes all values in the field. In the Hours field, * would include every hour.</td>
</tr>
<tr>
<td>/</td>
<td>The / (forward slash) wildcard specifies increments. In the Minutes field, you could enter 1/10 to specify every tenth minute, starting from the first minute of the hour. So 1/10 specifies the first, 11th, 21st, and 31st minute, and so on.</td>
</tr>
<tr>
<td>?</td>
<td>The ? (question mark) wildcard specifies one or another. In the Day-of-month field you could enter 7 and if you didn’t care what day of the week the 7th was, you could enter ? in the Day-of-week field.</td>
</tr>
<tr>
<td>L</td>
<td>The L wildcard in the Day-of-month or Day-of-week fields specifies the last day of the month or week.</td>
</tr>
<tr>
<td>W</td>
<td>The W wildcard in the Day-of-month field specifies a weekday. In the Day-of-month field, 3W specifies the day closest to the third weekday of the month.</td>
</tr>
</tbody>
</table>

**Note**
Cron expressions that lead to rates faster than five (5) minute are not supported. Support for specifying both a day-of-week and a day-of-month value is not complete. You must currently use the question mark (?) character in one of these fields.

For more information about cron expressions, see [CRON expression](https://en.wikipedia.org/wiki/Cron) at the *Wikipedia* website.
Rate Expressions
Rate expressions have the following two required fields. Fields are separated by white space.

### Required Fields for Rate Expressions

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>positive number, such as 1 or 15</td>
</tr>
<tr>
<td>Unit</td>
<td>minute</td>
</tr>
<tr>
<td></td>
<td>minutes</td>
</tr>
<tr>
<td></td>
<td>hour</td>
</tr>
<tr>
<td></td>
<td>hours</td>
</tr>
<tr>
<td></td>
<td>day</td>
</tr>
<tr>
<td></td>
<td>days</td>
</tr>
</tbody>
</table>

If the value is equal to 1, then the unit must be singular. Similarly, for values greater than 1, the unit must be plural. For example, rate(1 hours) and rate(5 hour) are not valid, but rate(1 hour) and rate(5 hours) are valid.

### Cron and Rate Expressions for Associations

This section includes examples of cron and rate expressions for State Manager associations. Before you create one of these expressions, be aware of the following restrictions.

- Associations only support the following cron expressions: every 1/2, 1, 2, 4, 8, or 12 hours; every day or every week at a specific time.
- Associations only support the following rate expressions: intervals of 30 minutes or greater and less than 31 days.
- If you specify the optional Seconds field, its value can only be 0 (zero). For example: `cron(0 */30 * * * ? *)`

The following table presents cron examples for associations using the required six fields.

### Cron Examples for Associations

<table>
<thead>
<tr>
<th>Example</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>cron(0/30 * * * ? *)</code></td>
<td>Every 30 minutes</td>
</tr>
<tr>
<td><code>cron(0 0/1 * * ? *)</code></td>
<td>Every hour</td>
</tr>
<tr>
<td><code>cron(0 0/2 * * ? *)</code></td>
<td>Every 2 hours</td>
</tr>
<tr>
<td><code>cron(0 0/4 * * ? *)</code></td>
<td>Every 4 hours</td>
</tr>
<tr>
<td><code>cron(0 0/8 * * ? *)</code></td>
<td>Every 8 hours</td>
</tr>
<tr>
<td><code>cron(0 0/12 * * ? *)</code></td>
<td>Every 12 hours</td>
</tr>
<tr>
<td><code>cron(15 13 ? * * *)</code></td>
<td>Every day at 1:15 PM</td>
</tr>
<tr>
<td><code>cron(15 13 ? * MON *)</code></td>
<td>Every Monday at 1:15 PM</td>
</tr>
</tbody>
</table>
Here are some rate examples for associations.

### Rate Examples for Associations

<table>
<thead>
<tr>
<th>Example</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>rate(30 minutes)</td>
<td>Every 30 minutes</td>
</tr>
<tr>
<td>rate(1 hour)</td>
<td>Every hour</td>
</tr>
<tr>
<td>rate(5 hours)</td>
<td>Every 5 hours</td>
</tr>
<tr>
<td>rate(15 days)</td>
<td>Every 15 days</td>
</tr>
</tbody>
</table>

### Cron and Rate Expressions for Maintenance Windows

This section includes examples of cron and rate expressions for maintenance windows.

Unlike State Manager associations, maintenance windows support all cron and rate expressions, including values other than 0 (zero) in the seconds field.

For example, the following 6-field cron expression runs a maintenance window at 9:30 AM every day:

```
cron(30 09 ? * * *)
```

By adding a value to the `Seconds` field, the following 7-field cron expression runs a maintenance window at 9:30:24 AM every day:

```
cron(24 30 09 ? * * *)
```

The following table provides additional 6-field cron examples for maintenance windows.

### Cron Examples for Maintenance Windows

<table>
<thead>
<tr>
<th>Example</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>cron(0 2 ? * THU#3 *)</td>
<td>02:00 AM the third Thursday of every month</td>
</tr>
<tr>
<td>cron(15 10 ? * * *)</td>
<td>10:15 AM every day</td>
</tr>
<tr>
<td>cron(15 10 ? * MON-FRI *)</td>
<td>10:15 AM every Monday, Tuesday, Wednesday, Thursday and Friday</td>
</tr>
<tr>
<td>cron(0 2 L * ? *)</td>
<td>02:00 AM on the last day of every month</td>
</tr>
<tr>
<td>cron(15 10 ? * 6L *)</td>
<td>10:15 AM on the last Friday of every month</td>
</tr>
</tbody>
</table>

The following table provides rate examples for maintenance windows.

### Rate Examples for Maintenance Windows

<table>
<thead>
<tr>
<th>Example</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>rate(30 minutes)</td>
<td>Every 30 minutes</td>
</tr>
<tr>
<td>rate(1 hour)</td>
<td>Every hour</td>
</tr>
</tbody>
</table>
Reference: Maintenance Windows Scheduling and Active Period Options

When you create a maintenance window, you must specify how often the maintenance window runs by using a Cron or Rate expression (p. 936). Optionally, you can specify a date range during which the maintenance window can run on its regular schedule, as well as a time zone on which to base that regular schedule.

Be aware, however, that the time zone option and the start date/end date options do not influence each other. Any start date and end date times that you specify (with or without an offset for your time zone) determine only the valid period during which the maintenance window can run on its schedule. A time zone option determines the international time zone that the maintenance window schedule is based on during its valid period.

Note
You specify start and end dates in ISO-8601 timestamp format. For example:
2019-04-07T14:29:00-08:00
You specify time zones in Internet Assigned Numbers Authority (IANA) format. For example:
America/Chicago, Europe/Berlin or Asia/Tokyo

Examples
- Example 1: Specify a maintenance window start date (p. 942)
- Example 2: Specify a maintenance window start date and end date (p. 943)
- Example 3: Create a maintenance window that runs only once (p. 943)

Example 1: Specify a maintenance window start date

Say that you use the AWS CLI to create a maintenance window with the following options:

- --start-date 2019-01-01T00:00:00-05:00
- --schedule-timezone "America/Los_Angeles"
- --schedule "cron(0 09 ? * FRI *)"

For example:

```
aws ssm create-maintenance-window --name "My-LAX-Maintenance-Window" --start-date 2019-01-01T00:00:00-08:00 --schedule-timezone "America/Los_Angeles" --schedule "cron(0 09 ? * FRI *)"
```

This means that the maintenance window won't run until after its specified start date and time, which is at Midnight US Eastern Time on Tuesday, January 1, 2019. (This time zone is five hours behind UTC time.) Taken together, the --schedule-timezone and --schedule values mean that the maintenance window runs at 9 AM every Friday in the US Pacific Time Zone (represented by "America/Los_Angeles" in IANA format). The first execution in the enabled period will be on Friday, January 4th, 2019, at 9 AM US Pacific Time.
Example 2: Specify a maintenance window start date and end date

Suppose that next you create a maintenance window with these options:

- `--start-date 2019-01-01T03:15:00+09:00`
- `--end-date 2019-06-30T06:15:00+09:00`
- `--schedule-timezone "Asia/Tokyo"`
- `--schedule "rate(7 days)"

For example:

```bash
aws ssm create-maintenance-window --name "My-NRT-Maintenance-Window" --start-date 2019-01-01T03:15:00+09:00 --end-date 2019-06-30T06:15:00+09:00 --schedule-timezone "Asia/Tokyo" --schedule "rate(7 days)"
```

The enabled period for this maintenance window begins at 3:15 AM Japan Standard Time on January 1, 2019. The valid period for this maintenance window ends at 6:15 AM Japan Standard Time on Sunday, June 30, 2019. (This time zone is nine hours ahead of UTC time.) Taken together, the `--schedule-timezone` and `--schedule` values mean that the maintenance window runs at 3:15 AM every Tuesday in the Japan Standard Time Zone (represented by "Asia/Tokyo" in IANA format). This is because the maintenance window runs every seven days, and it becomes active at 3:15 AM on Tuesday, January 1st. The last execution is at 3:15 AM Japan Standard Time on Tuesday, June 25, 2019. This is the last Tuesday before the enabled maintenance window period ends five days later.

Example 3: Create a maintenance window that runs only once

Now you create a maintenance window with this option:

- `--schedule "at(2020-07-07T15:55:00)"

For example:

```bash
aws ssm create-maintenance-window --name "My-One-Time-Maintenance-Window" --schedule "at(2020-07-07T15:55:00)" --duration 5 --cutoff 2 --allow-unassociated-targets
```

This maintenance window runs just once, at 3:55 PM UTC time on July 7, 2020. The maintenance window is enabled to run up to five hours, as needed, but new tasks are prevented from starting two hours before the end of the maintenance window period.

Related Content

- Reference: Cron and Rate Expressions for Systems Manager (p. 936)
- Create a Maintenance Window (Console) (p. 456)
- Tutorial: Create and Configure a Maintenance Window (AWS CLI) (p. 463)
- `CreateMaintenanceWindow` in the AWS Systems Manager API Reference
- `create-maintenance-window` in the AWS Systems Manager section of the AWS CLI Command Reference
- Time Zone Database on the IANA website
Reference: ec2messages, ssmmessages, and Other API Calls

If you monitor API calls, you might see calls to the following APIs.

- ec2messages:AcknowledgeMessage
- ec2messages:DeleteMessage
- ec2messages:FailMessage
- ec2messages:GetEndpoint
- ec2messages:GetMessages
- ec2messages:SendReply
- ssmmessages:CreateControlChannel
- ssmmessages:CreateDataChannel
- ssmmessages:OpenControlChannel
- ssmmessages:OpenDataChannel
- ssm:UpdateInstanceInformation
- ssm:ListInstanceAssociations
- ssm:DescribeInstanceProperties
- ssm:DescribeDocumentParameters

These special calls are used by Systems Manager for various operations.

**ec2messages API calls**

Calls to ec2messages:* APIs are calls to the Amazon Message Delivery Service endpoint. Systems Manager uses this endpoint to make calls from SSM Agent to the Systems Manager service in the cloud. This endpoint is required to send and receive commands. For more information, see Actions, Resources, and Condition Keys for Amazon Message Delivery Service.

**ssmmessages API calls**

Systems Manager uses the ssmmessages endpoint to make calls from SSM Agent to the Session Manager service in the cloud. This endpoint is required to create and delete session channels with the Session Manager service in the cloud.

**Instance-related API calls**

UpdateInstanceInformation: SSM Agent calls the Systems Manager service in the cloud every five minutes to provide heartbeat information. This call is necessary to maintain a heartbeat with the agent so that the service knows the agent is functioning as expected.

ListInstanceAssociations: The agent calls this API to see if a new Systems Manager State Manager association is available. This API is required for State Manager to function.

DescribeInstanceProperties and DescribeDocumentParameters: Systems Manager calls these APIs to render specific nodes in the Amazon EC2 console. The DescribeInstanceProperties API displays the Managed Instances node in the left navigation. The DescribeDocumentParameters API displays the Documents node in the left navigation.
Use Cases and Best Practices

This topic lists common use cases and best practices for AWS Systems Manager capabilities. If available, this topic also includes links to relevant blog posts and technical documentation.

**Note**
The title of each section here is an active link to the corresponding section in the technical documentation.

**Automation (p. 142)**

- Create self-service runbooks for infrastructure as Automation documents.
- Use Automation to simplify creating AMIs from the AWS Marketplace or custom AMIs, using public SSM documents or by authoring your own workflows.
- Build and maintain AMIs (p. 400) using the AWS-UpdateLinuxAmi and AWS-UpdateWindowsAmi Automation documents, or using custom Automation documents that you create.

**Inventory (p. 512)**

- Use Systems Manager Inventory with AWS Config to audit your application configurations over time.

**Maintenance Windows (p. 444)**

- Define a schedule to perform potentially disruptive actions on your instances such as OS patching, driver updates, or software installations.

**Parameter Store (p. 828)**

- Use Parameter Store to centrally manage global configuration settings.
- Use Parameter Store to encrypt and manage secrets by using AWS KMS (p. 878).
- Use Parameter Store with ECS task definitions to store secrets.

**Patch Manager (p. 686)**

- Use patch manager to rollout patches at scale and increase fleet compliance visibility across your instances.

**Run Command (p. 615)**

- Manage Instances at Scale without SSH Access Using EC2 Run Command.
- Audit all API calls made by on or on behalf of Run Command using AWS CloudTrail.
- Use the targets and rate control features in Run Command to perform a staged command execution (p. 625).
- Use fine-grained access permissions for Run Command (and all Systems Manager capabilities) by using AWS Identity and Access Management (IAM) policies (p. 919).

**State Manager (p. 648)**

- Update SSM Agent at least once a month using the pre-configured AWS-UpdateSSMAgent document (p. 684).
• **Bootstrap EC2 Instances on launch using EC2Config for Windows**
  • (Windows) Upload the PowerShell or DSC module to Amazon S3, and use AWS-InstallPowerShellModule.
  • Use Amazon EC2 tags to create application groups for your instances. And then target instances using the **Targets** parameter instead of specifying individual instance IDs.
  • **Automatically remediate findings generated by Amazon Inspector by using Systems Manager.**
  • **Use a centralized configuration repository for all of your SSM documents, and share documents across your organization (p. 793).**

**Managed Instances (p. 563)**

• Systems Manager requires accurate time references in order to perform its operations. If your instance's date and time are not set correctly, they may not match the signature date of your API requests. In some cases, this will lead to errors or incomplete functionality. For example, instances with incorrect time settings will not be included in your lists of managed instances.

For information on setting the time on your instances, see the following topics:
• **Setting the Time for Your Linux Instance**
• **Setting the Time for a Windows Instance**
### Document History

The following table describes the important changes to the documentation since the last release of AWS Systems Manager. For notification about updates to this documentation, you can subscribe to an RSS feed.

**Important**

An updated version of SSM Agent is released whenever new capabilities are added to Systems Manager or updates are made to existing capabilities. If an older version of the agent is running on an instance, some SSM Agent processes can fail. For that reason, we recommend that you automate the process of keeping SSM Agent up-to-date on your instances. For information, see Automate Updates to SSM Agent (p. 86). To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub.

- **API version:** 2014-11-06

<table>
<thead>
<tr>
<th>update-history-change</th>
<th>update-history-description</th>
<th>update-history-date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Restrict Session Manager access using AWS-supplied tags</strong> (p. 947)</td>
<td>A second method for controlling user access to session actions is now available. This new method lets you create IAM access policies using AWS-supplied session tags instead of using the <code>{aws:username}</code> variable. Using these AWS-supplied session tags makes it possible for organizations that use federated IDs to control user access to sessions. For information, see Allow a User to Terminate Only Sessions They Started.</td>
<td>October 2, 2019</td>
</tr>
</tbody>
</table>
| **New Ansible SSM Document:** AWS-ApplyAnsiblePlaybooks (p. 947) | You can create State Manager associations that run Ansible Playbooks by using the AWS-ApplyAnsiblePlaybooks document. This document offers the following benefits for running Playbooks:  
  - Support for running complex Playbooks  
  - Support for downloading Playbooks from GitHub and Amazon Simple Storage Service (Amazon S3)  
  - Support for compressed Playbook structure  
  - Enhanced logging | September 24, 2019 |
Port forwarding support for Session Manager (p. 947)

- Ability to specify which Playbook to run when Playbooks are bundled

For more information, see Creating Associations that Run Ansible Playbooks

Session Manager now supports port forwarding sessions. Port forwarding allows you to securely create tunnels between your instances deployed in private subnets, without the need to start the SSH service on the server, to open the SSH port in the security group, or to use a bastion host. Similar to SSH tunnels, port forwarding allows you to forward traffic between your laptop to open ports on your instance. Once port forwarding is configured, you can connect to the local port and access the server application running inside the instance. For more information, see the following topics:

- Port Forwarding Using AWS Systems Manager Session Manager on the AWS News Blog
- Starting a Session (Port Forwarding)

August 29, 2019
<table>
<thead>
<tr>
<th>Change Description</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify a default parameter tier or automate tier selection (p. 947)</td>
<td>You can now specify a default parameter tier to use for requests to create or update a parameter that do not specify a tier. You can set the default tier to standard parameters, advanced parameters, or a new option, Intelligent-Tiering. Intelligent-Tiering evaluates each PutParameter request and creates an advanced parameter only when required. (Advanced parameters are required if the size of the parameter value is more than 4 KB, a parameter policy is associated with the parameter, or the maximum 10,000 parameters supported for the standard tier are already created.) For more information about specifying a default tier and using Intelligent-Tiering, see Specifying a Default Parameter Tier.</td>
<td>August 27, 2019</td>
</tr>
<tr>
<td>Working with Associations section updated with CLI and PowerShell procedures (p. 947)</td>
<td>The Working with Associations section has been updated to include procedural documentation for managing associations using the AWS CLI or AWS Tools for PowerShell. For information see, Working with Associations in Systems Manager.</td>
<td>August 26, 2019</td>
</tr>
<tr>
<td>Working with Automation Executions section updated with CLI and PowerShell procedures (p. 947)</td>
<td>The Working with Automation Executions section has been updated to include procedural documentation for running Automation workflows using the AWS CLI or AWS Tools for PowerShell. For information see, Working with Automation Executions.</td>
<td>August 20, 2019</td>
</tr>
<tr>
<td>OpsCenter integrates with Application Insights (p. 947)</td>
<td>OpsCenter integrates with Amazon CloudWatch Application Insights for .NET and SQL Server. This means you can automatically create OpsItems for problems detected in your applications. For information about how to configure Application Insights to create OpsItems, see Setting Up Your Application in the Amazon CloudWatch User Guide.</td>
<td>August 7, 2019</td>
</tr>
</tbody>
</table>
Quick Setup is a new feature in the Systems Manager console that helps you quickly configure several Systems Manager components on your Amazon EC2 instances. Specifically, Quick Setup helps you configure the following components on the instances you choose or target by using tags:

- An AWS Identity and Access Management (IAM) instance profile role for Systems Manager.
- A scheduled, bi-monthly update of SSM Agent.
- A scheduled collection of Inventory metadata every 30 minutes.
- A daily scan of your instances to identify missing patches.
- A one-time installation and configuration of the Amazon CloudWatch agent.
- A scheduled, monthly update of the CloudWatch agent.

For more information, see [AWS Systems Manager Quick Setup](p. 947).
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
</table>
| Register a resource group as a maintenance window target (p. 947) | In addition to registering managed instances as the target of a maintenance window, you can now register a resource group as a maintenance window target. Maintenance Windows supports all the AWS resource types that are supported by AWS Resource Groups including AWS::EC2::Instance, AWS::DynamoDB::Table, AWS::OpsWorks::Instance, AWS::Redshift::Cluster, and more. With this release you can also send commands to a resource group, for example by using the Run Command console or the AWS CLI send-command command. For more information, see the following topics:  
- Assign Targets to a Maintenance Window (Console)  
- Examples: Register Targets with a Maintenance Window  
- Using Targets and Rate Controls to Send Commands to a Fleet | July 23, 2019 |
<p>| Simplified package creation and versioning with AWS Systems Manager Distributor (p. 947) | Distributor has a new, simplified package creation workflow that can generate a package manifest, scripts, and file hashes for you. You can also use the simplified workflow when you add a version to an existing package. | July 22, 2019 |
| New Document categories pane for Systems Manager Automation (p. 947) | Systems Manager includes a new Document categories pane when you run an Automation in the console. Use this pane to filter Automation documents based on their purpose. | July 18, 2019 |</p>
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify user permissions to access the default Session Manager configuration document (p. 947)</td>
<td>When a user in your account uses the AWS CLI to start a Session Manager session and doesn't specify a configuration document in the command, Systems Manager uses the default configuration document <code>SSM-SessionManagerRunShell</code>. You can now verify that the user has been granted permission to access this document by adding a condition element for <code>ssm:SessionDocumentAccessCheck</code> to the IAM user's policy. For information, see Enforce Document Permission Check for Default CLI Scenario.</td>
<td>July 9, 2019</td>
</tr>
<tr>
<td>Support for starting Session Manager sessions using operating system user credentials (p. 947)</td>
<td>By default, Session Manager sessions are launched using the credentials of a system-generated <code>ssm-user</code> account that is created on a managed instance. On Linux machines, you can now instead launch sessions using the credentials of an operating system account. For information, see Enable Run As Support for Linux Instances.</td>
<td>July 9, 2019</td>
</tr>
<tr>
<td>Support for starting Session Manager sessions using SSH (p. 947)</td>
<td>You can now use the AWS CLI to start an SSH session on a managed instance using Session Manager. For information about enabling SSH sessions with Session Manager, see (Optional) Enable SSH Session Manager Sessions. For information about starting an SSH session using Session Manager, see Starting a Session (SSH).</td>
<td>July 9, 2019</td>
</tr>
<tr>
<td>Support for changing passwords on managed instances (p. 947)</td>
<td>You can now reset passwords on machines that you manage using Systems Manager (managed instances). You can reset the password using the Systems Manager console or the AWS CLI. For information, see Resetting Passwords on Managed Instances.</td>
<td>July 9, 2019</td>
</tr>
<tr>
<td>Revisions to “What is AWS Systems Manager?” (p. 947)</td>
<td>The introductory content in <em>What is AWS Systems Manager?</em> has been expanded to provide a broader introduction to the service and reflect Systems Manager capabilities that have been released recently. In addition, other content in the section has been moved into individual topics for better discoverability.</td>
<td>June 10, 2019</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>New Systems Manager capability: OpsCenter (p. 947)</td>
<td>OpsCenter provides a central location where operations engineers and IT professionals can view, investigate, and resolve operational work items (OpsItems) related to AWS resources. OpsCenter is designed to reduce mean time to resolution for issues impacting AWS resources. This Systems Manager capability aggregates and standardizes OpsItems across services while providing contextual investigation data about each Opsitem, related Opsitems, and related resources. OpsCenter also provides Systems Manager Automation documents (runbooks) that you can use to quickly resolve issues. You can specify searchable, custom data for each OpsItem. You can also view automatically-generated summary reports about OpsItems by status and source. For more information, see <em>AWS Systems Manager OpsCenter</em>.</td>
<td>June 6, 2019</td>
</tr>
<tr>
<td>Changes to Systems Manager left navigation pane in the AWS Management Console (p. 947)</td>
<td>The Systems Manager left navigation pane in the AWS Management Console includes new headings, including a new heading for Ops Center, that provide a more logical grouping of Systems Manager capabilities.</td>
<td>June 6, 2019</td>
</tr>
<tr>
<td>Revisions and Updates</td>
<td>Details</td>
<td>Date</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------</td>
<td>------</td>
</tr>
</tbody>
</table>
| Revised tutorial for creating and configuring a maintenance window using the AWS CLI (p. 947) | Tutorial: Create and Configure a Maintenance Window (AWS CLI) has been overhauled to provide a simple path through the practice steps. You create a single maintenance window, identify a single target, and set up a simple task for the maintenance window to run. Along the way, we provide information and examples you can use to create your own task registration commands, including information for using pseudo parameters such as {{TARGET_ID}}. For additional information and examples, see the following topics:  
  - Examples: Register Targets with a Maintenance Window  
  - Examples: Register Tasks with a Maintenance Window  
  - About register-task-with-maintenance-windows Options  
  - About Pseudo Parameters | May 31, 2019 |
| Notifications about SSM Agent updates (p. 947) | To be notified about SSM Agent updates, subscribe to the SSM Agent Release Notes page on GitHub. | May 24, 2019 |
| Receive notifications or trigger actions based on changes in Parameter Store (p. 947) | The topic Set Up Notifications or Trigger Actions Based on Parameter Store Events now helps you set up Amazon CloudWatch Events rules to respond to changes in Parameter Store. You can receive notifications or trigger other actions when any of the following occur:  
  - A parameter is created, updated, or deleted.  
  - A parameter label version is created, updated, or deleted.  
  - A parameter expires, is going to expire, or hasn't changed in a specified period of time. | May 22, 2019 |
We have expanded and reorganized the Setting Up and Getting Started content in the AWS Systems Manager User Guide. Setting Up content has been divided into two sections. One section focuses on tasks for setting up Systems Manager to configure and manage your Amazon EC2 instances. The other focuses on tasks for setting up Systems Manager to configure and manage your on-premises servers and virtual machines (VMs) in a hybrid environment. Both sections now present all setup topics as major numbered steps, in the recommended order of completion. A new Getting Started chapter focuses on helping end-users get started with Systems Manager after account and service configuration tasks have been completed.

- Setting Up AWS Systems Manager
- Setting Up AWS Systems Manager for Hybrid Environments
- Getting Started with AWS Systems Manager
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include patches for Microsoft applications in patch baselines (Windows) (p. 947)</td>
<td>Patch Manager now supports patch updates for Microsoft applications on Windows Server instances. Previously, only patches for the Windows Server operating system were supported. Patch Manager provides two predefined patch baselines for Windows Server instances. The patch baseline <code>AWS-WindowsPredefinedPatchBaseline-OS</code> applies to operating system patches only. <code>AWS-WindowsPredefinedPatchBaseline-OS-Applications</code> applies to both the Windows Server operating system and Microsoft applications on Windows. For information about creating a custom patch baseline that includes patches for Microsoft applications, see the first procedure in Create a Custom Patch Baseline. Also, as part of this update, the names of AWS-provided predefined patch baselines are being changed. For more information, see Predefined Baselines.</td>
<td>May 7, 2019</td>
</tr>
<tr>
<td>Examples for registering maintenance window targets using the AWS CLI (p. 947)</td>
<td>The new topic Examples: Register Targets with a Maintenance Window provides three sample commands to demonstrate different ways you can specify the targets for a maintenance window when you use the AWS CLI. The topic also explains the best use case for each of the sample commands.</td>
<td>May 3, 2019</td>
</tr>
</tbody>
</table>
Updates to Patch Group topics (p. 947)

The topic About Patch Groups has been updated to include a section on how managed instances determine the appropriate patch baseline to use during patching operations. Additionally, instructions have been added for using the AWS CLI or Systems Manager console to add Patch Group tags to your managed instances and how to add a Patch Group to a patch baseline. For more information see Create a Patch Group and Add a Patch Group to a Patch Baseline.

May 1, 2019
Parameter Store offers the following new features:

- **Advanced parameters:**
  Parameter Store now enables you to individually configure parameters to use either a standard-parameter tier (the default tier) or an advanced-parameter tier. Advanced parameters offer a larger size limit for the parameter value, a higher limit for the number of parameters you can create per account and Region, and the ability to use parameter policies. For more information about advanced parameters, see *About Systems Manager Advanced Parameters.*

- **Parameter policies:**
  Parameter policies help you manage a growing set of parameters by enabling you to assign specific criteria to a parameter, such as an expiration date or *time to live.* Parameter policies are especially helpful in forcing you to update or delete passwords and configuration data stored in Parameter Store. Parameter policies are only available for parameters that use the advanced-parameter tier. For more information, see *Working with Parameter Policies.*

- **Higher throughput:** You can now increase the Parameter Store throughput limit to a maximum of 1,000 transactions per second. For more information, see *Increasing Parameter Store Throughput.*
<table>
<thead>
<tr>
<th>Updates to the Automation section (p. 947)</th>
<th>The Automation section has been updated for improved discoverability. In addition, four new topics have been added to the Automation section:</th>
</tr>
</thead>
</table>
|  | • Running an Automation Workflow Manually (p. 154)  
|  | • Running an Automation Workflow with Approvers (p. 160)  
|  | • Running Automation Workflows Based on Triggers (p. 177)  
<p>|  | • Sharing a Systems Manager Automation Document (p. 238) |
| Encrypt session data using an AWS KMS key (p. 947) | By default, Session Manager uses TLS 1.2 to encrypt session data transmitted between the local machines of users in your account and your Amazon EC2 instances. Now you can choose to further encrypt that data using a customer master key (CMK) that has been created in AWS Key Management Service. You can use a key that has been created in your AWS account or one that has been shared with you from another account. For information about specifying a CMK to encrypt session data, see Enable AWS KMS Key Encryption of Session Data (Console), Create Session Manager Preferences (AWS CLI), or Update Session Manager Preferences (AWS CLI). |
| Configuring Amazon SNS Notifications for AWS Systems Manager (p. 947) | Added instructions for using the AWS CLI or Systems Manager console to configure Amazon SNS notifications for Run Command and Run Command tasks registered to a maintenance window. For more information see Configuring Amazon SNS Notifications for AWS Systems Manager. |</p>
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced instances for servers and VMs in hybrid environments (p. 947)</td>
<td>AWS Systems Manager offers a standard-instances tier and an advanced-instances tier for servers and VMs in your hybrid environment. The standard-instances tier enables you to register a maximum of 1,000 servers or VMs per AWS account per AWS Region. If you need to register more than 1,000 servers or VMs in a single account and Region, then use the advanced-instances tier. You can create as many instances as you like in the advanced-instances tier, but all instances configured for Systems Manager are available on a pay-per-use basis. Advanced instances also enable you to connect to your hybrid machines by using AWS Systems Manager Session Manager. Session Manager provides interactive shell access to your instances. For more information about enabing advanced instances, see Using the Advanced-Instances Tier.</td>
<td>March 4, 2019</td>
</tr>
<tr>
<td>Create State Manager associations that use shared SSM documents (p. 947)</td>
<td>You can create State Manager associations that use SSM Command and Automation documents shared from other AWS accounts. Creating associations by using shared SSM documents helps to keep your Amazon EC2 and hybrid infrastructure in a consistent state even when instances are not in the same account. For information about sharing SSM documents, see AWS Systems Manager Documents. For information about creating a State Manager association, see Create an Association.</td>
<td>February 28, 2019</td>
</tr>
<tr>
<td>View lists of Systems Manager events supported for Amazon CloudWatch Events rules (p. 947)</td>
<td>The new topic Monitoring Systems Manager Events with Amazon CloudWatch Events provides a summary of the various events emitted by Systems Manager for which you can set up event monitoring rules in CloudWatch Events.</td>
<td>February 25, 2019</td>
</tr>
</tbody>
</table>
Add tags when you create Systems Manager resources (p. 947)

Systems Manager now supports the ability to add tags to certain resource types when you create them. The resources you can tag when you create them with the AWS CLI or an SDK include maintenance windows, patch baselines, Parameter Store parameters, and SSM documents. You can also assign tags to a managed instance when you create an activation for it. When you use the Systems Manager console, you can add tags to maintenance windows, patch baselines, and parameters.

Automatic IAM role creation for Systems Manager Inventory (p. 947)

Previously you had to create an AWS Identity and Access Management (IAM) role and attach separate policies to this role to view inventory data on the Inventory Detail View page in the console. You no longer need to create this role or attach policies to it. When you choose a Remote Data Sync on the Inventory Detail View page, Systems Manager automatically creates the AmazonGlueServicePolicyForSSM role and assigns the AmazonGlueServicePolicyForSSM-{Amazon S3 bucket name} policy and the AWSGlueServiceRole policy to it. For more information, see Querying Inventory Data from Multiple Regions and Accounts.

Maintenance Windows walkthroughs to update SSM Agent (p. 947)

Added two new walkthroughs to the Maintenance Windows documentation. The walkthroughs detail how to use the Systems Manager console or the AWS CLI to create a maintenance window that keeps SSM Agent up-to-date automatically. For more information, see Maintenance Windows Walkthroughs.

Using Parameter Store public parameters (p. 947)

Added short section describing Parameter Store public parameters. For more information, see Using Systems Manager Public Parameters.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the AWS CLI to Create Session Manager Preferences (p. 947)</td>
<td>Added instructions for using the AWS CLI to create Session Manager preferences, such as CloudWatch Logs, Amazon S3 bucket logging options, and session encryption settings. For more information, see Use the AWS CLI to Create Session Manager Preferences.</td>
<td>January 22, 2019</td>
</tr>
<tr>
<td>Executing Systems Manager Automations by using State Manager (p. 947)</td>
<td>AWS Systems Manager State Manager now supports creating associations that use SSM Automation documents. State Manager previously supported only command and policy documents, which meant that you could only create associations that targeted managed instances. With support for SSM Automation documents, you can now create associations that target different types of AWS resources. For more information, see Executing Systems Manager Automations by using State Manager.</td>
<td>January 22, 2019</td>
</tr>
<tr>
<td>Reference updates for Cron and Rate expressions and maintenance window scheduling options (p. 947)</td>
<td>The reference topic Cron and Rate Expressions for Systems Manager has been revised. The new version provides more examples and improved explanations of how to use cron and rate expressions to schedule your maintenance windows and State Manager associations. In addition, the new topic Maintenance Windows Scheduling and Active Period Options explains how the various schedule-related options for maintenance windows (Start date, End date, Time zone, Schedule frequency) relate to one another.</td>
<td>December 6, 2018</td>
</tr>
<tr>
<td>Updates to the Systems Manager Prerequisites topic (p. 947)</td>
<td>The Systems Manager Prerequisites topic has been updated to provide information about supported operating system versions in a more detailed tabular format, along with other changes in the page for improved readability.</td>
<td>December 4, 2018</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
<td>Date</td>
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</tr>
<tr>
<td>Enable SSM Agent debug logging (p. 947)</td>
<td>You can enable SSM Agent debug logging by editing the seelog.xml.template file on the managed instance. For more information, see Enable SSM Agent Debug Logging.</td>
<td>November 30, 2018</td>
</tr>
<tr>
<td>Support for ARM64 processor architectures (p. 947)</td>
<td>AWS Systems Manager now supports ARM64 versions of the Amazon Linux 2, Red Hat Enterprise Linux 7.6, and Ubuntu Server (18.04 LTS and 16.04 LTS) operating systems. For more information, see the instructions for installing Amazon Linux 2, RHEL, and Ubuntu Server 18.04 and 16.04 LTS with Snap packages. For more information about the A1 instance type, see General Purpose Instances in the Amazon EC2 User Guide for Linux Instances.</td>
<td>November 26, 2018</td>
</tr>
<tr>
<td>Create and deploy packages by using AWS Systems Manager Distributor (p. 947)</td>
<td>AWS Systems Manager Distributor lets you package your own software—or find AWS-provided agent software packages, such as AmazonCloudWatchAgent—to install on AWS Systems Manager managed instances. Distributor publishes resources, such as software packages, to AWS Systems Manager managed instances. Publishing a package advertises specific versions of the package's document—a Systems Manager document that you create when you add the package in Distributor—to managed instances that you identify by managed instance IDs, AWS account IDs, tags, or an AWS Region. For more information, see AWS Systems Manager Distributor.</td>
<td>November 20, 2018</td>
</tr>
<tr>
<td><strong>Concurrently run AWS Systems Manager Automations across multiple AWS Regions and AWS accounts from a central account (p. 947)</strong></td>
<td>You can concurrently run AWS Systems Manager Automations across multiple AWS Regions and AWS accounts or AWS Organizational Units (OUs) from an Automation management account. Concurrently executing Automations in multiple Regions and accounts or OUs reduces the time required to administer your AWS resources while enhancing the security of your computing environment. For more information see Executing Automations in Multiple AWS Regions and Accounts.</td>
<td>November 19, 2018</td>
</tr>
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<tr>
<td><strong>Query inventory data from multiple AWS Regions and accounts (p. 947)</strong></td>
<td>Systems Manager Inventory integrates with Amazon Athena to help you query inventory data from multiple AWS Regions and accounts. Athena integration uses Resource Data Sync so that you can view inventory data from all of your managed instances on the <strong>Inventory Detail View</strong> page in the AWS Systems Manager console. For more information see Querying Inventory Data from Multiple Regions and Accounts.</td>
<td>November 15, 2018</td>
</tr>
<tr>
<td><strong>Create State Manager associations that run MOF files (p. 947)</strong></td>
<td>You can run Managed Object Format (MOF) files to enforce a desired state on Windows Server managed instances with State Manager by using the AWS-ApplyDSCMofs SSM document. The AWS-ApplyDSCMofs document has two execution modes. With the first mode, you can configure the association to scan and report if the managed instances are currently in the desired state defined in the specified MOF files. In the second mode, you can run the MOF files and change the configuration of your instances based on the resources and their values defined in the MOF files. The AWS-ApplyDSCMofs document enables you to download and run MOF configuration files from Amazon Simple Storage Service (Amazon S3), a local share, or from a secure web site with an HTTPS domain. For more information, see Creating Associations that Run MOF Files.</td>
<td>November 15, 2018</td>
</tr>
<tr>
<td><strong>Restrict administrative access in Session Manager sessions (p. 947)</strong></td>
<td>Session Manager sessions are launched using the credentials of a user account that is created with default root or administrator privileges called ssm-user. Information about restricting administrative control for this account is now available in the topic Disable or Enable ssm-user Account Administrative Permissions.</td>
<td>November 13, 2018</td>
</tr>
<tr>
<td><strong>YAML examples in Automation Actions Reference (p. 947)</strong></td>
<td>The Automations Actions Reference now includes a YAML sample for each action that already includes a JSON sample.</td>
<td>October 31, 2018</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
<td>Date</td>
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<tr>
<td><strong>Assign compliance severity levels to associations (p. 947)</strong></td>
<td>You can now assign compliance severity levels to State Manager associations. These severity levels are reported in the Compliance Dashboard and can also be used to filter your compliance reports. The severity levels you can assign include Critical, High, Medium, Low, and Unspecified. For more information, see Create an Association (Console).</td>
<td>October 26, 2018</td>
</tr>
<tr>
<td><strong>Use targets and rate controls with Automation and State Manager (p. 947)</strong></td>
<td>Control the execution of Automations and State Manager associations across your fleet of resources by using targets, concurrency, and error thresholds. For more information see Using Targets and Rate Controls to Run Automation Workflows on a Fleet and Using Targets and Rate Controls with State Manager Associations.</td>
<td>October 23, 2018</td>
</tr>
<tr>
<td><strong>Specify active time ranges and international time zones for maintenance windows (p. 947)</strong></td>
<td>You can also specify dates that a maintenance window should not run before or after (start date and end date), and you can specify the international time zone on which to base the maintenance window schedule. For more information see Create a Maintenance Window (Console) and Update a Maintenance Window (AWS CLI).</td>
<td>October 9, 2018</td>
</tr>
<tr>
<td><strong>Maintain a custom list of patches for your patch baseline in an S3 bucket (p. 947)</strong></td>
<td>The new 'InstallOverrideList' parameter in the SSM document 'AWS-RunPatchBaseline' lets you specify an https URL or an Amazon Simple Storage Service (Amazon S3) path-style URL to a list of patches to be installed. This patch installation list, which you maintain in an S3 bucket in YAML format, overrides the patches specified by the default patch baseline. For more information, see Parameter name: InstallOverrideList.</td>
<td>October 5, 2018</td>
</tr>
<tr>
<td>Topic</td>
<td>Description</td>
<td>Date</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Expanded control over whether patch dependencies are installed (p. 947)</td>
<td>Previously, if a patch in your Rejected patches list was identified as a dependency of another patch, it would still be installed. Now you can choose whether to install these dependencies or block them from being installed. For more information, see Create a Patch Baseline.</td>
<td>October 5, 2018</td>
</tr>
<tr>
<td>Create dynamic Automation workflows with conditional branching (p. 947)</td>
<td>The <code>aws:branch</code> Automation action enables you to create a dynamic Automation workflow that evaluates multiple choices in a single step and then jumps to a different step in the Automation document based on the results of that evaluation. For more information, see Creating Dynamic Automation Workflows with Conditional Branching.</td>
<td>September 26, 2018</td>
</tr>
<tr>
<td>Use the AWS CLI to Update Session Manager Preferences (p. 947)</td>
<td>Instructions for using the CLI to update Session Manager preferences, such as CloudWatch Logs and Amazon S3 bucket logging options, have been added to the AWS Systems Manager User Guide. For information, see Use the AWS CLI to Update Session Manager Preferences.</td>
<td>September 25, 2018</td>
</tr>
<tr>
<td>Set up patching options more easily with the new 'Configure patching' page (p. 947)</td>
<td>Patch Manager has been updated with a new system for setting up patching configurations. On the Configure patching page, you can specify multiple patching options in a single location, including associating a maintenance window with a patching configuration and changing the patch baseline associated with a patch group. For more information, see About Patching Configurations and Create a Patching Configuration.</td>
<td>September 22, 2018</td>
</tr>
<tr>
<td>Updated SSM Agent requirement for Session Manager (p. 947)</td>
<td>Session Manager now requires SSM Agent version 2.3.68.0 or later. For more information about Session Manager prerequisites, see Complete Session Manager Prerequisites.</td>
<td>September 17, 2018</td>
</tr>
<tr>
<td><strong>Manage instances without opening inbound ports or maintaining bastion hosts using Session Manager (p. 947)</strong></td>
<td>Now available, Session Manager is a fully managed AWS Systems Manager capability that lets you manage your Amazon EC2 instances through an interactive one-click browser-based shell or through the AWS CLI. Session Manager provides secure and auditable instance management without the need to open inbound ports, maintain bastion hosts, or manage SSH keys. Session Manager also makes it easy to comply with corporate policies that require controlled access to instances, strict security practices, and fully auditable logs with instance access details, while still providing end users with simple one-click cross-platform access to your Amazon EC2 instances. For more information, see Learn More About Session Manager.</td>
<td>September 11, 2018</td>
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<tr>
<td><strong>Invoking other AWS Services from a Systems Manager Automation Workflow (p. 947)</strong></td>
<td>You can invoke other AWS services and other Systems Manager capabilities in your Automation workflow by using three new Automation actions (or plugins) in your Automation documents. For more information, see Invoking other AWS Services from a Systems Manager Automation Workflow.</td>
<td>August 28, 2018</td>
</tr>
<tr>
<td><strong>Use Systems Manager-specific condition keys in IAM policies (p. 947)</strong></td>
<td>The topic Specifying Conditions in a Policy has been updated to list the IAM condition keys for Systems Manager that you can incorporate in policies. You can use these keys to specify the conditions under which a policy should take effect. The topic also includes links to example policies and other related topics.</td>
<td>August 18, 2018</td>
</tr>
<tr>
<td>Topic</td>
<td>Description</td>
<td>Date</td>
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</tr>
<tr>
<td>Aggregate Inventory data with groups to see which instances are and aren't configured to collect an Inventory type (p. 947)</td>
<td>Groups enable you to quickly see a count of which managed instances are and aren’t configured to collect one or more Inventory types. With groups, you specify one or more Inventory types and a filter that uses the <code>exists</code> operator. For more information, see Aggregating Inventory Data.</td>
<td>August 16, 2018</td>
</tr>
<tr>
<td>View history and change tracking for Inventory and Configuration Compliance (p. 947)</td>
<td>You can now view history and change tracking for Inventory collected from your managed instances. You can also viewing history and changing tracking for Patch Manager patching and State Manager associations reported by Configuration Compliance. For more information, see Viewing Inventory History and Change Tracking.</td>
<td>August 9, 2018</td>
</tr>
<tr>
<td>Systems Manager service-linked role extends support for maintenance window tasks (p. 947)</td>
<td>The Maintenance Windows service requires a set of IAM permissions in order to run maintenance window tasks on your instances. Previously, the only option was to create a custom IAM role to supply these permissions. The service-linked role for Systems Manager has now been enhanced to provide these permissions, giving you two IAM role options. For more information, see Should I Use a Service-Linked Role or a Custom Service Role to Run Maintenance Windows Tasks?</td>
<td>August 2, 2018</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
<td>Date</td>
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<tr>
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</tr>
<tr>
<td>Parameter Store integrates with Secrets Manager (p. 947)</td>
<td>Parameter Store is now integrated with AWS Secrets Manager so that you can retrieve Secrets Manager secrets when using other AWS services that already support references to Parameter Store parameters. These services include Amazon EC2, Amazon Elastic Container Service, AWS Lambda, AWS CloudFormation, AWS CodeBuild, AWS CodeDeploy, and other Systems Manager capabilities. By using Parameter Store to reference Secrets Manager secrets, you create a consistent and secure process for calling and using secrets and reference data in your code and configuration scripts. For information, see Referencing AWS Secrets Manager Secrets from Parameter Store Parameters.</td>
<td>July 26, 2018</td>
</tr>
<tr>
<td>Attach labels to Parameter Store parameters (p. 947)</td>
<td>A parameter label is a user-defined alias to help you manage different versions of a parameter. When you modify a parameter, Systems Manager automatically saves a new version and increments the version number by one. A label can help you remember the purpose of a parameter version when there are multiple versions. For information, see Labeling Parameters.</td>
<td>July 26, 2018</td>
</tr>
<tr>
<td>Create dynamic Automation workflows (p. 947)</td>
<td>By default, the steps (or actions) that you define in the mainSteps section of an Automation document run in sequential order. After one action completes, the next action specified in the mainSteps section begins. With this release, you can now create Automation workflows that perform conditional branching. This means that you can create Automation workflows that dynamically respond to condition changes and jump to a specified step. For information, see Creating Dynamic Automation Workflows.</td>
<td>July 18, 2018</td>
</tr>
<tr>
<td>Topic</td>
<td>Description</td>
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<tr>
<td><strong>SSM Agent now pre-installed on Ubuntu Server 16.04 AMIs using Snap (p. 947)</strong></td>
<td>Beginning with instances created from Ubuntu Server 16.04 AMIs identified with 20180627, the SSM Agent is pre-installed using Snap packages. On instances created from earlier AMIs, you should continue using deb installer packages. For information, see About SSM Agent installations on 64-bit Ubuntu Server 16.04 instances.</td>
<td>July 7, 2018</td>
</tr>
<tr>
<td><strong>Review minimum S3 permissions required by SSM Agent (p. 947)</strong></td>
<td>The new topic Minimum S3 Bucket Permissions for SSM Agent provides information about the Amazon Simple Storage Service (Amazon S3) buckets that resources might need to access to perform Systems Manager operations. You can specify these buckets in a custom policy if you want to limit Amazon S3 bucket access for an instance profile or VPC endpoint to the minimum required to use Systems Manager.</td>
<td>July 5, 2018</td>
</tr>
<tr>
<td><strong>View complete execution history for a specific State Manager association ID (p. 947)</strong></td>
<td>The new topic Viewing Association Histories describes how to view all executions for a specific association ID and then view execution details for one or more resources.</td>
<td>July 2, 2018</td>
</tr>
<tr>
<td><strong>Patch Manager introduces support for Amazon Linux 2 (p. 947)</strong></td>
<td>You can now use Patch Manager to apply patches to Amazon Linux 2 instances. For general information about Patch Manager operating system support, see Patch Manager Prerequisites. For information about the supported key-value pairs for Amazon Linux 2 when defining a patch filter, see PatchFilter in the AWS Systems Manager API Reference.</td>
<td>June 26, 2018</td>
</tr>
<tr>
<td><strong>Send command output to Amazon CloudWatch Logs (p. 947)</strong></td>
<td>The new topic Configuring Amazon CloudWatch Logs for Run Command describes how to send Run Command output to CloudWatch Logs.</td>
<td>June 18, 2018</td>
</tr>
</tbody>
</table>
### Earlier Updates

The following table describes important changes in each release of the *AWS Systems Manager User Guide* before June 2018.

<table>
<thead>
<tr>
<th>Change Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quickly create or delete Resource Data Sync for Inventory by using AWS CloudFormation (p. 947)</td>
<td>June 11, 2018</td>
</tr>
<tr>
<td>You can use AWS CloudFormation to create or delete a Resource Data Sync for Systems Manager Inventory. To use AWS CloudFormation, add the <code>AWS::SSM::ResourceDataSync</code> resource to your AWS CloudFormation template. For more information, see <em>Working with AWS CloudFormation Templates</em> in the <em>AWS CloudFormation User Guide</em>. You can also manually create a Resource Data Sync for Inventory as described in <em>Configuring Resource Data Sync for Inventory</em>.</td>
<td></td>
</tr>
<tr>
<td>AWS Systems Manager User Guide update notifications now available through RSS (p. 947)</td>
<td>June 6, 2018</td>
</tr>
<tr>
<td>The HTML version of the Systems Manager User Guide now supports an RSS feed of updates that are documented in the <em>Systems Manager Documentation Update History</em> page. The RSS feed includes updates made in June, 2018, and later. Previously announced updates are still available in the <em>Systems Manager Documentation Update History</em> page. Use the RSS button in the top menu panel to subscribe to the feed.</td>
<td></td>
</tr>
<tr>
<td>Specify an exit code in scripts to reboot managed instances (p. 947)</td>
<td>June 3, 2018</td>
</tr>
<tr>
<td>The new topic <em>Rebooting Managed Instance from Scripts</em> describes how to instruct Systems Manager to reboot managed instances by specifying an exit code in scripts that you run with Run Command.</td>
<td></td>
</tr>
<tr>
<td>Create an event in Amazon CloudWatch Events whenever custom Inventory is deleted</td>
<td>June 1, 2018</td>
</tr>
<tr>
<td>The new topic <em>Viewing Inventory Delete Actions in CloudWatch Events</em> describes how to configure Amazon CloudWatch Events to create an event anytime a user deletes custom Inventory.</td>
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<tr>
<td>Change</td>
<td>Description</td>
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</tr>
<tr>
<td>Inventory all managed instances in your AWS account</td>
<td>You can easily inventory all managed instances in your AWS account by creating a global inventory association. For more information, see Inventory All Managed Instances in Your AWS Account (p. 524).</td>
</tr>
<tr>
<td>Note</td>
<td>Global inventory associations are available in SSM Agent version 2.0.790.0 or later. For information about how to update SSM Agent on your instances, see Update SSM Agent by using Run Command (p. 623).</td>
</tr>
<tr>
<td>SSM Agent installed by default on Ubuntu Server 18</td>
<td>SSM Agent is installed, by default, on Ubuntu Server 18.04 LTS 64-bit and 32-bit AMIs.</td>
</tr>
<tr>
<td>New topic</td>
<td>The new topic Sending Commands that Use the Document Version Parameter (p. 624) describes how to use the document-version parameter to specify which version of an SSM document to use when the command runs.</td>
</tr>
<tr>
<td>New topic</td>
<td>The new topic Deleting Custom Inventory (p. 543) describes how to delete custom inventory data from Amazon S3 by using the AWS CLI. The topic also describes how to use the SchemaDeleteOption to manage custom inventory by disabling or deleting a custom inventory type. This new feature uses the DeleteInventory API action.</td>
</tr>
<tr>
<td>Amazon SNS notifications for SSM Agent</td>
<td>You can subscribe to an Amazon SNS topic to receive notifications when a new version of SSM Agent is available. For more information, see Subscribe to SSM Agent Notifications (p. 86).</td>
</tr>
<tr>
<td>CentOS patching support</td>
<td>Systems Manager now supports patching CentOS instances. For information about supported CentOS versions, see Patch Manager Prerequisites (p. 687). For more information about how patching works, see How Patch Manager Operations Work (p. 688).</td>
</tr>
<tr>
<td>New section</td>
<td>To provide a single source for reference information in the AWS Systems Manager User Guide, a new section has been introduced, AWS Systems Manager Reference (p. 936). Additional content will be added to this section as it becomes available.</td>
</tr>
<tr>
<td>New topic</td>
<td>The new topic About Package Name Formats for Approved and Rejected Patch Lists (p. 715) details the package name formats you can enter in the lists of approved patches and rejected patches for a custom patch baseline. Sample formats are provided for each operating system type supported by Patch Manager.</td>
</tr>
<tr>
<td>New topic</td>
<td>Systems Manager now integrates with Chef InSpec. InSpec is an open-source, runtime framework that enables you to create human-readable profiles on GitHub or Amazon S3. Then you can use Systems Manager to run compliance scans and view compliant and noncompliant instances. For more</td>
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## Earlier Updates

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<tr>
<td>New topic</td>
<td>The new topic Using Service-Linked Roles for Systems Manager (p. 922) describes how to use an AWS Identity and Access Management (IAM) service-linked role with Systems Manager. Currently, service-linked roles are only required when using Systems Manager Inventory to collect metadata about tags and Resource Groups.</td>
<td>February 27, 2018</td>
</tr>
</tbody>
</table>
| New and updated topics | You can now use Patch Manager to install patches that are in a different source repository than the default one configured on the instance. This is useful for patching instances with updates not related to security; with the content of Personal Package Archives (PPA) for Ubuntu Server; with updates for internal corporate applications; and so on. You specify alternative patch source repositories when you create a custom patch baseline. For more information, see the following topics:  
  - How to Specify an Alternative Patch Source Repository (Linux) (p. 691)  
  - Create a Custom Patch Baseline (p. 724)  
  - Create a patch baseline with custom repositories for different OS versions (p. 741)  

   In addition, you can now use Patch Manager to patch SUSE Linux Enterprise Server instances. Patch Manager supports patching SLES 12.* versions (64-bit only). For more information, see the SLES-specific information in the following topics:  
  - How Security Patches Are Selected (p. 689)  
  - How Patches Are Installed (p. 693)  
  - How Patch Baseline Rules Work on SUSE Linux Enterprise Server (p. 700)  
<p>| New topic       | The new topic Upgrade the Python Requests Module on Amazon Linux Instances That Use a Proxy Server (p. 84) provides instructions for ensuring that instances created using an Amazon Linux AMI have been updated with a current version of the Python requests module. This requirement is to ensure compatibility with Patch Manager. | January 12, 2018 |
| New topic       | The new topic About SSM Documents for Patching Instances (p. 703) describes the seven SSM documents currently available to help you keep your managed instances patched with the latest security-related updates. | January 10, 2018 |</p>
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| Important updates regarding Linux support                    | Updated various topics with the following information:  
  • SSM Agent is installed, by default, on Amazon Linux base AMIs dated 2017.09 and later.  
  • You must manually install SSM Agent on other versions of Linux, including non-base images like Amazon ECS-Optimized AMIs. | January 9, 2018  |
| New topic                                                    | A new topic, About the SSM Document AWS-RunPatchBaseline (p. 706), provides details of how this SSM document operates on both Windows and Linux systems. It also provides information about the two available parameters in the AWS-RunPatchBaseline document, Operation and Snapshot ID. | January 5, 2018  |
| New topics                                                   | A new section, How Patch Manager Operations Work (p. 688), provides technical details that explain how Patch Manager determines which security patches to install and how it installs them on each supported operating system. It also provides information about how patch baseline rules work on different distributions of the Linux operating system | January 2, 2018  |
| Retitled and moved the Systems Manager Automation Actions Reference | Based on customer feedback, the Automation Actions Reference is now called the Systems Manager Automation Document Reference. Furthermore, we moved the reference into the Shared Resources > Documents node so it is closer to the SSM Document Plugin Reference (p. 803). For more information, see Systems Manager Automation Actions Reference (p. 241). | December 20, 2017|
| New Monitoring chapter and content                          | A new chapter, Monitoring AWS Systems Manager (p. 885), provides instructions for sending metrics and log data to Amazon CloudWatch Logs. A new topic, Sending Logs to CloudWatch Logs (CloudWatch agent) (p. 887), provides instructions for migrating on-instance monitoring tasks, on 64-bit Windows Server instances only, from SSM Agent to the CloudWatch agent. | December 14, 2017|
| New chapter                                                  | A new chapter, Authentication and Access Control for AWS Systems Manager (p. 909), provides comprehensive information about using AWS Identity and Access Management (IAM) and AWS Systems Manager to help secure access to your resources through the use of credentials. These credentials provide the permissions required to access AWS resources, such as accessing data stored in Amazon S3 buckets and sending commands to and reading the tags on Amazon EC2 instances. | December 11, 2017|
| Changes to the left navigation                              | We changed the headings in the left navigation of this user guide to match the headings in the new AWS Systems Manager console.                                                                               | December 8, 2017  |
## Earlier Updates

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| Multiple changes for re:Invent 2017 | - **Official launch of AWS Systems Manager**: AWS Systems Manager (formerly Amazon EC2 Systems Manager) is a unified interface that allows you to easily centralize operational data and automate tasks across your AWS resources. You can access the new AWS Systems Manager console [here](#). For more information, see [What Is AWS Systems Manager? (p. 1)](#).
- **YAML Support**: You can create SSM documents in YAML. For more information, see [AWS Systems Manager Documents (p. 778)](#). | November 29, 2017 |
<p>| Using Run Command to Take VSS-Enabled Snapshots of EBS Volumes | Using Run Command, you can take application-consistent snapshots of all <a href="#">Amazon Elastic Block Store (Amazon EBS)</a> volumes attached to your Amazon EC2 Windows instances. The snapshot process uses the Windows <a href="#">Volume Shadow Copy Service (VSS)</a> to take image-level backups of VSS-aware applications, including data from pending transactions between these applications and the disk. Furthermore, you don’t need to shut down your instances or disconnect them when you need to back up all attached volumes. For more information, see <a href="#">Using Run Command to Take VSS-Enabled Snapshots of EBS Volumes</a> in the <a href="#">Amazon EC2 User Guide for Windows Instances</a>. | November 20, 2017 |
| Enhanced Systems Manager Security Available By Using VPC Endpoints | You can improve the security posture of your managed instances (including managed instances in your hybrid environment) by configuring Systems Manager to use an interface VPC endpoint. Interface endpoints are powered by PrivateLink, a technology that enables you to privately access Amazon EC2 and Systems Manager APIs by using private IP addresses. PrivateLink restricts all network traffic between your managed instances, Systems Manager, and EC2 to the Amazon network (managed instances don’t have access to the Internet). Also, you don’t need an Internet gateway, a NAT device, or a virtual private gateway. For more information, see <a href="#">(Optional) Create a Virtual Private Cloud Endpoint (p. 36)</a>. | November 7, 2017 |</p>
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| Inventory Support for Files, Services, Windows Roles, and the Windows Registry | SSM Inventory now supports gathering the following information from your managed instances.  
- **Files**: Name, size, version, installed date, modification and last accessed times, etc.  
- **Services**: Name, display name, status, dependent services, service type, start type, etc.  
- **Windows Registry**: Registry key path, value name, value type, and value.  
- **Windows roles**: Name, display name, path, feature type, installed state, etc.  
Before you attempt to collect information for these inventory types, update SSM Agent on the instances you want to inventory. By running the latest version of SSM Agent, you ensure that you can collect metadata for all supported inventory types. For information about how to update SSM Agent by using State Manager, see [Automatically Update SSM Agent (CLI)](p. 684).  
For more information Inventory, see [Learn More About Systems Manager Inventory](p. 515). | November 6, 2017 |
<p>| Updates to Automation documentation | Fixed several issues in the information about setting up and configuring access for Systems Manager Automation. For more information, see [Getting Started with Automation](p. 144). | October 31, 2017 |</p>
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| GitHub and Amazon S3 Integration            | **Run remote scripts**: Systems Manager now supports downloading and running scripts from a private or public GitHub repository, and from Amazon S3. Using the AWS-RunRemoteScript pre-defined SSM document or the aws:downloadContent plugin in a custom SSM document, you can run Ansible Playbooks and scripts in Python, Ruby, or PowerShell, to name a few. These changes further enhance *infrastructure as code* when you use Systems Manager to automate configuration and deployment of Amazon EC2 instances and on-premises managed instances in your hybrid environment. For more information, see Partner and Product Integration (p. 90).  
**Create composite SSM documents**: Systems Manager now supports running one or more secondary SSM documents from a primary SSM document. These primary documents that run other documents are called *composite* documents. Composite documents enable you to create and share a standard set of secondary SSM documents across AWS accounts for common tasks such as boot-strapping anti-virus software or domain-joining instances. You can run composite and secondary documents stored in Systems Manager, GitHub, or Amazon S3. After you create a composite document, you can run it by using the AWS-RunDocument pre-defined SSM document. For more information, see Creating Composite Documents (p. 799) and Running Documents from Remote Locations (p. 800).  
**SSM document plugin reference**: For easier access, we moved the SSM Plugin Reference for SSM documents out of the Systems Manager API Reference and into the User Guide. For more information, see SSM Document Plugin Reference (p. 803).  | October 26, 2017 |
| Support for Parameter Versions in Parameter Store | When you edit a parameter, Parameter Store now automatically iterates the version number by 1. You can specify a parameter name and a specific version number in API calls and SSM documents. If you don't specify a version number, the system automatically uses the latest version.  
Parameter versions provide a layer of protection in the event that a parameter is accidentally changed. You can view the values of all versions, and reference older versions if necessary. You can also use parameter versions to see how many times a parameter changed over a period of time. For more information, see Working with Parameter Versions (p. 857).  | October 24, 2017 |
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<tr>
<td>Support for Tagging Systems Manager Documents</td>
<td>You can now use the AddTagsToResource API, the AWS CLI, or the AWS Tools for Windows to tag Systems Manager documents with key-value pairs. Tagging helps you quickly identify specific resources based on the tags you’ve assigned to them. This is in addition to existing tagging support for managed instances, maintenance windows, Parameter Store parameters, and patch baselines. New topics include Tagging Systems Manager Documents (p. 790) and Controlling Access to Documents Using Tags (p. 791).</td>
<td>October 3, 2017</td>
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| Various Documentation Updates to Fix Errors or Update Content Based on Feedback | • Updated Setting Up AWS Systems Manager for Hybrid Environments (p. 41) with information for Raspbian Linux.  
• Updated Setting Up AWS Systems Manager (p. 23) with new requirement for Windows instances. SSM Agent requires Windows PowerShell 3.0 or later to run certain SSM Documents on Windows instances (for example, the legacy AWS-ApplyPatchBaseline SSM document). Verify that your Windows instances are running Windows Management Framework 3.0 or later. The framework includes PowerShell. For more information, see Windows Management Framework 3.0. | October 2, 2017 |
| Troubleshoot Unreachable Windows Instances by Using the EC2Rescue Automation Workflow | EC2Rescue can help you diagnose and troubleshoot problems on Amazon EC2 Windows Server instances. You can run the tool as a Systems Manager Automation workflow by using the AWSSupport-ExecuteEC2Rescue document. The AWSSupport-ExecuteEC2Rescue document is designed to perform a combination of Systems Manager actions, AWS CloudFormation actions, and Lambda functions that automate the steps normally required to use EC2Rescue. For more information, see Run the EC2Rescue Tool on Unreachable Instances (p. 422). | September 29, 2017 |
| SSM Agent Installed By Default on Amazon Linux | SSM Agent is installed, by default, on Amazon Linux AMIs dated 2017.09 and later. You must manually install SSM Agent on other versions of Linux, as described in Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68). | September 27, 2017 |
| Run Command Enhancements | Run Command includes the following enhancements.  
• You can restrict command execution to specific instances by creating an IAM user policy that includes a condition that the user can only run commands on instances that are tagged with specific Amazon EC2 tags. For more information, see Restricting Run Command Access Based on Instance Tags (p. 619).  
• You have more options for targeting instances by using Amazon EC2 tags. You can now specify multiple tag keys and multiple tag values when sending commands. For more information, see Using Targets and Rate Controls to Send Commands to a Fleet (p. 625). | September 12, 2017 |
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<tr>
<td>Systems Manager Supported on Raspbian</td>
<td>Systems Manager can now run on Raspbian Jessie and Raspbian Stretch devices, including Raspberry Pi (32-Bit). For more information, see Raspbian (p. 80).</td>
<td>September 7, 2017</td>
</tr>
<tr>
<td>Automatically Send SSM Agent Logs to Amazon CloudWatch Logs</td>
<td>You can now make a simple configuration change on your instances to have SSM Agent send log files to CloudWatch. For more information, see Sending Logs to CloudWatch Logs (SSM Agent) (p. 885).</td>
<td>September 7, 2017</td>
</tr>
<tr>
<td>Encrypt Resource Data Sync</td>
<td>Systems Manager Resource Data Sync lets you aggregate Inventory data collected on dozens or hundreds of managed instance in a central Amazon S3 bucket. You can now encrypt Resource Data Sync by using an AWS Key Management Service key. For more information, see Walkthrough: Use Resource Data Sync to Aggregate Inventory Data (p. 556).</td>
<td>September 1, 2017</td>
</tr>
<tr>
<td>New State Manager Walkthroughs</td>
<td>Added two new walkthroughs to the State Manager documentation:</td>
<td>August 31, 2017</td>
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<td>Automatically Update SSM Agent (CLI) (p. 684)</td>
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<td></td>
<td>Walkthrough: Automatically Update PV Drivers on EC2 Windows Instances (Console) (p. 685)</td>
<td></td>
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<tr>
<td>Systems Manager Configuration Compliance</td>
<td>Use Configuration Compliance to scan your fleet of managed instances for patch compliance and configuration inconsistencies. You can collect and aggregate data from multiple AWS accounts and Regions, and then drill down into specific resources that aren't compliant. By default, Configuration Compliance displays compliance data about Patch Manager patching and State Manager associations. You can also customize the service and create your own compliance types based on your IT or business requirements. For more information, see AWS Systems Manager Configuration Compliance (p. 504).</td>
<td>August 28, 2017</td>
</tr>
<tr>
<td>New Automation Action: aws:executeAutomation</td>
<td>Runs a secondary Automation workflow by calling a secondary Automation document. With this action, you can create Automation documents for your most common workflows, and reference those documents during an Automation execution. This action can simplify your Automation documents by removing the need to duplicate steps across similar documents. For more information, see aws:executeAutomation (p. 267).</td>
<td>August 22, 2017</td>
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<tr>
<td>Automation as the Target of a CloudWatch Event</td>
<td>You can start an Automation workflow by specifying an Automation document as the target of an Amazon CloudWatch event. You can start workflows according to a schedule, or when a specific AWS system event occurs. For more information, see Running Automation Workflows with Triggers using CloudWatch Events (p. 177).</td>
<td>August 21, 2017</td>
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<tr>
<td>State Manager Association Versioning and General Updates</td>
<td>You can now create different State Manager association versions. There is a limit of 1,000 versions for each association. You can also specify names for your associations. Also, the State Manager documentation has been updated to address outdated information and inconsistencies. For more information, see AWS Systems Manager State Manager (p. 648).</td>
<td>August 21, 2017</td>
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</table>
| Changes to Maintenance Windows | Maintenance Windows include the following changes or enhancements:  
- Previously, Maintenance Windows could only perform tasks by using Run Command. You can now perform tasks by using Systems Manager Automation, AWS Lambda, and AWS Step Functions.  
- You can edit the targets of a maintenance window, specify a target name, description, and owner.  
- You can edit tasks in a maintenance window, including specifying a new SSM document for Run Command and Automation tasks.  
- All Run Command parameters are now supported, including DocumentHash, DocumentHashType, TimeoutSeconds, Comment, and NotificationConfig.  
- You can now use a safe flag when you attempt to deregister a target. If enabled, the system returns an error if the target is referenced by any task.  
For more information, see AWS Systems Manager Maintenance Windows (p. 444). | August 16, 2017 |
| New Automation Action: aws:approve | This new action for Automation documents temporarily pauses an Automation execution until designated principals either approve or reject the action. After the required number of approvals is reached, the Automation execution resumes.  
For more information, see Systems Manager Automation Actions Reference (p. 241). | August 10, 2017 |
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| Automation Assume Role No Longer Required | Automation previously required that you specify a service role (or *assume* role) so that the service had permission to perform actions on your behalf. Automation no longer requires this role because the service now operates by using the context of the user who invoked the execution. However, the following situations still require that you specify a service role for Automation:  
- When you want to restrict a user's privileges on a resource, but you want the user to run an Automation workflow that requires elevated privileges. In this scenario, you can create a service role with elevated privileges and allow the user to run the workflow.  
- Operations that you expect to run longer than 12 hours require a service role. | August 3, 2017 |
<p>| Configuration Compliance | Use Amazon EC2 Systems Manager Configuration Compliance to scan your fleet of managed instances for patch compliance and configuration inconsistencies. You can collect and aggregate data from multiple AWS accounts and Regions, and then drill down into specific resources that aren't compliant. For more information, see AWS Systems Manager Configuration Compliance (p. 504). | August 8, 2017 |
| SSM Document Enhancements | SSM Command and Policy documents now offer cross-platform support. This means that a single SSM document can process plugins for Windows and Linux operating systems. Cross-platform support enables you to consolidate the number of documents you manage. Cross-platform support is offered in SSM documents that use schema version 2.2 or later. SSM Command documents that use schema version 2.0 or later can now include multiple plugins of the same type. For example, you can create a Command document that calls the <em>aws:runRunShellScript</em> plugin multiple times. | July 12, 2017 |</p>
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<tr>
<td>Linux Patching</td>
<td>Patch Manager can now patch the following Linux distributions:</td>
<td>July 6, 2017</td>
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<td></td>
<td><strong>64-Bit and 32-Bit Systems</strong></td>
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</table>
|                        | • Amazon Linux 2014.03, 2014.09, or later  
|                        | • Ubuntu Server 16.04 LTS, 14.04 LTS, or 12.04 LTS  
|                        | • Red Hat Enterprise Linux (RHEL) 6.5 or later                                                                                                                                                               |              |
|                        | **64-Bit Systems Only**                                                                                                                                                                                     |              |
|                        | • Amazon Linux 2015.03, 2015.09, or later  
|                        | • Red Hat Enterprise Linux (RHEL) 7.x or later                                                                                                                                                               |              |
|                        | For more information, see [AWS Systems Manager Patch Manager](p. 686).                                                                                                                                     |              |
|                        | **Note**                                                                                                                                                                                                   |              |
|                        | • To patch Linux instances, your instances must be running SSM Agent version 2.0.834.0 or later. For information about updating the agent, see the section titled *Example: Update SSM Agent in Running Commands from the Console* (p. 622).  
<p>|                        | • The AWS-ApplyPatchBaseline SSM document is being replaced by the AWS-RunPatchBaseline document.                                                                                                          |              |
| Resource Data Sync     | You can use Systems Manager Resource Data Sync to send Inventory data collected from all of your managed instances to a single Amazon S3 bucket. Resource Data Sync then automatically updates the centralized data when new Inventory data is collected. With all Inventory data stored in a target Amazon S3 bucket, you can use services like Amazon Athena and Amazon QuickSight to query and analyze the aggregated data. For more information, see Configuring Resource Data Sync for Inventory (p. 520). For an example of how to work with Resource Data Sync, see Walkthrough: Use Resource Data Sync to Aggregate Inventory Data (p. 556). | June 29, 2017 |</p>
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<tr>
<td>Systems Manager Parameter Hierarchies</td>
<td>Managing dozens or hundreds of Systems Manager parameters as a flat list is time-consuming and prone to errors. You can use parameter hierarchies to help you organize and manage Systems Manager parameters. A hierarchy is a parameter name that includes a path that you define by using forward slashes. Here is an example that uses three hierarchy levels in the name to identify the following: /Environment/Type of computer/Application/Data /Dev/DBServer/MySQL/db-string13</td>
<td>June 22, 2017</td>
</tr>
<tr>
<td>SSM Agent Support for SUSE Linux Enterprise Server</td>
<td>You can install SSM Agent on 64-bit SUSE Linux Enterprise Server (SLES). For more information, see Installing and Configuring SSM Agent on Amazon EC2 Linux Instances (p. 68).</td>
<td>June 14, 2017</td>
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AWS Glossary

For the latest AWS terminology, see the AWS Glossary in the AWS General Reference.