General SAP Guides

SAP Guides
General SAP Guides: SAP Guides
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General SAP Guides

This section of the SAP on AWS technical documentation provides overviews and planning information for SAP users and partners, including general information about implementing, configuring, and operating SAP environments and solutions on the AWS Cloud. This section includes the following guides:

- SAP on AWS Overview and Planning (p. 2)
- AWS Data Provider for SAP (p. 20)
- SAP on AWS Pricing and Optimization (p. 59)

For information about specific SAP products, see the following sections of this documentation set:

- SAP HANA technical guides
- SAP NetWeaver technical guides
- SAP BusinessObjects technical guides

About this content set

SAP on AWS technical documentation provides detailed information on how to migrate, implement, configure, and operate SAP solutions on AWS.

Additional resources from AWS

- SAP and AWS: announcements, solutions, support, pricing, FAQ
- Find an AWS SAP partner
- AWS for SAP blog
- Case Studies
- AWS presentations from SAPPHIRE NOW 2018
- Questions and support

Resources from SAP

- SAP notes and Knowledge Base articles
- SAP Note 1656250: SAP on AWS: Supported instance types (requires SAP One Support Launchpad user account)
SAP on AWS Overview and Planning

*SAP specialists, Amazon Web Services (AWS)*

*Last updated (p. 19): May 2019*

This guide provides overview and planning information for SAP customers and partners who are considering implementing or migrating SAP environments or systems to the Amazon Web Services (AWS) Cloud.

This guide is intended for users who have previous experience installing, migrating, and operating SAP environments and systems on traditional on-premises infrastructure. It consists of three main sections:

- An overview of the AWS Cloud and AWS services (p. 2), for readers who are new to the cloud.
- An overview of SAP on AWS (p. 6), including software and licenses, support options, and partner services.
- Technical considerations (p. 10) that will help you plan and get the most out of your SAP environment on AWS.

**Note**

To access the SAP notes referenced in this guide, you must have an SAP One Support Launchpad user account. For more information, see the [SAP Support website](https://aws.amazon.com/sap/docs/).

About this Guide

This guide is part of a content series that provides detailed information about hosting, configuring, and using SAP technologies in the AWS Cloud. For the other guides in the series, ranging from overviews to advanced topics, see [https://aws.amazon.com/sap/docs/](https://aws.amazon.com/sap/docs/).

AWS Overview

AWS offers a broad set of global, cloud-based services, including compute, storage, networking, Internet of Things (IoT), and many others. These services help organizations move faster, lower IT costs, and support scalability. AWS is trusted by the largest enterprises and popular start-ups to power a wide variety of workloads, such as web and mobile applications, game development, data processing and warehousing, storage, and archiving.

AWS Services

AWS provides over 165 cloud services that you can use in combinations tailored to your business or organizational needs. For information about all AWS services, see the [Amazon Web Services Cloud Platform](https://aws.amazon.com/) whitepaper.

This section introduces the AWS services that are most relevant for the deployment and operation of SAP solutions. The following list provides a high-level description of each service and its use for SAP systems. To view features, pricing, and documentation for an individual service, follow the [details](https://aws.amazon.com/sap/docs/) link after the description.
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<td>Storage</td>
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<td>Amazon Simple Storage Service (Amazon S3)</td>
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<td>Amazon Elastic File System (Amazon EFS)</td>
<td>Simple, scalable, elastic file system for Linux-based workloads for use with AWS Cloud services and on-premises resources. (details)</td>
<td>Shared file system for SAP application servers (e.g., <code>/sapmnt</code>).</td>
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<td>Shared file system for SAP application servers (e.g., <code>/sapmnt</code>).</td>
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<td></td>
<td>Amazon Virtual Private Cloud (Amazon VPC)</td>
<td>Logically isolated section of the AWS Cloud where you can launch AWS resources in a virtual network that you define. (details)</td>
<td>Network for SAP resources. You can control the level of isolation of your EC2 instance from other networks, instances, and on-premises network resources, such as those in production and non-production environments.</td>
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<td>AWS Site-to-Site VPN</td>
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<td>Network connectivity between on-premises systems/users and SAP systems on AWS.</td>
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<td>AWS Direct Connect</td>
<td>Lets you establish private network connectivity between AWS and your data center, office, or co-</td>
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<td>Amazon CloudWatch</td>
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<td>Monitoring SAP systems running on AWS.</td>
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<td>AWS CloudTrail</td>
<td>Records activity made on your account and delivers log files to your S3 bucket. (details)</td>
<td>Audit capabilities within your AWS account, such as use of the Amazon EC2 API.</td>
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AWS Global Infrastructure

The AWS Cloud infrastructure is built around Regions and Availability Zones. An AWS Region is a physical location that provides multiple, physically separated and isolated Availability Zones. Each Availability Zone consists of one or more data centers that are connected with low-latency, high-throughput, and highly redundant networking. These Availability Zones offer an easier and more effective way to design and operate your applications and databases, making them more highly available, fault tolerant, and scalable than traditional single or multiple data center infrastructures.

For a list of the available AWS Regions and to learn more about the AWS global infrastructure, see Global Infrastructure on the AWS website.

AWS Security and Compliance

Security

At AWS, security is our top priority. As an AWS customer, you will benefit from a data center and network architecture built to meet the requirements of the most security-sensitive organizations. Security in the cloud is much like security in your on-premises data centers—only without the costs of maintaining facilities and hardware. In the cloud, you don’t have to manage physical servers or storage devices. Instead, you use software-based security tools to monitor and protect the flow of information into and out of your cloud resources.

As an AWS customer you inherit all the best practices of AWS policies, architecture, and operational processes built to satisfy the requirements of our most security-sensitive customers, and get the flexibility and agility you need in security controls.

The AWS Cloud enables a shared responsibility model. While AWS manages security of the cloud, you are responsible for security in the cloud. This means that you retain control of the security you choose to implement to protect your own data, platform, applications, systems, and networks no differently than you would in an on-site data center.

To learn more about AWS security, see AWS Cloud Security on the AWS website.

Compliance

AWS provides robust controls to help maintain security and data protection in the cloud. As systems are built on top of AWS Cloud infrastructure, compliance responsibilities will be shared. By tying together governance-focused, audit-friendly service features with applicable compliance or audit standards, AWS compliance enablers build on traditional programs and help you operate in an AWS security control environment.
The IT infrastructure that AWS provides to its customers is designed and managed in alignment with best security practices and a variety of IT security standards. The following is a partial list of assurance programs with which AWS complies:

- SOC 1/ISAE 3402, SOC 2, SOC 3
- FISMA, DIACAP, and FedRAMP
- PCI DSS Level 1
- ISO 9001, ISO 27001, ISO 27018

To learn more about AWS compliance, see AWS Cloud Compliance on the AWS website.

**AWS Provisioning and Management**

The provisioning and management of AWS services and resources use a self-service model managed by the customer or a partner. For an overview of the tools available for provisioning and management, see the management tools in the AWS Services (p. 2) section.

Figure 1 shows the services managed by AWS and the services managed by the customer or partner for SAP.

**Figure 1: Managed services for SAP on AWS**

**SAP on AWS Overview**

AWS has been working with SAP since 2011 to help customers deploy and migrate their SAP applications to AWS, and SAP supports running the vast majority of available SAP applications on AWS. In addition, AWS is working with SAP to power multiple SaaS services and offerings, such as SAP Concur, SAP SuccessFactors, SAP Cloud Platform, and SAP HANA Enterprise Cloud.

**SAP Software and Licenses on AWS**

This section describes the options available for SAP software and licenses on AWS.
Bring Your Own Software and License

The majority of SAP solutions that can be run on AWS use a bring-your-own-software and bring-your-own-license (BYOL) model. Running SAP systems on AWS doesn’t require special or new SAP licenses. If you’re an existing SAP customer, you can use your existing SAP licenses when running SAP on AWS. You are responsible for obtaining a valid SAP license, and you must ensure that you are in compliance with the SAP licensing policies. AWS does not provide or sell SAP licenses.

AWS Marketplace

AWS Marketplace is a digital catalog with thousands of software listings from independent software vendors that makes it easy to find, test, buy, and deploy software that runs on AWS. To view SAP-related offerings available in AWS Marketplace, follow this link: SAP in AWS Marketplace.

SAP Trial and Developer Licenses

The SAP Cloud Appliance Library provides access to an online repository of the latest preconfigured SAP solutions. You can quickly deploy these solutions on AWS by using a launch wizard that automates deployment. Some of the solutions available in the SAP Cloud Appliance Library are provided with free trial or developer edition licenses.

SAP Hardware Key Generation

SAP hardware key generation on EC2 instances uses a specific process that is dependent on the SAP kernel patch level. If a hardware key is generated before patching the SAP kernel to the proper level, and the kernel is updated at a later time, the hardware key may change, making the installed license invalid. For details on how the SAP hardware ID is generated on EC2 instances and the required SAP kernel patch levels see the following SAP notes (SAP One Support Launchpad access required):

- SAP Note 1178686 – Linux: Alternative method to generate a SAP hardware key
- SAP Note 2327159 – SAP NW License Behavior in Virtual and Cloud Environments
- SAP Note 1697114 – Determination of hardware ID In Amazon clouds
- SAP Note 2113263 – Additional public key for AWS Hardware ID
- SAP Note 2319387 – Adjustment of the license check for AWS China

SAP Support on AWS

AWS and SAP have worked together closely to ensure that you receive the same level of support via the same support channels, whether you’re running your SAP systems on AWS or on premises.

SAP Solutions Supported on AWS

The majority of SAP solutions that run on traditional on-premises infrastructure are fully supported by SAP on AWS. For the complete list of SAP solutions supported on AWS, see SAP Note 1656099 and the other notes referenced within that note.

SAP Support on AWS

To ensure full support of your SAP on AWS environment from SAP and AWS, you must follow the guidelines and requirements in SAP Note 1656250. Here are the primary requirements you must follow to ensure support of your SAP on AWS environment:
• Enable detailed monitoring for Amazon CloudWatch on each EC2 instance to ensure that the required AWS metrics are provided in one-minute intervals. For additional information on Amazon CloudWatch, see https://aws.amazon.com/cloudwatch.

• Install, configure, and run the AWS Data Provider for SAP (p. 20) on each EC2 instance. The AWS Data Provider collects the required performance and configuration data from a variety of sources, including the Amazon EC2 API, Amazon EC2 instance metadata, and Amazon CloudWatch, and shares it with SAP applications, to help monitor and improve the performance of business transactions.

• Any AWS account that you use for running SAP systems must have an AWS support plan for either Business Support or Enterprise Support.

Deploying SAP Systems on AWS

The section describes different options available for provisioning AWS infrastructure and installing SAP systems on AWS.

Manual Deployment

The majority of SAP solutions supported on AWS can be installed by manually provisioning the required AWS infrastructure resources and then following the relevant, standard SAP installation documentation to install the SAP system on AWS.

Automated Deployment

AWS Quick Starts are built by AWS solutions architects and partners to help you deploy popular solutions on AWS, based on AWS best practices for security and high availability. These reference deployments implement key technologies automatically on the AWS Cloud, and eliminate many of the manual steps required for deployment. You can build your test or production environment in a few steps, and start using it immediately.

Prebuilt Images

Some SAP solutions are available on AWS as a prebuilt system image that contains a preinstalled and preconfigured SAP system. A prebuilt SAP system image enables you to rapidly provision a new SAP system without spending the time and effort required by a traditional manual SAP installation.

Prebuilt SAP system images are available from the following sources:

• AWS Marketplace
• SAP Cloud Appliance Library

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### Getting Assistance from APN Partners

There are AWS Partner Network (APN) partners who are experienced in deploying and operating SAP solutions, and can help you with your SAP workloads on AWS. For additional information see the following section.

### Partner Services for SAP on AWS

The [AWS Partner Network (APN)](https://aws.amazon.com/partners/) is a community of companies that offer a wide range of services and products on AWS. APN SAP partners can provide SAP-specific services to help you fully maximize the benefits of running SAP solutions on AWS.

### Types of Partner Services and Solutions for SAP on AWS

- **Cloud assessment services** – Advisory services to help you develop an efficient and effective plan for your cloud adoption journey. Typical services include financial/TCO (total cost of ownership), technical, security and compliance, and licensing.

- **Proof-of-concept services** – Services to help you test SAP on AWS; for example: SAP ERP/ECC migration to SAP HANA or SAP S/4HANA, SAP Business Warehouse (BW) migration to SAP HANA or SAP BW/4HANA, SAP OS/DB migrations, new SAP solution implementation.

- **Migration services** – Services to migrate existing SAP environments or systems to AWS; for example: all-on-AWS SAP migrations (PRD/QAS/DEV), hybrid SAP migrations (QAS/DEV), single SAP system (e.g., SAP BW) migrations.

- **Managed services** – Managed services for SAP environments on AWS, including: AWS account and resource administration, OS administration/patching, backup and recovery, SAP Basis and SAP NetWeaver.

- **Packaged solutions** – Bundled software and service offerings from SAP Partners that combine SAP software, licenses, implementation, and managed services on AWS, such as SAP S/4HANA, SAP BusinessObjects BI, and many others.

- **ISV software solutions** – Partner software solutions for the migration, integration, and operation of SAP solutions on AWS; for example: system migration, high availability, backup and recovery, data replication, automatic scaling, disaster recovery.

### How to Find Partner Services and Solutions for SAP on AWS

The [AWS SAP Partner Services and Solutions Directory](https://aws.amazon.com/sap -> Partners -> Find a Partner) provides a centralized place to search, discover, and connect with trusted APN partners who offer solutions and services to help your business achieve faster time to value and maximize the benefits of running SAP solutions on AWS. The AWS SAP Partner Services and Solutions Directory can be found on the AWS website at the following path:
SAP on AWS Planning

If you are an experienced SAP Basis or SAP NetWeaver administrator, there are a number of AWS-specific considerations relating to compute configurations, storage, security, management, and monitoring that will help you get the most out of your SAP environment on AWS. This section provides guidelines for achieving optimal performance, availability, and reliability, and lower total cost of ownership (TCO) while running SAP solutions on AWS.

SAP Notes

Before migrating or implementing an SAP environment on AWS, you should read and follow the relevant SAP notes. Start from SAP Note 1656099 for general information and follow the links to other relevant SAP notes (SAP One Support Launchpad access required).

SAP on AWS Architectures

This section describes the two primary architectural patterns for SAP on AWS: all systems on AWS and hybrid.

All-on-AWS Architecture

With the SAP All-on-AWS architecture, all systems and components of your SAP environment are hosted on AWS. Example scenarios of such an architecture include:

- Implementation of a complete, new SAP environment on AWS
- Migration of a complete, existing SAP environment to AWS
Figure 3 depicts an SAP all-on-AWS architecture. The SAP environment running on AWS is integrated with on-premises systems and users via a VPN connection or a dedicated network connection via AWS Direct Connect. SAProuter is deployed in a public subnet and assigned a public IP address that is reachable from the internet to enable integration with the SAP OSS network via a virtual network computing (VNC) connection. A network address translation (NAT) gateway enables instances in the private subnet to connect to the internet or other AWS services, but prevents instances from receiving inbound traffic that is initiated by someone on the internet. For additional information, see the Configuring Network and Connectivity (p. 12) section.

Figure 3: SAP all-on-AWS architecture

Hybrid AWS Architecture

With an SAP hybrid AWS architecture, some SAP systems and components are hosted on your on-premises infrastructure and others are hosted on the AWS infrastructure. Example scenarios of such an architecture include:

- Running SAP test, trial, training, proof-of-concept (PoC), and similar systems on AWS
- Running non-production SAP landscapes (for example, DEV and QAS) on AWS, integrated with an SAP production landscape running on premises
- Implementing a new SAP application on AWS and integrating it with an existing SAP on-premises environment

Figure 4 depicts an SAP hybrid AWS architecture with SAP DEV and QAS landscapes and SAP test, training, and PoC systems running on AWS. These systems are integrated with SAP systems and users on the corporate network. Connectivity between the VPC and the corporate network is provided with either a VPN connection or an AWS Direct Connect connection. The existing SAProuter and SAP Solution Manager running on the corporate network are used to manage the SAP systems running within the VPC.
Choosing an AWS Region and Availability Zone

See the AWS Global Infrastructure (p. 5) section of this guide for information about AWS Regions and Availability Zones.

Choosing a Region

When choosing the AWS Region to deploy your SAP environment in, consider the following factors:

- Proximity to your on-premises data center(s), systems, and end users to minimize network latency.
- Data residency and regulatory compliance requirements.
- Availability of the AWS products and services you plan to use in the region. For a detailed list of AWS products and services by region, see the Region Table on the AWS website.
- Availability of the EC2 instance types you plan to use in the region. To view AWS Region availability for a specific instance type, see the Amazon EC2 Instance Types for SAP webpage.

Choosing an Availability Zone

No special considerations are required when choosing an Availability Zone for your SAP deployment on AWS. All SAP applications (SAP ERP, CRM, SRM, and so on) and systems (SAP database system, SAP Central Services system, and SAP application servers) should be deployed in the same Availability Zone. If high availability (HA) is a requirement, use multiple Availability Zones. For more information about high availability, see the SAP on AWS High Availability Guide.

Network and Connectivity

Amazon VPC

Amazon VPC enables you to define a virtual network in your own, logically isolated area within the AWS Cloud. 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 the AWS 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, and make 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.

For detailed instructions for setting up and configuring a VPC, and connectivity between your network and VPC, see the Amazon VPC documentation.

Network Connectivity Options

Multiple options are available to provide network connectivity between your on-premises users and systems with your SAP systems running on AWS, including a direct internet connection, hardware VPN, and private network connection.

Direct Internet Connection

The quickest and simplest way to connect to your SAP systems running on AWS involves using a VPC with a single public subnet and an internet gateway to enable communication over the internet. For additional information, see Scenario 1: VPC with a Public Subnet Only in the Amazon VPC User Guide.

Use cases: Most suitable for SAP demo, training, and test type systems that do not contain sensitive data.

Site-to-Site / Hardware VPN

AWS Site-to-Site VPN extends your data center or branch office to the cloud via Internet Protocol security (IPsec) tunnels, and supports connecting to both virtual private gateways and AWS Transit Gateway. You can optionally run Border Gateway Protocol (BGP) over the IPsec tunnel for a highly available solution. For additional information, see Adding a Hardware Virtual Private Gateway to your VPC in the Amazon VPC User Guide.

Use cases: Recommended for any SAP environments on AWS that require integration with on-premises users and systems.

Client VPN

AWS Client VPN provides a fully-managed VPN solution that can be accessed from anywhere with an internet connection and an OpenVPN-compatible client. It is elastic, automatically scales to meet your demand, and enables your users to connect to both AWS and on-premises networks. AWS Client VPN seamlessly integrates with your existing AWS infrastructure, including Amazon VPC and AWS Directory Service, so you don’t have to change your network topology.

Use cases: Provides quick and easy connectivity to your remote workforce and business partners.

Private Network Connection

AWS Direct Connect makes it easy to establish a dedicated network connection from your premises to AWS. Using AWS Direct Connect, you can establish private connectivity between AWS and your data center, office, or co-location environment. In many cases, this can reduce your network costs, increase bandwidth throughput, and provide a more consistent network experience than internet-based connections. For additional information, see the AWS Direct Connect User Guide.

Use cases: Recommended for customers who require greater bandwidth and lower latency than possible with a hardware VPN.
For additional information about the different Amazon VPC connectivity options, see the Amazon Virtual Private Cloud Connectivity Options whitepaper.

## Following Security Best Practices

In order to provide end-to-end security and end-to-end privacy, AWS builds services in accordance with security best practices, provides appropriate security features in those services, and documents how to use those features. In addition, AWS customers must use those features and best practices to architect an appropriately secure application environment. Enabling customers to ensure the confidentiality, integrity, and availability of their data is of the utmost importance to AWS, as is maintaining trust and confidence.

### Shared Responsibility Environment

There is a shared responsibility model between you as the customer and AWS. AWS operates, manages, and controls the components from the host operating system and virtualization layer down to the physical security of the facilities in which the services operate. In turn, you assume responsibility and management of the guest operating system (including updates and security patches), other associated application software, Amazon VPC setup and configuration, as well as the configuration of the AWS-provided security group firewall. For additional information on AWS security, visit the AWS Cloud Security page and review the various Security Resources available there.

### Amazon VPC

The foundation for security of an SAP environment on AWS is the use of Amazon VPC for providing the overall isolation. Amazon VPC includes security details that you must set up to enable proper access and restrictions for your resources. Amazon VPC provides features that you can use to help increase and monitor the security for your VPC:

- **Security groups** act as a firewall for associated EC2 instances, controlling both inbound and outbound traffic at the instance level.
- **Network access control lists (ACLs)** act as a firewall for associated subnets, controlling both inbound and outbound traffic at the subnet level.
- **Route tables** consist of a set of rules, called routes, that determine where network traffic is directed. Each subnet in your VPC must be associated with a route table; the table controls the routing for the subnet.
- **Flow logs** capture information about the IP traffic going to and from network interfaces in your VPC.

For detailed documentation about how to set up and manage security within a VPC, see the Security section of the Amazon VPC User Guide.

The Modular and Scalable VPC Quick Start provides a networking foundation based on AWS best practices for your AWS Cloud infrastructure. It builds a VPC environment with public and private subnets where you can launch AWS services and other resources. Use this Quick Start as a building block for your own deployments. You can scale it up or down as needed, and add other infrastructure components and software layers to complete your AWS environment.

### EC2 Instance Types for SAP

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instance types comprise varying combinations of CPU, memory, storage, and networking capacity and give you the flexibility to choose the appropriate mix of resources for your applications. Each instance type includes one or more instance sizes, allowing you to scale your resources to the requirements of your target workload.
SAP systems deployed on AWS that will require support from SAP must be run on an EC2 instance type that has been certified with SAP. This section describes where you can find details about the EC2 instance types that have been certified with SAP and additional information for specific SAP solutions.

**SAP NetWeaver-based Solutions**

SAP solutions based on the SAP NetWeaver platform and that use SAP Application Performance Standard (SAPS) for sizing must be run on a specific subset of EC2 instance types in order to receive support from SAP Support. For details, see:

- SAP Note 1656099
- Amazon EC2 Types for SAP

**SAP HANA**

The SAP HANA platform and SAP solutions that run on top of an SAP HANA database—for example, SAP Suite on HANA, SAP S/4HANA, SAP Business Warehouse (BW) on HANA, SAP BW/4HANA—require specific EC2 instance types that have been certified for SAP HANA. For details, see:

- SAP HANA-certified IaaS platforms
- Amazon EC2 Types for SAP
- Smaller X1e instances for SAP HANA non-production workloads

**SAP Business One, version for SAP HANA**

For information about the EC2 instance types that are certified for SAP Business One, version for SAP HANA, see:

- SAP Note 2058870
- SAP Business One on AWS

**Operating Systems**

**Supported Operating Systems**

EC2 instances run on 64-bit virtual processors based on the Intel x86 instruction set. The following 64-bit operating systems and versions are available and supported for SAP solutions on AWS.

- SUSE Linux Enterprise Server (SLES)
- SUSE Linux Enterprise Server for SAP Applications (SLES for SAP)
- Red Hat Enterprise Linux (RHEL)
- Red Hat Enterprise Linux for SAP Solutions (RHEL for SAP)
- Microsoft Windows Server
- Oracle Enterprise Linux

For additional information regarding SAP-supported operating systems on AWS, see SAP Note 1656250.

**SLES for SAP and RHEL for SAP**

SUSE and Red Hat offer SAP-specific versions of their operating systems that provide the following benefits:
• Configuration and tuning for SAP
• Extended release support
• High availability extension for SAP
• Dedicated support channel

**Note**
Because of these benefits, we strongly recommend using SLES for SAP or RHEL for SAP with High Availability (HA) and Update Services (US) for your SAP on AWS deployments.

To learn more about SUSE's and Red Hat's operating system versions for SAP, see the following information on the SLES and Red Hat websites.

**SLES for SAP**
- General information
- SUSE on AWS for SAP Applications
- SUSE Public Cloud Program – Bring Your Own Subscription (FAQ)

**RHEL for SAP**
- General information
- Red Hat in the Public Cloud
- Red Hat Cloud Access
- How to Locate Red Hat Cloud Access Gold Images on AWS EC2
- What is the Difference between Red Hat Cloud Access and Red Hat Enterprise Linux On-Demand Subscriptions in the public cloud?

**Operating System Licenses**

These operating system licensing options are available for SAP systems on AWS:

• On-demand – The operating system software and license are bundled in an Amazon Machine Image (AMI). The fee for the operating system license is included in the On-Demand Instance hourly fee or Reserved Instance fee for the instance type.

• Bring Your Own License/Subscription (BYOL) – Bring your existing operating system license or subscription to the AWS Cloud.

• AWS Marketplace – Purchase operating system licenses and subscriptions from AWS Marketplace.

The following table lists the licensing options available for each operating system and version. To learn more about each option, follow the link in the table.

<table>
<thead>
<tr>
<th>Operating system</th>
<th>License/subscription options</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLES</td>
<td>On-demand</td>
</tr>
<tr>
<td>SLES for SAP</td>
<td>AWS Marketplace</td>
</tr>
<tr>
<td>RHEL</td>
<td>On-demand</td>
</tr>
<tr>
<td>RHEL for SAP with HA and US</td>
<td>AWS Marketplace</td>
</tr>
</tbody>
</table>
## Databases

### Supported Databases

All the database platforms and versions supported by SAP for an on-premises infrastructure are also supported by SAP on AWS. For details about the databases supported with specific SAP solutions on AWS, see [SAP Note 1656099](https://support.sap.com). 

### Database Installation and Administration

#### Customer-Managed Database on Amazon EC2

The majority of SAP solutions use a customer-managed model on Amazon EC2. Installation, configuration, administration, and backup and recovery of the database are done by either the customer or a partner.

The following SAP solutions use a self-managed database model on Amazon EC2:

- SAP Business Suite and SAP NetWeaver-based applications
- SAP HANA
- SAP S/4HANA
- SAP BW/4HANA
- SAP BusinessObjects BI
- SAP Business One

#### Amazon RDS

Amazon Relational Database Service (Amazon RDS) is a managed service that makes it easy to set up, operate, and scale a relational database in the cloud. It provides cost-efficient and resizable capacity, while managing time-consuming database administration tasks, freeing you up to focus on your applications and business. Amazon RDS is currently supported for the following SAP solutions:

- SAP BusinessObjects BI
- SAP Commerce (previously known as SAP Hybris Commerce)

#### Amazon RDS

Amazon Aurora (Aurora) is a MySQL and PostgreSQL-compatible relational database built for the cloud. It combines the performance and availability of traditional enterprise databases with the simplicity and cost-effectiveness of open source databases. Aurora MySQL is currently supported for the following SAP solution:

- SAP Commerce (previously known as SAP Hybris Commerce)
Database Licenses

These database licensing options are available for SAP systems on AWS:

- **On-demand** – The database software and license are bundled in an Amazon Machine Image (AMI). The fee for the database license is included in the On-Demand Instance hourly fee or Reserved Instance fee for the instance type.
- **Bring Your Own License (BYOL)** – Bring your existing database licenses to the AWS Cloud.
- **AWS Marketplace** – Purchase database software and licenses from AWS Marketplace.

The following table lists the licensing options available on AWS for each database. For additional information, follow the links in the Licensing options column.

<table>
<thead>
<tr>
<th>Database</th>
<th>Licensing options</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP HANA</td>
<td>BYOL</td>
</tr>
<tr>
<td>SAP HANA, express edition</td>
<td>AWS Marketplace</td>
</tr>
<tr>
<td>SAP Adaptive Server Enterprise (ASE) (SAP ASE)</td>
<td>BYOL</td>
</tr>
<tr>
<td>Microsoft SQL Server</td>
<td>BYOL*</td>
</tr>
<tr>
<td>IBM DB2</td>
<td>BYOL</td>
</tr>
<tr>
<td>Oracle</td>
<td>BYOL</td>
</tr>
<tr>
<td>Amazon Aurora</td>
<td>On-demand</td>
</tr>
</tbody>
</table>

*SQL Server runtime licenses purchased from SAP require either Microsoft Software Assurance or Amazon EC2 Dedicated Hosts to bring these licenses to AWS. For additional information, see:

- SAP Note 2139358 - Effect of changes in licensing terms of SQL Server
- Microsoft Licensing on AWS

SAP Installation Media

The majority of SAP solutions on AWS use a bring-your-own-software model. There are two primary options for copying SAP installation media to AWS:

- **Download from the SAP Software Download Center to Amazon EC2.** From your EC2 instance, connect to the SAP Software Download Center and download the required installation media. This option will most likely be the fastest method for getting SAP installation media to AWS, because EC2 instances have very fast connections to the internet. You can create a dedicated Amazon EBS volume to store installation media, and then attach the volume to different instances as needed. You can also create a snapshot of the Amazon EBS volume and create multiple volumes that you can attach to multiple instances in parallel.

- **Copy from your network to Amazon EC2.** If you already have the required SAP installation media downloaded to a location on your network, you can copy the media from your network directly to an EC2 instance.
SAProuter and SAP Solution Manager

The following sections describe options for SAProuter and SAP Solution Manager when running SAP solutions on AWS.

For SAP All-on-AWS Architecture

When setting up an SAP environment on AWS, you will need to set up an SAP Solution Manager system and SAProuter with a connection to the SAP support network, as you would with any infrastructure. See the all-on-AWS architecture diagram (Figure 3 (p. 11)) for an illustration.

When setting up the SAProuter and SAP support network connection, follow these guidelines:

- Launch the instance that the SAProuter software is installed on into a public subnet of the VPC and assign it an Elastic IP address.
- Create a specific security group for the SAProuter instance with the necessary rules to allow the required inbound and outbound access to the SAP support network.
- Use the Secure Network Communications (SNC) type of internet connection. For more information, see https://service.sap.com/internetconnection.

For SAP Hybrid AWS Architecture

When using AWS as an extension of your IT infrastructure, you can use your existing SAP Solution Manager system and SAProuter that are running in your data center to manage SAP systems running on AWS within a VPC. See the hybrid architecture diagram (Figure 4 (p. 11)) for additional information.

Additional Reading

- SAP on AWS technical documentation
  - SAP HANA Environment Setup on AWS
  - SAP HANA on AWS Operations Guide
  - SAP NetWeaver Environment Setup for Linux on AWS

Document Revisions

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<tr>
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<tr>
<td>May 2019</td>
<td>Update</td>
<td>Changes throughout guide</td>
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<td>August 2018</td>
<td>Initial publication</td>
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AWS Data Provider for SAP

Installation and Operations Guide

AWS Data Provider Version 3.0

SAP specialists, Amazon Web Services (AWS)

Last updated (p. 58): April 2020

The Amazon Web Services (AWS) Data Provider for SAP is a tool that collects performance-related data from AWS services. It makes this data available to SAP applications to help monitor and improve the performance of business transactions. The AWS Data Provider for SAP uses operating system, network, and storage data that is most relevant to the operation of the SAP infrastructure. Its data sources include Amazon Elastic Compute Cloud (Amazon EC2) and Amazon CloudWatch. This guide provides installation, configuration, and troubleshooting information for the AWS Data Provider for SAP on both Linux and Windows.

About this Guide

This guide is part of a content series that provides detailed information about hosting, configuring, and using SAP technologies in the AWS Cloud. For the other guides in the series, ranging from overviews to advanced topics, see the SAP on AWS Technical Documentation home page.

Introduction

Many organizations of all sizes are choosing to host key SAP systems in the Amazon Web Services (AWS) Cloud. With AWS, you can quickly provision an SAP environment. Additionally, the elastic nature of the AWS Cloud enables you to scale computing resources up and down as needed. As a result, your business can dedicate more resources (both people and funds) to innovation.

Many SAP systems operate daily business transactions and are critical to business functions. As an SAP customer, you need the ability to track and troubleshoot the performance of these transactions. The AWS Data Provider for SAP is a tool that collects key performance data on an Amazon Elastic Compute Cloud (Amazon EC2) instance that SAP applications can use to monitor transactions built by SAP. The data is collected from a variety of sources within your AWS Cloud operating environment, including Amazon EC2 and Amazon CloudWatch. This data includes information about the operating system, network, and storage that is relevant to your SAP infrastructure. Data from the AWS Data Provider for SAP is read by the SAP Operating System Collector (SAPOSCOL) and the SAP CIM Provider.

Figure 1 provides a high-level illustration of the AWS Data Provider for SAP, its data sources, and its outputs.
The purpose of this guide is to help you:

- Understand the technical requirements and components necessary to install and operate the AWS Data Provider for SAP.
- Install the AWS Data Provider for SAP.
- Understand the update process for the AWS Data Provider for SAP.
- Troubleshoot installation issues.

**Upgrading from Earlier Versions**

The current version of the AWS Data Provider for SAP is version 3.0. Version 3.0 is not compatible with version 2.9 or older. Version 3.0 also requires a new AWS Identity and Access Management (IAM) policy. For a list of changes in each version, see Appendix C (p. 52). If you have an earlier version installed, you must uninstall it before installing the current version.

**Note on versions 2.9**

If you’ve already installed and customized the AWS Data Provider for SAP version 2.9 or older, save your custom `proxy.properties` file in the temp directory of your operating system. Then uninstall version 2.9 or older and install version 3.0 which will look for the `proxy.properties` file in the temp directory by default and use it for the new installation.

Uninstalling the data provider does not require SAP downtime and can be done online. The only impact will be a gap in metric monitoring information for the time there was in provider installed on the system.

See Appendix D (p. 54) on how to uninstall older Data Provider agents.

**Technical Requirements**

Before creating an SAP instance, ensure that the following technical requirements are met.

**Amazon VPC Network Topologies**

You need to deploy SAP systems that receive information from the AWS Data Provider for SAP within an Amazon Virtual Private Cloud (Amazon VPC). You can use one of the following network topologies to enable routing to internet-based endpoints:
• The first topology configures routes and traffic directly to the AWS Cloud through a NAT gateway within an Amazon VPC (see Figure 2). For more information about internet gateways, see the AWS documentation.

Figure 2: Connection to the AWS Cloud via an internet gateway

• A second topology routes traffic from the Amazon VPC, through your organization's on-premises data center, and back to the AWS Cloud (see Figure 3). For more information about this topology, see the AWS documentation.

Figure 3: Connection to the AWS Cloud via an on-premises data center

• A third topology uses service endpoints to access Amazon CloudWatch, Amazon EC2 API, and Amazon S3. This is the recommended approach as it does not require network configuration to access the services nor does any traffic leave AWS private network backbone which enhances your environments overall security.
Amazon VPC Endpoints

Create endpoints for the following services that the data provider uses:

- Amazon S3
- Monitoring
- Amazon EC2

To create data endpoints in the AWS console, use the following procedure for each of the three endpoints:

1. Sign in to the Amazon VPC console, navigate to Endpoints, and select Create Endpoint.
Figure 5: Creating a VPC endpoint
2. On the next screen, search for the service name, then select the appropriate VPC and route table, and select **Create Endpoint**.

Figure 6: Completing VPC endpoint creation
3. After creating all three endpoints you should see them in your list of endpoints as shown below:

Figure 7: VPC endpoints created
IAM Roles

You need to grant the AWS Data Provider for SAP read-only access to the Amazon CloudWatch, Amazon Simple Storage Service (Amazon S3), and Amazon EC2 services so that you can use their APIs. You can do this by creating an AWS Identity and Access Management (IAM) role for your Amazon EC2 instance and attaching a permissions policy.

Use the following procedure to create an IAM role and grant permissions to your Amazon EC2 instance:

1. Sign in to the AWS Management Console and open the IAM console.
2. In the navigation pane, select Roles, and select Create role.
3. Choose the AWS service role type, and select EC2.
4. Select EC2 as the use case, and select Next Permissions.
5. Select **Create policy**, and select **JSON**.

![Create role](image)

**Figure 9: Select Amazon EC2 as your use case**

6. Copy and paste the following policy into the input field, replace all existing text, and select **Review Policy**.

**Note**
Customers who are running their Amazon EC2 instances in a Chinese AWS region need to change the **Resource line** listed on the next page to the following:

```json
arn:aws-cn:s3:::aws-sap-data-provider-china/config.properties
```

```json
{
  "Version": "2012-10-17",
  "Statement": [
  
  ]
}
```
7. Provide a **Name** and **Description** for the role, and select **Create Policy**.

![Figure 11: Provide name and description](image)

8. Select **Create Policy**. The IAM console confirms the new policy with a message similar to the following.

![Figure 12: Policy confirmation](image)

9. Navigate to the **Create Role** page, refresh the screen, search for the newly created role, and select the policy.
Figure 13: Policy confirmation
10 Select **Next: Tags**.
11 Add any tags if needed, otherwise select **Next: Review**.
12 Provide a name for the Role and select **Create Role**.

Figure 14: Role confirmation

Installing the AWS Data Provider for SAP

The AWS Data Provider for SAP runs as a service that automatically starts at boot and collects, aggregates, and exposes metrics to the SAP host agent. Metrics are sourced from a variety of providers that pull metrics from the relevant areas of the platform. The AWS Data Provider for SAP is designed to continue operating, regardless of whether its providers have connectivity or permissions to access the AWS service metrics they are requesting. Providers that cannot reach the metrics they are harvesting return blank values.

For example, if your Amazon EC2 instance does not have an IAM role associated with it that grants explicit access to the Amazon CloudWatch **GetMetricStatistics** API, the CloudWatch provider will be unable to perform the **GetMetricStatistics** action on the Amazon EC2 instance and will return blank values.
The provider needs to be installed on each SAP production system in order to be eligible for SAP support. You can only install one instance of the provider at a time on a system.

The AWS Data Provider for SAP is designed to automatically update itself so that it can provide you with the most current metrics. When the AWS Data Provider for SAP starts up, a built-in update service retrieves the latest versions of its components and metric definitions from an AWS managed Amazon S3 bucket. If the AWS Data Provider for SAP cannot access the update service, it will continue to run as-is.

## Installing on Linux

On Linux the data provider is delivered as an RPM package.

### SUSE Linux Enterprise Server

To install the AWS Data Provider for SAP on SUSE Linux Enterprise Server (SLES) download the following files:

- **Default:** `aws-sap-dataprovider-3-sles.x86_64.rpm` and GPG Key
- **China:** `aws-sap-dataprovider-3-sles.x86_64.rpm` and GPG Key

The files are identical but AWS offers these two location options due to possible connectivity issues when working from China.

The GPG key is only required on SUSE and it is used by SUSE's package manager to validate the origin of the RPM package.

To install the data provider run the following commands:

```
wget https://<url to rpm package>
wget https://<url to GPG key>
rpm --import RPM-GPG-KEY-AWS
zypper install -y <rpm package>
```

**Example:**

```
wget https://aws-sap-data-provider.s3.amazonaws.com/Installers/aws-sap-dataprovider-3-sles.x86_64.rpm
rpm --import RPM-GPG-KEY-AWS
zypper install -y aws-sap-dataprovider-3-sles.x86_64.rpm
```

If you don’t have transparent HTTP/HTTPS access to the internet, before starting the installer place a text file called `proxy.properties` in `/tmp`.

The file should have the following contents:

```
# proxy.properties
# used to set web proxy settings for the AWS Data Provider for SAP
# Https is the only supported proxy method
# Blank values for everything means no proxy set
https.proxyHost=
https.proxyPort=
```

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The file should have the following contents with values specified for the parameters that you want to add (empty means no setting):

When the RPM package is installed you will see output onscreen, such as the installer pulling down the required files it needs, as shown below.

![AWS Data Provider for SAP update service](image)

**Figure 15: AWS Data Provider for SAP update service**

When it's completed, you will see the agent start as a daemon.

```
**** Starting the aws-dataprovider service as systemd
**** Important: Verify log files in /var/log/aws-dataprovider!
**** Installer completed, exiting.
```

**Figure 16: Completing the installation on Linux**

Verify that the service is running by calling `netstat -ant` to determine if the listener is running on localhost port 8888.

![Netstat output](image)

**Figure 17: Verifying the installation on Linux**

You should also view the log files at `/var/log/aws-dataprovider/messages` to ensure the daemon has the appropriate connectivity and authorization to access the required metrics.
At startup, the monitoring agent runs three sets of diagnostics:

- The AWS connectivity diagnostic ensures network connectivity to Amazon S3 for obtaining automatic updates to the AWS Data Provider for SAP.
- The second diagnostic tests for authorization to access CloudWatch. This authorization requires assigning an IAM role to the Amazon EC2 instance you are running on with an IAM policy that allows access to CloudWatch. For details, see IAM Roles (p. 25), earlier in this guide.
- The third diagnostic tests for authorization to access Amazon EC2, which also requires an IAM role associated with the Amazon EC2 instance.

The AWS Data Provider for SAP is designed to run with or without connectivity, but you can’t obtain updates without connectivity. Amazon CloudWatch and Amazon EC2 will return blank values if you don’t have the proper authorizations in place.

You can also call the AWS Data Provider for SAP directly to view the metrics. Calling `wget http://localhost:8888/vhostmd` returns a file of metrics. You can look inside the file to see the metrics that were returned, as shown here.
Installing on Red Hat and Oracle Enterprise Linux

For Red Hat and OEL (Oracle Enterprise Linux) the installation steps are the same as described for SLES above but the RPM file and command to install the RPM package differs.

- **Default:** `aws-sap-dataprovider-3-rhel.x86_64.rpm`
- **China:** `aws-sap-dataprovider-3-rhel.x86_64.rpm`

The two files are identical but AWS offers these two location options due to possible connectivity issues when working from China.

To install the data provider run the following commands:

```
wget https://<url to rpm package>
```
yum -y install <rpm package>

Example:

```
wget https://aws-sap-data-provider.s3.amazonaws.com/Installers/aws-sap-dataprovider-3-rhel.x86_64.rpm
yum -y install aws-sap-dataprovider-3-rhel.x86_64.rpm
```

## Installing on Windows

On Windows the installer is delivered in the form of an NSIS (Nullsoft Scriptable Install System) executable.

1. Open a web browser and download the installer:
   - **Default**: `aws-data-provider-installer-win-x64.exe`
   - **China**: `aws-data-provider-installer-win-x64.exe`

   The two files are identical but AWS offers these two location options due to possible connectivity issues when working from China.

2. If you don’t have transparent HTTP/HTTPS access to the internet, before starting the installer place a text file called `proxy.properties` in the Windows temp directory (%TEMP%).

   The file should have the following contents with values specified for the parameters that you want to add (empty means no setting):

   ```
   # proxy.properties
   # used to set web proxy settings for the AWS Data Provider for SAP
   # Https is the only supported proxy method
   # Blank values for everything means no proxy set
   https.proxyHost=
   https.proxyPort=
   https.proxyDomain=
   https.proxyUsername=
   https.proxyPassword=
   ```

   The installer will copy the file to the installation directory and then delete it.

3. Run the installer by double clicking the `.exe` and wait for it to finish.
4. Check the installation:
   - When the script has completed, the software is installed in the C:\Program Files\Amazon \DataProvider directory.
   - The installation also creates and starts a Windows service named AWS Data Provider for SAP.
   - To ensure that the service is running, open a web browser and enter http://localhost:8888/vhostmd. If it's running, it returns a page with metrics from the AWS Data Provider for SAP.

5. Configure the AWS Data Provider for SAP to use proxies:
   - Stop the Windows service AWS Data Provider for SAP.
   - Enter the required proxy information into this file: C:\Program Files\Amazon\DataProvider \proxy.properties.
   - Restart the Windows service, AWS Data Provider for SAP.
   - When the service starts, it performs an update of the agent, and then works in standard mode.

6. Verify that the service is running by calling netstat -ant from a command window or from a Windows PowerShell script to determine if the listener is running on localhost port 8888.

7. Navigate to the Windows event log, and find the application log for startup events from the AWS Data Provider for SAP. You should look at the diagnostics.
At startup, the monitoring agent runs three sets of diagnostics:

- The AWS connectivity diagnostic ensures network connectivity to Amazon S3 for obtaining automatic updates to the AWS Data Provider for SAP.
- The second diagnostic tests for authorization to access CloudWatch, which requires assigning an IAM role to the EC2 instance you are running on with an IAM policy that allows access to CloudWatch. For details, see IAM Roles (p. 25), earlier in this guide.
- The third diagnostic tests for authorization to access Amazon EC2, which also requires an IAM role associated with the Amazon EC2 instance.

The AWS Data Provider for SAP is designed to run with or without connectivity, but you can't obtain updates without connectivity. If you don't have the proper authorizations in place, Amazon CloudWatch and Amazon EC2 return blank values.

You can also call the AWS Data Provider for SAP directly from your web browser to view metrics, as shown in Figure 23.
The AWS Data Provider for SAP now starts automatically each time the operating system starts. You can also manually stop and restart the AWS Data Provider for SAP, just as you would stop and restart any other Windows service.

In order to configure proxy settings you can place a customized `proxy.properties` file in Windows’s temp directory, which is designated by the windows system variable %TEMP%. 

---

**Figure 23: Viewing metrics on Windows**

**Figure 24: Stopping and restarting the AWS Data Provider for SAP on Windows**
Updating the AWS Data Provider for SAP

AWS recommends to always uninstall an existing version of the AWS DataProvider for SAP before installing a new version. If you are running DataProvider version 2.9 or lower, you can't update to version 3.0, and will have to uninstall the old version first.

If you're using a proxy configuration, you should preserve the proxy.properties file. The easiest way to do this is by copying it into the temp directory of your operating system where version 3.0 data provider installers will look for the file and use it during installation.

Examples:

Linux

```
cp /usr/local/ec2/aws-dataprovider/proxy.properties /tmp
```

Windows:

```
copy "C:\Program Files\Amazon\DataProvider\proxy.properties" "%TEMP%"
```

Uninstalling on Linux

1. Log in to Linux as a superuser, like root.
2. Stop and remove the Data Provider using the following command.

   SLES

   ```
   zipper remove -y aws-sap-dataprovider
   ```

   RHEL / OEL

   ```
   yum -y erase aws-sap-dataprovider
   ```

Uninstalling on Windows

1. Run the uninstaller.

   ```
   C:\Program Files\Amazon\DataProvider\uninstall.exe
   ```
2. When prompted, choose Uninstall.
Troubleshooting

This section provides help to analyze installation problems.

Troubleshooting on Linux

Problem: The installation failed, and I’m not sure if my files are in a consistent state.

Stop and remove the Data Provider with the following command.

SLES:

```bash
zipper remove -y aws-sap-dataprovider
```

RHEL / OEL:

```bash
yum -y erase aws-sap-dataprovider
```

Problem: The AWS Data Provider for SAP failed to start at the end of the installation process.

Check the log files in `/var/log/aws-dataprovider` for hints on what is not going as expected. If needed uninstall and reinstall the Data Provider. If reinstalling the AWS Data Provider for SAP doesn’t solve the problem, you can gather debug information about the AWS Data Provider for SAP by editing the `/usr/local/ec2/aws-dataprovider/bin/aws-dataprovider` file.
Figure 26: Debugging the installation on Linux

Now if you run service aws-dataprovider-start or systemctl start aws-dataprovider, you will get a lot of debugging output that might help you diagnose the root cause of the problem.

Figure 27: Debugging information on Linux
Problem: When I looked at my logs I noticed that my installation failed all diagnostics.

```
14:32:15.862 I 08001 ** Running Diagnostics **
14:32:15.862 I 08002 Diagnostic : AWS Connectivity
14:33:19.362 W 08003 Diagnostic : Failed
14:33:19.362 I 08006 Diagnostic : Amazon CloudWatch Connectivity & Access
14:33:19.515 W 08007 Diagnostic : Failed
14:39:19.516 I 0800A Diagnostic : EC2 API Connectivity & Access
14:39:19.542 W 0800B Diagnostic : Failed
14:39:19.542 I 0800E ** Diagnostics Complete **
```

Figure 28: Symptoms of internet connectivity problems on Linux

Failing all diagnostics indicates that there's a problem with your outbound connection to the internet. You can confirm this by pinging a well-known internet location, like www.amazon.com. The most common cause of routing issues is in the VPC network configuration, which needs to have either an internet gateway in place or a VPN connection to your data center with a route to the internet. For details, see Amazon VPC Network Topologies (p. 21), earlier in this guide.

Problem: When I looked at my logs I noticed that I don’t have access to CloudWatch and Amazon EC2, but I did pass the first diagnostic for AWS connectivity.

```
14:38:57.467 I 08001 ** Running Diagnostics **
14:38:57.468 I 08002 Diagnostic : AWS Connectivity
14:38:58.182 I 08005 Diagnostic : Passed
14:38:58.182 I 08006 Diagnostic : Amazon CloudWatch Connectivity & Access
14:38:58.325 W 08007 Diagnostic : Failed
14:38:58.325 I 0800A Diagnostic : EC2 API Connectivity & Access
14:38:58.357 W 0800B Diagnostic : Failed
14:38:58.357 I 0800E ** Diagnostics Complete **
```

Figure 29: Symptoms of authorization issues on Linux

This is a clear indicator that you have an authorization issue when trying to access CloudWatch and Amazon EC2. The common cause for this problem is not having an IAM role associated with your instance that contains the IAM policy, as specified in IAM Roles (p. 25), earlier in this guide. You can quickly diagnose this issue by looking at the Amazon EC2 instance in question in the Amazon EC2 console and verifying the IAM role.
If the IAM role doesn't exist, you have to launch a new instance from an AMI and assign it an IAM role. IAM roles can't currently be assigned to an instance that is already launched.

If you do have an IAM role assigned to the instance, go to the IAM console, select the IAM role name, and then expand the policy. Verify that you have the required policy that is specified in IAM Roles (p. 25), earlier in this guide.

Figure 31: Verifying the policy for the IAM role

Troubleshooting on Windows

Problem: The installation failed, and I’m not sure if my files are in a consistent state.

Follow the procedure for the section called “Uninstalling on Windows” (p. 37), then the section called “Installing on Windows” (p. 33).
Problem: The AWS Data Provider for SAP failed to start at the end of the installation process.

Follow the procedure for the section called “Uninstalling on Windows” (p. 37), then the section called “Installing on Windows” (p. 33).

If reinstalling the AWS Data Provider for SAP doesn't solve the problem, you can gather debugging information about the AWS Data Provider for SAP by reviewing the log files in the C:\Program Files \Amazon\DataProvider directory.

These log files include an installation log, a log of the service installation, and the output of the AWS Data Provider for SAP itself.

![Log files on Windows](image)

Problem: I want to reinstall the AWS Data Provider for SAP from scratch.

Follow the procedure for the section called “Uninstalling on Windows” (p. 37), then the section called “Installing on Windows” (p. 33).

Problem: When I looked at my logs, I noticed that my installation failed all diagnostics.

![Symptoms of internet connectivity problems on Windows](image)

Failing all diagnostics indicates that there's a problem with your outbound connection to the internet. You can confirm this by pinging a well-known internet location, like www.amazon.com. The most common cause of routing issues is in the VPC network configuration, which needs to have either an internet gateway in place or a VPN connection to your data center with a route to the internet.
Problem: When I looked at my logs, I noticed that I don’t have access to CloudWatch and Amazon EC2, but I did pass the first diagnostic for AWS connectivity.

Figure 34: Symptoms of authorization issues on Windows

This is a clear indicator that you have an authorization issue when trying to access Amazon CloudWatch and Amazon EC2. The common cause for this problem is not having an IAM role associated with your instance that contains the IAM policy, as specified in IAM Roles (p. 25) earlier in this guide. You can quickly diagnose this issue by looking at the specific EC2 instance in the Amazon EC2 console and verifying the IAM role.

Figure 35: Verifying the IAM role for an EC2 instance

If the IAM role doesn't exist, you have to launch a new instance from an AMI and assign it an IAM role. You cannot currently assign IAM roles to an instance that is already launched.

If you do have an IAM role assigned to the instance, go to the IAM console, select the IAM role name, and then choose Show. Verify that you have the required policy that is specified in IAM Roles (p. 25).
Some settings are hard coded in the AWS Data Provider for SAP. You can override existing settings or add new settings. For example, when AWS adds new instance types, you can add these to the AWS Data Provider for SAP configuration.

The AWS Data Provider for SAP creates a database by reading the configuration information from the following files, in this sequence:

- It reads the `config.properties` file from the JAR (Java Archive) file of the data provider application.
- It reads the file from https://s3.amazonaws.com/aws-data-provider/config.properties, which provides settings for Amazon EC2 instance types and Amazon Elastic Block Store (Amazon EBS) volume types. For example, when AWS releases new instance types, AWS updates this file. This file doesn't have to exist.
- It reads the file from the directory in which the proxy configuration file is located. This file is required only if a user wants to override or extend the current configuration. Default locations are:
  - On Linux: /usr/local/ec2/aws-agent/config.properties
  - On Windows: C:\Program Files\Amazon\DataProvider\config

**Syntax Rules for Configuration Files**

- The configuration files require a comma after the last value in every row.
- Spaces are not ignored in strings. The entire string between the commas, including any spaces, is accepted as the value.
- If there are multiple rows with the same instance type, the existing value for that type is overwritten.
- Capitalization in strings is case sensitive.
User-Configurable EC2 Instance Types

The AWS Data Provider for SAP maintains a database of all relevant Amazon EC2 instance types for SAP. Entries for EC2 instance types must be in a comma-separated list, as follows:

```text
ec2type,i-type,cpu,core,threads,t-ecu,ecu,hthread,l-map,w-map,speed,p-ecu,
```

For example:

```text
ec2type,r3.8xlarge,2,16,2,32,1,thread,eth0,lan2,10000, true,
```

where the following applies:

<table>
<thead>
<tr>
<th>Field name</th>
<th>Content</th>
<th>Example</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>keyword</td>
<td>ec2type</td>
<td>—</td>
<td>String</td>
<td>A token to identify a record with an EC2 instance description</td>
</tr>
<tr>
<td>i-type (instance-type)</td>
<td>See list</td>
<td>r3.8xlarge</td>
<td>String</td>
<td>Instance type, which must match the EC2 instance metadata string</td>
</tr>
<tr>
<td>cpu (CPUs)</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Integer</td>
</tr>
<tr>
<td>core (Cores)</td>
<td>integer</td>
<td>16</td>
<td>Integer</td>
<td>Total number of processor cores</td>
</tr>
<tr>
<td>threads (threads per core)</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Integer</td>
</tr>
<tr>
<td>t-ecu (total ECU value)</td>
<td>integer</td>
<td>32</td>
<td>Double</td>
<td>ECU value for previous-generation instance types that have ECU ratings; number of cores for post-ECU instance types</td>
</tr>
<tr>
<td>ecu (ECU per core)</td>
<td>double</td>
<td>1</td>
<td>Double</td>
<td>1 for all post-ECU instance types; total ECU divided by cores for previous-generation instance types that have ECU ratings</td>
</tr>
<tr>
<td>hthread (hyperthreading)</td>
<td>thread</td>
<td>core</td>
<td>thread</td>
<td>String</td>
</tr>
</tbody>
</table>
### User-configurable EBS Volume Types

The AWS Data Provider for SAP maintains a database of all relevant EBS volume types for SAP. Entries for EBS volume types must be in a comma-separated list, as follows:

```
voltype,ebs-type,sample-time,
```

For example:

```
voltype,io1,60,
```

where the following applies:

<table>
<thead>
<tr>
<th>Field name</th>
<th>Content</th>
<th>Example</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>keyword</code></td>
<td><code>voltype</code></td>
<td>―</td>
<td><code>String</code></td>
<td>A token to identify a record with an EBS volume description</td>
</tr>
<tr>
<td><code>ebs-type (EBS-type)</code></td>
<td>`io1</td>
<td>gp2</td>
<td>sc1</td>
<td>st1`</td>
</tr>
<tr>
<td><code>sample-time</code></td>
<td>`60</td>
<td>300`</td>
<td><code>60</code></td>
<td><code>Integer</code></td>
</tr>
</tbody>
</table>

**Important**

The sample time is required to calibrate the EBS metrics to the SAP monitoring requirements. Changes in the sample time will lead to incorrect EBS metrics in the SAP monitoring system.
User-Configurable Support Status

To include optional entries for the support status, use a comma-separated list, as follows:

```
support,status,
```

For example:

```
support,status,
```

where the following applies:

<table>
<thead>
<tr>
<th>Field name</th>
<th>Content</th>
<th>Example</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>keyword</td>
<td>support</td>
<td>—</td>
<td>String</td>
<td>A token to identify the support status</td>
</tr>
<tr>
<td>status</td>
<td>production</td>
<td>anonymous</td>
<td>none</td>
<td>String</td>
</tr>
</tbody>
</table>

The status field supports the following values:

- **production** (default): Allows AWS to check whether the instance meets the SAP required prerequisites for SAP support, from SAP Note 1656250 (requires SAP support portal login).
- **anonymous**: Does not allow AWS to check whether the instance meets prerequisites.
- **none**: Legacy mode for version 1.3.1 backward compatibility.

Appendix B: Verification of AWS Data Provider for SAP in SAP System Monitoring

The AWS Data Provider for SAP exposes AWS-specific metrics through an XML page at http://localhost:8888/vhostmd of the given system.

This section explains which metrics get exposed to the SAP system and how you can access them for SAP system monitoring.

Checking Metrics with the SAP Operating System Collector (SAPOSCOL)

The information provided by the AWS Data Provider for SAP is read by the SAP Operating System Collector (SAPOSCOL). You can use the interactive mode of SAPOSCOL to verify that the two tools are working together correctly. The following example shows a lookup under Windows. A lookup under Linux is very similar.
1. Open a Windows command shell and direct the shell to the directory C:\Program Files\SAP\hostctrl\exe. Start saposcol.exe with the -d option.

![Figure 34: Starting SAPOSCOL](image)

2. SAPOSCOL is now in interactive mode. Type `dump ccm` and press Enter to list all values gathered. SAPOSCOL will display a lengthy list of metrics, as shown here.

![Figure 35: Metrics from SAPOSCOL](image)

The following two metrics indicate that SAPOSCOL is collaborating successfully with the AWS Data Provider for SAP:

- Enhanced Monitoring Access TRUE
- Enhanced Monitoring Details ACTIVE

The AWS-specific metrics start with the following strings:

- Virtualization_Configuration
- CPU_Virtualization_Virtual_System
- Memory_Virtualization_Virtual_System
- System_Info_Virtualization_System
SAPOSCOL hands the AWS-enhanced statistics with other operating system-specific metrics to the SAP system. You can also check the AWS-enhanced statistics in the SAP CCMS. You can enter the transaction st06 (or /nst06) in the upper-left transaction field of the SAP GUI for quick access to this data.

**Note**
You will need the appropriate authorizations to look up this information.

---

**Figure 36: AWS-specific metrics**
Figure 37: Statistics in the SAP CCMS (standard view)

On this screen, you can verify core AWS information such as:

- Cloud provider
- Instance type
- Status of enhanced monitoring access (must be TRUE)
- Status of enhanced monitoring details (must be ACTIVE)
- Virtual machine identifier

**Important**
The enhanced AWS metrics aren't shown in standard view.

To view enhanced AWS statistics, choose the **Standard View** button in the upper-left corner. It changes to **Expert View** and displays the enhanced AWS statistics. The list that appears is comprehensive. It shows the processor details.
Figure 38: Enhanced AWS statistics (expert view)

It also shows details about the memory subsystem (main memory and disks) and network interfaces.

Figure 39: Memory and networking statistics (expert view)
Note
The screen illustrations in Figures 37–39 were taken from SAP NetWeaver 7.4 SP08. This version shows the enhanced AWS statistics in the Memory Virtualization section. This problem has been fixed by SAP in later versions of NetWeaver.

Appendix C: Changes and Bug Fixes by Product Version

Version 1.2 (September 16, 2014)
- New: Support for the T2, R3, and C3 instance families.
- New: Support for post-ECU (EC2 Compute Unit) instance types:
  - New instance types no longer have ECU values.
  - The reference compute power for these instance types is a hardware thread of the given processor. The total CPU power is equal to the number of the vCPUs of a given instance type.
- New: Support for the new EBS GP2 volume type.
- Every volume is now tagged with the EBS volume type.
- EBS volumes now report their individual sample interval in a separate attribute.
- Bug fix: EBS volume mapping for Windows devices now reports the correct name.
- Bug fix: Installation, update, and operation through HTTP/HTTPS proxies has been fixed.
- New: JRE 8 support has been added on Linux.

Version 1.2.1 (September 29, 2014)
- Bug fix: EBS volumes now report correct attribute type ("string") for volume type.

Version 1.2.2 (October 1, 2014)
- Windows bug fix: Installer executable pulls installation from correct Amazon S3 bucket.
- Windows bug fix: AWS Data Provider for SAP now reports the correct disk mapping for Windows EBS volumes with the following names: xvd[a-z][a-z].

Version 1.3 (February 17, 2015)
- New: Support for new Amazon EC2 C4 instance family.
- Bug fix: Relative performance of c3.8xlarge instances is now reported correctly.
- New: CloudWatch and Amazon EC2 metrics access points:
  - Support for the EU (Frankfurt) Region was added.
  - Access points are user configurable. You can add information about new AWS Regions without having to install a new product version.
  - Access points are now updated from an internet-based database file. You can add new AWS Regions by updating a web-based configuration file and then restarting the daemon/service.
- New: Message log files with fixed disk space consumption are provided on Linux.
- New: User-configurable EC2 instance types are available.
- New: Web update support was added for future EC2 instance types without product updates.
• Bug fix: GP2 volumes now report the correct sample interval time.
• New: User-configurable sample times for new EBS volume types are now available.
• New: The AWS Data Provider for SAP now reports the virtualization type of the EC2 instance.

Version 1.3.1 (July 14, 2015)
• Bug fixes: Security fixes.
• New: Support for C4, D2, and M4 instance types. Users who migrate instances with installed 1.3 agents will automatically receive support for the new instance types through an updated configuration database on the web.

Version 2.0 (December 22, 2015)
• New: Windows devices in the range sdb to sdzz get correct SCSI device IDs assigned.
• New: Java VM consumption is now limited to 64 MB maximum heap size.

Version 2.1 (January 20, 2016)
• Support for Asia Pacific (Seoul) Region.
• Bug fix: Version 2.0 pulled files from an incorrect S3 bucket for installation. Version 2.0 needs to be uninstalled before version 2.1 is installed.

Version 2.5 (May 2, 2016)
• Bug fixes: Security and stability fixes in versions 2.2-2.4.
• New: Support for new Amazon EBS volume types:
  • Throughput Optimized HDD (st1)
  • Cold HDD (sc1)
• New: Support for the Amazon EC2 X1 instance family.

Version 2.6 (September 1, 2016)
• Bug fixes: Installation script checks for existence of wget
• Support for Oracle Linux.

Version 2.7 (December 21, 2016)
• Support for Canada (Central), US East (Ohio), and EU (London) Regions.
• Default access point resolution for common AWS Regions is added.

Version 2.8 (March 1, 2017)
• SLES 12, Red Hat 7, and Oracle Linux 7 will now use SYSTEMD to manage the daemon.
• Support for SLES and SLES for SAP 12 SP2.
• SLES 12 SP1 systems will get migrated from Linux services to SYSTEMD when trying to install the AWS Data Provider without having it de-installed first.
• Minor changes in logging texts.
• Support for R4 and M4 instance types.
• Updated Windows installation verification.
Version 2.9 (August 30, 2017)

- Added support for China Regions.
- Added Linux uninstaller.
- Linux installer can be customized to install from a custom S3 bucket.
- Silent installer for Windows (does not require any input).
- Improvements in determination of access points.
- Support for X1E instance family.

Version 3.0 (April, 2020)

- Initial release of the 3.0 version.
- Switched the Java Runtime from Oracle to Amazon Corretto.

Appendix D: Uninstalling older 2.X versions

**Linux:**

```
/usr/local/ec2/aws-agent/bin/aws-agent_uninstall
```

**Windows:**

```
"C:\Program Files\AmazonA\DataProvider\uninstall.exe"
```

Appendix E: Example of Captured Metrics

This following show example metrics. Your system metrics may slightly differ.

```
<metrics>
<metric context="host" category="config" type="long" unit="posixtime">
  <name>Time Stamp</name>
  <value>1584376572</value>
</metric>
<metric context="host" category="config" type="int64" unit="sec">
  <name>Refresh Interval</name>
  <value>60</value>
</metric>
<metric context="vm" category="config" type="string" unit="none">
  <name>Data Provider Version</name>
  <value>3.0.139</value>
</metric>
<metric context="host" category="config" type="string" unit="none">
  <name>Cloud Provider</name>
  <value>Amazon Web Services</value>
</metric>
<metric context="vm" category="config" type="string" unit="none">
  <name>Instance Type</name>
  <value>m5.large</value>
</metric>
<metric context="host" category="config" type="string" unit="none">
  <name>Virtualization Solution</name>
  <value>KVM</value>
</metric>
```
Appendix E: Example of Captured Metrics

```xml
<metric context="host" category="config" type="string" unit="none">
  <name>Virtualization Solution Version</name>
  <value>ba185a32</value>
</metric>

<metric context="host" category="config" type="long" unit="none">
  <name>CloudWatch Calls</name>
  <value>12</value>
</metric>

<metric context="host" category="config" type="long" unit="none">
  <name>EC2 Calls</name>
  <value>4</value>
</metric>

<metric context="vm" category="config" type="string" unit="none">
  <name>CPU Over-Provisioning</name>
  <value>no</value>
</metric>

<metric context="vm" category="config" type="string" unit="none">
  <name>Memory Over-Provisioning</name>
  <value>no</value>
</metric>

<metric context="vm" category="config" type="string" unit="none">
  <name>Virtualization Type</name>
  <value>default-hvm</value>
</metric>

<metric context="vm" category="config" type="long" unit="posixtime">
  <name>Virtual Machine ID</name>
  <value>i-#################</value>
</metric>

<metric context="host" category="cpu" type="string" unit="none">
  <name>Processor Type</name>
  <value>Intel(R) Xeon(R) @ 2500MHz</value>
</metric>

<metric context="host" category="cpu" type="int64" unit="none">
  <name>Number of Cores per CPU</name>
  <value>1</value>
</metric>

<metric context="host" category="cpu" type="int64" unit="MHz">
  <name>Max HW Frequency</name>
  <value>2500</value>
</metric>

<metric context="host" category="cpu" type="int64" unit="MHz">
  <name>Current HW Frequency</name>
  <value>2500</value>
</metric>

<metric context="vm" category="cpu" type="string" unit="none">
  <name>Reference Compute Unit (CU)</name>
  <value>Intel(R) Xeon(R) @ 2500MHz</value>
</metric>

<metric context="vm" category="cpu" type="string" unit="none">
  <name>vCPU Mappings</name>
  <value>thread</value>
</metric>

<metric context="vm" category="cpu" type="long" unit="cu">
  <name>Phys. Processing Power per vCPU</name>
  <value>1</value>
</metric>

<metric context="vm" category="cpu" type="int64" unit="cu">
  <name>Guaranteed VM Processing Power</name>
  <value>55</value>
</metric>
```
Appendix E: Example of Captured Metrics

<table>
<thead>
<tr>
<th>Metric Context</th>
<th>Category</th>
<th>Type</th>
<th>Unit</th>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>vm</td>
<td>cpu</td>
<td>int64</td>
<td>cu</td>
<td>Current VM Processing Power</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>cpu</td>
<td>int64</td>
<td>cu</td>
<td>Max. VM Processing Power</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>cpu</td>
<td>double</td>
<td>percent</td>
<td>VM Processing Power Consumption</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>long</td>
<td>MB</td>
<td>Guaranteed Memory assigned</td>
<td>8274</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>long</td>
<td>MB</td>
<td>Current Memory assigned</td>
<td>8274</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>long</td>
<td>MB</td>
<td>Max Memory assigned</td>
<td>8274</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>double</td>
<td>percent</td>
<td>VM Memory Consumption</td>
<td>29.00</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>int64</td>
<td>KB/sec</td>
<td>Memory SwapIn Rate</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>int64</td>
<td>MB</td>
<td>Memory Swapped Out</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>int64</td>
<td>MB</td>
<td>Memory Lent</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>int64</td>
<td>MB</td>
<td>Total Visible Memory</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>percent</td>
<td></td>
<td>Visible Memory Consumed</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>int64</td>
<td>KB/sec</td>
<td>Visible Memory SwapIn Rate</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>memory</td>
<td>int64</td>
<td>MB</td>
<td>Visible Memory Swapped Out</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>network</td>
<td>int64</td>
<td>bytes</td>
<td>Network Read Bytes</td>
<td>54110386</td>
</tr>
<tr>
<td></td>
<td>network</td>
<td>int64</td>
<td>bytes</td>
<td>Network Write Bytes</td>
<td>1330726</td>
</tr>
</tbody>
</table>
<metric context="vm" category="network" type="int64" unit="none">
    <name>TCP Packets Retransmitted</name>
    <value>396480</value>
</metric>

<metric context="vm" category="network" type="int64" unit="Mbps">
    <name>Minimum Network Bandwidth</name>
    <value>10000</value>
</metric>

<metric context="vm" category="network" type="int64" unit="Mbps">
    <name>Maximum Network Bandwidth</name>
    <value>10000</value>
</metric>

<metric context="vm" category="disk" type="int64" unit="msec">
    <name>Volume Idle Time</name>
    <value>58489</value>
</metric>

<metric context="vm" category="disk" type="int64" unit="msec">
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<metric context="vm" category="disk" type="int64" unit="none">
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    <value>144</value>
</metric>

<metric context="vm" category="disk" type="int64" unit="none">
    <name>Volume Write Ops</name>
    <value>3090</value>
</metric>

<metric context="vm" category="disk" type="string">
    <name>Volume Type</name>
    <value>gp2</value>
</metric>
Conclusion

This document helps SAP users to install and operate the AWS Data Provider for SAP. The AWS Data Provider for SAP allows SAP support to monitor SAP applications according to SAP standards.

Contributors

The following individuals contributed to this document:

- Sander Bleijenbergh, Solutions Architect, Amazon Web Services

Document Revisions

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SAP on AWS Pricing and Optimization

*SAP Specialists, Amazon Web Services (AWS)*

*Last updated (p. 76): July 2019*

About this Guide

This guide is part of a content series that provides detailed information about hosting, configuring, and using SAP technologies in the Amazon Web Services (AWS) Cloud. It explains how to estimate the cost of running your SAP environment on AWS.

For the other guides in the series, from overviews to advanced topics, see *SAP on AWS Technical Documentation*.

Overview

For SAP customers and partners who are new to Amazon Web Services (AWS), the process of estimating your monthly AWS bill might seem a bit overwhelming at first. This guide explains how to estimate the cost of running your SAP environment on AWS.

The number and types of services offered by AWS has increased dramatically over time, but the AWS philosophy on pricing has not changed: at the end of each month, you pay only for what you use, and you can start or stop using a service at any time. No long-term contracts are required.

This guide is intended for SAP customers and partners who need to estimate the monthly cost of running SAP environments on AWS. For the purposes of this guide, we assume that you already know how to architect and size SAP solutions on AWS. If you do not, before you continue, we suggest that you read the *SAP on AWS Overview and Planning* documentation.

To help you understand how to effectively estimate the cost of running your SAP environment on AWS, we provide three examples of SAP on AWS pricing using the AWS Simple Monthly Calculator. For each example, we review the architecture on AWS, example usage of each service, cost breakdown for each service, and total estimated monthly charge.

AWS Pricing Overview

AWS offers you a pay-as-you-go approach for pricing of more than 165 cloud services. With AWS you pay only for the individual services you use, for as long as you use them, and without requiring long-term contracts or complex licensing. AWS pricing is similar to how you pay for utilities, such as water and electricity. You only pay for the services you consume, and when you stop using them, there are no additional costs or termination fees.
For more information about AWS pricing, see How does AWS pricing work?

AWS Simple Monthly Calculator

The AWS Simple Monthly Calculator is an easy-to-use online tool that enables you to estimate the monthly cost of AWS services for your use case based on your expected usage. The AWS Simple Monthly Calculator is continuously updated with the latest pricing for all AWS services in all Regions. For an overview of how to use the AWS Simple Monthly Calculator, see the Getting Started with the AWS Simple Monthly Calculator video.

AWS TCO Calculator

With the AWS TCO calculator you can evaluate the savings from using AWS and compare an AWS Cloud environment to on-premises and co-location environments. The TCO calculator matches your current infrastructure to the most cost effective AWS offering. This tool considers all the costs to run a solution, including physical facilities, power, and cooling, to provide a realistic, end-to-end comparison of your costs.

SAP on AWS Pricing Fundamentals

AWS currently offers over 165 different products and services. The following is an overview of the pricing characteristics for the AWS services that are most relevant for the deployment and operation of SAP systems on AWS.

AWS Region Pricing

AWS service pricing varies between different AWS Regions. The first step in estimating any SAP environment on AWS is to select which AWS Region you will deploy your SAP environment in.

Compute Pricing

Instances

Amazon Elastic Compute Cloud (Amazon EC2) provides a wide selection of instance types that provide varying combinations of CPU, memory, storage, I/O, and networking capabilities. You are charged by the hour for each running instance. The hourly fee of an instance is based on a combination of the following characteristics:

- **Instance type** – Specific virtual machine and bare metal configurations that offer different CPU, memory, storage, I/O, and networking capabilities. For more information about Amazon EC2 instance types, see Amazon EC2 Instance Types.
- **Operating system** – You can choose to buy an operating system license from AWS or bring your own operating system license or subscription. If you choose to buy the operating system license from AWS, the license fee is included in the EC2 instance fees. For more information, see SAP on AWS Overview and Planning.
- **Monitoring** – You can use Amazon CloudWatch to monitor your Amazon EC2 instances. Basic monitoring is included in the hourly cost of an instance and provides metrics at five-minute intervals. For an additional cost, you can use detailed monitoring, which provides metrics at one-minute intervals.
Detailed monitoring is required for production SAP systems on AWS. For more information about Amazon CloudWatch pricing, see Amazon CloudWatch pricing.

- **I/O throughput** – Amazon EC2 instance types offer different levels of I/O throughput. For production SAP systems, either Amazon Elastic Block Store (Amazon EBS)-optimized instances or instances with 10 gigabit network connectivity are recommended. For more information about Amazon EBS-optimized instances and instances with 10 gigabit network connectivity, see Amazon EC2 Instance Configuration.

For more information about Amazon EC2 instance pricing, see Amazon EC2 pricing.

**Purchasing Options**

Amazon EC2 offers multiple purchasing options that give you flexibility to optimize your costs. The On-Demand, Reserved Instance, and Dedicated Host purchasing options are most appropriate for SAP systems.

**On-Demand**

With the On-Demand option, you pay for compute capacity by the hour with no long-term commitments or upfront payments. You can increase or decrease your compute capacity depending on the demands of your application, and pay only the specified hourly rate for the instances you use.

Recommended for:

- Initial purchasing option for SAP on AWS projects
- Temporary SAP systems for testing, upgrades, trials, demos, and proof of concepts (POCs)
- Temporary SAP systems for scaling to handle increased load

**Reserved Instances**

The Reserved Instance purchasing option provides you with a significant discount (up to 75%) compared to On-Demand instance pricing. In addition, when Reserved Instances are assigned to a specific Availability Zone, they provide a capacity reservation, which enables you to launch instances when you need them.

For applications that have steady state or predictable usage, Reserved Instances can provide significant savings compared to On-Demand Instances. For more information, see How to Purchase Reserved Instances.

Recommended for:

- Permanent SAP systems such as production, quality assurance, and development systems
- Consider for any SAP system that will be online more than 60% of the time.

**Dedicated Hosts**

A Dedicated Host is a physical Amazon EC2 server dedicated for your use. Dedicated Hosts enable you to use your existing server-bound software licenses, including Windows Server and SQL Server.

**Note**

Dedicated Hosts are required for Amazon EC2 High Memory instances (6 TB, 9 TB, and 12 TB of memory) and Amazon EC2 bare metal instances.
For more information about Amazon EC2 purchasing options, see Amazon EC2 Pricing.

Storage Pricing

AWS provides flexible, cost-effective, and easy-to-use data storage options for your SAP systems. Each option has a unique combination of performance and durability. This section provides an overview of the primary components of AWS storage pricing.

Primary Storage

Amazon Elastic Block Store (Amazon EBS) provides persistent, block-level storage volumes for SAP systems that run on Amazon EC2. Each SAP Amazon EC2 system requires one or more Amazon EBS volumes to store system components, such as the operating system, SAP software, SAP database data and log files, and local backup storage. For information about Amazon EBS pricing, see Amazon EBS Pricing.

Backup Storage

Multiple options are available to back up your SAP system on AWS. For an overview of options, see SAP on AWS Backup and Recovery Guide. Each option stores backup files in Amazon Simple Storage Service (Amazon S3) to provide highly durable storage that is independent of primary storage. For information about Amazon S3 pricing, see Amazon S3 Pricing.

The amount of backup storage required depends on the backup method, backup frequency, system size, and backup retention. How to calculate the amount of backup storage you require is not included in this guide.

Network Pricing

Amazon VPC Connectivity

There is no additional cost for using Amazon Virtual Private Cloud (Amazon VPC) over the standard Amazon EC2 usage charges. If a secure connection is required between your on-premises network and Amazon VPC, you can choose one of the following connectivity options.

Hardware VPN Connection

When you use hardware VPN connections to your Amazon VPC, you are charged for each VPN Connection-hour that your VPN connection is provisioned and available. For more information about hardware VPN connection pricing, see Amazon VPC pricing.

Private Network Connection

With AWS Direct Connect, you can make a dedicated network connection from your on-premises network to AWS. AWS Direct Connect is billed by port hours and outbound data transfer rate. For more information about AWS Direct Connect pricing, see AWS Direct Connect pricing.

Data Transfer

There is no charge for inbound data transfer to Amazon EC2. Charges do apply for data that is transferred out from Amazon EC2 to the internet, to another AWS Region, or to another Availability Zone. For details on AWS data transfer pricing, see the On-Demand section of the Amazon EC2 Pricing page.
AWS Support Pricing

AWS offers different levels of support, so you can choose the right level of support for your environment. AWS Basic support is included with all AWS services at no additional cost. If you require a deeper level of support, you can subscribe to Developer, Business, or Enterprise-level support. For more information about the different AWS support plans and pricing details, see AWS Support.

SAP on AWS Pricing Examples

To help you estimate the monthly cost of your SAP environment on AWS, review the following sample SAP on AWS environment estimates created using the AWS Simple Monthly Calculator.

- the section called “SAP HANA – Multi-AZ (HA) Single-Node Architecture – Up to 4 TB Memory” (p. 63)
- the section called “SAP HANA – Multi-AZ (HA) – Single-Node Architecture – 6–12 TB Memory” (p. 67)
- the section called “SAP S/4HANA – Multi-AZ (HA) – 3-Tier Architecture” (p. 72)

SAP HANA – Multi-AZ (HA) Single-Node Architecture – Up to 4 TB Memory

Description

The architecture in this example is based on the SAP HANA Multi-AZ (HA), single-node architecture described in the SAP HANA Quick Start guide. This architecture provisions two Amazon EC2 instances in private subnets in two different Availability Zones. High availability (HA) is based on SLES High Availability Extension (HAE), which is part of the SLES for SAP operating system. The SLES for SAP operating system uses a bring-your-own-subscription, or you can purchase a subscription through the AWS Marketplace. SAP HANA System Replication (HSR) synchronous replication is replicates between the primary node and secondary node. The SAP HANA nodes are run on the same sized Amazon EC2 instance types, and each system has its own set of Amazon EBS volumes.

- SAP HANA single node or scale-up system with 2 TB of memory
- SAP HANA scenarios – Include data mart, analytics, native SAP HANA application, ERP on HANA, S/4HANA, and BW/4HANA
- SAP HANA systems run in a private subnet and are not directly accessible from the internet
- Administrative and end user system access through a Windows Remote Desktop Services system running within a public subnet, which is accessible through a direct internet connection (VPN connection not required)

The following are sample compute requirements mapped to relevant Amazon EC2 instance types.

<table>
<thead>
<tr>
<th>System</th>
<th>SAPS</th>
<th>Memory</th>
<th>Amazon EC2 Instance Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP HANA DB – Primary</td>
<td>130,000</td>
<td>2 TB</td>
<td>x1.32xlarge</td>
</tr>
<tr>
<td>SAP HANA DB – Secondary</td>
<td>130,000</td>
<td>2 TB</td>
<td>x1.32xlarge</td>
</tr>
</tbody>
</table>
### Architecture

The following diagram shows the SAP HANA – Multi-AZ (HA) – Single-node architecture used in this example.

![Diagram](image)

**Figure 1 – SAP HANA – Multi-AZ (HA) – Single-node architecture**

### AWS Simple Monthly Calculator

You can see this sample estimate online in the AWS Simple Monthly Calculator at: SAP HANA – Multi-AZ (HA) – Single-Node Architecture – Up to 4 TB Memory

The following images show each part of the AWS Simple Monthly Calculator estimate.

![Image](image)

**Figure 2 – Amazon EC2 Instances example settings**

**Note**

Because this sample architecture uses SLES for the SAP operating system and a bring-your-own-subscription model on AWS, it uses a Linux operating system. If you do not require SLES for
SAP and want to use the bundled standard SLES software and license, you select a SUSE Linux Enterprise Server for the operating system. For more information, see the SAP on AWS Overview and Planning guide.

1. Bastion host system
2. RDP system
3. HANA Primary system
4. HANA Secondary system
5. All instances are set at 100% utilization
6. Amazon EC2 instance type selected
7. Linux operating system
8. Linux operating system
9. Amazon EC2 purchasing option – Reserved Instance 3 Year No Upfront Payment

![Figure 3 – Amazon EBS Volumes example settings](image)

A & B – HANA primary and secondary nodes are deployed in different Availability Zones and each have their own set of EBS volumes.

1. Bastion root volume
2. RDP C:\ drive volume
3. HANA root volume
4. HANA /usr/sap volume
5. HANA metadata volume
6. HANA Shared volume
7. HANA Data volume
8. HANA Log volume
9. HANA Backup volume
10. EBS volume type selected for each volume

11. Native or third-party backup tools are used to perform system backups.

12. Amazon EBS snapshots are not used, so there is no data in the Snapshot Storage fields.

Figure 4 – Elastic IP Address, Data Transfer, and Elastic Load Balancing example settings

1. One Elastic IP address per running instance is provided at no charge. Additional Elastic IP addresses are not required.

2. 2 TB per month is estimated for data transferred out to the internet.

3. 2 TB per month is estimated for data transferred in from the internet.

4. 500 GB per month Intra-Region Data Transfer for database replication between HANA Primary system in Availability Zone 1 and HANA Secondary system in Availability Zone 2.

Figure 5 – Amazon S3 example settings

1. 4 TB of Amazon S3 storage is estimated for storing system and database backups. The actual backup storage required depends on the backup method, frequency, volume, and retention policy.

2. 1,000 requests are estimated for Amazon S3 PUT, COPY, POST, and LIST operations, and 1,000 requests are estimated for GET and other operations.
SAP HANA – Multi-AZ (HA) – Single-Node Architecture – 6–12 TB Memory

Description

The architecture in this example is based on the SAP HANA Multi-AZ (HA), single-node architecture described in the SAP HANA Quick Start guide. This architecture provisions two Amazon EC2 instances in private subnets in two different Availability Zones. High availability is based on SLES High Availability Extension (HAE), which is part of the SLES for SAP operating system. The SLES for SAP operating system uses a bring-your-own-subscription model, or you can purchase a subscription through the AWS Marketplace. SAP HANA System Replication (HSR) synchronous replication is used to replicate between the primary node and secondary node. The SAP HANA nodes run on the same-sized Amazon EC2 instances types and each system has its own set of Amazon EBS volumes.

- SAP HANA scenarios – Include data mart, analytics, native SAP HANA application, ERP on HANA, S/4HANA, and BW/4HANA
- SAP HANA single node and scale-up system with 9 TB of memory
- High Availability
- SAP HANA system in a private subnet and not directly accessible from the internet
- Administrative and end user system access through a Windows Remote Desktop Services system running within a public subnet, which is accessible through a direct internet connection (VPN connection not required)
The following are sample compute requirements mapped to the relevant Amazon EC2 instance types.

<table>
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<tr>
<th>System</th>
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<th>Amazon EC2 Instance Type</th>
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<td>SAP HANA DB – Primary</td>
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<tr>
<td>SAP HANA DB – Secondary</td>
<td>130,000</td>
<td>9 TB</td>
<td>u-9tb1.metal</td>
</tr>
<tr>
<td>RDP</td>
<td>N/A</td>
<td>6 GB</td>
<td>c4.xlarge</td>
</tr>
<tr>
<td>Bastion host</td>
<td>N/A</td>
<td>2 GB</td>
<td>t2.small</td>
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**Architecture**

The following diagram shows the SAP HANA – Multi-AZ (HA) – Single-Node Architecture in this example.

**AWS Simple Monthly Calculator**

You can see this sample estimate online in the AWS Simple Monthly Calculator at: [SAP HANA – Multi-AZ (HA) Single-Node Architecture – 6 TB and larger](#)

The following images show each part of the AWS Simple Monthly Calculator estimate.
Figure 8 – Amazon EC2 example settings

A. On-demand Amazon EC2 instances
B. Amazon EC2 High Memory and bare metal instance types require Amazon EC2 Dedicated Hosts

1. Bastion host – EC2 instance
2. RDP – EC2 instance
3. All instances are set at 100% utilization
4. Amazon EC2 purchasing option
5. HANA Primary system
6. HANA Secondary system
7. All instances are set at 100% utilization
8. Amazon EC2 purchasing option
Figure 9 – Amazon EBS Volumes example settings

A & B – The HANA primary and secondary nodes are deployed in different Availability Zones and each have their own set of EBS volumes.

1. Bastion host root volume
2. RDP server C drive volume
3. HANA root volume
4. HANA /usr/sap volume
5. HANA metadata volume
6. HANA Shared volume
7. HANA Data volumes
8. HANA Log volume
9. HANA Backup volume
3. EBS volume type
4. Native or third-party backup tools are used to perform system backups. Amazon EBS snapshots are not used, so there is no data in the Snapshot Storage fields.

Figure 10 – Elastic IP Address, Data Transfer, and Elastic Load Balancing example settings

1. One Elastic IP address per running instance is provided at no charge. Additional Elastic IP addresses are not required.
2. 2 TB per month is estimated for data transferred out to the internet.
3. 2 TB per month is estimated for data transferred in from the internet.
4. 500 GB per month Intra-Region Data Transfer for database replication between HANA Primary system in Availability Zone 1 and HANA Secondary system in Availability Zone 2.
1. 4 TB of Amazon S3 storage is estimated for storing system and database backups. The actual backup storage required depends on the backup method, frequency, volume, and retention policy.

2. 1,000 requests are estimated for Amazon S3 PUT, COPY, POST, and LIST operations, and 1,000 requests are estimated for GET and other operations.

Figure 12 – Estimate of monthly bill example

1. Total and detailed breakdown of Amazon EC2 costs
2. Total and detailed breakdown of Amazon S3 costs
3. Total and detailed breakdown of data transfer costs
4. Total and detailed breakdown of AWS Support costs
5. **AWS Free Tier** discount
6. Total monthly charge for all AWS services

**SAP S/4HANA – Multi-AZ (HA) – 3-Tier Architecture**

**Description**

The architecture in this example is for an SAP S/4HANA 3-tier (PRD/QAS/DEV) environment with Multi-AZ high availability for production.

The following are sample compute requirements mapped to the relevant Amazon EC2 instance types.

<table>
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<th>SAPS</th>
<th>Memory</th>
<th>Amazon EC2 Instance Type</th>
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<td>PRD</td>
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<td>x1.32xlarge</td>
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<tr>
<td>SAP S/4HANA NW AS</td>
<td>PRD</td>
<td>10,000</td>
<td>64 GB</td>
<td>r5.2xlarge</td>
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<tr>
<td>SAP S/4HANA DB</td>
<td>PRD - HA</td>
<td>130,000</td>
<td>2 TB</td>
<td>x1.32xlarge</td>
</tr>
<tr>
<td>SAP S/4HANA NW AS</td>
<td>PRD - HA</td>
<td>10,000</td>
<td>64 GB</td>
<td>r5.2xlarge</td>
</tr>
<tr>
<td>SAP S/4HANA DB</td>
<td>QAS</td>
<td>130,000</td>
<td>2 TB</td>
<td>x1.32xlarge</td>
</tr>
<tr>
<td>SAP S/4HANA NW AS</td>
<td>QAS</td>
<td>10,000</td>
<td>64 GB</td>
<td>r5.2xlarge</td>
</tr>
<tr>
<td>SAP S/4HANA DB</td>
<td>DEV</td>
<td>5,000</td>
<td>32 GB</td>
<td>x1.16xlarge</td>
</tr>
<tr>
<td>SAP S/4HANA NW AS</td>
<td>DEV</td>
<td>5,000</td>
<td>32 GB</td>
<td>r5.2xlarge</td>
</tr>
<tr>
<td>SAP SolMan</td>
<td>N/A</td>
<td>10,000</td>
<td>16 GB</td>
<td>c5.2xlarge</td>
</tr>
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<td>SAP SAProuter</td>
<td>N/A</td>
<td>N/A</td>
<td>2 GB</td>
<td>t2.small</td>
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**Architecture**

The following diagram shows the SAP S/4HANA – Multi-AZ (HA) – 3 tier architecture in this example.
AWS Simple Monthly Calculator

This sample estimate is available online in the AWS Simple Monthly Calculator at SAP S/4HANA – Multi-AZ (HA) – 3-tier (PRD/QAS/DEV) architecture.

The following images show each part of the AWS Simple Monthly Calculator estimate.

Figure 14 – Amazon EC2 Instances example settings

1. PRD – SAP HANA DB system
2. PRD – SAP NetWeaver AS system
3. PRD-HA – SAP HANA DB system
4. PRD HA – SAP NetWeaver AS system
5. QAS – SAP HANA DB system
6. QAS – SAP NetWeaver AS system
7. DEV – SAP HANA DB system
8. DEV – SAP HANA NetWeaver AS system
9. SAP Solution Manager system
10. SAProuter system
11. Usage 100%
12. Amazon EC2 instance type selected for each system
13. Amazon EC2 purchasing option selected for each system

Figure 15 – Amazon EBS Volumes example settings

**Note**
To simplify the example, Amazon EBS requirements for each SAP HANA system have been aggregated into a single line item. For detailed Amazon EBS volume configuration information see the SAP HANA Quick Start guide.

1. PRD – HANA DB volume - General Purpose SSD (gp2)
2. PRD – NetWeaver AS volume - General Purpose SSD (gp2)
3. PRD-HA – HANA DB volume - General Purpose SSD (gp2)
4. PRD-HA – NetWeaver AS volume - General Purpose SSD (gp2)
5. QAS – HANA DB volume - General Purpose SSD (gp2)
6. QAS – NetWeaver AS volume - General Purpose SSD (gp2)
7. DEV – HANA DB volume - General Purpose SSD (gp2)
8. DEV – NetWeaver AS volume – General Purpose SSD (gp2)
9. Solution Manager volume – General Purpose SSD (gp2)
10. SAProuter volume – General Purpose SSD (gp2)
11. EBS volume type
12. Total amount of storage in GB estimated per system
13. Native or third-party backup tools are used to perform system backups. Amazon EBS snapshots are not used, so there is no data in the Snapshot Storage fields.
Figure 16 – Elastic IP Address, Data Transfer, and Elastic Load Balancing example settings

1. One Elastic IP address per running instance is provided at no charge. Additional Elastic IP addresses are not required.
2. 2 TB per month is estimated for data transferred out to the internet.
3. 2 TB per month is estimated for data transferred in from the internet.
4. 500 GB per month Intra-Region Data Transfer for database replication between HANA primary system in Availability Zone 1 and HANA secondary system in Availability Zone 2.

Figure 17 – Amazon S3 example settings

1. 16 TB of Amazon S3 storage is estimated for storing system and database backups. The actual backup storage required depends on the backup method, frequency, volume, and retention policy.
2. 1,000 requests are estimated for Amazon S3 PUT, COPY, POST, and LIST operations, and 1,000 requests are estimated for GET and other operations.
Figure 18 – Estimate of monthly bill example

1. Total and detailed breakdown of Amazon EC2 costs
2. Total and detailed breakdown of Amazon S3 costs
3. Total and detailed breakdown of data transfer costs
4. Total and detailed breakdown of AWS Support costs
5. AWS Free Tier discount
6. Total monthly charge for all AWS services

Document Revisions

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