Red Hat OpenShift Service on AWS
User Guide
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What is Red Hat OpenShift Service on AWS?

Red Hat OpenShift Service on AWS (ROSA) is a managed service that you can use to build, scale, and deploy containerized applications with the Red Hat OpenShift enterprise Kubernetes platform on AWS. ROSA streamlines moving on-premises Red Hat OpenShift workloads to AWS, and offers tight integration with other AWS services.

Features

ROSA is jointly supported and operated by AWS and Red Hat. Each ROSA cluster comes with 24-hour Red Hat site reliability engineer (SRE) support for cluster management, backed by Red Hat's 99.95% uptime service-level agreement (SLA). For more information about the service's support model, see Support for ROSA (p. 78).

ROSA also provides the following features:

- Red Hat SRE-supported cluster installation, cluster maintenance, and cluster upgrades.
- AWS service integrations include AWS compute, database, analytics, machine learning, networking, and mobile.
- Run and scale the Kubernetes control plane across multiple AWS Availability Zones to ensure high availability.
- Operate clusters using OpenShift APIs and developer productivity tools, including Service Mesh, CodeReady Workspaces, and Serverless.

ROSA cluster deployment models

ROSA provides two cluster deployment models: ROSA with hosted control planes (ROSA with HCP) and ROSA classic. With ROSA with HCP, each cluster has a dedicated control plane that is isolated within Red Hat's AWS account and managed by Red Hat. With ROSA classic, cluster control plane infrastructure is hosted in the customer's AWS account.

ROSA with HCP offers a more a more efficient control plane architecture that helps reduce the AWS infrastructure fees incurred when running ROSA and allows for faster cluster creation times. For more information about ROSA with HCP and ROSA classic, see Deployment options (p. 19).

Note

ROSA with hosted control planes (ROSA with HCP) is a Red Hat Technology Preview feature. Technology Preview features provide early access to upcoming product innovations, enabling you to test functionality and provide feedback during the development process. However, these features aren't fully supported under Red Hat Subscription Level Agreements, may not be functionally complete, and aren't intended for production use. For more information, see Technology Preview Features Support Scope on the Red Hat Support page.

While ROSA with HCP is a Red Hat Technology Preview feature, ROSA with HCP is available in the following AWS Regions only:
Accessing ROSA

You can define and configure your ROSA service deployments using the following interfaces.

**AWS**

- **ROSA console** — Provides a web interface to enable the ROSA subscription and purchase a ROSA software contract.
- **AWS Command Line Interface (AWS CLI)** — Provides commands for a broad set of AWS services and is supported on Windows, macOS, and Linux. For more information, see [AWS Command Line Interface](#).

**Red Hat OpenShift**

- **Red Hat Hybrid Cloud Console** — Provides a web interface to create, update, and manage ROSA clusters, install cluster add-ons, and create and deploy applications to a ROSA cluster.
- **ROSA CLI** — Provides commands to create, update, and manage ROSA clusters.
- **OpenShift CLI** — Provides commands to create applications and manage OpenShift Container Platform projects.

How to get started with ROSA
The following summarizes the getting started process for ROSA. For detailed getting started instructions, see Getting started with ROSA (p. 22).

AWS Management Console/AWS CLI

1. Configure permissions for AWS services that ROSA relies on to deliver service functionality. For more information, see Prerequisites (p. 34).
2. Install and configure the latest AWS CLI tool. For more information, see Installing or updating the latest version of the AWS CLI in the AWS CLI User Guide.
3. Enable ROSA in the ROSA console.

Red Hat Hybrid Cloud Console/ROSA CLI

1. Download the latest version of the ROSA CLI and OpenShift CLI from the Red Hat Hybrid Cloud Console. For more information, see Getting started with the ROSA CLI in the Red Hat documentation.
2. Create ROSA clusters in the Red Hat Hybrid Cloud Console or with the ROSA CLI.
3. When your cluster is ready, configure an identity provider to grant user access to the cluster.
4. Deploy and manage workloads on your ROSA cluster the same way that you would with any other OpenShift environment.

Pricing

Note
ROSA service fees will not be charged for ROSA with hosted control planes (ROSA with HCP) clusters while offered as a Red Hat Technology Preview feature. For more information, see Red Hat OpenShift Service on AWS Pricing.

The total cost of ROSA consists of two components: ROSA service fees and AWS infrastructure fees.

By default, ROSA service fees and AWS infrastructure fees are based on hourly usage. ROSA service fees accrue on demand at an hourly rate per 4 vCPU used by worker nodes. ROSA service fees are uniform across all supported AWS Regions.

AWS infrastructure fees apply to the underlying worker nodes, infrastructure nodes, control plane nodes, storage, and network resources hosted on AWS global infrastructure. AWS infrastructure fees vary by AWS Region.

For more information about pricing, see Red Hat OpenShift Service on AWS Pricing.

Overview of responsibilities for Red Hat OpenShift Service on AWS

This documentation outlines the responsibilities of Amazon Web Services (AWS), Red Hat, and customers for the Red Hat OpenShift Service on AWS (ROSA) managed service. For more information about ROSA and its components, see Policies and service definition in the Red Hat documentation.

The AWS shared responsibility model defines AWS responsibility for protecting the infrastructure that runs all of the services offered in the AWS Cloud, including ROSA. AWS infrastructure includes the hardware, software, networking, and facilities that run AWS Cloud services. This AWS responsibility is commonly referred to as the “security of the cloud”. To operate ROSA as a fully managed service, Red
Hat and the customer are responsible for the elements of the service that the AWS responsibility model defines as “security in the cloud”.

Red Hat is responsible for the ongoing management and security of the ROSA cluster infrastructure, the underlying application platform, and the operating system. While ROSA clusters are hosted on AWS resources in the customer AWS accounts, they are accessed remotely by ROSA service components and Red Hat site reliability engineers (SREs) through IAM roles that the customer creates. Red Hat uses this access to manage the deployment and capacity of all control plane and infrastructure nodes on the cluster, and maintain versions for the control plane nodes, infrastructure nodes, and worker nodes.

Red Hat and the customer share responsibility for ROSA network management, cluster logging, cluster versioning, and capacity management. While Red Hat manages the ROSA service, the customer is fully responsible for managing and securing any applications, workloads, and data deployed to ROSA.

Overview

The following table provides an overview of AWS, Red Hat, and customer responsibilities for Red Hat OpenShift Service on AWS.

**Note**

If the `cluster-admin` role is added to a user, see the responsibilities and exclusion notes in the [Red Hat Enterprise Agreement Appendix 4 (Online Subscription Services)](#).

<table>
<thead>
<tr>
<th>Resource</th>
<th>Incident and operations management</th>
<th>Change management</th>
<th>Access and identity authorization</th>
<th>Security and regulation compliance</th>
<th>Disaster recovery</th>
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<td>Customer data</td>
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<td>Virtual networking management</td>
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<td>Virtual compute management (control plane, infrastructure, and worker nodes)</td>
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### Tasks for shared responsibilities by area

AWS, Red Hat, and customers share responsibility for the monitoring and maintenance of ROSA components. This documentation defines ROSA service responsibilities by area and task.

#### Incident and operations management

AWS is responsible for protecting the hardware infrastructure that runs all of the services offered in the AWS Cloud. Red Hat is responsible for managing the service components necessary for default platform networking. The customer is responsible for incident and operations management of customer application data and any custom networking the customer may have configured.

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<thead>
<tr>
<th>Resource</th>
<th>Incident and operations management</th>
<th>Change management</th>
<th>Access and identity authorization</th>
<th>Security and regulation compliance</th>
<th>Disaster recovery</th>
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<tr>
<td>Cluster version</td>
<td>Red Hat</td>
<td>Red Hat and customer</td>
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<td>Capacity management</td>
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<td>Red Hat and customer</td>
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<td>Virtual storage management</td>
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<td>AWS software (public AWS services)</td>
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<td>Hardware/ AWS global infrastructure</td>
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#### Tasks for shared responsibilities by area

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<thead>
<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application networking</td>
<td>Red Hat</td>
<td>• Monitor health of application routes, and the endpoints behind them.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Report outages to AWS and Red Hat.</td>
</tr>
<tr>
<td>Virtual networking</td>
<td>Red Hat</td>
<td>• Monitor health of AWS load balancer endpoints.</td>
</tr>
<tr>
<td>management</td>
<td></td>
<td>• Monitor network traffic that is optionally configured through Amazon VPC-to-VPC connection, AWS VPN connection, or AWS Direct Connect for potential issues or security threats.</td>
</tr>
</tbody>
</table>
### Virtual storage management

**Red Hat**
- Monitor Amazon EBS volumes used for cluster nodes, and Amazon S3 buckets used for the ROSA service's built-in container image registry. Respond to alerts.

**Customer**
- Monitor health of application data.
- If customer managed AWS KMS keys are used, create and control the key lifecycle and key policies for Amazon EBS encryption.

### AWS software (public AWS services)

**AWS**
- For information about AWS incident and operations management, see [How AWS maintains operational resilience and continuity of service](https://aws.amazon.com/about-aws/whats-new/) in the AWS whitepaper.

**Customer**
- Monitor health of AWS resources in the customer account.
- Use IAM tools to apply the appropriate permissions to AWS resources in the customer account.

### Hardware/AWS global infrastructure

**AWS**
- For information about AWS incident and operations management, see [How AWS maintains operational resilience and continuity of service](https://aws.amazon.com/about-aws/whats-new/) in the AWS whitepaper.

**Customer**
- Configure, manage, and monitor customer applications and data to ensure application and data security controls are properly enforced.

## Change management

AWS is responsible for protecting the hardware infrastructure that runs all of the services offered in the AWS Cloud. Red Hat is responsible for enabling changes to the cluster infrastructure and services that the customer will control, as well as maintaining versions for the control plane nodes, infrastructure nodes, and worker nodes. The customer is responsible for initiating infrastructure changes. The customer is also responsible for installing and maintaining optional services, networking configurations on the cluster, and changes to customer data and applications.

### Logging

**Red Hat**
- Centrally aggregate and monitor platform audit logs.
- Provide and maintain a logging Operator to enable the customer to deploy a logging stack for default application logging.
- Provide audit logs upon customer request.

**Customer**
- Install the optional default application logging Operator on the cluster.
- Install, configure, and maintain any optional app logging solutions, such as logging sidecar containers or third-party logging applications.
- Tune size and frequency of application logs being...
<table>
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<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
</tr>
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<tbody>
<tr>
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<td></td>
<td>produced by customer applications if they are affecting the stability of the logging stack or the cluster.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Request platform audit logs through a support case for researching specific incidents.</td>
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<tr>
<td>Application networking</td>
<td>Red Hat</td>
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<tr>
<td></td>
<td>• Set up public load balancers. Provide the ability to set up private load balancers and up to one additional load balancer when required.</td>
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</tr>
<tr>
<td></td>
<td>• Set up the native OpenShift router service. Provide the ability to set the router as private and add up to one additional router shard.</td>
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</tr>
<tr>
<td></td>
<td>• Install, configure, and maintain OpenShift SDN components for default internal pod traffic.</td>
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<tr>
<td></td>
<td>• Provide the ability for the customer to manage NetworkPolicy and EgressNetworkPolicy (firewall) objects.</td>
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<td></td>
<td>Customer</td>
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<tr>
<td></td>
<td></td>
<td>• Configure non-default pod network permissions for project and pod networks, pod ingress, and pod egress using NetworkPolicy objects.</td>
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<td></td>
<td></td>
<td>• Use OpenShift Cluster Manager to request a private load balancer for default application routes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use OpenShift Cluster Manager to configure up to one additional public or private router shard and corresponding load balancer.</td>
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<tr>
<td></td>
<td></td>
<td>• Request and configure any additional service load balancers for specific services.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Configure any necessary DNS forwarding rules.</td>
</tr>
<tr>
<td>Cluster networking</td>
<td>Red Hat</td>
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</tr>
<tr>
<td></td>
<td>• Set up cluster management components, such as public or private service endpoints and necessary integration with Amazon VPC components.</td>
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<tr>
<td></td>
<td>• Set up internal networking components required for internal cluster communication between worker, infrastructure, and control plane nodes.</td>
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<td>Customer</td>
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<td></td>
<td></td>
<td>• Provide optional non-default IP address ranges for machine CIDR, service CIDR, and pod CIDR if needed through OpenShift Cluster Manager when the cluster is provisioned.</td>
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<td></td>
<td>• Request that the API service endpoint be made public or private on cluster creation or after cluster creation through OpenShift Cluster Manager.</td>
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<tr>
<td>Resource</td>
<td>Service responsibilities</td>
<td>Customer responsibilities</td>
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<tr>
<td>Virtual networking management</td>
<td>Red Hat</td>
<td>Customer</td>
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</tbody>
</table>
|                                  | • Set up and configure Amazon VPC components required to provision the cluster, such as subnets, load balancers, internet gateways, and NAT gateways.  
• Provide the ability for the customer to manage AWS VPN connectivity with on-premises resources, Amazon VPC-to-VPC connectivity, and AWS Direct Connect as required through OpenShift Cluster Manager.  
• Enable customers to create and deploy AWS load balancers for use with service load balancers. | • Set up and maintain optional Amazon VPC components, such as Amazon VPC-to-VPC connection, AWS VPN connection, or AWS Direct Connect.  
• Request and configure any additional load balancers for specific services. |
| Virtual compute management       | Red Hat                  | Customer                   |
|                                  | • Set up and configure the ROSA control plane and data plane to use Amazon EC2 instances for cluster compute.  
• Monitor and manage the deployment of Amazon EC2 control plane and infrastructure nodes on the cluster. | • Monitor and manage Amazon EC2 worker nodes by creating a machine pool using the OpenShift Cluster Manager or ROSA CLI.  
• Manage changes to customer-deployed applications and application data. |
| Cluster version                  | Red Hat                  | Customer                   |
|                                  | • Enable upgrade scheduling process.  
• Monitor upgrade progress and remedy any issues encountered.  
• Publish change logs and release notes for minor and maintenance upgrades. | • Schedule maintenance version upgrades either immediately, for the future, or have automatic upgrades.  
• Acknowledge and schedule minor version upgrades.  
• Ensure the cluster version stays on a supported minor version.  
• Test customer applications on minor and maintenance versions to ensure compatibility. |
<table>
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<tr>
<th>Resource</th>
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<th>Customer responsibilities</th>
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<tr>
<td><strong>Capacity management</strong></td>
<td><strong>Red Hat</strong></td>
<td><strong>Customer</strong></td>
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<tr>
<td></td>
<td>• Monitor the use of the control plane. Control planes include control plane nodes and infrastructure nodes.</td>
<td>• Monitor worker node utilization and, if appropriate, enable the auto scaling feature.</td>
</tr>
<tr>
<td></td>
<td>• Scale and resize control plane nodes to maintain quality of service.</td>
<td>• Determine the scaling strategy of the cluster. See the additional resources for more information on machine pools.</td>
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<tr>
<td></td>
<td></td>
<td>• Use the provided OpenShift Cluster Manager controls to add or remove additional worker nodes as required.</td>
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<td></td>
<td></td>
<td>• Respond to Red Hat notifications regarding cluster resource requirements.</td>
</tr>
<tr>
<td><strong>Virtual storage management</strong></td>
<td><strong>Red Hat</strong></td>
<td><strong>Customer</strong></td>
</tr>
<tr>
<td></td>
<td>• Set up and configure Amazon EBS to provision local node storage and persistent volume storage for the cluster.</td>
<td>• Optionally configure the Amazon EBS CSI driver or the Amazon EFS CSI driver to provision persistent volumes on the cluster.</td>
</tr>
<tr>
<td></td>
<td>• Set up and configure the built-in image registry to use Amazon S3 bucket storage.</td>
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<tr>
<td></td>
<td>• Regularly prune image registry resources in Amazon S3 to optimize Amazon S3 usage and cluster performance.</td>
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<tr>
<td>Resource</td>
<td>Service responsibilities</td>
<td>Customer responsibilities</td>
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<tr>
<td>AWS software (public AWS services)</td>
<td><strong>AWS</strong>&lt;br&gt;Compute&lt;br&gt;• Provide the Amazon EC2 service, used for ROSA control plane, infrastructure, and worker nodes.&lt;br&gt;Storage&lt;br&gt;• Provide Amazon EBS to allow the ROSA service to provision local node storage and persistent volume storage for the cluster.&lt;br&gt;Networking&lt;br&gt;• Provide the following AWS Cloud services to satisfy ROSA virtual networking infrastructure needs:&lt;br&gt;• Amazon VPC&lt;br&gt;• Elastic Load Balancing&lt;br&gt;• IAM&lt;br&gt;• Provide the following optional AWS service integrations for ROSA:&lt;br&gt;• AWS VPN&lt;br&gt;• AWS Direct Connect&lt;br&gt;• AWS PrivateLink&lt;br&gt;• AWS Transit Gateway</td>
<td><strong>Customer</strong>&lt;br&gt;• Sign requests using an access key ID and secret access key associated with an IAM principal or AWS STS temporary security credentials.&lt;br&gt;• Specify VPC subnets for the cluster to use during cluster creation.&lt;br&gt;• Optionally configure a customer-managed VPC for use with ROSA clusters.</td>
</tr>
<tr>
<td>Hardware/AWS global infrastructure</td>
<td><strong>AWS</strong>&lt;br&gt;• For information on management controls for AWS data centers, see Our Controls on the AWS Cloud Security page.&lt;br&gt;• For information on change management best practices, see Guidance for Change Management on AWS in the AWS Solutions Library.</td>
<td><strong>Customer</strong>&lt;br&gt;• Implement change management best practices for customer applications and data hosted on the AWS Cloud.</td>
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Access and identity authorization

Access and identity authorization includes responsibilities for managing authorized access to clusters, applications, and infrastructure resources. This includes tasks such as providing access control mechanisms, authentication, authorization, and managing access to resources.

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<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
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<tr>
<td>Logging</td>
<td>Red Hat</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td>• Adhere to an industry</td>
<td>• Configure OpenShift RBAC</td>
</tr>
<tr>
<td></td>
<td>standards-based tiered</td>
<td>to control access to projects and by extension a project's application logs.</td>
</tr>
<tr>
<td></td>
<td>internal access process for platform audit logs.</td>
<td>• For third-party or custom application logging solutions, the customer is responsible for access management.</td>
</tr>
<tr>
<td></td>
<td>• Provide native OpenShift RBAC capabilities.</td>
<td></td>
</tr>
<tr>
<td>Application networking</td>
<td>Red Hat</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td>• Provide native OpenShift RBAC and dedicated-admin capabilities.</td>
<td>• Configure OpenShift dedicated-admin and RBAC to control access to route configuration as required.</td>
</tr>
<tr>
<td>Cluster networking</td>
<td>Red Hat</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td>• Provide customer access controls through OpenShift Cluster Manager. Provide native OpenShift RBAC and dedicated-admin capabilities.</td>
<td>• Manage Red Hat organization membership of Red Hat accounts.</td>
</tr>
<tr>
<td>Virtual networking management</td>
<td>Red Hat</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td>• Provide customer access controls through OpenShift Cluster Manager.</td>
<td>• Manage organization administrators for Red Hat to grant access to OpenShift Cluster Manager.</td>
</tr>
<tr>
<td>Virtual compute management</td>
<td>Red Hat</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Manage optional user access to AWS components through OpenShift Cluster Manager.</td>
</tr>
<tr>
<td>Resource</td>
<td>Service responsibilities</td>
<td>Customer responsibilities</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>• Provide customer access controls through OpenShift Cluster Manager.</td>
<td>• Manage optional user access to AWS components through OpenShift Cluster Manager.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Create IAM roles and attached policies necessary to enable ROSA service access.</td>
</tr>
<tr>
<td>Virtual storage management</td>
<td>Red Hat</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td>• Provide customer access controls through OpenShift Cluster Manager.</td>
<td>• Manage optional user access to AWS components through OpenShift Cluster Manager.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Create IAM roles and attached policies necessary to enable ROSA service access.</td>
</tr>
<tr>
<td>AWS software (public AWS services)</td>
<td>AWS</td>
<td>Customer</td>
</tr>
<tr>
<td>Compute</td>
<td>• Provide the Amazon EC2 service, used for ROSA control plane, infrastructure, and worker nodes.</td>
<td>• Create IAM roles and attached policies necessary to enable ROSA service access.</td>
</tr>
<tr>
<td>Storage</td>
<td>• Provide Amazon EBS, used to allow ROSA to provision local node storage and persistent volume storage for the cluster.</td>
<td>• Use IAM tools to apply the appropriate permissions to AWS resources in the customer account.</td>
</tr>
<tr>
<td></td>
<td>• Provide Amazon S3, used for the service's built-in image registry.</td>
<td>• To enable ROSA across your AWS organization, the customer is responsible for managing AWS Organizations administrators.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To enable ROSA across your AWS organization, the customer is responsible for distributing the ROSA entitlement grant using AWS License Manager.</td>
</tr>
<tr>
<td>Networking</td>
<td>• Provide AWS Identity and Access Management (IAM), used by customers to control access to ROSA resources running on customer accounts.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware/AWS global infrastructure</td>
<td>AWS</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td>• For information on physical access controls for AWS data centers, see Our Controls on the AWS Cloud Security page.</td>
<td>• Customer is not responsible for AWS global infrastructure.</td>
</tr>
</tbody>
</table>
## Security and regulation compliance

The following are the responsibilities and controls related to compliance:

<table>
<thead>
<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logging</td>
<td><strong>Red Hat</strong></td>
<td><strong>Customer</strong></td>
</tr>
</tbody>
</table>
|                               | • Send cluster audit logs to a Red Hat SIEM to analyze for security events. Retain audit logs for a defined period of time to support forensic analysis. | • Analyze application logs for security events.  
• Send application logs to an external endpoint through logging sidecar containers or third-party logging applications if longer retention is required than is offered by the default logging stack. |
| Virtual networking management | **Red Hat**                                                                                                  | **Customer**                                                                                                  |
|                               | • Monitor virtual networking components for potential issues and security threats.  
• Use public AWS tools for additional monitoring and protection.                                                                          | • Monitor optional configured virtual networking components for potential issues and security threats.  
• Configure any necessary firewall rules or customer data center protections as required.                                                      |
| Virtual compute management    | **Red Hat**                                                                                                  | **Customer**                                                                                                  |
|                               | • Monitor virtual compute components for potential issues and security threats.  
• Use public AWS tools for additional monitoring and protection.                                                                          | • Monitor optional configured virtual networking components for potential issues and security threats.  
• Configure any necessary firewall rules or customer data center protections as required.                                                      |
| Virtual storage management    | **Red Hat**                                                                                                  | **Customer**                                                                                                  |
|                               | • Monitor virtual storage components for potential issues and security threats.  
• Use public AWS tools for additional monitoring and protection.  
• Configure the ROSA service to encrypt control plane, infrastructure, and worker node volume data by default using the AWS managed KMS key that Amazon EBS provides.  
• Configure the ROSA service to encrypt customer persistent | • Provision Amazon EBS volumes.  
• Manage Amazon EBS volume storage to ensure enough storage is available to mount as a volume in ROSA.  
• Create the persistent volume claim and generate a persistent volume through OpenShift Cluster Manager. |

---

13
<table>
<thead>
<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>volumes that use the default storage class with the AWS managed KMS key that Amazon EBS provides.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provide the ability for the customer to use a customer managed KMS key to encrypt persistent volumes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Configure the container image registry to encrypt image registry data at rest using server-side encryption with Amazon S3 managed keys (SSE-3).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provide the ability for the customer to create a public or private Amazon S3 image registry to protect their container images from unauthorized user access.</td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td>Service responsibilities</td>
<td>Customer responsibilities</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>--------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>AWS software (public AWS services)</td>
<td>AWS</td>
<td>Customer</td>
</tr>
<tr>
<td>Compute</td>
<td>• Provide Amazon EC2, used for ROSA control plane, infrastructure, and worker nodes. For more information, see <a href="#">Infrastructure security in Amazon EC2</a> in the Amazon EC2 User Guide.</td>
<td>• Ensure security best practices and the principle of least privilege are followed to protect data on the Amazon EC2 instance. For more information, see <a href="#">Infrastructure security in Amazon EC2</a> and <a href="#">Data protection in Amazon EC2</a>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Storage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provide Amazon EBS, used for ROSA control plane, infrastructure, and worker node volumes, as well as Kubernetes persistent volumes. For more information, see <a href="#">Data protection in Amazon EC2</a> in the Amazon EC2 User Guide.</td>
<td>• Monitor optional configured virtual networking components for potential issues and security threats.</td>
</tr>
<tr>
<td></td>
<td>• Provide AWS KMS, which ROSA uses to encrypt control plane, infrastructure, and worker node volumes and persistent volumes. For more information, see <a href="#">Amazon EBS encryption</a> in the Amazon EC2 User Guide.</td>
<td>• Configure any necessary firewall rules or customer data center protections as required.</td>
</tr>
<tr>
<td></td>
<td>• Provide Amazon S3, used for the ROSA service's built-in container image registry. For more information, see <a href="#">Amazon S3 security</a> in the Amazon S3 User Guide.</td>
<td>• Create an optional customer managed KMS key and encrypt the Amazon EBS persistent volume using the KMS key.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Monitor the customer data in virtual storage for potential issues and security threats. For more information, see the <a href="#">AWS Shared Responsibility Model</a>.</td>
</tr>
<tr>
<td></td>
<td>Networking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provide security capabilities and services to increase privacy and control network access on AWS global infrastructure, including network firewalls built into Amazon VPC, private or dedicated network connections, and automatic encryption of all traffic on the AWS global and regional networks between AWS secured facilities. For more information, see the <a href="#">AWS</a>.</td>
<td></td>
</tr>
</tbody>
</table>
Resource | Service responsibilities | Customer responsibilities
--- | --- | ---
Shared Responsibility Model and Infrastructure security in the Introduction to AWS Security whitepaper.

Hardware/AWS global infrastructure | AWS | Customer
- Provide the AWS global infrastructure that ROSA uses to deliver service functionality. For more information about AWS security controls, see Security of the AWS Infrastructure in the AWS whitepaper.
- Provide documentation for the customer to manage compliance needs and check their security state in AWS using tools such as AWS Artifact and AWS Security Hub. For more information, see Compliance validation for ROSA in the ROSA User Guide.

Disaster recovery

Disaster recovery includes data and configuration backup, data replication and configuration of the disaster recovery environment, and failover on disaster events.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
</tr>
</thead>
</table>
| Virtual networking management | Red Hat | Customer
- Restore or recreate affected virtual network components that are necessary for the platform to function. |

<table>
<thead>
<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
</tr>
</thead>
</table>
| Virtual compute management | Red Hat | Customer
- Monitor the cluster and replace failed Amazon EC2 control plane or infrastructure nodes.
- Provide the ability for the customer to manually or automatically replace failed worker nodes. |

<table>
<thead>
<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
</tr>
</thead>
</table>
| | | Customer
- Configure virtual networking connections with more than one tunnel where possible for protection against outages.
- Maintain failover DNS and load balancing if using a global load balancer with multiple clusters. |
| | | Customer
- Replace failed Amazon EC2 worker nodes by editing the machine pool configuration through OpenShift Cluster Manager or the ROSA CLI.
### Tasks for shared responsibilities by area

<table>
<thead>
<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
</tr>
</thead>
</table>
| **Virtual storage management**  | - For ROSA clusters created with AWS IAM user credentials, back up all Kubernetes objects on the cluster through hourly, daily, and weekly volume snapshots.  
- For ROSA clusters created with AWS IAM user credentials, back up persistent volumes on the cluster through daily and weekly volume snapshots. | - Back up customer applications and application data. |
| **AWS software (public AWS services)** | **Compute**  
  - Provide Amazon EC2 features that support data resiliency such as Amazon EBS snapshots and Amazon EC2 Auto Scaling. For more information, see [Resilience in Amazon EC2](https://docs.aws.amazon.com/AmazonEC2/latest/UserGuide/Resilience.html) in the Amazon EC2 User Guide. | **Storage**  
  - Provide the ability for the ROSA service and customers to back up the Amazon EBS volume on the cluster through Amazon EBS volume snapshots.  
  - For information about Amazon S3 features that support data resiliency, see [Resilience in Amazon S3](https://docs.aws.amazon.com/AmazonS3/latest/userguide/Resilience.html).  
  - Configure ROSA multi-AZ clusters to improve fault tolerance and cluster availability.  
  - Provision persistent volumes using the Amazon EBS CSI driver to enable volume snapshots.  
  - Create CSI volume snapshots of Amazon EBS persistent volumes. |
| **Networking**                  | - For information about Amazon VPC features that support data resiliency, see [Resilience in Amazon Virtual Private Cloud](https://docs.aws.amazon.com/AmazonVPC/latest/UserGuide/Resilience.html) in the Amazon VPC User Guide. |                                                      |
Customer responsibilities for data and applications

The customer is responsible for the applications, workloads, and data that they deploy to Red Hat OpenShift Service on AWS. However, AWS and Red Hat provide various tools to help the customer manage data and applications on the platform.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Service responsibilities</th>
<th>Customer responsibilities</th>
</tr>
</thead>
</table>
| Hardware/AWS global infrastructure | AWS  
  - Provide AWS global infrastructure that allows ROSA to scale control plane, infrastructure, and worker nodes across Availability Zones. This functionality enables ROSA to orchestrate automatic failover between zones without interruption.  
  - For more information about disaster recovery best practices, see [Disaster recovery options in the cloud](#) in the AWS Well-Architected Framework. | Customer  
  - Configure ROSA multi-AZ clusters to improve fault tolerance and cluster availability. |

**Customer responsibilities for data and applications**

<table>
<thead>
<tr>
<th>Resource</th>
<th>How AWS and Red Hat helps</th>
<th>Customer responsibilities</th>
</tr>
</thead>
</table>
| Customer data       | Red Hat  
  - Maintain platform-level standards for data encryption as defined by industry security and compliance standards.  
  - Provide OpenShift components to help manage application data, such as secrets.  
  - Enable integration with data services such as Amazon RDS to store and manage data outside of the cluster and/or AWS. | Customer  
  - Maintain responsibility for all customer data stored on the platform and how customer applications consume and expose this data. |
| Customer applications | Red Hat  
  - Provide Amazon RDS to allow customers to store and manage data outside of the cluster. | Customer  
  - Maintain responsibility for all customer data stored on the platform and how customer applications consume and expose this data. |
Deployment options

ROSA provides two cluster deployment models: ROSA with hosted control planes (ROSA with HCP) and ROSA classic. With ROSA with HCP, each cluster has a dedicated control plane that is isolated within Red Hat's AWS account and managed by Red Hat. With ROSA classic, cluster control plane infrastructure is hosted in the customer's AWS account.

ROSA with HCP offers a more a more efficient control plane architecture that helps reduces the AWS infrastructure fees incurred when running ROSA and allows for faster cluster creation times. Both cluster deployment models can be enabled in the AWS ROSA console. You have the choice to select which deployment model you want to use when you provision ROSA clusters using the ROSA CLI.

<table>
<thead>
<tr>
<th>Resource</th>
<th>How AWS and Red Hat helps</th>
<th>Customer responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provision clusters with OpenShift components installed so that customers can access the OpenShift and Kubernetes APIs to deploy and manage containerized applications</td>
<td>• Maintain responsibility for customer and third-party applications, data, and the complete application lifecycle.</td>
<td></td>
</tr>
<tr>
<td>• Create clusters with image pull secrets so that customer deployments can pull images from the Red Hat Container Catalog registry.</td>
<td>• If a customer adds Red Hat, community, third-party, their own, or other services to the cluster by using Operators or external images, the customer is responsible for these services and for working with the appropriate provider (including Red Hat) to troubleshoot any issues.</td>
<td></td>
</tr>
<tr>
<td>• Provide access to OpenShift APIs that a customer can use to set up Operators to add community, third-party, AWS, and Red Hat services to the cluster.</td>
<td>• Use the provided tools and features to configure and deploy; keep up to date; set up resource requests and limits; size the cluster to have enough resources to run apps; set up permissions; integrate with other services; manage any image streams or templates that the customer deploys; externally serve; save, back up, and restore data; and otherwise manage their highly available and resilient workloads.</td>
<td></td>
</tr>
<tr>
<td>• Provide storage classes and plugins to support persistent volumes for use with customer applications.</td>
<td>• Maintain responsibility for monitoring the applications run on Red Hat OpenShift Service on AWS, including installing and operating software to gather metrics, create alerts, and protect secrets in the application.</td>
<td></td>
</tr>
<tr>
<td>• Provide a container image registry so customers can securely store application container images on the cluster to deploy and manage applications.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWS</td>
<td>• Provide Amazon EBS to support persistent volumes for use with customer applications.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provide Amazon S3 to support Red Hat provisioning of the container image registry.</td>
<td></td>
</tr>
</tbody>
</table>
Note
ROSA with hosted control planes (ROSA with HCP) is a Red Hat Technology Preview feature. Technology Preview features provide early access to upcoming product innovations, enabling you to test functionality and provide feedback during the development process. However, these features are not fully supported under Red Hat Subscription Level Agreements, may not be functionally complete, and are not intended for production use. For more information, see Technology Preview Features Support Scope on the Red Hat Support page.

While ROSA with HCP is a Red Hat Technology Preview feature, ROSA with HCP is available in the following AWS Regions only:

<table>
<thead>
<tr>
<th>Region Name</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>US East (N. Virginia)</td>
<td>us-east-1</td>
</tr>
<tr>
<td>US East (Ohio)</td>
<td>us-east-2</td>
</tr>
<tr>
<td>US West (Oregon)</td>
<td>us-west-2</td>
</tr>
<tr>
<td>Europe (Frankfurt)</td>
<td>eu-central-1</td>
</tr>
<tr>
<td>Europe (Ireland)</td>
<td>eu-west-1</td>
</tr>
<tr>
<td>Asia Pacific (Jakarta)</td>
<td>ap-southeast-3</td>
</tr>
</tbody>
</table>

Note
ROSA with hosted control planes does not offer compliance certifications or Federal Information Processing Standards (FIPS) at this time. For more information, see Compliance in the Red Hat documentation.

Differences between ROSA with HCP and ROSA classic

There are several technical differences between ROSA with HCP and ROSA classic.

<table>
<thead>
<tr>
<th></th>
<th>ROSA with HCP</th>
<th>ROSA classic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster infrastructure hosting</td>
<td>• Control plane components, such as etcd, API server, and oauth, are hosted on Red Hat-owned and managed AWS accounts. Worker node infrastructure is hosted on the customer's AWS account.</td>
<td>• Control plane components are hosted on the customer's AWS account, alongside infrastructure and worker nodes.</td>
</tr>
<tr>
<td>Provisioning time</td>
<td>• Approximately 10 minutes.</td>
<td>• Approximately 40 minutes.</td>
</tr>
</tbody>
</table>
| Architecture           | • Control plane infrastructure is fully managed by Red Hat. Control plane infrastructure is not directly available to end customers, except through dedicated and explicitly exposed endpoints.  
                          | • Worker nodes are hosted on the customer's AWS account.                   | • Control plane infrastructure is hosted in the customer's AWS account.  
                          |                                                                           | • Worker nodes are hosted on the customer's AWS account. |


## Differences between ROSA with HCP and ROSA classic

<table>
<thead>
<tr>
<th>Minimum Amazon EC2 footprint</th>
<th>ROSA with HCP</th>
<th>ROSA classic</th>
</tr>
</thead>
<tbody>
<tr>
<td>One cluster requires a minimum of two nodes hosted on the customer’s AWS account.</td>
<td>• One cluster requires a minimum of two nodes hosted on the customer’s AWS account.</td>
<td>• One cluster requires a minimum of seven nodes hosted on the customer’s AWS account.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cluster provisioning</th>
<th>ROSA with HCP</th>
<th>ROSA classic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision clusters using the ROSA CLI.</td>
<td>• Provision clusters using the ROSA CLI.</td>
<td>• Provision clusters using the ROSA CLI or web UI.</td>
</tr>
<tr>
<td>Customers provision clusters that deploy the control plane components into Red Hat’s AWS account.</td>
<td>• Customers provision clusters that deploy the control plane components into Red Hat’s AWS account.</td>
<td>• Cluster control plane, worker nodes, and infrastructure nodes are provisioned into the customer’s AWS account.</td>
</tr>
<tr>
<td>Customers provision machine pools that deploy worker nodes into the customer’s AWS account.</td>
<td>• Customers provision machine pools that deploy worker nodes into the customer’s AWS account.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Upgrades</th>
<th>ROSA with HCP</th>
<th>ROSA classic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrade control plane and machine pools separately.</td>
<td>• Upgrade control plane and machine pools separately.</td>
<td>• Entire cluster must be upgraded at the same time.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AWS Regions</th>
<th>ROSA with HCP</th>
<th>ROSA classic</th>
</tr>
</thead>
<tbody>
<tr>
<td>US East (N. Virginia) (us-east-1)</td>
<td>• US East (N. Virginia) (us-east-1)</td>
<td>• For AWS Region availability, see <a href="https://aws.amazon.com/billing/account">Red Hat OpenShift Service on AWS endpoints and quotas</a> in the AWS General Reference Guide.</td>
</tr>
<tr>
<td>US East (Ohio) (us-east-2)</td>
<td>• US East (Ohio) (us-east-2)</td>
<td></td>
</tr>
<tr>
<td>US West (Oregon) (us-west-2)</td>
<td>• US West (Oregon) (us-west-2)</td>
<td></td>
</tr>
<tr>
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<td>• Europe (Frankfort) (eu-central-1)</td>
<td></td>
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<td>• Europe (Ireland) (eu-west-1)</td>
<td></td>
</tr>
<tr>
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<td>• Asia Pacific (Jakarta) (ap-southeast-3)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compliance</th>
<th>ROSA with HCP</th>
<th>ROSA classic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance certifications and FIPS not yet available.</td>
<td>• Compliance certifications and FIPS not yet available.</td>
<td>• For compliance information, see <a href="https://access.redhat.com/documentation">Compliance</a> in the Red Hat documentation.</td>
</tr>
</tbody>
</table>
Getting started with ROSA

Red Hat OpenShift Service on AWS (ROSA) is a managed service that you can use to build, scale, and deploy containerized applications with the Red Hat OpenShift enterprise Kubernetes platform on AWS.

ROSA cluster deployment models

ROSA supports two cluster deployment models: ROSA with hosted control planes (ROSA with HCP) and ROSA classic. ROSA with HCP offers a more efficient control plane architecture that reduces the AWS infrastructure costs for ROSA and allows for faster cluster creation times. For more information about ROSA with HCP and ROSA classic, see Deployment options (p. 19).

Note
ROSA with hosted control planes (ROSA with HCP) is a Red Hat Technology Preview feature. Technology Preview features provide early access to upcoming product innovations, enabling you to test functionality and provide feedback during the development process. However, these features are not fully supported under Red Hat Subscription Level Agreements, may not be functionally complete, and are not intended for production use. For more information, see Technology Preview Features Support Scope on the Red Hat Support page.
While ROSA with HCP is a Technology Preview feature, it will only be available in the following AWS Regions:

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<td>eu-central-1</td>
</tr>
<tr>
<td>Europe (Ireland)</td>
<td>eu-west-1</td>
</tr>
</tbody>
</table>

Note
ROSA with hosted control planes does not offer compliance certifications or FIPS at this time. For more information, see Compliance in the Red Hat documentation.

Getting started guides

There are four getting started guides available for deploying an application to a newly created ROSA cluster. Each tutorial covers the following:

- Enabling the ROSA service and configuring AWS prerequisites
- Creating the necessary IAM roles and policies
- Creating the ROSA cluster
• Creating a cluster administrator for quick cluster access
• Configuring an identity provider
• Granting user access to the cluster
• Deploy an application to the cluster
• Deleting the cluster and cluster resources

Getting started with ROSA with HCP

With ROSA with HCP, you can use AWS STS and the ROSA CLI to create a cluster with the necessary IAM roles and policies attached. For more information about IAM policies for ROSA with HCP, see AWS managed IAM policies for ROSA (p. 62).

Once the cluster is created, you can deploy public application workloads to the cluster using the Red Hat Hybrid Cloud Console or the OpenShift CLI. For steps to deploy an application to a newly created ROSA with HCP cluster, see Getting started with ROSA with HCP using the ROSA CLI in auto mode (p. 23).

Getting started with ROSA classic

With ROSA classic, you can use AWS STS and the ROSA CLI to create a cluster with the necessary IAM roles and policies attached. Once the cluster is created, you can then deploy public application workloads to the cluster using the Red Hat Hybrid Cloud Console or the OpenShift CLI. For steps to get started using the ROSA CLI’s automatic cluster creation (auto) mode, see Getting started with ROSA classic using the ROSA CLI in auto mode (p. 33). For steps to get started using the ROSA CLI’s manual cluster creation (manual) mode, see Getting started with ROSA classic using the ROSA CLI in manual mode (p. 40).

If you require the ROSA classic cluster and application workloads to be private, see Getting started with ROSA classic using AWS PrivateLink (p. 47).

Getting started with ROSA with HCP using the ROSA CLI in auto mode

The following sections describe how to get started with ROSA with hosted control planes (ROSA with HCP) using AWS STS and the ROSA CLI. For more information about ROSA with HCP, see Deployment options (p. 19).

The ROSA CLI uses auto mode or manual mode to create the IAM resources and OpenID Connect (OIDC) configuration required to create a ROSA cluster. auto mode automatically creates the required IAM roles and policies and OIDC provider. manual mode outputs the AWS CLI commands that are needed to create the IAM resources manually. By using manual mode, you can review the generated AWS CLI commands before running them manually. With manual mode, you can also pass the commands to another administrator or group in your organization so they can create the resources.

The procedures in this document use the auto mode of the ROSA CLI to create the required IAM resources and OIDC configuration for ROSA with HCP. For more options to get started, see Getting started with ROSA (p. 22).

Topics
• Prerequisites (p. 24)
• Step 1: Enable ROSA and configure prerequisites (p. 24)
Prerequisites

Before getting started, make sure you completed these actions:

- Install and configure the latest AWS CLI. For more information, see Installing or updating the latest version of the AWS CLI.
- Install and configure the latest ROSA CLI and OpenShift Container Platform CLI. For more information, see Getting started with the ROSA CLI.
- Service Quotas must have the required service quotas set for Amazon EC2, Amazon VPC, Amazon EBS, and Elastic Load Balancing that are needed to create and run a ROSA cluster. AWS or Red Hat may request service quota increases on your behalf as required for issue resolution. To view the required quotas, see Red Hat OpenShift Service on AWS endpoints and quotas in the AWS General Reference.
- To receive AWS support for ROSA, you must enable AWS Business, Enterprise On-Ramp, or Enterprise support plans. Red Hat may request AWS support on your behalf as required for issue resolution. For more information, see Support for ROSA (p. 78). To enable AWS Support, see the AWS Support page.
- If you’re using AWS Organizations to manage the AWS accounts that host the ROSA service, the organization’s service control policy (SCP) must be configured to allow Red Hat to perform policy actions that’s listed in the SCP without restriction. For more information, see the ROSA SCP troubleshooting documentation (p. 79). For more information about SCPs, see Service control policies (SCPs).
- If deploying a ROSA cluster with AWS STS into an enabled AWS Region that’s disabled by default, you must update the security token to version 2 for all the Regions in the AWS account with the following command.

```bash
aws iam set-security-token-service-preferences --global-endpoint-token-version v2Token
```

For more information about enabling Regions, see Managing AWS Regions in the AWS General Reference.

Step 1: Enable ROSA and configure prerequisites

To create a ROSA cluster, you must first enable the ROSA service in the AWS ROSA console. The AWS ROSA console verifies if your AWS account has the necessary AWS Marketplace permissions, service quotas, and the Elastic Load Balancing (ELB) service-linked role named AWSServiceRoleForElasticLoadBalancing. If any of these prerequisites are missing, the console provides guidance on how to configure your account to meet the prerequisites.

1. Navigate to the ROSA console.
2. Choose Get started.
Step 2: Create Amazon VPC architecture for ROSA with HCP clusters

To create a ROSA with HCP cluster, you must first configure your own Amazon VPC architecture to deploy your solution into. ROSA with HCP requires that customers configure at least one public and private subnet per Availability Zone used to create clusters. For single-AZ clusters, only use Availability Zone is used. For multi-AZ clusters, three Availability Zones are needed.

Important
If Amazon VPC requirements are not met, cluster creation fails.

The following procedure uses the AWS CLI to create both a public and private subnet into a single Availability Zone for a Single-AZ cluster. All cluster resources are in the private subnet. The public subnet routes outbound traffic by using a NAT gateway to the internet.

This example uses the CIDR block 10.0.0.0/16 for the Amazon VPC. However, you can choose a different CIDR block. For more information, see VPC sizing.

1. Set an environment variable for the cluster name by running the following command.

   ```bash
   ROSA_CLUSTER_NAME=rosa-hcp
   ```

2. Create a VPC with a 10.0.0.0/16 CIDR block.

   ```bash
   aws ec2 create-vpc --cidr-block 10.0.0.0/16 --query Vpc.VpcId --output text
   ```

   The preceding command returns the ID of the new VPC. The following is an example output.

   ```
   vpc-0410832ee325aafea
   ```

3. Using the VPC ID from the previous step, tag the VPC using the ROSA_CLUSTER_NAME variable.

   ```bash
   aws ec2 create-tags --resources <VPC_ID_VALUE> --tags Key=Name,Value=$ROSA_CLUSTER_NAME
   ```

4. Enable DNS hostname support on the VPC.

   ```bash
   aws ec2 modify-vpc-attribute --vpc-id <VPC_ID_VALUE> --enable-dns-hostnames
   ```

5. Create a public subnet in the VPC with a 10.0.1.0/24 CIDR block, specifying the Availability Zone where the resource should be created.

   ```bash
   aws ec2 create-subnet --vpc-id <VPC_ID_VALUE> --availability-zone <AVAILABILITY_ZONE> --cidr-block 10.0.1.0/24
   ```

   Important
   When creating subnets, make sure that subnets are created to an Availability Zone that has ROSA instance types available. If you don't choose a specific Availability Zone, the subnet is created in any one of the Availability Zones in the AWS Region that you specify.

   To specify a specific Availability Zone, use the --availability-zone argument in the create-subnet command. You can use the rosa list instance-types command to list all ROSA instance types available. To check if an instance type is available for a given Availability Zone, use the following command.

   ```bash
   rosa list instance-types --availability-zone <AVAILABILITY_ZONE>
   ```
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Step 2: Create Amazon VPC
architecture for ROSA with HCP clusters

aws ec2 describe-instance-type-offerings --location-type availability-zone --filters Name=location,Values=<availability_zone> --region <region> --output text | egrep "<instance_type>"

Important
ROSA with HCP requires that customers configure at least one public and private subnet per Availability Zone used to create clusters. For single-AZ clusters, only one Availability Zone is needed. For multi-AZ clusters, three Availability Zones are needed. If these requirements are not met, cluster creation fails.

aws ec2 create-subnet --vpc-id <VPC_ID_VALUE> --cidr-block 10.0.1.0/24 --availability-zone <AZ_NAME> --query Subnet.SubnetId --output text

The preceding command returns the ID of the new subnet. The following is an example output.

subnet-0b6a7e8cbbc8b75920

6. Using the subnet ID from the previous step, tag the subnet using the ROSA_CLUSTER_NAME-public variable.

aws ec2 create-tags --resources <PUBLIC_SUBNET_ID> --tags Key=Name,Value=$ROSA_CLUSTER_NAME-public

7. Create a private subnet in the VPC with a 10.0.0.0/24 CIDR block, specifying the same Availability Zone that the public subnet deployed into.

aws ec2 create-subnet --vpc-id <VPC_ID_VALUE> --cidr-block 10.0.0.0/24 --availability-zone <AZ_NAME> --query Subnet.SubnetId --output text

The preceding command returns the ID of the new subnet. The following is an example output.

subnet-0b6a7e8cbbc8b75920

8. Using the subnet ID from the previous step, tag the subnet using the ROSA_CLUSTER_NAME-private variable.

aws ec2 create-tags --resources <PRIVATE_SUBNET_ID> --tags Key=Name,Value=$ROSA_CLUSTER_NAME-private

9. Create an internet gateway for outbound traffic and attach it to the VPC.

aws ec2 create-internet-gateway --query InternetGateway.InternetGatewayId --output text
aws ec2 attach-internet-gateway --vpc-id <VPC_ID_VALUE> --internet-gateway-id <IG_ID_VALUE>

10. Tag the internet gateway with the ROSA_CLUSTER_NAME variable.

aws ec2 create-tags --resources <IG_ID_VALUE> --tags Key=Name,Value=$ROSA_CLUSTER_NAME

11. Create a route table for outbound traffic, associate it to the public subnet, and configure traffic to route to the internet gateway.

aws ec2 create-route-table --vpc-id <VPC_ID_VALUE> --query RouteTable.RouteTableId --output text
Step 3: Create the required IAM roles and OpenID Connect configuration

Before creating a ROSA with HCP cluster, you must create the necessary IAM roles and policies and the OpenID Connect (OIDC) configuration. For more information about IAM roles and policies for ROSA with HCP, see AWS managed IAM policies for ROSA (p. 62).

This procedure uses the auto mode of the ROSA CLI to automatically create the OIDC configuration necessary to create a ROSA with HCP cluster.

1. Create the required IAM account roles and policies.

```bash
aws ec2 associate-route-table --subnet-id <PUBLIC_SUBNET_ID> --route-table-id <PUBLIC_RT_ID>
aws ec2 create-route --route-table-id <PUBLIC_RT_ID> --destination-cidr-block 0.0.0.0/0 --gateway-id <IG_ID_VALUE>
```

12. Tag the public route table with the ROSA_CLUSTER_NAME variable and verify that the route table was properly configured.

```bash
aws ec2 create-tags --resources <PUBLIC_RT_ID> --tags Key=Name,Value=$ROSA_CLUSTER_NAME
aws ec2 describe-route-tables --route-table-id <PUBLIC_RT_ID>
```

13. Create a NAT gateway in the public subnet with an elastic IP address to enable traffic to the private subnet.

```bash
aws ec2 allocate-address --domain vpc --query AllocationId --output text
aws ec2 create-nat-gateway --subnet-id <PUBLIC_SUBNET_ID> --allocation-id <EIP_ADDRESS> --query NatGateway.NatGatewayId --output text
```

14. Tag the NAT gateway and elastic IP address with the $ROSA_CLUSTER_NAME variable.

```bash
aws ec2 create-tags --resources <EIP_ADDRESS> --resources <NAT_GATEWAY_ID> --tags Key=Name,Value=$ROSA_CLUSTER_NAME
```

15. Create a route table for private subnet traffic, associate it to the private subnet, and configure traffic to route to the NAT gateway.

```bash
aws ec2 create-route-table --vpc-id <VPC_ID_VALUE> --query RouteTable.RouteTableId --output text
aws ec2 associate-route-table --subnet-id <PRIVATE_SUBNET_ID> --route-table-id <PRIVATE_RT_ID>
aws ec2 create-route --route-table-id <PRIVATE_RT_ID> --destination-cidr-block 0.0.0.0/0 --gateway-id <NAT_GATEWAY_ID>
```

16. Tag the private route table and elastic IP address with the $ROSA_CLUSTER_NAME-private variable.

```bash
aws ec2 create-tags --resources <PRIVATE_RT_ID> <EIP_ADDRESS> --tags Key=Name,Value=$ROSA_CLUSTER_NAME-private
```
Step 4: Create a ROSA with HCP cluster with AWS STS and the ROSA CLI auto mode

You can create a ROSA with HCP cluster using AWS Security Token Service (AWS STS) and the auto mode that's provided in the ROSA CLI. You have the option to create a cluster with a public API and Ingress or a private API and Ingress.

You can create a cluster with a single Availability Zone (Single-AZ) or multiple Availability Zones (Multi-AZ). In either case, your machine’s CIDR value must match your VPC's CIDR value.

The following procedure uses the `rosa create cluster --hosted-cp` command to create a Single-AZ ROSA with HCP cluster. To create a Multi-AZ cluster, specify `multi-az` in the command and the private subnet IDs for each private subnet you want to deploy to.

1. Create a ROSA with HCP cluster with one of the following commands.

```bash
rosa create account-roles --force-policy-creation
```

The `--force-policy-creation` parameter updates any existing roles and policies that are present. If no roles and policies are present, the command creates these resources instead.

**Note**
If your offline access token has expired, the ROSA CLI outputs an error message stating that your authorization token needs updated. For steps to troubleshoot, see [Troubleshoot ROSA CLI expired offline access tokens](p. 83).

2. Create the OpenID Connect (OIDC) configuration that enables user authentication to the cluster. This configuration is registered to be used with OpenShift Cluster Manager (OCM).

```bash
rosa create oidc-config --mode=auto
```

3. Copy the OIDC config ID provided in the ROSA CLI output. The OIDC config ID needs to be provided later to create the ROSA with HCP cluster.

4. To verify the OIDC configurations available for clusters associated with your user organization, run the following command.

```bash
rosa list oidc-config
```

5. Create the required IAM operator roles, replacing `<OIDC_CONFIG_ID>` with the OIDC config ID copied previously.

**Example**

**Important**
You must supply a prefix in `<PREFIX_NAME>` when creating the Operator roles. Failing to do so produces an error.

```bash
rosa create operator-roles --prefix <PREFIX_NAME> --oidc-config-id <OIDC_CONFIG_ID> --hosted-cp
```

6. To verify the IAM operator roles were created, run the following command:

```bash
rosa list operator-roles
```

---

**Step 4: Create a ROSA with HCP cluster with AWS STS and the ROSA CLI auto mode**

You can create a ROSA with HCP cluster using AWS Security Token Service (AWS STS) and the auto mode that's provided in the ROSA CLI. You have the option to create a cluster with a public API and Ingress or a private API and Ingress.

You can create a cluster with a single Availability Zone (Single-AZ) or multiple Availability Zones (Multi-AZ). In either case, your machine’s CIDR value must match your VPC’s CIDR value.

The following procedure uses the `rosa create cluster --hosted-cp` command to create a Single-AZ ROSA with HCP cluster. To create a Multi-AZ cluster, specify `multi-az` in the command and the private subnet IDs for each private subnet you want to deploy to.
Step 5: Configure an identity provider and grant cluster access

ROSA includes a built-in OAuth server. After your cluster is created, you must configure OAuth to use an identity provider. You can then add users to your configured identity provider to grant them access to your cluster. You can grant these users cluster-admin or dedicated-admin permissions as required.

You can configure different identity provider types for your ROSA cluster. Supported types include GitHub, GitHub Enterprise, GitLab, Google, LDAP, OpenID Connect, and HTPasswd identity providers.

Important
The HTPasswd identity provider is included only to enable a single, static administrator user to be created. HTPasswd isn't supported as a general-use identity provider for ROSA.

The following procedure configures a GitHub identity provider as an example. For instructions on how to configure each of the supported identity provider types, see Configuring identity providers for AWS STS.

1. Navigate to github.com and log in to your GitHub account.
2. If you don't have a GitHub organization to use for identity provisioning for your cluster, create one. For more information, see the steps in the GitHub documentation.
3. Using the ROSA CLI's interactive mode, configure an identity provider for your cluster.

   rosa create idp --cluster=<CLUSTER_NAME> --interactive

4. Follow the configuration prompts in the output to restrict cluster access to members of your GitHub organization.

I: Interactive mode enabled.
Any optional fields can be left empty and a default will be selected.

? Type of identity provider: github
? Identity provider name: github-1
? Restrict to members of: organizations
? GitHub organizations: <GITHUB_ORG_NAME>

? To use GitHub as an identity provider, you must first register the application:
- Open the following URL:
  https://github.com/organizations/<GITHUB_ORG_NAME>/settings/applications/new?
oauth_application%5Bcallback_url%5D=https%3A%2F%2Foauth-openshift.apps.<CLUSTER_NAME>/
  <RANDOM_STRING>.p1.openshiftapps.com%2Foauth2callback%2Fgithub-1&oauth_application
  %5Bname%5D=<CLUSTER_NAME>&oauth_application%5Burl%5D=https%3A%2F%2Fconsole-openshift-
  console.apps.<CLUSTER_NAME>/<RANDOM_STRING>.p1.openshiftapps.com
- Click on 'Register application'

5. Open the URL in the output, replacing <GITHUB_ORG_NAME> with the name of your GitHub organization.

6. On the GitHub web page, choose Register application to register a new OAuth application in your GitHub organization.

7. Use the information from the GitHub OAuth page to populate the remaining rosa create idp interactive prompts by running the following command. Replace <GITHUB_CLIENT_ID> and <GITHUB_CLIENT_SECRET> with the credentials from your GitHub OAuth application.

? Client ID: <GITHUB_CLIENT_ID>
? GitHub Enterprise Hostname (optional):
? Mapping method: claim
I: Configuring IDP for cluster '<CLUSTER_NAME>'
I: Identity Provider 'github-1' has been created.
   It will take up to 1 minute for this configuration to be enabled.
   To add cluster administrators, see 'rosa grant user --help'.
To login into the console, open https://console-openshift-console.apps.<CLUSTER_NAME>/<RANDOM_STRING>.p1.openshiftapps.com and click on github-1.

Note
It might take approximately two minutes for the identity provider configuration to become active. If you configured a cluster-admin user, you can run oc get pods -n openshift-authentication --watch to watch the OAuth pods redeploy with the updated configuration.

8. Verify that the identity provider is configured correctly.

rosa list idps --cluster=<CLUSTER_NAME>

Step 6: Grant user access to a cluster

You can grant a user access to your cluster by adding them to the configured identity provider.

The following procedure adds a user to a GitHub organization that’s configured for identity provisioning to the cluster.

1. Navigate to github.com and log in to your GitHub account.
2. Invite users that require cluster access to your GitHub organization. For more information, see Inviting users to join your organization in the GitHub documentation.
Step 7: Grant administrator permissions to a user

After you add a user to your configured identity provider, you can grant the user `cluster-admin` or `dedicated-admin` permissions for your cluster.

**Configure cluster-admin permissions**

1. Grant the `cluster-admin` permissions by running the following command. Replace `<IDP_USER_NAME>` and `<CLUSTER_NAME>` with your user and cluster name.

   ```bash
   rosa grant user cluster-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
   ```

2. Verify that the user is listed as a member of the `cluster-admins` group.

   ```bash
   rosa list users --cluster=<CLUSTER_NAME>
   ```

**Configure dedicated-admin permissions**

1. Grant the `dedicated-admin` permissions by using the following command. Replace `<IDP_USER_NAME>` and `<CLUSTER_NAME>` with your user and cluster name by running the following command.

   ```bash
   rosa grant user dedicated-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
   ```

2. Verify that the user is listed as a member of the `cluster-admins` group.

   ```bash
   rosa list users --cluster=<CLUSTER_NAME>
   ```

Step 8: Access a cluster through the Red Hat Hybrid Cloud Console

Log in to your cluster through the Red Hat Hybrid Cloud Console.

1. Obtain the console URL for your cluster using the following command. Replace `<CLUSTER_NAME>` with the name of your cluster.

   ```bash
   rosa describe cluster -c <CLUSTER_NAME> | grep Console
   ```

2. Navigate to the console URL in the output and log in.

   In the Log in with... dialog, choose the identity provider name and complete any authorization requests presented by your provider.

Step 9: Deploy an application from the Developer Catalog

From the Red Hat Hybrid Cloud Console, you can deploy a Developer Catalog test application and expose it with a route.
1. Navigate to Red Hat Hybrid Cloud Console and choose the cluster you want to deploy the app into.
2. On the cluster’s page, choose Open console.
3. In the Administrator perspective, choose Home > Projects > Create Project.
4. Enter a name for your project and optionally add a Display Name and Description.
5. Choose Create to create the project.
6. Switch to the Developer perspective and choose +Add. Make sure that the selected project is the one that was just created.
7. In the Developer Catalog dialog, choose All services.
8. In the Developer Catalog page, choose Languages > JavaScript from the menu.
9. Choose Node.js, and then choose Create Application to open the Create Source-to-Image Application page.
   
   **Note**
   You might need to choose Clear All Filters to display the Node.js option.

10. In the Git section, choose Try Sample.
11. In the Name field, add a unique name.
12. Choose Create.

   **Note**
   The new application takes several minutes to deploy.

13. When the deployment is complete, choose the route URL for the application.

   A new tab in the browser opens with a message that is similar to the following.

   Welcome to your Node.js application on OpenShift

14. (Optional) Delete the application and clean up resources:
   a. In the Administrator perspective, choose Home > Projects.
   b. Open the action menu for your project and choose Delete Project.

---

**Step 10: Delete a cluster and AWS STS resources**

You can use the ROSA CLI to delete a cluster that uses AWS Security Token Service (AWS STS). You can also use the ROSA CLI to delete the IAM roles and OIDC provider created by ROSA. To delete the IAM policies created by ROSA, you can use the IAM console.

**Important**
IAM roles and policies created by ROSA might be used by other ROSA clusters in the same account.

1. Delete the cluster and watch the logs. Replace `<CLUSTER_NAME>` with the name or ID of your cluster.

   ```
   rosa delete cluster --cluster=<CLUSTER_NAME> --watch
   ```

   **Important**
   You must wait for the cluster to delete completely before you remove the IAM roles, policies, and OIDC provider. The account IAM roles are required to delete the resources created by the installer. The operator IAM roles are required to clean up the resources created by the OpenShift operators. The operators use the OIDC provider to authenticate.

2. Delete the OIDC provider that the cluster operators use to authenticate by running the following command.
3. Delete the cluster-specific operator IAM roles.

```bash
rosa delete operator-roles -c <CLUSTER_ID> --mode auto
```

4. Delete the account IAM roles using the following command. Replace `<PREFIX>` with the prefix of the account IAM roles to delete. If you specified a custom prefix when creating the account IAM roles, specify the default `ManagedOpenShift` prefix.

```bash
rosa delete account-roles --prefix <PREFIX> --mode auto
```

5. Delete the IAM policies created by ROSA.
   a. Log in to the IAM console.
   b. On the left menu under Access management, choose Policies.
   c. Select the policy that you want to delete and choose Actions > Delete.
   d. Enter the policy name and choose Delete.
   e. Repeat this step to delete each of the IAM policies for the cluster.

## Getting started with ROSA classic using the ROSA CLI in auto mode

The following sections describe how to get started with ROSA classic using AWS STS and the ROSA CLI. For more information about ROSA classic, see Deployment options (p. 19).

The ROSA CLI uses auto mode or manual mode to create the IAM resources required to provision a ROSA cluster. auto mode immediately creates the required IAM roles and policies and an OpenID Connect (OIDC) provider. manual mode outputs the AWS CLI commands that are needed to create the IAM resources. By using manual mode, you can review the generated AWS CLI commands before running them manually. With manual mode, you can also pass the commands to another administrator or group in your organization so they can create the resources.

The procedures in this document use the auto mode of the ROSA CLI to create the required IAM resources for ROSA classic. For more options to get started, see Getting started with ROSA (p. 22).

### Topics

- Prerequisites (p. 34)
- Step 1: Enable ROSA and configure prerequisites (p. 34)
- Step 2: Create a ROSA classic cluster with AWS STS and the ROSA CLI auto mode (p. 35)
- Step 3: Configure an identity provider and grant cluster access (p. 35)
- Step 4: Grant user access to a cluster (p. 37)
- Step 5: Grant administrator permissions to a user (p. 37)
- Step 6: Access a cluster through the web console (p. 37)
- Step 7: Deploy an application from the Developer Catalog (p. 38)
- Step 8: Revoke administrator permissions and user access (p. 38)
- Step 9: Delete a cluster and AWS STS resources (p. 39)
Prerequisites

Before getting started, make sure you completed these actions:

- Install and configure the latest AWS CLI. For more information, see [Installing or updating the latest version of the AWS CLI](#).
- Install and configure the latest ROSA CLI and OpenShift Container Platform CLI. For more information, see [Getting started with the ROSA CLI](#).
- Service Quotas must have the required service quotas set for Amazon EC2, Amazon VPC, Amazon EBS, and Elastic Load Balancing that are needed to create and run a ROSA cluster. AWS or Red Hat may request service quota increases on your behalf as required for issue resolution. To view the required quotas, see [Red Hat OpenShift Service on AWS endpoints and quotas](#) in the AWS General Reference.
- To receive AWS support for ROSA, you must enable AWS Business, Enterprise On-Ramp, or Enterprise support plans. Red Hat may request AWS support on your behalf as required for issue resolution. For more information, see [Support for ROSA (p. 78)](#). To enable AWS Support, see the AWS Support page.
- If you're using AWS Organizations to manage the AWS accounts that host the ROSA service, the organization's service control policy (SCP) must be configured to allow Red Hat to perform policy actions that's listed in the SCP without restriction. For more information, see the [ROSA SCP troubleshooting documentation](#). For more information about SCPs, see [Service control policies (SCPs)](#).
- If deploying a ROSA cluster with AWS STS into an enabled AWS Region that's disabled by default, you must update the security token to version 2 for all the Regions in the AWS account with the following command.

```
aws iam set-security-token-service-preferences --global-endpoint-token-version v2Token
```

For more information about enabling Regions, see [Managing AWS Regions](#) in the AWS General Reference.

Step 1: Enable ROSA and configure prerequisites

To create a ROSA cluster, you must first enable the ROSA service in the AWS ROSA console and verify that AWS prerequisites have been met. The AWS ROSA console verifies if your AWS account has the necessary AWS Marketplace permissions, service quotas, and the Elastic Load Balancing (ELB) service-linked role named `AWSServiceRoleForElasticLoadBalancing`. If any of these prerequisites are missing, the console provides guidance on how to configure your account to meet the prerequisites.

1. Navigate to the ROSA console.
2. Choose Get started.
3. On the Verify ROSA prerequisites page, select I agree to share my contact information with Red Hat.
4. Choose Enable ROSA.
5. Once the page has verified your service quotas meet ROSA prerequisites and the ELB service-linked role is created, open a new terminal session to create your first ROSA classic cluster using the ROSA CLI.
Step 2: Create a ROSA classic cluster with AWS STS and the ROSA CLI auto mode

You can create a ROSA classic cluster using AWS Security Token Service (AWS STS) and the auto mode that's provided in the ROSA CLI.

1. Create the required IAM account roles and policies.

   ```bash
   rosa create account-roles --mode auto
   ```

   **Note**
   If your offline access token has expired, the ROSA CLI outputs an error message stating that your authorization token needs updated. For steps to troubleshoot, see Troubleshoot ROSA CLI expired offline access tokens (p. 83).

2. Create a cluster with AWS STS using the defaults in the ROSA CLI's auto mode. When using the defaults, the latest stable OpenShift version is installed.

   ```bash
   rosa create cluster --cluster-name <CLUSTER_NAME> --sts --mode auto
   ```

   **Note**
   When you specify `--mode auto`, the `rosa create cluster` command creates the cluster-specific operator IAM roles and the OIDC provider automatically. The operators use the OIDC provider to authenticate.

3. Check the status of your cluster.

   ```bash
   rosa describe cluster -c <CLUSTER_NAME>
   ```

   **Note**
   If the provisioning process fails or the State field doesn't change to a ready status after 40 minutes, see Troubleshoot ROSA cluster provisioning issues (p. 82).

To contact AWS Support or Red Hat support for assistance, see Support for ROSA (p. 78).

4. Track the progress of the cluster creation by watching the OpenShift installer logs.

   ```bash
   rosa logs install -c <CLUSTER_NAME> --watch
   ```

Step 3: Configure an identity provider and grant cluster access

ROSA includes a built-in OAuth server. After your cluster is created, you must configure OAuth to use an identity provider. You can then add users to your configured identity provider to grant them access to your cluster. You can grant these users cluster-admin or dedicated-admin permissions as required.

You can configure different identity provider types for your ROSA cluster. Supported types include GitHub, GitHub Enterprise, GitLab, Google, LDAP, OpenID Connect, and HTPasswd identity providers.

**Important**
The HTPasswd identity provider is included only to enable a single, static administrator user to be created. HTPasswd isn't supported as a general-use identity provider for ROSA.

The following procedure configures a GitHub identity provider as an example. For instructions on how to configure each of the supported identity provider types, see Configuring identity providers for AWS STS.
1. Navigate to github.com and log in to your GitHub account.

2. If you don’t have a GitHub organization to use for identity provisioning for your cluster, create one. For more information, see the steps in the GitHub documentation.

3. Using the ROSA CLI’s interactive mode, configure an identity provider for your cluster.

   ```
   rosa create idp --cluster=<CLUSTER_NAME> --interactive
   ```

4. Follow the configuration prompts in the output to restrict cluster access to members of your GitHub organization.

   ```
   Type of identity provider: github
   Identity provider name: github-1
   Restrict to members of: organizations
   GitHub organizations: <GITHUB_ORG_NAME>
   To use GitHub as an identity provider, you must first register the application:
   - Open the following URL:
   - Click on 'Register application'
   ```

5. Open the URL in the output, replacing <GITHUB_ORG_NAME> with the name of your GitHub organization.

6. On the GitHub web page, choose Register application to register a new OAuth application in your GitHub organization.

7. Use the information from the GitHub OAuth page to populate the remaining rosa create idp interactive prompts by running the following command. Replace <GITHUB_CLIENT_ID> and <GITHUB_CLIENT_SECRET> with the credentials from your GitHub OAuth application.

   ```
   Client ID: <GITHUB_CLIENT_ID>
   Client Secret: [? for help] <GITHUB_CLIENT_SECRET>
   GitHub Enterprise Hostname (optional):
   Mapping method: claim
   ```

   I: Configuring IDP for cluster '<CLUSTER_NAME>'
   I: Identity Provider 'github-1' has been created.
   It will take up to 1 minute for this configuration to be enabled.
   To add cluster administrators, see 'rosa grant user --help'.
   To login into the console, open https://console-openshift-console.app.<CLUSTER_NAME>.<RANDOM_STRING>.p1.openshiftapps.com and click on github-1.

   **Note**
   It might take approximately two minutes for the identity provider configuration to become active. If you configured a cluster-admin user, you can run oc get pods -n openshift-authentication --watch to watch the OAuth pods redeploy with the updated configuration.

8. Verify that the identity provider is configured correctly.

   ```
   rosa list idps --cluster=<CLUSTER_NAME>
   ```
Step 4: Grant user access to a cluster

You can grant a user access to your cluster by adding them to the configured identity provider.

The following procedure adds a user to a GitHub organization that’s configured for identity provisioning to the cluster.

1. Navigate to github.com and log in to your GitHub account.
2. Invite users that require cluster access to your GitHub organization. For more information, see Inviting users to join your organization in the GitHub documentation.

Step 5: Grant administrator permissions to a user

After you add a user to your configured identity provider, you can grant the user cluster-admin or dedicated-admin permissions for your cluster.

Configure cluster-admin permissions

1. Grant the cluster-admin permissions by running the following command. Replace <IDP_USER_NAME> and <CLUSTER_NAME> with your user and cluster name.

   `rosa grant user cluster-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>`

2. Verify that the user is listed as a member of the cluster-admins group.

   `rosa list users --cluster=<CLUSTER_NAME>`

Configure dedicated-admin permissions

1. Grant the dedicated-admin permissions by using the following command. Replace <IDP_USER_NAME> and <CLUSTER_NAME> with your user and cluster name by running the following command.

   `rosa grant user dedicated-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>`

2. Verify that the user is listed as a member of the cluster-admins group.

   `rosa list users --cluster=<CLUSTER_NAME>`

Step 6: Access a cluster through the web console

After you create a cluster administrator user or added a user to your configured identity provider, you can log in to your cluster through the Red Hat Hybrid Cloud Console.

1. Obtain the console URL for your cluster using the following command. Replace <CLUSTER_NAME> with the name of your cluster.

   `rosa describe cluster -c <CLUSTER_NAME> | grep Console`

2. Navigate to the console URL in the output and log in.
   - If you created a cluster-admin user, log in using the provided credentials.
Step 7: Deploy an application from the Developer Catalog

From the Red Hat Hybrid Cloud Console, you can deploy a Developer Catalog test application and expose it with a route.

1. Navigate to Red Hat Hybrid Cloud Console and choose the cluster you want to deploy the app into.
2. On the cluster’s page, choose Open console.
3. In the Administrator perspective, choose Home > Projects > Create Project.
4. Enter a name for your project and optionally add a Display Name and Description.
5. Choose Create to create the project.
6. Switch to the Developer perspective and choose +Add. Make sure that the selected project is the one that was just created.
7. In the Developer Catalog dialog, choose All services.
8. In the Developer Catalog page, choose Languages > JavaScript from the menu.
9. Choose Node.js, and then choose Create Application to open the Create Source-to-Image Application page.
   
   Note
   You might need to choose Clear All Filters to display the Node.js option.

10. In the Git section, choose Try Sample.
11. In the Name field, add a unique name.
12. Choose Create.
   
   Note
   The new application takes several minutes to deploy.

13. When the deployment is complete, choose the route URL for the application.

   A new tab in the browser opens with a message that's similar to the following.

   Welcome to your Node.js application on OpenShift

14. (Optional) Delete the application and clean up resources:
   a. In the Administrator perspective, choose Home > Projects.
   b. Open the action menu for your project and choose Delete Project.

Step 8: Revoke administrator permissions and user access

You can revoke cluster-admin or dedicated-admin permissions from a user by using the ROSA CLI.

To revoke access from a user, you must remove the user from your configured identity provider.

Revoke cluster-admin permissions from a user

1. Revoke the cluster-admin permissions using the following command. Replace <IDP_USER_NAME> and <CLUSTER_NAME> with your user and cluster name.
Step 9: Delete a cluster and AWS STS resources

You can use the ROSA CLI to delete a cluster that uses AWS Security Token Service (AWS STS). You can also use the ROSA CLI to delete the IAM roles and OIDC provider created by ROSA. To delete the IAM policies created by ROSA, you can use the IAM console.

Important
IAM roles and policies created by ROSA might be used by other ROSA clusters in the same account.

1. Delete the cluster and watch the logs. Replace `<CLUSTER_NAME>` with the name or ID of your cluster.

   ```
   rosa delete cluster --cluster=<CLUSTER_NAME> --watch
   ```

   Important
   You must wait for the cluster to delete completely before you remove the IAM roles, policies, and OIDC provider. The account IAM roles are required to delete the resources created by the installer. The operator IAM roles are required to clean up the resources created by the OpenShift operators. The operators use the OIDC provider to authenticate.

2. Delete the OIDC provider that the cluster operators use to authenticate by running the following command.

   ```
   # Replace <OIDC_PROVIDER_NAME> with the name of your OIDC provider.
   rosa delete oidc-provider --name=<OIDC_PROVIDER_NAME> --cluster=<CLUSTER_NAME>
   ```
3. Delete the cluster-specific operator IAM roles.

    rosa delete operator-roles -c <CLUSTER_ID> --mode auto

4. Delete the account IAM roles using the following command. Replace `<PREFIX>` with the prefix of the account IAM roles to delete. If you specified a custom prefix when creating the account IAM roles, specify the default ManagedOpenShift prefix.

    rosa delete account-roles --prefix <PREFIX> --mode auto

5. Delete the IAM policies created by ROSA.
   a. Log in to the IAM console.
   b. On the left menu under Access management, choose Policies.
   c. Select the policy that you want to delete and choose Actions > Delete.
   d. Enter the policy name and choose Delete.
   e. Repeat this step to delete each of the IAM policies for the cluster.

Getting started with ROSA classic using the ROSA CLI in manual mode

The following sections describe how to get started with ROSA classic using AWS STS and the ROSA CLI. For more information about ROSA classic, see Deployment options (p. 19).

The ROSA CLI uses auto mode or manual mode to create the IAM resources that are required to provision a ROSA cluster. auto mode immediately creates the required IAM roles and policies and an OpenID Connect (OIDC) provider. manual mode outputs the AWS CLI commands that are needed to create the IAM resources. By using manual mode, you can review the generated AWS CLI commands before running them manually. You can also use manual to pass the commands to another administrator or group in your organization so they can create the resources.

The procedures in this document use the manual mode of the ROSA CLI to create the required IAM resources for ROSA classic. For more options to get started, see Getting started with ROSA (p. 22).

Topics

- Prerequisites (p. 41)
- Step 1: Enable ROSA and configure prerequisites (p. 41)
- Step 2: Create a ROSA classic cluster with AWS STS and the ROSA CLI manual mode (p. 42)
- Step 3: Configure an identity provider and grant cluster access (p. 43)
- Step 4: Grant user access to a cluster (p. 44)
- Step 5: Grant administrator permissions to a user (p. 44)
- Step 6: Access a cluster through the web console (p. 45)
- Step 7: Deploy an application from the Developer Catalog (p. 45)
- Step 8: Revoke administrator permissions and user access (p. 46)
- Step 9: Delete a cluster and AWS STS resources (p. 47)
Prerequisites

Before getting started, make sure you completed these actions:

- Install and configure the latest AWS CLI. For more information, see [Installing or updating the latest version of the AWS CLI](#).
- Install and configure the latest ROSA CLI and OpenShift Container Platform CLI. For more information, see [Getting started with the ROSA CLI](#).
- Service Quotas must have the required service quotas set for Amazon EC2, Amazon VPC, Amazon EBS, and Elastic Load Balancing that are needed to create and run a ROSA cluster. AWS or Red Hat may request service quota increases on your behalf as required for issue resolution. To view the required quotas, see [Red Hat OpenShift Service on AWS endpoints and quotas](#) in the [AWS General Reference](#).
- To receive AWS support for ROSA, you must enable AWS Business, Enterprise On-Ramp, or Enterprise support plans. Red Hat may request AWS support on your behalf as required for issue resolution. For more information, see [Support for ROSA](#). To enable AWS Support, see the [AWS Support page](#).
- If you’re using AWS Organizations to manage the AWS accounts that host the ROSA service, the organization’s service control policy (SCP) must be configured to allow Red Hat to perform policy actions that’s listed in the SCP without restriction. For more information, see the [ROSA SCP troubleshooting documentation](#). For more information about SCPs, see [Service control policies (SCPs)](#).
- If deploying a ROSA cluster with AWS STS into an enabled AWS Region that’s disabled by default, you must update the security token to version 2 for all the Regions in the AWS account with the following command.

```bash
aws iam set-security-token-service-preferences --global-endpoint-token-version v2Token
```

For more information about enabling Regions, see [Managing AWS Regions](#) in the [AWS General Reference](#).

Step 1: Enable ROSA and configure prerequisites

To create a ROSA cluster, you must first enable the ROSA service in the AWS ROSA console. The AWS ROSA console verifies if your AWS account has the necessary AWS Marketplace permissions, service quotas, and the Elastic Load Balancing (ELB) service-linked role named AWSServiceRoleForElasticLoadBalancing. If any of these prerequisites are missing, the console provides guidance on how to configure your account to meet the prerequisites.

1. Navigate to the [ROSA console](#).
2. Choose [Get started](#).
3. On the [Verify ROSA prerequisites](#) page, select [I agree to share my contact information with Red Hat](#).
4. Choose [Enable ROSA](#).
5. Once the page has verified your service quotas meet ROSA prerequisites and the ELB service-linked role is created, open a new terminal session to create your first ROSA cluster using the ROSA CLI.
Step 2: Create a ROSA classic cluster with AWS STS and the ROSA CLI manual mode

You can create a ROSA classic cluster using AWS Security Token Service (AWS STS) and the manual mode that's provided in the ROSA CLI.

When you create a cluster, you can run `rosa create cluster --interactive` to customize your deployment with a series of interactive prompts. For more information, see Interactive cluster creation mode reference in the Red Hat documentation.

After the cluster is provisioned, a single command is provided in the output. Run this command to deploy further clusters that use the exact same custom configuration.

**Note**

AWS shared VPCs aren’t currently supported for ROSA installations.

1. Create the required IAM account roles and policies.

   ```
   rosa create account-roles --mode manual
   ```

   **Note**
   If your offline access token has expired, the ROSA CLI outputs an error message stating that your authorization token needs updated. For steps to troubleshoot, see Troubleshoot ROSA CLI expired offline access tokens (p. 83).

2. Run the AWS CLI commands generated in the output to create the roles and policies.

3. Create a cluster with AWS STS in --interactive mode to specify any custom settings.

   ```
   rosa create cluster --interactive --sts
   ```

   **Important**
   After you enable etcd encryption for the key values in etcd, you incur a performance overhead of approximately 20%. The overhead is a result of introducing this second layer of encryption, in addition to the default Amazon EBS encryption that encrypts the etcd volumes.

4. To create the cluster-specific operator IAM roles, generate the operator policy JSON files in the current working directory and output the AWS CLI commands for review.

   ```
   rosa create operator-roles --mode manual --cluster <CLUSTER_NAME|CLUSTER_ID>
   ```

5. Run the AWS CLI commands from the output.

6. Create the OpenID Connect (OIDC) provider the cluster operators use to authenticate.

   ```
   rosa create oidc-provider --mode auto --cluster <CLUSTER_NAME|CLUSTER_ID>
   ```

7. Check the status of your cluster.

   ```
   rosa describe cluster -c <CLUSTER_NAME>
   ```

   **Note**
   If the creation process fails or the State field doesn’t change to a ready status after 40 minutes, see Troubleshoot ROSA cluster creation issues (p. 82). To contact AWS Support or Red Hat support for assistance, see Support for ROSA (p. 78).

8. Track the progress of the cluster creation by watching the OpenShift installer logs.
Step 3: Configure an identity provider and grant cluster access

ROSA includes a built-in OAuth server. After your cluster is created, you must configure OAuth to use an identity provider. You can then add users to your configured identity provider to grant them access to your cluster. You can grant these users cluster-admin or dedicated-admin permissions as required.

You can configure different identity provider types for your cluster. Supported types include GitHub, GitHub Enterprise, GitLab, Google, LDAP, OpenID Connect, and HTPasswd identity providers.

Important
The HTPasswd identity provider is included only to enable a single, static administrator user to be created. HTPasswd isn't supported as a general-use identity provider for ROSA.

The following procedure configures a GitHub identity provider as an example. For instructions on how to configure each of the supported identity provider types, see Configuring identity providers for AWS STS.

1. Navigate to github.com and log in to your GitHub account.
2. If you don’t have a GitHub organization to use for identity provisioning for your ROSA cluster, create one. For more information, see the steps in the GitHub documentation.
3. Using the ROSA CLI's interactive mode, configure an identity provider for your cluster.

   ```
   rosa create idp --cluster=<CLUSTER_NAME> --interactive
   ```

4. Follow the configuration prompts in the output to restrict cluster access to members of your GitHub organization.

   I: Interactive mode enabled.
   Any optional fields can be left empty and a default will be selected.
   Question: Type of identity provider: github
   Identity provider name: github-1
   Question: Restrict to members of: organizations
   GitHub organizations: <GITHUB_ORG_NAME>
   To use GitHub as an identity provider, you must first register the application:
   - Open the following URL:
     https://github.com/organizations/<GITHUB_ORG_NAME>/settings/applications/new?
     oauth_application%5Bcallback_url%5D=https%3A%2F%2Foauth-openshift.apps.<CLUSTER_NAME>/
     <RANDOM_STRING>.p1.openshiftapps.com%2Foauth2callback%2Fgithub-1&oauth_application
     %5Bname%5D=<CLUSTER_NAME>&oauth_application%5Burl%5D=https%3A%2F%2Fconsole-openshift
     console.apps.<CLUSTER_NAME>/<RANDOM_STRING>.p1.openshiftapps.com
   - Click on 'Register application'
   ...

5. Open the URL in the output with the following command. Replace <GITHUB_ORG_NAME> with the name of your GitHub organization.

6. On the GitHub web page, choose Register application to register a new OAuth application in your GitHub organization.

7. Use the information from the GitHub OAuth page to populate the remaining rosa create idp interactive prompts using the following command. Replace <GITHUB_CLIENT_ID> and <GITHUB_CLIENT_SECRET> with the credentials from your GitHub OAuth application.

   ```
Step 4: Grant user access to a cluster

You can grant a user access to your cluster by adding them to the configured identity provider.

The following procedure adds a user to a GitHub organization that's configured for identity provisioning to the cluster.

1. Navigate to github.com and log in to your GitHub account.
2. Invite users that require cluster access to your GitHub organization. For more information, see Inviting users to join your organization in the documentation on Github.

Step 5: Grant administrator permissions to a user

After you add a user to your configured identity provider, you can grant the user cluster-admin or dedicated-admin permissions for your cluster.

Configure cluster-admin permissions

1. Grant the cluster-admin permissions using the following command. Replace <IDP_USER_NAME> and <CLUSTER_NAME> with your user and cluster name.

```
rosa grant user cluster-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
```

2. Verify that the user is listed as a member of the cluster-admins group.

```
rosa list users --cluster=<CLUSTER_NAME>
```

Configure dedicated-admin permissions

1. Grant the dedicated-admin permissions using the following command. Replace <IDP_USER_NAME> and <CLUSTER_NAME> with your user and cluster name.

```
rosa grant user dedicated-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
```
Step 6: Access a cluster through the web console

After you create a cluster administrator user or add a user to your configured identity provider, you can log in to your cluster through the Red Hat Hybrid Cloud Console.

1. Obtain the console URL for your cluster by using the following command. Replace `<CLUSTER_NAME>` with the name of your cluster.

   ```sh
   rosa describe cluster -c <CLUSTER_NAME> | grep Console
   ```

2. Navigate to the console URL in the output and log in.
   - If you create a cluster-admin user, log in using the provided credentials.
   - If you configure an identity provider for your cluster, choose the identity provider name in the Log in with... dialog and complete any authorization requests that are presented by your provider.

Step 7: Deploy an application from the Developer Catalog

From the Red Hat Hybrid Cloud Console, you can deploy a Developer Catalog test application and expose it with a route.

1. Navigate to Red Hat Hybrid Cloud Console and choose the cluster you want to deploy the app into.
2. On the cluster's page, choose Open console.
3. In the Administrator perspective, choose Home > Projects > Create Project.
4. Enter a name for your project and optionally add a Display Name and Description.
5. Choose Create to create the project.
6. Switch to the Developer perspective and choose +Add. Make sure that the selected project is the one that was just created.
7. In the Developer Catalog dialog, choose All services.
8. In the Developer Catalog page, choose Languages > JavaScript from the menu.
9. Choose Node.js, and then choose Create Application to open the Create Source-to-Image Application page.
   
   **Note**
   You might need to choose Clear All Filters to display the Node.js option.

10. In the Git section, choose Try Sample.
11. In the Name field, add a unique name.
12. Choose Create.
   
   **Note**
   The new application takes several minutes to deploy.
13. When the deployment is complete, choose the route URL for the application.
A new tab in the browser opens with a message similar to the following.

```
Welcome to your Node.js application on OpenShift
```

(Optional) Delete the application and clean up resources.

a. In the Administrator perspective, choose Home > Projects.

b. Open the action menu for your project and choose Delete Project.

### Step 8: Revoke administrator permissions and user access

You can revoke cluster-admin or dedicated-admin permissions from a user by using the ROSA CLI.

To revoke access from a user, you must remove the user from your configured identity provider.

#### Revoke cluster-admin permissions from a user

1. Revoke the cluster-admin permission by using the following command. Replace `<IDP_USER_NAME>` and `<CLUSTER_NAME>` with your user and cluster name.

   ```
   rosa revoke user cluster-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
   ```

2. Verify that the user isn’t listed as a member of the cluster-admins group.

   ```
   rosa list users --cluster=<CLUSTER_NAME>
   ```

#### Revoke dedicated-admin permissions from a user

1. Revoke the dedicated-admin permission using the following command. Replace `<IDP_USER_NAME>` and `<CLUSTER_NAME>` with your user and cluster name.

   ```
   rosa revoke user dedicated-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
   ```

2. Verify that the user isn’t listed as a member of the dedicated-admins group.

   ```
   rosa list users --cluster=<CLUSTER_NAME>
   ```

#### Revoke user access to a cluster

You can revoke cluster access for an identity provider user by removing them from the configured identity provider.

You can configure different types of identity providers for your cluster. The following procedure revokes cluster access for a member of a GitHub organization.

1. Navigate to [github.com](https://github.com) and log in to your GitHub account.

2. Remove the user from your GitHub organization. For more information, see [Removing a member from your organization](https://docs.github.com) in the GitHub documentation.
Step 9: Delete a cluster and AWS STS resources

You can use the ROSA CLI to delete a cluster that uses AWS Security Token Service (AWS STS). You can also use the ROSA CLI to delete the IAM roles and OIDC provider created by ROSA. To delete the IAM policies created by ROSA, you can use the IAM console.

**Important**
IAM roles and policies created by ROSA might be used by other ROSA clusters in the same account.

1. Delete the cluster and watch the logs. Replace `<CLUSTER_NAME>` with the name or ID of your cluster.

   ```bash
   rosa delete cluster --cluster=<CLUSTER_NAME> --watch
   ```

   **Important**
   You must wait for the cluster to delete completely before you remove the IAM roles, policies, and OIDC provider. The account IAM roles are required to delete the resources created by the installer. The operator IAM roles are required to clean up the resources created by the OpenShift operators. The operators use the OIDC provider to authenticate.

2. Delete the OIDC provider that the cluster operators use to authenticate by running the following command.

   ```bash
   rosa delete oidc-provider -c <CLUSTER_ID> --mode auto
   ```

3. Delete the cluster-specific operator IAM roles.

   ```bash
   rosa delete operator-roles -c <CLUSTER_ID> --mode auto
   ```

4. Delete the account IAM roles using the following command. Replace `<PREFIX>` with the prefix of the account IAM roles to delete. If you specified a custom prefix when creating the account IAM roles, specify the default `ManagedOpenShift` prefix.

   ```bash
   rosa delete account-roles --prefix <PREFIX> --mode auto
   ```

5. Delete the IAM policies created by ROSA.
   a. Log in to the [IAM console](#).
   b. On the left menu under **Access management**, choose **Policies**.
   c. Select the policy that you want to delete and choose **Actions > Delete**.
   d. Enter the policy name and choose **Delete**.
   e. Repeat this step to delete each of the IAM policies for the cluster.

Getting started with ROSA classic using AWS PrivateLink

ROSA classic clusters can be deployed in a few different ways: public, private, or private with AWS PrivateLink. For more information about ROSA classic, see Deployment options (p. 19). For both public and private cluster configurations, the OpenShift cluster has access to the internet, and privacy is set on the application workloads at the application layer.

If you require both the cluster and the application workloads to be private, you can configure AWS PrivateLink with ROSA classic. AWS PrivateLink is a highly available, scalable technology that ROSA uses...
Prerequisites

Before getting started, make sure you completed these actions:

- Install and configure the latest AWS CLI. For more information, see [Installing or updating the latest version of the AWS CLI](#).
- Install and configure the latest ROSA CLI and OpenShift Container Platform CLI. For more information, see [Getting started with the ROSA CLI](#).
- Service Quotas must have the required service quotas set for Amazon EC2, Amazon VPC, Amazon EBS, and Elastic Load Balancing that are needed to create and run a ROSA cluster. AWS or Red Hat may request service quota increases on your behalf as required for issue resolution. To view the required quotas, see [Red Hat OpenShift Service on AWS endpoints and quotas](#) in the [AWS General Reference](#).
- To receive AWS support for ROSA, you must enable AWS Business, Enterprise On-Ramp, or Enterprise support plans. Red Hat may request AWS support on your behalf as required for issue resolution. For more information, see [Support for ROSA](#). To enable AWS Support, see the [AWS Support page](#).
- If you're using AWS Organizations to manage the AWS accounts that host the ROSA service, the organization's service control policy (SCP) must be configured to allow Red Hat to perform policy actions that's listed in the SCP without restriction. For more information, see the [ROSA SCP troubleshooting documentation](#). For more information about SCPS, see [Service control policies (SCPs)](#).
- If deploying a ROSA cluster with AWS STS into an enabled AWS Region that's disabled by default, you must update the security token to version 2 for all the Regions in the AWS account with the following command.

```bash
aws iam set-security-token-service-preferences --global-endpoint-token-version v2Token
```

For more information about enabling Regions, see [Managing AWS Regions](#) in the [AWS General Reference](#).
Step 1: Enable ROSA and configure prerequisites

To create a ROSA cluster, you must first enable the ROSA service in the AWS ROSA console. The AWS ROSA console verifies if your AWS account has the necessary AWS Marketplace permissions, service quotas, and the Elastic Load Balancing (ELB) service-linked role named AWSServiceRoleForElasticLoadBalancing. If any of these prerequisites are missing, the console provides guidance on how to configure your account to meet the prerequisites.

1. Navigate to the ROSA console.
2. Choose Get started.
3. On the Verify ROSA prerequisites page, select I agree to share my contact information with Red Hat.
4. Choose Enable ROSA.
5. Once the page has verified your service quotas meet ROSA prerequisites and the ELB service-linked role is created, open a new terminal session to create your first ROSA cluster using the ROSA CLI.

Step 2: Create Amazon VPC architecture for the cluster

To create a ROSA cluster that uses AWS PrivateLink, you must first configure your own Amazon VPC architecture to deploy your solution into. ROSA requires that customers configure at least one public and private subnet per Availability Zone used to create clusters. For single-AZ clusters, only use Availability Zone is used. For multi-AZ clusters, three Availability Zones are needed.

Important
If Amazon VPC requirements are not met, cluster creation fails.

The following procedure uses the AWS CLI to create both a public and private subnet into a single Availability Zone for a Single-AZ cluster. All cluster resources are in the private subnet. The public subnet routes outbound traffic by using a NAT gateway to the internet.

This example uses the CIDR block 10.0.0.0/16 for the Amazon VPC. However, you can choose a different CIDR block. For more information, see VPC sizing.

1. Set an environment variable for the cluster name by running the following command.

   ROSA_CLUSTER_NAME=rosa-privatelink

2. Create a VPC with a 10.0.0.0/16 CIDR block.

   aws ec2 create-vpc --cidr-block 10.0.0.0/16 --query Vpc.VpcId --output text

   The preceding command returns the ID of the new VPC. The following is an example output.

   vpc-0410832ee325aafea

3. Using the VPC ID from the previous step, tag the VPC using the ROSA_CLUSTER_NAME variable.

   aws ec2 create-tags --resources <VPC_ID_VALUE> --tags Key=Name,Value=$ROSA_CLUSTER_NAME

4. Enable DNS hostname support on the VPC.

   aws ec2 modify-vpc-attribute --vpc-id <VPC_ID_VALUE> --enable-dns-hostnames
5. Create a public subnet in the VPC with a 10.0.1.0/24 CIDR block, specifying the Availability Zone where the resource should be created.

   **Important**
   When creating subnets, make sure that subnets are created to an Availability Zone that has ROSA instance types available. If you don't choose a specific Availability Zone, the subnet is created in any one of the Availability Zones in the AWS Region that you specify. To specify a specific Availability Zone, use the `--availability-zone` argument in the `create-subnet` command. You can use the `rosa list instance-types` command to list all ROSA instance types available. To check if an instance type is available for a given Availability Zone, use the following command.

   ```bash
   aws ec2 describe-instance-type-offerings --location-type availability-zone --filters Name=location,Values=<availability_zone> --region <region> --output text | egrep "<instance_type>"
   ```

   **Important**
   ROSA requires that customers configure at least one public and private subnet per Availability Zone used to create clusters. For single-AZ clusters, only one Availability Zone is needed. For multi-AZ clusters, three Availability Zones are needed. If these requirements are not met, cluster creation fails.

   ```bash
   aws ec2 create-subnet --vpc-id <VPC_ID_VALUE> --cidr-block 10.0.1.0/24 --availability-zone <AZ_NAME> --query Subnet.SubnetId --output text
   ```

   The preceding command returns the ID of the new subnet. The following is an example output.

   ```
   subnet-0b6a7e8c8c8b75920
   ```

   6. Using the subnet ID from the previous step, tag the subnet using the `ROSA_CLUSTER_NAME-public` variable.

   ```bash
   aws ec2 create-tags --resources <PUBLIC_SUBNET_ID> --tags Key=Name,Value=$ROSA_CLUSTER_NAME-public
   ```

   7. Create a private subnet in the VPC with a 10.0.0.0/24 CIDR block, specifying the same Availability Zone that the public subnet deployed into.

   ```bash
   aws ec2 create-subnet --vpc-id <VPC_ID_VALUE> --cidr-block 10.0.0.0/24 --availability-zone <AZ_NAME> --query Subnet.SubnetId --output text
   ```

   The preceding command returns the ID of the new subnet. The following is an example output.

   ```
   subnet-0b6a7e8c8c8b75920
   ```

   8. Using the subnet ID from the previous step, tag the subnet using the `ROSA_CLUSTER_NAME-private` variable.

   ```bash
   aws ec2 create-tags --resources <PRIVATE_SUBNET_ID> --tags Key=Name,Value=$ROSA_CLUSTER_NAME-private
   ```

   9. Create an internet gateway for outbound traffic and attach it to the VPC.

   ```bash
   aws ec2 create-internet-gateway --query InternetGateway.InternetGatewayId --output text
   ```
Step 2: Create Amazon VPC architecture for the cluster

10. Tag the internet gateway with the \texttt{ROSA\_CLUSTER\_NAME} variable.

\begin{verbatim}
aws ec2 attach-internet-gateway --vpc-id <VPC\_ID\_VALUE> --internet-gateway-id <IG\_ID\_VALUE>
\end{verbatim}

11. Create a route table for outbound traffic, associate it to the public subnet, and configure traffic to route to the internet gateway.

\begin{verbatim}
aws ec2 create-route-table --vpc-id <VPC\_ID\_VALUE> --query RouteTable.RouteTableId --output text
aws ec2 associate-route-table --subnet-id <PUBLIC\_SUBNET\_ID> --route-table-id <PUBLIC\_RT\_ID>
aws ec2 create-route --route-table-id <PUBLIC\_RT\_ID> --destination-cidr-block 0.0.0.0/0 --gateway-id <IG\_ID\_VALUE>
\end{verbatim}

12. Tag the public route table with the \texttt{ROSA\_CLUSTER\_NAME} variable and verify that the route table was properly configured.

\begin{verbatim}
aws ec2 create-tags --resources <PUBLIC\_RT\_ID> --tags Key=Name,Value=\texttt{ROSA\_CLUSTER\_NAME}
aws ec2 describe-route-tables --route-table-id <PUBLIC\_RT\_ID>
\end{verbatim}

13. Create a NAT gateway in the public subnet with an elastic IP address to enable traffic to the private subnet.

\begin{verbatim}
aws ec2 allocate-address --domain vpc --query AllocationId --output text
aws ec2 create-nat-gateway --subnet-id <PUBLIC\_SUBNET\_ID> --allocation-id <EIP\_ADDRESS> --query NatGateway.NatGatewayId --output text
\end{verbatim}

14. Tag the NAT gateway and elastic IP address with the \texttt{ROSA\_CLUSTER\_NAME} variable.

\begin{verbatim}
aws ec2 create-tags --resources <EIP\_ADDRESS> --resources <NAT\_GATEWAY\_ID> --tags Key=Name,Value=\texttt{ROSA\_CLUSTER\_NAME}
\end{verbatim}

15. Create a route table for private subnet traffic, associate it to the private subnet, and configure traffic to route to the NAT gateway.

\begin{verbatim}
aws ec2 create-route-table --vpc-id <VPC\_ID\_VALUE> --query RouteTable.RouteTableId --output text
aws ec2 associate-route-table --subnet-id <PRIVATE\_SUBNET\_ID> --route-table-id <PRIVATE\_RT\_ID>
aws ec2 create-route --route-table-id <PRIVATE\_RT\_ID> --destination-cidr-block 0.0.0.0/0 --gateway-id <NAT\_GATEWAY\_ID>
\end{verbatim}

16. Tag the private route table and elastic IP address with the \texttt{ROSA\_CLUSTER\_NAME-private} variable.

\begin{verbatim}
aws ec2 create-tags --resources <PRIVATE\_RT\_ID> <EIP\_ADDRESS> --tags Key=Name,Value=\texttt{ROSA\_CLUSTER\_NAME-private}
\end{verbatim}
Step 3: Create a cluster with AWS PrivateLink

You can use AWS PrivateLink and the ROSA CLI to create a cluster with a single Availability Zone (Single-AZ) or multiple Availability Zones (Multi-AZ). In either case, your machine's CIDR value must match your VPC's CIDR value.

The following procedure uses the `rosa create cluster` command to create a Single-AZ ROSA cluster. To create a Multi-AZ cluster, specify `multi-az` in the command and the private subnet IDs for each private subnet you want you to deploy to.

Note
If you use a firewall, you must configure it so that ROSA can access the sites that it requires to function.
For more information, see AWS firewall prerequisites in the Red Hat OpenShift documentation.

1. Create a Single-AZ cluster by running the following command.

   ```
   rosa create cluster --private-link --cluster-name=<CLUSTER_NAME> --machine-cidr=10.0.0.0/16 --subnet-ids=<PRIVATE_SUBNET_ID>
   ```

   Note
   To create a cluster that uses AWS PrivateLink with AWS Security Token Service (AWS STS) short-lived credentials, append `--sts --mode auto` or `--sts --mode manual` to the end of the `rosa create cluster` command.

2. Create the cluster operator IAM roles by following the interactive prompts.

   ```
   rosa create operator-roles --interactive -c <CLUSTER_NAME>
   ```

3. Create the OpenID Connect (OIDC) provider the cluster operators use to authenticate.

   ```
   rosa create oidc-provider --interactive -c <CLUSTER_NAME>
   ```

4. Check the status of your cluster.

   ```
   rosa describe cluster -c <CLUSTER_NAME>
   ```

   Example

   Note
   It may take up to 40 minutes for the cluster State field to show the ready status. If provisioning fails or doesn't show as ready after 40 minutes, see Troubleshoot ROSA cluster provisioning issues (p. 82).

   To contact AWS Support or Red Hat support for assistance, see Support for ROSA (p. 78).

5. Track the progress of the cluster creation by watching the OpenShift installer logs.

   ```
   rosa logs install -c <CLUSTER_NAME> --watch
   ```

Step 4: Configure AWS PrivateLink DNS forwarding

Clusters that use AWS PrivateLink create a public hosted zone and a private hosted zone in Route 53. Records within the Route 53 private hosted zone are resolvable only from within the VPC that it's assigned to.
The Let's Encrypt DNS-01 validation requires a public zone so that valid and publicly trusted certificates can be issued for the domain. The validation records are deleted after Let's Encrypt validation is complete. The zone is still required for issuing and renewing these certificates, which are typically required every 60 days. Although these zones usually appear empty, a public zone serves a critical role in the validation process.

For more information about AWS private hosted zones, see Working with private zones. For more information about public hosted zones, see Working with public hosted zones.

Configure a Route 53 Resolver inbound endpoint

To allow for records such as api.<cluster_domain> and *.apps.<cluster_domain> to resolve outside of the VPC, configure a Route 53 Resolver inbound endpoint.

1. Open the Route 53 console.
2. In the navigation pane under Resolver, choose Inbound endpoints.
3. Choose Configure endpoints.
4. In the upper right, use the AWS Region selector to choose the AWS Region that contains the VPC used for the cluster.
5. Under Basic configuration, choose Inbound only and then choose Next.
6. On the Configure inbound endpoint page, complete the General settings for inbound endpoint section. Under Security group for this endpoint, choose a security group that allows inbound UDP and TCP traffic from the remote network on destination port 53.
7. In the IP address section, choose the Availability Zones and private subnets that were used when creating the cluster and choose Next.
8. (Optional) Complete the Tags section.
9. Choose Submit.

Configure DNS forwarding for the cluster

After the Route 53 Resolver internal endpoint is associated and operational, configure DNS forwarding so DNS queries can be handled by the designated servers on your network.

1. Configure your corporate network to forward DNS queries to those IP addresses for the top-level domain, such as drow-pl-01.htno.p1.openshiftapps.com.
2. If you’re forwarding DNS queries from one VPC to another VPC, follow the instructions in Managing forwarding rules.
3. If you’re configuring your remote network DNS server, see your specific DNS server documentation to configure selective DNS forwarding for the installed cluster domain.

Step 5: Configure an identity provider and grant cluster access

ROSA includes a built-in OAuth server. After your ROSA cluster is created, you must configure OAuth to use an identity provider. You can then add users to your configured identity provider to grant them access to your cluster. You can grant these users cluster-admin or dedicated-admin permissions as required.

You can configure different identity provider types for your cluster. The supported types include GitHub, GitHub Enterprise, GitLab, Google, LDAP, OpenID Connect, and HTPasswd identity providers.
Important
The HTPasswd identity provider is included only to enable a single, static administrator user to be created. HTPasswd isn't supported as a general-use identity provider for ROSA.

The following procedure configures a GitHub identity provider as an example. For instructions on how to configure each of the supported identity provider types, see Configuring identity providers for AWS STS.

1. Navigate to github.com and log in to your GitHub account.
2. If you don’t have a GitHub organization to use for identity provisioning for your ROSA cluster, create one. For more information, see the steps in the GitHub documentation.
3. Using the ROSA CLI’s interactive mode, configure an identity provider for your cluster by running the following command.

   rosa create idp --cluster=<CLUSTER_NAME> --interactive

4. Follow the configuration prompts in the output to restrict cluster access to members of your GitHub organization.

   I: Interactive mode enabled.
   Any optional fields can be left empty and a default will be selected.
   ? Type of identity provider: github
   ? Identity provider name: github-1
   ? Restrict to members of: organizations
   ? GitHub organizations: <GITHUB_ORG_NAME>
   ? To use GitHub as an identity provider, you must first register the application:
     - Open the following URL:
       https://github.com/organizations/<GITHUB_ORG_NAME>/settings/applications/new?
       oauth_application%5Bcallback_url%5D=https%3A%2F%2Foauth-openshift.apps.<CLUSTER_NAME>/
       <RANDOM_STRING>.p1.openshiftapps.com%2Foauth2callback%2Fgithub-1&oauth_application
       %5Bname%5D=<CLUSTER_NAME>&oauth_application%5Burl%5D=https%3A%2F%2Fconsole-openshift-
       console.apps.<CLUSTER_NAME>/<RANDOM_STRING>.p1.openshiftapps.com
     - Click on 'Register application'
   ...

5. Open the URL in the output, replacing <GITHUB_ORG_NAME> with the name of your GitHub organization.
6. On the GitHub web page, choose Register application to register a new OAuth application in your GitHub organization.
7. Use the information from the GitHub OAuth page to populate the remaining rosa create idp interactive prompts, replacing <GITHUB_CLIENT_ID> and <GITHUB_CLIENT_SECRET> with the credentials from your GitHub OAuth application.

   ...
   ? Client ID: <GITHUB_CLIENT_ID>
   ? GitHub Enterprise Hostname (optional):
   ? Mapping method: claim
   I: Configuring IDP for cluster '<CLUSTER_NAME>'
   I: Identity Provider 'github-1' has been created.
   It will take up to 1 minute for this configuration to be enabled.
   To add cluster administrators, see 'rosa grant user --help'.
   To login into the console, open https://console-openshift-console.apps.<CLUSTER_NAME>..<RANDOM_STRING>.p1.openshiftapps.com and click on github-1.

Note
It might take around two minutes for the identity provider configuration to become active.
If you configured a cluster-admin user, you can run the oc get pods -n openshift-authentication --watch command to watch the OAuth pods redeploy with the updated configuration.
Step 6: Grant user access to a cluster

You can grant a user access to your cluster by adding them to the configured identity provider. The following procedure adds a user to a GitHub organization that’s configured for identity provisioning to the cluster.

1. Navigate to github.com and log in to your GitHub account.
2. Invite users that require cluster access to your GitHub organization. For more information, see Inviting users to join your organization in the GitHub documentation.

Configure cluster-admin permissions

1. Grant the cluster-admin permissions using the following command. Replace <IDP_USER_NAME> and <CLUSTER_NAME> with your user and cluster name.
   
   ```
   rosa grant user cluster-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
   ```

2. Verify the user is listed as a member of the cluster-admins group.
   
   ```
   rosa list users --cluster=<CLUSTER_NAME>
   ```

Configure dedicated-admin permissions

1. Grant the dedicated-admin permissions with the following command. Replace <IDP_USER_NAME> and <CLUSTER_NAME> with your user and cluster name.
   
   ```
   rosa grant user dedicated-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
   ```

2. Verify the user is listed as a member of the cluster-admins group.
   
   ```
   rosa list users --cluster=<CLUSTER_NAME>
   ```

Step 8: Access a cluster through the web console

After you created a cluster administrator user or added a user to your configured identity provider, you can log in to your cluster through the Red Hat Hybrid Cloud Console.

1. Obtain the console URL for your cluster using the following command. Replace <CLUSTER_NAME> with the name of your cluster.
   
   ```
   rosa list idps --cluster=<CLUSTER_NAME>
   ```
Step 9: Deploy an application from the Developer Catalog

From the Red Hat Hybrid Cloud Console, you can deploy a Developer Catalog test application and expose it with a route.

1. Navigate to [Red Hat Hybrid Cloud Console](#) and choose the cluster that you want to deploy the app into.
2. On the cluster’s page, choose Open console.
3. In the Administrator perspective, choose Home > Projects > Create Project.
4. Enter a name for your project and optionally add a Display Name and Description.
5. Choose Create to create the project.
6. Switch to the Developer perspective and choose +Add. Make sure that the selected project is the one that was just created.
7. In the Developer Catalog dialog, choose All services.
8. In the Developer Catalog page, choose Languages > JavaScript from the menu.
9. Choose Node.js, and then choose Create Application to open the Create Source-to-Image Application page.
   
   **Note**
   You might need to choose Clear All Filters to display the Node.js option.
10. In the Git section, choose Try Sample.
11. In the Name field, add a unique name.
12. Choose Create.
   
   **Note**
   The new application takes several minutes to deploy.
13. When the deployment is complete, choose the route URL for the application.
   
   A new tab in the browser opens with a message that’s similar to the following.

   Welcome to your Node.js application on OpenShift

14. (Optional) Delete the application and clean up resources.
   a. In the Administrator perspective, choose Home > Projects.
   b. Open the action menu for your project and choose Delete Project.

Step 10: Revoke administrator permissions and user access

You can revoke cluster-admin or dedicated-admin permissions from a user by using the ROSA CLI.
To revoke access from a user, you must remove the user from your configured identity provider.

**Revoke cluster-admin permissions from a user**

1. Revoke the cluster-admin permissions using the following command. Replace `<IDP_USER_NAME>` and `<CLUSTER_NAME>` with your user and cluster name.

   ```sh
tests  
rosa revoke user cluster-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
```

2. Verify that the user isn’t listed as a member of the cluster-admins group.

   ```sh
tests  
rosa list users --cluster=<CLUSTER_NAME>
```

**Revoke dedicated-admin permissions from a user**

1. Revoke the dedicated-admin permissions using the following command. Replace `<IDP_USER_NAME>` and `<CLUSTER_NAME>` with your user and cluster name.

   ```sh
tests  
rosa revoke user dedicated-admin --user=<IDP_USER_NAME> --cluster=<CLUSTER_NAME>
```

2. Verify that the user isn’t listed as a member of the dedicated-admins group.

   ```sh
tests  
rosa list users --cluster=<CLUSTER_NAME>
```

**Revoke user access to a cluster**

You can revoke cluster access for an identity provider user by removing them from the configured identity provider.

You can configure different types of identity providers for your cluster. The following procedure revokes cluster access for a member of a GitHub organization.

1. Navigate to [github.com](http://github.com) and log in to your GitHub account.
2. Remove the user from your GitHub organization. For more information, see [Removing a member from your organization](https://docs.github.com/en/orgs/settings/members) in the GitHub documentation.

**Step 11: Delete a cluster and AWS STS resources**

You can use the ROSA CLI to delete a cluster that uses AWS Security Token Service (AWS STS). You can also use the ROSA CLI to delete the IAM roles and OIDC provider created by ROSA. To delete the IAM policies created by ROSA, you can use the IAM console.

**Important**

IAM roles and policies created by ROSA might be used by other ROSA clusters in the same account.

1. Delete the cluster and watch the logs. Replace `<CLUSTER_NAME>` with the name or ID of your cluster.

   ```sh
tests  
rosa delete cluster --cluster=<CLUSTER_NAME> --watch
```
Important
You must wait for the cluster to delete completely before you remove the IAM roles, policies, and OIDC provider. The account IAM roles are required to delete the resources created by the installer. The operator IAM roles are required to clean up the resources created by the OpenShift operators. The operators use the OIDC provider to authenticate.

2. Delete the OIDC provider that the cluster operators use to authenticate by running the following command.

```
rosa delete oidc-provider -c <CLUSTER_ID> --mode auto
```

3. Delete the cluster-specific operator IAM roles.

```
rosa delete operator-roles -c <CLUSTER_ID> --mode auto
```

4. Delete the account IAM roles using the following command. Replace `<PREFIX>` with the prefix of the account IAM roles to delete. If you specified a custom prefix when creating the account IAM roles, specify the default `ManagedOpenShift` prefix.

```
rosa delete account-roles --prefix <PREFIX> --mode auto
```

5. Delete the IAM policies created by ROSA.
   a. Log in to the [IAM console](https://iam.amazonaws.com).
   b. On the left menu under **Access management**, choose **Policies**.
   c. Select the policy that you want to delete and choose **Actions > Delete**.
   d. Enter the policy name and choose **Delete**.
   e. Repeat this step to delete each of the IAM policies for the cluster.
Security in ROSA

Cloud security at AWS is the highest priority. As an AWS customer, you benefit from a data center and network architecture that is built to meet the requirements of the most security-sensitive organizations.

Security is a shared responsibility between AWS and you. The shared responsibility model describes this as security of the cloud and security in the cloud:

- **Security of the cloud** – AWS is responsible for protecting the infrastructure that runs AWS services in the AWS Cloud. AWS also provides you with services that you can use securely. Third-party auditors regularly test and verify the effectiveness of our security as part of the AWS Compliance Programs. To learn about the compliance programs that apply to ROSA, see AWS services in Scope by Compliance Program.

- **Security in the cloud** – Your responsibility is determined by the AWS service that you use. You are also responsible for other factors including the sensitivity of your data, your company’s requirements, and applicable laws and regulations.

This documentation helps you understand how to apply the shared responsibility model when using ROSA. It shows you how to configure ROSA to meet your security and compliance objectives. You also learn how to use other AWS services that help you to monitor and secure your ROSA resources.

Topics
- Data protection in ROSA (p. 59)
- AWS managed IAM policies for ROSA (p. 62)
- Resilience in ROSA (p. 72)
- Infrastructure security in ROSA (p. 73)

Data protection in ROSA

The Overview of responsibilities for ROSA (p. 3) documentation and AWS shared responsibility model define data protection in ROSA. AWS is responsible for protecting the global infrastructure that runs all of the AWS Cloud. Red Hat is responsible for protecting the cluster infrastructure and underlying service platform. The customer is responsible for maintaining control over content that is hosted on this infrastructure. This content includes the security configuration and management tasks for the AWS services that you use. For more information about data privacy, see the Data Privacy FAQ. For information about data protection in Europe, see the AWS Shared Responsibility Model and GDPR blog post on the AWS Security Blog.

For data protection purposes, we recommend that you protect AWS account credentials and set up individual users with AWS Identity and Access Management (IAM). That way each user is given only the permissions necessary to fulfill their job duties. We also recommend that you secure your data in the following ways:

- Use multi-factor authentication (MFA) with each account.
- Use SSL/TLS to communicate with AWS resources. We require TLS 1.2 and recommend TLS 1.3.
- Set up API and user activity logging with AWS CloudTrail.
- Use AWS encryption solutions, along with all default security controls within AWS services.
- Use advanced managed security services such as Amazon Macie, which assists in discovering and securing sensitive data that is stored in Amazon S3.
• If you require FIPS 140-2 validated cryptographic modules when accessing AWS through a command line interface or an API, use a FIPS endpoint. For more information about the available FIPS endpoints, see Federal Information Processing Standard (FIPS) 140-2.

We strongly recommend that you never put sensitive identifying information, such as your customers' account numbers, into free-form fields such as a Name field. This includes when you work with ROSA or other AWS services using the console, API, AWS CLI, or AWS SDKs. Any data that you enter into ROSA or other services might get picked up for inclusion in diagnostic logs. When you provide a URL to an external server, don’t include credentials information in the URL to validate your request to that server.

Topics
• Protecting data using encryption (p. 60)
• Internetwork traffic privacy (p. 62)

Protecting data using encryption

Data protection refers to protecting data while in transit (as it travels to and from ROSA) and at rest (while it is stored on disks in AWS data centers).

Red Hat OpenShift Service on AWS provides secure access to Amazon Elastic Block Store (Amazon EBS) storage volumes attached to Amazon EC2 instances for ROSA control plane, infrastructure, and worker nodes, as well as Kubernetes persistent volumes for persistent storage. ROSA encrypts volume data at rest and in transit, and uses AWS Key Management Service (AWS KMS) to help protect your encrypted data. The service uses Amazon S3 for container image registry storage, which is encrypted at rest by default.

Important
Because ROSA is a managed service, AWS and Red Hat manage the infrastructure that ROSA uses. Customers should not attempt to manually shut down the Amazon EC2 instances that ROSA uses from the AWS console or CLI. This action can lead to customer data loss.

Data encryption for Amazon EBS-backed storage volumes

Red Hat OpenShift Service on AWS uses the Kubernetes persistent volume (PV) framework to allow cluster administrators to provision a cluster with persistent storage. Persistent volumes, as well as the control plane, infrastructure, and worker nodes, are backed by Amazon Elastic Block Store (Amazon EBS) storage volumes attached to Amazon EC2 instances.

For ROSA persistent volumes and nodes backed by Amazon EBS, encryption operations occur on the servers that host EC2 instances, ensuring the security of both data at rest and data in transit between an instance and its attached storage. For more information, see Amazon EBS encryption in the Amazon EC2 User Guide.

Data encryption for the Amazon EBS CSI driver and Amazon EFS CSI driver

ROSA defaults to using the Amazon EBS CSI driver to provision Amazon EBS storage. The Amazon EBS CSI driver and Amazon EBS CSI Driver Operator are installed on the cluster by default in the openshift-cluster-csi-drivers namespace. The Amazon EBS CSI driver and operator allow you to dynamically provision persistent volumes and create volume snapshots.

ROSA is also capable of provisioning persistent volumes using the Amazon EFS CSI driver and Amazon EFS CSI Driver Operator. The Amazon EFS driver and operator also allow you to share file system data between pods or with other applications within or outside of Kubernetes.

Volume data is secured in transit for both the Amazon EBS CSI driver and Amazon EFS CSI driver. For more information, see Using Container Storage Interface (CSI) in the Red Hat documentation.
**Important**

When dynamically provisioning ROSA persistent volumes using the Amazon EFS CSI driver, Amazon EFS considers the user ID, group ID (GID), and secondary group IDs of the access point when evaluating file system permissions. Amazon EFS replaces the user and group IDs on files with the user and group IDs on the access point and ignores NFS client IDs. As a result, Amazon EFS silently ignores `fsGroup` settings. ROSA is not able to replace the GIDs of files by using `fsGroup`. Any pod that can access a mounted Amazon EFS access point can access any file on the volume. For more information, see [Working with Amazon EFS access points](https://docs.aws.amazon.com/efs/latest/ug/) in the *Amazon EFS User Guide*.

**etcd encryption**

ROSA provides the option to enable encryption of `etcd` key values within the `etcd` volume during cluster creation, adding an additional layer of encryption. Once `etcd` is encrypted, you will incur approximately 20% additional performance overhead. We recommend that you enable `etcd` encryption only if you specifically require it for your use case. For more information, see [etcd encryption](https://docs.openshift.com/enterprise/4.1/rhel/023-awsservice-rosa-etcd-encryption.html) in the ROSA service definition.

**Key management**

ROSA uses KMS keys to securely manage control plane, infrastructure, and worker data volumes and persistent volumes for customer applications. During cluster creation, you have the choice of using the default AWS managed KMS key provided by Amazon EBS, or specifying your own customer managed key. For more information, see [Data encryption using KMS](https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/efs-kms-key.html) (p. 61).

**Data encryption for the built-in image registry**

ROSA provides a built-in container image registry to store, retrieve, and share container images via Amazon S3 bucket storage. The registry is configured and managed by the OpenShift Image Registry Operator. It provides an out-of-the-box solution for users to manage the images that run their workloads, and runs on top of the existing cluster infrastructure. For more information, see [Registry](https://docs.openshift.com/enterprise/4.1/rhel/023-awsservice-rosa-registries.html) in the Red Hat documentation.

ROSA offers public and private image registries. For enterprise applications, we recommend using a private registry to protect your images from being used by unauthorized users. To protect your registry’s data at rest, ROSA uses server-side encryption by default with Amazon S3 managed keys (SSE-S3). This does not require any action on your part, and is offered at no additional charge. For more information, see [Protecting data using server-side encryption with Amazon S3 managed encryption keys (SSE-S3)](https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/efs-kms-key.html) in the *Amazon S3 User Guide*.

ROSA uses Transport Layer Security (TLS) protocol to secure data in transit to and from the image registry. For more information, see [Registry](https://docs.openshift.com/enterprise/4.1/rhel/023-awsservice-rosa-registries.html) in the Red Hat documentation.

**Data encryption using KMS**

ROSA uses AWS KMS to securely manage keys for encrypted data. Control plane, infrastructure, and worker node volumes are encrypted by default using the AWS managed KMS key provided by Amazon EBS. This KMS key has the alias `aws/ebs`. Persistent volumes that use the default gp3 storage class are also encrypted by default using this KMS key.

Newly created ROSA clusters are configured to use the default gp3 storage class to encrypt persistent volumes. Persistent volumes created by using any other storage class are only encrypted if the storage class is configured to be encrypted. For more information about ROSA pre-built storage classes, see [Configuring persistent storage](https://docs.openshift.com/enterprise/4.1/rhel/023-awsservice-rosa-configuring-persistent-storage.html) in the Red Hat documentation. Newly created ROSA clusters are configured to use the default gp3 storage class to encrypt persistent volumes. Persistent volumes created by using any other storage class are only encrypted if the storage class is configured to be encrypted.
encrypted. For more information about ROSA pre-built storage classes, see Configuring persistent storage in the Red Hat documentation.

During cluster creation, you can choose to encrypt the persistent volumes in your cluster using the default Amazon EBS-provided key, or specify your own customer managed symmetric KMS key. For more information about creating keys, see Creating symmetric encryption KMS keys in the AWS KMS Developer Guide.

You can also encrypt persistent volumes for individual containers within a cluster by defining a KMS key. This is useful when you have explicit compliance and security guidelines when deploying to AWS. For more information, see Encrypting container persistent volumes on AWS with a KMS key in the Red Hat documentation.

The following points should be considered when encrypting persistent volumes using your own KMS keys:

- When you use KMS encryption with your own KMS key, the key must exist in the same AWS Region as your cluster.
- There is a cost associated with creating and using your own KMS keys. For more information, see AWS Key Management Service pricing.

Internetwork traffic privacy

Red Hat OpenShift Service on AWS uses Amazon Virtual Private Cloud (Amazon VPC) to create boundaries between resources in your ROSA cluster and control traffic between them, your on-premises network, and the internet. For more information about Amazon VPC security, see Internetwork traffic privacy in Amazon VPC in the Amazon VPC User Guide.

Within the VPC, you can configure your ROSA clusters to use an HTTP or HTTPS proxy server to deny direct internet access. If you are a cluster administrator, you can also define network policies at the pod level that restrict internetwork traffic to pods in your ROSA cluster. For more information, see Infrastructure security in ROSA (p. 73).

AWS managed IAM policies for ROSA

To add permissions to users, groups, and roles, it is easier to use AWS managed policies than to write policies yourself. It takes time and expertise to create IAM customer managed policies that provide your team with only the permissions they need. To get started quickly, you can use our AWS managed policies. For more information about AWS managed policies, see AWS managed policies in the IAM User Guide.

AWS services maintain and update AWS managed policies. You can’t change the permissions in AWS managed policies. Services occasionally add additional permissions to an AWS managed policy to support new features. This type of update affects all the identities (users, groups, and roles) where the policy is attached. Services are most likely to update an AWS managed policy when a new feature is launched or when new operations become available. Services do not remove permissions from an AWS managed policy, so policy updates won’t break your existing permissions.

Additionally, AWS supports managed policies for job functions that span multiple services. For example, the ViewOnlyAccess AWS managed policy provides read-only access to many AWS services and resources. When a service launches a new feature, AWS adds read-only permissions for new operations and resources. For a list and descriptions of job function policies, see AWS managed policies for job functions in the IAM User Guide.

Before you can create ROSA clusters, you must first create ROSA account roles and operator IAM roles with the required IAM policies attached. A single set of account roles will be used by any ROSA cluster running in your AWS account, whereas a unique set of operator roles is required for each cluster.
AWS managed policy: ROSAManageSubscription

You can attach the ROSAManageSubscription policy to your IAM entities. Before you enable ROSA in the AWS ROSA console, you must first attach this policy to a console role.

This policy grants the AWS Marketplace permissions required for you to manage the ROSA subscription.

Permissions details

This policy includes the following permissions:

- `aws-marketplace:Subscribe` – Grants permission to subscribe to the AWS Marketplace product for ROSA.
- `aws-marketplace:Unsubscribe` – Allows principals to remove subscriptions to AWS Marketplace products.
- `aws-marketplace:ViewSubscriptions` – Allows principals to view subscriptions from AWS Marketplace. This is required so that the IAM principal can view the available AWS Marketplace subscriptions.

To view the full JSON policy document, see ROSAManageSubscription in the AWS Managed Policy Reference Guide.

AWS managed policies for ROSA with HCP account roles

You can attach these AWS managed policies to the account roles needed to use ROSA with hosted control planes (ROSA with HCP). The permissions are required for Red Hat site reliability engineering (SRE) technical support, cluster installation, and control plane and compute functionality.

The following managed policies are required:

- `ROSAWorkerInstancePolicy` (p. 67) — Allows the ROSA service to manage Amazon EC2 instance lifecycles in a ROSA cluster.
- `ROSAHCPESRESupportPolicy` (p. 67) — Grants required permissions to Red Hat site reliability engineers (SREs) to directly observe, diagnose, and support AWS resources associated with ROSA clusters, including the ability to change ROSA cluster node state.
- `ROSAInstallerPolicy` (p. 68) — Grants required permissions to the installer to manage AWS resources that support cluster installation.

AWS managed policies for ROSA with HCP operator roles

You can attach these AWS managed policies to the operator roles needed to use ROSA with hosted control planes (ROSA with HCP). The permissions are required to allow OpenShift operators to manage ROSA with HCP cluster nodes.

The following managed policies are required:

- `ROSAAmazonEBSCSIDriverOperatorPolicy` (p. 69) — Grants required permissions to the Amazon EBS CSI Driver Operator to install and maintain the Amazon EBS CSI driver on a ROSA cluster.
- `ROSAIngressOperatorPolicy` (p. 69) — Grants required permissions to the Ingress Operator to provision and manage load balancers and DNS configurations for ROSA clusters. The policy allows read
access to tag values. The operator then filters the tag values for Route 53 resources to discover hosted zones.

- **ROSAImageRegistryOperatorPolicy (p. 70)** — Grants required permissions to the Image Registry Operator to provision and manage resources for the ROSA in-cluster image registry and dependent services, including S3.
- **ROSACloudNetworkConfigOperatorPolicy (p. 70)** — Grants required permissions to the Cloud Network Config Controller Operator to provision and manage networking resources for the ROSA cluster networking overlay.
- **ROSAKubeControllerPolicy (p. 70)** — Grants required permissions to kube controller to manage Amazon EC2, Elastic Load Balancing, and AWS KMS resources for a ROSA with hosted control planes cluster.
- **ROSAKMSProviderPolicy (p. 71)** — Grants required permissions to the built-in AWS Encryption Provider to manage AWS KMS keys that support etcd data encryption. This policy allows Amazon EC2 to encrypt and decrypt etcd data using the KMS keys provided by the AWS Encryption Provider.
- **ROSAControlPlaneOperatorPolicy (p. 72)** — Grants required permissions to the Control Plane Operator to manage Amazon EC2 and Route 53 resources for ROSA with hosted control planes clusters.

To view managed policy permissions, see [AWS managed policies](#) in the AWS Managed Policy Reference Guide.

## ROSA updates to AWS managed policies

View details about updates to AWS managed policies for ROSA since this service began tracking these changes. For automatic alerts about changes to this page, subscribe to the RSS feed on the [ROSA document history](#) page.

<table>
<thead>
<tr>
<th>Change</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROSAKubeControllerPolicy — Policy updated</td>
<td>ROSA updated the policy to allow the kube-controller-manager to describe Availability Zones, Amazon EC2 instances, route tables, security groups, VPCs, and subnets. To learn more, see <a href="#">ROSAKubeControllerPolicy</a>.</td>
<td>October 16, 2023</td>
</tr>
<tr>
<td>ROSAManageSubscription — Policy updated</td>
<td>ROSA updated the policy to add the ROSA with hosted control planes ProductId. To learn more, see <a href="#">ROSAManageSubscription</a>.</td>
<td>August 1, 2023</td>
</tr>
<tr>
<td>ROSAKubeControllerPolicy — Policy updated</td>
<td>ROSA updated the policy to allow the kube-controller-manager to create Network Load Balancers as Kubernetes service load balancers. Network Load Balancers provide greater ability to handle volatile</td>
<td>July 13, 2023</td>
</tr>
<tr>
<td>Change</td>
<td>Description</td>
<td>Date</td>
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<tr>
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<tr>
<td>workloads and support static IP addresses for the load balancer. To learn more, see ROSAKubeControllerPolicy (p. 70).</td>
<td>ROSA updates to AWS managed policies</td>
<td></td>
</tr>
<tr>
<td>ROSANodePoolManagementPolicy — New policy added</td>
<td>ROSA added a new policy to allow the NodePool controller to describe, run, and terminate Amazon EC2 instances managed as worker nodes. This policy also enables disk encryption of the worker node root volume using AWS KMS keys. To learn more, see ROSANodePoolManagementPolicy (p. 71).</td>
<td>June 8, 2023</td>
</tr>
<tr>
<td>ROSAInstallerPolicy — New policy added</td>
<td>ROSA added a new policy to allow the installer to manage AWS resources that support cluster installation. To learn more, see ROSAInstallerPolicy (p. 68).</td>
<td>June 6, 2023</td>
</tr>
<tr>
<td>ROSASRESupportPolicy — New policy added</td>
<td>ROSA added a new policy to allow Red Hat SREs to directly observe, diagnose and support AWS resources associated with ROSA clusters, including the ability to change ROSA cluster node state. To learn more, see ROSASRESupportPolicy (p. 67).</td>
<td>June 1, 2023</td>
</tr>
<tr>
<td>ROSAKMSProviderPolicy — New policy added</td>
<td>ROSA added a new policy to allow the built-in AWS Encryption Provider to manage AWS KMS keys to support etcd data encryption. To learn more, see ROSAKMSProviderPolicy (p. 71).</td>
<td>April 27, 2023</td>
</tr>
<tr>
<td>ROSAKubeControllerPolicy — New policy added</td>
<td>ROSA added a new policy to allow the kube controller to manage Amazon EC2, Elastic Load Balancing, and AWS KMS resources for ROSA with hosted control planes clusters. To learn more, see ROSAKubeControllerPolicy (p. 70).</td>
<td>April 27, 2023</td>
</tr>
<tr>
<td>Change</td>
<td>Description</td>
<td>Date</td>
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<tr>
<td>ROSAImageRegistryOperatorPolicy — New policy added</td>
<td>ROSA added a new policy to allow the Image Registry Operator to provision and manage resources for the ROSA in-cluster image registry and dependent services, including S3. To learn more, see ROSAImageRegistryOperatorPolicy (p. 70).</td>
<td>April 27, 2023</td>
</tr>
<tr>
<td>ROSAControlPlaneOperatorPolicy — New policy added</td>
<td>ROSA added a new policy to allow the Control Plane Operator to manage Amazon EC2 and Route 53 resources for ROSA with hosted control planes clusters. To learn more, see ROSAControlPlaneOperatorPolicy (p. 72).</td>
<td>April 24, 2023</td>
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<tr>
<td>ROSACloudNetworkConfigOperatorPolicy — New policy added</td>
<td>ROSA added a new policy to allow the Cloud Network Config Controller Operator to provision and manage networking resources for the ROSA cluster networking overlay. To learn more, see ROSACloudNetworkConfigOperatorPolicy (p. 70).</td>
<td>April 20, 2023</td>
</tr>
<tr>
<td>ROSAIngressOperatorPolicy — New policy added</td>
<td>ROSA added a new policy to allow the Ingress Operator to provision and manage load balancers and DNS configurations for ROSA clusters. To learn more, see ROSAIngressOperatorPolicy (p. 69).</td>
<td>April 20, 2023</td>
</tr>
<tr>
<td>ROSAAmazonEBSCSIDriverOperatorPolicy — New policy added</td>
<td>ROSA added a new policy to allow the Amazon EBS CSI Driver Operator to install and maintain the Amazon EBS CSI driver on a ROSA cluster. To learn more, see ROSAAmazonEBSCSIDriverOperatorPolicy (p. 69).</td>
<td>April 20, 2023</td>
</tr>
<tr>
<td>ROSAWorkerInstancePolicy — New policy added</td>
<td>ROSA added a new policy to allow the service to manage cluster resources. To learn more, see ROSAWorkerInstancePolicy (p. 67).</td>
<td>April 20, 2023</td>
</tr>
<tr>
<td>ROSAManageSubscription — New policy added</td>
<td>ROSA added a new policy to grant the AWS Marketplace permissions required to manage the ROSA subscription. To learn more, see ROSAManageSubscription (p. 63).</td>
<td>April 11, 2022</td>
</tr>
</tbody>
</table>
Red Hat OpenShift Service on AWS started tracking changes for its AWS managed policies. March 2, 2022

AWS managed policies for ROSA account roles

Note
These AWS managed policies are intended for use by ROSA with hosted control planes, an upcoming service update. ROSA clusters created with the existing architecture will continue to use customer managed IAM policies. For more information about customer managed IAM policies used by ROSA, see About IAM resources for ROSA clusters that use AWS STS.

These AWS managed policies add permissions used by ROSA IAM roles. The permissions are required for Red Hat site reliability engineering (SRE) technical support, cluster installation, and control plane and compute functionality.

Topics
• AWS managed policy: ROSAWorkerInstancePolicy (p. 67)
• AWS managed policy: ROSASRESupportPolicy (p. 67)
• AWS managed policy: ROSAInstallerPolicy (p. 68)

AWS managed policy: ROSAWorkerInstancePolicy

You can attach ROSAWorkerInstancePolicy to your IAM entities. Before you create a ROSA cluster, you must first attach this policy to a worker IAM role.

Permissions details
This policy includes the following permissions that allow the ROSA service to complete the following tasks:

- ec2 — Review AWS Region and Amazon EC2 instance details as part of the lifecycle management of worker nodes in a ROSA cluster.

To view the full JSON policy document, see ROSAWorkerInstancePolicy in the AWS Managed Policy Reference Guide.

AWS managed policy: ROSASRESupportPolicy

You can attach ROSASRESupportPolicy to your IAM entities.

Before you create a ROSA cluster, you must first attach this policy to a support IAM role. This policy grants required permissions to Red Hat site reliability engineers (SREs) to directly observe, diagnose, and support AWS resources associated with ROSA clusters, including the ability to change ROSA cluster node state.

Permissions details
This policy includes the following permissions that allow Red Hat SREs to complete the following tasks:

- cloudtrail — Read AWS CloudTrail events and trails relevant to the cluster.
- cloudwatch — Read Amazon CloudWatch metrics relevant to the cluster.
Operator policies for ROSA

- **ec2** — Read, describe, and review Amazon EC2 components related to the cluster’s health. Launch, stop, reboot, and terminate Amazon EC2 instances.
- **elasticloadbalancing** — Read, describe, and review Elastic Load Balancing parameters related to the cluster’s health.
- **iam** — Evaluate IAM roles that relate to the cluster’s health.
- **route53** — Review DNS settings related to the cluster’s health.
- **sts** — DecodeAuthorizationMessage — Read IAM messages for debugging purposes.

To view the full JSON policy document, see [ROSAASResSupportPolicy](#) in the [AWS Managed Policy Reference Guide](#).

**AWS managed policy: ROSAInstallerPolicy**

You can attach ROSAInstallerPolicy to your IAM entities.

Before you create a ROSA cluster, you must first attach this policy to an IAM role named [Prefix]-ROSA-Worker-Role. This policy allows entities to add any role that follows the [Prefix]-ROSA-Worker-Role pattern to an instance profile. This policy grants necessary permissions to the installer to manage AWS resources that support ROSA cluster installation.

**Permissions details**

This policy includes the following permissions that allow the installer to complete the following tasks:

- **ec2** — Run Amazon EC2 instances using AMIs hosted in AWS accounts owned and managed by Red Hat. Describe Amazon EC2 instances, volumes, and network resources associated with Amazon EC2 nodes. This is required so that the Kubernetes control plane can join instances to a cluster. This is also required so that the cluster can evaluate its presence within Amazon VPC.
- **elasticloadbalancing** — Add load balancers to target nodes on a cluster. Remove load balancers from target nodes on a cluster. This permission is required so that the Kubernetes control plane can dynamically provision load balancers requested by Kubernetes services and OpenShift application services.
- **kms** — Read an AWS KMS key, create and manage grants to Amazon EC2, and return a unique symmetric data key for use outside of AWS KMS. This is required for the use of encrypted etcd data when etcd encryption is enabled at cluster creation.
- **iam** — Validate IAM roles and policies. Dynamically provision and manage Amazon EC2 instance profiles relevant to the cluster. Add tags to an IAM instance profile by using the `iam:TagInstanceProfile` permission.
- **route53** — Manage Route 53 resources needed to create clusters.
- **servicequotas** — Evaluate service quotas required to create a cluster.
- **sts** — Create temporary AWS STS credentials for ROSA components. Assume the credentials for cluster creation.
- **secretsmanager** — Read a secret value to securely allow customer-managed OIDC configuration as part of cluster provisioning.

To view the full JSON policy document, see [ROSAInstallerPolicy](#) in the [AWS Managed Policy Reference Guide](#).

**AWS managed policies for ROSA operator roles**

**Note**

These AWS managed policies are intended for use by ROSA with hosted control planes, an upcoming service update. ROSA clusters created with the existing architecture will continue...
to use customer managed IAM policies. For more information about customer managed IAM policies used by ROSA, see About IAM resources for ROSA clusters that use AWS STS.

These AWS managed policies add permissions used by ROSA IAM roles. The permissions are required for OpenShift operators on the ROSA with hosted control planes cluster to manage cluster nodes.

**Topics**

- **AWS managed policy:** ROSAAmazonEBSCSIDriverOperatorPolicy (p. 69)
- **AWS managed policy:** ROSAIngressOperatorPolicy (p. 69)
- **AWS managed policy:** ROSAImageRegistryOperatorPolicy (p. 70)
- **AWS managed policy:** ROSACloudNetworkConfigOperatorPolicy (p. 70)
- **AWS managed policy:** ROSAKubeControllerPolicy (p. 70)
- **AWS managed policy:** ROSANodePoolManagementPolicy (p. 71)
- **AWS managed policy:** ROSAKMSProviderPolicy (p. 71)
- **AWS managed policy:** ROSAControlPlaneOperatorPolicy (p. 72)

**AWS managed policy: ROSAAmazonEBSCSIDriverOperatorPolicy**

You can attach ROSAAmazonEBSCSIDriverOperatorPolicy to your IAM entities. You must attach this policy to an operator IAM role to allow a ROSA with hosted control planes cluster to make calls to other AWS services. A unique set of operator roles is required for each cluster.

This policy grants necessary permissions to the Amazon EBS CSI Driver Operator to install and maintain the Amazon EBS CSI driver on a ROSA cluster. For more information about the operator, see [aws-ebs-csi-driver operator](https://github.com/openshift/aws-ebs-csi-driver) in the OpenShift GitHub documentation.

**Permissions details**

This policy includes the following permissions that allow the Amazon EBS Driver Operator to complete the following tasks:

- **ec2** — Create, modify, attach, detach, and delete Amazon EBS volumes that are attached to Amazon EC2 instances. Create and delete Amazon EBS volume snapshots and list Amazon EC2 instances, volumes, and snapshots.

To view the full JSON policy document, see ROSAAmazonEBSCSIDriverOperatorPolicy in the AWS Managed Policy Reference Guide.

**AWS managed policy: ROSAIngressOperatorPolicy**

You can attach ROSAIngressOperatorPolicy to your IAM entities. You must attach this policy to an operator IAM role to allow a ROSA with hosted control planes cluster to make calls to other AWS services. A unique set of operator roles is required for each cluster.

This policy grants required permissions to the Ingress Operator to provision and manage load balancers and DNS configurations for ROSA clusters. The policy allows read access to tag values. The operator then filters the tag values for Route 53 resources to discover hosted zones. For more information about the operator, see [OpenShift Ingress Operator](https://github.com/openshift/ingress) in the OpenShift GitHub documentation.

**Permissions details**

This policy includes the following permissions that allow the Ingress Operator to complete the following tasks:

- **elasticloadbalancing** — Describe the state of provisioned load balancers.
• route53 — List Route 53 hosted zones and edit records that manage the DNS controlled by the ROSA cluster.
• tag — Manage tagged resources by using the tag:GetResources permission.

To view the full JSON policy document, see ROSAINgressOperatorPolicy in the AWS Managed Policy Reference Guide.

**AWS managed policy: ROSAImageRegistryOperatorPolicy**

You can attach ROSAImageRegistryOperatorPolicy to your IAM entities. You must attach this policy to an operator IAM role to allow a ROSA with hosted control planes cluster to make calls to other AWS services. A unique set of operator roles is required for each cluster.

This policy grants required permissions to the Image Registry Operator to provision and manage resources for the ROSA in-cluster image registry and dependent services, including S3. This is required so that the operator can install and maintain the internal registry of a ROSA cluster. For more information about the operator, see Image Registry Operator in the OpenShift GitHub documentation.

**Permissions details**
This policy includes the following permissions that allow the Image Registry Operator to complete the following actions:

• s3 — Manage and evaluate Amazon S3 buckets as persistent storage for container image content and cluster metadata.

To view the full JSON policy document, see ROSAImageRegistryOperatorPolicy in the AWS Managed Policy Reference Guide.

**AWS managed policy: ROSACloudNetworkConfigOperatorPolicy**

You can attach ROSACloudNetworkConfigOperatorPolicy to your IAM entities. You must attach this policy to an operator IAM role to allow a ROSA with hosted control planes cluster to make calls to other AWS services. A unique set of operator roles is required for each cluster.

This policy grants required permissions to the Cloud Network Config Controller Operator to provision and manage networking resources for the ROSA cluster networking overlay. The operator uses these permissions to manage private IP addresses for Amazon EC2 instances as part of the ROSA cluster. For more information about the operator, see Cloud-network-config-controller in the OpenShift GitHub documentation.

**Permissions details**
This policy includes the following permissions that allow the Cloud Network Config Controller Operator to complete the following tasks:

• ec2 — Read, assign, and describe configurations for connecting Amazon EC2 instances, Amazon VPC subnets, and elastic network interfaces in a ROSA cluster.

To view the full JSON policy document, see ROSACloudNetworkConfigOperatorPolicy in the AWS Managed Policy Reference Guide.

**AWS managed policy: ROSAKubeControllerPolicy**

You can attach ROSAKubeControllerPolicy to your IAM entities. You must attach this policy to an operator IAM role to allow a ROSA with hosted control planes cluster to make calls to other AWS services. A unique set of operator roles is required for each cluster.
This policy grants required permissions to the kube controller to manage Amazon EC2, Elastic Load Balancing, and AWS KMS resources for a ROSA with hosted control planes cluster. For more information about this controller, see Controller architecture in the OpenShift documentation.

**Permissions details**

This policy includes the following permissions that allow the kube controller to complete the following tasks:

- **ec2** — Create, delete, and add tags to Amazon EC2 instance security groups. Add inbound rules to security groups. Describe Availability Zones, Amazon EC2 instances, route tables, security groups, VPCs, and subnets.
- **elasticloadbalancing** — Create and manage load balancers and their policies, create and manage load balancer listeners, register targets with target groups and manage target groups, register and de-register Amazon EC2 instances with a load balancer, and add tags to load balancers.
- **kms** — Retrieve detailed information about an AWS KMS key. This is required for the use of encrypted etcd data when etcd encryption is enabled at cluster creation.

To view the full JSON policy document, see ROSAKubeControllerPolicy in the AWS Managed Policy Reference Guide.

**AWS managed policy: ROSANodePoolManagementPolicy**

You can attach ROSANodePoolManagementPolicy to your IAM entities.

Before you create a ROSA with hosted control planes cluster, you must first attach this policy to an IAM role named [Prefix]-ROSA-Worker-Role. A unique set of operator roles is required for each cluster.

This policy grants required permissions to the NodePool controller to describe, run, and terminate Amazon EC2 instances managed as worker nodes. This policy also grants permissions to allow for disk encryption of the worker node root volume using AWS KMS keys. For more information about this controller, see Controller architecture in the OpenShift documentation.

**Permissions details**

This policy includes the following permissions that allow the NodePool controller to complete the following tasks:

- **ec2** — Run Amazon EC2 instances using AMIs hosted in AWS accounts owned and managed by Red Hat. Manage EC2 lifecycles in the ROSA cluster. Dynamically create and integrate worker nodes with Elastic Load Balancing, Amazon VPC, Route 53, Amazon EBS, and Amazon EC2.
- **iam** — Use Elastic Load Balancing via the service-linked role named AWSServiceRoleForElasticLoadBalancing. Assign roles to Amazon EC2 instance profiles.
- **kms** — Read an AWS KMS key, create and manage grants to Amazon EC2, and return a unique symmetric data key for use outside of AWS KMS. This is required to allow for disk encryption of the worker node root volume.

To view the full JSON policy document, see ROSANodePoolManagementPolicy in the AWS Managed Policy Reference Guide.

**AWS managed policy: ROSAKMSProviderPolicy**

You can attach ROSAKMSProviderPolicy to your IAM entities. You must attach this policy to an operator IAM role to allow a ROSA with hosted control planes cluster to make calls to other AWS services. A unique set of operator roles is required for each cluster.
This policy grants required permissions to the built-in AWS Encryption Provider to manage AWS KMS keys that support etcd data encryption. This policy allows Amazon EC2 to use KMS keys that the AWS Encryption Provider provides to encrypt and decrypt etcd data. For more information about this provider, see AWS Encryption Provider in the Kubernetes GitHub documentation.

Permissions details

This policy includes the following permissions that allow the AWS Encryption Provider to complete the following tasks:

- kms — Encrypt, decrypt, and retrieve an AWS KMS key. This is required for the use of encrypted etcd data when etcd encryption is enabled at cluster creation.

To view the full JSON policy document, see ROSAKMSProviderPolicy in the AWS Managed Policy Reference Guide.

AWS managed policy: ROSAControlPlaneOperatorPolicy

You can attach ROSAControlPlaneOperatorPolicy to your IAM entities. You must attach this policy to an operator IAM role to allow a ROSA with hosted control planes cluster to make calls to other AWS services. A unique set of operator roles is required for each cluster.

This policy grants required permissions to the Control Plane Operator to manage Amazon EC2 and Route 53 resources for ROSA with hosted control planes clusters. For more information about this operator, see Controller architecture in the OpenShift documentation.

Permissions details

This policy includes the following permissions that allow the Control Plane Operator to complete the following tasks:

- ec2 — Create and manage Amazon VPC endpoints.
- route53 — List and change Route 53 record sets and list hosted zones.

To view the full JSON policy document, see ROSAControlPlaneOperatorPolicy in the AWS Managed Policy Reference Guide.

Resilience in ROSA

AWS global infrastructure resilience

The AWS global infrastructure is built around AWS Regions and Availability Zones. AWS Regions provide multiple physically separated and isolated Availability Zones, which are connected through low-latency, high-throughput, and highly redundant networking. With Availability Zones, you can design and operate applications and databases that automatically fail over between zones without interruption. Availability Zones are more highly available, fault tolerant, and scalable than traditional single or multiple data center infrastructures.

ROSA provides customers with the option to run the Kubernetes control plane and data plane in a single AWS Availability Zone, or across multiple Availability Zones. While Single-AZ clusters can be useful for experimentation, customers are encouraged to run their workloads in more than one Availability Zone. This ensures that applications can withstand even a complete Availability Zone failure - a very rare event in itself.
ROSA cluster resilience

The ROSA control plane consists of at least three OpenShift control plane nodes. Each control plane node is made up of an API server instance, an etcd instance, and controllers. In the event of a control plane node failure, all API requests are automatically routed to the other available nodes to ensure cluster availability.

The ROSA data plane consists of at least two OpenShift infrastructure nodes and two OpenShift worker nodes. Infrastructure nodes run pods that support OpenShift cluster infrastructure components such as the default router, the built-in OpenShift registry, and the components for cluster metrics and monitoring. OpenShift worker nodes run end-user application pods.

Red Hat site reliability engineers (SREs) fully manage the control plane and infrastructure nodes. Red Hat SREs proactively monitor the ROSA cluster, and are responsible for replacing any failed control plane nodes and infrastructure nodes. For more information, see Overview of responsibilities for ROSA (p. 3).

Important
Because ROSA is a managed service, Red Hat is responsible for managing the underlying AWS infrastructure that ROSA uses. Customers should not attempt to manually shut down the Amazon EC2 instances that ROSA uses from the AWS console or AWS CLI. This action can lead to customer data loss.

If a worker node fails on the data plane, the control plane relocates unscheduled pods to the functioning worker node(s) until the failed node is recovered or replaced. Failed worker nodes can be replaced manually or automatically by enabling automatic scaling of machines in a cluster. For more information, see About autoscaling nodes on a cluster in the Red Hat documentation.

Customer-deployed application resilience

Although ROSA provides many protections to ensure high availability of the service, customers are responsible for building their deployed applications for high availability to protect workloads against downtime. For more information, see About availability for ROSA in the Red Hat documentation.

Infrastructure security in ROSA

As a managed service, Red Hat OpenShift Service on AWS is protected by the AWS global network security. For information about AWS security services and how AWS protects infrastructure, see AWS Cloud Security. To design your AWS environment using the best practices for infrastructure security, see Infrastructure Protection in Security Pillar — AWS Well-Architected Framework.

You use AWS published API calls to access ROSA through the AWS network. Clients must support the following:

- Transport Layer Security (TLS). We require TLS 1.2 and recommend TLS 1.3.
- Cipher suites with perfect forward secrecy (PFS) such as DHE (Ephemeral Diffie-Hellman) or ECDHE (Elliptic Curve Ephemeral Diffie-Hellman). Most modern systems such as Java 7 and later support these modes.

Additionally, requests must be signed by using an access key ID and a secret access key that is associated with an IAM principal. Or you can use the AWS Security Token Service (AWS STS) to generate temporary security credentials to sign requests.
Cluster network isolation

Red Hat site reliability engineers (SREs) are responsible for the ongoing management and network security of the cluster and underlying application platform. For more information on Red Hat responsibilities for ROSA, see Overview of responsibilities for ROSA (p. 3).

When you create a new cluster, ROSA provides the option of creating a public Kubernetes API server endpoint and application routes or a private Kubernetes API endpoint and application routes. This connection is used to communicate with your cluster (using OpenShift management tools such as the ROSA CLI and OpenShift CLI). A private connection allows all communication between your nodes and the API server to stay within your VPC. If you enable private access to the API server and application routes, you must use an existing VPC and AWS PrivateLink to connect the VPC to the OpenShift backend service.

Kubernetes API server access is secured using a combination of AWS Identity and Access Management (IAM) and native Kubernetes role-based access control (RBAC). For more information on Kubernetes RBAC, see Using RBAC Authorization in the Kubernetes documentation.

ROSA allows you to create secured application routes using several types of TLS termination to serve certificates to the client. For more information, see Secured routes in the Red Hat documentation.

If you create a ROSA cluster in an existing VPC, you specify the VPC subnets and Availability Zones for your cluster to use. You also define the CIDR ranges for the cluster network to use, and match these CIDR ranges to the VPC subnets. For more information, see CIDR range definitions in the Red Hat documentation.

For clusters that use the public API endpoint, ROSA requires that your VPC is configured with a public and private subnet for each Availability Zone that you want the cluster deployed into. For clusters that use the private API endpoint, only private subnets are required.

If you are using an existing VPC, you can configure your ROSA clusters to use an HTTP or HTTPS proxy server during or after cluster creation to encrypt cluster web traffic, adding another layer of security for your data. When you enable a proxy, the core cluster components are denied direct access to the internet. The proxy does not deny internet access for user workloads. For more information, see Configuring a cluster-wide proxy in the Red Hat documentation.

Pod network isolation

If you are a cluster administrator, you can define network policies at the pod level that restrict traffic to pods in your ROSA cluster. For more information, see Network policy in the Red Hat documentation.
ROSA service quotas

Red Hat OpenShift Service on AWS (ROSA) uses service quotas for Amazon EC2, Amazon Virtual Private Cloud (Amazon VPC), Amazon Elastic Block Store (Amazon EBS), and Elastic Load Balancing (ELB) to provision clusters.

Required minimum quotas for ROSA

For the following Amazon EC2 and Amazon EBS quotas, ROSA requires a higher quota than the default service provides. To use ROSA, you may need to request an increase for these quotas. For more information, see Requesting a quota increase in the Service Quotas User Guide.

Important
For On-Demand Standard (A, C, D, H, I, M, R, T, Z) Amazon EC2 instances, the default value of 5 vCPUs is not sufficient to create ROSA clusters. ROSA requires 100 vCPUs or greater for cluster creation. To increase this quota, open the Service Quotas console and request a quota increase.

Note
You can check your quotas using the AWS SDKs, but the SDK calculation does not include existing ROSA resources. The quota check in the SDK may pass, and ROSA cluster creation may fail. To fix this issue, open the Service Quotas console and request a quota increase.

<table>
<thead>
<tr>
<th>Name</th>
<th>Service code</th>
<th>Default</th>
<th>Minimum required</th>
<th>Adjustable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running On-Demand Standard (A, C, D, H, I, M, R, T, Z) instances</td>
<td>ec2</td>
<td>5</td>
<td>100</td>
<td>Yes</td>
<td>Maximum number of vCPUs assigned to the Running On-Demand Standard (A, C, D, H, I, M, R, T, Z) instances. The default value of 5 vCPUs is not sufficient to create ROSA clusters. ROSA requires 100 vCPUs for cluster creation.</td>
</tr>
<tr>
<td>Storage for General Purpose SSD (gp3) volumes, in TiB</td>
<td>ebs</td>
<td>50</td>
<td>300</td>
<td>Yes</td>
<td>The maximum aggregated amount of storage, in TiB, that can be provisioned across General Purpose SSD</td>
</tr>
<tr>
<td>Name</td>
<td>Service code</td>
<td>Default</td>
<td>Minimum required</td>
<td>Adjustable</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td>--------------</td>
<td>---------</td>
<td>------------------</td>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Storage for General Purpose SSD (gp2) volumes, in TiB</td>
<td>ebs</td>
<td>50</td>
<td>300</td>
<td>Yes</td>
<td>The maximum aggregated amount of storage, in TiB, that can be provisioned across General Purpose SSD (gp2) volumes in this Region. 300 TiB of storage is required for optimal performance.</td>
</tr>
<tr>
<td>Storage for Provisioned IOPS SSD (io1) volumes, in TiB</td>
<td>ebs</td>
<td>50</td>
<td>300</td>
<td>Yes</td>
<td>The maximum aggregated amount of storage, in TiB, that can be provisioned across Provisioned IOPS SSD (io1) volumes in this Region. 300 TiB of storage is required for optimal performance.</td>
</tr>
</tbody>
</table>

**Note**

The default values are the initial quotas set by AWS, which are separate from the actual applied quota value and maximum possible service quota. For more information, see Terminology in Service Quotas in the Service Quotas User Guide.
Default quotas for ROSA

ROSA uses the following default quotas for Amazon EC2, Amazon VPC, Amazon EBS, and Elastic Load Balancing. For information on increasing quotas, see Requesting a quota increase in the Service Quotas User Guide.

Amazon EC2
- EC2-VPC Elastic IPs

Amazon VPC
- VPCs per Region
- Network interfaces per Region
- Internet gateways per Region

Amazon EBS
- Snapshots per Region
- IOPS for Provisioned IOPS SSD (io1) volumes

Elastic Load Balancing
- Application Load Balancers per Region
- Classic Load Balancers per Region
Troubleshooting

The following documentation covers how to troubleshoot issues that might occur when enabling ROSA and provisioning ROSA clusters.

Topics

• Support for ROSA (p. 78)
• Troubleshoot ROSA enablement errors in the ROSA console (p. 78)
• Troubleshoot ROSA cluster creation issues (p. 82)
• Troubleshoot non-STS ROSA cluster issues (p. 83)

Support for ROSA

With ROSA, you can receive troubleshooting support from AWS Support and the Red Hat support teams. Support cases can be opened with either organization, and are routed to the correct team to resolve your issue.

AWS Support

An AWS Business or Enterprise Support plan is not required to obtain support from AWS for ROSA, but we recommend that ROSA customers enable at least AWS Business Support for 24X7 access to technical support and architectural guidance. For more information about AWS Support plans, see AWS Support.

For steps to enable an AWS Support plan, see How do I sign up for an AWS Support plan?

For information about creating an AWS Support case, see Creating support cases and case management.

Red Hat Support

ROSA includes Red Hat Premium Support. To receive Red Hat Premium Support, navigate to the Red Hat Customer Portal and use the support case tool to create a support ticket. For more information, see How to engage with Red Hat support.

Troubleshoot ROSA enablement errors in the ROSA console

ROSA uses AWS Marketplace to facilitate subscription management, billing, and metering. When you enable ROSA, the AWS ROSA console page subscribes to a ROSA listing on AWS Marketplace. If your IAM principal is missing required aws-marketplace subscription permissions when you enable ROSA in the ROSA console, the console generates an error message.

This section covers how to troubleshoot AWS Marketplace subscription permission issues that you might encounter when you choose Enable ROSA in the ROSA console.
With ROSA, you can also receive troubleshooting support from AWS Support and the Red Hat support teams. For more information, see Support for ROSA (p. 78).

Topics
- AWS Organizations service control policy (SCP) is denying required AWS Marketplace permissions (p. 79)
- User or role does not have the required AWS Marketplace permissions (p. 81)
- Required AWS Marketplace permissions blocked by an administrator (p. 81)

AWS Organizations service control policy (SCP) is denying required AWS Marketplace permissions

Description
If your AWS Organizations service control policy (SCP) isn't configured to allow the required aws-marketplace:Subscribe permission when you choose Enable ROSA, the ROSA console generates the following error message: An error occurred while enabling Red Hat OpenShift Service on AWS (ROSA), because an AWS Organizations Service Control Policy (SCP) is denying required permissions. Contact your AWS Organizations management account administrator, and consult the documentation for troubleshooting.

Solution
Your organization's management account administrator can enable ROSA in the organization's management account. Then, they can use AWS License Manager to grant and activate ROSA subscriptions for other accounts within the organization.

Contact your account administrator and request that they take the following actions to grant ROSA entitlement and activate your license.

Grant entitlement through AWS License Manager

1. Log in to your organization's management account.
2. Navigate to the ROSA console.
3. Choose Get started.
4. On the Verify ROSA prerequisites page, select I agree to share my contact information with Red Hat.
5. Choose Enable ROSA.
6. In the Enable ROSA across your AWS organization dialog, choose Grant entitlements. This action creates the service-linked roles that are needed for the account to share subscriptions with other accounts, and launches the AWS License Manager console.
7. From the AWS License Manager console, select the ROSA granted license to view the product details page.
8. Under Grants, choose Create grant.
9. To grant the ROSA license to an individual AWS account in your organization, enter a grant name and the account ID. If you want to grant the license to all organization accounts at once, enter your organization ID or ARN.
10. Select the Auto acceptance checkbox and choose Create grant.
AWS Organizations service control policy (SCP) is denying required AWS Marketplace permissions.

11. If the **Link AWS Organizations accounts** dialog box appears, choose **Link** to enable auto-acceptance for managed entitlement distributions.

12. Choose **Create grant**.

**Activate account licenses**

Before individuals can start using the distributed ROSA license, the license needs to be activated. After this is done, application owners can deploy ROSA clusters using the ROSA CLI.

In License Manager, licenses can be activated in bulk by the organization administrator. Or, licenses can be activated individually by either the administrator or an individual user. Follow these steps to bulk activate licenses on multiple accounts at once.

1. Go to your organization’s parent grant page in License Manager.
2. On the left menu, choose **Granted licenses**.
3. Choose the ROSA granted license.
4. Under **Grants**, choose the ROSA grant.
5. Choose **Activate**.
6. In the **Activate grant** dialog box, enter *activate* and choose **Activate**.

After the grant is activated, ROSA is enabled and can be used among all organization users who received the ROSA entitlement.
User or role does not have the required AWS Marketplace permissions

Description

If your IAM principal doesn't have the required `aws-marketplace:Subscribe` permission when you choose **Enable ROSA**, the ROSA console generates the following error message: An error occurred while enabling Red Hat OpenShift Service on AWS (ROSA), because your user or role does not have the required permissions.

Solution

1. Navigate to the [ROSA console](#) and attach the AWS managed policy `ROSAManageSubscription` to your IAM identity. For more information about `ROSAManageSubscription`, see [AWS managed policy: ROSAManageSubscription](#).

   **Note**
   
   ROSAManageSubscription does not yet grant permission to subscribe to the ROSA with hosted control planes Marketplace product. If you would like to enable ROSA with hosted control planes, ensure that your user or role has permission to call `aws-marketplace:Subscribe` for ProductId: "bfdca560-2c78-4e64-8193-794c159e6d30".

2. Choose **Get started**.
3. On the **Verify ROSA prerequisites** page, select I agree to share my contact information with Red Hat.
4. Choose **Enable ROSA**.

If you don’t have permission to view or to update your permission set in IAM, contact your AWS account administrator and ask them to enable ROSA for your account.

Required AWS Marketplace permissions blocked by an administrator

Description

If your account administrator blocked the required `aws-marketplace:Subscribe` permission, the ROSA console generates the following error message when you choose **Enable ROSA**: An error occurred while enabling Red Hat OpenShift Service on AWS (ROSA), because required permissions have been blocked by an administrator.

ROSAManageSubscription, an AWS managed policy, includes the permissions required to enable ROSA. Consult the documentation and try again.

Solution

Contact your AWS account administrator and ask them to take the following action:

1. Navigate to the [ROSA console](#).
2. Choose **Get started**.
3. On the **Verify ROSA prerequisites** page, select I agree to share my contact information with Red Hat.
4. Choose **Enable ROSA**. This action enables ROSA for all IAM identities under the AWS account.
Troubleshoot ROSA cluster creation issues

This section contains solutions to issues you may have when creating ROSA clusters.

With ROSA, you can also receive troubleshooting support from AWS Support and the Red Hat support teams. For more information, see Support for ROSA (p. 78).

Topics

- Access ROSA cluster debug logs (p. 82)
- Elastic Load Balancing (ELB) role does not exist (p. 82)
- ROSA cluster fails AWS service quota check during cluster creation (p. 82)
- Troubleshoot ROSA CLI expired offline access tokens (p. 83)

Access ROSA cluster debug logs

To begin to troubleshoot issues with your application, first review the debug logs. The ROSA CLI debug logs provide details on the error messages that are produced when a cluster fails to create.

To display cluster debug information, run the following ROSA CLI command. In the command, replace `<cluster_name>` with the name of your cluster.

```
rosa describe cluster -c <cluster_name> --debug
```

Elastic Load Balancing (ELB) role does not exist

Description

If you didn't create a load balancer in your AWS account, the `AWSServiceRoleForElasticLoadBalancing` role might have not been created. If you don't configure the Elastic Load Balancing role correctly and attempt to create a ROSA cluster, the following error message is returned: `Error creating network Load Balancer: AccessDenied`.

Solution

1. Check if your account has the `AWSServiceRoleForElasticLoadBalancing` role.

   ```
   aws iam get-role --role-name "AWSServiceRoleForElasticLoadBalancing"
   ```

2. If you don't have this role, create the role by running the following command.

   ```
   aws iam get-role --role-name "AWSServiceRoleForElasticLoadBalancing" || aws iam create-service-linked-role --aws-service-name "elasticloadbalancing.amazonaws.com"
   ```

ROSA cluster fails AWS service quota check during cluster creation

Description

To use ROSA, the service quotas for your account may need increased. For more information, see ROSA service quotas (p. 75).
Solution

1. Run the following command to identify your account’s quotas.

   rosa verify quota

   **Note**
   Quotas are different in different AWS Regions. Make sure to verify each of the quotas for your Regions.

2. If you need to increase your quota, navigate to the Service Quotas console.
3. On the navigation pane, choose AWS services.
4. Choose the service that needs a quota increase.
5. Select the quota that needs to be increased and choose Request quota increase.
6. For Request quota increase, enter the total amount that you want the quota to be and choose Request.

Troubleshoot ROSA CLI expired offline access tokens

Description

If you use the ROSA CLI and your api.openshift.com offline access token expires, an error message appears. This happens when sso.redhat.com invalidates the token.

Solution

1. Navigate to the OpenShift Cluster Manager API Token page and choose Load Token.
2. Copy and paste the following authentication command in the terminal.

   rosa login --token="<api_token>"

Troubleshoot non-STST ROSA cluster issues

This section covers how to troubleshoot issues that you might encounter when provisioning non-STST ROSA clusters.

We recommend that you provision ROSA clusters using AWS Security Token Service (STS) short-lived credentials for better security protection. For more information about provisioning ROSA STS clusters, see Getting started with ROSA using AWS STS in auto mode (p. 33).

With ROSA, you can also receive troubleshooting support from AWS Support or the Red Hat support teams. For more information, see Support for ROSA (p. 78).

Failed to create a cluster with an osdCcsAdmin error

**Note**
This error occurs only when you use the non-STST method of provisioning ROSA clusters. To avoid this issue, provision your ROSA clusters using AWS STS. For more information, see Getting started with ROSA using AWS STS in auto mode (p. 33).
Description
If your cluster fails to create, you might receive the following error message:

Failed to create cluster: Unable to create cluster spec: Failed to get access keys for user 'osdCcsAdmin': NoSuchEntity: The user with name osdCcsAdmin cannot be found.

Solution
1. Delete the stack.
   `rosa init --delete-stack`
2. Reinitialize your account.
   `rosa init`
## Document history for the ROSA User Guide

The following table covers all of the documentation updates for ROSA.

<table>
<thead>
<tr>
<th>Change</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updated</td>
<td>Updated the AWS managed policy ROSAKubeControllerPolicy.</td>
<td>October 16, 2023</td>
</tr>
<tr>
<td>Updated</td>
<td>Updated the AWS managed policy ROSAManageSubscription.</td>
<td>August 1, 2023</td>
</tr>
<tr>
<td>Updated</td>
<td>Updated the AWS managed policy ROSAKubeControllerPolicy.</td>
<td>July 13, 2023</td>
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<tr>
<td>Added</td>
<td>Resilience in ROSA, Infrastructure security in ROSA, and Data protection in ROSA pages were added.</td>
<td>June 30, 2023</td>
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<tr>
<td>Added</td>
<td>Deployment options page was added.</td>
<td>June 9, 2023</td>
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<td>Added</td>
<td>New AWS managed policy ROSANodePoolManagementPolicy was added.</td>
<td>June 8, 2023</td>
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<td>New AWS managed policy ROSAInstallerPolicy was added.</td>
<td>June 6, 2023</td>
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<td>Added</td>
<td>New AWS managed policy ROSASRESupportPolicy was added.</td>
<td>June 1, 2023</td>
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<td>Added</td>
<td>Added Overview of responsibilities for ROSA page.</td>
<td>May 26, 2023</td>
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<td>Updated</td>
<td>Updated the What is Red Hat OpenShift Service on AWS page.</td>
<td>May 24, 2023</td>
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<tr>
<td>Added</td>
<td>New AWS managed policies ROSAImageRegistryOperatorPolicy, ROSAKubeControllerPolicy, and ROSAKMSProviderPolicy were added.</td>
<td>April 27, 2023</td>
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<tr>
<td>Added</td>
<td>New AWS managed policy ROSAClusterOperatorPolicy was added.</td>
<td>April 24, 2023</td>
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<tr>
<td>Added new AWS managed policies for ROSA account roles (p. 85)</td>
<td>New AWS managed policy pages for ROSA account and operator roles page were added.</td>
<td>April 20, 2023</td>
</tr>
<tr>
<td>Added the ROSA service quotas page (p. 85)</td>
<td>The ROSA service quotas page was added.</td>
<td>December 22, 2022</td>
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<td>Added troubleshooting pages (p. 85)</td>
<td>Troubleshooting pages were added.</td>
<td>November 1, 2022</td>
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<td>Added getting started pages (p. 85)</td>
<td>Getting started pages were added.</td>
<td>August 12, 2022</td>
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<td>Added new AWS managed policy ROSAManageSubscription (p. 85)</td>
<td>New AWS managed policy ROSAManageSubscription was added.</td>
<td>April 11, 2022</td>
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<tr>
<td>Initial release (p. 85)</td>
<td>The initial release of the Red Hat OpenShift Service on AWS User Guide</td>
<td>March 24, 2021</td>
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