OpenShift Container Platform 4.7

Updating clusters

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Legal Notice

Abstract

This document provides instructions for updating, or upgrading, OpenShift Container Platform clusters. Updating your cluster is a simple process that does not require you to take your cluster offline.

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CHAPTER 1. UNDERSTANDING THE OPENSHIFT UPDATE SERVICE

For clusters with internet accessibility, Red Hat provides over-the-air updates through an OpenShift Container Platform update service as a hosted service located behind public APIs.

NOTE

If you are on a restricted network where disconnected clusters cannot access the public APIs, you can install the OpenShift Update Service locally. See Installing and configuring the OpenShift Update Service.

1.1. ABOUT THE OPENSHIFT UPDATE SERVICE

The OpenShift Update Service (OSUS) provides over-the-air updates to OpenShift Container Platform, including Red Hat Enterprise Linux CoreOS (RHCOS). It provides a graph, or diagram, that contains the *vertices* of component Operators and the *edges* that connect them. The edges in the graph show which versions you can safely update to. The vertices are update payloads that specify the intended state of the managed cluster components.

The Cluster Version Operator (CVO) in your cluster checks with the OpenShift Update Service to see the valid updates and update paths based on current component versions and information in the graph. When you request an update, the CVO uses the release image for that update to update your cluster. The release artifacts are hosted in Quay as container images.

To allow the OpenShift Update Service to provide only compatible updates, a release verification pipeline drives automation. Each release artifact is verified for compatibility with supported cloud platforms and system architectures, as well as other component packages. After the pipeline confirms the suitability of a release, the OpenShift Update Service notifies you that it is available.

IMPORTANT

The OpenShift Update Service displays all recommended updates for your current cluster. If an upgrade path is not recommended by the OpenShift Update Service, it might be because of a known issue with the update or the target release.

Two controllers run during continuous update mode. The first controller continuously updates the payload manifests, applies the manifests to the cluster, and outputs the controlled rollout status of the Operators to indicate whether they are available, upgrading, or failed. The second controller polls the OpenShift Update Service to determine if updates are available.

IMPORTANT

Only upgrading to a newer version is supported. Reverting or rolling back your cluster to a previous version is not supported. If your update fails, contact Red Hat support.

During the update process, the Machine Config Operator (MCO) applies the new configuration to your cluster machines. The MCO cordons the number of nodes as specified by the **maxUnavailable** field on the machine configuration pool and marks them as unavailable. By default, this value is set to **1**. The MCO then applies the new configuration and reboots the machine.

If you use Red Hat Enterprise Linux (RHEL) machines as workers, the MCO does not update the kubelet because you must update the OpenShift API on the machines first.

With the specification for the new version applied to the old kubelet, the RHEL machine cannot return to the **Ready** state. You cannot complete the update until the machines are available. However, the maximum number of unavailable nodes is set to ensure that normal cluster operations can continue with that number of machines out of service.

The OpenShift Update Service is composed of an Operator and one or more application instances.

1.2. SUPPORT POLICY FOR UNMANAGED OPERATORS

The *management state* of an Operator determines whether an Operator is actively managing the resources for its related component in the cluster as designed. If an Operator is set to an *unmanaged* state, it does not respond to changes in configuration nor does it receive updates.

While this can be helpful in non-production clusters or during debugging, Operators in an unmanaged state are unsupported and the cluster administrator assumes full control of the individual component configurations and upgrades.

An Operator can be set to an unmanaged state using the following methods:

- **Individual Operator configuration**
  Individual Operators have a **managementState** parameter in their configuration. This can be accessed in different ways, depending on the Operator. For example, the Red Hat OpenShift Logging Operator accomplishes this by modifying a custom resource (CR) that it manages, while the Cluster Samples Operator uses a cluster-wide configuration resource.

  Changing the **managementState** parameter to **Unmanaged** means that the Operator is not actively managing its resources and will take no action related to the related component. Some Operators might not support this management state as it might damage the cluster and require manual recovery.

  WARNING

  Changing individual Operators to the **Unmanaged** state renders that particular component and functionality unsupported. Reported issues must be reproduced in **Managed** state for support to proceed.

- **Cluster Version Operator (CVO) overrides**
  The **spec.overrides** parameter can be added to the CVO's configuration to allow administrators to provide a list of overrides to the CVO's behavior for a component. Setting the **spec.overrides[].unmanaged** parameter to **true** for a component blocks cluster upgrades and alerts the administrator after a CVO override has been set:

  > Disabling ownership via cluster version overrides prevents upgrades. Please remove overrides before continuing.

WARNING

Setting a CVO override puts the entire cluster in an unsupported state. Reported issues must be reproduced after removing any overrides for support to proceed.

CHAPTER 2. UPDATING CLUSTERS OVERVIEW

You can update an OpenShift Container Platform 4 cluster with a single operation by using the web console or the OpenShift CLI (oc).

2.1. UNDERSTANDING THE OPENSHIFT UPDATE SERVICE

Understanding the OpenShift Update Service : For clusters with internet accessibility, Red Hat provides over-the-air updates through an OpenShift Container Platform update service as a hosted service located behind public APIs. For more information, see the following:

- About the OpenShift Update Service
- Understanding support policy for unmanaged Operators

2.2. INSTALLING AND CONFIGURING THE OPENSHIFT UPDATE SERVICE

Installing and configuring the OpenShift Update Service : Clusters with internet accessibility can access public APIs; clusters in a restricted network are unable to access public APIs for update information. To provide a similar upgrade experience in a restricted network, you can install and configure the OpenShift Update Service locally so that it is available within a disconnected environment. For more information, see the following:

- Installing the OpenShift Update Service Operator
- Creating an OpenShift Update Service application
- Deleting an OpenShift Update Service application
- Uninstalling the OpenShift Update Service Operator

2.3. UNDERSTANDING UPGRADE CHANNELS AND RELEASES

Upgrade channels and releases: Upgrade channels allow you to choose an upgrade strategy. Upgrade channels are specific to a minor version of OpenShift Container Platform. Upgrade channels control only release selection and do not impact the version of the cluster that you install. The **openshift-install** binary file for a specific version of the OpenShift Container Platform always installs that minor version. For more information, see the following:

- Upgrading version paths
- Understanding fast and stable channel use and strategies
- Understanding restricted network clusters
- Switching between channels

2.4. UPDATING A CLUSTER USING THE WEB CONSOLE

Updating a cluster using the web console : You can update an OpenShift Container Platform cluster by using the web console. The following steps update a cluster within a minor version. You can use the same instructions for updating a cluster between minor versions.

- Performing a canary rollout update
- Updating a cluster by using the web console
- Changing the update server by using the web console

2.5. UPDATING A CLUSTER USING THE CLI

Updating a cluster using the CLI: You can update an OpenShift Container Platform cluster within a minor version by using the OpenShift CLI (oc). The following steps update a cluster within a minor version. You can use the same instructions for updating a cluster between minor versions.

- Updating a cluster by using the CLI
- Changing the update server by using the CLI

2.6. PERFORMING A CANARY ROLLOUT UPDATE

Performing a canary rollout update : By controlling rollout of an update to the worker nodes, you can ensure that mission-critical applications stay available during the whole update, even if the update process causes your applications to fail. Depending on your organizational needs, you might want to update a small subset of worker nodes, evaluate cluster and workload health over a period of time, and then update the remaining nodes. This is referred to as a *canary* update. Alternatively, you might also want to fit worker node updates, which often requires a host reboot, into smaller defined maintenance windows when it is not possible to take a large maintenance window to update the entire cluster at one time. You can perform the following procedures:

- Creating machine configuration pools to perform a canary rollout update
- Pausing the machine configuration pools
- Performing the cluster update
- Unpausing the machine configuration pools
- Moving a node to the original machine configuration pool

2.7. UPDATING A CLUSTER THAT INCLUDES RHEL COMPUTE MACHINES

Updating a cluster that includes RHEL compute machines : If your cluster contains Red Hat Enterprise Linux (RHEL) machines, you must perform additional steps to update those machines. You can perform the following procedures:

- Optional: Adding hooks to perform Ansible tasks on RHEL machines
- Updating RHEL compute machines in your cluster

2.8. UPDATING A RESTRICTED NETWORK CLUSTER

Updating a restricted network cluster : If your mirror host cannot access both the internet and the cluster, you can mirror the images to a file system that is disconnected from that environment and then bring that host or removable media across that gap. If the local container registry and the cluster are connected to the mirror host of a registry, you can directly push the release images to the local registry.

- Preparing your mirror host
- Configuring credentials that allow images to be mirrored
- Mirroring the OpenShift Container Platform image repository
- Creating the image signature config map
- Updating the restricted network cluster
- Configuring image registry repository mirroring
- Widening the scope of the mirror image catalog to reduce the frequency of cluster node reboots

CHAPTER 3. INSTALLING AND CONFIGURING THE OPENSHIFT UPDATE SERVICE

For clusters with internet accessibility, Red Hat provides over-the-air updates through an OpenShift Container Platform update service as a hosted service located behind public APIs. However, clusters in a restricted network have no way to access public APIs for update information.

To provide a similar update experience in a restricted network, you can install and configure the OpenShift Update Service locally so that it is available within a disconnected environment.

The following sections describe how to provide over-the-air updates for your disconnected cluster and its underlying operating system.

3.1. PREREQUISITES

- For more information on installing Operators, see Installing Operators in your namespace .

3.1.1. Configuring access to a secured registry for the OpenShift update service

If the release images are contained in a secure registry, complete the steps in Configuring additional trust stores for image registry access along with following changes for the update service.

The OpenShift Update Service Operator needs the config map key name **updateservice-registry** in the registry CA cert.

Image registry CA config map example for the update service

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: my-registry-ca
data:
  updateservice-registry: | 1
    -----BEGIN CERTIFICATE-----
    ...
    -----END CERTIFICATE-----
  registry-with-port.example.com..5000: | 2
    -----BEGIN CERTIFICATE-----
    ...
    -----END CERTIFICATE-----
```

1. The OpenShift Update Service Operator requires the config map key name updateservice-registry in the registry CA cert.

2. If the registry has the port, such as **registry-with-port.example.com:5000**, **:** should be replaced with **..**.

3.1.2. Updating the global cluster pull secret

You can update the global pull secret for your cluster by either replacing the current pull secret or appending a new pull secret.

The procedure is required when users use a separate registry to store images than the registry used during installation.

WARNING

Cluster resources must adjust to the new pull secret, which can temporarily limit the usability of the cluster.

Prerequisites

- You have access to the cluster as a user with the **cluster-admin** role.

Procedure

1. Optional: To append a new pull secret to the existing pull secret, complete the following steps:
   a. Enter the following command to download the pull secret:

```
$ oc get secret/pull-secret -n openshift-config --template='{{index .data
".dockerconfigjson" | base64decode}}' ><pull_secret_location> 1
```

   1 Provide the path to the pull secret file.

   b. Enter the following command to add the new pull secret:

```
$ oc registry login --registry="<registry>" \ 1
--auth-basic="<username>:<password>" \ 2
--to=<pull_secret_location> 3
```

   1 Provide the new registry. You can include multiple repositories within the same registry, for example: **--registry="<registry/my-namespace/my-repository>"**.

   2 Provide the credentials of the new registry.

   3 Provide the path to the pull secret file.

   Alternatively, you can perform a manual update to the pull secret file.

2. Enter the following command to update the global pull secret for your cluster:

```
$ oc set data secret/pull-secret -n openshift-config --from-file=.dockerconfigjson=
<pull_secret_location> 1
```

   1 Provide the path to the new pull secret file.

   This update is rolled out to all nodes, which can take some time depending on the size of your cluster.

NOTE

As of OpenShift Container Platform 4.7.4, changes to the global pull secret no longer trigger a node drain or reboot.

3.2. INSTALLING THE OPENSHIFT UPDATE SERVICE OPERATOR

To install the OpenShift Update Service, you must first install the OpenShift Update Service Operator by using the OpenShift Container Platform web console or CLI.

NOTE

For clusters that are installed on restricted networks, also known as disconnected clusters, Operator Lifecycle Manager by default cannot access the Red Hat-provided OperatorHub sources hosted on remote registries because those remote sources require full internet connectivity. For more information, see Using Operator Lifecycle Manager on restricted networks.

3.2.1. Installing the OpenShift Update Service Operator by using the web console

You can use the web console to install the OpenShift Update Service Operator.

Procedure

1. In the web console, click **Operators → OperatorHub**.

NOTE

Enter **Update Service** into the **Filter by keyword...** field to find the Operator faster.

2. Choose **OpenShift Update Service** from the list of available Operators, and click **Install**.
   a. Channel **v1** is selected as the **Update Channel** since it is the only channel available in this release.
   b. Select **A specific namespace on the cluster** under **Installation Mode**.
   c. Select a namespace for **Installed Namespace** or accept the recommended namespace **openshift-update-service**.
   d. Select an **Approval Strategy**:
      - The **Automatic** strategy allows Operator Lifecycle Manager (OLM) to automatically update the Operator when a new version is available.
      - The **Manual** strategy requires a cluster administrator to approve the Operator update.
   e. Click **Install**.
3. Verify that the OpenShift Update Service Operator is installed by switching to the **Operators → Installed Operators** page.
4. Ensure that **OpenShift Update Service** is listed in the selected namespace with a **Status** of **Succeeded**.

3.2.2. Installing the OpenShift Update Service Operator by using the CLI

You can use the OpenShift CLI (**oc**) to install the OpenShift Update Service Operator.

Procedure

1. Create a namespace for the OpenShift Update Service Operator:
   a. Create a **Namespace** object YAML file, for example, **update-service-namespace.yaml**, for the OpenShift Update Service Operator:

```
apiVersion: v1
kind: Namespace
metadata:
  name: openshift-update-service
  annotations:
    openshift.io/node-selector: ""
  labels:
    openshift.io/cluster-monitoring: "true" 1
```

   1 Set the **openshift.io/cluster-monitoring** label to enable Operator-recommended cluster monitoring on this namespace.

   b. Create the namespace:

```
$ oc create -f <filename>.yaml
```

   For example:

```
$ oc create -f update-service-namespace.yaml
```

2. Install the OpenShift Update Service Operator by creating the following objects:
   a. Create an **OperatorGroup** object YAML file, for example, **update-service-operator-group.yaml**:

```
apiVersion: operators.coreos.com/v1
kind: OperatorGroup
metadata:
  name: update-service-operator-group
spec:
  targetNamespaces:
  - openshift-update-service
```

   b. Create an **OperatorGroup** object:

```
$ oc -n openshift-update-service create -f <filename>.yaml
```

   For example:

```
$ oc -n openshift-update-service create -f update-service-operator-group.yaml
```

   c. Create a **Subscription** object YAML file, for example, **update-service-subscription.yaml**:

Example Subscription

```
apiVersion: operators.coreos.com/v1alpha1
kind: Subscription
metadata:
  name: update-service-subscription
spec:
  channel: v1
  installPlanApproval: "Automatic"
  source: "redhat-operators" (1)
  sourceNamespace: "openshift-marketplace"
  name: "cincinnati-operator"
```

1. Specify the name of the catalog source that provides the Operator. For clusters that do not use a custom Operator Lifecycle Manager (OLM), specify **redhat-operators**. If your OpenShift Container Platform cluster is installed on a restricted network, also known as a disconnected cluster, specify the name of the **CatalogSource** object created when you configured Operator Lifecycle Manager (OLM).

d. Create the **Subscription** object:

```
$ oc create -f <filename>.yaml
```

For example:

```
$ oc -n openshift-update-service create -f update-service-subscription.yaml
```

The OpenShift Update Service Operator is installed to the **openshift-update-service** namespace and targets the **openshift-update-service** namespace.

3. Verify the Operator installation:

```
$ oc -n openshift-update-service get clusterserviceversions
```

Example output

```
NAME                         DISPLAY                VERSION   REPLACES   PHASE
update-service-operator.v4.6.0   OpenShift Update Service   4.6.0             Succeeded
...
```

If the OpenShift Update Service Operator is listed, the installation was successful. The version number might be different than shown.

3.2.3. Creating the OpenShift Update Service graph data container image

The OpenShift Update Service requires a graph-data container image, from which the OpenShift Update Service retrieves information about channel membership and blocked update edges. Graph data is typically fetched directly from the upgrade graph data repository. In environments where an internet connection is unavailable, loading this information from an init container is another way to make the graph data available to the OpenShift Update Service. The role of the init container is to provide a local copy of the graph data, and during pod initialization, the init container copies the data to a volume that is accessible by the service.

Procedure

1. Create a Dockerfile, for example, **./Dockerfile**, containing the following:

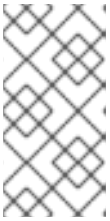
```
FROM registry.access.redhat.com/ubi8/ubi:8.1

RUN curl -L -o cincinnati-graph-data.tar.gz https://github.com/openshift/cincinnati-graph-data/archive/master.tar.gz

CMD exec /bin/bash -c "tar xvzf cincinnati-graph-data.tar.gz -C /var/lib/cincinnati/graph-data/ --strip-components=1"
```

2. Use the docker file created in the above step to build a graph-data container image, for example, **registry.example.com/openshift/graph-data:latest**:

```
$ podman build -f ./Dockerfile -t registry.example.com/openshift/graph-data:latest
```

3. Push the graph-data container image created in the previous step to a repository that is accessible to the OpenShift Update Service, for example, **registry.example.com/openshift/graph-data:latest**:

```
$ podman push registry.example.com/openshift/graph-data:latest
```

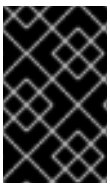


NOTE

To push a graph data image to a local registry in a restricted network, copy the graph-data container image created in the previous step to a repository that is accessible to the OpenShift Update Service. Run **oc image mirror --help** for available options.

3.2.4. Mirroring the OpenShift Container Platform image repository

The OpenShift Update Service requires a locally accessible registry containing update release payloads.



IMPORTANT

To avoid excessive memory usage by the OpenShift Update Service application, it is recommended that you mirror release images to a separate repository, as described in the following procedure.

Prerequisites

- You reviewed and completed the steps from "Mirroring images for a disconnected installation" up to but not including the section entitled **Mirroring the OpenShift Container Platform image repository**.
- You configured a mirror registry to use in your restricted network and can access the certificate and credentials that you configured.
- You downloaded the pull secret from the Red Hat OpenShift Cluster Manager and modified it to include authentication to your mirror repository.

- If you use self-signed certificates that do not set a Subject Alternative Name, you must precede the **oc** commands in this procedure with **GODEBUG=x509ignoreCN=0**. If you do not set this variable, the **oc** commands will fail with the following error:

```
x509: certificate relies on legacy Common Name field, use SANs or temporarily enable
Common Name matching with GODEBUG=x509ignoreCN=0
```

Procedure

Complete the following steps on the mirror host:

1. Review the OpenShift Container Platform downloads page to determine the version of OpenShift Container Platform to which you want to update and determine the corresponding tag on the Repository Tags page.

2. Set the required environment variables:

   a. Export the release version:

   ```
   $ OCP_RELEASE=<release_version>
   ```

   For **<release_version>**, specify the tag that corresponds to the version of OpenShift Container Platform to install, such as **4.6.4**.

   b. Export the local registry name and host port:

   ```
   $ LOCAL_REGISTRY='<local_registry_host_name>:<local_registry_host_port>'
   ```

   For **<local_registry_host_name>**, specify the registry domain name for your mirror repository, and for **<local_registry_host_port>**, specify the port that it serves content on.

   c. Export the local repository name:

   ```
   $ LOCAL_REPOSITORY='<local_repository_name>'
   ```

   For **<local_repository_name>**, specify the name of the repository to create in your registry, such as **ocp4/openshift4**.

   d. Export an additional local repository name to contain the release images:

   ```
   $
   LOCAL_RELEASE_IMAGES_REPOSITORY='<local_release_images_repository_name>'
   ```

   For **<local_release_images_repository_name>**, specify the name of the repository to create in your registry, such as **ocp4/openshift4-release-images**.

   e. Export the name of the repository to mirror:

   ```
   $ PRODUCT_REPO='openshift-release-dev'
   ```

   For a production release, you must specify **openshift-release-dev**.

   f. Export the path to your registry pull secret:

   ```
   $ LOCAL_SECRET_JSON='<path_to_pull_secret>'
   ```

For **<path_to_pull_secret>**, specify the absolute path to and file name of the pull secret for your mirror registry that you created.

g. Export the release mirror:

```
$ RELEASE_NAME="ocp-release"
```

For a production release, you must specify **ocp-release**.

h. Export the type of architecture for your server, such as **x86_64**:

```
$ ARCHITECTURE=<server_architecture>
```

i. Export the path to the directory to host the mirrored images:

```
$ REMOVABLE_MEDIA_PATH=<path> 1
```

1 Specify the full path, including the initial forward slash (/) character.

3. Mirror the version images to the mirror registry:

- If your mirror host does not have internet access, take the following actions:

i. Connect the removable media to a system that is connected to the Internet.

ii. Review the images and configuration manifests to mirror:

```
$ oc adm release mirror -a ${LOCAL_SECRET_JSON}  \
     --from=quay.io/${PRODUCT_REPO}/${RELEASE_NAME}:${OCP_RELEASE}-
${ARCHITECTURE} \
     --to=${LOCAL_REGISTRY}/${LOCAL_REPOSITORY} \
     --to-release-
image=${LOCAL_REGISTRY}/${LOCAL_RELEASE_IMAGES_REPOSITORY}:${OC
P_RELEASE}-${ARCHITECTURE} --dry-run
```

iii. Mirror the images to a directory on the removable media:

```
$ oc adm release mirror -a ${LOCAL_SECRET_JSON} --to-
dir=${REMOVABLE_MEDIA_PATH}/mirror
quay.io/${PRODUCT_REPO}/${RELEASE_NAME}:${OCP_RELEASE}-
${ARCHITECTURE}
```

iv. Take the media to the restricted network environment and upload the images to the local container registry:

```
$ oc image mirror -a ${LOCAL_SECRET_JSON} --from-
dir=${REMOVABLE_MEDIA_PATH}/mirror
"file://openshift/release:${OCP_RELEASE}*"
${LOCAL_REGISTRY}/${LOCAL_REPOSITORY} 1
```

1 For **REMOVABLE_MEDIA_PATH**, you must use the path where you mounted the removable media.

v. Mirror the release image to a separate repository:

```
$ oc image mirror -a ${LOCAL_SECRET_JSON}
${LOCAL_REGISTRY}/${LOCAL_REPOSITORY}:${OCP_RELEASE}-
${ARCHITECTURE}
${LOCAL_REGISTRY}/${LOCAL_RELEASE_IMAGES_REPOSITORY}:${OCP_REL
EASE}-${ARCHITECTURE}
```

- If the local container registry is connected to the mirror host, push the release images directly to the local registry:

```
$ oc adm release mirror -a ${LOCAL_SECRET_JSON}  \
    --from=quay.io/${PRODUCT_REPO}/${RELEASE_NAME}:${OCP_RELEASE}-
${ARCHITECTURE} \
    --to=${LOCAL_REGISTRY}/${LOCAL_REPOSITORY} \
    --to-release-
image=${LOCAL_REGISTRY}/${LOCAL_RELEASE_IMAGES_REPOSITORY}:${OCP_R
ELEASE}-${ARCHITECTURE}
```

3.3. CREATING AN OPENSHIFT UPDATE SERVICE APPLICATION

You can create an OpenShift Update Service application by using the OpenShift Container Platform web console or CLI.

3.3.1. Creating an OpenShift Update Service application by using the web console

You can use the OpenShift Container Platform web console to create an OpenShift Update Service application by using the OpenShift Update Service Operator.

Prerequisites

- The OpenShift Update Service Operator has been installed.
- The OpenShift Update Service graph-data container image has been created and pushed to a repository that is accessible to the OpenShift Update Service.
- The current release and update target releases have been mirrored to a locally accessible registry.

Procedure

1. In the web console, click **Operators → Installed Operators**.
2. Choose **OpenShift Update Service** from the list of installed Operators.
3. Click the **Update Service** tab.
4. Click **Create UpdateService**.
5. Enter a name in the **Name** field, for example, **service**.
6. Enter the local pullspec in the **Graph Data Image** field to the graph-data container image created in "Creating the OpenShift Update Service graph data container image", for example, **registry.example.com/openshift/graph-data:latest**.

7. In the **Releases** field, enter the local registry and repository created to contain the release images in "Mirroring the OpenShift Container Platform image repository", for example, **registry.example.com/ocp4/openshift4-release-images**.

8. Enter **2** in the **Replicas** field.

9. Click **Create** to create the OpenShift Update Service application.

10. Verify the OpenShift Update Service application:

    - From the **UpdateServices** list in the **Update Service** tab, click the Update Service application just created.
    - Click the **Resources** tab.
    - Verify each application resource has a status of **Created**.

3.3.2. Creating an OpenShift Update Service application by using the CLI

You can use the OpenShift CLI (**oc**) to create an OpenShift Update Service application.

Prerequisites

- The OpenShift Update Service Operator has been installed.
- The OpenShift Update Service graph-data container image has been created and pushed to a repository that is accessible to the OpenShift Update Service.
- The current release and update target releases have been mirrored to a locally accessible registry.

Procedure

1. Configure the OpenShift Update Service target namespace, for example, **openshift-update-service**:

   ```
   $ NAMESPACE=openshift-update-service
   ```

   The namespace must match the **targetNamespaces** value from the operator group.

2. Configure the name of the OpenShift Update Service application, for example, **service**:

   ```
   $ NAME=service
   ```

3. Configure the local registry and repository for the release images as configured in "Mirroring the OpenShift Container Platform image repository", for example, **registry.example.com/ocp4/openshift4-release-images**:

   ```
   $ RELEASE_IMAGES=registry.example.com/ocp4/openshift4-release-images
   ```

4. Set the local pullspec for the graph-data image to the graph-data container image created in "Creating the OpenShift Update Service graph data container image", for example, **registry.example.com/openshift/graph-data:latest**:

   ```
   $ GRAPH_DATA_IMAGE=registry.example.com/openshift/graph-data:latest
   ```

5. Create an OpenShift Update Service application object:

```
$ oc -n "${NAMESPACE}" create -f - <<EOF
apiVersion: updateservice.operator.openshift.io/v1
kind: UpdateService
metadata:
  name: ${NAME}
spec:
  replicas: 2
  releases: ${RELEASE_IMAGES}
  graphDataImage: ${GRAPH_DATA_IMAGE}
EOF
```

6. Verify the OpenShift Update Service application:

   a. Use the following command to obtain a policy engine route:

```
$ while sleep 1; do POLICY_ENGINE_GRAPH_URI="$(oc -n "${NAMESPACE}" get -o
jsonpath='{.status.policyEngineURI}/api/upgrades_info/v1/graph{"\n"}' updateservice
"${NAME}")"; SCHEME="${POLICY_ENGINE_GRAPH_URI%%:*}"; if test "${SCHEME}"
= http -o "${SCHEME}" = https; then break; fi; done
```

   You might need to poll until the command succeeds.

   b. Retrieve a graph from the policy engine. Be sure to specify a valid version for **channel**. For example, if running in OpenShift Container Platform 4.7, use **stable-4.7**:

```
$ while sleep 10; do HTTP_CODE="$(curl --header Accept:application/json --output
/dev/stderr --write-out "%{http_code}" "${POLICY_ENGINE_GRAPH_URI}?
channel=stable-4.6")"; if test "${HTTP_CODE}" -eq 200; then break; fi; echo
"${HTTP_CODE}"; done
```

   This polls until the graph request succeeds; however, the resulting graph might be empty depending on which release images you have mirrored.

NOTE

The policy engine route name must not be more than 63 characters based on RFC-1123. If you see **ReconcileCompleted** status as **false** with the reason **CreateRouteFailed** caused by **host must conform to DNS 1123 naming convention and must be no more than 63 characters**, try creating the Update Service with a shorter name.

3.3.3. Configuring the Cluster Version Operator (CVO)

After the OpenShift Update Service Operator has been installed and the OpenShift Update Service application has been created, the Cluster Version Operator (CVO) can be updated to pull graph data from the locally installed OpenShift Update Service.

Prerequisites

- The OpenShift Update Service Operator has been installed.
- The OpenShift Update Service graph-data container image has been created and pushed to a repository that is accessible to the OpenShift Update Service.

- The current release and update target releases have been mirrored to a locally accessible registry.
- The OpenShift Update Service application has been created.

Procedure

1. Set the OpenShift Update Service target namespace, for example, **openshift-update-service**:

```
$ NAMESPACE=openshift-update-service
```

2. Set the name of the OpenShift Update Service application, for example, **service**:

```
$ NAME=service
```

3. Obtain the policy engine route:

```
$ POLICY_ENGINE_GRAPH_URI="$(oc -n "${NAMESPACE}" get -o
jsonpath='{.status.policyEngineURI}/api/upgrades_info/v1/graph{"\n"}' updateservice
"${NAME}")"
```

4. Set the patch for the pull graph data:

```
$ PATCH="{\"spec\":{\"upstream\":\"${POLICY_ENGINE_GRAPH_URI}\"}}"
```

5. Patch the CVO to use the local OpenShift Update Service:

```
$ oc patch clusterversion version -p $PATCH --type merge
```

NOTE

See Enabling the cluster-wide proxy to configure the CA to trust the update server.

3.4. DELETING AN OPENSHIFT UPDATE SERVICE APPLICATION

You can delete an OpenShift Update Service application by using the OpenShift Container Platform web console or CLI.

3.4.1. Deleting an OpenShift Update Service application by using the web console

You can use the OpenShift Container Platform web console to delete an OpenShift Update Service application by using the OpenShift Update Service Operator.

Prerequisites

- The OpenShift Update Service Operator has been installed.

Procedure

1. In the web console, click **Operators → Installed Operators**.
2. Choose **OpenShift Update Service** from the list of installed Operators.

3. Click the **Update Service** tab.
4. From the list of installed OpenShift Update Service applications, select the application to be deleted and then click **Delete UpdateService**.
5. From the **Delete UpdateService?** confirmation dialog, click **Delete** to confirm the deletion.

3.4.2. Deleting an OpenShift Update Service application by using the CLI

You can use the OpenShift CLI (**oc**) to delete an OpenShift Update Service application.

Procedure

1. Get the OpenShift Update Service application name using the namespace the OpenShift Update Service application was created in, for example, **openshift-update-service**:

```
$ oc get updateservice -n openshift-update-service
```

Example output

```
NAME      AGE
service   6s
```

2. Delete the OpenShift Update Service application using the **NAME** value from the previous step and the namespace the OpenShift Update Service application was created in, for example, **openshift-update-service**:

```
$ oc delete updateservice service -n openshift-update-service
```

Example output

```
updateservice.updateservice.operator.openshift.io "service" deleted
```

3.5. UNINSTALLING THE OPENSHIFT UPDATE SERVICE OPERATOR

To uninstall the OpenShift Update Service, you must first delete all OpenShift Update Service applications by using the OpenShift Container Platform web console or CLI.

3.5.1. Uninstalling the OpenShift Update Service Operator by using the web console

You can use the OpenShift Container Platform web console to uninstall the OpenShift Update Service Operator.

Prerequisites

- All OpenShift Update Service applications have been deleted.

Procedure

1. In the web console, click **Operators → Installed Operators**.

2. Select **OpenShift Update Service** from the list of installed Operators and click **Uninstall Operator**.

3. From the **Uninstall Operator?** confirmation dialog, click **Uninstall** to confirm the uninstallation.

3.5.2. Uninstalling the OpenShift Update Service Operator by using the CLI

You can use the OpenShift CLI (**oc**) to uninstall the OpenShift Update Service Operator.

Prerequisites

- All OpenShift Update Service applications have been deleted.

Procedure

1. Change to the project containing the OpenShift Update Service Operator, for example, **openshift-update-service**:

```
$ oc project openshift-update-service
```

Example output

```
Now using project "openshift-update-service" on server "https://example.com:6443".
```

2. Get the name of the OpenShift Update Service Operator operator group:

```
$ oc get operatorgroup
```

Example output

```
NAME                              AGE
openshift-update-service-fprx2   4m41s
```

3. Delete the operator group, for example, **openshift-update-service-fprx2**:

```
$ oc delete operatorgroup openshift-update-service-fprx2
```

Example output

```
operatorgroup.operators.coreos.com "openshift-update-service-fprx2" deleted
```

4. Get the name of the OpenShift Update Service Operator subscription:

```
$ oc get subscription
```

Example output

```
NAME                        PACKAGE                     SOURCE                        CHANNEL
update-service-operator   update-service-operator   updateservice-index-catalog   v1
```

5. Using the **Name** value from the previous step, check the current version of the subscribed OpenShift Update Service Operator in the **currentCSV** field:

```
$ oc get subscription update-service-operator -o yaml | grep " currentCSV"
```

Example output

```
  currentCSV: update-service-operator.v0.0.1
```

6. Delete the subscription, for example, **update-service-operator**:

```
$ oc delete subscription update-service-operator
```

Example output

```
subscription.operators.coreos.com "update-service-operator" deleted
```

7. Delete the CSV for the OpenShift Update Service Operator using the **currentCSV** value from the previous step:

```
$ oc delete clusterserviceversion update-service-operator.v0.0.1
```

Example output

```
clusterserviceversion.operators.coreos.com "update-service-operator.v0.0.1" deleted
```

CHAPTER 4. UNDERSTANDING UPGRADE CHANNELS AND RELEASES

In OpenShift Container Platform 4.1, Red Hat introduced the concept of channels for recommending the appropriate release versions for cluster updates. By controlling the pace of updates, these upgrade channels allow you to choose an update strategy. Upgrade channels are tied to a minor version of OpenShift Container Platform. For instance, OpenShift Container Platform 4.7 upgrade channels recommend updates to 4.7 and updates within 4.7. They also recommend updates within 4.6 and from 4.6 to 4.7, to allow clusters on 4.6 to eventually update to 4.7. They do not recommend updates to 4.8 or later releases. This strategy ensures that administrators explicitly decide to update to the next minor version of OpenShift Container Platform.

Upgrade channels control only release selection and do not impact the version of the cluster that you install; the **openshift-install** binary file for a specific version of OpenShift Container Platform always installs that version.

OpenShift Container Platform 4.7 offers the following upgrade channels:

- **candidate-4.7**
- **fast-4.7**
- **stable-4.7**
- **eus-4.y** (only when running an even-numbered 4.y cluster release, like 4.6)

WARNING

Red Hat recommends upgrading to versions suggested by Openshift Update Service only. For minor version update, versions must be contiguous. Red Hat does not test updates to noncontiguous versions and cannot guarantee compatibility with earlier versions.

4.1. UPGRADE CHANNELS AND RELEASE PATHS

Cluster administrators can configure the upgrade channel from the web console.

4.1.1. candidate-4.7 channel

The **candidate-4.7** channel contains candidate builds for a z-stream (4.7.z) and previous minor version releases. Release candidates contain all the features of the product but are not supported. Use release candidate versions to test feature acceptance and assist in qualifying the next version of OpenShift Container Platform. A release candidate is any build that is available in the candidate channel, including ones that do not contain a pre-release version such as **-rc** in their names. After a version is available in the candidate channel, it goes through more quality checks. If it meets the quality standard, it is promoted to the **fast-4.7** or **stable-4.7** channels. Because of this strategy, if a specific release is available in both the **candidate-4.7** channel and in the **fast-4.7** or **stable-4.7** channels, it is a Red Hat-supported version. The **candidate-4.7** channel can include release versions from which there are no recommended updates in any channel.

You can use the **candidate-4.7** channel to update from a previous minor version of OpenShift Container Platform.

NOTE

Release candidates differ from the nightly builds. Nightly builds are available for early access to features, but updating to or from nightly builds is neither recommended nor supported. Nightly builds are not available in any upgrade channel. You can reference the OpenShift Container Platform release statuses for more build information.

4.1.2. fast-4.7 channel

The **fast-4.7** channel is updated with new and previous minor versions of 4.7 as soon as Red Hat declares the given version as a general availability release. As such, these releases are fully supported, are production quality, and have performed well while available as a release candidate in the **candidate-4.7** channel from where they were promoted. Some time after a release appears in the **fast-4.7** channel, it is added to the **stable-4.7** channel. Releases never appear in the **stable-4.7** channel before they appear in the **fast-4.7** channel.

You can use the **fast-4.7** channel to update from a previous minor version of OpenShift Container Platform.

4.1.3. stable-4.7 channel

While the **fast-4.7** channel contains releases as soon as their errata are published, releases are added to the **stable-4.7** channel after a delay. During this delay, data is collected from Red Hat SRE teams, Red Hat support services, and pre-production and production environments that participate in connected customer program about the stability of the release. You can use the **stable-4.7** channel to update from a previous minor version of OpenShift Container Platform.

4.1.4. eus-4.y channel

In addition to the stable channel, all even-numbered minor versions of OpenShift Container Platform offer an Extended Update Support (EUS). These EUS versions extend the Full and Maintenance support phases for customers with Standard and Premium Subscriptions to 18 months.

Although there is no difference between **stable-4.y** and **eus-4.y** channels until OpenShift Container Platform 4.y transitions to the EUS phase, you can switch to the **eus-4.y** channel as soon as it becomes available.

When updates to the next EUS channel are offered, you can switch to the next EUS channel and update until you have reached the next EUS version.

This update process does not apply for the **eus-4.6** channel.

NOTE

Both standard and non-EUS subscribers can access all EUS repositories and necessary RPMs (**rhel-*-eus-rpms**) to be able to support critical purposes such as debugging and building drivers.

4.1.5. Upgrade version paths

OpenShift Container Platform maintains an upgrade recommendation service that understands the version of OpenShift Container Platform you have installed as well as the path to take within the channel you choose to get you to the next release.

You can imagine seeing the following in the **fast-4.7** channel:

- 4.7.0
- 4.7.1
- 4.7.3
- 4.7.4

The service recommends only update that have been tested and have no serious issues. It will not suggest updating to a version of OpenShift Container Platform that contains known vulnerabilities. For example, if your cluster is on 4.7.1 and OpenShift Container Platform suggests 4.7.4, then it is safe for you to update from 4.7.1 to 4.7.4. Do not rely on consecutive patch numbers. In this example, 4.7.2 is not and never was available in the channel.

Update stability depends on your channel. The presence of an update recommendation in the **candidate-4.7** channel does not imply that the update is supported. It means that no serious issues have been found with the update yet, but there might not be significant traffic through the update to suggest stability. The presence of an update recommendation in the **fast-4.7** or **stable-4.7** channels at any point is a declaration that the update is supported. While releases will never be removed from a channel, update recommendations that exhibit serious issues will be removed from all channels. Updates initiated after the update recommendation has been removed are still supported.

Red Hat will eventually provide supported update paths from any supported release in the **fast-4.7** or **stable-4.7** channels to the latest release in 4.7.z, although there can be delays while safe paths away from troubled releases are constructed and verified.

4.1.6. Fast and stable channel use and strategies

The **fast-4.7** and **stable-4.7** channels present a choice between receiving general availability releases as soon as they are available or allowing Red Hat to control the rollout of those updates. If issues are detected during rollout or at a later time, updates to that version might be blocked in both the **fast-4.7** and **stable-4.7** channels, and a new version might be introduced that becomes the new preferred update target.

Customers can improve this process by configuring pre-production systems on the **fast-4.7** channel, configuring production systems on the **stable-4.7** channel, and participating in the Red Hat connected customer program. Red Hat uses this program to observe the impact of updates on your specific hardware and software configurations. Future releases might improve or alter the pace at which updates move from the **fast-4.7** to the **stable-4.7** channel.

4.1.7. Restricted network clusters

If you manage the container images for your OpenShift Container Platform clusters yourself, you must consult the Red Hat errata that is associated with product releases and note any comments that impact updates. During update, the user interface might warn you about switching between these versions, so you must ensure that you selected an appropriate version before you bypass those warnings.

4.1.8. Switching between channels

A channel can be switched from the web console or through the **patch** command:

```
$ oc patch clusterversion version --type json -p '[{"op": "add", "path": "/spec/channel", "value": "
<channel>"}]'
```

The web console will display an alert if you switch to a channel that does not include the current release. The web console does not recommend any updates while on a channel without the current release. You can return to the original channel at any point, however.

Changing your channel might impact the supportability of your cluster. The following conditions might apply:

- Your cluster is still supported if you change from the **stable-4.7** channel to the **fast-4.7** channel.
- You can switch to the **candidate-4.7** channel but, some releases for this channel might be unsupported.
- You can switch from the **candidate-4.7** channel to the **fast-4.7** channel if your current release is a general availability release.
- You can always switch from the **fast-4.7** channel to the **stable-4.7** channel. There is a possible delay of up to a day for the release to be promoted to **stable-4.7** if the current release was recently promoted.

CHAPTER 5. UPDATING A CLUSTER USING THE WEB CONSOLE

You can update, or upgrade, an OpenShift Container Platform cluster by using the web console. The following steps update a cluster within a minor version. You can use the same instructions for updating a cluster between minor versions.

NOTE

Because of the difficulty of changing update channels by using **oc**, use the web console to change the update channel. It is recommended to complete the update process within the web console. You can follow the steps in Updating a cluster using the CLI to complete the update after you change to a 4.7 channel.

5.1. PREREQUISITES

- Have access to the cluster as a user with **admin** privileges. See Using RBAC to define and apply permissions.
- Have a recent etcd backup in case your update fails and you must restore your cluster to a previous state.
- Ensure all Operators previously installed through Operator Lifecycle Manager (OLM) are updated to their latest version in their latest channel. Updating the Operators ensures they have a valid upgrade path when the default OperatorHub catalogs switch from the current minor version to the next during a cluster update. See Upgrading installed Operators for more information.
- Ensure that all machine config pools (MCPs) are running and not paused. Nodes associated with a paused MCP are skipped during the update process. You can pause the MCPs if you are performing a canary rollout update strategy.
- If your cluster uses manually maintained credentials, ensure that the Cloud Credential Operator (CCO) is in an upgradeable state. For more information, see *Upgrading clusters with manually maintained credentials* for AWS, Azure, or GCP.

IMPORTANT

- When an update is failing to complete, the Cluster Version Operator (CVO) reports the status of any blocking components while attempting to reconcile the update. Rolling your cluster back to a previous version is not supported. If your update is failing to complete, contact Red Hat support.
- Using the **unsupportedConfigOverrides** section to modify the configuration of an Operator is unsupported and might block cluster updates. You must remove this setting before you can update your cluster.

Additional resources

- Support policy for unmanaged Operators

5.2. PERFORMING A CANARY ROLLOUT UPDATE

In some specific use cases, you might want a more controlled update process where you do not want specific nodes updated concurrently with the rest of the cluster. These use cases include, but are not limited to:

- You have mission-critical applications that you do not want unavailable during the update. You can slowly test the applications on your nodes in small batches after the update.
- You have a small maintenance window that does not allow the time for all nodes to be updated, or you have multiple maintenance windows.

The rolling update process is **not** a typical update workflow. With larger clusters, it can be a time-consuming process that requires you execute multiple commands. This complexity can result in errors that can affect the entire cluster. It is recommended that you carefully consider whether your organization wants to use a rolling update and carefully plan the implementation of the process before you start.

The rolling update process described in this topic involves:

- Creating one or more custom machine config pools (MCPs).
- Labeling each node that you do not want to update immediately to move those nodes to the custom MCPs.
- Pausing those custom MCPs, which prevents updates to those nodes.
- Performing the cluster update.
- Unpausing one custom MCP, which triggers the update on those nodes.
- Testing the applications on those nodes to make sure the applications work as expected on those newly-updated nodes.
- Optionally removing the custom labels from the remaining nodes in small batches and testing the applications on those nodes.

NOTE

Pausing an MCP prevents the Machine Config Operator from applying any configuration changes on the associated nodes. Pausing an MCP also prevents any automatically-rotated certificates from being pushed to the associated nodes, including the automatic CA rotation of the **kube-apiserver-to-kubelet-signer** CA certificate. If the MCP is paused when the **kube-apiserver-to-kubelet-signer** CA certificate expires and the MCO attempts to automatically renew the certificate, the new certificate is created but not applied across the nodes in the respective machine config pool. This causes failure in multiple **oc** commands, including but not limited to **oc debug**, **oc logs**, **oc exec**, and **oc attach**. Pausing an MCP should be done with careful consideration about the **kube-apiserver-to-kubelet-signer** CA certificate expiration and for short periods of time only.

If you want to use the canary rollout update process, see Performing a canary rollout update .

5.3. UPDATING A CLUSTER BY USING THE WEB CONSOLE

If updates are available, you can update your cluster from the web console.

You can find information about available OpenShift Container Platform advisories and updates in the errata section of the Customer Portal.

Prerequisites

- Have access to the web console as a user with **admin** privileges.

Procedure

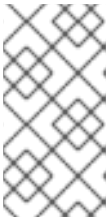
1. From the web console, click **Administration → Cluster Settings** and review the contents of the **Details** tab.
2. For production clusters, ensure that the **Channel** is set to the correct channel for the version that you want to update to, such as **stable-4.7**.

IMPORTANT

For production clusters, you must subscribe to a **stable-*** or **fast-*** channel.

   - If the **Update status** is not **Updates available**, you cannot update your cluster.
   - **Select channel** indicates the cluster version that your cluster is running or is updating to.

3. Select a version to update to, and click **Save**.
   The Input channel **Update status** changes to **Update to <product-version> in progress**, and you can review the progress of the cluster update by watching the progress bars for the Operators and nodes.



NOTE

If you are upgrading your cluster to the next minor version, like version 4.y to 4.(y+1), it is recommended to confirm your nodes are updated before deploying workloads that rely on a new feature. Any pools with worker nodes that are not yet updated are displayed on the **Cluster Settings** page.

4. After the update completes and the Cluster Version Operator refreshes the available updates, check if more updates are available in your current channel.
   - If updates are available, continue to perform updates in the current channel until you can no longer update.
   - If no updates are available, change the **Channel** to the **stable-*** or **fast-*** channel for the next minor version, and update to the version that you want in that channel.

   You might need to perform several intermediate updates until you reach the version that you want.

5.4. CHANGING THE UPDATE SERVER BY USING THE WEB CONSOLE

Changing the update server is optional. If you have an OpenShift Update Service (OSUS) installed and configured locally, you must set the URL for the server as the **upstream** to use the local server during updates.

Procedure

1. Navigate to **Administration → Cluster Settings**, click **version**.

2. Click the **YAML** tab and then edit the **upstream** parameter value:

   Example output

   ```
   ...
   spec:
     clusterID: db93436d-7b05-42cc-b856-43e11ad2d31a
     upstream: '<update-server-url>' (1)
   ...
   ```

   (1) The **<update-server-url>** variable specifies the URL for the update server.

   The default **upstream** is **https://api.openshift.com/api/upgrades_info/v1/graph**.

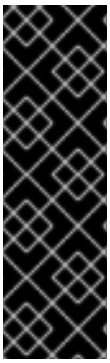
3. Click **Save**.

CHAPTER 6. UPDATING A CLUSTER USING THE CLI

You can update, or upgrade, an OpenShift Container Platform cluster within a minor version by using the OpenShift CLI (**oc**). You can also update a cluster between minor versions by following the same instructions.

6.1. PREREQUISITES

- Have access to the cluster as a user with **admin** privileges. See Using RBAC to define and apply permissions.
- Have a recent etcd backup in case your update fails and you must restore your cluster to a previous state.
- Ensure all Operators previously installed through Operator Lifecycle Manager (OLM) are updated to their latest version in their latest channel. Updating the Operators ensures they have a valid upgrade path when the default OperatorHub catalogs switch from the current minor version to the next during a cluster update. See Upgrading installed Operators for more information.
- Ensure that all machine config pools (MCPs) are running and not paused. Nodes associated with a paused MCP are skipped during the update process. You can pause the MCPs if you are performing a canary rollout update strategy.
- If your cluster uses manually maintained credentials, ensure that the Cloud Credential Operator (CCO) is in an upgradeable state. For more information, see *Upgrading clusters with manually maintained credentials* for AWS, Azure, or GCP.



IMPORTANT

- When an update is failing to complete, the Cluster Version Operator (CVO) reports the status of any blocking components while attempting to reconcile the update. Rolling your cluster back to a previous version is not supported. If your update is failing to complete, contact Red Hat support.
- Using the **unsupportedConfigOverrides** section to modify the configuration of an Operator is unsupported and might block cluster updates. You must remove this setting before you can update your cluster.

Additional resources

- Support policy for unmanaged Operators

6.2. UPDATING A CLUSTER BY USING THE CLI

If updates are available, you can update your cluster by using the OpenShift CLI (**oc**).

You can find information about available OpenShift Container Platform advisories and updates in the errata section of the Customer Portal.

Prerequisites

- Install the OpenShift CLI (**oc**) that matches the version for your updated version.

- Log in to the cluster as user with **cluster-admin** privileges.
- Install the **jq** package.

Procedure

1. Ensure that your cluster is available:

```
$ oc get clusterversion
```

Example output

```
NAME     VERSION   AVAILABLE   PROGRESSING   SINCE   STATUS
version  4.6.9     True        False         158m    Cluster version is 4.6.9
```

2. Review the current update channel information and confirm that your channel is set to **stable-4.7**:

```
$ oc get clusterversion -o json|jq ".items[0].spec"
```

Example output

```
{
  "channel": "stable-4.7",
  "clusterID": "990f7ab8-109b-4c95-8480-2bd1deec55ff"
}
```

IMPORTANT

For production clusters, you must subscribe to a **stable-*** or **fast-*** channel.

3. View the available updates and note the version number of the update that you want to apply:

```
$ oc adm upgrade
```

Example output

```
Cluster version is 4.1.0

Updates:

VERSION IMAGE
4.1.2   quay.io/openshift-release-dev/ocp-release@sha256:9c5f0df8b192a0d7b46cd5f6a4da2289c155fd5302dec7954f8f06c878160b8b
```

4. Apply an update:
   - To update to the latest version:

```
$ oc adm upgrade --to-latest=true 1
```

   - To update to a specific version:

```
$ oc adm upgrade --to=<version> 1
```

1 1 **<version>** is the update version that you obtained from the output of the previous command.

5. Review the status of the Cluster Version Operator:

```
$ oc get clusterversion -o json|jq ".items[0].spec"
```

Example output

```
{
  "channel": "stable-4.7",
  "clusterID": "990f7ab8-109b-4c95-8480-2bd1deec55ff",
  "desiredUpdate": {
    "force": false,
    "image": "quay.io/openshift-release-dev/ocp-
release@sha256:9c5f0df8b192a0d7b46cd5f6a4da2289c155fd5302dec7954f8f06c878160b8b",

    "version": "4.7.0" 1
  }
}
```

1 If the **version** number in the **desiredUpdate** stanza matches the value that you specified, the update is in progress.

6. Review the cluster version status history to monitor the status of the update. It might take some time for all the objects to finish updating.

```
$ oc get clusterversion -o json|jq ".items[0].status.history"
```

Example output

```
[
  {
    "completionTime": null,
    "image": "quay.io/openshift-release-dev/ocp-
release@sha256:b8fa13e09d869089fc5957c32b02b7d3792a0b6f36693432acc0409615ab23b
7",
    "startedTime": "2021-01-28T20:30:50Z",
    "state": "Partial",
    "verified": true,
    "version": "4.7.0"
  },
  {
    "completionTime": "2021-01-28T20:30:50Z",
    "image": "quay.io/openshift-release-dev/ocp-
release@sha256:b8fa13e09d869089fc5957c32b02b7d3792a0b6f36693432acc0409615ab23b
7",
    "startedTime": "2021-01-28T17:38:10Z",
    "state": "Completed",
    "verified": false,
```

```
    "version": "4.7.0"
  }
]
```

The history contains a list of the most recent versions applied to the cluster. This value is updated when the CVO applies an update. The list is ordered by date, where the newest update is first in the list. Updates in the history have state **Completed** if the rollout completed and **Partial** if the update failed or did not complete.

7. After the update completes, you can confirm that the cluster version has updated to the new version:

```
$ oc get clusterversion
```

Example output

```
NAME      VERSION     AVAILABLE   PROGRESSING   SINCE     STATUS
version   4.7.0       True        False         2m        Cluster version is 4.7.0
```

8. If you are upgrading your cluster to the next minor version, like version 4.y to 4.(y+1), it is recommended to confirm your nodes are upgraded before deploying workloads that rely on a new feature:

```
$ oc get nodes
```

Example output

```
NAME                         STATUS   ROLES    AGE   VERSION
ip-10-0-168-251.ec2.internal   Ready    master   82m   v1.20.0
ip-10-0-170-223.ec2.internal   Ready    master   82m   v1.20.0
ip-10-0-179-95.ec2.internal    Ready    worker   70m   v1.20.0
ip-10-0-182-134.ec2.internal   Ready    worker   70m   v1.20.0
ip-10-0-211-16.ec2.internal    Ready    master   82m   v1.20.0
ip-10-0-250-100.ec2.internal   Ready    worker   69m   v1.20.0
```

6.3. CHANGING THE UPDATE SERVER BY USING THE CLI

Changing the update server is optional. If you have an OpenShift Update Service (OSUS) installed and configured locally, you must set the URL for the server as the **upstream** to use the local server during updates. The default value for **upstream** is **https://api.openshift.com/api/upgrades_info/v1/graph**.

Procedure

- Change the **upstream** parameter value in the cluster version:

```
$ oc patch clusterversion/version --patch '{"spec":{"upstream":"<update-server-url>"}}' --type=merge
```

The **<update-server-url>** variable specifies the URL for the update server.

Example output

```
clusterversion.config.openshift.io/version patched
```

CHAPTER 7. PERFORMING A CANARY ROLLOUT UPDATE

There might be some scenarios where you want a more controlled rollout of an update to the worker nodes in order to ensure that mission-critical applications stay available during the whole update, even if the update process causes your applications to fail. Depending on your organizational needs, you might want to update a small subset of worker nodes, evaluate cluster and workload health over a period of time, then update the remaining nodes. This is commonly referred to as a *canary* update. Or, you might also want to fit worker node updates, which often require a host reboot, into smaller defined maintenance windows when it is not possible to take a large maintenance window to update the entire cluster at one time.

In these scenarios, you can create multiple custom machine config pools (MCPs) to prevent certain worker nodes from updating when you update the cluster. After the rest of the cluster is updated, you can update those worker nodes in batches at appropriate times.

For example, if you have a cluster with 100 nodes with 10% excess capacity, maintenance windows that must not exceed 4 hours, and you know that it takes no longer than 8 minutes to drain and reboot a worker node, you can leverage MCPs to meet your goals. For example, you could define four MCPs, named **workerpool-canary**, **workerpool-A**, **workerpool-B**, and **workerpool-C**, with 10, 30, 30, and 30 nodes respectively.

During your first maintenance window, you would pause the MCP for **workerpool-A**, **workerpool-B**, and **workerpool-C**, then initiate the cluster update. This updates components that run on top of OpenShift Container Platform and the 10 nodes which are members of the **workerpool-canary** MCP, because that pool was not paused. The other three MCPs are not updated, because they were paused. If for some reason, you determine that your cluster or workload health was negatively affected by the **workerpool-canary** update, you would then cordon and drain all nodes in that pool while still maintaining sufficient capacity until you have diagnosed the problem. When everything is working as expected, you would then evaluate the cluster and workload health before deciding to unpause, and thus update, **workerpool-A**, **workerpool-B**, and **workerpool-C** in succession during each additional maintenance window.

While managing worker node updates using custom MCPs provides flexibility, it can be a time-consuming process that requires you execute multiple commands. This complexity can result in errors that can affect the entire cluster. It is recommended that you carefully consider your organizational needs and carefully plan the implemention of the process before you start.

NOTE

It is not recommended to update the MCPs to different OpenShift Container Platform versions. For example, do not update one MCP from 4.y.10 to 4.y.11 and another to 4.y.12. This scenario has not been tested and might result in an undefined cluster state.

IMPORTANT

Pausing a machine config pool prevents the Machine Config Operator from applying any configuration changes on the associated nodes. Pausing an MCP also prevents any automatically-rotated certificates from being pushed to the associated nodes, including the automatic CA rotation of the **kube-apiserver-to-kubelet-signer** CA certificate. If the MCP is paused when the **kube-apiserver-to-kubelet-signer** CA certificate expires and the MCO attempts to automatially renew the certificate, the new certificate is created but not applied across the nodes in the respective machine config pool. This causes failure in multiple **oc** commands, including but not limited to **oc debug**, **oc logs**, **oc exec**, and **oc attach**. Pausing an MCP should be done with careful consideration about the **kube-apiserver-to-kubelet-signer** CA certificate expiration and for short periods of time only.

7.1. ABOUT THE CANARY ROLLOUT UPDATE PROCESS AND MCPS

In OpenShift Container Platform, nodes are not considered individually. Nodes are grouped into machine config pools (MCP). There are two MCPs in a default OpenShift Container Platform cluster: one for the control plane nodes and one for the worker nodes. An OpenShift Container Platform update affects all MCPs concurrently.

During the update, the Machine Config Operator (MCO) drains and cordons all nodes within a MCP up to the specified **maxUnavailable** number of nodes (if specified), by default **1**. Draining and cordoning a node deschedules all pods on the node and marks the node as unschedulable. After the node is drained, the Machine Config Daemon applies a new machine configuration, which can include updating the operating system (OS). Updating the OS requires the host to reboot.

To prevent specific nodes from being updated, and thus, not drained, cordoned, and updated, you can create custom MCPs. Then, pause those MCPs to ensure that the nodes associated with those MCPs are not updated. The MCO does not update any paused MCPs. You can create one or more custom MCPs, which can give you more control over the sequence in which you update those nodes. After you update the nodes in the first MCP, you can verify the application compatibility, and then update the rest of the nodes gradually to the new version.

NOTE

To ensure the stability of the control plane, creating a custom MCP from the control plane nodes (also known as the master nodes) is not supported. The Machine Config Operator (MCO) ignores any custom MCP created for the control plane nodes.

You should give careful consideration to the number of MCPs you create and the number of nodes in each MCP, based on your workload deployment topology. For example, If you need to fit updates into specific maintenance windows, you need to know how many nodes that OpenShift Container Platform can update within a window. This number is dependent on your unique cluster and workload characteristics.

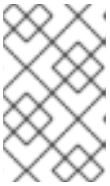
Also, you need to consider how much extra capacity you have available in your cluster. For example, in the case where your applications fail to work as expected on the updated nodes, you can cordon and drain those nodes in the pool, which moves the application pods to other nodes. You need to consider how much extra capacity you have available in order to determine the number of custom MCPs you need and how many nodes are in each MCP. For example, if you use two custom MCPs and 50% of your nodes are in each pool, you need to determine if running 50% of your nodes would provide sufficient quality-of-service (QoS) for your applications.

You can use this update process with all documented OpenShift Container Platform update processes. However, the process does not work with Red Hat Enterprise Linux (RHEL) machines, which are updated using Ansible playbooks.

7.2. ABOUT PERFORMING A CANARY ROLLOUT UPDATE

This topic describes the general workflow of this canary rollout update process. The steps to perform each task in the workflow are described in the following sections.

1. Create MCPs based on the worker pool. The number of nodes in each MCP depends on a few factors, such as your maintenance window duration for each MCP, and the amount of reserve capacity, meaning extra worker nodes, available in your cluster.



NOTE

You can change the **maxUnavailable** setting in an MCP to specify the percentage or the number of machines that can be updating at any given time. The default is 1.

2. Add a node selector to the custom MCPs. For each node that you do not want to update simultaneously with the rest of the cluster, add a matching label to the nodes. This label associates the node to the MCP.

NOTE

Do not remove the default worker label from the nodes. The nodes **must** have a role label to function properly in the cluster.

3. Pause the MCPs you do not want to update as part of the update process.

NOTE

Pausing the MCP also pauses the kube-apiserver-to-kubelet-signer automatic CA certificates rotation. New CA certificates are generated at 292 days from the installation date and old certificates are removed 365 days from the installation date. See the Understand CA cert auto renewal in Red Hat OpenShift 4 to find out how much time you have before the next automatic CA certificate rotation. Make sure the pools are unpaused when the CA cert rotation happens. If the MCPs are paused, the cert rotation does not happen, which causes the cluster to become degraded and causes failure in multiple **oc** commands, including but not limited to **oc debug**, **oc logs**, **oc exec**, and **oc attach**.

4. Perform the cluster update. The update process updates the MCPs that are not paused, including the control plane nodes (also known as the master nodes).

5. Test the applications on the updated nodes to ensure they are working as expected.

6. Unpause the remaining MCPs one-by-one and test the applications on those nodes until all worker nodes are updated. Unpausing an MCP starts the update process for the nodes associated with that MCP. You can check the progress of the update from the web console by clicking **Administration → Cluster settings**. Or, use the **oc get machineconfigpools** CLI command.

7. Optionally, remove the custom label from updated nodes and delete the custom MCPs.

7.3. CREATING MACHINE CONFIG POOLS TO PERFORM A CANARY ROLLOUT UPDATE

The first task in performing this canary rollout update is to create one or more machine config pools (MCP).

1. Create an MCP from a worker node.

   a. List the worker nodes in your cluster.

```
$ oc get -l 'node-role.kubernetes.io/master!=' -o 'jsonpath={range .items[*]}
{.metadata.name}{"\n"}{end}' nodes
```

-

Example output

```
ci-ln-pwnll6b-f76d1-s8t9n-worker-a-s75z4
ci-ln-pwnll6b-f76d1-s8t9n-worker-b-dglj2
ci-ln-pwnll6b-f76d1-s8t9n-worker-c-lldbm
```

b. For the nodes you want to delay, add a custom label to the node:

```
$ oc label node <node name> node-role.kubernetes.io/<custom-label>=
```

For example:

```
$ oc label node ci-ln-0qv1yp2-f76d1-kl2tq-worker-a-j2ssz node-
role.kubernetes.io/workerpool-canary=
```

Example output

```
node/ci-ln-gtrwm8t-f76d1-spbl7-worker-a-xk76k labeled
```

c. Create the new MCP:

```
apiVersion: machineconfiguration.openshift.io/v1
kind: MachineConfigPool
metadata:
  name: workerpool-canary (1)
spec:
  machineConfigSelector:
    matchExpressions: (2)
      - {
        key: machineconfiguration.openshift.io/role,
        operator: In,
        values: [worker,workerpool-canary]
       }
  nodeSelector:
    matchLabels:
      node-role.kubernetes.io/workerpool-canary: "" (3)
```

(1) Specify a name for the MCP.

(2) Specify the **worker** and custom MCP name.

(3) Specify the custom label you added to the nodes that you want in this pool.

```
$ oc create -f <file_name>
```

Example output

```
machineconfigpool.machineconfiguration.openshift.io/workerpool-canary created
```

d. View the list of MCPs in the cluster and their current state:

-

```
$ oc get machineconfigpool
```

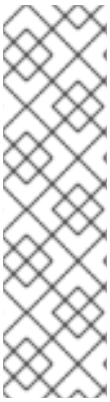
Example output

```
NAME              CONFIG                                             UPDATED   UPDATING
DEGRADED   MACHINECOUNT   READYMACHINECOUNT
UPDATEDMACHINECOUNT   DEGRADEDMACHINECOUNT   AGE
master            rendered-master-b0bb90c4921860f2a5d8a2f8137c1867   True
False      False      3           3                 3                   0                    97m
workerpool-canary rendered-workerpool-canary-87ba3dec1ad78cb6aecebf7fbb476a36
True       False      False      1           1                 1                   0                    2m42s
worker            rendered-worker-87ba3dec1ad78cb6aecebf7fbb476a36   True
False      False      2           2                 2                   0                    97m
```

The new machine config pool, **workerpool-canary**, is created and the number of nodes to which you added the custom label are shown in the machine counts. The worker MCP machine counts are reduced by the same number. It can take several minutes to update the machine counts. In this example, one node was moved from the **worker** MCP to the **workerpool-canary** MCP.

7.4. PAUSING THE MACHINE CONFIG POOLS

In this canary rollout update process, after you label the nodes that you do not want to update with the rest of your OpenShift Container Platform cluster and create the machine config pools (MCPs), you pause those MCPs. Pausing an MCP prevents the Machine Config Operator (MCO) from updating the nodes associated with that MCP.



NOTE

Pausing the MCP also pauses the kube-apiserver-to-kubelet-signer automatic CA certificates rotation. New CA certificates are generated at 292 days from the installation date and old certificates are removed 365 days from the installation date. See the Understand CA cert auto renewal in Red Hat OpenShift 4 to find out how much time you have before the next automatic CA certificate rotation. Make sure the pools are unpaused when the CA cert rotation happens. If the MCPs are paused, the cert rotation does not happen, which causes the cluster to become degraded and causes failure in multiple **oc** commands, including but not limited to **oc debug**, **oc logs**, **oc exec**, and **oc attach**.

To pause an MCP:

1. Patch the MCP that you want paused:

```
$ oc patch mcp/<mcp_name> --patch '{"spec":{"paused":true}}' --type=merge
```

For example:

```
$  oc patch mcp/workerpool-canary --patch '{"spec":{"paused":true}}' --type=merge
```

Example output

```
machineconfigpool.machineconfiguration.openshift.io/workerpool-canary patched
```

7.5. PERFORMING THE CLUSTER UPDATE

When the MCPs enter ready state, you can peform the cluster update. See one of the following update methods, as appropriate for your cluster:

- Updating a cluster using the web console
- Updating a cluster using the CLI

After the update is complete, you can start to unpause the MCPs one-by-one.

7.6. UNPAUSING THE MACHINE CONFIG POOLS

In this canary rollout update process, after the OpenShift Container Platform update is complete, unpause your custom MCPs one-by-one. Unpausing an MCP allows the Machine Config Operator (MCO) to update the nodes associated with that MCP.

To unpause an MCP:

1. Patch the MCP that you want to unpause:

   ```
   $ oc patch mcp/<mcp_name> --patch '{"spec":{"paused":false}}' --type=merge
   ```

   For example:

   ```
   $  oc patch mcp/workerpool-canary --patch '{"spec":{"paused":false}}' --type=merge
   ```

   Example output

   ```
   machineconfigpool.machineconfiguration.openshift.io/workerpool-canary patched
   ```

   You can check the progress of the update by using the **oc get machineconfigpools** command.

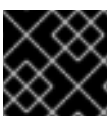
2. Test your applications on the updated nodes to ensure that they are working as expected.
3. Unpause any other paused MCPs one-by-one and verify that your applications work.

7.6.1. In case of application failure

In case of a failure, such as your applications not working on the updated nodes, you can cordon and drain the nodes in the pool, which moves the application pods to other nodes to help maintain the quality-of-service for the applications. This first MCP should be no larger than the excess capacity.

7.7. MOVING A NODE TO THE ORIGINAL MACHINE CONFIG POOL

In this canary rollout update process, after you have unpaused a custom machine config pool (MCP) and verified that the applications on the nodes associated with that MCP are working as expected, you should move the node back to its original MCP by removing the custom label you added to the node.



IMPORTANT

A node must have a role to be properly functioning in the cluster.

To move a node to its original MCP:

1. Remove the custom label from the node.

```
$ oc label node <node_name> node-role.kubernetes.io/<custom-label>-
```

For example:

```
$ oc label node ci-ln-0qv1yp2-f76d1-kl2tq-worker-a-j2ssz node-
role.kubernetes.io/workerpool-canary-
```

Example output

```
node/ci-ln-0qv1yp2-f76d1-kl2tq-worker-a-j2ssz labeled
```

The MCO moves the nodes back to the original MCP and reconciles the node to the MCP configuration.

2. View the list of MCPs in the cluster and their current state:

```
$oc get mcp
```

```
NAME              CONFIG                                        UPDATED   UPDATING
DEGRADED   MACHINECOUNT   READYMACHINECOUNT   UPDATEDMACHINECOUNT
DEGRADEDMACHINECOUNT   AGE
master            rendered-master-1203f157d053fd987c7cbd91e3fbc0ed        True      False
False      3            3                 3                   0                  61m
workerpool-canary   rendered-mcp-noupdate-5ad4791166c468f3a35cd16e734c9028   True
False      False      0            0                 0                   0                  21m
worker            rendered-worker-5ad4791166c468f3a35cd16e734c9028        True      False
False      3            3                 3                   0                  61m
```

The node is removed from the custom MCP and moved back to the original MCP. It can take several minutes to update the machine counts. In this example, one node was moved from the removed **workerpool-canary** MCP to the `worker`MCP.

3. Optional: Delete the custom MCP:

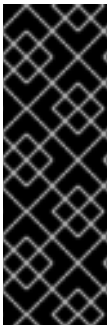
```
$ oc delete mcp <mcp_name>
```

CHAPTER 8. UPDATING A CLUSTER THAT INCLUDES RHEL COMPUTE MACHINES

You can update, or upgrade, an OpenShift Container Platform cluster. If your cluster contains Red Hat Enterprise Linux (RHEL) machines, you must perform more steps to update those machines.

8.1. PREREQUISITES

- Have access to the cluster as a user with **admin** privileges. See Using RBAC to define and apply permissions.
- Have a recent etcd backup in case your update fails and you must restore your cluster to a previous state.
- If your cluster uses manually maintained credentials, ensure that the Cloud Credential Operator (CCO) is in an upgradeable state. For more information, see *Upgrading clusters with manually maintained credentials* for AWS, Azure, or GCP.



IMPORTANT

If you are running cluster monitoring with an attached PVC for Prometheus, you might experience OOM kills during cluster update. When persistent storage is in use for Prometheus, Prometheus memory usage doubles during cluster update and for several hours after update is complete. To avoid the OOM kill issue, allow worker nodes with double the size of memory that was available prior to the update. For example, if you are running monitoring on the minimum recommended nodes, which is 2 cores with 8 GB of RAM, increase memory to 16 GB. For more information, see BZ#1925061.

Additional resources

- Support policy for unmanaged Operators

8.2. UPDATING A CLUSTER BY USING THE WEB CONSOLE

If updates are available, you can update your cluster from the web console.

You can find information about available OpenShift Container Platform advisories and updates in the errata section of the Customer Portal.

Prerequisites

- Have access to the web console as a user with **admin** privileges.

Procedure

1. From the web console, click **Administration → Cluster Settings** and review the contents of the **Details** tab.
2. For production clusters, ensure that the **Channel** is set to the correct channel for the version that you want to update to, such as **stable-4.7**.

IMPORTANT

For production clusters, you must subscribe to a **stable-*** or **fast-*** channel.

- If the **Update status** is not **Updates available**, you cannot update your cluster.
- **Select channel** indicates the cluster version that your cluster is running or is updating to.

3. Select a version to update to, and click **Save**.
   The Input channel **Update status** changes to **Update to <product-version> in progress**, and you can review the progress of the cluster update by watching the progress bars for the Operators and nodes.

NOTE

If you are upgrading your cluster to the next minor version, like version 4.y to 4.(y+1), it is recommended to confirm your nodes are updated before deploying workloads that rely on a new feature. Any pools with worker nodes that are not yet updated are displayed on the **Cluster Settings** page.

4. After the update completes and the Cluster Version Operator refreshes the available updates, check if more updates are available in your current channel.
   - If updates are available, continue to perform updates in the current channel until you can no longer update.
   - If no updates are available, change the **Channel** to the **stable-*** or **fast-*** channel for the next minor version, and update to the version that you want in that channel.

   You might need to perform several intermediate updates until you reach the version that you want.

NOTE

When you update a cluster that contains Red Hat Enterprise Linux (RHEL) worker machines, those workers temporarily become unavailable during the update process. You must run the update playbook against each RHEL machine as it enters the **NotReady** state for the cluster to finish updating.

8.3. OPTIONAL: ADDING HOOKS TO PERFORM ANSIBLE TASKS ON RHEL MACHINES

You can use *hooks* to run Ansible tasks on the RHEL compute machines during the OpenShift Container Platform update.

8.3.1. About Ansible hooks for upgrades

When you update OpenShift Container Platform, you can run custom tasks on your Red Hat Enterprise Linux (RHEL) nodes during specific operations by using *hooks*. Hooks allow you to provide files that define tasks to run before or after specific update tasks. You can use hooks to validate or modify custom infrastructure when you update the RHEL compute nodes in you OpenShift Container Platform cluster.

Because when a hook fails, the operation fails, you must design hooks that are idempotent, or can run multiple times and provide the same results.

Hooks have the following important limitations: - Hooks do not have a defined or versioned interface. They can use internal **openshift-ansible** variables, but it is possible that the variables will be modified or removed in future OpenShift Container Platform releases. - Hooks do not have error handling, so an error in a hook halts the update process. If you get an error, you must address the problem and then start the upgrade again.

8.3.2. Configuring the Ansible inventory file to use hooks

You define the hooks to use when you update the Red Hat Enterprise Linux (RHEL) compute machines, which are also known as worker machines, in the **hosts** inventory file under the **all:vars** section.

Prerequisites

- You have access to the machine that you used to add the RHEL compute machines cluster. You must have access to the **hosts** Ansible inventory file that defines your RHEL machines.

Procedure

1. After you design the hook, create a YAML file that defines the Ansible tasks for it. This file must be a set of tasks and cannot be a playbook, as shown in the following example:

```
---
# Trivial example forcing an operator to acknowledge the start of an upgrade
# file=/home/user/openshift-ansible/hooks/pre_compute.yml

- name: note the start of a compute machine update
  debug:
    msg: "Compute machine upgrade of {{ inventory_hostname }} is about to start"

- name: require the user agree to start an upgrade
  pause:
    prompt: "Press Enter to start the compute machine update"
```

2. Modify the **hosts** Ansible inventory file to specify the hook files. The hook files are specified as parameter values in the **[all:vars]** section, as shown:

   Example hook definitions in an inventory file

```
[all:vars]
openshift_node_pre_upgrade_hook=/home/user/openshift-ansible/hooks/pre_node.yml
openshift_node_post_upgrade_hook=/home/user/openshift-ansible/hooks/post_node.yml
```

   To avoid ambiguity in the paths to the hook, use absolute paths instead of a relative paths in their definitions.

8.3.3. Available hooks for RHEL compute machines

You can use the following hooks when you update the Red Hat Enterprise Linux (RHEL) compute machines in your OpenShift Container Platform cluster.

Hook name	Description
openshift_node_pre_cordon_hook	• Runs **before** each node is cordoned. • This hook runs against **each node** in serial. • If a task must run against a different host, the task must use **delegate_to** or **local_action**.
openshift_node_pre_upgrade_hook	• Runs **after** each node is cordoned but **before** it is updated. • This hook runs against **each node** in serial. • If a task must run against a different host, the task must use **delegate_to** or **local_action**.
openshift_node_pre_uncordon_hook	• Runs **after** each node is updated but **before** it is uncordoned. • This hook runs against **each node** in serial. • If a task must run against a different host, they task must use **delegate_to** or **local_action**.
openshift_node_post_upgrade_hook	• Runs **after** each node uncordoned. It is the **last** node update action. • This hook runs against **each node** in serial. • If a task must run against a different host, the task must use **delegate_to** or **local_action**.

8.4. UPDATING RHEL COMPUTE MACHINES IN YOUR CLUSTER

After you update your cluster, you must update the Red Hat Enterprise Linux (RHEL) compute machines in your cluster.

IMPORTANT

Because only Red Hat Enterprise Linux (RHEL) version 7.9 or later is supported for worker (compute) machines, you must not upgrade the RHEL worker machines to version 8.

You can also update your compute machines to another minor version of OpenShift Container Platform if you are using RHEL as the operating system. You do not need to exclude any RPM packages from RHEL when performing a minor version update.

Prerequisites

- You updated your cluster.

IMPORTANT

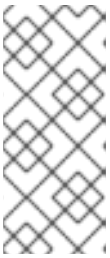
Because the RHEL machines require assets that are generated by the cluster to complete the update process, you must update the cluster before you update the RHEL worker machines in it.

- You have access to the local machine that you used to add the RHEL compute machines to your cluster. You must have access to the **hosts** Ansible inventory file that defines your RHEL machines and the **upgrade** playbook.
- For updates to a minor version, the RPM repository is using the same version of OpenShift Container Platform that is running on your cluster.

Procedure

1. Stop and disable firewalld on the host:

```
# systemctl disable --now firewalld.service
```



NOTE

By default, the base OS RHEL with "Minimal" installation option enables firewalld serivce. Having the firewalld service enabled on your host prevents you from accessing OpenShift Container Platform logs on the worker. Do not enable firewalld later if you wish to continue accessing OpenShift Container Platform logs on the worker.

2. Enable the repositories that are required for OpenShift Container Platform 4.7:
   a. On the machine that you run the Ansible playbooks, update the required repositories:

```
# subscription-manager repos --disable=rhel-7-server-ose-4.6-rpms \
                           --enable=rhel-7-server-ansible-2.9-rpms \
                           --enable=rhel-7-server-ose-4.7-rpms
```

   b. On the machine that you run the Ansible playbooks, update the required packages, including **openshift-ansible**:

```
# yum update openshift-ansible openshift-clients
```

   c. On each RHEL compute node, update the required repositories:

```
# subscription-manager repos --disable=rhel-7-server-ose-4.6-rpms \
                           --enable=rhel-7-server-ose-4.7-rpms  \
                           --enable=rhel-7-fast-datapath-rpms   \
```

```
                --enable=rhel-7-server-optional-rpms
```

3. Update a RHEL worker machine:

   a. Review the current node status to determine which RHEL worker to update:

   ```
   # oc get node
   ```

   Example output

   ```
   NAME                 STATUS                     ROLES    AGE    VERSION
   mycluster-control-plane-0   Ready                      master   145m   v1.20.0
   mycluster-control-plane-1   Ready                      master   145m   v1.20.0
   mycluster-control-plane-2   Ready                      master   145m   v1.20.0
   mycluster-rhel7-0        NotReady,SchedulingDisabled   worker   98m
   v1.14.6+97c81d00e
   mycluster-rhel7-1        Ready                      worker   98m    v1.14.6+97c81d00e
   mycluster-rhel7-2        Ready                      worker   98m    v1.14.6+97c81d00e
   mycluster-rhel7-3        Ready                      worker   98m    v1.14.6+97c81d00e
   ```

   Note which machine has the **NotReady,SchedulingDisabled** status.

   b. Review your Ansible inventory file at **/<path>/inventory/hosts** and update its contents so that only the machine with the **NotReady,SchedulingDisabled** status is listed in the **[workers]** section, as shown in the following example:

   ```
   [all:vars]
   ansible_user=root
   #ansible_become=True

   openshift_kubeconfig_path="~/.kube/config"

   [workers]
   mycluster-rhel7-0.example.com
   ```

   c. Change to the **openshift-ansible** directory:

   ```
   $ cd /usr/share/ansible/openshift-ansible
   ```

   d. Run the **upgrade** playbook:

   ```
   $ ansible-playbook -i /<path>/inventory/hosts playbooks/upgrade.yml 1
   ```

   1 For **<path>**, specify the path to the Ansible inventory file that you created.

   NOTE

   The **upgrade** playbook only upgrades the OpenShift Container Platform packages. It does not update the operating system packages.

4. Follow the process in the previous step to update each RHEL worker machine in your cluster.

5. After you update all of the workers, confirm that all of your cluster nodes have updated to the new version:

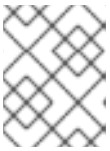
```
# oc get node
```

Example output

```
NAME                         STATUS                        ROLES    AGE    VERSION
mycluster-control-plane-0    Ready                         master   145m   v1.20.0
mycluster-control-plane-1    Ready                         master   145m   v1.20.0
mycluster-control-plane-2    Ready                         master   145m   v1.20.0
mycluster-rhel7-0            NotReady,SchedulingDisabled   worker   98m    v1.20.0
mycluster-rhel7-1            Ready                         worker   98m    v1.20.0
mycluster-rhel7-2            Ready                         worker   98m    v1.20.0
mycluster-rhel7-3            Ready                         worker   98m    v1.20.0
```

6. Optional: Update the operating system packages that were not updated by the **upgrade** playbook. To update packages that are not on 4.7, use the following command:

```
# yum update
```



NOTE

You do not need to exclude RPM packages if you are using the same RPM repository that you used when you installed 4.7.

CHAPTER 9. UPDATING A RESTRICTED NETWORK CLUSTER

You can update a restricted network OpenShift Container Platform cluster by using the **oc** command-line interface (CLI).

A restricted network environment is the one in which your cluster nodes cannot access the internet. For this reason, you must populate a registry with the installation images. If your registry host cannot access both the internet and the cluster, you can mirror the images to a file system that disconnected from that environment and then bring that host or removable media across that gap. If the local container registry and the cluster are connected to the mirror registry's host, you can directly push the release images to the local registry.

If multiple clusters are present within the restricted network, mirror the required release images to a single container image registry and use that registry to update all the clusters.

9.1. PREREQUISITES

- Have access to the internet to obtain the necessary container images.
- Have write access to a container registry in the restricted-network environment to push and pull images. The container registry must be compatible with Docker registry API v2.
- You must have the **oc** command-line interface (CLI) tool installed.
- Have access to the cluster as a user with **admin** privileges. See Using RBAC to define and apply permissions.
- Have a recent etcd backup in case your update fails and you must restore your cluster to a previous state.
- Ensure that all machine config pools (MCPs) are running and not paused. Nodes associated with a paused MCP are skipped during the update process. You can pause the MCPs if you are performing a canary rollout update strategy.
- If your cluster uses manually maintained credentials, ensure that the Cloud Credential Operator (CCO) is in an upgradeable state. For more information, see *Upgrading clusters with manually maintained credentials* for AWS, Azure, or GCP.

IMPORTANT

If you are running cluster monitoring with an attached PVC for Prometheus, you might experience OOM kills during cluster update. When persistent storage is in use for Prometheus, Prometheus memory usage doubles during cluster update and for several hours after update is complete. To avoid the OOM kill issue, allow worker nodes with double the size of memory that was available prior to the update. For example, if you are running monitoring on the minimum recommended nodes, which is 2 cores with 8 GB of RAM, increase memory to 16 GB. For more information, see BZ#1925061.

9.2. PREPARING YOUR MIRROR HOST

Before you perform the mirror procedure, you must prepare the host to retrieve content and push it to the remote location.

9.2.1. Installing the OpenShift CLI by downloading the binary

You can install the OpenShift CLI (**oc**) to interact with OpenShift Container Platform from a command-line interface. You can install **oc** on Linux, Windows, or macOS.

IMPORTANT

If you installed an earlier version of **oc**, you cannot use it to complete all of the commands in OpenShift Container Platform 4.7. Download and install the new version of **oc**. If you are upgrading a cluster in a restricted network, install the **oc** version that you plan to upgrade to.

9.2.1.1. Installing the OpenShift CLI on Linux

You can install the OpenShift CLI (**oc**) binary on Linux by using the following procedure.

Procedure

1. Navigate to the OpenShift Container Platform downloads page on the Red Hat Customer Portal.
2. Select the appropriate version in the **Version** drop-down menu.
3. Click **Download Now** next to the **OpenShift v4.7 Linux Client** entry and save the file.
4. Unpack the archive:

```
$ tar xvzf <file>
```

5. Place the **oc** binary in a directory that is on your **PATH**.
   To check your **PATH**, execute the following command:

```
$ echo $PATH
```

After you install the OpenShift CLI, it is available using the **oc** command:

```
$ oc <command>
```

9.2.1.2. Installing the OpenShift CLI on Windows

You can install the OpenShift CLI (**oc**) binary on Windows by using the following procedure.

Procedure

1. Navigate to the OpenShift Container Platform downloads page on the Red Hat Customer Portal.
2. Select the appropriate version in the **Version** drop-down menu.
3. Click **Download Now** next to the **OpenShift v4.7 Windows Client** entry and save the file.
4. Unzip the archive with a ZIP program.
5. Move the **oc** binary to a directory that is on your **PATH**.
   To check your **PATH**, open the command prompt and execute the following command:

```
-
```

```
C:\> path
```

After you install the OpenShift CLI, it is available using the **oc** command:

```
C:\> oc <command>
```

9.2.1.3. Installing the OpenShift CLI on macOS

You can install the OpenShift CLI (**oc**) binary on macOS by using the following procedure.

Procedure

1. Navigate to the OpenShift Container Platform downloads page on the Red Hat Customer Portal.
2. Select the appropriate version in the **Version** drop-down menu.
3. Click **Download Now** next to the **OpenShift v4.7 MacOSX Client** entry and save the file.
4. Unpack and unzip the archive.
5. Move the **oc** binary to a directory on your PATH.
   To check your **PATH**, open a terminal and execute the following command:

```
$ echo $PATH
```

After you install the OpenShift CLI, it is available using the **oc** command:

```
$ oc <command>
```

9.3. CONFIGURING CREDENTIALS THAT ALLOW IMAGES TO BE MIRRORED

Create a container image registry credentials file that allows mirroring images from Red Hat to your mirror.

WARNING

Do not use this image registry credentials file as the pull secret when you install a cluster. If you provide this file when you install cluster, all of the machines in the cluster will have write access to your mirror registry.

WARNING

This process requires that you have write access to a container image registry on the mirror registry and adds the credentials to a registry pull secret.

Prerequisites

- You configured a mirror registry to use in your restricted network.
- You identified an image repository location on your mirror registry to mirror images into.
- You provisioned a mirror registry account that allows images to be uploaded to that image repository.

Procedure

Complete the following steps on the installation host:

1. Download your **registry.redhat.io** pull secret from the Red Hat OpenShift Cluster Manager and save it to a **.json** file.
2. Generate the base64-encoded user name and password or token for your mirror registry:

```
$ echo -n '<user_name>:<password>' | base64 -w0 1
BGVtbYk3ZHAtqXs=
```

1 For **<user_name>** and **<password>**, specify the user name and password that you configured for your registry.

3. Make a copy of your pull secret in JSON format:

```
$ cat ./pull-secret.text | jq .  > <path>/<pull_secret_file_in_json> 1
```

1 Specify the path to the folder to store the pull secret in and a name for the JSON file that you create.

4. Save the file either as ~/**.docker/config.json** or **$XDG_RUNTIME_DIR/containers/auth.json**. The contents of the file resemble the following example:

```
{
  "auths": {
    "cloud.openshift.com": {
      "auth": "b3BlbnNo...",
      "email": "you@example.com"
    },
    "quay.io": {
      "auth": "b3BlbnNo...",
      "email": "you@example.com"
    },
```

```
    "registry.connect.redhat.com": {
      "auth": "NTE3Njg5Nj...",
      "email": "you@example.com"
    },
    "registry.redhat.io": {
      "auth": "NTE3Njg5Nj...",
      "email": "you@example.com"
    }
  }
}
```

5. Edit the new file and add a section that describes your registry to it:

```
"auths": {
  "<mirror_registry>": { 1
    "auth": "<credentials>", 2
    "email": "you@example.com"
},
```

1 For **<mirror_registry>**, specify the registry domain name, and optionally the port, that your mirror registry uses to serve content. For example, **registry.example.com** or **registry.example.com:8443**

2 For **<credentials>**, specify the base64-encoded user name and password for the mirror registry.

The file resembles the following example:

```
{
  "auths": {
    "registry.example.com": {
      "auth": "BGVtbYk3ZHAtqXs=",
      "email": "you@example.com"
    },
    "cloud.openshift.com": {
      "auth": "b3BlbnNo...",
      "email": "you@example.com"
    },
    "quay.io": {
      "auth": "b3BlbnNo...",
      "email": "you@example.com"
    },
    "registry.connect.redhat.com": {
      "auth": "NTE3Njg5Nj...",
      "email": "you@example.com"
    },
    "registry.redhat.io": {
      "auth": "NTE3Njg5Nj...",
      "email": "you@example.com"
    }
  }
}
```

9.4. MIRRORING THE OPENSHIFT CONTAINER PLATFORM IMAGE REPOSITORY

Before you update a cluster on infrastructure that you provision in a restricted network, you must mirror the required container images into that environment. You can also use this procedure in unrestricted networks to ensure your clusters only use container images that have satisfied your organizational controls on external content.

Procedure

1. Use the Red Hat OpenShift Container Platform Upgrade Graph visualizer and update planner to plan an update from one version to another. The OpenShift Upgrade Graph provides channel graphs and a way to confirm that there is an update path between your current and intended cluster versions.

2. Set the required environment variables:

   a. Export the release version:

   ```
   $ export OCP_RELEASE=<release_version>
   ```

   For **<release_version>**, specify the tag that corresponds to the version of OpenShift Container Platform to which you want to update, such as **4.5.4**.

   b. Export the local registry name and host port:

   ```
   $ LOCAL_REGISTRY='<local_registry_host_name>:<local_registry_host_port>'
   ```

   For **<local_registry_host_name>**, specify the registry domain name for your mirror repository, and for **<local_registry_host_port>**, specify the port that it serves content on.

   c. Export the local repository name:

   ```
   $ LOCAL_REPOSITORY='<local_repository_name>'
   ```

   For **<local_repository_name>**, specify the name of the repository to create in your registry, such as **ocp4/openshift4**.

   d. Export the name of the repository to mirror:

   ```
   $ PRODUCT_REPO='openshift-release-dev'
   ```

   For a production release, you must specify **openshift-release-dev**.

   e. Export the path to your registry pull secret:

   ```
   $ LOCAL_SECRET_JSON='<path_to_pull_secret>'
   ```

   For **<path_to_pull_secret>**, specify the absolute path to and file name of the pull secret for your mirror registry that you created.

NOTE

If your cluster uses an **ImageContentSourcePolicy** object to configure repository mirroring, you can use only global pull secrets for mirrored registries. You cannot add a pull secret to a project.

f. Export the release mirror:

```
$ RELEASE_NAME="ocp-release"
```

For a production release, you must specify **ocp-release**.

g. Export the type of architecture for your server, such as **x86_64**.:

```
$ ARCHITECTURE=<server_architecture>
```

h. Export the path to the directory to host the mirrored images:

```
$ REMOVABLE_MEDIA_PATH=<path> 1
```

1 Specify the full path, including the initial forward slash (/) character.

3. Review the images and configuration manifests to mirror:

```
$ oc adm release mirror -a ${LOCAL_SECRET_JSON} --to-
dir=${REMOVABLE_MEDIA_PATH}/mirror
quay.io/${PRODUCT_REPO}/${RELEASE_NAME}:${OCP_RELEASE}-${ARCHITECTURE}
--dry-run
```

4. Mirror the version images to the mirror registry.

- If your mirror host does not have internet access, take the following actions:

i. Connect the removable media to a system that is connected to the internet.

ii. Mirror the images and configuration manifests to a directory on the removable media:

```
$ oc adm release mirror -a ${LOCAL_SECRET_JSON} --to-
dir=${REMOVABLE_MEDIA_PATH}/mirror
quay.io/${PRODUCT_REPO}/${RELEASE_NAME}:${OCP_RELEASE}-
${ARCHITECTURE}
```

iii. Take the media to the restricted network environment and upload the images to the local container registry.

```
$ oc image mirror  -a ${LOCAL_SECRET_JSON} --from-
dir=${REMOVABLE_MEDIA_PATH}/mirror
"file://openshift/release:${OCP_RELEASE}*"
${LOCAL_REGISTRY}/${LOCAL_REPOSITORY} 1
```

1 For **REMOVABLE_MEDIA_PATH**, you must use the same path that you specified when you mirrored the images.

iv. Use **oc** command-line interface (CLI) to log in to the cluster that you are upgrading.

v. Apply the mirrored release image signature config map to the connected cluster:

```
$ oc apply -f ${REMOVABLE_MEDIA_PATH}/mirror/config/<image_signature_file>
```
(1)

(1) For **<image_signature_file>**, specify the path and name of the file, for example, **signature-sha256-81154f5c03294534.yaml**.

- If the local container registry and the cluster are connected to the mirror host, directly push the release images to the local registry and apply the config map to the cluster by using following command:

```
$ oc adm release mirror -a ${LOCAL_SECRET_JSON} --
from=quay.io/${PRODUCT_REPO}/${RELEASE_NAME}:${OCP_RELEASE}-
${ARCHITECTURE} \
  --to=${LOCAL_REGISTRY}/${LOCAL_REPOSITORY} --apply-release-image-signature
```

NOTE

If you include the **--apply-release-image-signature** option, do not create the config map for image signature verification.

9.5. CREATING THE IMAGE SIGNATURE CONFIG MAP

Before you update your cluster, you must manually create a config map that contains the signatures of the release images that you use. This signature allows the Cluster Version Operator (CVO) to verify that the release images have not been modified by comparing the expected and actual image signatures.

If you are upgrading from version 4.4.8 or later, you can use the **oc** CLI to create the config map. If you are upgrading from an earlier version, you must use the manual method.

9.5.1. Creating an image signature config map manually

Create and apply the image signature config map to the cluster that you want to update.

NOTE

You must perform following steps each time that you update a cluster.

Procedure

1. Review the OpenShift Container Platform upgrade paths knowledge base article to determine a valid update path for your cluster.

2. Add the version to the **OCP_RELEASE_NUMBER** environment variable:

```
$ OCP_RELEASE_NUMBER=<release_version>
```
(1)

(1) For **<release_version>**, specify the tag that corresponds to the version of OpenShift Container Platform you want to update the cluster, such as **4.4.0**.

3. Add the system architecture for your cluster to **ARCHITECTURE** environment variable:

```
$ ARCHITECTURE=<server_architecture> 1
```

1 For **server_architecture**, specify the architecture of the server, such as **x86_64**.

4. Get the release image digest from Quay:

```
$ DIGEST="$(oc adm release info quay.io/openshift-release-dev/ocp-
release:${OCP_RELEASE_NUMBER}-${ARCHITECTURE} | sed -n 's/Pull From: .*@//p')"
```

5. Set the digest algorithm:

```
$ DIGEST_ALGO="${DIGEST%%:*}"
```

6. Set the digest signature:

```
$ DIGEST_ENCODED="${DIGEST#*:}"
```

7. Get the image signature from mirror.openshift.com website.

```
$ SIGNATURE_BASE64=$(curl -s "https://mirror.openshift.com/pub/openshift-
v4/signatures/openshift/release/${DIGEST_ALGO}=${DIGEST_ENCODED}/signature-1" |
base64 -w0 && echo)
```

8. Create the config map:

```
$ cat >checksum-${OCP_RELEASE_NUMBER}.yaml <<EOF
apiVersion: v1
kind: ConfigMap
metadata:
  name: release-image-${OCP_RELEASE_NUMBER}
  namespace: openshift-config-managed
  labels:
    release.openshift.io/verification-signatures: ""
binaryData:
  ${DIGEST_ALGO}-${DIGEST_ENCODED}: ${SIGNATURE_BASE64}
EOF
```

9. Apply the config map to the cluster to update:

```
$ oc apply -f checksum-${OCP_RELEASE_NUMBER}.yaml
```

9.6. UPGRADING THE RESTRICTED NETWORK CLUSTER

Update the restricted network cluster to the OpenShift Container Platform version that you downloaded the release images for.

NOTE

If you have a local OpenShift Update Service, you can update by using the connected web console or CLI instructions instead of this procedure.

Prerequisites

- You mirrored the images for the new release to your registry.
- You applied the release image signature ConfigMap for the new release to your cluster.
- You obtained the sha256 sum value for the release from the image signature ConfigMap.
- Install the OpenShift CLI (**oc**), version 4.4.8 or later.

Procedure

- Update the cluster:

```
$ oc adm upgrade --allow-explicit-upgrade --to-image
${LOCAL_REGISTRY}/${LOCAL_REPOSITORY}<sha256_sum_value> 1
```

1 The **<sha256_sum_value>** value is the sha256 sum value for the release from the image signature ConfigMap, for example, **@sha256:81154f5c03294534e1eaf0319bef7a601134f891689ccede5d705ef659aa8c92**

If you use an **ImageContentSourcePolicy** for the mirror registry, you can use the canonical registry name instead of **LOCAL_REGISTRY**.

NOTE

You can only configure global pull secrets for clusters that have an **ImageContentSourcePolicy** object. You cannot add a pull secret to a project.

9.7. CONFIGURING IMAGE REGISTRY REPOSITORY MIRRORING

Setting up container registry repository mirroring enables you to do the following:

- Configure your OpenShift Container Platform cluster to redirect requests to pull images from a repository on a source image registry and have it resolved by a repository on a mirrored image registry.
- Identify multiple mirrored repositories for each target repository, to make sure that if one mirror is down, another can be used.

The attributes of repository mirroring in OpenShift Container Platform include:

- Image pulls are resilient to registry downtimes.
- Clusters in restricted networks can pull images from critical locations, such as quay.io, and have registries behind a company firewall provide the requested images.
- A particular order of registries is tried when an image pull request is made, with the permanent registry typically being the last one tried.

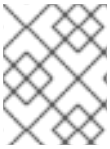
- The mirror information you enter is added to the **/etc/containers/registries.conf** file on every node in the OpenShift Container Platform cluster.
- When a node makes a request for an image from the source repository, it tries each mirrored repository in turn until it finds the requested content. If all mirrors fail, the cluster tries the source repository. If successful, the image is pulled to the node.

Setting up repository mirroring can be done in the following ways:

- At OpenShift Container Platform installation:
  By pulling container images needed by OpenShift Container Platform and then bringing those images behind your company's firewall, you can install OpenShift Container Platform into a datacenter that is in a restricted network.
- After OpenShift Container Platform installation:
  Even if you don't configure mirroring during OpenShift Container Platform installation, you can do so later using the **ImageContentSourcePolicy** object.

The following procedure provides a post-installation mirror configuration, where you create an **ImageContentSourcePolicy** object that identifies:

- The source of the container image repository you want to mirror.
- A separate entry for each mirror repository you want to offer the content requested from the source repository.



NOTE

You can only configure global pull secrets for clusters that have an **ImageContentSourcePolicy** object. You cannot add a pull secret to a project.

Prerequisites

- Access to the cluster as a user with the **cluster-admin** role.

Procedure

1. Configure mirrored repositories, by either:
   - Setting up a mirrored repository with Red Hat Quay, as described in Red Hat Quay Repository Mirroring. Using Red Hat Quay allows you to copy images from one repository to another and also automatically sync those repositories repeatedly over time.
   - Using a tool such as **skopeo** to copy images manually from the source directory to the mirrored repository.
     For example, after installing the skopeo RPM package on a Red Hat Enterprise Linux (RHEL) 7 or RHEL 8 system, use the **skopeo** command as shown in this example:

     ```
     $ skopeo copy \
     docker://registry.access.redhat.com/ubi8/ubi-minimal@sha256:5cfbaf45ca96806917830c183e9f37df2e913b187adb32e89fd83fa455ebaa6 \
     docker://example.io/example/ubi-minimal
     ```

     In this example, you have a container image registry that is named **example.io** with an

image repository named **example** to which you want to copy the **ubi8/ubi-minimal** image from **registry.access.redhat.com**. After you create the registry, you can configure your OpenShift Container Platform cluster to redirect requests made of the source repository to the mirrored repository.

2. Log in to your OpenShift Container Platform cluster.

3. Create an **ImageContentSourcePolicy** file (for example, **registryrepomirror.yaml**), replacing the source and mirrors with your own registry and repository pairs and images:

```
apiVersion: operator.openshift.io/v1alpha1
kind: ImageContentSourcePolicy
metadata:
  name: ubi8repo
spec:
  repositoryDigestMirrors:
  - mirrors:
    - example.io/example/ubi-minimal (1)
    source: registry.access.redhat.com/ubi8/ubi-minimal (2)
  - mirrors:
    - example.com/example/ubi-minimal
    source: registry.access.redhat.com/ubi8/ubi-minimal
  - mirrors:
    - mirror.example.com/redhat
    source: registry.redhat.io/openshift4 (3)
```

(1) Indicates the name of the image registry and repository.

(2) Indicates the registry and repository containing the content that is mirrored.

(3) You can configure a namespace inside a registry to use any image in that namespace. If you use a registry domain as a source, the **ImageContentSourcePolicy** resource is applied to all repositories from the registry.

4. Create the new **ImageContentSourcePolicy** object:

```
$ oc create -f registryrepomirror.yaml
```

After the **ImageContentSourcePolicy** object is created, the new settings are deployed to each node and the cluster starts using the mirrored repository for requests to the source repository.

5. To check that the mirrored configuration settings, are applied, do the following on one of the nodes.

   a. List your nodes:

```
$ oc get node
```

Example output

```
NAME                           STATUS                     ROLES    AGE  VERSION
ip-10-0-137-44.ec2.internal    Ready                      worker   7m   v1.20.0
ip-10-0-138-148.ec2.internal   Ready                      master   11m  v1.20.0
ip-10-0-139-122.ec2.internal   Ready                      master   11m  v1.20.0
```

```
ip-10-0-147-35.ec2.internal   Ready,SchedulingDisabled   worker   7m   v1.20.0
ip-10-0-153-12.ec2.internal   Ready                      worker   7m   v1.20.0
ip-10-0-154-10.ec2.internal   Ready                      master   11m  v1.20.0
```

You can see that scheduling on each worker node is disabled as the change is being applied.

b. Start the debugging process to access the node:

```
$ oc debug node/ip-10-0-147-35.ec2.internal
```

Example output

```
Starting pod/ip-10-0-147-35ec2internal-debug ...
To use host binaries, run `chroot /host`
```

c. Access the node's files:

```
sh-4.2# chroot /host
```

d. Check the **/etc/containers/registries.conf** file to make sure the changes were made:

```
sh-4.2# cat /etc/containers/registries.conf
```

Example output

```
unqualified-search-registries = ["registry.access.redhat.com", "docker.io"]
[[registry]]
  location = "registry.access.redhat.com/ubi8/"
  insecure = false
  blocked = false
  mirror-by-digest-only = true
  prefix = ""

  [[registry.mirror]]
    location = "example.io/example/ubi8-minimal"
    insecure = false

  [[registry.mirror]]
    location = "example.com/example/ubi8-minimal"
    insecure = false
```

e. Pull an image digest to the node from the source and check if it is resolved by the mirror. **ImageContentSourcePolicy** objects support image digests only, not image tags.

```
sh-4.2# podman pull --log-level=debug registry.access.redhat.com/ubi8/ubi-
minimal@sha256:5cfbaf45ca96806917830c183e9f37df2e913b187adb32e89fd83fa455eba
a6
```

Troubleshooting repository mirroring

If the repository mirroring procedure does not work as described, use the following information about how repository mirroring works to help troubleshoot the problem.

- The first working mirror is used to supply the pulled image.
- The main registry is only used if no other mirror works.
- From the system context, the **Insecure** flags are used as fallback.
- The format of the **/etc/containers/registries.conf** file has changed recently. It is now version 2 and in TOML format.

9.8. WIDENING THE SCOPE OF THE MIRROR IMAGE CATALOG TO REDUCE THE FREQUENCY OF CLUSTER NODE REBOOTS

You can scope the mirrored image catalog at the repository level or the wider registry level. A widely scoped **ImageContentSourcePolicy** resource reduces the number of times the nodes need to reboot in response to changes to the resource.

To widen the scope of the mirror image catalog in the **ImageContentSourcePolicy** resource, perform the following procedure.

Prerequisites

- Install the OpenShift Container Platform CLI **oc**.
- Log in as a user with **cluster-admin** privileges.
- Configure a mirrored image catalog for use in your disconnected cluster.

Procedure

1. Run the following command, specifying values for **<local_registry>**, **<pull_spec>**, and **<pull_secret_file>**:

```
$ oc adm catalog mirror <local_registry>/<pull_spec> <local_registry> -a <pull_secret_file> --icsp-scope=registry
```

where:

<local_registry>
: is the local registry you have configured for your disconnected cluster, for example, **local.registry:5000**.

<pull_spec>
: is the pull specification as configured in your disconnected registry, for example, **redhat/redhat-operator-index:v4.7**

<pull_secret_file>
: is the **registry.redhat.io** pull secret in **.json** file format. You can download the pull secret from the Red Hat OpenShift Cluster Manager.

The **oc adm catalog mirror** command creates a **/redhat-operator-index-manifests** directory and generates **imageContentSourcePolicy.yaml**, **catalogSource.yaml**, and **mapping.txt** files.

2. Apply the new **ImageContentSourcePolicy** resource to the cluster:

```
$ oc apply -f imageContentSourcePolicy.yaml
```

Verification

- Verify that **oc apply** successfully applied the change to **ImageContentSourcePolicy**:

```
$ oc get ImageContentSourcePolicy -o yaml
```

Example output

```
apiVersion: v1
items:
- apiVersion: operator.openshift.io/v1alpha1
  kind: ImageContentSourcePolicy
  metadata:
    annotations:
      kubectl.kubernetes.io/last-applied-configuration: |

{"apiVersion":"operator.openshift.io/v1alpha1","kind":"ImageContentSourcePolicy","metadata":
{"annotations":{},"name":"redhat-operator-index"},"spec":{"repositoryDigestMirrors":
[{"mirrors":["local.registry:5000"],"source":"registry.redhat.io"}]}}
...
```

After you update the **ImageContentSourcePolicy** resource, OpenShift Container Platform deploys the new settings to each node and the cluster starts using the mirrored repository for requests to the source repository.

9.9. ADDITIONAL RESOURCES

- Using Operator Lifecycle Manager on restricted networks
- Machine Config Overview
- Installing and configuring the OpenShift Update Service