Red Hat OpenShift Container Storage 4.6

Deploying OpenShift Container Storage using bare metal infrastructure

How to install and set up your bare metal environment

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Red Hat OpenShift Container Storage 4.6 Deploying OpenShift Container Storage using bare metal infrastructure

How to install and set up your bare metal environment

Legal Notice

Abstract

Read this document for instructions on installing Red Hat OpenShift Container Storage 4.6 to use local storage on bare metal infrastructure.

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PREFACE

Red Hat OpenShift Container Storage 4.6 supports deployment on existing Red Hat OpenShift Container Platform (RHOCP) bare metal clusters in connected or disconnected environments along with out-of-the-box support for proxy environments.

NOTE

Both internal and external Openshift Container Storage clusters are supported on bare metal. See Planning your deployment for more information about deployment requirements.

To deploy OpenShift Container Storage, follow the appropriate deployment process for your environment:

- Internal mode
  - Deploy using local storage devices
- External mode

CHAPTER 1. DEPLOYING USING LOCAL STORAGE DEVICES

Deploying OpenShift Container Storage on OpenShift Container Platform using local storage devices provides you with the option to create internal cluster resources. This will result in the internal provisioning of the base services, which helps to make additional storage classes available to applications.

Use this section to deploy OpenShift Container Storage on bare metal infrastructure where OpenShift Container Platform is already installed.

To deploy Red Hat OpenShift Container Storage using local storage, follow these steps:

1. Understand the requirements for installing OpenShift Container Storage using local storage devices.
2. For Red Hat Enterprise Linux based hosts for worker nodes, enable file system access for containers on Red Hat Enterprise Linux based nodes.

NOTE

Skip this step for Red Hat Enterprise Linux CoreOS (RHCOS).

3. Install the Red Hat OpenShift Container Storage Operator .
4. Install Local Storage Operator .
5. Create OpenShift Container Storage cluster on bare metal .

1.1. REQUIREMENTS FOR INSTALLING OPENSHIFT CONTAINER STORAGE USING LOCAL STORAGE DEVICES

- You must upgrade to a latest version of OpenShift Container Platform 4.6 before deploying OpenShift Container Storage 4.6. For information, see Updating OpenShift Container Platform clusters guide.
- The Local Storage Operator version must match the Red Hat OpenShift Container Platform version in order to have the Local Storage Operator fully supported with Red Hat OpenShift Container Storage. The Local Storage Operator does not get upgraded when Red Hat OpenShift Container Platform is upgraded.
- You must have at least three OpenShift Container Platform worker nodes in the cluster with locally attached storage devices on each of them.
  - Each of the three selected nodes must have at least one raw block device available to be used by OpenShift Container Storage.
  - The devices you use must be empty; the disks must not include physical volumes (PVs), volume groups (VGs), or logical volumes (LVs) remaining on the disk.
- For minimum starting node requirements, see Resource requirements section in Planning guide.
- To configure OpenShift Container Platform in compact mode, see Configuring a three-node cluster and Delivering a Three-node Architecture for Edge Deployments . [Technology Preview]

1.2. ENABLING FILE SYSTEM ACCESS FOR CONTAINERS ON RED HAT ENTERPRISE LINUX BASED NODES

Deploying OpenShift Container Storage on an OpenShift Container Platform with worker nodes on a Red Hat Enterprise Linux base in a user provisioned infrastructure (UPI) does not automatically provide container access to the underlying Ceph file system.

NOTE

This process is not necessary for hosts based on Red Hat Enterprise Linux CoreOS.

Procedure

Perform the following steps on each node in your cluster.

1. Log in to the Red Hat Enterprise Linux based node and open a terminal.
2. Verify that the node has access to the rhel-7-server-extras-rpms repository.

```
# subscription-manager repos --list-enabled | grep rhel-7-server
```

   If you do not see both **rhel-7-server-rpms** and **rhel-7-server-extras-rpms** in the output, or if there is no output, run the following commands to enable each repository.

```
# subscription-manager repos --enable=rhel-7-server-rpms
# subscription-manager repos --enable=rhel-7-server-extras-rpms
```

3. Install the required packages.

```
# yum install -y policycoreutils container-selinux
```

4. Persistently enable container use of the Ceph file system in SELinux.

```
# setsebool -P container_use_cephfs on
```

1.3. INSTALLING RED HAT OPENSHIFT CONTAINER STORAGE OPERATOR

You can install Red Hat OpenShift Container Storage Operator using the Red Hat OpenShift Container Platform Operator Hub. For information about the hardware and software requirements, see Planning your deployment.

Prerequisites

- You must be logged into the OpenShift Container Platform (RHOCP) cluster.
- You must have at least three worker nodes in the RHOCP cluster.

NOTE

- When you need to override the cluster-wide default node selector for OpenShift Container Storage, you can use the following command in command line interface to specify a blank node selector for the **openshift-storage** namespace:

```
$ oc annotate namespace openshift-storage openshift.io/node-selector=
```

- Taint a node as **infra** to ensure only Red Hat OpenShift Container Storage resources are scheduled on that node. This helps you save on subscription costs. For more information, see How to use dedicated worker nodes for Red Hat OpenShift Container Storage chapter in Managing and Allocating Storage Resources guide.

Procedure

1. Click **Operators → OperatorHub** in the left pane of the OpenShift Web Console.
2. Use **Filter by keyword** text box or the filter list to search for OpenShift Container Storage from the list of operators.
3. Click **OpenShift Container Storage**.
4. On the **OpenShift Container Storage operator** page, click Install.
5. On the **Install Operator** page, ensure the following options are selected by default::
   a. Update Channel as **stable-4.6**
   b. Installation Mode as **A specific namespace on the cluster**
   c. Installed Namespace as **Operator recommended namespace openshift-storage**. If Namespace **openshift-storage** does not exist, it will be created during the operator installation.
   d. Select **Enable operator recommended cluster monitoring on this namespace** checkbox as this is required for cluster monitoring.
   e. Select **Approval Strategy** as **Automatic** or **Manual**. Approval Strategy is set to **Automatic** by default.
      - **Approval Strategy** as **Automatic**.

NOTE

When you select the Approval Strategy as **Automatic**, approval is not required either during fresh installation or when updating to the latest version of OpenShift Container Storage.

      i. Click **Install**
      ii. Wait for the install to initiate. This may take up to 20 minutes.
      iii. Click **Operators → Installed Operators**

iv. Ensure the **Project** is **openshift-storage**. By default, the **Project** is **openshift-storage**.

v. Wait for the **Status** of **OpenShift Container Storage** to change to **Succeeded**.

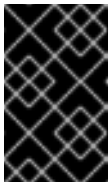
- **Approval Strategy** as **Manual**.

NOTE

When you select the Approval Strategy as **Manual**, approval is required during fresh installation or when updating to the latest version of OpenShift Container Storage.

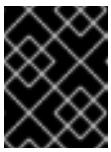
i. Click **Install**

ii. On the **Manual approval required** page, you can either click **Approve** or **View Installed Operators in namespace openshift-storage** to install the operator.



IMPORTANT

Before you click either of the options, wait for a few minutes on the **Manual approval required** page until the install plan gets loaded in the window.



IMPORTANT

If you choose to click **Approve**, you must review the install plan before you proceed.

- If you click **Approve**.
  - Wait for a few minutes while the OpenShift Container Storage Operator is getting installed.
  - On the **Installed operator - ready for use** page, click **View Operator**.
  - Ensure the **Project** is **openshift-storage**. By default, the **Project** is **openshift-storage**.
  - Click **Operators → Installed Operators**
  - Wait for the **Status** of **OpenShift Container Storage** to change to **Succeeded**.
- If you click **View Installed Operators in namespace openshift-storage**.
  - On the **Installed Operators** page, click **ocs-operator**.
  - On the **Subscription Details** page, click the **Install Plan** link.
  - On the **InstallPlan Details** page, click **Preview Install Plan**.
  - Review the install plan and click **Approve**.
  - Wait for the **Status** of the **Components** to change from **Unknown** to either **Created** or **Present**.

- Click **Operators → Installed Operators**
- Ensure the **Project** is **openshift-storage**. By default, the **Project** is **openshift-storage**.
- Wait for the **Status** of **OpenShift Container Storage** to change to **Succeeded**.

Verification steps

- Verify that **OpenShift Container Storage** Operator shows a green tick indicating successful installation.
- Click **View Installed Operators in namespace openshift-storage** link to verify that OpenShift Container Storage Operator shows the **Status** as **Succeeded** on the Installed Operators dashboard.

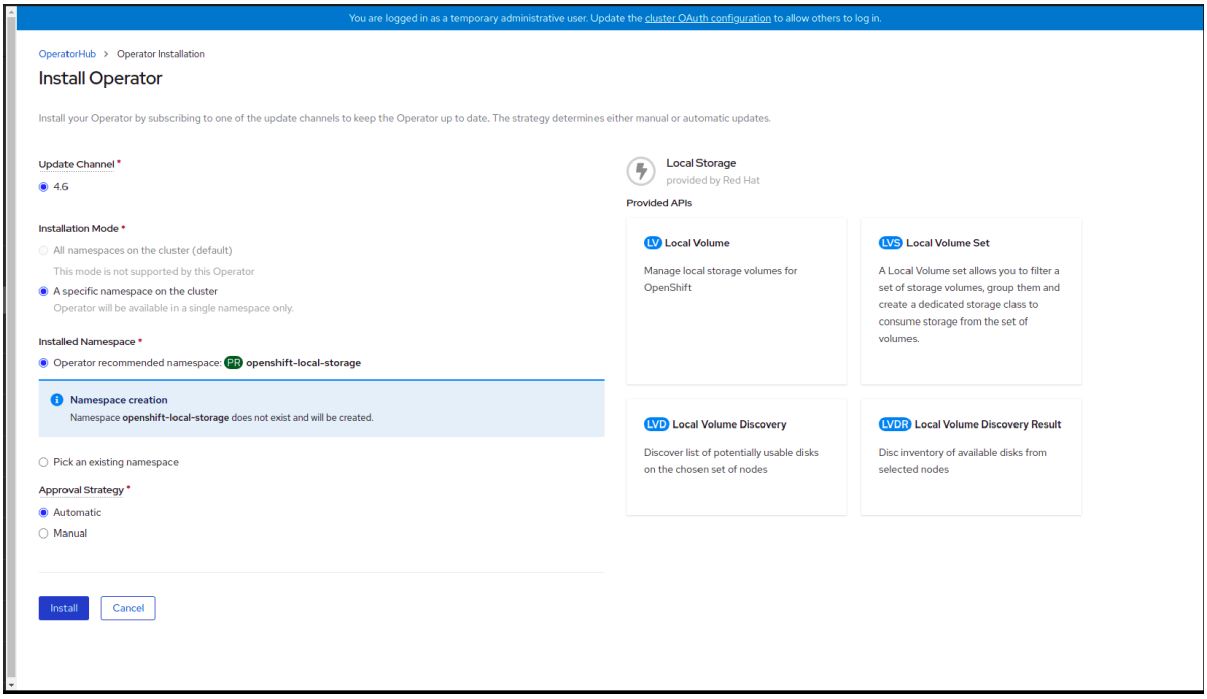
1.4. INSTALLING LOCAL STORAGE OPERATOR

Use this procedure to install the Local Storage Operator from the Operator Hub before creating OpenShift Container Storage clusters on local storage devices.

Procedure

1. Log in to the OpenShift Web Console.
2. Click **Operators → OperatorHub**.
3. Search for **Local Storage Operator** from the list of operators and click on it.
4. Click **Install**.

Figure 1.1. Install Operator page



5. Set the following options on the **Install Operator** page:

a. Update Channel as **4.6**

b. Installation Mode as **A specific namespace on the cluster**

c. Installed Namespace as **Operator recommended namespace openshift-local-storage**.

d. Approval Strategy as **Automatic**

6. Click **Install**.

7. Verify that the Local Storage Operator shows the Status as **Succeeded**.

1.5. CREATING OPENSHIFT CONTAINER STORAGE CLUSTER ON BARE METAL

Use this procedure to create a storage cluster when a storage class does not exist.

If you already have a storage class created, you can directly create a storage cluster as described in Creating a storage cluster on bare metal when a storage class exists .

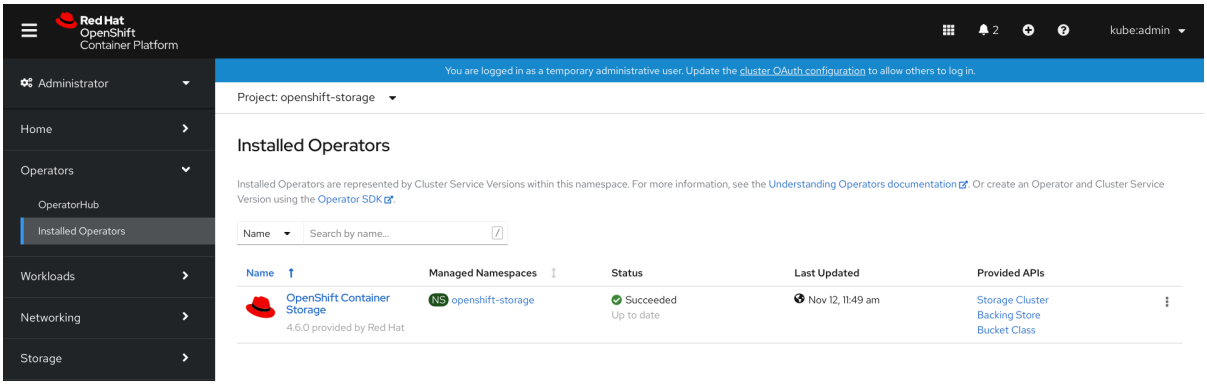
Prerequisites

- Ensure that all the requirements in the Requirements for installing OpenShift Container Storage using local storage devices section are met.
- You must have a minimum of three worker nodes with the same storage type and size attached to each node (for example, 2TB NVMe hard drive) to use local storage devices on bare metal.

Procedure

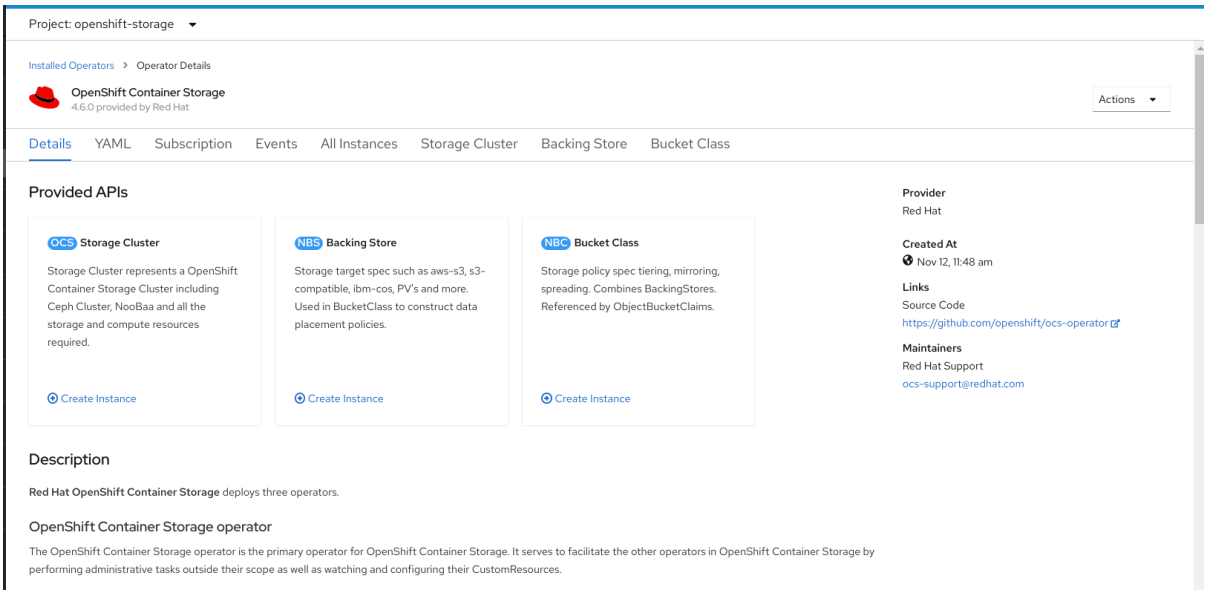
1. Log into the OpenShift Web Console.
2. Click **Operators → Installed Operators** to view all the installed operators.
   Ensure that the **Project** selected is **openshift-storage**.

   Figure 1.2. OpenShift Container Storage Operator page



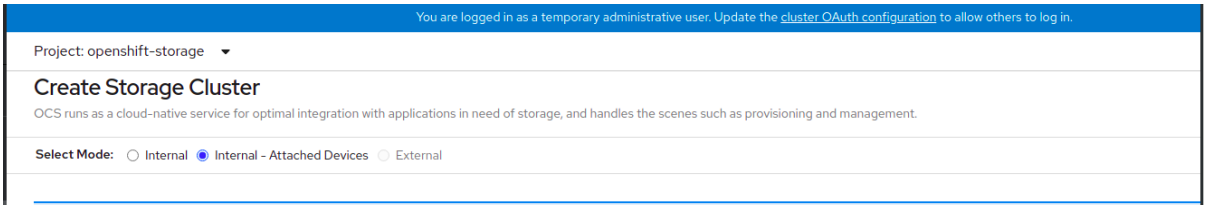
3. Click **OpenShift Container Storage**.

Figure 1.3. Details tab of OpenShift Container Storage



4. Click **Create Instance** link of Storage Cluster.

Figure 1.4. Create Storage Cluster page



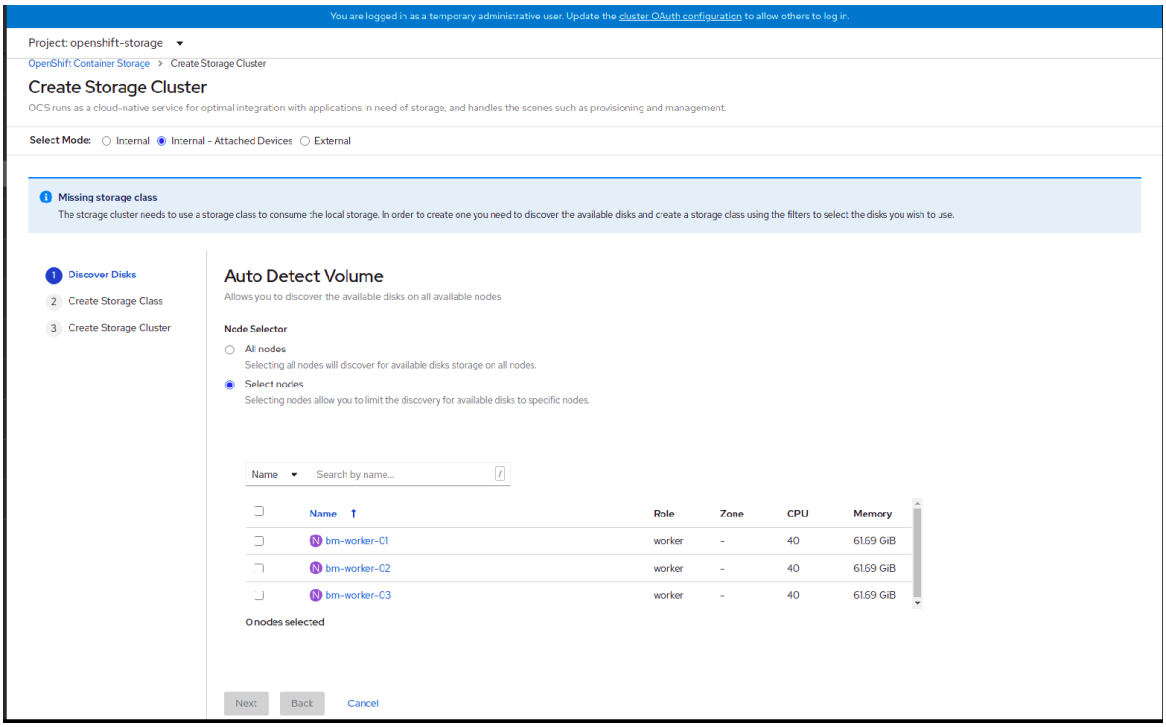
5. Select **Internal-Attached devices** for the **Select Mode**. By default, Internal is selected.

6. Create a storage cluster using the wizard that includes disk discovery, storage class creation, and storage cluster creation.
   You are prompted to install the Local Storage Operator if it is not already installed. Click **Install** and install the operator as described in Installing Local Storage Operator .

Discover disks

You can discover a list of potentially usable disks on the selected nodes. Block disks and partitions that are not in use and available for provisioning persistent volumes (PVs) are discovered.

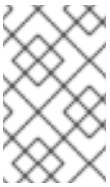
Figure 1.5. Discovery Disks wizard page



a. Choose one of the following:

- **All nodes** to discover disks in all the nodes.
- **Select nodes** to discover disks from a subset of the listed nodes.
  To find specific worker nodes in the cluster, you can filter nodes on the basis of Name or Label. Name allows you to search by name of the node and Label allows you to search by selecting the predefined label.

  If the nodes selected do not match the OpenShift Container Storage cluster requirement of an aggregated 30 CPUs and 72 GiB of RAM, a minimal cluster will be deployed. For minimum starting node requirements, see Resource requirements section in Planning guide.



NOTE

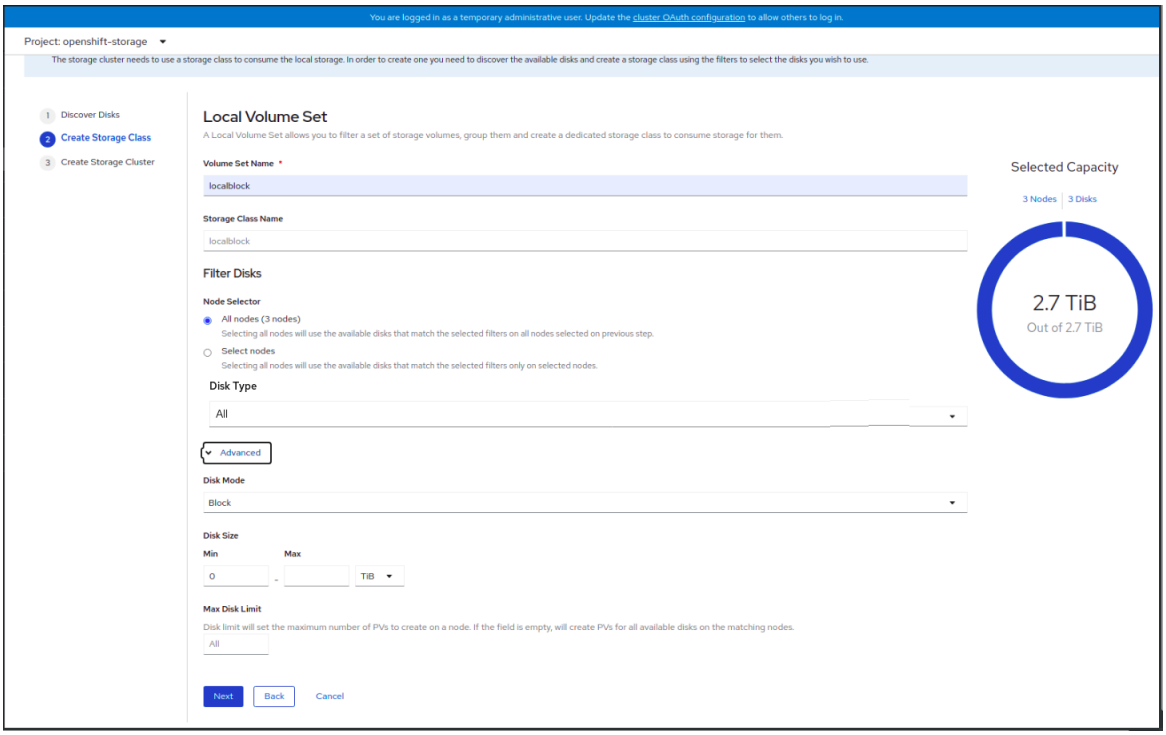
If the nodes to be selected are tainted and not discovered in the wizard, follow the steps provided in the Red Hat Knowledgebase Solution as a workaround.

b. Click **Next**.

Create Storage Class

You can create a dedicated storage class to consume storage by filtering a set of storage volumes.

Figure 1.6. Create Storage Class wizard page



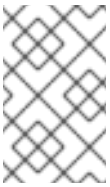
a. Enter the **Volume Set Name**.

b. Enter the **Storage Class Name**. By default, the volume set name appears for the storage class name.

c. The nodes selected for disk discovery in the earlier step are displayed in the **Filter Disks** section. Choose one of the following:

- **All nodes** to select all the nodes for which you discovered the devices.
- **Select nodes** to select a subset of the nodes for which you discovered the devices. To find specific worker nodes in the cluster, you can filter nodes on the basis of Name or Label. Name allows you to search by name of the node and Label allows you to search by selecting the predefined label.

  It is recommended that the worker nodes are spread across three different physical nodes, racks or failure domains for high availability.



NOTE

Ensure OpenShift Container Storage rack labels are aligned with physical racks in the datacenter to prevent a double node failure at the failure domain level.

d. Select the required **Disk Type**. The following options are available:

All	Selects all types of disks present on the nodes. By default, this option is selected.
SSD/NVME	Selects only SSD NVME type of disks.

HDD	Selects only HDD type of disks.

e. In the **Advanced** section, you can set the following:

Disk Mode	Block is selected by default.
Disk Size	Minimum and maximum avaialable size of the device that needs to be included. **NOTE** You must set a minimum size of 100GB for the device.
Max Disk Limit	This indicates the maximum number of PVs that can be created on a node. If this field is left empty, then PVs are created for all the available disks on the matching nodes.

f. (Optional) You can view the selected capacity of the disks on the selected nodes using the *Select Capacity* chart.
This chart might take a few minutes to reflect the disks that are discovered in the previous step.

You can click on the ***Nodes*** and ***Disks*** links on the chart to bring up the list of nodes and disks to view more details.

Figure 1.7. List of selected nodes

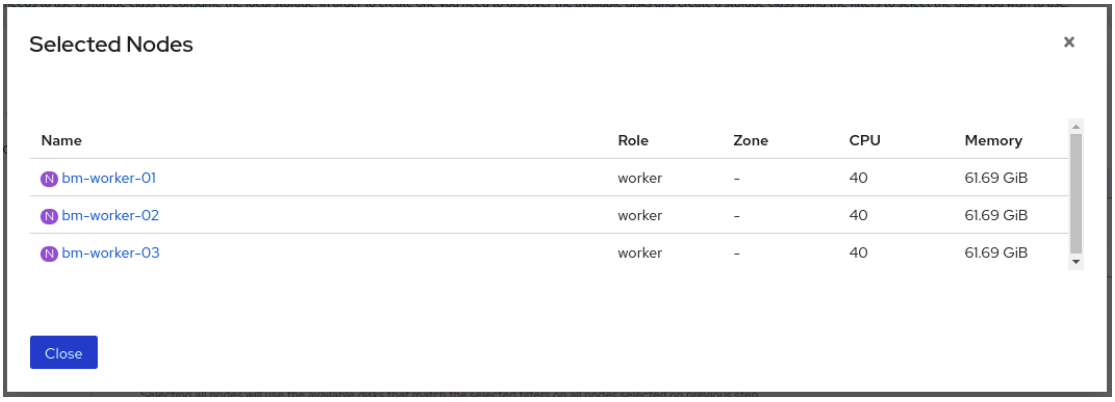
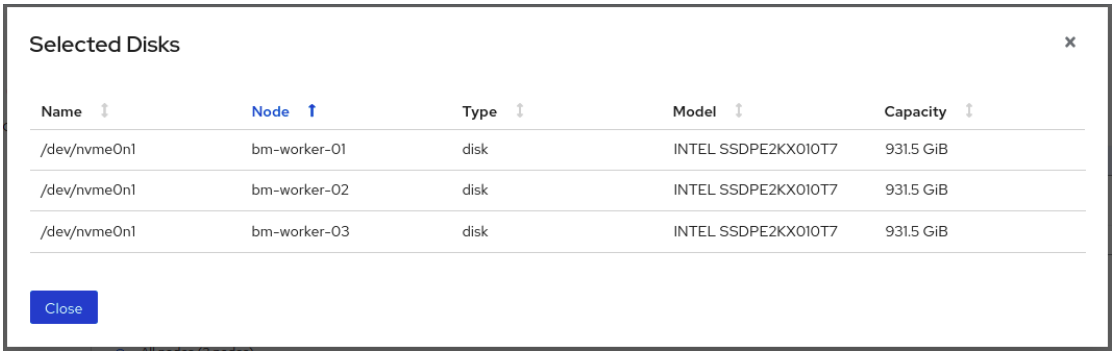


Figure 1.8. List of selected disks

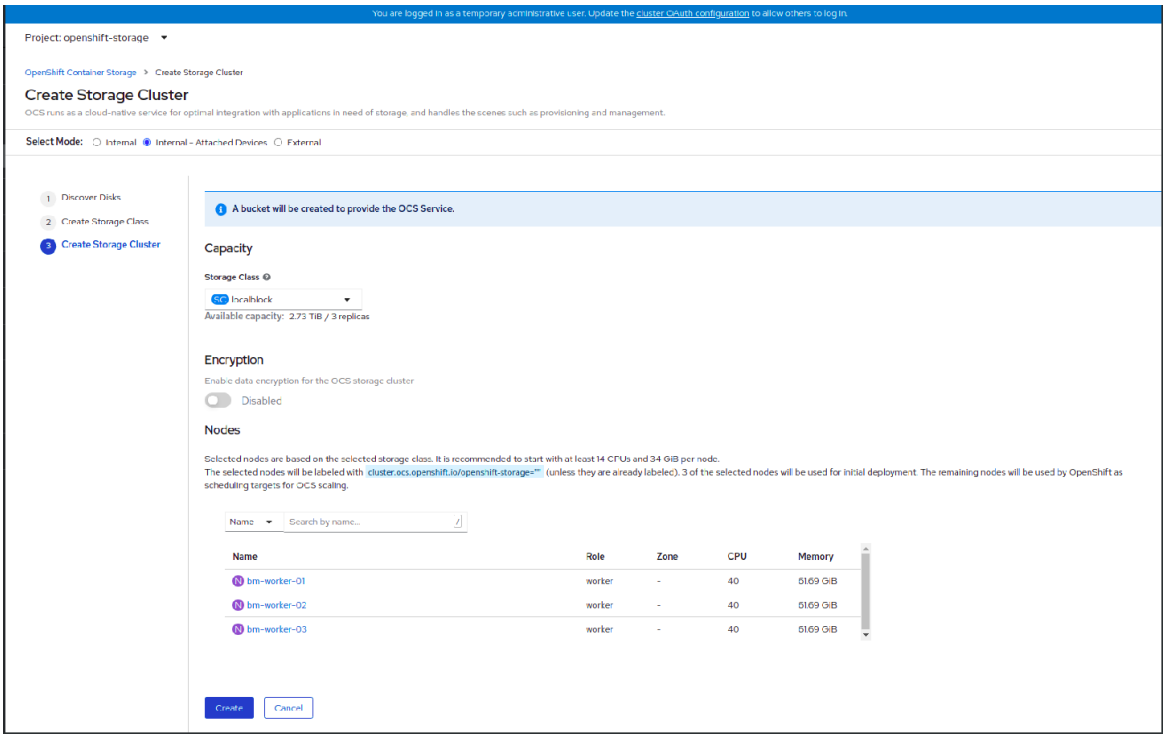


g. Click **Next**.

h. Click **Yes** in the message alert to confirm the creation of the storage class.
After the local volume set and storage class are created, it is not possible to go back to the step.

Create Storage Cluster

Figure 1.9. Create Storage Cluster wizard page



a. Select the required storage class.
You might need to wait a couple of minutes for the storage nodes corresponding to the selected storage class to get populated.

b. (Optional) In the Encryption section, set the toggle to Enabled to enable data encryption on the cluster.

c. The nodes corresponding to the storage class are displayed based on the storage class that you selected from the drop down list.

d. Click **Create**.
The **Create** button is enabled only when a minimum of three nodes are selected. A new storage cluster of three volumes will be created with one volume per worker node. The default configuration uses a replication factor of 3.

To expand the capacity of the initial cluster, see Scaling Storage guide.

Verification steps

See Verifying your OpenShift Container Storage installation .

1.6. CREATING A STORAGE CLUSTER ON BARE METAL WHEN A STORAGE CLASS EXISTS

You can create a Openshift Container Storage Cluster using the existing storage class that is created through the Local Storage Operator page.

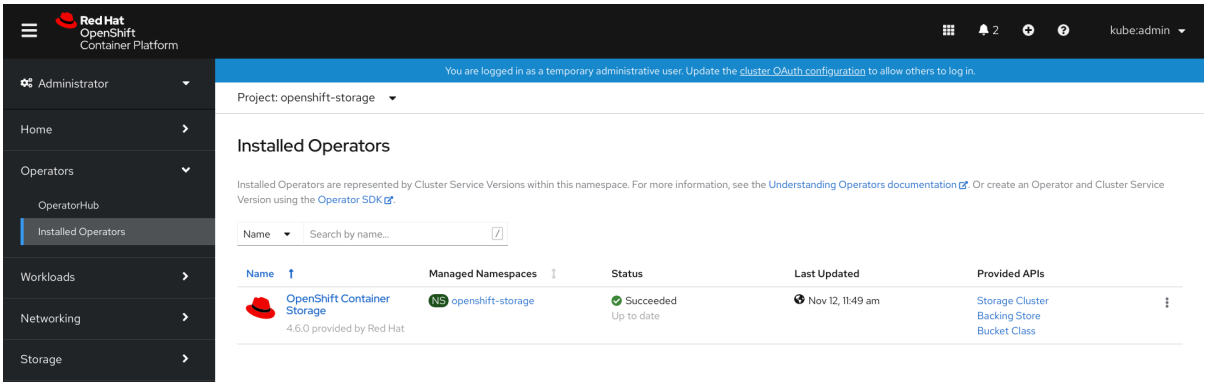
Prerequisites

- Ensure that all the requirements in the Requirements for installing OpenShift Container Storage using local storage devices section are met.
- You must have a minimum of three worker nodes with the same storage type and size attached to each node (for example, 2TB NVMe hard drive) to use local storage devices on bare metal.
- You must have created a storage class that consists of a minimum of three nodes and volume attached to it.

Procedure

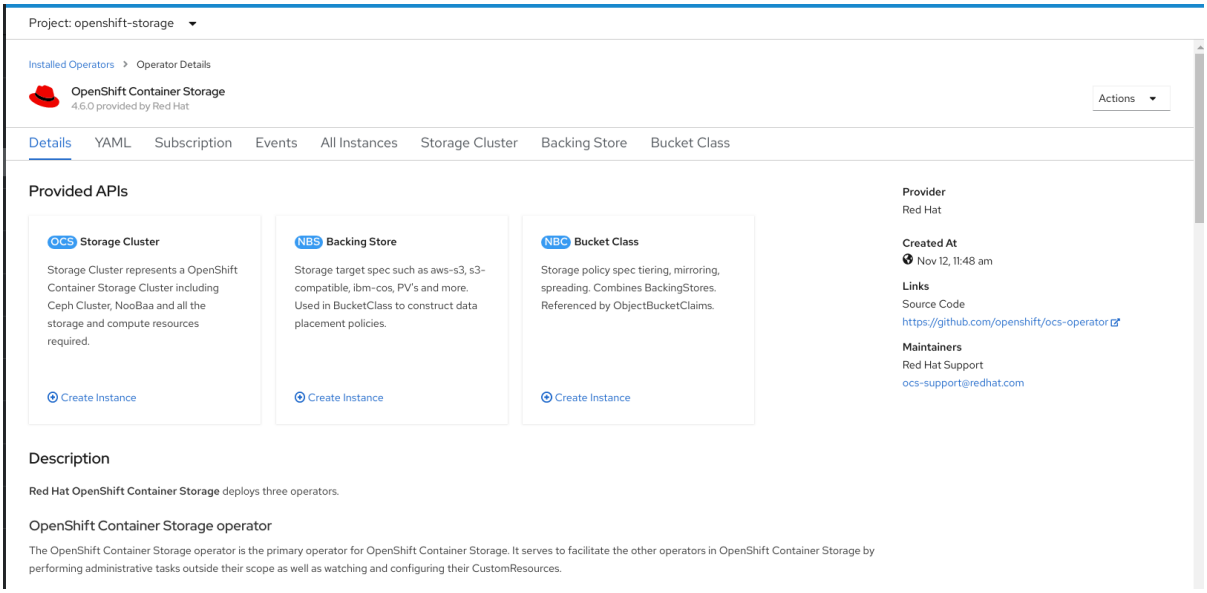
1. Log into the OpenShift Web Console.
2. Click **Operators → Installed Operators** to view all the installed operators.
   Ensure that the **Project** selected is **openshift-storage**.

   Figure 1.10. OpenShift Container Storage Operator page



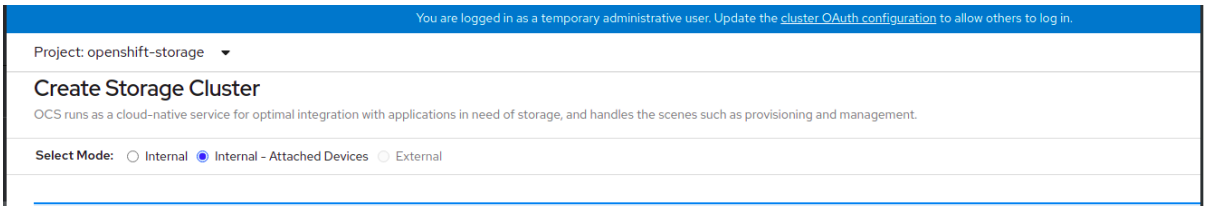
3. Click **OpenShift Container Storage**.

   Figure 1.11. Details tab of OpenShift Container Storage



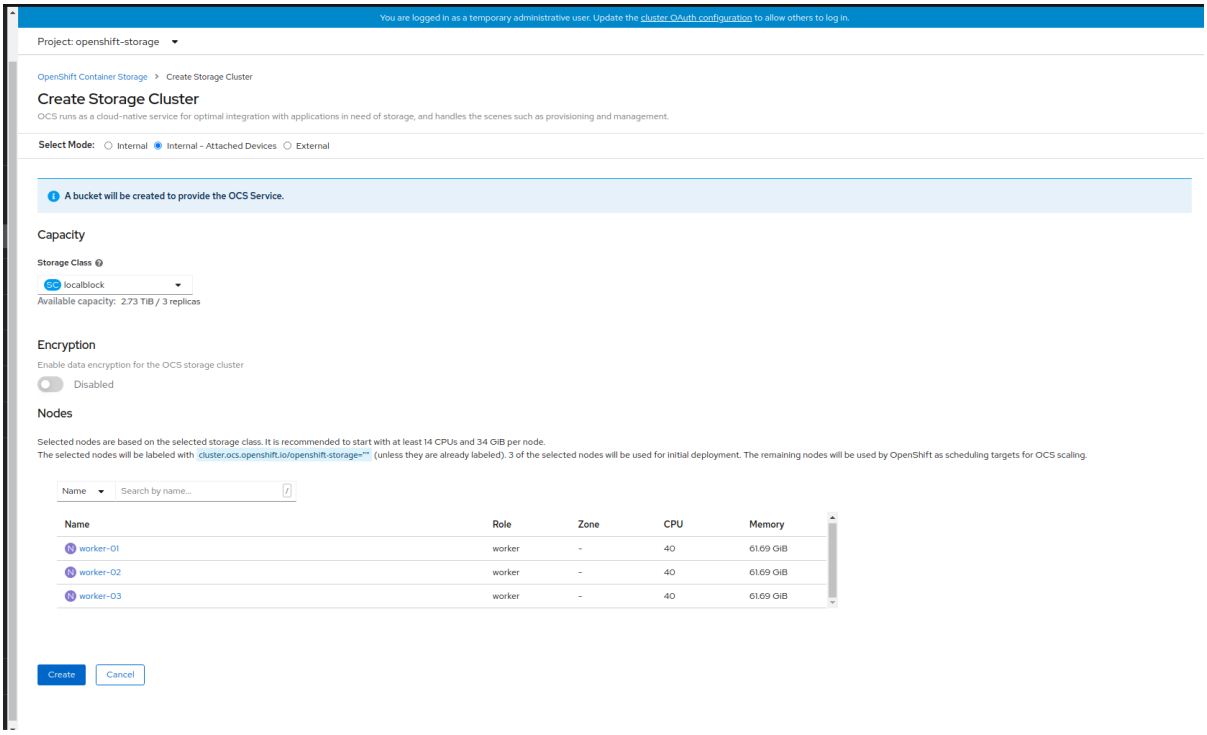
4. Click **Create Instance** link of Storage Cluster.

Figure 1.12. Create Storage Cluster page



5. Select **Internal-Attached devices** for the **Select Mode**. By default, Internal is selected.

Figure 1.13. Create Storage Cluster page



6. (Optional) In the Encryption section, set the toggle to Enabled to enable data encryption on the cluster.

7. The nodes corresponding to the selected storage class are displayed.
   The selected nodes are labeled with **cluster.ocs.openshift.io/openshift-storage=''** if they are not already labeled. Three of the selected nodes are used for initial deployment and the remaining nodes are used as the scheduling targets for OpenShift Container Storage scaling.

8. Click **Create**.
   The **Create** button is enabled only when a minimum of three nodes are selected.

   A new storage cluster of three volumes will be created with one volume per worker node. The default configuration uses a replication factor of 3.

To expand the capacity of the initial cluster, see Scaling Storage guide.

Verification steps

See Verifying your OpenShift Container Storage installation .

CHAPTER 2. VERIFYING OPENSHIFT CONTAINER STORAGE DEPLOYMENT FOR INTERNAL MODE

Use this section to verify that OpenShift Container Storage is deployed correctly.

2.1. VERIFYING THE STATE OF THE PODS

To determine if OpenShift Container storage is deployed successfully, you can verify that the pods are in **Running** state.

Procedure

1. Click **Workloads → Pods** from the left pane of the OpenShift Web Console.
2. Select **openshift-storage** from the **Project** drop down list.
   For more information on the expected number of pods for each component and how it varies depending on the number of nodes, see Table 2.1, "Pods corresponding to OpenShift Container storage cluster".
3. Verify that the following pods are in running and completed state by clicking on the **Running** and the **Completed** tabs:

Table 2.1. Pods corresponding to OpenShift Container storage cluster

Component	Corresponding pods
OpenShift Container Storage Operator	• **ocs-operator-*** (1 pod on any worker node) • **ocs-metrics-exporter-***
Rook-ceph Operator	**rook-ceph-operator-*** (1 pod on any worker node)
Multicloud Object Gateway	• **noobaa-operator-*** (1 pod on any worker node) • **noobaa-core-*** (1 pod on any storage node) • **noobaa-db-*** (1 pod on any storage node) • **noobaa-endpoint-*** (1 pod on any storage node)
MON	**rook-ceph-mon-*** (3 pods distributed across storage nodes)

Component	Corresponding pods
MGR	**rook-ceph-mgr-*** (1 pod on any storage node)
MDS	**rook-ceph-mds-ocs-storagecluster-cephfilesystem-*** (2 pods distributed across storage nodes)
RGW	**rook-ceph-rgw-ocs-storagecluster-cephobjectstore-*** (2 pods distributed across storage nodes)

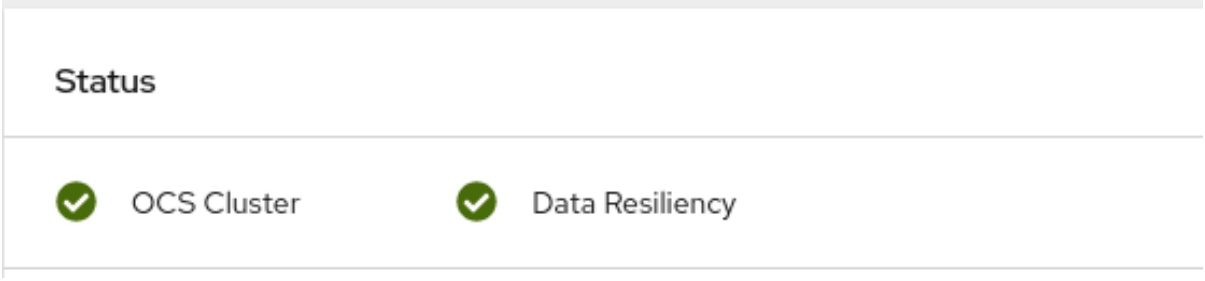
CSI	• **cephfs**
	  ◦ **csi-cephfsplugin-*** (1 pod on each worker node)
	  ◦ **csi-cephfsplugin-provisioner-*** (2 pods distributed across worker nodes)
	• **rbd**
	  ◦ **csi-rbdplugin-*** (1 pod on each worker node)
	  ◦ **csi-rbdplugin-provisioner-*** (2 pods distributed across worker nodes)

rook-ceph-crashcollector	**rook-ceph-crashcollector-*** (1 pod on each storage node)
OSD	• **rook-ceph-osd-*** (1 pod for each device) • **rook-ceph-osd-prepare-ocs-deviceset-*** (1 pod for each device)

2.2. VERIFYING THE OPENSHIFT CONTAINER STORAGE CLUSTER IS HEALTHY

- Click **Home → Overview** from the left pane of the OpenShift Web Console and click **Persistent Storage** tab.
- In the **Status card**, verify that *OCS Cluster* and *Data Resiliency* has a green tick mark as shown in the following image:

Figure 2.1. Health status card in Persistent Storage Overview Dashboard



- In the **Details card**, verify that the cluster information is displayed as follows:

  Service Name

  OpenShift Container Storage

  Cluster Name

  ocs-storagecluster

  Provider

  None

  Mode

  Internal

  Version

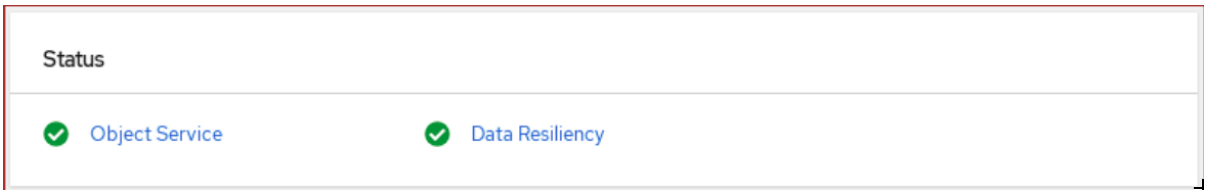
  ocs-operator-4.6.0

For more information on the health of OpenShift Container Storage cluster using the persistent storage dashboard, see Monitoring OpenShift Container Storage .

2.3. VERIFYING THE MULTICLOUD OBJECT GATEWAY IS HEALTHY

- Click **Home → Overview** from the left pane of the OpenShift Web Console and click the **Object Service** tab.
- In the **Status card**, verify that both *Object Service* and *Data Resiliency* are in **Ready** state (green tick).

Figure 2.2. Health status card in Object Service Overview Dashboard



- In the **Details card**, verify that the MCG information is displayed as follows:

  Service Name

  OpenShift Container Storage

  System Name

  Multicloud Object Gateway
  RADOS Object Gateway

  Provider

None

Version

ocs-operator-4.6.0

For more information on the health of the OpenShift Container Storage cluster using the object service dashboard, see Monitoring OpenShift Container Storage .

2.4. VERIFYING THAT THE OPENSHIFT CONTAINER STORAGE SPECIFIC STORAGE CLASSES EXIST

To verify the storage classes exists in the cluster:

- Click **Storage → Storage Classes**from the left pane of the OpenShift Web Console.
- Verify that the following storage classes are created with the OpenShift Container Storage cluster creation:
  - **ocs-storagecluster-ceph-rbd**
  - **ocs-storagecluster-cephfs**
  - **openshift-storage.noobaa.io**
  - **ocs-storagecluster-ceph-rgw**

CHAPTER 3. UNINSTALLING OPENSHIFT CONTAINER STORAGE

3.1. UNINSTALLING OPENSHIFT CONTAINER STORAGE IN INTERNAL MODE

Use the steps in this section to uninstall OpenShift Container Storage.

Uninstall Annotations

Annotations on the Storage Cluster are used to change the behavior of the uninstall process. To define the uninstall behavior, the following two annotations have been introduced in the storage cluster:

- **uninstall.ocs.openshift.io/cleanup-policy: delete**
- **uninstall.ocs.openshift.io/mode: graceful**

The below table provides information on the different values that can used with these annotations:

Table 3.1. uninstall.ocs.openshift.io uninstall annotations descriptions

Annotation	Value	Default	Behavior
cleanup-policy	delete	Yes	Rook cleans up the physical drives and the **DataDirHostPath**
cleanup-policy	retain	No	Rook does **not** clean up the physical drives and the **DataDirHostPath**
mode	graceful	Yes	Rook and NooBaa **pauses** the uninstall process until the PVCs and the OBCs are removed by the administrator/user
mode	forced	No	Rook and NooBaa proceeds with uninstall even if PVCs/OBCs provisioned using Rook and NooBaa exist respectively.

You can change the cleanup policy or the uninstall mode by editing the value of the annotation by using the following commands:

```
$ oc annotate storagecluster -n openshift-storage ocs-storagecluster
uninstall.ocs.openshift.io/cleanup-policy="retain" --overwrite
storagecluster.ocs.openshift.io/ocs-storagecluster annotated
```

```
$ oc annotate storagecluster -n openshift-storage ocs-storagecluster
uninstall.ocs.openshift.io/mode="forced" --overwrite
storagecluster.ocs.openshift.io/ocs-storagecluster annotated
```

Prerequisites

- Ensure that the OpenShift Container Storage cluster is in a healthy state. The uninstall process can fail when some of the pods are not terminated successfully due to insufficient resources or nodes. In case the cluster is in an unhealthy state, contact Red Hat Customer Support before uninstalling OpenShift Container Storage.
- Ensure that applications are not consuming persistent volume claims (PVCs) or object bucket claims (OBCs) using the storage classes provided by OpenShift Container Storage.
- If any custom resources (such as custom storage classes, cephblockpools) were created by the admin, they must be deleted by the admin after removing the resources which consumed them.

Procedure

1. Delete the volume snapshots that are using OpenShift Container Storage.
   a. List the volume snapshots from all the namespaces.

      ```
      $ oc get volumesnapshot --all-namespaces
      ```

   b. From the output of the previous command, identify and delete the volume snapshots that are using OpenShift Container Storage.

      ```
      $ oc delete volumesnapshot <VOLUME-SNAPSHOT-NAME> -n <NAMESPACE>
      ```

2. Delete PVCs and OBCs that are using OpenShift Container Storage.
   In the default uninstall mode (graceful), the uninstaller waits till all the PVCs and OBCs that use OpenShift Container Storage are deleted.

   If you wish to delete the Storage Cluster without deleting the PVCs beforehand, you may set the uninstall mode annotation to "forced" and skip this step. Doing so will result in orphan PVCs and OBCs in the system.

   a. Delete OpenShift Container Platform monitoring stack PVCs using OpenShift Container Storage.
      See Section 3.2, “Removing monitoring stack from OpenShift Container Storage”

   b. Delete OpenShift Container Platform Registry PVCs using OpenShift Container Storage.
      See Section 3.3, “Removing OpenShift Container Platform registry from OpenShift Container Storage”

   c. Delete OpenShift Container Platform logging PVCs using OpenShift Container Storage.
      See Section 3.4, “Removing the cluster logging operator from OpenShift Container Storage”

   d. Delete other PVCs and OBCs provisioned using OpenShift Container Storage.

      - Given below is a sample script to identify the PVCs and OBCs provisioned using OpenShift Container Storage. The script ignores the PVCs that are used internally by Openshift Container Storage.

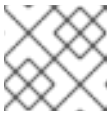
```
#!/bin/bash

RBD_PROVISIONER="openshift-storage.rbd.csi.ceph.com"
CEPHFS_PROVISIONER="openshift-storage.cephfs.csi.ceph.com"
NOOBAA_PROVISIONER="openshift-storage.noobaa.io/obc"
RGW_PROVISIONER="openshift-storage.ceph.rook.io/bucket"

NOOBAA_DB_PVC="noobaa-db"
NOOBAA_BACKINGSTORE_PVC="noobaa-default-backing-store-noobaa-pvc"

# Find all the OCS StorageClasses
OCS_STORAGECLASSES=$(oc get storageclasses | grep -e
"$RBD_PROVISIONER" -e "$CEPHFS_PROVISIONER" -e
"$NOOBAA_PROVISIONER" -e "$RGW_PROVISIONER" | awk '{print $1}')

# List PVCs in each of the StorageClasses
for SC in $OCS_STORAGECLASSES
do
        echo
"============================================================================
=="
        echo "$SC StorageClass PVCs and OBCs"
        echo
"============================================================================
=="
        oc get pvc  --all-namespaces --no-headers 2>/dev/null | grep $SC | grep -v -e
"$NOOBAA_DB_PVC" -e "$NOOBAA_BACKINGSTORE_PVC"
        oc get obc  --all-namespaces --no-headers 2>/dev/null | grep $SC
        echo
done
```



NOTE

Omit **RGW_PROVISIONER** for cloud platforms.

- Delete the OBCs.

```
$ oc delete obc <obc name> -n <project name>
```

- Delete the PVCs.

```
$ oc delete pvc <pvc name> -n <project-name>
```

NOTE

Ensure that you have removed any custom backing stores, bucket classes, etc., created in the cluster.

3. Delete the Storage Cluster object and wait for the removal of the associated resources.

```
$ oc delete -n openshift-storage storagecluster --all --wait=true
```

4. Check for cleanup pods if the **uninstall.ocs.openshift.io/cleanup-policy** was set to **delete**(default) and ensure that their status is **Completed**.

```
$ oc get pods -n openshift-storage | grep -i cleanup
NAME                          READY   STATUS      RESTARTS   AGE
cluster-cleanup-job-<xx>       0/1     Completed   0          8m35s
cluster-cleanup-job-<yy>       0/1     Completed   0          8m35s
cluster-cleanup-job-<zz>       0/1     Completed   0          8m35s
```

5. Confirm that the directory **/var/lib/rook** is now empty. This directory will be empty only if the **uninstall.ocs.openshift.io/cleanup-policy** annotation was set to **delete**(default).

```
$ for i in $(oc get node -l cluster.ocs.openshift.io/openshift-storage= -o jsonpath='{
.items[*].metadata.name }'); do oc debug node/${i} -- chroot /host  ls -l /var/lib/rook; done
```

6. If encryption was enabled at the time of install, remove **dm-crypt** managed **device-mapper** mapping from OSD devices on all the OpenShift Container Storage nodes.

   a. Create a **debug** pod and **chroot** to the host on the storage node.

```
$ oc debug node/<node name>
$ chroot /host
```

   b. Get Device names and make note of the OpenShift Container Storage devices.

```
$ dmsetup ls
ocs-deviceset-0-data-0-57snx-block-dmcrypt (253:1)
```

   c. Remove the mapped device.

```
$ cryptsetup luksClose --debug --verbose ocs-deviceset-0-data-0-57snx-block-dmcrypt
```

   If the above command gets stuck due to insufficient privileges, run the following commands:

   - Press **CTRL+Z** to exit the above command.
   - Find PID of the **cryptsetup** process which was stuck.

```
$ ps
```

     Example output:

```
PID    TTY    TIME     CMD
778825  ?     00:00:00 cryptsetup
```

     Take a note of the **PID** number to kill. In this example, **PID** is **778825**.

   - Terminate the process using **kill** command.

```
$ kill -9 <PID>
```

   - Verify that the device name is removed.

```
$ dmsetup ls
```

7. Delete the namespace and wait till the deletion is complete. You will need to switch to another project if **openshift-storage** is the active project.
   For example:

   ```
   $ oc project default
   $ oc delete project openshift-storage --wait=true --timeout=5m
   ```

   The project is deleted if the following command returns a **NotFound** error.

   ```
   $ oc get project openshift-storage
   ```

   NOTE

   While uninstalling OpenShift Container Storage, if namespace is not deleted completely and remains in **Terminating** state, perform the steps in Troubleshooting and deleting remaining resources during Uninstall to identify objects that are blocking the namespace from being terminated.

8. Delete the local storage operator configurations if you have deployed OpenShift Container Storage using local storage devices. See Removing local storage operator configurations .

9. Unlabel the storage nodes.

   ```
   $ oc label nodes  --all cluster.ocs.openshift.io/openshift-storage-
   $ oc label nodes  --all topology.rook.io/rack-
   ```

10. Remove the OpenShift Container Storage taint if the nodes were tainted.

    ```
    $ oc adm taint nodes --all node.ocs.openshift.io/storage-
    ```

11. Confirm all PVs provisioned using OpenShift Container Storage are deleted. If there is any PV left in the **Released** state, delete it.

    ```
    $ oc get pv
    $ oc delete pv <pv name>
    ```

12. Delete the Multicloud Object Gateway storageclass.

    ```
    $ oc delete storageclass openshift-storage.noobaa.io --wait=true --timeout=5m
    ```

13. Remove **CustomResourceDefinitions**.

    ```
    $ oc delete crd backingstores.noobaa.io bucketclasses.noobaa.io
    cephblockpools.ceph.rook.io cephclusters.ceph.rook.io cephfilesystems.ceph.rook.io
    cephnfses.ceph.rook.io cephobjectstores.ceph.rook.io cephobjectstoreusers.ceph.rook.io
    noobaas.noobaa.io ocsinitializations.ocs.openshift.io storageclusters.ocs.openshift.io
    cephclients.ceph.rook.io cephobjectrealms.ceph.rook.io cephobjectzonegroups.ceph.rook.io
    cephobjectzones.ceph.rook.io cephrbdmirrors.ceph.rook.io --wait=true --timeout=5m
    ```

14. To ensure that OpenShift Container Storage is uninstalled completely, on the OpenShift Container Platform Web Console,

    a. Click **Home → Overview** to access the dashboard.

    b. Verify that the Persistent Storage and Object Service tabs no longer appear next to the **Cluster** tab.

3.1.1. Removing local storage operator configurations

Use the instructions in this section only if you have deployed OpenShift Container Storage using local storage devices.

NOTE

For OpenShift Container Storage deployments only using **localvolume** resources, go directly to step 8.

Procedure

1. Identify the **LocalVolumeSet** and the corresponding **StorageClassName** being used by OpenShift Container Storage.
2. Set the variable SC to the **StorageClass** providing the **LocalVolumeSet**.

```
$ export SC="<StorageClassName>"
```

3. Delete the **LocalVolumeSet**.

```
$ oc delete localvolumesets.local.storage.openshift.io <name-of-volumeset> -n openshift-local-storage
```

4. Delete the local storage PVs for the given **StorageClassName**.

```
$ oc get pv | grep $SC | awk '{print $1}'| xargs oc delete pv
```

5. Delete the **StorageClassName**.

```
$ oc delete sc $SC
```

6. Delete the symlinks created by the **LocalVolumeSet**.

```
[[ ! -z $SC ]] && for i in $(oc get node -l cluster.ocs.openshift.io/openshift-storage= -o jsonpath='{ .items[*].metadata.name }'); do oc debug node/${i} -- chroot /host rm -rfv /mnt/local-storage/${SC}/; done
```

7. Delete **LocalVolumeDiscovery**.

```
$ oc delete localvolumediscovery.local.storage.openshift.io/auto-discover-devices -n openshift-local-storage
```

8. Removing **LocalVolume** resources (if any).

Use the following steps to remove the **LocalVolume** resources that were used to provision PVs in the current or previous OpenShift Container Storage version. Also, ensure that these resources are not being used by other tenants on the cluster.

For each of the local volumes, do the following:

a. Identify the **LocalVolume** and the corresponding **StorageClassName** being used by OpenShift Container Storage.

b. Set the variable LV to the name of the LocalVolume and variable SC to the name of the StorageClass
For example:

```
$ LV=local-block
$ SC=localblock
```

c. Delete the local volume resource.

```
$ oc delete localvolume -n local-storage --wait=true $LV
```

d. Delete the remaining PVs and StorageClasses if they exist.

```
$ oc delete pv -l storage.openshift.com/local-volume-owner-name=${LV} --wait --timeout=5m
$ oc delete storageclass $SC --wait --timeout=5m
```

e. Clean up the artifacts from the storage nodes for that resource.

```
$ [[ ! -z $SC ]] && for i in $(oc get node -l cluster.ocs.openshift.io/openshift-storage= -o jsonpath='{ .items[*].metadata.name }'); do oc debug node/${i} -- chroot /host rm -rfv /mnt/local-storage/${SC}/; done
```

Example output:

```
Starting pod/node-xxx-debug ...
To use host binaries, run `chroot /host`
removed '/mnt/local-storage/localblock/nvme2n1'
removed directory '/mnt/local-storage/localblock'

Removing debug pod ...
Starting pod/node-yyy-debug ...
To use host binaries, run `chroot /host`
removed '/mnt/local-storage/localblock/nvme2n1'
removed directory '/mnt/local-storage/localblock'

Removing debug pod ...
Starting pod/node-zzz-debug ...
To use host binaries, run `chroot /host`
removed '/mnt/local-storage/localblock/nvme2n1'
removed directory '/mnt/local-storage/localblock'

Removing debug pod ...
```

3.2. REMOVING MONITORING STACK FROM OPENSHIFT CONTAINER STORAGE

Use this section to clean up the monitoring stack from OpenShift Container Storage.

The PVCs that are created as a part of configuring the monitoring stack are in the **openshift-monitoring** namespace.

Prerequisites

- PVCs are configured to use OpenShift Container Platform monitoring stack.
  For information, see configuring monitoring stack.

Procedure

1. List the pods and PVCs that are currently running in the **openshift-monitoring** namespace.

```
$ oc get pod,pvc -n openshift-monitoring
NAME                          READY   STATUS    RESTARTS   AGE
pod/alertmanager-main-0       3/3     Running   0          8d
pod/alertmanager-main-1       3/3     Running   0          8d
pod/alertmanager-main-2       3/3     Running   0          8d
pod/cluster-monitoring-
operator-84457656d-pkrxm      1/1     Running   0          8d
pod/grafana-79ccf6689f-2ll28  2/2     Running   0          8d
pod/kube-state-metrics-
7d86fb966-rvd9w               3/3     Running   0          8d
pod/node-exporter-25894       2/2     Running   0          8d
pod/node-exporter-4dsd7       2/2     Running   0          8d
pod/node-exporter-6p4zc       2/2     Running   0          8d
pod/node-exporter-jbjvg       2/2     Running   0          8d
pod/node-exporter-jj4t5       2/2     Running   0          6d18h
pod/node-exporter-k856s       2/2     Running   0          6d18h
pod/node-exporter-rf8gn       2/2     Running   0          8d
pod/node-exporter-rmb5m       2/2     Running   0          6d18h
pod/node-exporter-zj7kx       2/2     Running   0          8d
pod/openshift-state-metrics-
59dbd4f654-4clng              3/3     Running   0          8d
pod/prometheus-adapter-
5df5865596-k8dzn              1/1     Running   0          7d23h
pod/prometheus-adapter-
5df5865596-n2gj9              1/1     Running   0          7d23h
pod/prometheus-k8s-0          6/6     Running   1          8d
pod/prometheus-k8s-1          6/6     Running   1          8d
pod/prometheus-operator-
55cfb858c9-c4zd9              1/1     Running   0          6d21h
pod/telemeter-client-
78fc8fc97d-2rgfp              3/3     Running   0          8d

NAME                                         STATUS   VOLUME
CAPACITY   ACCESS MODES   STORAGECLASS                AGE
persistentvolumeclaim/my-alertmanager-claim-alertmanager-main-0   Bound    pvc-0d519c4f-
15a5-11ea-baa0-026d231574aa   40Gi       RWO           ocs-storagecluster-ceph-rbd   8d
persistentvolumeclaim/my-alertmanager-claim-alertmanager-main-1   Bound    pvc-
0d5a9825-15a5-11ea-baa0-026d231574aa   40Gi       RWO           ocs-storagecluster-ceph-
```

```
rbd   8d
persistentvolumeclaim/my-alertmanager-claim-alertmanager-main-2   Bound    pvc-
0d6413dc-15a5-11ea-baa0-026d231574aa   40Gi       RWO            ocs-storagecluster-ceph-
rbd   8d
persistentvolumeclaim/my-prometheus-claim-prometheus-k8s-0        Bound    pvc-0b7c19b0-
15a5-11ea-baa0-026d231574aa   40Gi       RWO            ocs-storagecluster-ceph-rbd   8d
persistentvolumeclaim/my-prometheus-claim-prometheus-k8s-1        Bound    pvc-0b8aed3f-
15a5-11ea-baa0-026d231574aa   40Gi       RWO            ocs-storagecluster-ceph-rbd   8d
```

2. Edit the monitoring **configmap**.

```
$ oc -n openshift-monitoring edit configmap cluster-monitoring-config
```

3. Remove any **config** sections that reference the OpenShift Container Storage storage classes as shown in the following example and save it.

Before editing

```
.
.
.
apiVersion: v1
data:
  config.yaml: |
    alertmanagerMain:
      volumeClaimTemplate:
        metadata:
          name: my-alertmanager-claim
        spec:
          resources:
            requests:
              storage: 40Gi
          storageClassName: ocs-storagecluster-ceph-rbd
    prometheusK8s:
      volumeClaimTemplate:
        metadata:
          name: my-prometheus-claim
        spec:
          resources:
            requests:
              storage: 40Gi
          storageClassName: ocs-storagecluster-ceph-rbd
kind: ConfigMap
metadata:
  creationTimestamp: "2019-12-02T07:47:29Z"
  name: cluster-monitoring-config
  namespace: openshift-monitoring
  resourceVersion: "22110"
  selfLink: /api/v1/namespaces/openshift-monitoring/configmaps/cluster-monitoring-config
  uid: fd6d988b-14d7-11ea-84ff-066035b9efa8
.
.
.
```

After editing

```
.
.
.
apiVersion: v1
data:
  config.yaml: |
kind: ConfigMap
metadata:
  creationTimestamp: "2019-11-21T13:07:05Z"
  name: cluster-monitoring-config
  namespace: openshift-monitoring
  resourceVersion: "404352"
  selfLink: /api/v1/namespaces/openshift-monitoring/configmaps/cluster-monitoring-config
  uid: d12c796a-0c5f-11ea-9832-063cd735b81c
.
.
.
```

In this example, **alertmanagerMain** and **prometheusK8s** monitoring components are using the OpenShift Container Storage PVCs.

4. Delete relevant PVCs. Make sure you delete all the PVCs that are consuming the storage classes.

```
$ oc delete -n openshift-monitoring pvc <pvc-name> --wait=true --timeout=5m
```

3.3. REMOVING OPENSHIFT CONTAINER PLATFORM REGISTRY FROM OPENSHIFT CONTAINER STORAGE

Use this section to clean up OpenShift Container Platform registry from OpenShift Container Storage. If you want to configure an alternative storage, see image registry

The PVCs that are created as a part of configuring OpenShift Container Platform registry are in the **openshift-image-registry** namespace.

Prerequisites

- The image registry should have been configured to use an OpenShift Container Storage PVC.

Procedure

1. Edit the **configs.imageregistry.operator.openshift.io** object and remove the content in the **storage** section.

```
$ oc edit configs.imageregistry.operator.openshift.io
```

Before editing

```
.
.
.
storage:
  pvc:
    claim: registry-cephfs-rwx-pvc
.
.
.
```

After editing

```
.
.
.
storage:
  emptyDir: {}
.
.
.
```

In this example, the PVC is called **registry-cephfs-rwx-pvc**, which is now safe to delete.

2. Delete the PVC.

```
$ oc delete pvc <pvc-name> -n openshift-image-registry --wait=true --timeout=5m
```

3.4. REMOVING THE CLUSTER LOGGING OPERATOR FROM OPENSHIFT CONTAINER STORAGE

Use this section to clean up the cluster logging operator from OpenShift Container Storage.

The PVCs that are created as a part of configuring cluster logging operator are in the **openshift-logging** namespace.

Prerequisites

- The cluster logging instance should have been configured to use OpenShift Container Storage PVCs.

Procedure

1. Remove the **ClusterLogging** instance in the namespace.

```
$ oc delete clusterlogging instance -n openshift-logging --wait=true --timeout=5m
```

The PVCs in the **openshift-logging** namespace are now safe to delete.

2. Delete PVCs.

```
$ oc delete pvc <pvc-name> -n openshift-logging --wait=true --timeout=5m
```