

Red Hat OpenShift Container Storage 4.6

Scaling storage

Horizontal and vertical scaling options

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Horizontal and vertical scaling options

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Abstract

This document explains scaling options for Red Hat OpenShift Container Storage.

Table of Contents

PREFACE	3
CHAPTER 1. REQUIREMENTS FOR SCALING STORAGE NODES	4 4
CHAPTER 2. SCALING UP STORAGE CAPACITY	5
2.1. CREATING A STORAGE CLASS	5
2.2. SCALING UP STORAGE BY ADDING CAPACITY TO YOUR OPENSHIFT CONTAINER STORAGE NODES	6
2.3. SCALING UP STORAGE BY ADDING CAPACITY TO YOUR OPENSHIFT CONTAINER STORAGE NODES	0
USING LOCAL STORAGE DEVICES	9
2.4. SCALING UP STORAGE BY ADDING CAPACITY TO YOUR OPENSHIFT CONTAINER STORAGE NODES ON IBM POWER SYSTEMS INFRASTRUCTURE USING LOCAL STORAGE DEVICES	12
2.5. SCALING UP STORAGE BY ADDING CAPACITY TO YOUR OPENSHIFT CONTAINER STORAGE NODES ON IBM Z OR LINUXONE INFRASTRUCTURE	15
CHAPTER 3. SCALING OUT STORAGE CAPACITY	19
3.1. ADDING A NODE	19
3.1.1. Adding a node on an installer-provisioned infrastructure	19
3.1.2. Adding a node on an user-provisioned infrastructure	20
3.1.3. Adding a node using a local storage device	21
3.1.4. Verifying the addition of a new node	23
3.2. SCALING UP STORAGE CAPACITY	24

PREFACE

To scale the storage capacity of OpenShift Container Storage in internal mode, you can do either of the following:

- Scale up storage nodes Add storage capacity to the existing Red Hat OpenShift Container Storage worker nodes
- Scale out storage nodes Add new worker nodes containing storage capacity

For scaling your storage in external mode, see Red Hat Ceph Storage documentation .

CHAPTER 1. REQUIREMENTS FOR SCALING STORAGE NODES

Before you proceed to scale the storage nodes, refer to the following sections to understand the node requirements for your specific Red Hat OpenShift Container Storage instance:

- Platform requirements
- Storage device requirements
 - Dynamic storage devices
 - Local storage devices
 - Capacity planning



IMPORTANT

Always ensure that you have plenty of storage capacity.

If storage ever fills completely, it is not possible to add capacity or delete or migrate content away from the storage to free up space. Completely full storage is very difficult to recover.

Capacity alerts are issued when cluster storage capacity reaches 75% (near-full) and 85% (full) of total capacity. Always address capacity warnings promptly, and review your storage regularly to ensure that you do not run out of storage space.

If you do run out of storage space completely, contact Red Hat Customer Support.

1.1. SUPPORTED DEPLOYMENTS FOR RED HAT OPENSHIFT CONTAINER STORAGE

- User-provisioned infrastructure:
 - Amazon Web Services (AWS)
 - VMware
 - Bare metal
 - IBM Power Systems
 - IBM Z or LinuxONE
- Installer-provisioned infrastructure:
 - Amazon Web Services (AWS)
 - Microsoft Azure

CHAPTER 2. SCALING UP STORAGE CAPACITY

Depending on the type of your deployment, you can choose one of the following procedures to scale up storage capacity.

- For AWS, VMware, or Azure infrastructures using dynamic or automated provisioning of storage devices, see Section 2.2, "Scaling up storage by adding capacity to your OpenShift Container Storage nodes"
- For bare metal, Amazon EC2 I3, or VMware infrastructures using local storage devices, see Section 2.3, "Scaling up storage by adding capacity to your OpenShift Container Storage nodes using local storage devices"
- For IBM Z or LinuxONE infrastructures using local storage devices, see Section 2.5, "Scaling up storage by adding capacity to your OpenShift Container Storage nodes on IBM Z or LinuxONE infrastructure"
- For IBM Power Systems using local storage devices, see Section 2.4, "Scaling up storage by adding capacity to your OpenShift Container Storage nodes on IBM Power Systems infrastructure using local storage devices"

If you want to scale using a storage class other than the one provisioned during deployment, you must also define an additional storage class before you scale. See Creating a storage class for details.



NOTE

OpenShift Container Storage does not support heterogeneous OSD sizes.

2.1. CREATING A STORAGE CLASS

You can define a new storage class to dynamically provision storage from an existing provider.



IMPORTANT

Using storage classes other than the default for your provider is a Technology Preview feature.

Technology Preview features are not supported with Red Hat production service level agreements (SLAs) and might not be functionally complete. Red Hat does not recommend using them in production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process.

For more information, see Technology Preview Features Support Scope.

Prerequisites

• Administrator access to OpenShift web console.

Procedure

- 1. Log in to OpenShift Web Console.
- 2. Click Storage → Storage Classes.

- 3. Click Create Storage Class
- 4. Enter the storage class Name and Description.
- 5. Select the required **Reclaim Policy** and **Provisioner**.
- 6. Click **Create** to create the Storage Class.

Verification steps

• Click Storage → Storage Classes and verify that you can see the new storage class.

2.2. SCALING UP STORAGE BY ADDING CAPACITY TO YOUR OPENSHIFT CONTAINER STORAGE NODES

Use this procedure to add storage capacity and performance to your configured Red Hat OpenShift Container Storage worker nodes on the following infrastructures:

- AWS
- VMware vSphere
- Microsoft Azure

Prerequisites

- A running OpenShift Container Storage Platform.
- Administrative privileges on the OpenShift Web Console.
- To scale using a storage class other than the one provisioned during deployment, first define an additional storage class. See Creating a storage class for details.

Procedure

- 1. Log in to the OpenShift Web Console.
- 2. Click on **Operators** → **Installed Operators**.
- 3. Click OpenShift Container Storage Operator.

Red Hat OpenShift Container Platf	orm						2	Ð	0	kube:admin 👻
Administration	_		You are logged in as a tempora	ry administrative user. Update tl	ne <u>cluster OAuth configuration</u> to allow others	to log in.				
Administrator		Project: openshift-storage 🔻								
Home		Installed Operators								
Operators		Installed Operators are represented Version using the Operator SDK r .	by Cluster Service Versions within this na	amespace. For more information	, see the Understanding Operators document	ation 🗗. Or	create	an Oper	rator and	Cluster Service
OperatorHub Installed Operators		Name Search by name	Z							
Workloads		Name 🏌	Managed Namespaces 1	Status	Last Updated	Pi	ovideo	l APIs		
Networking		4.6.0 provided by Red Hi	NS openshift-storage	Succeeded Up to date	🚱 Nov 12, 11:49 am	St Bi Bi	orage acking ucket C	Cluster Store Ilass		:
Storage										

4. Click **Storage Cluster** tab.

Red Hat OpenShift Container Plat	orm		 ♣ з	Ð	Ø	kube:admin 👻
••• • • • • • • • • • • • •						
- Administrator		Project: openshift-storage 🔻				
Home	>					
		Installed Operators > Operator Details				
Operators		OpenShift Container Storage				Actions 🝷
OperatorHub		Details YAML Subscription Events All Instances Storage Cluster Backing Store Bucket Class				
1						

- 5. The visible list should have only one item. Click (:) on the far right to extend the options menu.
- 6. Select Add Capacity from the options menu.

Add Capacity	
Adding capacity for ocs-storagecluster ,	may increase your expenses.
Storage Class 🔞	
SC thin 🗸	
Raw Capacity 🐵	
0.5	x 3 replicas = 1.50 TiB
Currently Used: 15.2 GiB / 0.5 TiB	
	Cancel Add

7. Select a storage class.

Set the storage class to **gp2** on AWS, **thin** on VMware, or **managed_premium** on Microsoft Azure if you are using the default storage class generated during deployment. If you have created other storage classes, select whichever is appropriate.



IMPORTANT

Using storage classes other than the default for your provider is a Technology Preview feature.

Technology Preview features are not supported with Red Hat production service level agreements (SLAs) and might not be functionally complete. Red Hat does not recommend using them in production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process.

For more information, see Technology Preview Features Support Scope .

The **Raw Capacity** field shows the size set during storage class creation. The total amount of storage consumed is three times this amount, because OpenShift Container Storage uses a replica count of 3.

8. Click Add and wait for the cluster state to change to Ready.

Verification steps

• Navigate to **Overview** \rightarrow **Persistent Storage** tab, then check the **Capacity breakdown** card.

Capacity breakdown	View more	Projects 💌
9.44 GiB used		847.7 GiB available
openshift 5.75 GiB openshift 3.18 GiB depension depension depension depension depension depension depension depension dependence de la construction de la const		

Note that the capacity increases based on your selections.

- Verify that the new OSDs and their corresponding new PVCs are created.
 - To view the state of the newly created OSDs:
 - a. Click Workloads → Pods from the OpenShift Web Console.
 - b. Select openshift-storage from the Project drop-down list.
 - To view the state of the PVCs:
 - a. Click **Storage** → **Persistent Volume Claims** from the OpenShift Web Console.
 - b. Select openshift-storage from the Project drop-down list.
- (Optional) If data encryption is enabled on the cluster, verify that the new OSD devices are encrypted.
 - a. Identify the node(s) where the new OSD pod(s) are running.

\$ oc get -o=custom-columns=NODE:.spec.nodeName pod/<OSD pod name>

For example:

oc get -o=custom-columns=NODE:.spec.nodeName pod/rook-ceph-osd-0-544db49d7fqrgqm

- b. For each of the nodes identified in previous step, do the following:
 - i. Create a debug pod and open a chroot environment for the selected host(s).

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

ii. Run "Isblk" and check for the "crypt" keyword beside the **ocs-deviceset** name(s)

\$ Isblk



IMPORTANT

Cluster reduction is not currently supported, regardless of whether reduction would be done by removing nodes or OSDs.

2.3. SCALING UP STORAGE BY ADDING CAPACITY TO YOUR OPENSHIFT CONTAINER STORAGE NODES USING LOCAL STORAGE DEVICES

Use this procedure to add storage capacity (additional storage devices) to your configured local storage based OpenShift Container Storage worker nodes on bare metal and VMware infrastructures.



IMPORTANT

Scaling up storage on Amazon EC2 I3 is a Technology Preview feature. Technology Preview features are not supported with Red Hat production service level agreements (SLAs) and might not be functionally complete. Red Hat does not recommend using them in production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process.

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NOTE

For Amazon EC2 I3 infrastructure, adding nodes is the only option for adding capacity, as deployment is done using both the available NVMe devices.

Prerequisites

- You must be logged into the OpenShift Container Platform cluster.
- You must have installed local storage operator. Use any of the following procedures applicable to your infrastructure:
 - Installing Local Storage Operator on bare metal
 - Installing Local Storage Operator on vSphere cluster
- If you have upgraded from a previous version of OpenShift Container Storage, create a **LocalVolumeSet** object to enable automatic provisioning of devices as described in Post-update configuration changes.
- If you upgraded to OpenShift Container Storage 4.6 from a previous version, ensure that you have followed post-upgrade procedures to create the **LocalVolumeDiscovery** object. See Post-update configuration changes for details.
- You must have three OpenShift Container Platform worker nodes with the same storage type and size attached to each node (for example, 2TB NVMe drive) as the original OpenShift Container Storage StorageCluster was created with.

Procedure

To add capacity, you can either use a storage class that you provisioned during the deployment or any other storage class that matches the filter.

1. On the OpenShift web console, click on **Operators** \rightarrow **Installed Operators**.

Red Hat OpenShift Container Plat	tform						4 2	o	0	kube:admin 👻
📌 Administrator	_		You are logged in as a tempora	ry administrative user. Update th	ne <u>cluster OAuth configuration</u> to allow others	s to log ir	n.			
Administrator		Project: openshift-storage 🔹								
Home										
Operators		Installed Operators								
OperatorHub		Installed Operators are represented I Version using the Operator SDK @.	by Cluster Service Versions within this na	mespace. For more information,	see the Understanding Operators document	tation 🕜	. Or creat	e an Op	erator and	Cluster Service
Installed Operators		Name Search by name	7							
Workloads		Name 🏌	Managed Namespaces 🗍	Status	Last Updated		Provide	ed APIs		
Networking		OpenShift Container Storage 4.6.0 provided by Red Hat	NS openshift-storage	Succeeded Up to date	🚱 Nov 12, 11:49 am		Storage Backing Bucket	Cluster Store Class		ŧ
Storage										

- 2. Click **OpenShift Container Storage** Operator.
- 3. Click Storage Cluster tab.

Red Hat OpenShift Container Platf	orm		 ≜ З	Ð	?	kube:admin 👻
** Adatatata	-	You are logged in as a temporary administrative user. Update the cluster OAuth configuration to allow others to log in.				
Maministrator		Project: openshift-storage 🔹				
Home		Installed Operators > Operator Details				
Operators		OpenShift Container Storage 4.6.0 provided by Red Hat				Actions 👻
OperatorHub		Details VAMI Subscription Events All Instances Storage Cluster Backing Store Bucket Class				
Installed Operators		Second mane conservation events manufactores conside claster becking store backet class				

- 4. The visible list should have only one item. Click (:) on the far right to extend the options menu.
- 5. Select Add Capacity from the options menu.

Add Capacity	
Adding capacity for ocs-storagecluster , may increa	ase your expenses.
Storage Class 🔞	
SC localblock -	
Available capacity: 2.73 TiB / 3 replicas	

- 6. Select the **Storage Class** for which you added disks or the new storage class depending on your requirement. Available Capacity displayed is based on the local disks available in storage class.
- 7. Click Add.

You might need to wait a couple of minutes for the storage cluster to reach **Ready** state.

Verification steps

• Navigate to **Overview** \rightarrow **Persistent Storage** tab, then check the **Capacity breakdown** card.

Capacity breakdown	View more	Projects 👻
5.74 GiB used		1.4 TiB available
openshift 5.38 GiB openshift 363.5 MiB OB		

Note that the capacity increases based on your selections.

- Verify that the new OSDs and their corresponding new PVCs are created.
 - To view the state of the newly created OSDs:
 - a. Click **Workloads** \rightarrow **Pods** from the OpenShift Web Console.
 - b. Select openshift-storage from the Project drop-down list.
 - To view the state of the PVCs:
 - a. Click **Storage** → **Persistent Volume Claims** from the OpenShift Web Console.
 - b. Select **openshift-storage** from the **Project** drop-down list.
- (Optional) If data encryption is enabled on the cluster, verify that the new OSD devices are encrypted.
 - a. Identify the node(s) where the new OSD pod(s) are running.

\$ oc get -o=custom-columns=NODE:.spec.nodeName pod/<OSD pod name>

For example:

oc get -o=custom-columns=NODE:.spec.nodeName pod/rook-ceph-osd-0-544db49d7fqrgqm

- b. For each of the nodes identified in previous step, do the following:
 - i. Create a debug pod and open a chroot environment for the selected host(s).

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

ii. Run "Isblk" and check for the "crypt" keyword beside the **ocs-deviceset** name(s)

\$ Isblk



IMPORTANT

OpenShift Container Storage does not support cluster reduction either by reducing OSDs or reducing nodes.

2.4. SCALING UP STORAGE BY ADDING CAPACITY TO YOUR OPENSHIFT CONTAINER STORAGE NODES ON IBM POWER SYSTEMS INFRASTRUCTURE USING LOCAL STORAGE DEVICES

Use this procedure to add storage capacity (additional storage devices) to your configured local storage based OpenShift Container Storage worker nodes on IBM Power Systems infrastructures.

Prerequisites

- You must be logged into OpenShift Container Platform (RHOCP) cluster.
- You must have installed local storage operator. Use the following procedures, see
 - Installing Local Storage Operator on IBM Power Systems
- You must have three OpenShift Container Platform worker nodes with the same storage type and size attached to each node (for example, 0.5TB SSD) as the original OpenShift Container Storage StorageCluster was created with.

Procedure

- 1. To add storage capacity to OpenShift Container Platform nodes with OpenShift Container Storage installed, you need to
 - a. Add a new disk that is, minimum of one device per worker node in your Openshift Container Platform (RHOCP) cluster.
 - b. Check if the new disk is added to the node by running lsblk inside node.

\$ oc debug node/worker-0 \$lsblk

Example output:

Creating debug nat Starting pod/worke To use host binarie Pod IP: 192.168.88 If you don't see a c	mespace/openshift-debug-node-ggrqr r-2-debug es, run `chroot /host` 8.23 ommand prompt, try pressing enter.
sh-4.4# chroot /hos	10
SN-4.4# ISDIK	
NAME	MAJ:MIN RM SIZE RO TYPE MOUNTPOINT
loop0	7:0 0 256G 0 loop
vda	252:0 0 40G 0 disk
-vda1	252:1 0 4M 0 part
-vda2	252:2 0 384M 0 part /boot
`-vda4	252:4 0 39.6G 0 part
`-coreos-luks-root	-nocrypt 253:0 0 39.6G 0 dm /sysroot
vdb	252:16 0 512B 1 disk
vdc	252:32 0 256G 0 disk
vdd	252:48 0 256G 0 disk
sh-4.4#	
sh-4.4#	
Removing debug p	od
Removing debug n	amespace/openshift-debug-node-ggrar
0	

- c. Newly added disk will automatically gets discovered by LocalVolumeSet.
- 2. Display the newly created PVs with storageclass name used in localVolumeSet CR.

\$ oc get pv | grep localblock | grep Available

Example output:

local-pv-290020c2 256Gi RWO Delete Available localblock 2m35s local-pv-7702952c 256Gi RWO Delete Available localblock 2m27s local-pv-a7a567d 256Gi RWO Delete Available localblock 2m22s ...

There are three more available PVs of same size which will be used for new OSDs.

- 3. Navigate to the OpenShift Web Console.
- 4. Click on **Operators** on the left navigation bar.
- 5. Select Installed Operators.
- 6. In the window, click OpenShift Container Storage Operator:

Red Hat OpenShift Container Platfo	irm					₩ 4° 0	kube:admin 🔻
Administrator			You are logged in as a t	emporary administrative user. Update th	ne <u>cluster OAuth configuration</u> to allow others to log	in.	
Administrator		Project: openshift-storage 🔹					
	>	la stalla d'Os sustana					
Operators	~	Installed Operators					
OperatorHub		Installed Operators are represented by Cluste	r Service Versions within this namespace.	For more information, see the Operator	r Lifecycle Manager documentation 🗗. Or create an	Operator and Cluster Service Version using the O	perator SDK 🗗
Installed Operators		Name Search by name	$\overline{\mathcal{A}}$				
	>	Name 1	Managed Namespaces 🗍	Status	Last Updated	Provided APIs	
	>	OpenShift Container Storage	NS openshift-storage	Succeeded	🚱 a minute ago	Storage Cluster	:
	>	4.6.0-133.ci provided by Red Hat		Up to date		Backing Store Bucket Class	
Builds	>						
	>						
	>						
	>						
	>						

7. In the top navigation bar, scroll right and click Storage Cluster tab.

Red Hat OpenShift Container Pla	atform				🇱 🐥 2 🗢 😧 kube:admin 🗸
📽 Administrator			You are logged in as a temporary adm	inistrative user. Update the <u>cluster OAuth configuration</u> to allow	w others to log in.
		Project: openshift-storage 🔹			
Home		Installed Operators > Operator Details			
Operators		OpenShift Container Storage 4.6.0-134.cl provided by Red Hat			Actions 👻
OperatorHub		Details YAML Subscription E	vents All Instances Storage Cluste	r Backing Store Bucket Class	
Installed Operators					
Workloads		Provided APIs			Provider Red Hat
Networking		OCS Storage Cluster	NBS Backing Store	NBC Bucket Class	Created At Created At Creat
Storage		Container Storage Cluster including Ceph Cluster, NooBaa and all the	compatible, ibm-cos, PV's and more. Used in BucketClass to construct data	spreading. Combines BackingStores. Referenced by ObjectBucketClaims.	Links Source Code https://dithub.com/openshift/ope_operator.ff
Builds		storage and compute resources required.	placement policies.		Maintainers
Monitoring		Ocreate Instance	Create Instance	Create Instance	Red Hat Support ocs-support@redhat.com
Compute					
User Management		Description			
A -l		Red Hat OpenShift Container Storage deploys	three operators.		
Administration	,	OpenShift Container Storage operate	or		
		The OpenShift Container Storage operator is the performing administrative tasks outside their sco	primary operator for OpenShift Container Storage. pe as well as watching and configuring their Custom	It serves to facilitate the other operators in OpenShift Contair Resources.	ner Storage by

- 8. The visible list should have only one item. Click (:) on the far right to extend the options menu.
- 9. Select Add Capacity from the options menu.

Add Capacity	
Adding capacity for ocs-storagecluster , may increa	ase your expenses.
Storage Class 🚱	
SC localblock 🗸	
Available capacity: 2.73 TiB / 3 replicas	
	Cancel Add

From this dialog box, set the **Storage Class** name to the name used in the **localVolumeset** CR. Available Capacity displayed is based on the local disks available in storage class.

- 10. Once you are done with your setting, click **Add**. You might need to wait a couple of minutes for the storage cluster to reach **Ready** state.
- 11. Verify that the new OSDs and their corresponding new PVCs are created.

\$ oc get -n openshift-storage pods -l app=rook-ceph-osd

Example output:

NAME	READY	STAT	US RES	TARTS	AGE
rook-ceph-osd-0-6f8655	off7b-gj226	1/1	Running	0	1h
rook-ceph-osd-1-6c66d	77f65-cfgfq	1/1	Running	0	1h
rook-ceph-osd-2-69f6b4	lc597-mtsdv	/ 1/1	Running	g 0	1h
rook-ceph-osd-3-c784b	dbd4-w4cm	j 1/1	Running	g 0	5m
rook-ceph-osd-4-6d998	45f5b-k7f8r	1/1	Running	0	5m
rook-ceph-osd-5-fdd989	97c9-r9mgb	1/1	Running	0	5m

In the above example, osd-3, osd-4, and osd-5 are the newly added pods to the OpenShift Container Storage cluster.

\$ oc get pvc -n openshift-storage |grep localblock

Example output:

ocs-deviceset-localblock-0-data-0-sfsgf Bound local-pv-8137c873 256Gi RWO localblock 1h ocs-deviceset-localblock-0-data-1-qhs9m Bound local-pv-290020c2 256Gi RWO localblock 10m ocs-deviceset-localblock-1-data-0-499r2 Bound local-pv-ec7f2b80 256Gi RWO localblock 1h ocs-deviceset-localblock-1-data-1-p9rth Bound local-pv-a7a567d 256Gi RWO localblock 10m ocs-deviceset-localblock-2-data-0-8pzjr Bound local-pv-1e31f771 256Gi RWO localblock 1h ocs-deviceset-localblock-2-data-1-7zwwn Bound local-pv-7702952c 256Gi RWO localblock 10m

In the above example, we see three new PVCs are created.

Verification steps

1. Navigate to **Overview** → **Persistent Storage** tab, then check the **Capacity breakdown** card.

Capacity breakdown	Projects 🔻
354.5 MiB used	433.1 GiB available
openshift 354.5 MiB	

Note that the capacity increases based on your selections.



IMPORTANT

OpenShift Container Storage does not support cluster reduction either by reducing OSDs or reducing nodes.

2.5. SCALING UP STORAGE BY ADDING CAPACITY TO YOUR OPENSHIFT CONTAINER STORAGE NODES ON IBM Z OR LINUXONE INFRASTRUCTURE

Use this procedure to add storage capacity and performance to your configured Red Hat OpenShift Container Storage worker nodes.

Prerequisites

- A running OpenShift Container Storage Platform.
- Administrative privileges on the OpenShift Web Console.
- To scale using a storage class other than the one provisioned during deployment, first define an additional storage class. See Creating a storage class for details.

Procedure

- 1. Add additional hardware resources with zFCP disks
 - a. List all the disks with the following command.

\$ lszdev

Example output:

```
        TYPE
        ID
        ON
        PERS
        NAMES

        zfcp-host
        0.0.8204
        yes
        yes

        zfcp-lun
        0.0.8204:0x102107630b1b5060:0x4001402900000000 yes no
        sda sg0

        zfcp-lun
        0.0.8204:0x500407630c0b50a4:0x3002b0300000000 yes yes
        sdb sg1

        qeth
        0.0.bdd0:0.0.bdd1:0.0.bdd2
        yes no
        encbdd0

        generic-ccw
        0.0.0009
        yes no
        yes no
```

A SCSI disk is represented as a **zfcp-lun** with the structure **<device-id>:<wwpn>:<lun-id>** in the ID section. The first disk is used for the operating system. The device id for the new disk can be the same.

b. Append a new SCSI disk with the following command.



\$ chzdev -e 0.0.8204:0x400506630b1b50a4:0x3001301a0000000



NOTE

The device ID for the new disk must be the same as the disk to be replaced. The new disk is identified with its WWPN and LUN ID.

c. List all the FCP devices to verify the new disk is configured.

\$ lszdev z	zfcp-lun		
TYPE	ID	ON PERS NAMES	
zfcp-lun	0.0.8204:0x102	107630b1b5060:0x4001402900000000 yes no	sda sg0
zfcp-lun	0.0.8204:0x500	507630b1b50a4:0x4001302a00000000 yes yes	sdb sg1
zfcp-lun	0.0.8204:0x400	506630b1b50a4:0x3001301a00000000 yes yes	sdc sg2

- 2. Navigate to the OpenShift Web Console.
- 3. Click **Operators** on the left navigation bar.
- 4. Select Installed Operators.
- 5. In the window, click **OpenShift Container Storage** Operator:

Red Hat OpenShift Container Play	tform						. 2	•	🕽 kube:admin 👻
📌 Administrator	_		You are logged in as a tempora	ry administrative user. Update th	e <u>cluster OAuth configuration</u> to allow othe	rs to log in	1 .		
Auministrator		Project: openshift-storage 👻							
Home									
		Installed Operators							
Operators		Installed Operators are represented	by Cluster Service Versions within this n	amespace. For more information,	see the Understanding Operators documer	ntation 🗗	Or create	an Operat	or and Cluster Service
OperatorHub		Version using the Operator SDK 2.							
Installed Operators		Name 👻 Search by name	7						
		Name 1	Managed Namespages	Status	Last Indated		Provide		
Workloads	,	OpenShift Container		Succeeded	Nov 12 11:49 am		Storage	Cluster	
Networking		Storage	opensint-storage	Up to date	• Nov 12, 11:45 ann		Backing	Store	:
		4.6.0 provided by Red Ha					Bucket (Jass	
Storage	>								

6. In the top navigation bar, scroll right and click **Storage Cluster** tab.

Red Hat OpenShift Container Platfor	rm		₩	4 3	Ð	0	kube:admin 👻
*** Administration							
Administrator		Project: openshift-storage 🔹					
Home	>						
		Installed Operators > Operator Details					
Operators		OpenShift Container Storage					Actions 👻
OperatorHub		Details YAML Subscription Events All Instances Storage Cluster Backing Store Bucket Class					

- 7. Click (:) next to the visible list to extend the options menu.
- 8. Select Add Capacity from the options menu.

Add Capacity	
Adding capacity for ocs-storagecluster ,	may increase your expenses.
Storage Class 🔞	
SC thin -	
Raw Capacity 😡	
0.5	x 3 replicas = 1.50 TiB
Currently Used: 15.2 GiB / 0.5 TiB	
	Cancel Add

The **Raw Capacity** field shows the size set during storage class creation. The total amount of storage consumed is three times this amount, because OpenShift Container Storage uses a replica count of 3.

9. Click Add and wait for the cluster state to change to Ready.

Verification steps

1. Navigate to **Overview** → **Persistent Storage** tab, then check the **Capacity breakdown** card.

Capacity breakdown	View more Projects -
9.44 GiB used	847.7 GiB available
openshift 5.75 GiB 3.18 GiB openshift openshift fedora 44.03	a-pods MiB

2. Note that the capacity increases based on your selections.



IMPORTANT

Cluster reduction is not currently supported, regardless of whether reduction would be done by removing nodes or OSDs.

CHAPTER 3. SCALING OUT STORAGE CAPACITY

To scale out storage capacity, you need to perform the following steps:

- Add a new node
- Verify that the new node is added successfully
- Scale up the storage capacity



NOTE

OpenShift Container Storage does not support heterogeneous OSD sizes.

3.1. ADDING A NODE

You can add nodes to increase the storage capacity when existing worker nodes are already running at their maximum supported OSDs, which is increment of 3 OSDs of the capacity selected during initial configuration.

Depending on the type of your deployment, you can choose one of the following procedures to add a storage node:

- For AWS or Azure installer-provisioned infrastructures, see Adding a node on an AWS installerprovisioned infrastructure
- For AWS or VMware user-provisioned infrastructure, see Adding a node on an AWS or a VMware user-provisioned infrastructure
- For bare metal, IBM Power Systems, IBM Z or LinuxONE, Amazon EC2 I3, or VMware infrastructures, see Adding a node using a local storage device

3.1.1. Adding a node on an installer-provisioned infrastructure

Use this proecdure to add a node on an AWS or Azure installer provisioned infrastructure.

Prerequisites

• You must be logged into OpenShift Container Platform (RHOCP) cluster.

Procedure

- 1. Navigate to Compute \rightarrow Machine Sets.
- 2. On the machine set where you want to add nodes, select Edit Machine Count
- 3. Add the amount of nodes, and click **Save**.
- 4. Click **Compute** \rightarrow **Nodes** and confirm if the new node is in **Ready** state.
- 5. Apply the OpenShift Container Storage label to the new node.
 - a. For the new node, Action menu (:) \rightarrow Edit Labels.
 - b. Add cluster.ocs.openshift.io/openshift-storage and click Save.



NOTE

It is recommended to add 3 nodes each in different zones. You must add 3 nodes and perform this procedure for all of them.

Verification steps

• To verify that the new node is added, see Verifying the addition of a new node .

3.1.2. Adding a node on an user-provisioned infrastructure

Use this procedure to add a node on an AWS or VMware user-provisioned infrastructure.

Prerequisites

• You must be logged into OpenShift Container Platform (RHOCP) cluster.

Procedure

- 1. Depending on whether you are adding a node on an AWS user provisioned infrastructure or a VMware user-provisioned infrastructure, perform the following steps:
 - For AWS
 - a. Create a new AWS machine instance with the required infrastructure. See Platform requirements.
 - b. Create a new OpenShift Container Platform node using the new AWS machine instance.
 - For VMware:
 - a. Create a new VM on vSphere with the required infrastructure. See Platform requirements.
 - b. Create a new OpenShift Container Platform worker node using the new VM.
- 2. Check for certificate signing requests (CSRs) related to OpenShift Container Storage that are in **Pending** state:

\$ oc get csr

3. Approve all required OpenShift Container Storage CSRs for the new node:

\$ oc adm certificate approve <Certificate_Name>

- 4. Click **Compute** \rightarrow **Nodes**, confirm if the new node is in **Ready** state.
- 5. Apply the OpenShift Container Storage label to the new node using any one of the following:

From User interface

- a. For the new node, click Action Menu (:) \rightarrow Edit Labels
- b. Add cluster.ocs.openshift.io/openshift-storage and click Save.

From Command line interface

• Execute the following command to apply the OpenShift Container Storage label to the new node:

\$ oc label node <new_node_name> cluster.ocs.openshift.io/openshift-storage=""



NOTE

It is recommended to add 3 nodes each in different zones. You must add 3 nodes and perform this procedure for all of them.

Verification steps

• To verify that the new node is added, see Verifying the addition of a new node .

3.1.3. Adding a node using a local storage device

Use this procedure to add a node on bare metal, IBM Power Systems, IBM Z or LinuxONE, Amazon EC2, and VMware infrastructures.



IMPORTANT

Scaling storage nodes for Amazon EC2 infrastructure is a Technology Preview feature. Technology Preview features are not supported with Red Hat production service level agreements (SLAs) and might not be functionally complete. Red Hat does not recommend using them in production. These features provide early access to upcoming product features, enabling customers to test functionality and provide feedback during the development process.

Prerequisites

- You must be logged into the OpenShift Container Platform (RHOCP) cluster.
- If you upgraded to OpenShift Container Storage 4.6 from a previous version, ensure that you have followed post-upgrade procedures to create the **LocalVolumeDiscovery** object. See Post-update configuration changes for details.
- You must have three OpenShift Container Platform worker nodes with the same storage type and size attached to each node (for example, 2TB SSD or 2TB NVMe drive) as the original OpenShift Container Storage StorageCluster was created with.
- If you have upgraded from a previous version of OpenShift Container Storage, create a LocalVolumeSet object to enable automatic provisioning of devices as described in Post-update configuration changes.

Procedure

- 1. Depending on whether you are adding a node on bare metal, IBM Power Systems, IBM Z or LinuxONE, Amazon EC2, or VMware infrastructure, perform the following steps:
 - For Amazon EC2
 - a. Create a new Amazon EC2 I3 machine instance with the required infrastructure. See Creating a MachineSet in AWS and Platform requirements.

- b. Create a new OpenShift Container Platform node using the new Amazon EC2 I3 machine instance.
- For VMware:
 - a. Create a new VM on vSphere with the required infrastructure. See Platform requirements.
 - b. Create a new OpenShift Container Platform worker node using the new VM.
- For bare metal:
 - a. Get a new bare metal machine with the required infrastructure. See Platform requirements.
 - b. Create a new OpenShift Container Platform node using the new bare metal machine.
- For IBM Power Systems:
 - a. Get a new IBM Power machine with the required infrastructure. See Platform requirements.
 - b. Create a new OpenShift Container Platform node using the new IBM Power machine.
- For IBM Z or LinuxONE:
 - a. Get a new IBM Z or LinuxONE machine with the required infrastructure. See Platform requirements.
 - b. Create a new OpenShift Container Platform node using the new IBM Z or LinuxONE machine.
- 2. Check for certificate signing requests (CSRs) related to OpenShift Container Storage that are in **Pending** state:

\$ oc get csr

3. Approve all required OpenShift Container Storage CSRs for the new node:

\$ oc adm certificate approve <Certificate_Name>

- 4. Click **Compute** \rightarrow **Nodes**, confirm if the new node is in **Ready** state.
- 5. Apply the OpenShift Container Storage label to the new node using any one of the following:

From User interface

- a. For the new node, click Action Menu (∶) → Edit Labels
- b. Add cluster.ocs.openshift.io/openshift-storage and click Save.

From Command line interface

• Execute the following command to apply the OpenShift Container Storage label to the new node:

\$ oc label node <new_node_name> cluster.ocs.openshift.io/openshift-storage=""

- Click Operators → Installed Operators from the OpenShift Web Console.
 From the Project drop-down list, make sure to select the project where the Local Storage Operator is installed.
- 7. Click on Local Storage.
- 8. Click the Local Volume Discovery tab
- 9. Beside the LocalVolumeDiscovery, click Action menu (:) → Edit Local Volume Discovery.
- 10. In the YAML, add the hostname of the new node in the values field under the **node selector**.
- 11. Click Save.
- 12. Click the Local Volume Sets tab.
- 13. Beside the **LocalVolumeSet**, click Action menu (:) → Edit Local Volume Set
- 14. In the YAML, add the hostname of the new node in the **values** field under the **node selector**.

Figure 3.1. YAML showing the addition of new hostnames

Details	YAML Resources Events	
	View shortc	uts 🟮 View sidebar
42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65	cleviceInclusionSpec: deviceInclusionSpec: deviceInclusionSpec: - NonRotational deviceTypes: - Oisk - disk - part minSize: 100Gi - nodeSelector: nodeSelectorTerms: - mathExpressions: - key: kubernetes.io/hostname operator: In values: - worker1.example.com - worker4.example.com - worker4.example.com - worker4.example.com - worker6.example.com - worker6.example.com - worker6.example.com - worker6.example.com	uts Viewsidebar
66 67 68	message: 'DiskMaker: Available, LocalProvisioner: Available' status: 'True'	
69 Save	Reload Cancel	La Download

15. Click Save.



NOTE

It is recommended to add 3 nodes each in different zones. You must add 3 nodes and perform this procedure for all of them.

Verification steps

• To verify that the new node is added, see Verifying the addition of a new node .

3.1.4. Verifying the addition of a new node

1. Execute the following command and verify that the new node is present in the output:

\$ oc get nodes --show-labels | grep cluster.ocs.openshift.io/openshift-storage= |cut -d' ' -f1

- Click Workloads → Pods, confirm that at least the following pods on the new node are in Running state:
 - csi-cephfsplugin-*
 - csi-rbdplugin-*

3.2. SCALING UP STORAGE CAPACITY

To scale up storage capacity, see Scaling up storage by adding capacity.