eSDK Huawei Storage Kubernetes CSM Plugins V2.2.0

User Guide

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About This Document

Intended Audience

This document is intended for:

- Technical support engineers
- O&M engineers
- Engineers with basic knowledge of storage, Kubernetes, and CSI

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
⚠ DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
🕮 NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Issue	Date	Description
01	2025-03-28	This issue is the first official release.

Contents

1 Product Description

Container Storage Monitor (CSM) is a tool used for visual display of Huawei storage resources and Kubernetes resources in Kubernetes container scenarios. This tool can notify storage of the relationship between a PV/Pod and a LUN/file system so that the relationship can be displayed on the storage for storage administrators to view. It can also upload the performance, capacity, IOPS, and other data of a LUN/file system to a third-party network management system for application administrators to view. In this way, O&M availability in container scenarios can be improved.

2 Compatibility and Features

2.1 Kubernetes Compatibility

Table 2-1 Supported container management platforms

Container Management Platform	Version
Kubernetes	1.16 to 1.32
Red Hat OpenShift Container Platform	4.12 to 4.17
CCE Agile	22.3.2

2.2 Compatibility with Huawei Storage

NOTE

- When CSM is used to interconnect with storage, only LUNs/file systems provisioned by CSI can be displayed. Dtrees are not supported.
- Only OceanStor 6.1.7 and later and OceanStor Dorado 6.1.7 and later support the CSM-Storage label function.

Table 2-2 CSM-Storage compatibility

Storage Version	Huawei CSI Version
OceanStor 6.1.7/6.1.8/V700R001C00 OceanStor Dorado 6.1.7/6.1.8/V700R001C00	4.7.0

Table 2-3 CSM-Prometheus compatibility

Storage Version	Prometheus Version	Grafana Version	Huawei CSI Version
OceanStor 6.1.3/6.1.5/6.1.6/6.1.7/6.1.8/V700R001C00 OceanStor Dorado 6.1.0[1]/6.1.2/6.1.3/6.1.5/6.1.6/6.1.7/6.1.8/V700R001C00	2.25.0 - 2.43.0	Grafana 7.0.4	4.7.0

- Note 1: If OceanStor Dorado 6.1.0 is used, the display of Prometheus performance monitoring metrics may be broken or discontinuous as the number of concurrent requests increases.

2.3 csm-prometheus Feature Description

csm-prometheus collects storage monitoring data and exposes the data to the Prometheus platform for collection. The following table lists the supported monitoring metrics.

Table 2-4 Object metrics supported by monitored objects of centralized storage

Object Type	Object Metric
Storage	● Basic information ● Monitoring status ● Running status
Controller	● CPU usage ● Memory usage ● Health status ● Running status

Object Type	Object Metric
Storage pool	● Total capacity ● Remaining capacity ● Used capacity ● Capacity usage
LUN	● Total capacity ● Capacity usage
File system	● Total capacity ● Capacity usage
PV	● Total capacity ● Capacity usage

Table 2-5 Performance metrics supported by monitored objects of centralized storage

Object Type	Performance Metric
Controller	● **21**: bandwidth (MB/s) ● **23**: read bandwidth (MB/s) ● **26**: write bandwidth (MB/s) ● **22**: IOPS ● **25**: read IOPS ● **28**: write IOPS ● **370**: average I/O response time (µs)
Storage pool	● **21**: bandwidth (MB/s) ● **22**: IOPS ● **370**: average I/O response time (µs)
LUN	● **21**: bandwidth (MB/s) ● **22**: IOPS ● **370**: average I/O response time (µs)
File system	● **182**: OPS ● **524**: average read OPS response time (µs) ● **525**: average write OPS response time (µs)

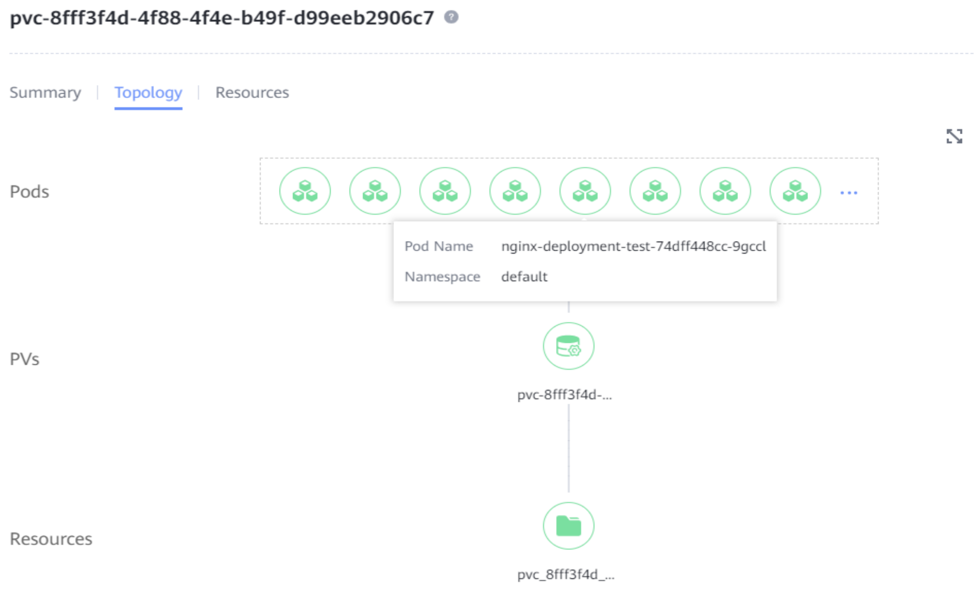
Object Type	Performance Metric
PV	● LUN bandwidth: bandwidth (MB/s) of a PV of the LUN type on the storage ● LUN IOPS: IOPS of a PV of the LUN type on the storage ● Average LUN I/O response time: average I/O response time (µs) of a PV of the LUN type on the storage ● File system OPS: OPS of a PV of the file system type on the storage ● Average file system read OPS response time: average read OPS response time (µs) of a PV of the file system type on the storage ● Average file system write OPS response time: average write OPS response time (µs) of a PV of the file system type on the storage

2.4 csm-storage Feature Description

NOTICE

The default memory quota of the CSM topology service is 512 Mi. The memory usage of the topology service increases linearly with the number of PVs and Pods in the cluster. If there are a large number of resources in the cluster, you can manually modify the memory quota of the topology service to ensure that the csm-storage feature can be used properly. For configuration details, see **Table 3-7**.

csm-storage reports the PVs and the topology relationships with associated Pods, file systems, and LUNs to the storage system. The following figure shows the resource display effect on the storage GUI.



pvc-8fff3f4d-4f88-4f4e-b49f-d99eeb2906c7

Pod Name nginx-deployment-test-74dff448cc-9gccl

Namespace default

2.5 Constraints

Performance Constraints

Table 2-6 CSM specifications management

Specifications Management		Recommended Value
Storage management	Number of connected storage devices	5
	Number of CSMs interconnected with a single storage device	≤ 3
Monitoring item management	Maximum number of monitoring items supported by a storage device	15000
	Maximum number of monitoring items of all storage devices	40000
Scraping interval management	Object data scraping interval (for metrics in **Table 2-4**)	300s
	Performance data scraping interval (for metrics in **Table 2-5**)	300s

NOTICE

- If the data scraping interval is too small, the storage backend pressure will increase, adversely impacting the running of the storage backend.
- It is recommended that the object data scraping interval be different from the performance data scraping interval to prevent query failures caused by heavy storage backend pressure.
- A single storage resource (LUN or file system) does not support repeated topology creation.
- Topology relationships cannot be reported for resources with the same name of different vStores on the same storage device.

Table 2-7 Concurrent data scraping requests recommended by CSM

Total Number of Storage File Systems and LUNs	Recommended Number of Concurrent Requests
< 2000	20
2000-5000	10
> 5000	5

NOTICE

The default number of concurrent CSM data scraping requests is 20. When the number of storage resources increases, you are advised to configure the number of concurrent data scraping requests based on the recommended values to reduce the storage query load. For details about how to configure the number of concurrent requests, see **9.2 Manually Adjusting the Number of Concurrent Data Scraping Requests**.

3 Installation Preparations

3.1 Obtaining Tools and Software Packages

Tools

Table 3-1 lists the tools required for software installation, configuration, and commissioning.

Table 3-1 Required tools

Tool	Description	How to Obtain
PuTTY	Cross-platform remote access tool. It is used to access a node running a Windows OS during software installation.	You can visit the chiark homepage to download the PuTTY software. You are advised to use PuTTY of the latest version to ensure successful login to the storage system.
WinSCP	Cross-platform file transfer tool. Use version 5.7.5 or later and select SCP during file transfer. It is used to transfer files between Windows and Linux.	You can visit the WinSCP homepage to download the WinSCP software.

Software Packages

Before deploying services, you need to prepare the CSM software installation packages listed in **Table 3-2**.

Table 3-2 Required software packages

Package	Description	How to Obtain
eSDK_Huawei_Storage_CSM_V2.2.0_X86_64.zip eSDK_Huawei_Storage_CSM_V2.2.0_ARM_64.zip	CSM software installation package.	**https://github.com/Huawei/csm/releases**

NOTE

To prevent a software package from being maliciously tampered with during transmission or storage, download the corresponding digital signature file together with the software package for integrity verification.

After the software package is downloaded from Huawei Support website, verify its PGP digital signature by referring to *OpenPGP Signature Verification Guide*. If the verification fails, do not use the software package and contact Huawei technical support engineers.

Before a software package is used in installation or upgrade, its digital signature also needs to be verified according to *OpenPGP Signature Verification Guide* to ensure that the software package is not tampered with.

- For carrier users, visit **https://support.huawei.com/carrier/digitalSignatureAction**.
- For enterprise users, visit **https://support.huawei.com/enterprise/en/tool/pgp-verify-TL1000000054**.

3.2 Uploading Images to the Image Repository

Prerequisites

- The required CSM software package is available. For details about how to obtain it, see **3.1 Obtaining Tools and Software Packages**.
- An image repository has been prepared and can communicate with worker nodes. In addition, you have obtained the IP address, account, and password of the image repository.
- A project has been created in the image repository.
- A Linux host with Docker installed is available, and the host can access the image repository.

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to the Linux host where Docker is installed through the management IP address.

Step 2 Use WinSCP to upload the software package to the **/opt** directory.

Step 3 Run the **unzip /opt/***Software package name* command to decompress the software package.

Software package name indicates the CSM software package name. **eSDK_Huawei_Storage_CSM_V2.2.0_X86_64.zip** is used as an example.

```
# unzip /opt/eSDK_Huawei_Storage_CSM_V2.2.0_X86_64.zip.zip -d /opt/huawei-csm
```

Step 4 Run the **docker login** *<IP address of the image repository>* command and enter the account and password to log in to the image repository.

Step 5 Run the following command to upload the CSM image.

chmod +x /opt/huawei-csm/helm/huawei-csm/upload-image.sh; ./opt/huawei-csm/helm/huawei-csm/upload-image.sh --imageRepo *<Image repository project name>*

```
# chmod +x /opt/huawei-csm/helm/huawei-csm/upload-image.sh;sh /opt/huawei-csm/helm/huawei-csm/
upload-image.sh --imageRepo <Image repository project name>
-------------------------------------------------
> Uploading Huawei-CSM Images to Image Repository
-------------------------------------------------
|
|- Start to upload images                                Success
 |
 |--> Start to load the images                            Success
 |
 |--> Start to tag the images                             Success
 |
 |--> Start to push the images to the image repository            Success
 |
 |--> Start to cleanup local images                        Success
 |
 |--> Images uploaded                                    Success
-------------------------------------------------
```

----End

NOTICE

- The **upload-image.sh** script is interpreted and executed using the Bash (Bourne-Again Shell). Before executing the script, ensure that the current system supports the Unix shell of the Bash type.
- For details about how to import and upload images to the CCE Agile platform, see the user manual of the platform.

3.3 Installing Helm

NOTE

Currently, only Helm 3 is supported.

Helm is a software package management tool in the Kubernetes ecosystem. Similar to Advanced Packaging Tool (APT) of Ubuntu, Yellowdog Updater, Modified (YUM) of CentOS, or Package Installer for Python (PIP) of Python, Helm manages Kubernetes application resources. You can use Helm to package, distribute, install, upgrade, and roll back Kubernetes applications in a unified manner.

- For details about how to obtain and install Helm, **click here**.
- For other information about Helm, **click here**.

3.4 Preparing the Configuration File

When using Helm, you need to prepare the **values.yaml** file based on the Huawei storage connected during deployment and the features to be used.

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Use WinSCP to upload the software package to the **/opt** directory.

Step 3 Run the **unzip /opt/***Software package name* command to decompress the software package.

Software package name indicates the software package name. **eSDK_Huawei_Storage_CSM_V2.2.0_X86_64.zip** is used as an example.

```
# unzip /opt/eSDK_Huawei_Storage_CSM_V2.2.0_X86_64.zip -d /opt/huawei-csm
```

Step 4 Run the **cd /opt/huawei-csm/helm/huawei-csm** command to go to the Helm working directory.

Step 5 Run the **vi values.yaml** command to set parameters in the **values.yaml** file. After the modification is complete, press **Esc** and enter **:wq!** to save the modification. **Table 3-3**, **Table 3-4**, **Table 3-5**, and **Table 3-6** describe related parameters.

The **global** configuration items are used to configure the global information required by the system.

Table 3-3 global configuration items

Parameter	Description	Mandatory	Default Value
replicaCount	Number of Pod copies corresponding to the Deployment deployed using CSM. When the number of Pod copies is greater than 1, the system automatically enables the leaderElection function.	No	1. It is recommended that the value be less than or equal to 2. ● If the number of Pod copies is 1: Ensure that the number of CPU cores is 4 or above and the memory is 4 GB or above in Kubernetes. ● If the number of Pod copies is 2: Ensure that the number of CPU cores is 8 or above and the memory is 8 GB or above in Kubernetes. **NOTICE** – If the single-copy mode is used during deployment and you want to change it to the multi-copy mode, update the **replicaCount** parameter by following the instructions in **4.1.3 Upgrading the Software**. – Do not use other methods to change the number of Pod copies corresponding to the Deployment deployed using CSM. If you use other methods, for example, directly editing the **Spec.replicas** parameter in a Deployment deployed using CSM, the multi-copy function will be abnormal.
imageRepo	Image repository name.	Yes	None. The value must be the same as the image repository name in **Step 5**.

Parameter	Description	Mandatory	Default Value
logging.module	Log mode.	Yes	file The value can be **file** or **console**. **NOTICE** If the permission is insufficient when the **file** mode is used (for example, in the OpenShift environment), manually plan the log directory by following the instructions in **9.4 The Pod Status Is CrashLoopBackOff and the Log Contains "mkdir permission denied"**.
logging.level	Log level.	Yes	info The value can be **debug**, **info**, **warning**, or **error**.
logging.fileSize	Log file size.	Yes	20 MB
logging.maxBackups	Maximum number of backup logs.	Yes	9
leaderElection.leaseDuration	Leader duration. This parameter takes effect only in the multi-copy mode.	No	8s
leaderElection.renewDeadline	Time for the leader to be re-elected. This parameter takes effect only in the multi-copy mode.	No	6s
leaderElection.retryPeriod	Leader election retry time. This parameter takes effect only in the multi-copy mode.	No	2s
balancedDeploy	If this parameter is set to **true**, Pods of different services will be scheduled to different nodes during CSM installation.	No	true If the schedule of **balancedDeploy** conflicts with that of **nodeSelector**, the schedule of **balancedDeploy** does not take effect.

The **features** configuration items are used to enable and disable features.

Table 3-4 features configuration items

Parameter	Description	Mandatory	Default Value	Remarks
prometheusCollector.enabled	Whether to enable the Prometheus collection service.	Yes	true	-
prometheusCollector.nodePort	Prometheus nodePort.	No	30074	The default value is **30074**. This port is a host port. If a conflict occurs, change the value.
prometheusCollector.csiDriverName	Registered CSI driver name.	Yes	csi.huawei.com	● Use the default value. ● For the CCE Agile platform, modify this field. For example, **csi.oceanstor.com**.
prometheusCollector.prometheusCollectorSSL.enabled	Whether to enable the HTTPS service. After it is enabled, the Prometheus plug-in will provide the HTTPS service.	Yes	true	The certificate path must be specified after the service is enabled. For details about how to configure the certificate, see **Configuring the HTTPS Service**.
prometheusCollector.prometheusCollectorSSL.certPath	HTTPS certificate path after the Prometheus plug-in provides the HTTPS service.	This parameter is mandatory when **prometheusCollector.prometheusCollectorSSL.enabled** is set to **true**.	-	The path must be a relative path in the Helm working path.

Parameter	Description	Mandatory	Default Value	Remarks
prometheusCollector.prometheusCollectorSSL.keyPath	HTTPS key path after the Prometheus plug-in provides the HTTPS service.	This parameter is mandatory when **prometheusCollector.prometheusCollectorSSL.enabled** is set to **true**.	-	The path must be a relative path in the Helm working path.
prometheusCollector.nodeSelector	Node selector of csm-prometheus-service. After this parameter is set, csm-prometheus-service will be scheduled only to a node with the label.	No	-	For details about the node selector, see **Assign Pods to Nodes**.
storageTopo.enabled	Whether to enable the storage topology display service.	Yes	true	Only OceanStor 6.1.7/OceanStor Dorado 6.1.7 and later versions are supported.
storageTopo.rtRetryMaxDelay	Maximum retry delay of a topo resource synchronization task.	No	5m	You are advised to use the default value. The minimum retry delay is 5 seconds.
storageTopo.pvRetryMaxDelay	Maximum retry delay of PV resource creation and topo resource deletion tasks	No	1m	You are advised to use the default value. The minimum retry delay is 5 seconds.
storageTopo.podRetryMaxDelay	Maximum retry delay of the topo resource label update task for Pod resources.	No	1m	You are advised to use the default value. The minimum retry delay is 5 seconds.

Parameter	Description	Mandatory	Default Value	Remarks
storageTopo.resyncPeriod	Interval for refreshing topo resources.	No	15m	You are advised to use the default setting. The minimum refresh interval is 5 minutes.
storageTopo.nodeSelector	Node selector of csm-storage-service. After this parameter is set, csm-storage-service will be scheduled only to a node with the label.	No	-	For details about the node selector, see **Assign Pods to Nodes**.

The **images** configuration items are used to configure the image information required by CSM.

Table 3-5 images configuration items

Parameter	Description	Mandatory	Default Value
prometheusCollector	Image of the Prometheus storage data collection plug-in.	Yes	csm-prometheus-collector:2.2.0
topoService	Resource topology service image.	Yes	csm-topo-service:2.2.0
containerMonitorInterface	Container monitoring interface image.	Yes	csm-cmi:2.2.0
livenessProbe	Liveness probe service image.	Yes	csm-liveness-probe:2.2.0

The **cluster** configuration item mainly describes the Kubernetes cluster information.

Table 3-6 cluster configuration item

Parameter	Description	Mandatory	Default Value
cluster.name	Custom cluster name.	Yes	kubernetes

The **containerResoucesSet** configuration items are used to configure the container resources of each Pod.

Table 3-7 containerResoucesSet configuration items

Parameter	Description	Mandatory	Default Value
prometheusService.livenessProbe.requests.memory	Minimum memory resource of the livenessProbe container in a Prometheus Pod.	Yes	128Mi
prometheusService.livenessProbe.limits.cpu	Maximum CPU resource of the livenessProbe container in a Prometheus Pod.	Yes	100m
prometheusService.livenessProbe.limits.memory	Maximum memory resource of the livenessProbe container in a Prometheus Pod.	Yes	128Mi
prometheusService.prometheusCollector.requests.cpu	Minimum CPU resource of the prometheusCollector container in a Prometheus Pod.	Yes	50m
prometheusService.prometheusCollector.requests.memory	Minimum memory resource of the prometheusCollector container in a Prometheus Pod.	Yes	128Mi
prometheusService.prometheusCollector.limits.cpu	Maximum CPU resource of the prometheusCollector container in a Prometheus Pod.	Yes	300m
prometheusService.prometheusCollector.limits.memory	Maximum memory resource of the prometheusCollector container in a Prometheus Pod.	Yes	512Mi

Parameter	Description	Mandatory	Default Value
prometheusService.cmiController.requests.cpu	Minimum CPU resource of the cmiController container in a Prometheus Pod.	Yes	50m
prometheusService.cmiController.requests.memory	Minimum memory resource of the cmiController container in a Prometheus Pod.	Yes	128Mi
prometheusService.cmiController.limits.cpu	Maximum CPU resource of the cmiController container in a Prometheus Pod.	Yes	300m
prometheusService.cmiController.limits.memory	Maximum memory resource of the cmiController container in a Prometheus Pod.	Yes	512Mi
storageService.livenessProbe.requests.cpu	Minimum CPU resource of the livenessProbe container in a storage Pod.	Yes	10m
storageService.livenessProbe.requests.memory	Minimum memory resource of the livenessProbe container in a storage Pod.	Yes	128Mi
storageService.livenessProbe.limits.cpu	Maximum CPU resource of the livenessProbe container in a storage Pod.	Yes	100m
storageService.livenessProbe.limits.memory	Maximum memory resource of the livenessProbe container in a storage Pod.	Yes	128Mi
storageService.cmiController.requests.cpu	Minimum CPU resource of the cmiController container in a storage Pod.	Yes	50m
storageService.cmiController.requests.memory	Minimum memory resource of the cmiController container in a storage Pod.	Yes	128Mi

Parameter	Description	Mandatory	Default Value
storageService.cmiController.limits.cpu	Maximum CPU resource of the cmiController container in a storage Pod.	Yes	300m
storageService.cmiController.limits.memory	Maximum memory resource of the cmiController container in a storage Pod.	Yes	512Mi
storageService.topoService.requests.cpu	Minimum CPU resource of the topoService container in a storage Pod.	Yes	50m
storageService.topoService.requests.memory	Minimum memory resource of the topoService container in a storage Pod.	Yes	128Mi
storageService.topoService.limits.cpu	Maximum CPU resource of the topoService container in a storage Pod.	Yes	300m
storageService.topoService.limits.memory	Maximum memory resource of the topoService container in a storage Pod.	Yes	512Mi

----End

4 Installation and Deployment

4.1 Installation and Deployment Using Helm

4.1.1 Installing the Software

Prerequisites

- Helm 3 has been installed on the master node.
- The **values.yaml** file has been configured. For details, see **3.4 Preparing the Configuration File**.

Preparations

For the OpenShift platform, run the following commands to create the **SecurityContextConstraints** resource.

1. Run the **vi huawei-csm-scc.yaml** command to create a **SecurityContextConstraints** file.

```
# vi huawei-csm-scc.yaml
allowHostDirVolumePlugin: true
allowHostIPC: false
allowHostNetwork: true
allowHostPID: false
allowHostPorts: false
allowPrivilegeEscalation: false
allowPrivilegedContainer: false

apiVersion: security.openshift.io/v1
kind: SecurityContextConstraints
metadata:
  name: huawei-csm-scc
runAsUser:
  type: RunAsAny
seLinuxContext:
  type: RunAsAny
fsGroup:
  type: RunAsAny
```

```
users:
- system:serviceaccount:huawei-csm:csm-prometheus-sa
- system:serviceaccount:huawei-csm:csm-storage-sa
volumes:
- hostpath
- emptyDir
- persistentVolumeClaim
- secret
- configMap
```

2. Run the **oc create -f huawei-csm-scc.yaml** command to create **SecurityContextConstraints**.

```
# oc create -f huawei-csm-scc.yaml
securitycontextconstraints.security.openshift.io/huawei-csm-scc created
```

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/helm/huawei-csm** command to go to the Helm working directory.

Step 3 Run the **helm install huawei-csm ./ -n huawei-csm --create-namespace** command to install CSM services.

```
# helm install huawei-csm ./ -n huawei-csm --create-namespace
NAME: huawei-csm
LAST DEPLOYED: Tue Aug  8 23:11:18 2023
NAMESPACE: huawei-csm
STATUS: deployed
REVISION: 1
TEST SUITE: None
```

Step 4 Run the **kubectl get pod -n huawei-csm** command to check whether the services are started.

```
# kubectl get pod -n huawei-csm
NAME                                      READY     STATUS      RESTARTS    AGE
csm-prometheus-service-86c795d68-b5xjg   2/2       Running     0           5s
csm-storage-service-85485fd75f-9wg8m     2/2       Running     0           4s
```

----End

4.1.2 Installing the Software on CCE Agile

4.1.2.1 Creating a Helm Installation Package

To install Huawei CSM on the CCE Agile platform, you need to create a Helm installation package. This section describes how to create a Helm installation package.

Prerequisites

- Helm 3 has been installed on a node server.
- The **values.yaml** file required for installing CSM has been prepared. For details, see **3.4 Preparing the Configuration File**.

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to any node where Helm is deployed through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/helm/** command to go to the Helm working directory.

Step 3 Run the **helm package huawei-csm/ -d ./** command to create a Helm installation package. This command will generate the installation package to the current path.

```
# helm package huawei-csm/ -d ./
Successfully packaged chart and saved it to: huawei-csm-2.2.0.tgz
```

----End

4.1.2.2 Installing Huawei CSM

Prerequisites

A Huawei CSM Helm installation package has been created. For details, see **4.1.2.1 Creating a Helm Installation Package**.

Procedure

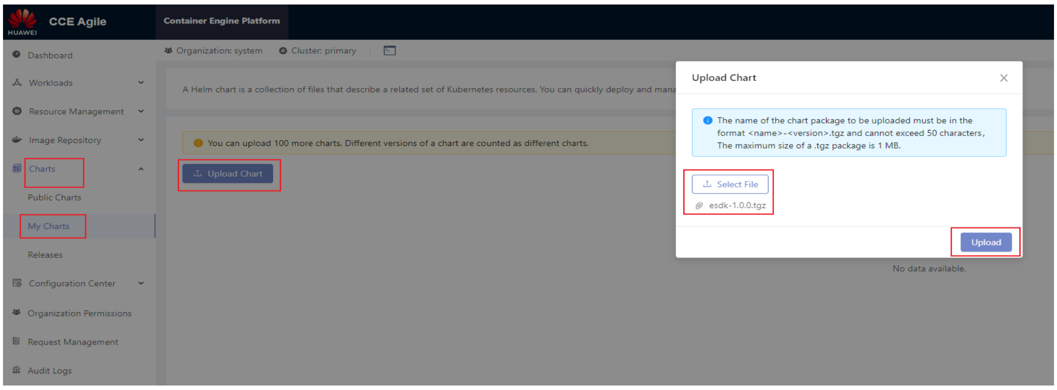
Step 1 Use a remote access tool, such as PuTTY, to log in to any master node where the CCE Agile platform is deployed through the management IP address.

Step 2 Run the **kubectl create namespace** *huawei-csm* command to create a namespace for deploying Huawei CSM. *huawei-csm* indicates the custom namespace.

```
# kubectl create namespace huawei-csm
```

Step 3 Export the Helm installation package. For details, see **4.1.2.1 Creating a Helm Installation Package**.

Step 4 On the home page, choose **Charts** > **My Charts** > **Upload Chart**. The **Upload Chart** dialog box is displayed. Import the exported Helm installation package to the CCE Agile platform.



A Helm chart is a collection of files that describe a related set of Kubernetes resources. You can quickly deploy and mana

You can upload 100 more charts. Different versions of a chart are counted as different charts.

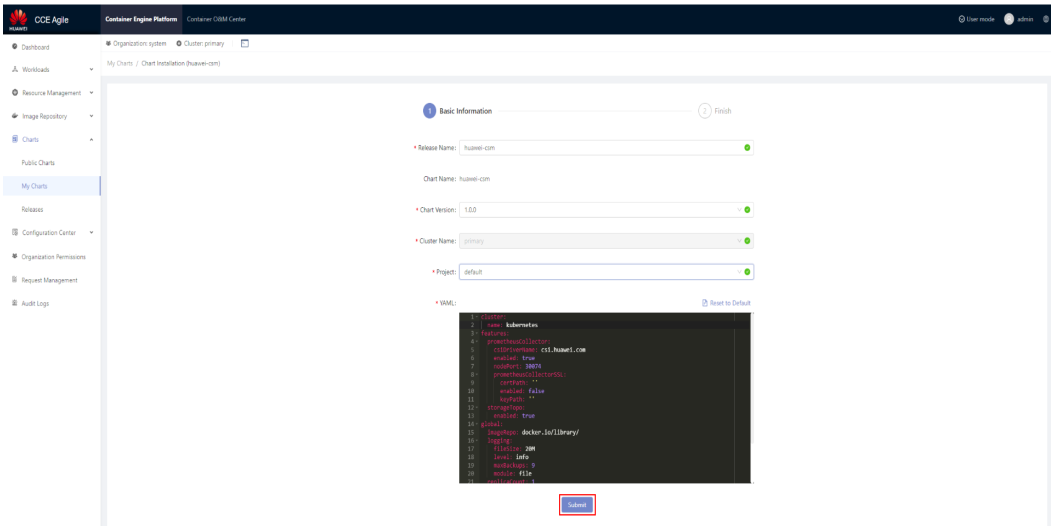
Upload Chart

The name of the chart package to be uploaded must be in the format <name>-<version>.tgz and cannot exceed 50 characters, The maximum size of a .tgz package is 1 MB.

esdk-1.0.0.tgz

No data available.

Step 5 After the installation package is uploaded, choose **Charts** > **My Charts**. On the **My Charts** page that is displayed, choose **Install** > **Submit**. The chart release name can be customized.



* Release Name: huawei-csm

Chart Name: huawei-csm

* Chart Version: 1.0.0

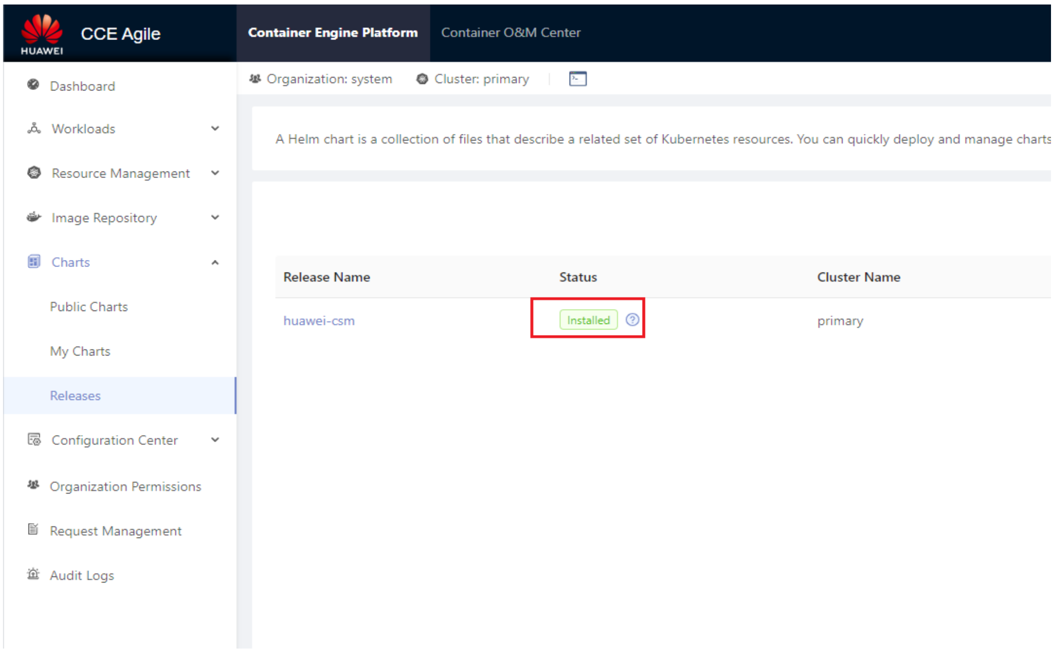
* Cluster Name: primary

* Project: default

* YAML:

```
cluster:
  name: kubernetes
features:
  prometheusCollector:
    csiDriverName: csi.huawei.com
    enabled: true
    nodePort: 30074
    prometheusCollectorSSL:
      certPath: ''
      enabled: false
      keyPath: ''
  storageTopo:
    enabled: true
global:
  imageRepo: docker.io/library/
  logging:
    fileSize: 20M
    level: info
    maxBackups: 9
    module: file
  replicaCount: 1
```

Step 6 On the home page, choose **Charts** > **Releases** and select the project specified during installation (for example, **default** in the following figure). After the installation is successful, **Installed** is displayed in the **Status** column.



A Helm chart is a collection of files that describe a related set of Kubernetes resources. You can quickly deploy and manage charts

Release Name	Status	Cluster Name
huawei-csm	Installed	primary

----End

4.1.3 Upgrading the Software

Scenario

When upgrading the CSM service version, perform the operations described in this section.

Prerequisites

CSM has been deployed using Helm 3.

Precautions

During the upgrade, if the **values.yaml** and **update-value.yaml** files contain the same parameter settings, the parameters in the **update-value.yaml** file are preferentially used.

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Import the new images to the corresponding node. For details, see **3.2 Uploading Images to the Image Repository**.

Step 3 (Optional) Run the **kubectl delete validatingWebhookConfiguration topo-service.xuanwu.huawei.io** command to delete the webhook resource. If the **topo-service.xuanwu.huawei.io** resource does not exist, skip this step.

```
# kubectl delete validatingWebhookConfiguration topo-service.xuanwu.huawei.io
```

Step 4 Run the **cd /opt/huawei-csm/helm/huawei-csm/** command to go to the Helm working directory.

Step 5 Run the **kubectl apply -f crds/** command to update crd resources.

```
# kubectl apply -f crds/
customresourcedefinition.apiextensions.k8s.io/resourcetopologies.xuanwu.huawei.io configured
```

Step 6 Run the **helm get values huawei-csm -n huawei-csm -a > update-value.yaml** command to obtain the original service configuration file.

Step 7 Run the **vi update-value.yaml** command to open the file and update the parameter values as required. After the modification is complete, press **Esc** and enter **:wq!** to save the modification. For details, see **3.4 Preparing the Configuration File**.

Step 8 Run the **helm upgrade huawei-csm ./ -n huawei-csm -f ./values.yaml -f update-value.yaml --wait --timeout 2m** command to upgrade CSM services. If **Release "huawei-csm" has been upgraded** is displayed in the command output, the CSM services are successfully upgraded.

```
# helm upgrade huawei-csm ./ -n huawei-csm -f ./values.yaml -f update-value.yaml --wait  --timeout 2m
Release "huawei-csm" has been upgraded. Happy Helming!
NAME: huawei-csm
LAST DEPLOYED: Wed Aug  9 04:19:10 2023
NAMESPACE: huawei-csm
STATUS: deployed
REVISION: 3
TEST SUITE: None
```

Step 9 (Optional) Run the **kubectl get rt | grep topo- | awk '{print "kubectl delete rt "$1}' | sh** command to delete the residual topo resources of the source version. If there is no residual topo resource of the source version in the cluster, skip this step.

----End

4.1.4 Rolling Back the Software

Prerequisites

- CSM has been deployed using Helm 3.
- CSM has been upgraded using Helm 3.

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/helm/huawei-csm/** command to go to the Helm working directory.

Step 3 Run the **helm history huawei-csm -n huawei-csm** command to query the historical versions of the services deployed using Helm.

```
# helm history huawei-csm -n huawei-csm
REVISION    UPDATED                     STATUS        CHART              APP VERSION
DESCRIPTION
1           Tue Aug  8 23:11:18 2023    superseded    huawei-csm-2.2.0    1.0.0         Install
complete
2           Wed Aug  9 04:19:10 2023    deployed      huawei-csm-2.2.0    1.0.0         Upgrade complete
```

Step 4 Run the **helm rollback huawei-csm** *revision-number* **-n huawei-csm --wait --timeout 2m** command to roll back the CSM services to the specified version. If **Rollback was a success** is displayed in the command output, the CSM services are successfully rolled back to the specified version.

In the preceding command, *revision-number* indicates a version number queried in **Step 3**. For example, the version is **1**.

```
# helm rollback huawei-csm 1 -n huawei-csm --wait --timeout 2m
Rollback was a success! Happy Helming!
```

----End

4.1.5 Uninstalling the Software

Prerequisites

- CSM has been deployed using Helm 3.
- Resources created using CSM are no longer needed and have been deleted.

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/helm/huawei-csm/** command to go to the Helm working directory.

Step 3 Run the **helm uninstall huawei-csm -n huawei-csm** command to uninstall CSM services. If **release "huawei-csm" uninstalled** is displayed in the command output, the services are successfully uninstalled.

```
# helm uninstall huawei-csm -n huawei-csm
release "huawei-csm" uninstalled
```

Step 4 (Optional) Run the **kubectl delete validatingWebhookConfiguration topo-service.xuanwu.huawei.io** command to delete the webhook resource. If the **topo-service.xuanwu.huawei.io** resource does not exist, skip this step.

```
kubectl delete validatingWebhookConfiguration topo-service.xuanwu.huawei.io
```

Step 5 (Optional) Run the **kubectl delete -f crds/** command to clear crd resources.

NOTICE

- If Huawei CSM is no longer used and related resource objects of Huawei CSM have been cleared from the environment, perform this step. Otherwise, skip this step.
- Before deleting crd resources, ensure that the resources created using Huawei CSM have been cleared. For details about the crd resource types, see the files in the **/opt/huawei-csm/helm/huawei-csm/crds** directory.
- Deleting a crd resource will clear all resources associated with the crd. Exercise caution when performing this operation.
- If a message similar to **<Error from server (NotFound): error when deleting "crds/xuanwu.huawei.io_resourcetopologies.yaml": customresourcedefinitions.apiextensions.k8s.io "resourcetopologies.xuanwu.huawei.io" not found>** is displayed, the crd resource has been uninstalled. In this case, ignore the message.

```
# kubectl delete -f crds/
customresourcedefinition.apiextensions.k8s.io "resourcetopologies.xuanwu.huawei.io" deleted
```

Step 6 Run the **kubectl delete ns huawei-csm** command to delete the namespace.

NOTICE

Deleting a namespace will clear all resources in the namespace. Exercise caution when performing this operation.

Step 7 If the OpenShift platform is used, run the **oc delete securitycontextconstraints huawei-csm-scc** command to delete the **SecurityContextConstraints** resource. Otherwise, skip this step.

```
# oc delete securitycontextconstraints huawei-csm-scc
securitycontextconstraints.security.openshift.io "huawei-csm-scc" deleted
```

----End

4.1.6 Uninstalling the Software from CCE Agile

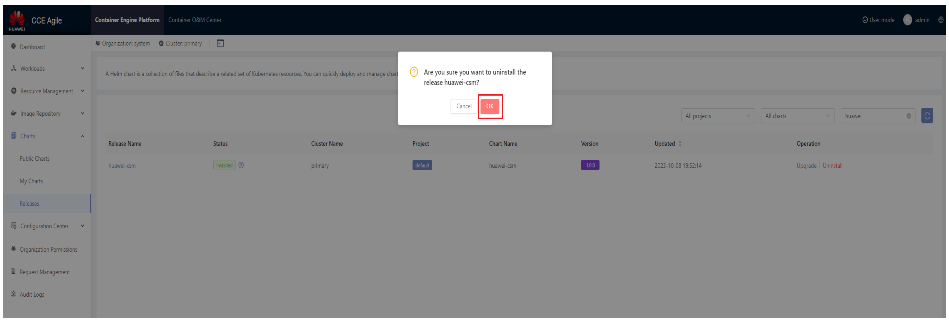
This section describes how to uninstall Huawei CSM from the CCE Agile platform. The following uses CCE Agile v22.3.2 as an example.

Procedure

Step 1 Log in to the CCE Agile platform.

Step 2 On the home page, choose **Charts** > **Releases**. The **Releases** page is displayed.

Step 3 Select a Huawei CSM release and click **Uninstall**. In the displayed dialog box, click **OK**.



A Helm chart is a collection of files that describe a related set of Kubernetes resources. You can quickly deploy and manage chart

Are you sure you want to uninstall the release huawei-csm?

Release Name	Status	Cluster Name	Project	Chart Name	Version	Updated	Operation
huawei-csm	Installed	primary	default	huawei-csm	1.0.0	2023-10-08 19:52:14	Upgrade Uninstall

----End

4.2 Manual Installation and Deployment

4.2.1 Manually Installing the Software

Preparations

For the OpenShift platform, run the following commands to create the **SecurityContextConstraints** resource.

1. Run the **vi huawei-csm-scc.yaml** command to create a **SecurityContextConstraints** file.

```
# vi huawei-csm-scc.yaml
allowHostDirVolumePlugin: true
allowHostIPC: false
allowHostNetwork: true
allowHostPID: false
allowHostPorts: false
allowPrivilegeEscalation: false
allowPrivilegedContainer: false

apiVersion: security.openshift.io/v1
kind: SecurityContextConstraints
metadata:
  name: huawei-csm-scc
runAsUser:
  type: RunAsAny
seLinuxContext:
  type: RunAsAny
fsGroup:
  type: RunAsAny
users:
- system:serviceaccount:huawei-csm:csm-prometheus-sa
- system:serviceaccount:huawei-csm:csm-storage-sa
volumes:
- hostpath
- emptyDir
- persistentVolumeClaim
- secret
- configMap
```

2. Run the **oc create -f huawei-csm-scc.yaml** command to create **SecurityContextConstraints**.

```
# oc create -f huawei-csm-scc.yaml
securitycontextconstraints.security.openshift.io/huawei-csm-scc created
```

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **kubectl create namespace huawei-csm** command to create a namespace named **huawei-csm**.

```
# kubectl create namespace huawei-csm
namespace/huawei-csm created
```

Step 3 Run the **cd /opt/huawei-csm/manual/huawei-csm** command to go to the Huawei CSM installation directory.

Step 4 Run the **kubectl apply -f crds/** command to install crd resources.

```
# kubectl apply -f crds/
customresourcedefinition.apiextensions.k8s.io/resourcetopologies.xuanwu.huawei.io created
```

Step 5 Run the **cd /opt/huawei-csm/manual/huawei-csm/templates** command to go to the Huawei CSM working directory.

Step 6 (Optional) If the single-copy deployment mode is used, skip this step. If the multi-copy deployment mode is used, you need to manually change the number of Deployment resource copies in all files in the **templates** directory and set all **enable-leader-election** parameters to **true**.

```
apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: csm-storage-service
  name: csm-storage-service
  namespace: huawei-csm
spec:
  progressDeadlineSeconds: 600
  replicas: 2
  ...
        args:
          - --enable-leader-election=true
  ...
```

Step 7 (Optional) To configure the node selector of the CSM service, manually uncomment the **nodeSelector** field of the Deployment resources in all files in the **templates** directory and configure the corresponding node matching tag.

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: csm-prometheus-service
  ...
    spec:
# uncomment if you wish to configure selection constraints for csm-prometheus-service pods
      nodeSelector:
        kubernetes.io/hostname: <host-name>
  ...
```

Step 8 (Optional) To enable the Prometheus plug-in to provide the HTTPS service, manually configure the **prometheus-ssl.yaml** certificate file by following the instructions in Table 4-1. Run the **kubectl apply -f prometheus-ssl.yaml** command to create a certificate file. Manually uncomment the certificate-related fields in the **csm-prometheus.yaml** file and change the value of **use-https** to **true**. If the default HTTP service is used, skip this step.

```
# kubectl apply -f prometheus-ssl.yaml
secret/prometheus-ssl created
```

Table 4-1 prometheus-ssl parameters

Parameter	Description	Mandatory	Default Value
data.tls.crt	Certificate information encoded using Base64.	Yes	-
data.tls.key	Private key information encoded using Base64.	Yes	-

```
prometheus-ssl.yaml
  ...
    containers:
      - name: prometheus-collector
  ...
        args:
          - --use-https=true    # modify the value to "true" if configured the SSL cert
  ...
        volumeMounts:
# uncomment if configured the SSL cert
          - name: secret-volume
            mountPath: /etc/secret-volume
            readOnly: true
        livenessProbe:
          failureThreshold: 5
          httpGet:
# uncomment if configured the SSL cert
            scheme: HTTPS
            path: /healthz
            port: 8887
  ...
    volumes:
# uncomment if configured the SSL cert
      - name: secret-volume
        secret:
          secretName: prometheus-ssl
          defaultMode: 0400
```

Step 9 Run the **kubectl apply -f csm-prometheus.yaml** command to deploy the csm-prometheus service.

```
# kubectl apply -f csm-prometheus.yaml
serviceaccount/csm-prometheus-sa created
clusterrole.rbac.authorization.k8s.io/prometheus-collector-role created
clusterrolebinding.rbac.authorization.k8s.io/prometheus-collector-binding created
clusterrole.rbac.authorization.k8s.io/cmi-collector-role created
clusterrolebinding.rbac.authorization.k8s.io/cmi-collector-binding created
deployment.apps/csm-prometheus-service created
service/csm-prometheus-service created
```

Step 10 Run the **kubectl apply -f csm-storage.yaml** command to deploy the csm-storage service.

```
# kubectl apply -f csm-storage.yaml
serviceaccount/csm-storage-sa created
clusterrole.rbac.authorization.k8s.io/topo-service-role created
clusterrole.rbac.authorization.k8s.io/cmi-controller-role created
clusterrolebinding.rbac.authorization.k8s.io/topo-service-binding created
clusterrolebinding.rbac.authorization.k8s.io/cmi-controller-binding created
deployment.apps/csm-storage-service created
service/csm-storage-service created
```

Step 11 Run the **kubectl get pod -n huawei-csm** command to check the Pod creation result. If the following information is displayed, the Huawei CSM services are successfully created.

```
# kubectl get pod -n huawei-csm
NAME                                      READY   STATUS    RESTARTS   AGE
csm-prometheus-service-7c8bd8fd89-lbfvn   3/3     Running   0          3m21s
csm-storage-service-747dbc5cbd-n24j8      3/3     Running   0          2m19s
```

----End

4.2.2 Manually Updating the Software

Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 1 Manually uninstall Huawei CSM of the earlier version by following the instructions in **4.2.3 Manually Uninstalling the Software**.

Step 2 Go to the **/opt/huawei-csm/manual/huawei-csm** directory where the new installation package is stored and run the **kubectl apply -f** *crds/* command to update crd resources.

```
# kubectl apply -f crds/
customresourcedefinition.apiextensions.k8s.io/resourcetopologies.xuanwu.huawei.io configured
```

Step 3 Install Huawei CSM of the current version. For details, see **4.2.1 Manually Installing the Software**.

----End

4.2.3 Manually Uninstalling the Software

Prerequisites

Huawei CSM has been installed, and Huawei CSM services are running properly.

Uninstalling the csm-prometheus Service

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/manual/huawei-csm/templates** command to go to the Huawei CSM working directory.

Step 3 Run the **kubectl delete -f csm-prometheus.yaml** command to uninstall the csm-prometheus service.

```
# kubectl delete -f csm-prometheus.yaml
serviceaccount "csm-prometheus-sa" deleted
clusterrole.rbac.authorization.k8s.io "prometheus-collector-role" deleted
clusterrolebinding.rbac.authorization.k8s.io "prometheus-collector-binding" deleted
clusterrole.rbac.authorization.k8s.io "cmi-collector-role" deleted
clusterrolebinding.rbac.authorization.k8s.io "cmi-collector-binding" deleted
deployment.apps "csm-prometheus-service" deleted
service "csm-prometheus-service" deleted
```

Step 4 (Optional) If no certificate file is configured, skip this step. Run the **kubectl delete -f prometheus-ssl.yaml** command to delete the certificate secret file.

```
# kubectl delete -f prometheus-ssl.yaml
secret "prometheus-ssl" deleted
```

----End

Uninstalling the csm-storage Service

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/manual/huawei-csm/templates** command to go to the Huawei CSM working directory.

Step 3 Run the **kubectl delete -f csm-storage.yaml** command to uninstall the csm-storage service.

```
# kubectl delete -f csm-storage.yaml
serviceaccount "csm-storage-sa" deleted
clusterrole.rbac.authorization.k8s.io "topo-service-role" deleted
clusterrole.rbac.authorization.k8s.io "cmi-controller-role" deleted
clusterrolebinding.rbac.authorization.k8s.io "topo-service-binding" deleted
clusterrolebinding.rbac.authorization.k8s.io "cmi-controller-binding" deleted
deployment.apps "csm-storage-service" deleted
service "csm-storage-service" deleted
```

----End

Uninstalling Other Resources

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/manual/huawei-csm** command to go to the Huawei CSM installation directory.

Step 3 Run the **kubectl delete configmap -n huawei-csm huawei-csm-version** command to delete the **configmap** resources.

```
# kubectl delete configmap -n huawei-csm huawei-csm-version
configmap "huawei-csm-version" deleted
```

Step 4 (Optional) If Huawei CSM is deployed in single-copy mode, skip this step. Run the **kubectl delete lease -n huawei-csm resource-topology** command to delete the **lease** resources.

Step 5 (Optional) Run the **kubectl delete -f crds/** command to clear crd resources.

NOTICE

- If Huawei CSM is no longer used and related resource objects of Huawei CSM have been cleared from the environment, perform this step. Otherwise, skip this step.
- Before deleting crd resources, ensure that the resources created using Huawei CSM have been cleared. For details about the crd resource types, see the files in the **/opt/huawei-csm/manual/huawei-csm/crds** directory.
- Deleting a crd resource will clear all resources associated with the crd. Exercise caution when performing this operation.
- If a message similar to **<Error from server (NotFound): error when deleting "crds/xuanwu.huawei.io_resourcetopologies.yaml": customresourcedefinitions.apiextensions.k8s.io "resourcetopologies.xuanwu.huawei.io" not found>** is displayed, the crd resource has been uninstalled. In this case, ignore the message.

```
# kubectl delete -f crds/
customresourcedefinition.apiextensions.k8s.io "resourcetopologies.xuanwu.huawei.io" deleted
```

Step 6 Run the **kubectl delete ns huawei-csm** command to delete the namespace.

NOTICE

Deleting a namespace will clear all resources in the namespace. Exercise caution when performing this operation.

Step 7 If the OpenShift platform is used, run the **oc delete securitycontextconstraints huawei-csm-scc** command to delete the **SecurityContextConstraints** resource. Otherwise, skip this step.

```
# oc delete securitycontextconstraints huawei-csm-scc
securitycontextconstraints.security.openshift.io "huawei-csm-scc" deleted
```

----End

5 Configuring Prometheus

5.1 Installing Prometheus

Prometheus is an open-source systems monitoring and alerting toolkit. Prometheus joined the Cloud Native Computing Foundation (CNCF) in 2016 as the second hosted project, after Kubernetes.

For details about how to obtain and install Prometheus, **click here**.

For other information about Prometheus, **click here**.

5.2 Configuring the Prometheus Service

Configuration Description

Prometheus invokes the interfaces provided by the plug-in to monitor storage data. No matter Prometheus is deployed in Kubernetes or on an independent server, a configuration file is required to start Prometheus and monitor the plug-in.

This section only describes how to add configurations related to the plug-in to the Prometheus configuration file. For details about other configurations, **click here** to see the Prometheus official document.

Step 1 Modify the Prometheus configuration file. Add the storage backend monitoring items created using CSM to the **scrape_configs** section.

NOTE

This configuration file is the configuration file of the Prometheus platform. Its location varies depending on the deployment mode. For details, **click here** to see the Prometheus official document.

Step 2 Add resource monitoring items. The configuration template is as follows:

```
scrape_configs:
- job_name: ******
  scrape_interval: ***
  scrape_timeout: ***
  metrics_path: /object/***
  scheme: http/https
  params:
    controller: ['']
    storagepool: ['']
    filesystem: ['']
    lun: ['']
    array: ['']
    pv: ['']
  tls_config:
    ca_file: ******
    cert_file: ******
    key_file: ******
  static_configs:
    - targets: ['*.*.*.*:<Port number>']
```

Table 5-1 describes the parameters in the **scrape_configs** section.

Table 5-1 Parameter description

Parameter	Description	Example
job_name	Monitoring job name.	job_name: OceanStor-Monitor
scheme	Web request mode. If this parameter is not set, the default value **http** is used. After **tls_config** is configured in the plug-in, set this parameter to **https**.	scheme: https
scrape_interval	Data scraping interval.	scrape_interval: 15m
scrape_timeout	Data scraping timeout. You are advised to set this parameter to be the same as the value of **scrape_interval**.	scrape_timeout: 15m
metrics_path	Data scraping path, in the format of **/object/** ***. *** indicates the storage backend name in the plug-in configuration file. **NOTE** Only users with the corresponding roles in the storage system group can query the metric data of the backend. Such roles include the super administrator, administrator, and monitoring administrator.	metrics_path: /object/backend1

Parameter	Description	Example
params	Monitored object of centralized storage. Currently, the following types are supported: - **controller**: controller - **storagepool**: storage pool - **filesystem**: file system - **lun**: LUN - **array**: array - **pv**: PV data of Kubernetes **NOTE** - If you do not need a certain object, you can delete it. - The value of an object parameter must be in the format of **['']**. - For details about object metric data, see **Table 2-4**.	controller: [''] storagepool: [''] filesystem: [''] lun: [''] array: [''] pv: ['']
tls_config	TLS configuration when **scheme** is set to **https**. This parameter is mandatory when **scheme** is set to **https**. - **ca_file**: path of the CA certificate used to verify the API server certificate. - **cert_file**: path of the certificate file used for client certificate authentication on the server. - **key_file**: path of the key file used for client certificate authentication on the server.	ca_file: /opt/huawei/ca.crt cert_file: /opt/huawei/client.crt key_file: /opt/huawei/client.key **NOTE** The paths can be customized.
targets	Listening address (for example, the IP address of a host in the cluster deployed using CSM) and port exposed by the CSM plug-in. For Kubernetes deployment, the default port is 30074. The specific port is the one specified during plug-in deployment. For non-Kubernetes deployment, no default port is available. The specific port is the one specified during plug-in deployment.	['192.168.1.1:30074']

NOTE

For details about **scrape_configs** parameters, **click here** to visit the Prometheus official website.

Step 3 Add performance monitoring items. The configuration template is as follows:

```
scrape_configs:
- job_name: ******
  scrape_interval: ***
  scrape_timeout: ***
  metrics_path: /performance/***
  scheme: http/https
  params:
    controller: ['21,22,370']
    storagepool: ['21,22,370']
    lun: ['21,22,370']
    filesystem: ['182,524,525']
    pv: ['filesystem,lun']
  tls_config:
    ca_file: ******
    cert_file: ******
    key_file: ******
  static_configs:
    - targets: ['*.*.*.*:<Port number>']
```

Table 5-2 describes the parameters in the **scrape_configs** section.

Table 5-2 Parameter description

Parameter	Description	Example
job_name	Monitoring job name.	job_name: OceanStor-Monitor
scheme	Web request mode. If this parameter is not set, the default value **http** is used. After **tls_config** is configured in the plug-in, set this parameter to **https**.	scheme: https
scrape_interval	Data scraping interval.	scrape_interval: 15m
scrape_timeout	Data scraping timeout. You are advised to set this parameter to be the same as the value of **scrape_interval**.	scrape_timeout: 15m

Parameter	Description	Example
metrics_path	Data scraping path, in the format of **/performance/*****. *** indicates the storage backend name in the plug-in configuration file. **NOTE** Only users with the corresponding roles in the storage system group can query the metric data of the backend. Such roles include the super administrator, administrator, and monitoring administrator.	metrics_path: /performance/backend1
params	Currently, the following types are supported: ● **controller**: controller ● **storagepool**: storage pool ● **filesystem**: file system ● **lun**: LUN ● **pv**: PV data of Kubernetes **NOTE** ● If you do not need a certain object, you can delete it. ● The object parameter value is used to specify the performance metric of the object. The format is 'Metric 1,Metric 2...'. If you do not need a certain metric, you can delete it. ● For details about performance metric data and mappings, see **Table 2-5**.	controller: ['21,22,23,25,26,28,370'] storagepool: ['21,22,370'] lun: ['21,22,370'] filesystem: ['182,524,525'] pv: ['filesystem,lun']
tls_config	TLS configuration when **scheme** is set to **https**. This parameter is mandatory when **scheme** is set to **https**. ● **ca_file**: path of the CA certificate used to verify the API server certificate. ● **cert_file**: path of the certificate file used for client certificate authentication on the server. ● **key_file**: path of the key file used for client certificate authentication on the server.	ca_file: /opt/huawei/ca.crt cert_file: /opt/huawei/client.crt key_file: /opt/huawei/client.key **NOTE** The paths can be customized.

Parameter	Description	Example
targets	Listening address (for example, the IP address of a host in the cluster deployed using CSM) and port exposed by the CSM plug-in. For Kubernetes deployment, the default port is 30074. The specific port is the one specified during plug-in deployment. For non-Kubernetes deployment, no default port is available. The specific port is the one specified during plug-in deployment.	['192.168.1.1:30074']

📖 NOTE

For details about **scrape_configs** parameters, **click here** to visit the Prometheus official website.

Step 4 To monitor multiple storage backends, repeat **Step 2** and **Step 3**.

Step 5 Restart the Prometheus service.

📖 NOTE

Prometheus is an open-source component. The startup mode varies depending on the deployment mode. For details, **click here** to see the Prometheus official document.

----End

5.3 Configuring the Prometheus Dashboard

Step 1 In the address box of a browser, enter the IP address and port of the Prometheus service to log in to the Prometheus monitoring UI. The default port is **9090**.

Step 2 Click the **Graph** tab, enter **huawei** in the search box, and select the desired monitoring item.

----End

6 Configuring Grafana

6.1 Installing Grafana

Grafana is an open-source visualization platform that provides full support for Prometheus.

NOTE

- Grafana 2.5.0 (released on October 28, 2015) and later versions allow Prometheus to function as a Grafana data source. Currently, Huawei storage can interconnect with only Grafana 7.0.4.
- CCE Agile provides the Grafana component and has the default Prometheus data source. You can go to **Using Grafana to Monitor Storage** to perform the next step.

For details about how to install Grafana, see **the Grafana official documentation**.

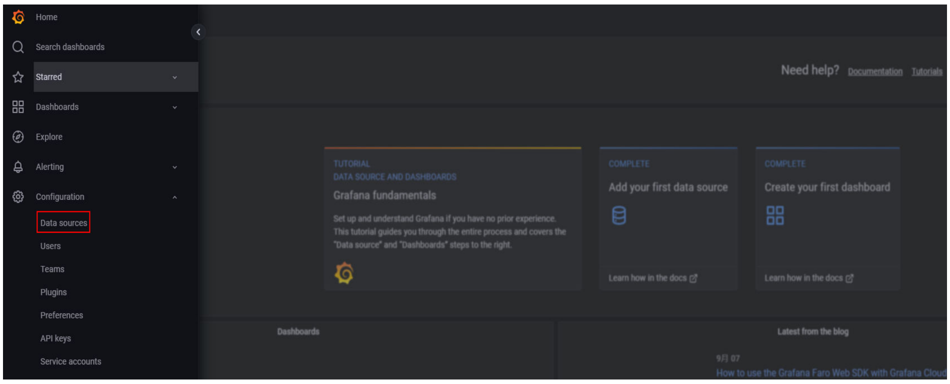
6.2 Using Grafana

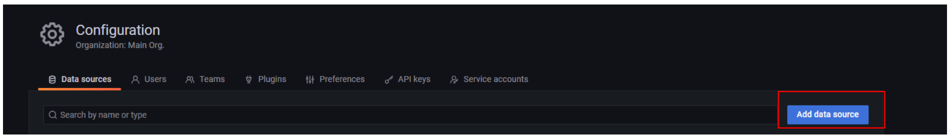
NOTE

By default, Grafana listens on port 3000.

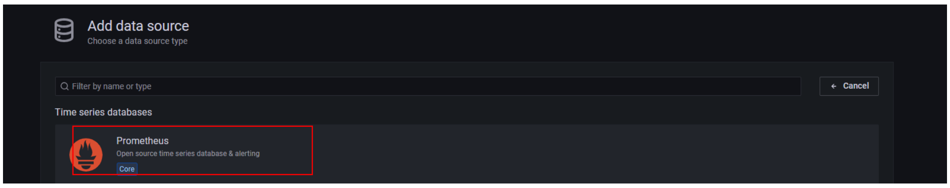
Adding Prometheus and Configuring a Data Source

Step 1 In the navigation pane on the left, choose **Configuration** > **Data sources** and click **Add data source** to add a data source.


Home
Search dashboards
Starred
Dashboards
Explore
Alerting
Configuration
Data sources
Users
Teams
Plugins
Preferences
API keys
Service accounts
Need help? Documentation Tutorials
TUTORIAL
DATA SOURCE AND DASHBOARDS
Grafana fundamentals
Set up and understand Grafana if you have no prior experience. This tutorial guides you through the entire process and covers the "Data source" and "Dashboards" steps to the right.
COMPLETE
Add your first data source
Learn how in the docs
COMPLETE
Create your first dashboard
Learn how in the docs
Dashboards
Latest from the blog
How to use the Grafana Faro Web SDK with Grafana Cloud

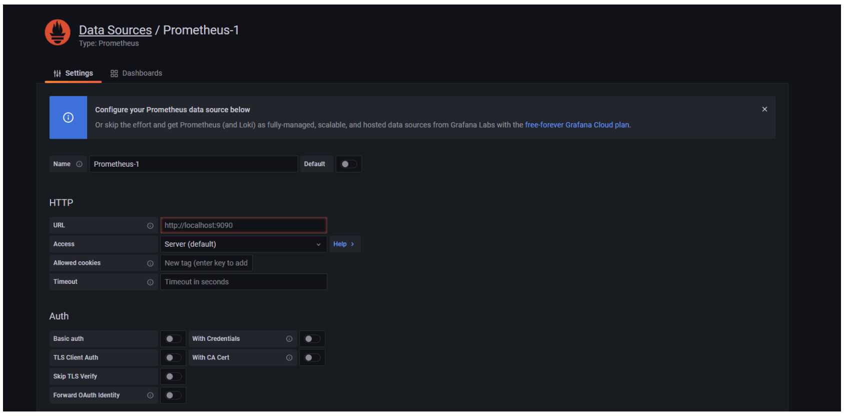


Step 2 Select Prometheus and add a data source.



Step 3 Configure data source information.

- **Name**: name of the data source.
- **URL**: IP address of the Prometheus server.
- **Access**: Set this parameter based on site requirements.
  - If this parameter is set to **Server**, a browser sends a request to the Grafana server and then the Grafana server sends a request to the Prometheus server to obtain data.
  - If this parameter is set to **Browser**, a browser directly sends a request to the Prometheus server to obtain data. (The cross-domain problem needs to be solved.)


Data Sources / Prometheus-1

Type: Prometheus

Configure your Prometheus data source below

Or skip the effort and get Prometheus (and Loki) as fully-managed, scalable, and hosted data sources from Grafana Labs with the free-forever Grafana Cloud plan.

Name: Prometheus-1

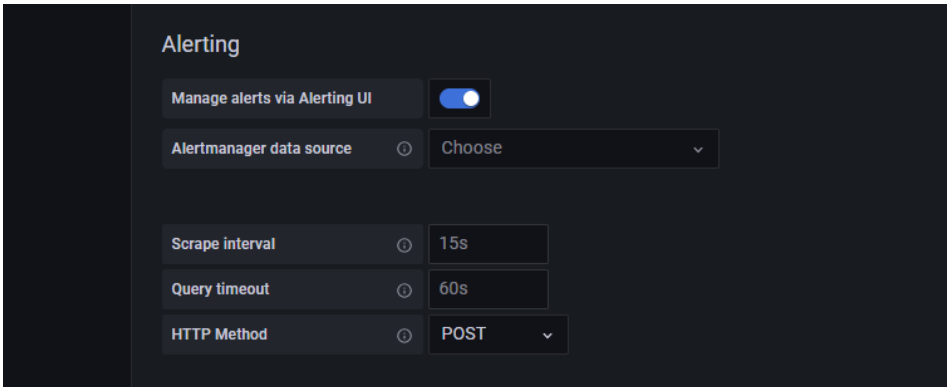
HTTP

URL: http://localhost:9090

Access: Server (default)

Step 4 Set the HTTP method.

- **POST**: recommended when a large amount of data is queried.



Alerting

Manage alerts via Alerting UI ●

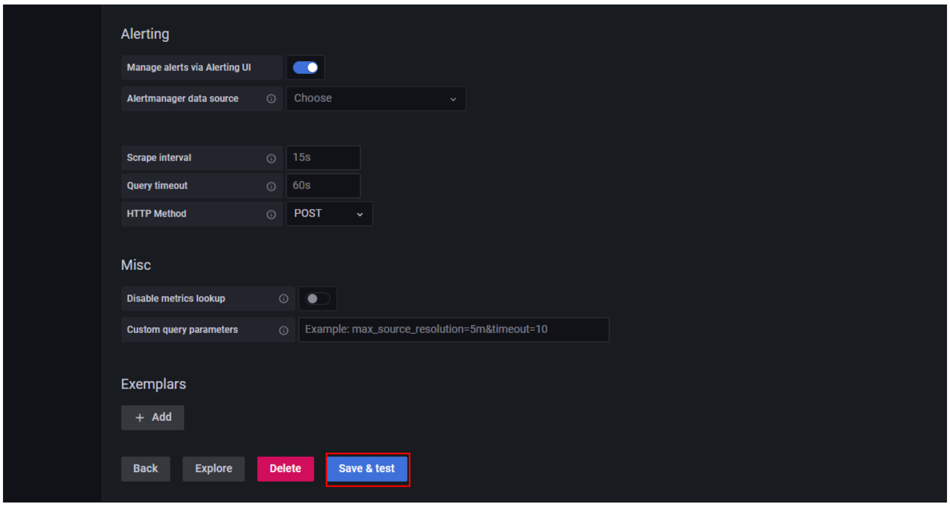
Alertmanager data source: Choose

Scrape interval: 15s

Query timeout: 60s

HTTP Method: POST

Step 5 Click **Save & Test** to save the new data source.



Alerting

Manage alerts via Alerting UI ●

Alertmanager data source: Choose

Scrape interval: 15s

Query timeout: 60s

HTTP Method: POST

Misc

Disable metrics lookup ○

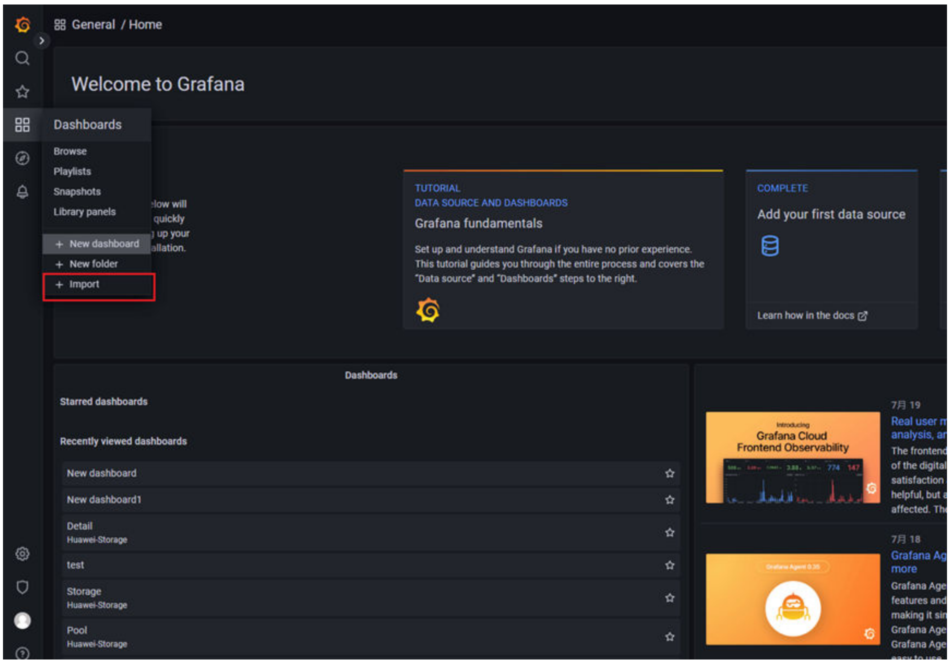
Custom query parameters: Example: max_source_resolution=5m&timeout=10

Exemplars

----End

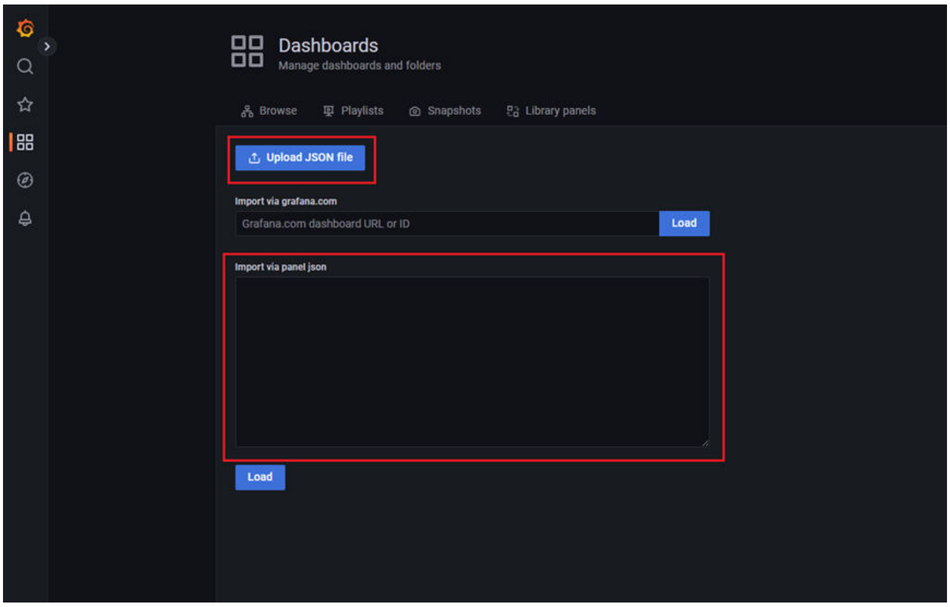
Using Grafana to Monitor Storage

Step 1 In the navigation pane on the left, choose **Dashboards** > **Import**.

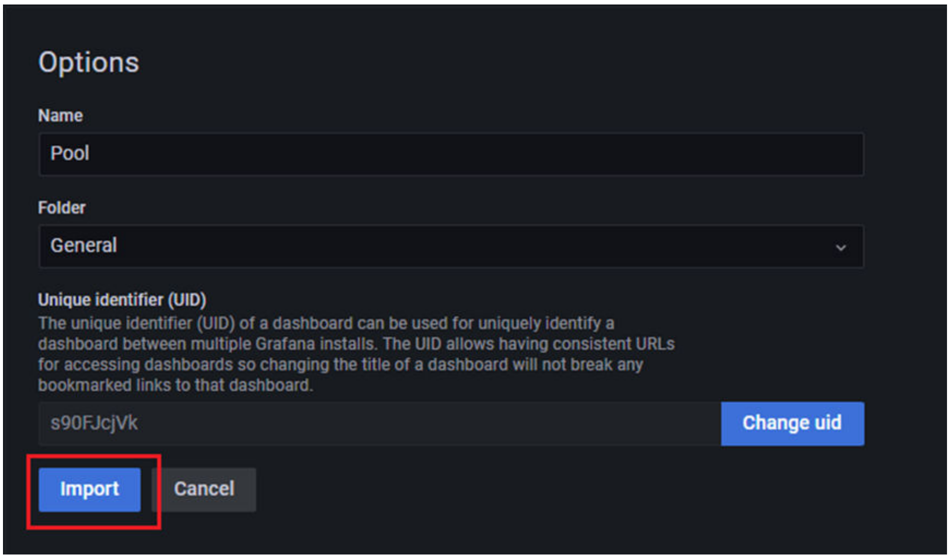


Set up and understand Grafana if you have no prior experience. This tutorial guides you through the entire process and covers the "Data source" and "Dashboards" steps to the right.

Step 2 Click **Upload JSON file** to upload a JSON file or directly paste JSON data to load the existing dashboard. After the loading is successful, you can view the JSON file in the **helm/huawei-csm/grafana/OceanStor.json** directory in the path where the CSM software package is decompressed on the **Browse** tab page. The JSON file is a sample template.



Step 3 After setting the dashboard name and folder, click **Import**.



Options

Name

Pool

Folder

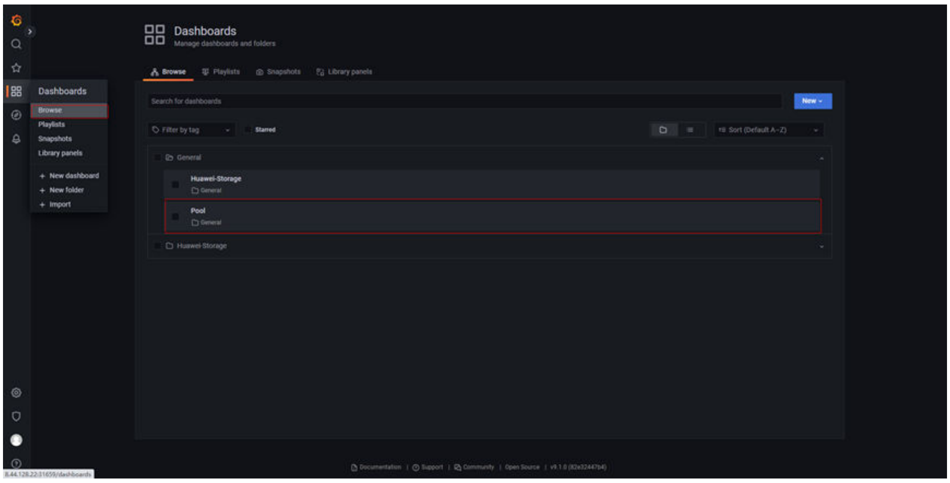
General

Unique identifier (UID)

The unique identifier (UID) of a dashboard can be used for uniquely identify a dashboard between multiple Grafana installs. The UID allows having consistent URLs for accessing dashboards so changing the title of a dashboard will not break any bookmarked links to that dashboard.

s90FJcjVk

Step 4 In the navigation pane on the left, choose **Dashboards** > **Browse**. On the **Browse** tab page, find the imported dashboard and click it.

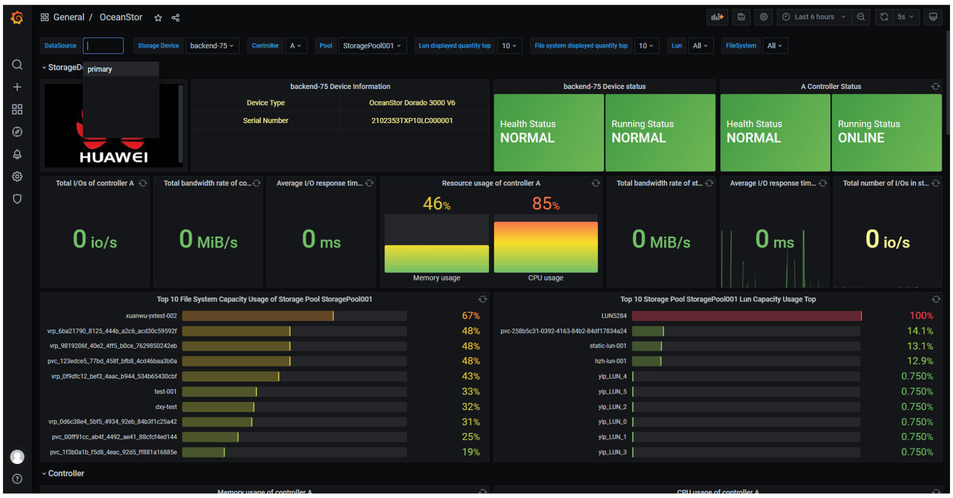


Dashboards
Manage dashboards and folders

General
Huawei-Storage
General
Pool
General
Huawei-Storage

Documentation | Support | Community | Open Source | v9.1.0 (82e32447b4)
8.44.128.22:31659/dashboards

Step 5 In the **DataSource** drop-down list on the dashboard, select the configured data source.



DataSource: primary
Storage Device: backend-75
Controller: A
Pool: StoragePool001
Lun displayed quantity top: 10
File system displayed quantity top: 10
Lun: All
FileSystem: All

backend-75 Device Information

Device Type	OceanStor Dorado 3000 V6
Serial Number	2102353TXP10LC000001

backend-75 Device status: Health Status NORMAL; Running Status NORMAL

A Controller Status: Health Status NORMAL; Running Status ONLINE

Total I/Os of controller A: 0 io/s

Total bandwidth rate of co...: 0 MiB/s

Average I/O response tim...: 0 ms

Resource usage of controller A: Memory usage 46%; CPU usage 85%

Total bandwidth rate of st...: 0 MiB/s

Average I/O response tim...: 0 ms

Total number of I/Os in st...: 0 io/s

Top 10 File System Capacity Usage of Storage Pool StoragePool001

xuanwu-yxtest-002	67%
vrp_6ba21790_8125_444b_a2c6_acd30c59592f	48%
vrp_9819206f_40e2_4ff5_b0ce_7629850242eb	48%
pvc_123edce5_77bd_458f_bfb8_4cd46baa3b0a	48%
vrp_0f9dfc12_bef3_4aac_b944_534b65430cbf	43%
test-001	33%
dxy-test	32%
vrp_0d6c38e4_5bf5_4934_92eb_84b3f1c25a42	31%
pvc_00ff91cc_ab4f_4492_ae41_88cfcf4ed144	25%
pvc_1f3b0a1b_f5d8_4eac_92d5_ff881a16885e	19%

Top 10 Storage Pool StoragePool001 Lun Capacity Usage Top

LUN5284	100%
pvc-258b5c31-0392-4163-84b2-84df17834a24	14.1%
static-lun-001	13.1%
hzh-lun-001	12.9%
ylp_LUN_4	0.750%
ylp_LUN_5	0.750%
ylp_LUN_2	0.750%
ylp_LUN_0	0.750%
ylp_LUN_1	0.750%
ylp_LUN_3	0.750%

Controller

NOTE

The Huawei logo in the upper left corner of the template can be loaded only in a public network environment.

----End

7 Common O&M Guide

7.1 Collecting Logs

NOTICE

If you use the oceanctl tool to collect logs, the CPU usage on the master node may increase sharply in a short period of time. Therefore, determine whether to use this function based on the workload and CPU usage on the master node. You can also manually collect CSM logs in the log archive directory (**/var/log/huawei-csm/**) on each node.

7.1.1 Performing Check Before Collection

Step 1 Use a remote access tool, such as PuTTY, to log in to the node where the oceanctl tool is installed in the Kubernetes cluster through the management IP address.

Step 2 Run the **oceanctl version** command. The displayed version is **v4.7.0**.

```
$ oceanctl version
Oceanctl Version: v4.7.0
```

Step 3 Run the **oceanctl --help** command. The following information is displayed.

```
$ oceanctl --help
A CLI tool for Ocean Storage in Kubernetes

Usage:
  oceanctl [command]

Available Commands:
  collect     collect messages in Kubernetes
  create      Create a resource to Ocean Storage in Kubernetes
  delete      Delete one or more resources from Ocean Storage in Kubernetes
  get         Get one or more resources from Ocean Storage in Kubernetes
  help        Help about any command
  update      Update a resource for Ocean Storage in Kubernetes
  version     Print the version of oceanctl
```

```
Flags:
  -h, --help   help for oceanctl

Use "oceanctl [command] --help" for more information about a command.
```

Step 4 Run the **kubectl get deploy -n** *${NAMESPACE}* command to check whether a Pod is started properly. In the preceding command, *${NAMESPACE}* indicates the namespace for installing CSM. **huawei-csm** is used as an example.

```
$ kubectl get deploy -n huawei-csm
NAME                     READY   UP-TO-DATE   AVAILABLE   AGE
csm-prometheus-service   1/1     1            1           3h23m
csm-storage-service      1/1     1            1           3h23m
```

----End

7.1.2 Collecting CSM Logs Using oceanctl

Step 1 Use a remote access tool, such as PuTTY, to log in to the node checked in **7.1.1 Performing Check Before Collection** through the management IP address.

Step 2 Run the **oceanctl collect logs -n huawei-csm -a** command to collect CSM logs of all nodes where CSM containers reside in the cluster.

```
$ oceanctl collect logs -n huawei-csm -a
node[node2] Collection Progress: [++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++] 1/1 Pods
node[node3] Collection Progress: [++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++] 1/1 Pods
```

Step 3 Check the log package generated in the **/tmp** directory. You can run the **unzip** *${zip_name}* **-d collect_logs** command to decompress the log package. In the preceding command, *${zip_name}* indicates the package name.

```
$ date
Fri Sep  8 22:14:57 CST 2023

$ ls /tmp
huawei-csm-2023-09-08-22:13:01-all.zip
```

----End

7.2 Viewing Version Information

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **kubectl get cm -n** *${NAMESPACE}* **huawei-csm-version -o yaml** command. In the preceding command, *${NAMESPACE}* indicates the namespace name, for example, **huawei-csm**.

```
$ kubectl get cm -n huawei-csm huawei-csm-version -o yaml
apiVersion: v1
data:
  cmi-controller: 2.2.0
  liveness-probe: 2.2.0
  prometheus-collector: 2.2.0
  topo-service: 2.2.0
kind: ConfigMap
metadata:
  name: huawei-csm-version
  namespace: huawei-csm
```

----End

8 Appendix

8.1 Accessing Kubernetes As a Non-root User

Prerequisites

The non-root user has the sudo permission to use **/bin/cp** and **/bin/chown**.

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **mkdir -p $HOME/.kube** command to create a directory for storing the authentication file of the Kubernetes cluster.

```
$ mkdir -p $HOME/.kube
```

Step 3 Run the **sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config** command to copy the authentication file of the Kubernetes cluster.

Replace **/etc/kubernetes/admin.conf** with the actual authentication file.

```
$ sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
```

Step 4 Run the **sudo chown $(id -u):$(id -g) $HOME/.kube/config** command to change the user and user group of the authentication file.

```
$ sudo chown $(id -u):$(id -g) $HOME/.kube/config
```

Step 5 Run the following commands to configure the **KUBECONFIG** environment variable for the current user (Ubuntu 20.04 is used as an example).

```
$ echo "export KUBECONFIG=$HOME/.kube/config" >> ~/.bashrc
$ source ~/.bashrc
```

----End

8.2 Configuring the HTTPS Service for csm-prometheus

8.2.1 Configuring the HTTPS Service Certificate of csm-prometheus

Prerequisites

- Kubernetes is running properly.
- You have obtained the certificate and key.

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to the node where the **helm** folder of CSM is stored in the Kubernetes cluster through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/helm/huawei-csm** command to go to the Helm working directory.

Step 3 Run the **mkdir cert** command to create a folder for storing the certificate.

Step 4 Save the certificate and key files to the **/opt/huawei-csm/helm/huawei-csm/cert** directory.

```
-rw-r--r-- 1 root root 4.5K Sep  8 23:00 server.crt
-rw-r--r-- 1 root root 1.7K Sep  8 23:00 server.key
```

Step 5 Run the **vim /opt/huawei-csm/helm/huawei-csm/values.yaml** command. Then:

- Set **features.prometheusCollector.prometheusCollectorSSL.enabled** to **true**.
- Set **features.prometheusCollector.prometheusCollectorSSL.certPath** to **"cert/server.crt"**.
- Set **features.prometheusCollector.prometheusCollectorSSL.keyPath** to **"cert/server.key"**.

```
# all supported features
features:
  # prometheusCollector: allowed prometheus use the storage to collect metrics
  prometheusCollector:
    # Allowed values:
    #   true: enable prometheus collect feature
    #   false: disable prometheus collect feature
    # Default value: false
    enabled: true
    # nodePort: port the containers are provided to the prometheus
    # Default value: 30074
    nodePort: 30074
    # prometheusCollectorSSL: parameters required to start https
    # Default value: 30074
    prometheusCollectorSSL:
      # Allowed values:
      #   true: enable https, when set it certPath and keyPath must set
      #   false: disable https, use http
      # Default value: true
      enabled: true
      # The Path of cert, need to be placed in the huawei-csm directory
      certPath: "cert/server.crt"
      # The Path of key, need to be placed in the huawei-csm directory
      keyPath: "cert/server.key"
```

Step 6 Complete the installation by referring to **4.1.1 Installing the Software**.

----End

8.2.2 Deleting the HTTPS Service Certificate of csm-prometheus

Prerequisites

- Kubernetes is running properly.
- You have obtained the certificate and key.

Procedure

Step 1 Use a remote access tool, such as PuTTY, to log in to the node where the **helm** folder of CSM is stored in the Kubernetes cluster through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/helm/huawei-csm** command to go to the Helm working directory.

Step 3 Run the **helm get values huawei-csm -n huawei-csm -a > update-value.yaml** command to obtain the original service configuration file.

Step 4 Run the **vim /opt/huawei-csm/helm/huawei-csm/update-value.yaml** command. Then:

- Set **features.prometheusCollector.prometheusCollectorSSL.enabled** to **false**.
- Set **features.prometheusCollector.prometheusCollectorSSL.certPath** to **""**.
- Set **features.prometheusCollector.prometheusCollectorSSL.keyPath** to **""**.

```
features:
  prometheusCollector:
    csiDriverName: csi.huawei.com
    enabled: true
    nodePort: 30074
    prometheusCollectorSSL:
      enabled: false
      certPath: ""
      keyPath: ""
```

Step 5 Run the **helm upgrade huawei-csm ./ -n huawei-csm -f ./values.yaml -f update-value.yaml --wait --timeout 2m** command to upgrade CSM services. If **Release "huawei-csm" has been upgraded** is displayed in the command output, the CSM services are successfully upgraded.

----End

8.2.3 Updating the HTTPS Service Certificate of csm-prometheus

Step 1 Use a remote access tool, such as PuTTY, to log in to the node where the **helm** folder of CSM is stored in the Kubernetes cluster through the management IP address.

Step 2 Run the **cd /opt/huawei-csm/helm/huawei-csm** command to go to the Helm working directory.

Step 3 Run the **mkdir cert** command to create a folder for storing the certificate.

Step 4 Save the new certificate and key files to the **/opt/huawei-csm/helm/huawei-csm/cert** directory.

```
-rw-r--r-- 1 root root 4.5K Sep  8 23:00 server.crt
-rw-r--r-- 1 root root 1.7K Sep  8 23:00 server.key
```

Step 5 Run the **helm get values huawei-csm -n huawei-csm -a > update-value.yaml** command to obtain the original service configuration file.

Step 6 Run the **vim /opt/huawei-csm/helm/huawei-csm/update-value.yaml** command. Then:

- Set **features.prometheusCollector.prometheusCollectorSSL.enabled** to **true**.
- Set **features.prometheusCollector.prometheusCollectorSSL.certPath** to **"cert/server.crt"**.
- Set **features.prometheusCollector.prometheusCollectorSSL.keyPath** to **"cert/server.key"**.

```
features:
  prometheusCollector:
    csiDriverName: csi.huawei.com
    enabled: true
    nodePort: 30074
    prometheusCollectorSSL:
      enabled: true
      certPath: "cert/server.crt"
      keyPath: "cert/server.key"
```

Step 7 Run the **helm upgrade huawei-csm ./ -n huawei-csm -f ./values.yaml -f update-value.yaml --wait --timeout 2m** command to upgrade CSM services. If **Release "huawei-csm" has been upgraded** is displayed in the command output, the CSM services are successfully upgraded.

----End

8.3 Managing Storage Certificates

For details, see section "Storage Backend Management" in the user guide of Huawei Storage Kubernetes CSI.

8.4 Permission Matrix

Table 8-1 Permission matrix

ClusterRole	ApiGroups	Resources	Verbs
prometheus-collector-role	-	"persistentvolumes","persistentvolumeclaims","pods"	"get","list"

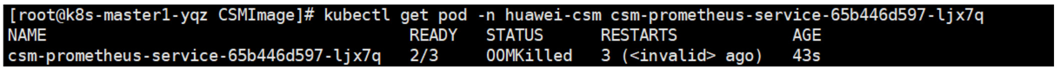
ClusterRole	ApiGroups	Resources	Verbs
	"xuanwu.huawei.io"	"storagebackendclaims"	"get","list"
cmi-collector-role	"xuanwu.huawei.io"	"storagebackendclaims"	"get"
	-	"secrets"	"get"
	-	"configmaps"	"create", "get", "update"
topo-service-role	-	"secrets", "events", "configmaps"	"create", "get", "update", "delete"
	"coordination.k8s.io"	"leases"	"create", "get", "update", "delete"
	"xuanwu.huawei.io"	"resourcetopologies", "resourcetopologies/status"	"create", "get", "list", "watch", "update", "delete"
	"*"	"*"	"get", "list", "watch"
cmi-controller-role	"xuanwu.huawei.io"	"storagebackendclaims"	"get"
	-	"secrets"	"get"
	-	"configmaps"	"create", "get", "update"

9 FAQs

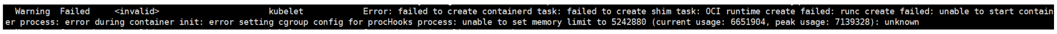
9.1 Pod in OOMKilled State

Symptom

Check the Pod status. The Pod state is **OOMKilled**, and alarm "unable to set memory limit to xxx (current usage: xxx, peak usage: xxx): unknown" is generated in the Pod.



```
[root@k8s-master1-yqz CSMImage]# kubectl get pod -n huawei-csm csm-prometheus-service-65b446d597-ljx7q
NAME                                      READY   STATUS      RESTARTS            AGE
csm-prometheus-service-65b446d597-ljx7q   2/3     OOMKilled   3 (<invalid> ago)   43s
```



```
  Warning  Failed     <invalid>                    kubelet            Error: failed to create containerd task: failed to create shim task: OCI runtime create failed: runc create failed: unable to start contain
er process: error during container init: error setting cgroup config for procHooks process: unable to set memory limit to 5242880 (current usage: 6651904, peak usage: 7139328): unknown
```

Root Cause Analysis

The container memory usage in the Pod reaches the upper limit. You need to increase the upper limit of the available memory.

Solution

Modify the container resource configuration and update CSM. For details, see **4.1.3 Upgrading the Software**.

9.2 Manually Adjusting the Number of Concurrent Data Scraping Requests

Step 1 Use a remote access tool, such as PuTTY, to log in to any master node in the Kubernetes cluster through the management IP address.

Step 2 Run the **kubectl edit deployments.apps -n huawei-csm csm-prometheus-service** command to edit the **deployments** configuration item.

Step 3 For example, to set the number of concurrent requests to 10, add **args** list item **--client-max-threads=10** to the container whose **name** is **cmi-controller** as follows.

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: csm-prometheus-service
  namespace: huawei-csm
...
...
spec:
  template:
    metadata:
      creationTimestamp: null
      labels:
        app: csm-prometheus-service
    spec:
      containers:
...
...
      - args:
        - --cmi-address=$(ENDPOINT)
        - --cmi-name=cmi.huawei.com
        - --page-size=100
        - --backend-namespace=huawei-csi
        - --log-file-dir=/var/log/huawei-csm/csm-prometheus-service
        - --log-file=cmi-service
        - --logging-module=file
        - --log-level=info
        - --log-file-size=20M
        - --max-backups=9
        - --client-max-threads=10
        name: cmi-controller
...
...
```

Step 4 Run the **:wq** command to save the configuration and exit.

Step 5 Run the **kubectl get pod -n huawei-csm** command and wait until the container is restarted.

Step 6 Run the **kubectl get deployments.apps -n huawei-csm csm-prometheus-service -o yaml | grep client-max-threads** command to check whether the configuration is successful.

----End

9.3 Residual Pod Labels on the Storage Side

Symptom

After CSM is upgraded from 1.*x.x* to 2.*x.x*, residual Pod topo relationships exist on storage resources and cannot be cleared.

Root Cause Analysis

In 1.*x.x*, the name of a topo resource is the name of a storage resource. In 2.*x.x*, the name of a topo resource is changed to a PV name in the cluster, and the prefix is changed from **topo-** to **rt-**.

1.*x.x*:

```
NAME                                         PROVISIONER      VOLUMEHANDLE
STATUS    AGE
topo-pvc-0a8f7871-f26e-4665-b4be-53dfa9c878cb   cmi.huawei.com   181-iscsi.pvc-0a8f7871-f26e-4665-
b4be-53dfa9c878cb   Normal    353d
topo-pvc-3b6b1dd6-b3dd-4394-8251-4bd6009411cf   cmi.huawei.com   181-iscsi.pvc-3b6b1dd6-
b3dd-4394-8251-4bd6009411cf   Normal    354d
```

2.*x.x* and later:

```
NAME                                       PROVISIONER      VOLUMEHANDLE
STATUS   AGE
rt-pvc-0a8f7871-f26e-4665-b4be-53dfa9c878cb   cmi.huawei.com   181-iscsi.pvc-0a8f7871-f26e-4665-
b4be-53dfa9c878cb     Normal   353d
rt-pvc-3b6b1dd6-b3dd-4394-8251-4bd6009411cf   cmi.huawei.com   181-iscsi.pvc-3b6b1dd6-
b3dd-4394-8251-4bd6009411cf     Normal   354d
```

After CSM is upgraded to 2.x.x, the topology service creates new topo resources based on the resource information in the cluster and binds the new topo resources to the topology relationships of the source version on the storage side.

If a Pod whose topology relationship has been to the storage device is deleted when the CSM topology service is disabled, the old topology relationship bound to the topo resource cannot be created based on the existing resources in the cluster after the CSM topology service is enabled again.

In this case, the old topology relationship remains on the storage device and cannot be cleared.

Solution or Workaround

If the preceding storage topology relationship remains, you can only delete the storage resources to clear the residual topology relationship.

During the upgrade from CSM 1.*x.x* to 2.*x.x*, if the CSM topology service is enabled in the source version, enabling the CSM topology service during the upgrade can prevent the preceding problem.

9.4 The Pod Status Is CrashLoopBackOff and the Log Contains "mkdir permission denied"

Symptom

On the OpenShift platform, the log mode is **file**. During CSM installation, the Pod status is **CrashLoopBackOff** and the following error information is displayed in the log:

```
init log error: [could not initialize logging to file: could not create log directory /var/log/huawei-csm/csm-prometheus-service. mkdir /var/log/huawei-csm: permission denied]
```

Root Cause Analysis

Due to OpenShift platform restrictions or user security configurations, the CSM container does not have sufficient permission to create log directories on the host.

Solution or Workaround

Solution 1: Change the log mode to **console**.

Solution 2: Manually plan the CSM log directory on the corresponding nodes. The procedure is as follows:

Step 1 Use a remote access tool, such as PuTTY, to log in to a node in the Kubernetes cluster through the management IP address.

Step 2 If the container platform is Kubernetes, run the **mkdir -p /var/log/huawei-csm && chmod 757 /var/log/huawei-csm** command to create a log directory and set the DAC permission of the log directory to **757**.

```
# mkdir -p /var/log/huawei-csm && chmod 757 /var/log/huawei-csm
```

If the container platform is OpenShift, run the **mkdir -p /var/log/huawei-csm && chmod 757 /var/log/huawei-csm && chcon -t svirt_sandbox_file_t /var/log/huawei-csm** command to create a log directory, and set the DAC permission of the log directory to **757** and the SELinux permission to **svirt_sandbox_file_t**.

```
# mkdir -p /var/log/huawei-csm && chmod 757 /var/log/huawei-csm && chcon -t
svirt_sandbox_file_t /var/log/huawei-csm
```

Step 3 Repeat the preceding steps to plan the **/var/log/huawei-csm** log directory on the nodes where Huawei CSM container runs.

NOTICE

Ensure that the **/var/log/huawei-csm** log directory has been planned for all nodes that may be scheduled by Huawei CSM container. If node failover occurs during the running of Huawei CSM container and the log directory is not planned for the new node where the container runs in advance, the container cannot be started due to insufficient permission.

----End