



# **Kubernetes clusters documentation**

## **Kubernetes clusters**

NetApp  
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# Kubernetes clusters documentation

# What's new with Kubernetes in Cloud Manager

Learn what's new in Kubernetes in Cloud Manager.

## 6 June 2022

Cloud Manager now supports Amazon FSx for ONTAP as backend storage.

## 4 May 2022

### Drag and drop to add storage class

You can now drag your Kubernetes cluster and drop it onto the Cloud Volumes ONTAP working environment to add a storage class directly from the Canvas.

[Add storage class](#)

## 4 April 2022

### Manage Kubernetes clusters using the Cloud Manager resource page

Kubernetes cluster management now has enhanced integration directly from the cluster working environment. A new [Quick start](#) gets you up and running quickly.

You can now take the following actions from the cluster resource page.

- [Install Astra Trident](#)
- [Add storage classes](#)
- [View persistent volumes](#)
- [Remove clusters](#)
- [Enable data services](#)

## 27 February 2022

### Support for Kubernetes clusters in Google Cloud

You can now add and manage managed Google Kubernetes Engine (GKE) clusters and self-managed Kubernetes clusters in Google Cloud using Cloud Manager.

[Learn how to get started with Kubernetes clusters in Google Cloud.](#)

## 11 January 2022

### Support for Kubernetes clusters in Azure

You can now add and manage managed Azure Kubernetes clusters (AKS) and self-managed Kubernetes clusters in Azure using Cloud Manager.

## 28 November 2021

### Support for Kubernetes clusters in AWS

You can now add your managed-Kubernetes clusters to Cloud Manager's Canvas for advanced data management.

- Discover Amazon EKS clusters
- Back up persistent volumes using Cloud Backup

[Learn more about Kubernetes support.](#)



The existing Kubernetes service (available through the **K8s** tab) has been deprecated and will be removed in a future release.

# Get started

## Kubernetes data management in Cloud Manager

Astra Trident is a fully-supported open source project maintained by NetApp. Astra Trident integrates natively with Kubernetes and its Persistent Volume framework to seamlessly provision and manage volumes from systems running any combination of NetApp storage platforms. [Learn more about Trident](#).

### Features

You can directly manage your Kubernetes clusters using Cloud Manager.

- Install Astra Trident.
- Add and manage clusters as part of your hybrid cloud infrastructure.
- Add and manage storage classes and connect them to Working Environments.
- Back up persistent volumes using Cloud Backup Service.

### Supported Kubernetes deployments

Cloud Manager supports managed-Kubernetes clusters running in:

- [Amazon Elastic Kubernetes Service \(Amazon EKS\)](#)
- [Microsoft Azure Kubernetes Service \(AKS\)](#)
- [Google Kubernetes Engine \(GKE\)](#)

### Supported Astra Trident deployments

One of the four most recent versions of Astra Trident is required. You can install Astra Trident directly from Cloud Manager. You should [review the prerequisites](#) prior to installation.

To upgrade Astra Trident, [upgrade with the operator](#).

### Supported backend storage

NetApp's Astra Trident must be installed on each Kubernetes cluster and Cloud Volumes ONTAP or Amazon FSx for ONTAP must be configured as backend storage for the clusters.

### Cost

There are no charges to *discover* your Kubernetes clusters in Cloud Manager, but you will be charged when you back up persistent volumes using Cloud Backup Service.

## Get started with Kubernetes clusters

Add Kubernetes clusters to Cloud Manager for advanced data management in a few quick steps.

## Quick start

Get started quickly by following these steps.

1

### **Review prerequisites**

Ensure your environment meets the prerequisites for your cluster type.

[Requirements for Kubernetes clusters in Google Cloud](#)

2

### **Add your Kubernetes clusters to Cloud Manager**

You can add Kubernetes clusters and connect them to a Working Environment using Cloud Manager.

[Add a Google Cloud Kubernetes cluster](#)

3

### **Start provisioning Persistent Volumes**

Request and manage Persistent Volumes using native Kubernetes interfaces and constructs. Cloud Manager creates NFS and iSCSI storage classes that you can use when provisioning Persistent Volumes.

[Learn more about provisioning your first volume with Astra Trident.](#)

4

### **Manage your clusters using Cloud Manager**

After adding Kubernetes clusters to Cloud Manager, you can manage the clusters from the Cloud Manager resource page.

[Learn how to manage Kubernetes clusters.](#)

# Requirements

## Requirements for Kubernetes clusters in Google Cloud

You can add and manage managed Google Kubernetes Engine (GKE) clusters and self-managed Kubernetes clusters in Google using Cloud Manager. Before you can add the clusters to Cloud Manager, ensure the following requirements are met.



This topic uses *Kubernetes cluster* where configuration is the same for GKE and self-managed Kubernetes clusters. The cluster type is specified where configuration differs.

### Requirements

#### Astra Trident

One of the four most recent versions of Astra Trident is required. You can install Astra Trident directly from Cloud Manager. You should [review the prerequisites](#) prior to installing Astra Trident

To upgrade Astra Trident, [upgrade with the operator](#).

#### Cloud Volumes ONTAP

Cloud Volumes ONTAP must be in Cloud Manager under the same tenancy account, workspace, and Connector as the Kubernetes cluster. [Go to the Astra Trident docs for configuration steps](#).

#### Cloud Manager Connector

A Connector must be running in Google with the required permissions. [Learn more below](#).

#### Network connectivity

Network connectivity is required between the Kubernetes cluster and the Connector and between the Kubernetes cluster and Cloud Volumes ONTAP. [Learn more below](#).

#### RBAC authorization

Cloud Manager supports RBAC-enabled clusters with and without Active Directory. The Cloud Manager Connector role must be authorized on each GKE cluster. [Learn more below](#).

### Prepare a Connector

A Cloud Manager Connector in Google is required to discover and manage Kubernetes clusters. You'll need to create a new Connector or use an existing Connector that has the required permissions.

#### Create a new Connector

Follow the steps in one of the links below.

- [Create a Connector from Cloud Manager](#) (recommended)
- [Install the Connector on an existing Linux host](#)

#### Add the required permissions to an existing Connector (to discover a managed GKE cluster)

If you want to discover a managed GKE cluster, you might need to modify the custom role for the Connector to provide the permissions.



## Steps

1. In [Cloud Console](#), go to the **Roles** page.
2. Using the drop-down list at the top of the page, select the project or organization that contains the role that you want to edit.
3. Click a custom role.
4. Click **Edit Role** to update the role's permissions.
5. Click **Add Permissions** to add the following new permissions to the role.

```
container.clusters.get  
container.clusters.list
```

6. Click **Update** to save the edited role.

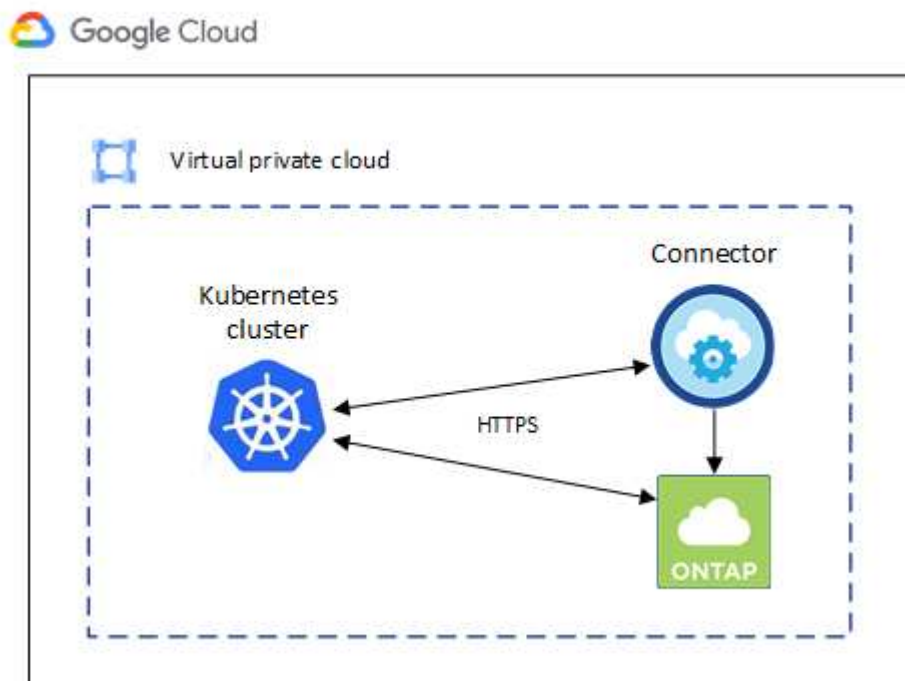
## Review networking requirements

You need to provide network connectivity between the Kubernetes cluster and the Connector and between the Kubernetes cluster and the Cloud Volumes ONTAP system that provides backend storage to the cluster.

- Each Kubernetes cluster must have an inbound connection from the Connector
- The Connector must have an outbound connection to each Kubernetes cluster over port 443

The simplest way to provide this connectivity is to deploy the Connector and Cloud Volumes ONTAP in the same VPC as the Kubernetes cluster. Otherwise, you need to set up a peering connection between the different VPC.

Here's an example that shows each component in the same VPC.



## Set up RBAC authorization

RBAC validation occurs only on Kubernetes clusters with Active Directory (AD) enabled. Kubernetes clusters without AD will pass validation automatically.

You need authorize the Connector role on each Kubernetes cluster so the Connector can discover and manage a cluster.

## Backup and restore

Backup and restore requires only basic authorization.

## Add storage classes

Expanded authorization is required to add storage classes using Cloud Manager.

## Install Astra trident

You need to provide full authorization for Cloud Manager to install Astra Trident.



When installing Astra Trident, Cloud Manager installs the Astra Trident backend and Kubernetes secret that contains the credentials Astra Trident needs to communicate with the storage cluster.

## Before you begin

To configure `subjects: name:` in the YAML file, you need to know the Cloud Manager Unique ID.

You can find the unique ID one of two ways:

- Using the command:

```
gcloud iam service-accounts list
gcloud iam service-accounts describe <service-account-email>
```

- In the Service Account Details on the [Cloud Console](#).

CloudSync-Dev

←

Cloud Manager Service Account

DETAILSPERMISSIONSKEYSMETRICSLOGS

Service account details

Name

Cloud Manager Service Account

SAVE

Description

SAVE

Email

cloudmanager-service-account@cloudsync-dev-214020.iam.gserviceaccount.com

Unique ID

102217358851946603445

## Steps

Create a cluster role and role binding.

1. Create a YAML file that includes the following text based on your authorization requirements. Replace the `subjects: kind: variable` with your username and `subjects: user:` with the unique ID for the authorized service account.

## Backup/restore

Add basic authorization to enable backup and restore for Kubernetes clusters.

```
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  name: cloudmanager-access-clusterrole
rules:
  - apiGroups:
      - ''
    resources:
      - namespaces
    verbs:
      - list
  - apiGroups:
      - ''
    resources:
      - persistentvolumes
    verbs:
      - list
  - apiGroups:
      - ''
    resources:
      - pods
      - pods/exec
    verbs:
      - get
      - list
  - apiGroups:
      - ''
    resources:
      - persistentvolumeclaims
    verbs:
      - list
      - create
  - apiGroups:
      - storage.k8s.io
    resources:
      - storageclasses
    verbs:
      - list
  - apiGroups:
      - trident.netapp.io
    resources:
      - tridentbackends
```

```

    verbs:
      - list
  - apiGroups:
      - trident.netapp.io
    resources:
      - tridentorchestrators
    verbs:
      - get
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: k8s-access-binding
subjects:
  - kind: User
    name:
    apiGroup: rbac.authorization.k8s.io
roleRef:
  kind: ClusterRole
  name: cloudmanager-access-clusterrole
  apiGroup: rbac.authorization.k8s.io

```

### Storage classes

Add expanded authorization to add storage classes using Cloud Manager.

```

apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  name: cloudmanager-access-clusterrole
rules:
  - apiGroups:
      - ''
    resources:
      - secrets
      - namespaces
      - persistentvolumeclaims
      - persistentvolumes
      - pods
      - pods/exec
    verbs:
      - get
      - list
      - create
      - delete
  - apiGroups:

```

```

      - storage.k8s.io
resources:
  - storageclasses
verbs:
  - get
  - create
  - list
  - delete
  - patch
- apiGroups:
  - trident.netapp.io
resources:
  - tridentbackends
  - tridentorchestrators
  - tridentbackendconfigs
verbs:
  - get
  - list
  - create
  - delete
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: k8s-access-binding
subjects:
  - kind: User
    name:
    apiGroup: rbac.authorization.k8s.io
roleRef:
  kind: ClusterRole
  name: cloudmanager-access-clusterrole
  apiGroup: rbac.authorization.k8s.io

```

### Install Trident

Use the command line to provide full authorization and enable Cloud Manager to install Astra Trident.

```
kubectl create clusterrolebinding test --clusterrole cluster-admin
--user <Unique ID>
```

2. Apply the configuration to a cluster.

```
kubectl apply -f <file-name>
```

# Add Kubernetes clusters

## Add a Google Cloud Kubernetes cluster to Cloud Manager

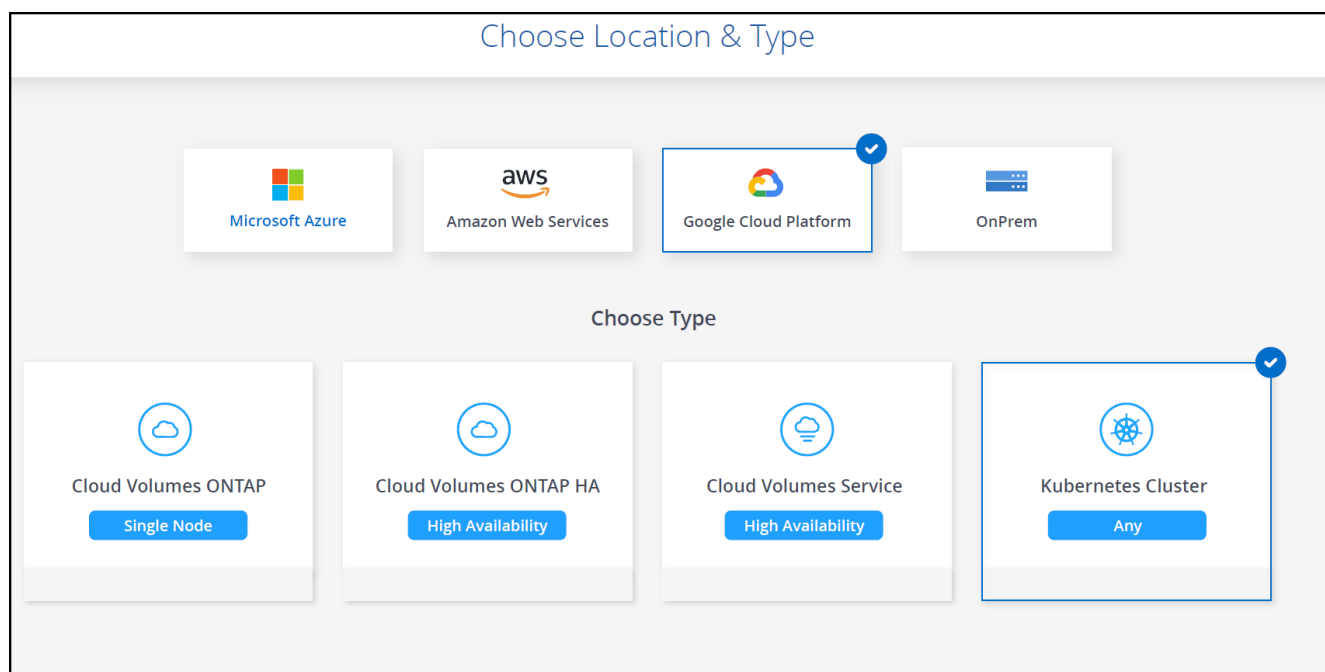
You can discover or import Kubernetes clusters to Cloud Manager so that you can back up persistent volumes to Google Cloud.

### Discover a cluster

You can discover a fully-managed or self-managed Kubernetes cluster. Managed clusters must be discovered; they cannot be imported.

#### Steps

1. On the **Canvas**, click **Add Working Environment**.
2. Select **Google Cloud Platform** > **Kubernetes Cluster** and click **Next**.



3. Select **Discover Cluster** and click **Next**.
4. To select a Kubernetes cluster in a different Google Cloud Project, click **Edit project** and choose an available project.



5. Select a Kubernetes cluster and click **Next**.



## Result

Cloud Manager adds the Kubernetes cluster to the Canvas.





## Import a Cluster

You can import a self-managed Kubernetes cluster using a Kubernetes configuration file.

### Before you get started

You will need Certificate Authority, Client Key, and Client Certificate certificates for the user specified in the cluster role YAML file to import Kubernetes clusters. The Kubernetes cluster administrator receives these certifications when creating users on the Kubernetes cluster.

#### Steps

1. On the **Canvas**, click **Add Working Environment**.
2. Select **Google Cloud Platform > Kubernetes Cluster** and click **Next**.
3. Select **Import Cluster** and click **Next**.
4. Upload a Kubernetes configuration file in YAML format.

Add Existing Kubernetes Cluster

Import Kubernetes Cluster

Upload a Kubernetes configuration file that's in YAML format and has the extension ".txt", ".kubeconfig", or ".config"

Kubernetes configuration file

KubConfig.txt

Upload

3 Kubernetes Clusters

	Kubernetes Cluster Name	Kubernetes Type	Kubernetes Version
<input checked="" type="radio"/>	Cluster_1	???	10.2.23.36
<input type="radio"/>	Cluster_2	???	10.2.23.36
<input type="radio"/>	Cluster_2	???	10.2.23.36

**Result**

Cloud Manager adds the Kubernetes cluster to the Canvas.

# Manage Kubernetes clusters

You can use Cloud Manager to install Astra Trident, configure storage classes, remove clusters, and enable data services.

## Features

After adding Kubernetes clusters to Cloud Manager, you can manage the clusters from the resource page. To open the resource page, double-click the Kubernetes working environment on the Canvas.



From the resource page you can:

- View the Kubernetes cluster status.
- Confirm Astra Trident is installed. See [Install Astra Trident](#).
- Add and remove storage classes. See [Manage storage classes](#).
- View persistent volumes. See [View persistent volumes](#).
- Remove Kubernetes clusters from the workspace. See [Remove clusters](#).
- Activate or view Cloud Backup. See [Use NetApp cloud data services](#).

## Install Astra Trident

After you add a managed-Kubernetes cluster to the Canvas, you can use Cloud Manager to confirm a compatible Astra Trident installation or install Astra Trident. One of the four most recent versions of Astra Trident is required.

To learn more about Astra Trident, see [Astra Trident documentation](#).



If Astra Trident is not installed, or an incompatible version of Astra Trident is installed, the cluster will show there is an action required.

### Steps

1. Double-click the Kubernetes working environment on the Canvas or click **Enter Working Environment**.
  - a. If Astra Trident is not installed, click **Install Trident**.



- b. If a back level version of Astra Trident is installed, [go to the Astra Trident docs for upgrade steps](#).



## Results

The latest version of Astra Trident is installed. You can now add storage classes.

## Manage storage classes

After you add a managed-Kubernetes cluster to the Canvas, you can use Cloud Manager

to manage storage classes.



If no storage class is defined, the cluster will show there is an action required. Double-clicking the cluster on the Canvas opens the action page to add a storage class.

## Add storage class

### Steps

1. From the Canvas, drag and drop the Kubernetes working environment on the Cloud Volumes ONTAP working environment to open the storage class wizard.
2. Provide a name for the storage class, select definition options, and click **Next**.

The screenshot shows a two-step wizard. Step 1, 'Storage Class Definitions', is active. It features a title 'Storage Class Definition for "Kubernetes Cluster Name"' and a text input field for 'Storage Class Name'. Below this is a list of four settings, each with a radio button: 'Storage Class' (Block selected), 'Support Volume Expansion' (Yes selected), 'Volume Binding Mode' (Immediate selected), and 'Set as Default Storage Class' (Yes selected). Step 2, 'Select Working Environment', is visible in the background.

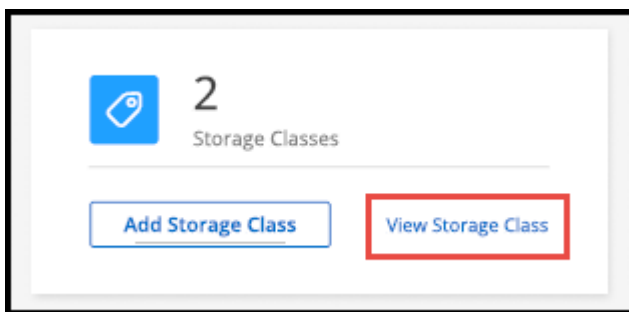
Setting	Option 1	Option 2
Storage Class	<input checked="" type="radio"/> Block	<input type="radio"/> Filesystem
Support Volume Expansion	<input checked="" type="radio"/> Yes	<input type="radio"/> No
Volume Binding Mode	<input checked="" type="radio"/> Immediate	<input type="radio"/> WaitForFirstConsumer
Set as Default Storage Class	<input checked="" type="radio"/> Yes	<input type="radio"/> No

3. Select a working environment to connect to the cluster. Click **Add**.



## Results

You can click to view the storage class from the resource page for the Kubernetes cluster.



## View working environment details

### Steps

1. Double-click the Kubernetes working environment on the Canvas or click **Enter Working Environment**.
2. Click the **Storage Classes** tab.
3. Click the information icon to view details for the working environment.

### Results

The working environment details panel opens.

2 Storage Classes
Add Storage Classes

Storage Class Name #1 ID: 01234567890123456789 ☆ Default Storage Class				
csi.trident.netapp.com Provisioner Name	Nas Storage Class Type (Driver)	WaitForFirstConsumer Volume Binding Mode	True Volume Expansion	Working Environment Name Type: Cloud Volumes ONTAP Node: High Availability Provider: AWS Status : ON Region: US East (Northern Virginia)

Storage Class Name #1 ID: 01234567890123456789				
csi.trident.netapp.com Provisioner Name	Nas Storage Class Type (Driver)	WaitForFirstConsumer Volume Binding Mode	True Volume Expansion	

## Set default storage class

### Steps

1. Double-click the Kubernetes working environment on the Canvas or click **Enter Working Environment**.
2. Click the **Storage Classes** tab.
3. Click the action menu for the storage class and click **Set as Default**.



### Results

The selected storage class is set as the default.

Storage Class Name #2  
ID: 01234567890123456789 ☆ Default Storage Class

csi.trident.netapp.com Provisioner Name	Nas Storage Class Type (Driver)	WaitForFirstConsumer Volume Binding Mode	True Volume Expansion	Working Environment Name Attached Working Environment
--	------------------------------------	---	--------------------------	--

## Remove storage class

### Steps

1. Double-click the Kubernetes working environment on the Canvas or click **Enter Working Environment**.
2. Click the **Storage Classes** tab.
3. Click the action menu for the storage class and click **Set as Default**.



- Click **Remove** to confirm removal of the storage class.



## Results

The selected storage class is removed.

## View persistent volumes

After you add a managed-Kubernetes cluster to the Canvas, you can use Cloud Manager to view persistent volumes.

### Steps

- Double-click the Kubernetes working environment on the Canvas or click **Enter Working Environment**.
- Click **View Volumes** from the **Overview** tab or click the **Persistent Volumes** tab. If no persistent volumes are configured, see [Provisioning](#) for details on provisioning volumes in Astra Trident.

## Results

A table of the configured persistent volumes displays.

Volumes Summary

8

Total Volumes

400

GiB

Total Allocated Capacity

201.2

GiB

Total Used Capacity

8 Volumes

Volume Name	Name Space	Storage Class	Access Mode	Allocated Capacity	Used Capacity
<div>Volumes Very Long Name</div> <div>● On</div>	Name Space	Storage Class Name	Access Mode	50 GiB	25.15 GiB
<div>Volumes Very Long Name</div> <div>● On</div>	Name Space	Storage Class Name	Access Mode	50 GiB	25.15 GiB



# Remove Kubernetes clusters from the workspace

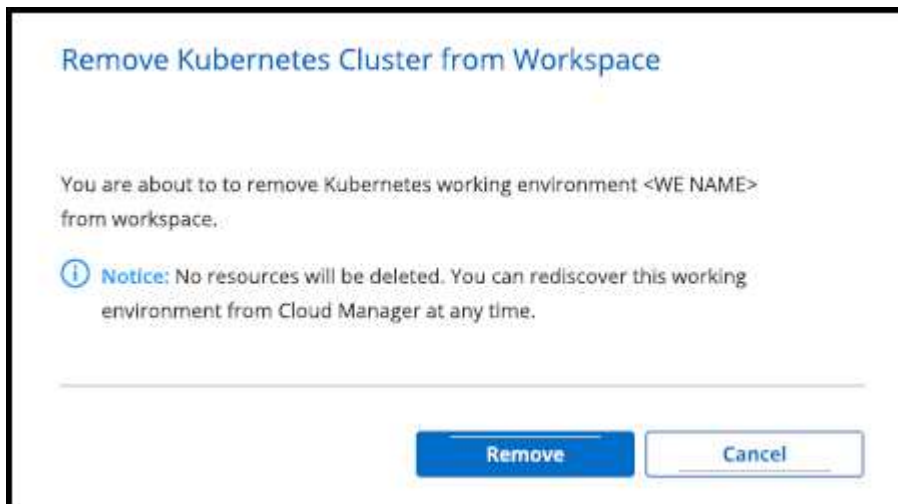
After you add a managed-Kubernetes cluster to the Canvas, you can use Cloud Manager to remove clusters from the workspace.

## Steps

1. Double-click the Kubernetes working environment on the Canvas or click **Enter Working Environment**.
2. At the top right of the page, select the actions menu and click **Remove from Workspace**.



3. Click **Remove** to confirm removal of the cluster from the workspace. You can rediscover this cluster at any time.



## Results

The Kubernetes cluster is removed from the workspace and is no longer visible on the Canvas.

# Use NetApp cloud data services with Kubernetes clusters

After you add a managed-Kubernetes cluster to the Canvas, you can use NetApp cloud data services for advanced data management.

At this time, Cloud Backup is supported with Kubernetes clusters. You can use Cloud Backup to back up persistent volumes to object storage.

[Learn how to protect your Kubernetes cluster data using Cloud Backup.](#)

Restore

Kubernetes

1 Selected Kubernetes Clusters

Backup Settings

1

Kubernetes Clusters

5

Protected PVs

97.66 KB

Total Backups Size

Protected Persistent Volumes Status

5

Healthy Backup

0

Failed Backup

5 Backup Jobs

Source K8s Cluster	Source Persistent Volume	Source Namespace	Last Backup	Backup Copies	Backup Status	
<div>On</div>	<div>pvc-1704aa1f-af1d-49e9-87fd-6edd86125855</div> <div>Online</div>	default	Nov 25 2021, 14:56:3	2	Enabled	...
<div>On</div>	<div>pvc-d1f839c1-d932-4f49-b620-33321dbe939e</div> <div>Online</div>	trident	Nov 25 2021, 14:56:3	2	Enabled	...
<div>On</div>	<div>pvc-f615f0a8-2d5d-44d0-b4e4-f365cc3fb4a6</div> <div>Online</div>	default	Nov 25 2021, 14:56:3	2	Enabled	...
<div>On</div>	<div>pvc-1615f0a8-2d5d-44d0-b4e4-f365cc3fb4a6</div> <div>Online</div>	default	Nov 25 2021, 14:56:3	2	Enabled	...
<div>On</div>	<div>pvc-05881c70-cf5f-4edc-8537-a0a5ce36f9a1</div> <div>Online</div>	default	Nov 25 2021, 14:56:3	2	Enabled	...

# Knowledge and support

## Register for support

Before you can open a support case with NetApp technical support, you need to add a NetApp Support Site account to Cloud Manager and then register for support.

### Add an NSS account

The Support Dashboard enables you to add and manage all of your NetApp Support Site accounts from a single location.

#### Steps

1. If you don't have a NetApp Support Site account yet, [register for one](#).
2. In the upper right of the Cloud Manager console, click the Help icon, and select **Support**.



3. Click **NSS Management > Add NSS Account**.
  4. When you're prompted, click **Continue** to be redirected to a Microsoft login page.
- NetApp uses Microsoft Azure Active Directory as the identity provider for authentication services specific to support and licensing.
5. At the login page, provide your NetApp Support Site registered email address and password to perform the authentication process.

This action enables Cloud Manager to use your NSS account.

Note the account must be a customer-level account (not a guest or temp account).

## Register your account for support

Support registration is available from Cloud Manager in the Support Dashboard.

#### Steps

1. In the upper right of the Cloud Manager console, click the Help icon, and select **Support**.



2. In the **Resources** tab, click **Register for Support**.
3. Select the NSS credentials that you want to register and then click **Register**.

## Get help

NetApp provides support for Cloud Manager and its cloud services in a variety of ways. Extensive free self-support options are available 24x7, such as knowledgebase (KB) articles and a community forum. Your support registration includes remote technical support via web ticketing.

### Self support

These options are available for free, 24 hours a day, 7 days a week:

- [Knowledge base](#)

Search through the Cloud Manager knowledge base to find helpful articles to troubleshoot issues.

- [Communities](#)

Join the Cloud Manager community to follow ongoing discussions or create new ones.

- [Documentation](#)

The Cloud Manager documentation that you're currently viewing.

- [Feedback email](#)

We value your input. Submit feedback to help us improve Cloud Manager.

### NetApp support

In addition to the self-support options above, you can work with a NetApp Support Engineer to resolve any issues after you activate support.

## Steps

1. In Cloud Manager, click **Help > Support**.
2. Choose one of the available options under Technical Support:
  - a. Click **Call Us** to find phone numbers for NetApp technical support.
  - b. Click **Open an Issue**, select one the options, and then click **Send**.

A NetApp representative will review your case and get back to you soon.

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- [Notice for the Cloud Backup](#)

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