



Administer Cloud Manager

Cloud Manager

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Table of Contents

- Administer Cloud Manager 1
 - Manage Connectors 1
 - Manage cloud provider credentials 10
 - Add and manage NetApp Support Site accounts in Cloud Manager 42
 - Managing your account 48
 - Monitoring operations in your account 57
 - Managing an HTTPS certificate for secure access 60
 - Removing Cloud Volumes ONTAP working environments 61
 - Configuring a Connector to use an HTTP proxy server 62
 - Reference 64

Administer Cloud Manager

Manage Connectors

Finding the system ID for a Connector

To help you get started, your NetApp representative might ask you for the system ID for a Connector. The ID is typically used for licensing and troubleshooting purposes.

Steps

1. In the upper right of the Cloud Manager console, click the Help icon.
2. Click **Support > Connector**.

The system ID appears at the top.

Example



Managing existing Connectors

After you create one or more Connectors, you can manage them by switching between Connectors, connecting to the local user interface running on a Connector, and more.

Switch between Connectors

If you have multiple Connectors, you can switch between them to see the Working Environments that are associated with a specific Connector.

For example, let's say that you're working in a multi-cloud environment. You might have one Connector in AWS and another in Google Cloud. You'd need to switch between those Connectors to manage the Cloud Volumes ONTAP systems running in those clouds.

Step

1. Click the **Connector** drop-down, select another Connector, and then click **Switch**.



Cloud Manager refreshes and shows the Working Environments associated with the selected Connector.

Access the local UI

While you should perform almost all tasks from the SaaS user interface, a local user interface is still available on the Connector. This interface is needed for a few tasks that need to be performed from the Connector itself:

- [Setting a proxy server](#)
- Installing a patch (you'll typically work with NetApp personnel to install a patch)
- Downloading AutoSupport messages (usually directed by NetApp personnel when you have issues)

Steps

1. [Log in to the Cloud Manager SaaS interface](#) from a machine that has a network connection to the Connector instance.

If the Connector doesn't have a public IP address, you'll need a VPN connection or you'll need to connect from a jump host that's in the same network as the Connector.

2. Click the **Connector** drop-down and then click **Go to Local UI**.



The Cloud Manager interface running on the Connector loads in a new browser tab.

Download or send an AutoSupport message

If you're having problems, NetApp personnel might ask you to send an AutoSupport message to NetApp support for troubleshooting purposes.

Steps

1. Connect to the Connector local UI, as described in the section above.
2. In the upper right of the Cloud Manager console, click the Help icon, and select **Support**.



3. Click **Connector**.
4. Depending on how you need to send the information to NetApp support, choose one of the following options:
 - a. Select the option to download the AutoSupport message to your local machine. You can then send it to NetApp Support using a preferred method.
 - b. Click **Send AutoSupport** to directly send the message to NetApp Support.



Connect to the Linux VM

If you need to connect to the Linux VM that the Connector runs on, you can do so by using the connectivity options available from your cloud provider.

AWS

When you created the Connector instance in AWS, you provided an AWS access key and secret key. You can use this key pair to SSH to the instance.

[AWS Docs: Connect to your Linux instance](#)

Azure

When you created the Connector VM in Azure, you chose to authenticate with a password or SSH public key. Use the authentication method that you chose to connect to the VM.

[Azure Docs: SSH into your VM](#)

Google Cloud

You can't specify an authentication method when you create a Connector in Google Cloud. However, you can connect to the Linux VM instance using the Google Cloud Console or Google Cloud CLI (gcloud).

[Google Cloud Docs: Connect to Linux VMs](#)

Apply security updates

Update the operating system on the Connector to ensure that it's patched with the latest security updates.

Steps

1. Access the CLI shell on the Connector host.
2. Run the following commands with elevated privileges:

```
sudo -s
service service-manager stop
yum -y update --security
service service-manager start
```

Edit a Connector's URIs

Add and remove the URIs for a Connector.

Steps

1. Click the **Connector** drop-down from the Cloud Manager header.
2. Click **Manage Connectors**.
3. Click the action menu for a Connector and click **Edit URIs**.
4. Add and remove URIs and then click **Apply**.

Fix download failures when using a Google Cloud NAT gateway

The Connector automatically downloads software updates for Cloud Volumes ONTAP. The download can fail if your configuration uses a Google Cloud NAT gateway. You can correct this issue by limiting the number of parts that the software image is divided into. This step must be completed by using the Cloud Manager API.

Step

1. Submit a PUT request to `/occm/config` with the following JSON as body:

```
{
  "maxDownloadSessions": 32
}
```

The value for *maxDownloadSessions* can be 1 or any integer greater than 1. If the value is 1, then the downloaded image will not be divided.

Note that 32 is an example value. The value that you should use depends on your NAT configuration and the number of sessions that you can have simultaneously.

[Learn more about the `/occm/config` API call.](#)

Upgrade the Connector on-prem without internet access

If you [installed the Connector on an on-premises host that doesn't have internet access](#), you can upgrade the Connector when a newer version is available from the NetApp Support Site.

The Connector needs to restart during the upgrade process so the user interface will be unavailable during the upgrade.

Steps

1. Download the Cloud Manager software from the [NetApp Support Site](#).
2. Copy the installer to the Linux host.
3. Assign permissions to run the script.

```
chmod +x /path/cloud-manager-connector-offline-v3.9.14
```

4. Run the installation script:

```
sudo /path/cloud-manager-connector-offline-v3.9.14
```

5. After the upgrade is complete, you can verify the Connector's version by going to **Help > Support > Connector**.

What about software upgrades on hosts that have internet access?

The Connector automatically updates its software to the latest version, as long as it has [outbound internet access](#) to obtain the software update.

Remove Connectors from Cloud Manager

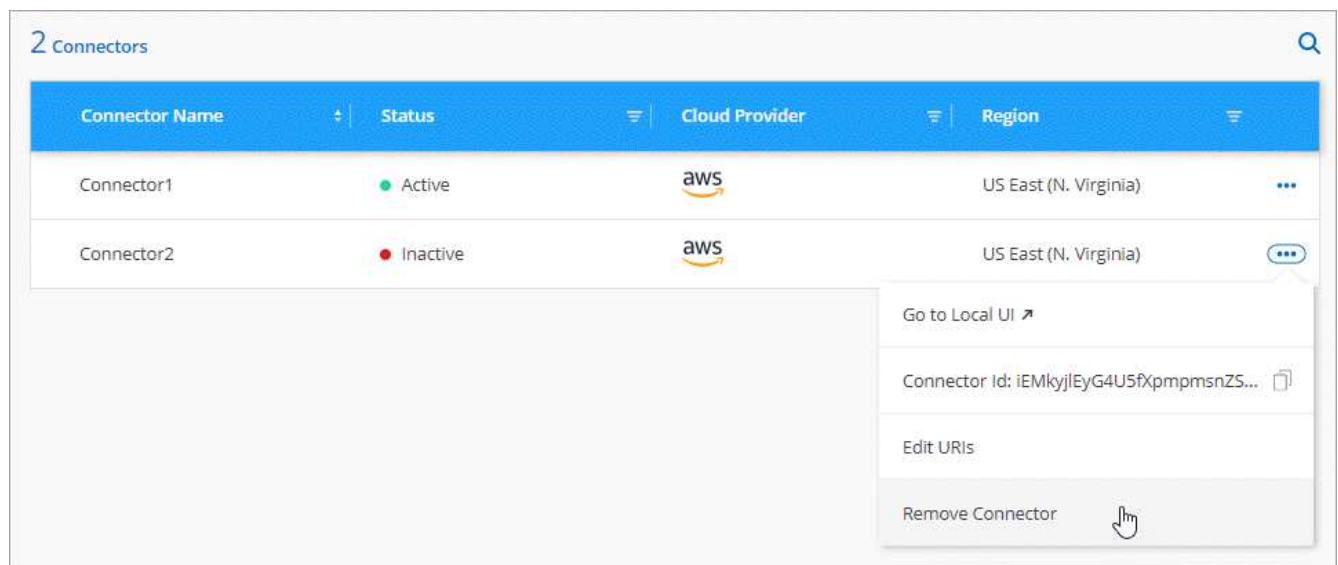
If a Connector is inactive, you can remove it from the list of Connectors in Cloud Manager. You might do this if you deleted the Connector virtual machine or if you uninstalled the Connector software.

Note the following about removing a Connector:

- This action doesn't delete the virtual machine.
- This action can't be reverted—once you remove a Connector from Cloud Manager, you can't add it back to Cloud Manager.

Steps

1. Click the **Connector** drop-down from the Cloud Manager header.
2. Click **Manage Connectors**.
3. Click the action menu for an inactive Connector and click **Remove Connector**.



4. Enter the name of the Connector to confirm and then click Remove.

Result

Cloud Manager removes the Connector from its records.

Uninstall the Connector software

Uninstall the Connector software to troubleshoot issues or to permanently remove the software from the host. The steps that you need to use depends on whether you installed the Connector on a host that has internet access or a host in a restricted network that doesn't have internet access.

Uninstall from a host with internet access

The online Connector includes an uninstallation script that you can use to uninstall the software.

Step

1. From the Linux host, run the uninstallation script:

```
/opt/application/netapp/cloudmanager/bin/uninstall.sh [silent]
```

silent runs the script without prompting you for confirmation.

Uninstall from a host without internet access

Use these commands if you downloaded the Connector software from the NetApp Support Site and installed it in a restricted network that doesn't have internet access.

Step

1. From the Linux host, run the following commands:

```
docker-compose -f /opt/application/netapp/ds/docker-compose.yml down -v  
rm -rf /opt/application/netapp/ds
```

Default configuration for the Connector

If you need to troubleshoot the Connector, it might help to understand how it's configured.

Default configuration with internet access

- If you deployed the Connector from Cloud Manager (or directly from a cloud provider's marketplace), note the following:
 - In AWS, the user name for the EC2 Linux instance is `ec2-user`.
 - The operating system for the image is as follows:
 - AWS: Red Hat Enterprise Linux 7.6 (HVM)
 - Azure: CentOS 7.6
 - GCP: CentOS 7.9

The operating system does not include a GUI. You must use a terminal to access the system.

- When deployed from Cloud Manager, the default system disk is as follows:
 - AWS: 50 GiB gp2 disk
 - Azure: 100 GiB premium SSD disk
 - Google Cloud: 100 GiB SSD persistent disk
- The Connector installation folder resides in the following location:

```
/opt/application/netapp/cloudmanager
```

- Log files are contained in the following folders:

- `/opt/application/netapp/cloudmanager/log`

The logs in this folder provide details about the Connector and docker images.

- `/opt/application/netapp/cloudmanager/docker_occml/data/log`

The logs in this folder provide details about cloud services and the Cloud Manager service that runs on the Connector.

- The Cloud Manager service is named `occm`.
- The `occm` service is dependent on the MySQL service.

If the MySQL service is down, then the `occm` service is down too.

- Cloud Manager installs the following packages on the Linux host, if they are not already installed:
 - 7Zip
 - AWSCLI
 - Docker
 - Java
 - Kubectl
 - MySQL
 - Tridentctl
 - Pull
 - Wget
- The Connector uses the following ports on the Linux host:
 - 80 for HTTP access
 - 443 for HTTPS access
 - 3306 for the Cloud Manager database
 - 8080 for the Cloud Manager API proxy
 - 8666 for the Service Manager API
 - 8777 for the Health-Checker Container Service API

Default configuration without internet access

The following configuration applies if you manually installed the Connector on an on-premises Linux host that doesn't have internet access. [Learn more about this installation option.](#)

- The Connector installation folder resides in the following location:

`/opt/application/netapp/ds`

- Log files are contained in the following folders:

`/var/lib/docker/volumes/ds_occmdata/_data/log`

The logs in this folder provide details about the Connector and docker images.

- All services are running inside docker containers

The services are dependent on the docker runtime service running

- The Connector uses the following ports on the Linux host:
 - 80 for HTTP access
 - 443 for HTTPS access

Manage cloud provider credentials

AWS

AWS credentials and permissions

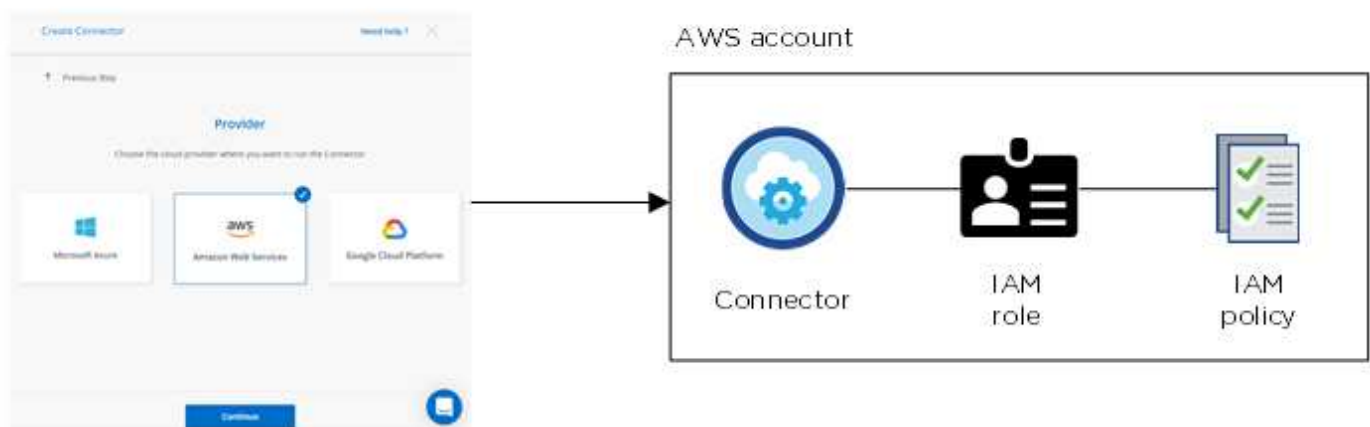
Cloud Manager enables you to choose the AWS credentials to use when deploying Cloud Volumes ONTAP. You can deploy all of your Cloud Volumes ONTAP systems using the initial AWS credentials, or you can add additional credentials.

Initial AWS credentials


When you deploy a Connector from Cloud Manager, you need to use an AWS account that has permissions to launch the Connector instance. The required permissions are listed in the [Connector deployment policy for AWS](#).

When Cloud Manager launches the Connector instance in AWS, it creates an IAM role and an instance profile for the instance. It also attaches a policy that provides Cloud Manager with permissions to manage resources and processes within that AWS account. [Review how Cloud Manager uses the permissions](#).

Cloud Manager

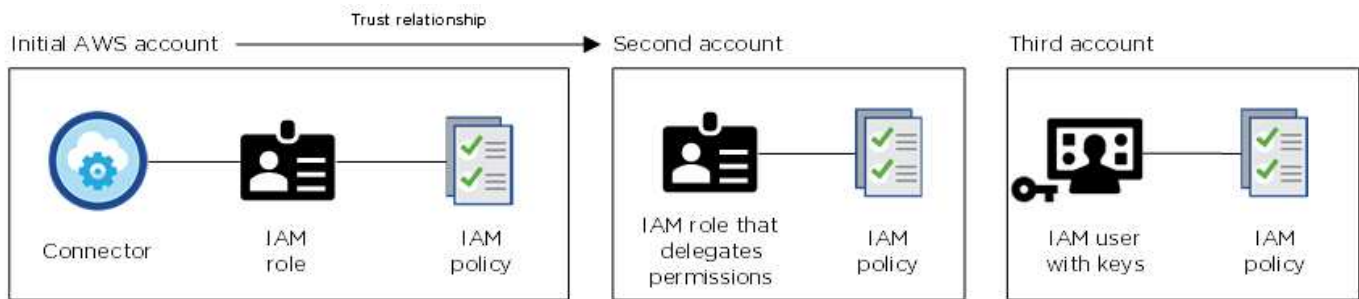


Cloud Manager selects these AWS credentials by default when you create a new working environment for Cloud Volumes ONTAP:

Details & Credentials			
Instance Profile		QA Subscription	Edit Credentials
Credentials	Account ID	Marketplace Subscription	

Additional AWS credentials

If you want to launch Cloud Volumes ONTAP in different AWS accounts, then you can either [provide AWS keys for an IAM user or the ARN of a role in a trusted account](#). The following image shows two additional accounts, one providing permissions through an IAM role in a trusted account and another through the AWS keys of an IAM user:



You would then [add the account credentials to Cloud Manager](#) by specifying the Amazon Resource Name (ARN) of the IAM role, or the AWS keys for the IAM user.

After you add another set of credentials, you can switch to them when creating a new working environment:

Edit Account & Add Subscription

Credentials

Keys | Account ID: [REDACTED]

Instance Profile | Account ID: [REDACTED]

QA Subscription

Associate Subscription to Credentials

To create a pay-as-you-go Cloud Volumes ONTAP system, you need to select AWS credentials that are associated with a subscription to Cloud Volumes ONTAP from the AWS Marketplace.

[+ Add Subscription](#)

Apply

Cancel

What about Marketplace deployments and on-prem deployments?

The sections above describe the recommended deployment method for the Connector, which is from Cloud Manager. You can also deploy a Connector in AWS from the [AWS Marketplace](#) and you can [install the Connector on-premises](#).

If you use the Marketplace, permissions are provided in the same way. You just need to manually create and set up the IAM role, and then provide permissions for any additional accounts.

For on-premises deployments, you can't set up an IAM role for the Cloud Manager system, but you can provide permissions just like you would for additional AWS accounts.

How can I securely rotate my AWS credentials?

As described above, Cloud Manager enables you to provide AWS credentials in a few ways: an IAM role associated with the Connector instance, by assuming an IAM role in a trusted account, or by providing AWS

access keys.

With the first two options, Cloud Manager uses the AWS Security Token Service to obtain temporary credentials that rotate constantly. This process is the best practice—it's automatic and it's secure.

If you provide Cloud Manager with AWS access keys, you should rotate the keys by updating them in Cloud Manager at a regular interval. This is a completely manual process.

Manage AWS credentials and subscriptions for Cloud Manager

Add and manage AWS credentials so that Cloud Manager has the permissions that it needs to deploy and manage cloud resources in your AWS accounts. If you manage multiple AWS subscriptions, you can assign each one of them to different AWS credentials from the Credentials page.

Overview

You can add AWS credentials to an existing Connector or directly to Cloud Manager:

- Add AWS credentials to an existing Connector

Adding new AWS credentials to an existing Connector enables you to deploy Cloud Volumes ONTAP in another AWS account using the same Connector. [Learn how to add AWS credentials to a Connector.](#)

- Add AWS credentials directly to Cloud Manager

Adding new AWS credentials to Cloud Manager enable you to create an FSx for ONTAP working environment. [Learn how to add AWS credentials to Cloud Manager.](#)

How to rotate credentials

Cloud Manager enables you to provide AWS credentials in a few ways: an IAM role associated with the Connector instance, by assuming an IAM role in a trusted account, or by providing AWS access keys. [Learn more about AWS credentials and permissions.](#)

With the first two options, Cloud Manager uses the AWS Security Token Service to obtain temporary credentials that rotate constantly. This process is the best practice because it's automatic and it's secure.

If you provide Cloud Manager with AWS access keys, you should rotate the keys by updating them in Cloud Manager at a regular interval. This is a completely manual process.

Add credentials to a Connector

Add AWS credentials to enable the Connector to deploy and manage Cloud Volumes ONTAP in other AWS accounts. You can either provide the ARN of an IAM role in another account or provide AWS access keys.

Grant permissions

Before you add additional AWS credentials to a Connector, you need to provide the required permissions. The permissions enable Cloud Manager to manage resources and processes within that AWS account. How you provide the permissions depends on whether you want to provide Cloud Manager with the ARN of a role in a trusted account or AWS keys.



When you deployed a Connector from Cloud Manager, Cloud Manager automatically added AWS credentials for the account in which you deployed the Connector. This initial account is not added if you manually installed the Connector software on an existing system. [Learn about AWS credentials and permissions.](#)

Choices

- [Grant permissions by assuming an IAM role in another account](#)
- [Grant permissions by providing AWS keys](#)

Grant permissions by assuming an IAM role in another account

You can set up a trust relationship between the source AWS account in which you deployed the Connector instance and other AWS accounts by using IAM roles. You would then provide Cloud Manager with the ARN of the IAM roles from the trusted accounts.

Steps

1. Go to the IAM console in the target account where you want to deploy Cloud Volumes ONTAP.
2. Under Access Management, click **Roles > Create Role** and follow the steps to create the role.

Be sure to do the following:

- Under **Trusted entity type**, select **AWS account**.
 - Select **Another AWS account** and enter the ID of the account where the Connector instance resides.
 - Create a policy using the Cloud Manager IAM policy, which is available from the [Cloud Manager Policies page](#).
3. Copy the Role ARN of the IAM role so that you can paste it in Cloud Manager later on.

Result

The account now has the required permissions. [You can now add the credentials to a Connector.](#)

Grant permissions by providing AWS keys

If you want to provide Cloud Manager with AWS keys for an IAM user, then you need to grant the required permissions to that user. The Cloud Manager IAM policy defines the AWS actions and resources that Cloud Manager is allowed to use.

Steps

1. Download the Cloud Manager IAM policy from the [Cloud Manager Policies page](#).
2. From the IAM console, create your own policy by copying and pasting the text from the Cloud Manager IAM policy.

[AWS Documentation: Creating IAM Policies](#)

3. Attach the policy to an IAM role or an IAM user.
 - [AWS Documentation: Creating IAM Roles](#)
 - [AWS Documentation: Adding and Removing IAM Policies](#)

Result

The account now has the required permissions. [You can now add the credentials to a Connector.](#)

Add the credentials

After you provide an AWS account with the required permissions, you can add the credentials for that account to an existing Connector. This enables you to launch Cloud Volumes ONTAP systems in that account using the same Connector.

Before you get started

If you just created these credentials in your cloud provider, it might take a few minutes until they are available for use. Wait a few minutes before you add the credentials to Cloud Manager.

Steps

1. Ensure that the correct Connector is currently selected in Cloud Manager.
2. In the upper right of the Cloud Manager console, click the Settings icon, and select **Credentials**.



3. Click **Add Credentials** and follow the steps in the wizard.
 - a. **Credentials Location:** Select **Amazon Web Services > Connector**.
 - b. **Define Credentials:** Provide the ARN (Amazon Resource Name) of a trusted IAM role, or enter an AWS access key and secret key.
 - c. **Marketplace Subscription:** Associate a Marketplace subscription with these credentials by subscribing now or by selecting an existing subscription.

To pay for Cloud Volumes ONTAP at an hourly rate (PAYGO) or with an annual contract, AWS credentials must be associated with a subscription to Cloud Volumes ONTAP from the AWS Marketplace.

- d. **Review:** Confirm the details about the new credentials and click **Add**.

Result

You can now switch to a different set of credentials from the Details and Credentials page when creating a new working environment:

Edit Credentials & Add Subscription

Associate Subscription to Credentials ?

Credentials

keys | Account ID:

Instance Profile | Account ID:

casaba QA subscription

+ Add Subscription

Apply

Cancel

Add credentials to Cloud Manager

Add AWS credentials to Cloud Manager by providing the ARN of an IAM role that gives Cloud Manager the permissions needed to create an FSx for ONTAP working environment.

Set up the IAM role

Set up an IAM role that enables the Cloud Manager SaaS to assume the role.

Steps

1. Go to the IAM console in the target account.
2. Under Access Management, click **Roles > Create Role** and follow the steps to create the role.

Be sure to do the following:

- Under **Trusted entity type**, select **AWS account**.
- Select **Another AWS account** and enter the ID of the Cloud Manager SaaS: 952013314444
- Create a policy that includes the following permissions:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "VisualEditor0",
      "Effect": "Allow",
      "Action": [
        "fsx:*",
        "ec2:Describe*",
        "ec2:CreateTags",
        "kms:Describe*",
        "kms:List*",
        "iam:CreateServiceLinkedRole"
      ],
      "Resource": "*"
    }
  ]
}
```

3. Copy the Role ARN of the IAM role so that you can paste it in Cloud Manager in the next step.

Result

The IAM role now has the required permissions. [You can now add it to Cloud Manager.](#)

Add the credentials

After you provide the IAM role with the required permissions, add the role ARN to Cloud Manager.

Before you get started

If you just created the IAM role, it might take a few minutes until they are available for use. Wait a few minutes before you add the credentials to Cloud Manager.

Steps

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



2. Click **Add Credentials** and follow the steps in the wizard.

- Credentials Location:** Select **Amazon Web Services > Cloud Manager**.
- Define Credentials:** Provide the ARN (Amazon Resource Name) of the IAM role.
- Review:** Confirm the details about the new credentials and click **Add**.

Result

You can now use the credentials when creating an FSx for ONTAP working environment.

Associate an AWS subscription

After you add your AWS credentials to Cloud Manager, you can associate an AWS Marketplace subscription with those credentials. The subscription enables you to pay for Cloud Volumes ONTAP at an hourly rate (PAYGO) or using an annual contract, and to use other NetApp cloud services.

There are two scenarios in which you might associate an AWS Marketplace subscription after you've already added the credentials to Cloud Manager:

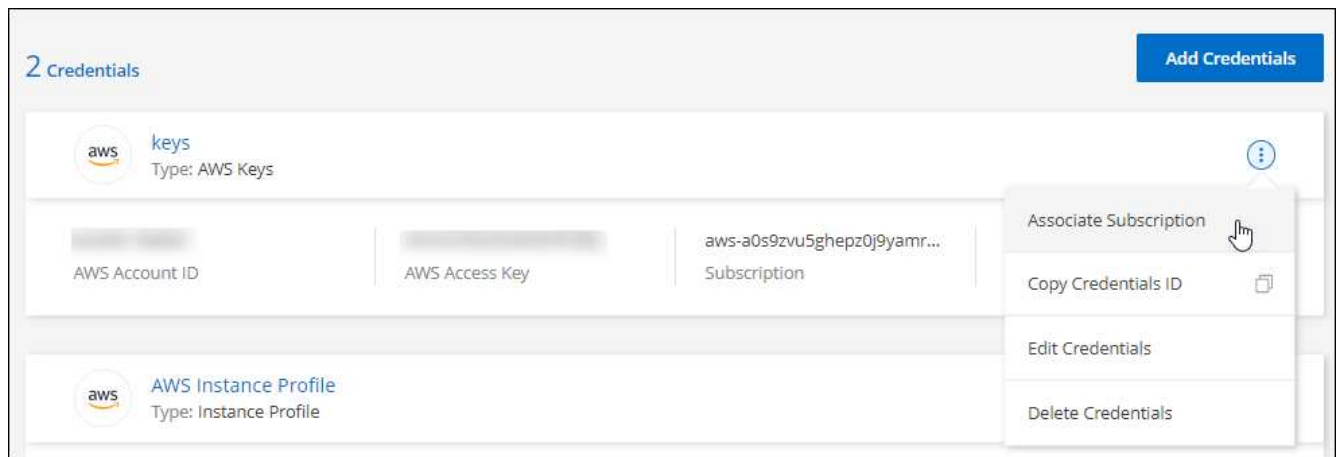
- You didn't associate a subscription when you initially added the credentials to Cloud Manager.
- You want to replace an existing AWS Marketplace subscription with a new subscription.

What you'll need

You need to create a Connector before you can change Cloud Manager settings. [Learn how to create a Connector.](#)

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Associate Subscription**.



3. Select an existing subscription from the down-down list or click **Add Subscription** and follow the steps to create a new subscription.

► https://docs.netapp.com/us-en/occm//media/video_subscribing_aws.mp4 (video)

Edit credentials

Edit your AWS credentials in Cloud Manager by changing the account type (AWS keys or assume role), by editing the name, or by updating the credentials themselves (the keys or the role ARN).



You can't edit the credentials for an instance profile that is associated with a Connector instance.

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Edit Credentials**.
3. Make the required changes and then click **Apply**.

Deleting credentials

If you no longer need a set of credentials, you can delete them from Cloud Manager. You can only delete credentials that aren't associated with a working environment.



You can't delete the credentials for an instance profile that is associated with a Connector instance.

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Delete Credentials**.
3. Click **Delete** to confirm.

Azure

Azure credentials and permissions

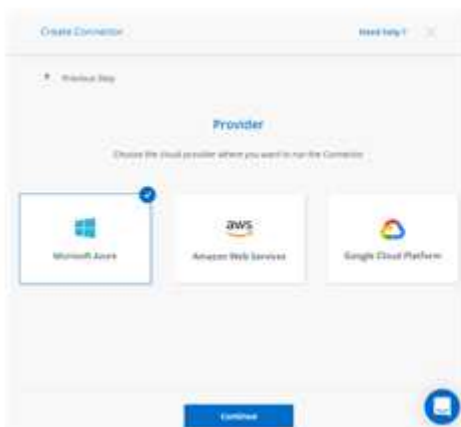
Cloud Manager enables you to choose the Azure credentials to use when deploying Cloud Volumes ONTAP. You can deploy all of your Cloud Volumes ONTAP systems using the initial Azure credentials, or you can add additional credentials.

Initial Azure credentials

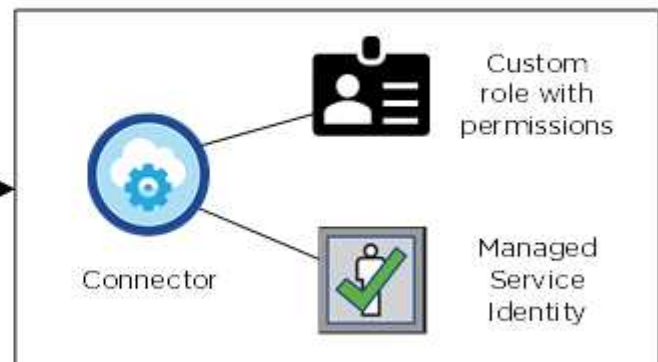
When you deploy a Connector from Cloud Manager, you need to use an Azure account or service principal that has permissions to deploy the Connector virtual machine. The required permissions are listed in the [Connector deployment policy for Azure](#).

When Cloud Manager deploys the Connector virtual machine in Azure, it enables a [system-assigned managed identity](#) on virtual machine, creates a custom role, and assigns it to the virtual machine. The role provides Cloud Manager with permissions to manage resources and processes within that Azure subscription. [Review how Cloud Manager uses the permissions](#).

Cloud Manager



Azure account



Cloud Manager selects these Azure credentials by default when you create a new working environment for Cloud Volumes ONTAP:

Details & Credentials			
Managed Service Ide...	OCCM QA1	ⓘ No subscription is associated	Edit Credentials
Credential Name	Azure Subscription	Marketplace Subscription	

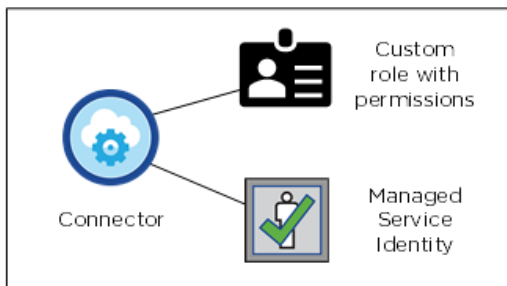
Additional Azure subscriptions for a managed identity

The managed identity is associated with the subscription in which you launched the Connector. If you want to select a different Azure subscription, then you need to [associate the managed identity with those subscriptions](#).

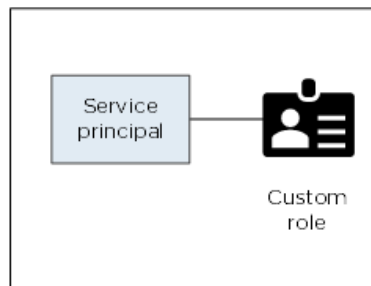
Additional Azure credentials

If you want to deploy Cloud Volumes ONTAP using different Azure credentials, then you must grant the required permissions by [creating and setting up a service principal in Azure Active Directory](#) for each Azure account. The following image shows two additional accounts, each set up with a service principal and custom role that provides permissions:

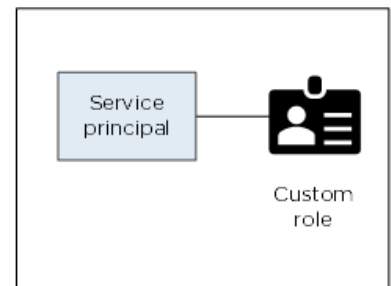
Initial Azure account



Second account



Third account



You would then [add the account credentials to Cloud Manager](#) by providing details about the AD service principal.

After you add another set of credentials, you can switch to them when creating a new working environment:

Edit Account & Add Subscription

Credentials

cloud-manager-app | Application ID: 57c42424-88a0-480a.

Managed Service Identity

OCCM QA1 (Default)

What about Marketplace deployments and on-prem deployments?

The sections above describe the recommended deployment method for the Connector, which is from NetApp Cloud Central. You can also deploy a Connector in Azure from the [Azure Marketplace](#), and you can [install the Connector on-premises](#).

If you use the Marketplace, permissions are provided in the same way. You just need to manually create and set up the managed identity for the Connector, and then provide permissions for any additional accounts.

For on-premises deployments, you can't set up a managed identity for the Connector, but you can provide permissions just like you would for additional accounts by using a service principal.

Managing Azure credentials and subscriptions for Cloud Manager

When you create a Cloud Volumes ONTAP system, you need to select the Azure credentials to use with that system. You also need to choose a Marketplace subscription, if you're using pay-as-you-go licensing. Follow the steps on this page if you need to use multiple Azure credentials or multiple Azure Marketplace subscriptions for Cloud Volumes ONTAP.

There are two ways to add additional Azure subscriptions and credentials in Cloud Manager.

1. Associate additional Azure subscriptions with the Azure managed identity.
2. If you want to deploy Cloud Volumes ONTAP using different Azure credentials, grant Azure permissions using a service principal and add its credentials to Cloud Manager.

Associating additional Azure subscriptions with a managed identity

Cloud Manager enables you to choose the Azure credentials and Azure subscription in which you want to deploy Cloud Volumes ONTAP. You can't select a different Azure subscription for the managed identity profile unless you associate the [managed identity](#) with those subscriptions.

About this task

A managed identity is [the initial Azure account](#) when you deploy a Connector from Cloud Manager. When you deployed the Connector, Cloud Manager created the Cloud Manager Operator role and assigned it to the Connector virtual machine.

Steps

1. Log in to the Azure portal.
2. Open the **Subscriptions** service and then select the subscription in which you want to deploy Cloud Volumes ONTAP.
3. Click **Access control (IAM)**.
 - a. Click **Add > Add role assignment** and then add the permissions:
 - Select the **Cloud Manager Operator** role.



Cloud Manager Operator is the default name provided in the [Cloud Manager policy](#). If you chose a different name for the role, then select that name instead.

- Assign access to a **Virtual Machine**.
- Select the subscription in which the Connector virtual machine was created.
- Select the Connector virtual machine.
- Click **Save**.

4. Repeat these steps for additional subscriptions.

Result

When you create a new working environment, you should now have the ability to select from multiple Azure subscriptions for the managed identity profile.

Edit Account & Add Subscription

Credentials

Managed Service Identity

Azure Subscription

OCCM Dev

OCCM QA1 (Default)

No subscription is associated with this account

Adding additional Azure credentials to Cloud Manager

When you deploy a Connector from Cloud Manager, Cloud Manager enables a system-assigned managed identity on the virtual machine that has the required permissions. Cloud Manager selects these Azure credentials by default when you create a new working environment for Cloud Volumes ONTAP.



An initial set of credentials isn't added if you manually installed the Connector software on an existing system. [Learn about Azure credentials and permissions.](#)

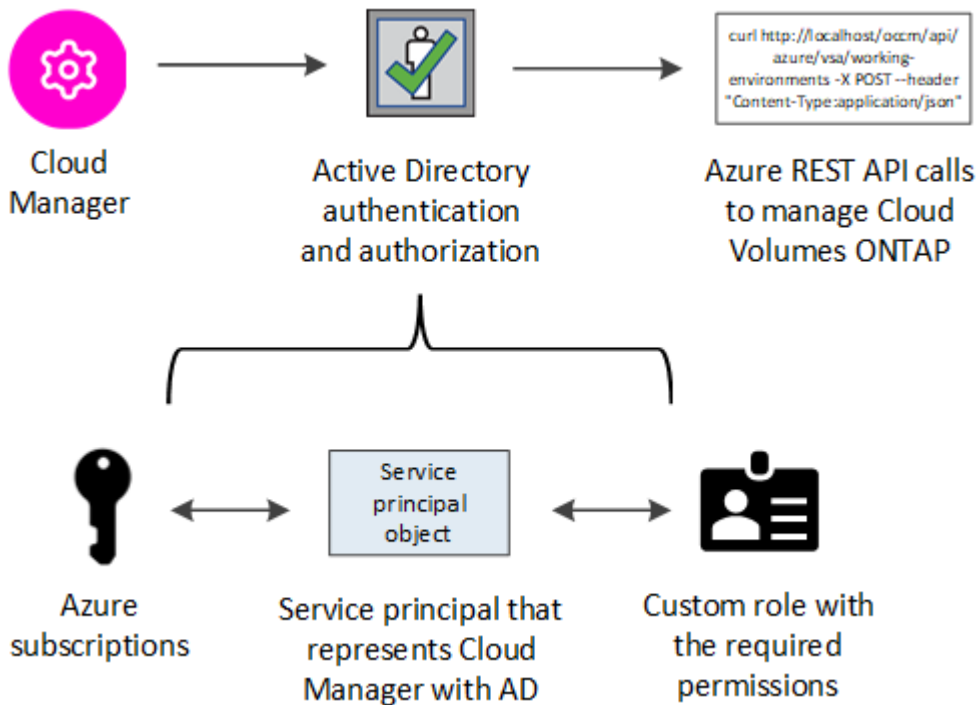
If you want to deploy Cloud Volumes ONTAP using *different* Azure credentials, then you must grant the required permissions by creating and setting up a service principal in Azure Active Directory for each Azure account. You can then add the new credentials to Cloud Manager.

Granting Azure permissions using a service principal

Cloud Manager needs permissions to perform actions in Azure. You can grant the required permissions to an Azure account by creating and setting up a service principal in Azure Active Directory and by obtaining the Azure credentials that Cloud Manager needs.

About this task

The following image depicts how Cloud Manager obtains permissions to perform operations in Azure. A service principal object, which is tied to one or more Azure subscriptions, represents Cloud Manager in Azure Active Directory and is assigned to a custom role that allows the required permissions.



Steps

1. [Create an Azure Active Directory application.](#)
2. [Assign the application to a role.](#)
3. [Add Windows Azure Service Management API permissions.](#)
4. [Get the application ID and directory ID.](#)
5. [Create a client secret.](#)

Creating an Azure Active Directory application

Create an Azure Active Directory (AD) application and service principal that Cloud Manager can use for role-based access control.

Before you begin

You must have the right permissions in Azure to create an Active Directory application and to assign the application to a role. For details, refer to [Microsoft Azure Documentation: Required permissions](#).

Steps

1. From the Azure portal, open the **Azure Active Directory** service.



2. In the menu, click **App registrations**.
3. Click **New registration**.
4. Specify details about the application:
 - **Name**: Enter a name for the application.
 - **Account type**: Select an account type (any will work with Cloud Manager).
 - **Redirect URI**: You can leave this field blank.
5. Click **Register**.

Result

You've created the AD application and service principal.

Assigning the application to a role

You must bind the service principal to one or more Azure subscriptions and assign it the custom "OnCommand Cloud Manager Operator" role so Cloud Manager has permissions in Azure.

Steps

1. Download the [Cloud Manager Azure policy](#).



Right-click the link and click **Save link as...** to download the file.

2. Modify the JSON file by adding Azure subscription IDs to the assignable scope.

You should add the ID for each Azure subscription from which users will create Cloud Volumes ONTAP systems.

Example

```
"AssignableScopes": [  
  "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz",  
  "/subscriptions/54b91999-b3e6-4599-908e-416e0zzzzzzz",  
  "/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
```

3. Use the JSON file to create a custom role in Azure.

The following steps describe how to create the role by using Bash in Azure Cloud Shell.

- a. Start [Azure Cloud Shell](#) and choose the Bash environment.
- b. Upload the JSON file.



- c. Enter the following Azure CLI command:

```
az role definition create --role-definition  
Policy_for_cloud_Manager_Azure_3.9.8.json
```

You should now have a custom role called *Cloud Manager Operator*.

4. Assign the application to the role:
 - a. From the Azure portal, open the **Subscriptions** service.
 - b. Select the subscription.
 - c. Click **Access control (IAM) > Add > Add role assignment**.
 - d. In the **Role** tab, select the **Cloud Manager Operator** role and click **Next**.
 - e. In the **Members** tab, complete the following steps:
 - Keep **User, group, or service principal** selected.
 - Click **Select members**.

Add role assignment ...

[Got feedback?](#)

Role **Members** [Review + assign](#)

Selected role Cloud Manager Operator 3.9.12_B

Assign access to ☒ User, group, or service principal
☐ Managed identity

Members [+ Select members](#)

- Search for the name of the application.

Here's an example:

Select members ×

Select ⓘ

test-service-principal

test-service-principal

- Select the application and click **Select**.
- Click **Next**.

f. Click **Review + assign**.

The service principal now has the required Azure permissions to deploy the Connector.

If you want to deploy Cloud Volumes ONTAP from multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. Cloud Manager enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Adding Windows Azure Service Management API permissions

The service principal must have "Windows Azure Service Management API" permissions.

Steps

1. In the **Azure Active Directory** service, click **App registrations** and select the application.
2. Click **API permissions > Add a permission**.
3. Under **Microsoft APIs**, select **Azure Service Management**.

Request API permissions

Select an API

Microsoft APIs APIs my organization uses My APIs

Commonly used Microsoft APIs

Microsoft Graph
Take advantage of the tremendous amount of data in Office 365, Enterprise Mobility + Security, and Windows 10. Access Azure AD, Excel, Intune, Outlook/Exchange, OneDrive, OneNote, SharePoint, Planner, and more through a single endpoint.



**Azure Batch**
Schedule large-scale parallel and HPC applications in the cloud

**Azure Data Catalog**
Programmatic access to Data Catalog resources to register, annotate and search data assets

**Azure Data Explorer**
Perform ad-hoc queries on terabytes of data to build near real-time and complex analytics solutions

**Azure Data Lake**
Access to storage and compute for big data analytic scenarios

**Azure DevOps**
Integrate with Azure DevOps and Azure DevOps server

**Azure Import/Export**
Programmatic control of import/export jobs

**Azure Key Vault**
Manage your key vaults as well as the keys, secrets, and certificates within your Key Vaults

**Azure Rights Management Services**
Allow validated users to read and write protected content

**Azure Service Management**
Programmatic access to much of the functionality available through the Azure portal

**Azure Storage**
Secure, massively scalable object and data lake storage for unstructured and semi-structured data

**Customer Insights**
Create profile and interaction models for your products

**Data Export Service for Microsoft Dynamics 365**
Export data from Microsoft Dynamics CRM organization to an external destination

4. Click **Access Azure Service Management as organization users** and then click **Add permissions**.

Request API permissions

[← All APIs](#)



Azure Service Management

<https://management.azure.com/> [Docs](#)

What type of permissions does your application require?

Delegated permissions

Your application needs to access the API as the signed-in user.

Application permissions

Your application runs as a background service or daemon without a signed-in user.

Select permissions

[expand all](#)

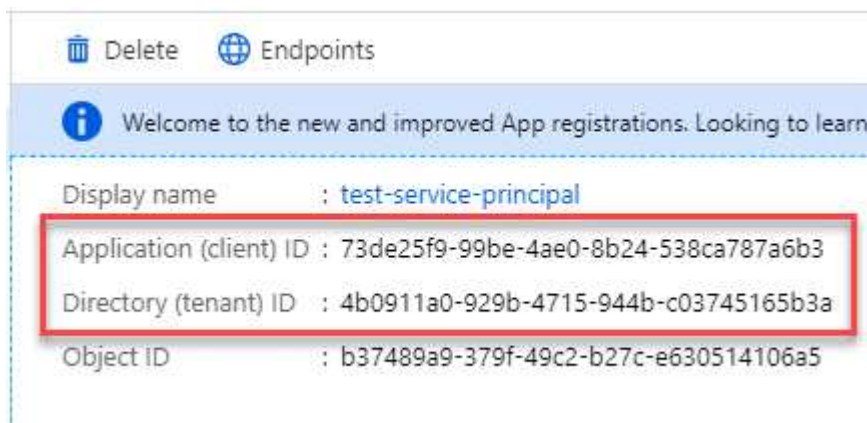
Type to search	
PERMISSION	ADMIN CONSENT REQUIRED
<input checked="" type="checkbox"/> user_impersonation Access Azure Service Management as organization users (preview) ⓘ	-

Getting the application ID and directory ID

When you add the Azure account to Cloud Manager, you need to provide the application (client) ID and the directory (tenant) ID for the application. Cloud Manager uses the IDs to programmatically sign in.

Steps

1. In the **Azure Active Directory** service, click **App registrations** and select the application.
2. Copy the **Application (client) ID** and the **Directory (tenant) ID**.



Creating a client secret

You need to create a client secret and then provide Cloud Manager with the value of the secret so Cloud Manager can use it to authenticate with Azure AD.

Steps

1. Open the **Azure Active Directory** service.
2. Click **App registrations** and select your application.
3. Click **Certificates & secrets > New client secret**.

4. Provide a description of the secret and a duration.
5. Click **Add**.
6. Copy the value of the client secret.

Client secrets

A secret string that the application uses to prove its identity when requesting a token. Also can be referred to as application password.

+ New client secret		
DESCRIPTION	EXPIRES	VALUE
test secret	8/16/2020	*sZ1jSe2By:D*-ZRoV4NLfdAcY7:+0vA

Copy to clipboard

Result

Your service principal is now setup and you should have copied the application (client) ID, the directory (tenant) ID, and the value of the client secret. You need to enter this information in Cloud Manager when you add an Azure account.

Adding the credentials to Cloud Manager

After you provide an Azure account with the required permissions, you can add the credentials for that account to Cloud Manager. Completing this step enables you to launch Cloud Volumes ONTAP using different Azure credentials.

Before you get started

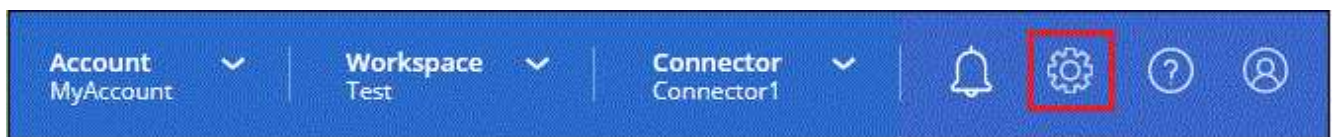
If you just created these credentials in your cloud provider, it might take a few minutes until they are available for use. Wait a few minutes before you add the credentials to Cloud Manager.

What you'll need

You need to create a Connector before you can change Cloud Manager settings. [Learn how](#).

Steps

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



2. Click **Add Credentials** and follow the steps in the wizard.
 - a. **Credentials Location:** Select **Microsoft Azure > Connector**.
 - b. **Define Credentials:** Enter information about the Azure Active Directory service principal that grants the required permissions:
 - Application (client) ID: See [Getting the application ID and directory ID](#).
 - Directory (tenant) ID: See [Getting the application ID and directory ID](#).
 - Client Secret: See [Creating a client secret](#).
 - c. **Marketplace Subscription:** Associate a Marketplace subscription with these credentials by subscribing now or by selecting an existing subscription.

To pay for Cloud Volumes ONTAP at an hourly rate (PAYGO), these Azure credentials must be associated with a subscription from the Azure Marketplace.

- d. **Review**: Confirm the details about the new credentials and click **Add**.

Result

You can now switch to different set of credentials from the Details and Credentials page [when creating a new working environment](#):



Manage existing credentials

Manage the Azure credentials that you've already added to Cloud Manager by associating a Marketplace subscription, editing credentials, and deleting them.

Associating an Azure Marketplace subscription to credentials

After you add your Azure credentials to Cloud Manager, you can associate an Azure Marketplace subscription to those credentials. The subscription enables you to create a pay-as-you-go Cloud Volumes ONTAP system, and to use other NetApp cloud services.

There are two scenarios in which you might associate an Azure Marketplace subscription after you've already added the credentials to Cloud Manager:

- You didn't associate a subscription when you initially added the credentials to Cloud Manager.
- You want to replace an existing Azure Marketplace subscription with a new subscription.

What you'll need

You need to create a Connector before you can change Cloud Manager settings. [Learn how](#).

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Associate Subscription**.



3. Select a subscription from the down-down list or click **Add Subscription** and follow the steps to create a new subscription.

The following video starts from the context of the working environment wizard, but shows you the same workflow after you click **Add Subscription**:

► https://docs.netapp.com/us-en/occm//media/video_subscribing_azure.mp4 (video)

Editing credentials

Edit your Azure credentials in Cloud Manager by modifying the details about your Azure service credentials. For example, you might need to update the client secret if a new secret was created for the service principal application.

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Edit Credentials**.
3. Make the required changes and then click **Apply**.

Deleting credentials

If you no longer need a set of credentials, you can delete them from Cloud Manager. You can only delete credentials that aren't associated with a working environment.

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Delete Credentials**.
3. Click **Delete** to confirm.

GCP

Google Cloud projects, permissions, and accounts

A service account provides Cloud Manager with permissions to deploy and manage Cloud Volumes ONTAP systems that are in the same project as the Connector, or in different projects.

Project and permissions for Cloud Manager

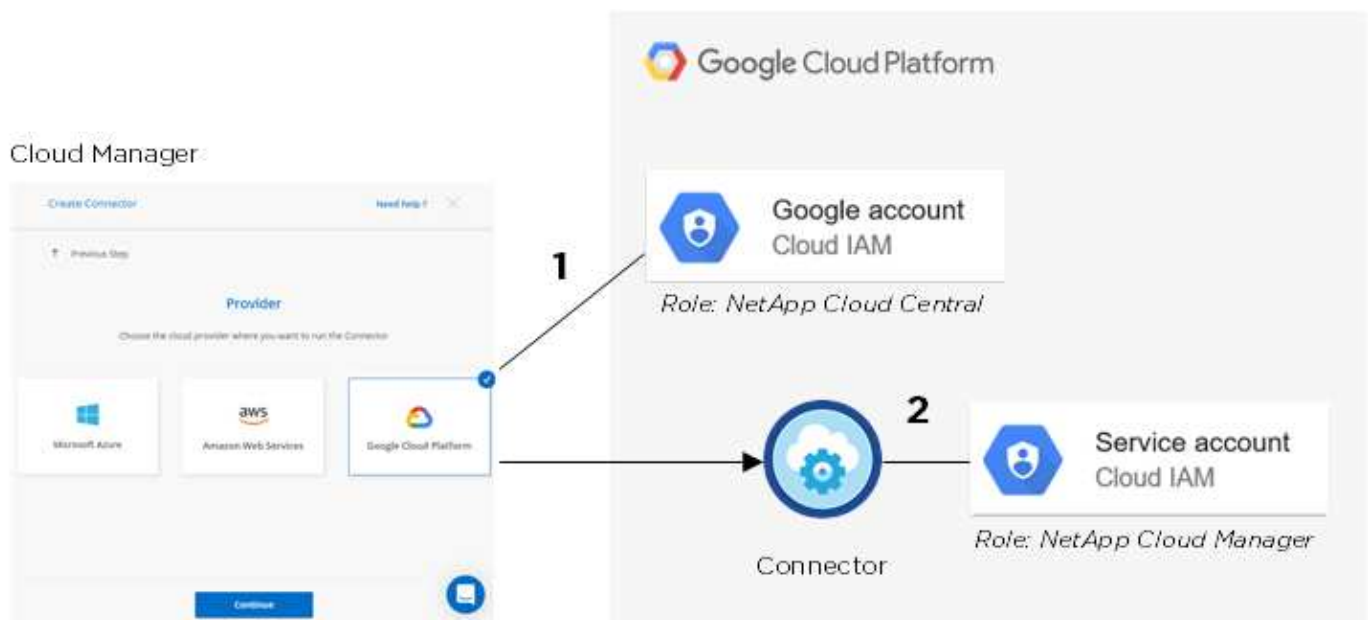
Before you can deploy Cloud Volumes ONTAP in Google Cloud, you must first deploy a Connector in a Google Cloud project. The Connector can't be running on your premises, or in a different cloud provider.

Two sets of permissions must be in place before you deploy a Connector directly from Cloud Manager:

1. You need to deploy a Connector using a Google account that has permissions to launch the Connector VM instance from Cloud Manager.
2. When deploying the Connector, you are prompted to select a [service account](#) for the VM instance. Cloud Manager gets permissions from the service account to create and manage Cloud Volumes ONTAP systems on your behalf. Permissions are provided by attaching a custom role to the service account.

We have set up two YAML files that include the required permissions for the user and the service account. [Learn how to use the YAML files to set up permissions.](#)

The following image depicts the permission requirements described in numbers 1 and 2 above:



Project for Cloud Volumes ONTAP

Cloud Volumes ONTAP can reside in the same project as the Connector, or in a different project. To deploy Cloud Volumes ONTAP in a different project, you need to first add the Connector service account and role to that project.

- [Learn how to set up service account \(see step 2\).](#)
- [Learn how to deploy Cloud Volumes ONTAP in GCP and select a project.](#)

Account for data tiering



Cloud Manager requires a GCP account for Cloud Volumes ONTAP 9.6, but not for 9.7 and later. If you want to use data tiering with Cloud Volumes ONTAP 9.7 or later, then follow step 4 in [Getting started with Cloud Volumes ONTAP in Google Cloud Platform.](#)

Adding a Google Cloud account to Cloud Manager is required to enable data tiering on a Cloud Volumes ONTAP 9.6 system. Data tiering automatically tiers cold data to low-cost object storage, enabling you to

reclaim space on your primary storage and shrink secondary storage.

When you add the account, you need to provide Cloud Manager with a storage access key for a service account that has Storage Admin permissions. Cloud Manager uses the access keys to set up and manage a Cloud Storage bucket for data tiering.

After you add a Google Cloud account, you can then enable data tiering on individual volumes when you create, modify, or replicate them.

- [Learn how to set up and add GCP accounts to Cloud Manager.](#)
- [Learn how to tier inactive data to low-cost object storage.](#)

Managing GCP credentials and subscriptions for Cloud Manager

You can manage two types of Google Cloud Platform credentials from Cloud Manager: the credentials that are associated with the Connector VM instance and storage access keys used with a Cloud Volumes ONTAP 9.6 system for [data tiering](#).

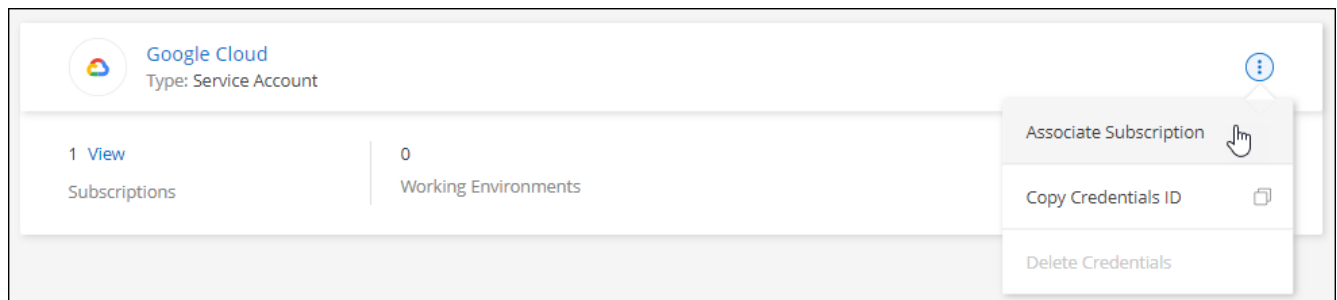
Associating a Marketplace subscription with GCP credentials

When you deploy a Connector in GCP, Cloud Manager creates a default set of credentials that are associated with the Connector VM instance. These are the credentials that Cloud Manager uses to deploy Cloud Volumes ONTAP.

At any time, you can change the Marketplace subscription that's associated with these credentials. The subscription enables you to create a pay-as-you-go Cloud Volumes ONTAP system, and to use other NetApp cloud services.

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Associate Subscription**.



3. Select a Google Cloud project and subscription from the down-down list.

Google Cloud Project

OCCM-Dev ▼

Subscription

 GCP subscription for staging ▼

 [Add Subscription](#)

4. Click **Associate**.

5. If you don't already have a subscription, click **Add Subscription** and follow the steps to create a new subscription below.




Before you complete the following steps, ensure that you have both Billing Admin privileges in your Google Cloud account as well as a NetApp Cloud Central login.

6. Reivew the subscription steps and click **Continue**.

Add Subscription

Subscription Steps:

- 1 **Cloud Manager**
Clicking **Continue** to create your subscription from the Google Cloud Marketplace.
 - 2 **Google Cloud Marketplace**
Subscribe and then then click **Register With NetApp** to configure your account from Cloud Central.
 - 3 **Cloud Central**
Save your subscription.
 - 4 **Cloud Manager**
Associate the Marketplace subscription with your Google Cloud project.
-  View video instructions

Continue

Cancel

7. After you're redirected to the [NetApp Cloud Manager page on the Google Cloud Marketplace](#), ensure that the correct project is selected at the top navigation menu.

 Google Cloud Platform 





Cloud Manager for Cloud Volumes ONTAP

NetApp, Inc.

Enterprise-grade data management and protection

SUBSCRIBE

[OVERVIEW](#) [PRICING](#) [SUPPORT](#)

Overview

Cloud Volumes ONTAP is a data-management layer that runs natively on Google Cloud infrastructure enabling enhanced control, data protection, mobility and agility for business application data. Get consistent enterprise-grade storage across your hybrid cloud platforms with built-in disaster recovery, backup and ransomware protection. Seamlessly migrate enterprise applications without reengineering. Create company-wide file shares with simultaneous NFS and CIFS/SMB access and iSCSI block storage for GCE instances with scalability up to 368TB. Automate persistent storage provisioning for your Kubernetes clusters. Accelerate CI/CD cycles with instant, zero-capacity data replication. Reduce storage costs by 70% with advanced storage efficiencies. Cloud Manager is the console used to deploy, manage and automate Cloud Volumes ONTAP instances across the hybrid multi-cloud.

[Learn more](#)

Additional details

Type: [APIs & services](#)

Last updated: 3/26/21

Category: [Storage](#)

Runs on: NetApp, Inc. Cloud Servers

8. Click **Subscribe**.
9. Select the appropriate billing account and agree to the terms and conditions.

2. Purchase details

Select a billing account *
Secondary_Billing_Account

3. Terms

Cancellation and change policy

- Usage fee is billed every month.
- You can cancel the service at any time and it will take effect immediately. You will be billed by the amount you used for that month.

Additional terms

- ☒ I understand this subscription will be automatically renewed at the end of the current term.
- ☒ I authorize Google LLC and its affiliates ("Google") to share my purchase, usage, operational (e.g., project lifecycle events), support ticket, and account information with NetApp, Inc., its affiliates and subcontractors, for the purposes of providing the service, sales attribution, and technical support. I represent that I have the authority to bind my company.
- ☒ By deploying the software or accessing the service you are agreeing to comply with the [End User License Agreement](#), [GCP Marketplace Terms of Service](#), and the terms of applicable open source software licenses bundled with the software or service. Please review these terms and licenses carefully for details about any obligations you may have related to the software or service. To the limited extent an open source software license related to the software or service expressly supersedes the GCP Marketplace Terms of Service, that open source software license governs your use of that software or service.

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Google is providing this software or service "as-is" and any support for this software or service will be provided by NetApp, Inc. under their terms of service.

SUBSCRIBE

10. Click **Subscribe**.

This step sends your transfer request to NetApp.

11. On the pop-up dialog box, click **Register with NetApp, Inc.** to be redirected to NetApp Cloud Central.



This step must be completed to link the GCP subscription to your NetApp account. The process of linking a subscription isn't complete until you are redirected from this page and then sign in to NetApp Cloud Central.

12. After you're redirected to Cloud Central, log in to NetApp Cloud Central or sign up, and then click **Done** to proceed.

The GCP subscription will be linked to all NetApp accounts that your user login is associated with.



If someone from your organization has already subscribed to the NetApp Cloud Manager subscription from your billing account, then you will be redirected to [the Cloud Volumes ONTAP page on NetApp Cloud Central](#) instead. If this is unexpected, contact your NetApp sales team. Google enables only one subscription per Google billing account.

13. Once this process is complete, navigate back to the Credentials page in Cloud Manager and select this new subscription.

Google Cloud Project

OCCM-Dev
▼

Subscription

● GCP subscription for staging
▼

+ Add Subscription

Troubleshooting the Marketplace subscription process

Sometimes subscribing to Cloud Volumes ONTAP through the Google Cloud Marketplace can become fragmented due to incorrect permissions or accidentally not following the redirection to NetApp Cloud Central. If this happens, use the following steps to complete the subscription process.

Steps

1. Navigate to the [NetApp Cloud Manager page on the Google Cloud Marketplace](#) to check on the state of the order. If the page states **Manage on Provider**, scroll down and click **Manage Orders**.

Pricing

✓ The product was purchased on 12/9/20.

MANAGE ORDERS

- a. If the order shows a green check mark and this is unexpected, somebody else from the organization using the same billing account might already be subscribed. If this is unexpected or you require the details of this subscription, contact your NetApp sales team.

Filter Enter property name or value										
Status	Order number	Plan	Discount	Start date ↓	Plan duration	End date	Payment Schedule	Auto-renew	Next plan	
✓	2eebbc...	Cloud Manager	-	10/21/21	1 month	-	Postpay	N/A	N/A	⋮

- b. If the order shows a clock and **Pending** status, go back to the marketplace page and choose **Manage on Provider** to complete the process as documented above.

Filter Enter property name or value										
Status	Order number	Plan	Discount	Start date ↓	Plan duration	End date	Payment Schedule	Auto-renew	Next plan	
🕒	d56c66...	Cloud Manager	-	Pending	1 month	Pending	Postpay	N/A	N/A	⋮

Setting up and adding GCP accounts for data tiering with Cloud Volumes ONTAP 9.6

If you want to enable a Cloud Volumes ONTAP 9.6 system for [data tiering](#), you need to provide Cloud Manager with a storage access key for a service account that has Storage Admin permissions. Cloud Manager uses the access keys to set up and manage a Cloud Storage bucket for data tiering.



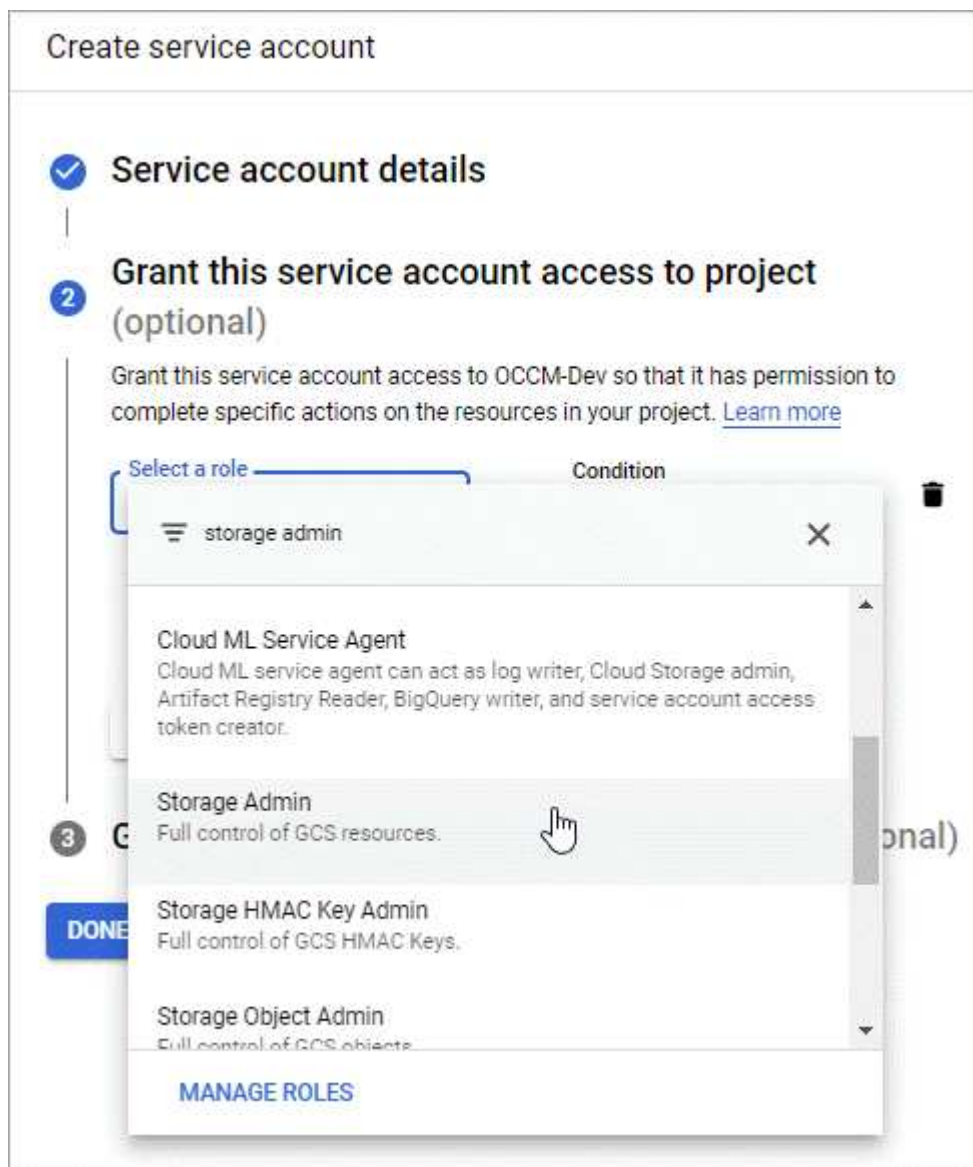
If you want to use data tiering with Cloud Volumes ONTAP 9.7 or later, then follow step 4 in [Getting started with Cloud Volumes ONTAP in Google Cloud Platform](#).

Setting up a service account and access keys for Google Cloud Storage

A service account enables Cloud Manager to authenticate and access Cloud Storage buckets used for data tiering. The keys are required so that Google Cloud Storage knows who is making the request.

Steps

1. Open the GCP IAM console and [create a service account that has the Storage Admin role](#).



2. Go to [GCP Storage Settings](#).

3. If you're prompted, select a project.
4. Click the **Interoperability** tab.
5. If you haven't already done so, click **Enable interoperability access**.
6. Under **Access keys for service accounts**, click **Create a key for a service account**.
7. Select the service account that you created in step 1.

Select a service account

Email	Name	Keys
<input checked="" type="radio"/> data-tiering-for-netapp@top-monitor-250116.iam.gserviceaccount.com	data tiering for netapp	—

CANCEL
CREATE KEY
|
CREATE NEW ACCOUNT

8. Click **Create Key**.
9. Copy the access key and secret.

You'll need to enter this information in Cloud Manager when you add the GCP account for data tiering.

Adding a GCP account to Cloud Manager

Now that you have an access key for a service account, you can add it to Cloud Manager.

What you'll need

You need to create a Connector before you can change Cloud Manager settings. [Learn how](#).

Steps

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



2. Click **Add Credentials** and select **Google Cloud**.
3. Enter the access key and secret for the service account.

The keys enable Cloud Manager to set up a Cloud Storage bucket for data tiering.

4. Confirm that the policy requirements have been met and then click **Create Account**.

What's next?

You can now enable data tiering on individual volumes on a Cloud Volumes ONTAP 9.6 system when you create, modify, or replicate them. For details, see [Tiering inactive data to low-cost object storage](#).

But before you do, be sure that the subnet in which Cloud Volumes ONTAP resides is configured for Private Google Access. For instructions, refer to [Google Cloud Documentation: Configuring Private Google Access](#).

Add and manage NetApp Support Site accounts in Cloud Manager

Provide the credentials for your NetApp Support Site (NSS) accounts to enable key workflows for Cloud Volumes ONTAP and to enable predictive analytics and proactive support through Active IQ.

Overview

Adding your NetApp Support Site account to Cloud Manager is required to enable the following tasks:

- To deploy Cloud Volumes ONTAP when you bring your own license (BYOL)

Providing your NSS account is required so that Cloud Manager can upload your license key and to enable the subscription for the term that you purchased. This includes automatic updates for term renewals.

- To register pay-as-you-go Cloud Volumes ONTAP systems

Providing your NSS account is required to activate support for your system and to gain access to NetApp technical support resources.

- To upgrade Cloud Volumes ONTAP software to the latest release
- To use Active IQ Digital Advisor from within Cloud Manager

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 following requirements for the account:

- The account must be a customer-level account (not a guest or temp account).
- If you plan to deploy a node-based BYOL system:
 - The account must be authorized to access the serial numbers of the BYOL systems.
 - If you purchased a secure BYOL subscription, then a secure NSS account is required.

What's next?

Users can now select the account when creating new Cloud Volumes ONTAP systems, when registering existing Cloud Volumes ONTAP systems, and when viewing data in Active IQ.

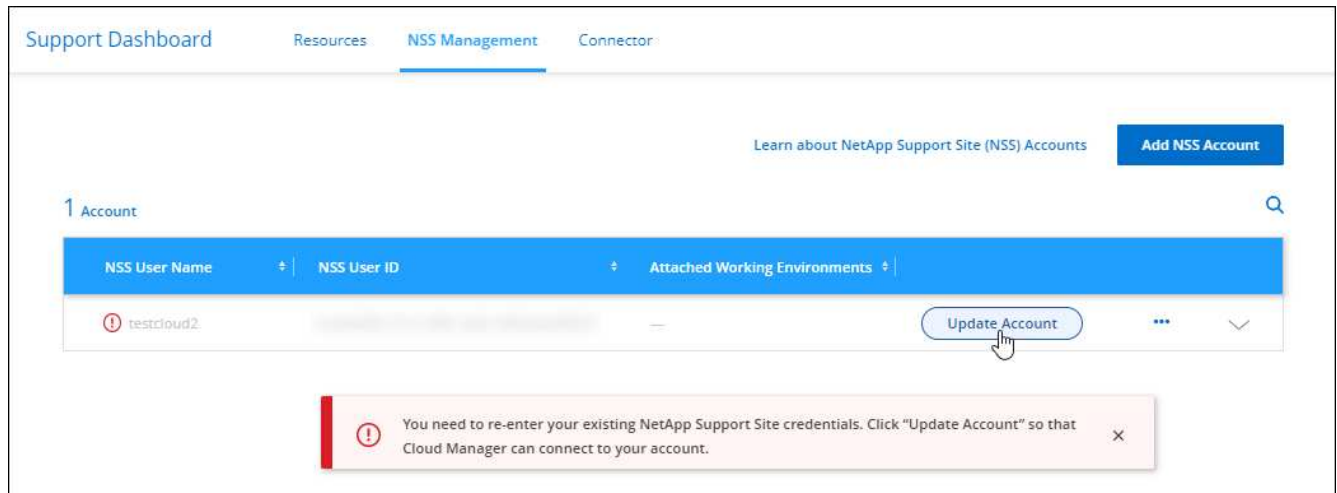
- [Launching Cloud Volumes ONTAP in AWS](#)
- [Launching Cloud Volumes ONTAP in Azure](#)
- [Launching Cloud Volumes ONTAP in GCP](#)
- [Registering pay-as-you-go systems](#)
- [Learn how Cloud Manager manages license files](#)

Update an NSS account for the new authentication method

Starting in November 2021, NetApp now uses Microsoft Azure Active Directory as the identity provider for authentication services specific to support and licensing. As a result of this update, Cloud Manager will prompt you to update the credentials for any existing accounts that you previously added.

Steps

1. If you haven't already done so, [create a Microsoft Azure Active Directory B2C account that will be linked to your current NetApp account](#).
2. In the upper right of the Cloud Manager console, click the Help icon, and select **Support**.
3. Click **NSS Management**.
4. For the NSS account that you want to update, click **Update Account**.



5. 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.

6. At the login page, provide your NetApp Support Site registered email address and password to perform the authentication process.

After the process is complete, the account that you updated should now be listed as a *new* account in the table. The *older* version of the account is still listed in the table, along with any existing working environment associations.

7. If existing Cloud Volumes ONTAP working environments are attached to the older version of the account, follow the steps below to [attach those working environments to a different NSS account](#).
8. Go to the older version of the NSS account, click **...** and then select **Delete**.

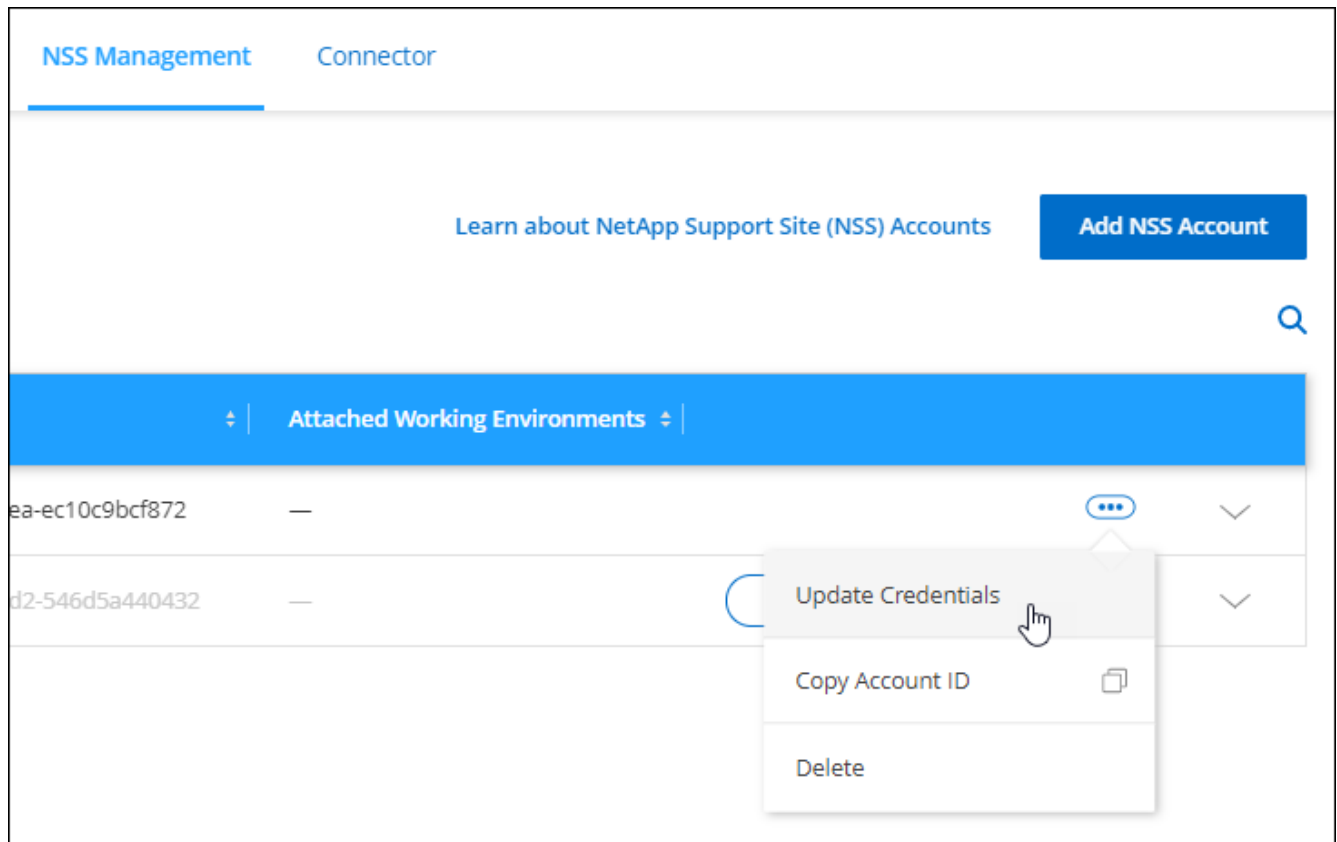
Update NSS credentials

Whenever you change the credentials for your NSS account, you'll need to update them in Cloud Manager.

Steps

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

3. For the NSS account that you want to update, click **...** and then select **Update Credentials**.



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.

Attach a working environment to a different NSS account

If your organization has multiple NetApp Support Site accounts, you can change which account is associated with a Cloud Volumes ONTAP system.

This feature is only supported with NSS accounts that are configured to use Microsoft Azure AD adopted by NetApp for identity management. Before you can use this feature, you need click **Add NSS Account** or **Update Account**.

Steps

1. In the upper right of the Cloud Manager console, click the Help icon, and select **Support**.
2. Click **NSS Management**.
3. Complete the following steps to change the NSS account:
 - a. Expand the row for the NetApp Support Site account that the working environment is currently associated with.
 - b. For the working environment that you want to change the association for, click **...**

c. Select **Change to a different NSS account**.



d. Select the account and then click **Save**.

Display the email address for an NSS account

Now that NetApp Support Site accounts use Microsoft Azure Active Directory for authentication services, the NSS user name that displays in Cloud Manager is typically an identifier generated by Azure AD. As a result, you might not immediately know the email address associated with that account. But Cloud Manager has an option to show you the associated email address.



When you go to the NSS Management page, Cloud Manager generates a token for each account in the table. That token includes information about the associated email address. The token is then removed when you leave the page. The information is never cached, which helps protect your privacy.

Steps

1. In the upper right of the Cloud Manager console, click the Help icon, and select **Support**.
2. Click **NSS Management**.
3. For the NSS account that you want to update, click **...** and then select **Display Email Address**.



Result

Cloud Manager displays the NetApp Support Site user name and the associated email address. You can use the copy button to copy the email address.

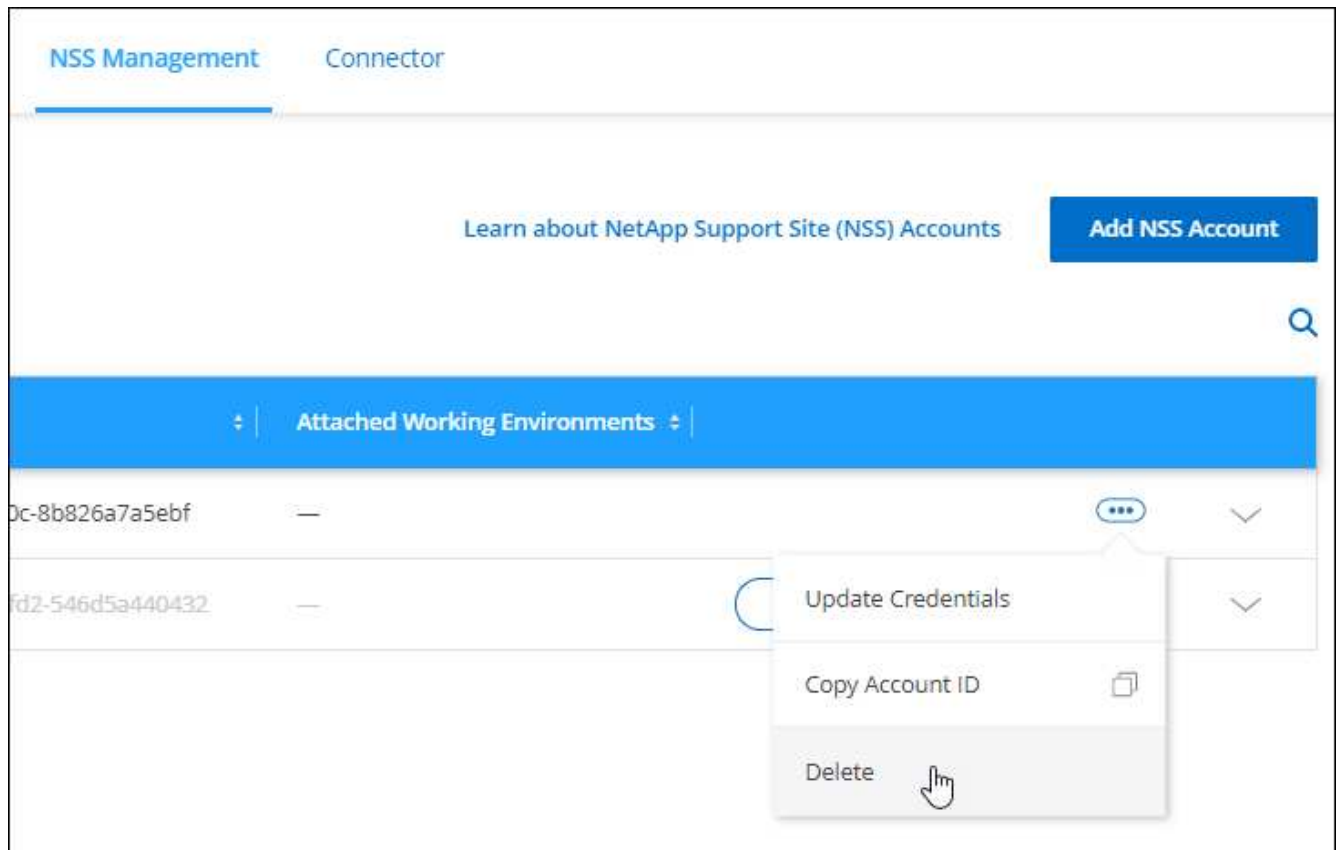
Remove an NSS account

Delete any of the NSS accounts that you no longer want to use with Cloud Manager.

Note that you can't delete an account that is currently associated with a Cloud Volumes ONTAP working environment. You first need to [attach those working environments to a different NSS account](#).

Steps

1. In the upper right of the Cloud Manager console, click the Help icon, and select **Support**.
2. Click **NSS Management**.
3. For the NSS account that you want to delete, click **...** and then select **Delete**.



4. Click **Delete** to confirm.

Managing your account

After you perform initial setup, you can administer your account settings later by managing users, service accounts, workspaces, Connectors, and subscriptions.

[Learn more about how NetApp accounts work.](#)

Managing your account with the Tenancy API

If you want to manage your account settings by sending API requests, then you'll need to use the *Tenancy* API. This API is different than the Cloud Manager API, which you use to create and manage working environments.

[View endpoints for the Tenancy API.](#)

Creating and managing users

The user's in your account can access the manage the resources in your account's workspaces.

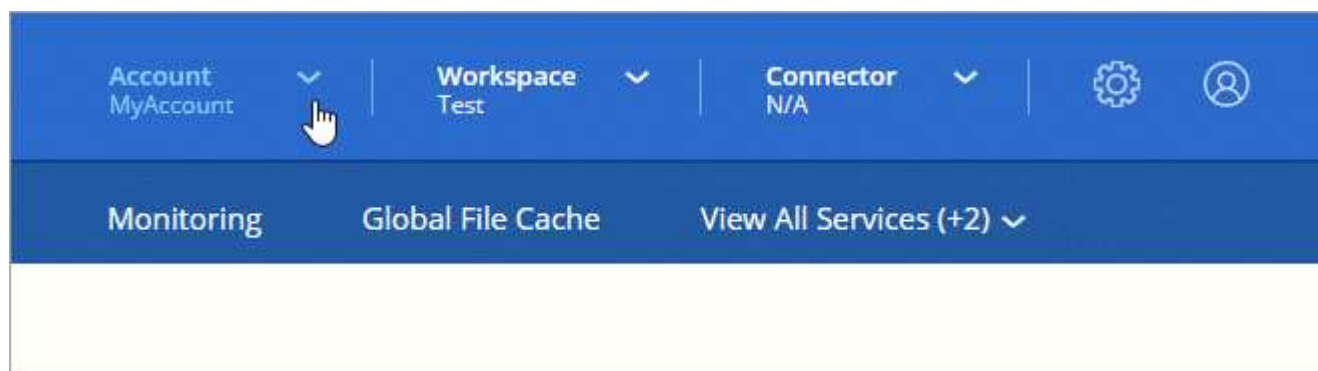
Adding users

Associate Cloud Central users with the NetApp account so those users can create and manage working environments in Cloud Manager.

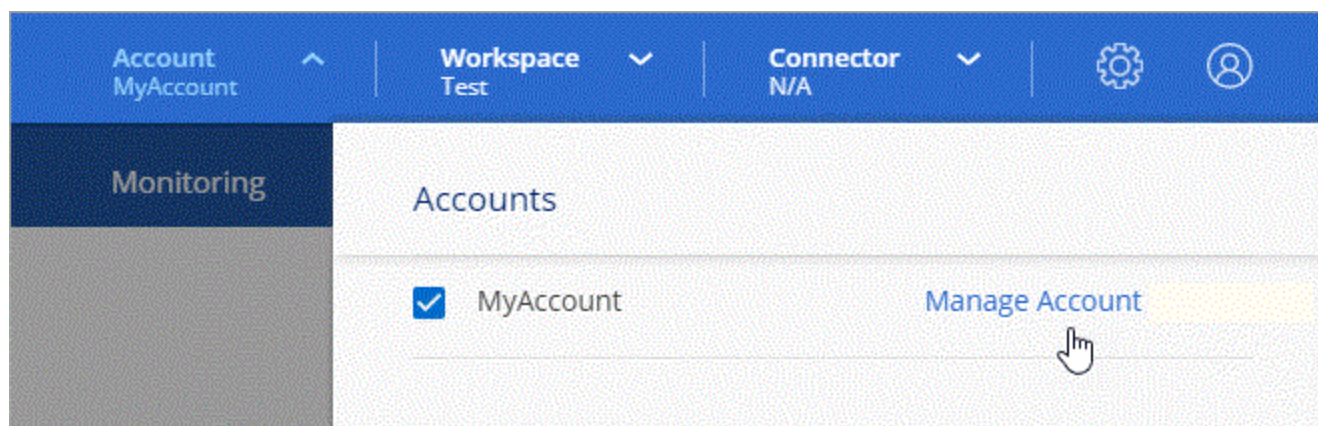
Steps

1. If the user hasn't already done so, ask the user to go to [NetApp Cloud Central](#) and sign up.

2. From the top of Cloud Manager, click the **Account** drop-down.



3. Click **Manage Account** next to the currently selected account.



4. From the Members tab, click **Associate User**.

5. Enter the user's email address and select a role for the user:

- **Account Admin:** Can perform any action in Cloud Manager.
- **Workspace Admin:** Can create and manage resources in assigned workspaces.
- **Compliance Viewer:** Can only view Cloud Data Sense compliance information and generate reports for workspaces that they have permission to access.
- **SnapCenter Admin:** Can use the SnapCenter Service to create application consistent backups and restore data using those backups. *This service is currently in Beta.*

6. If you selected Workspace Admin or Compliance Viewer, select one or more workspaces to associate with that user.



Associate User

To add a user to your NetApp Cloud Account, that user must already have signed up at [NetApp Cloud Central](#). Enter the email address that they used when signing up with Cloud Central.

User's Email

Role

Associate User to Workspaces

CancelAssociate User

7. Click **Associate**.

Result

The user should receive an email from NetApp Cloud Central titled "Account Association." The email includes the information needed to access Cloud Manager.

Removing users

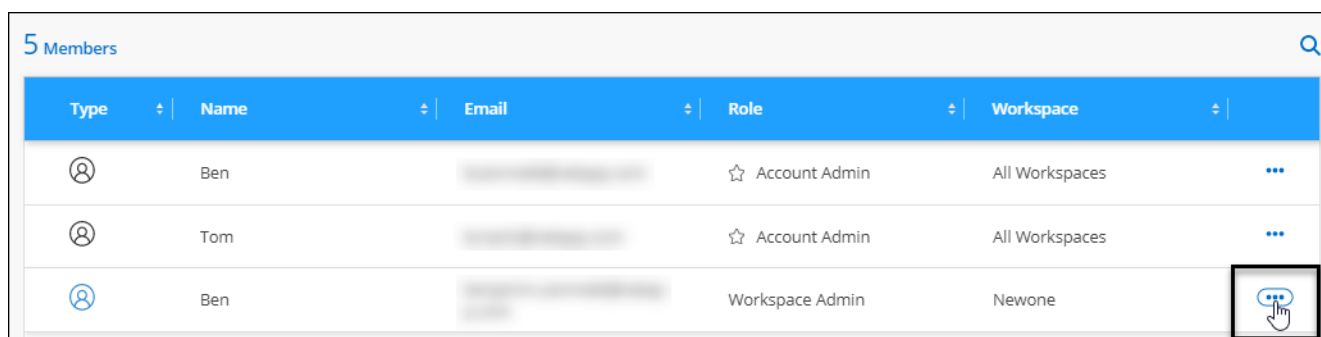
Disassociating a user makes it so they can no longer access the resources in a NetApp account.

Steps

1. From the top of Cloud Manager, click the **Account** drop-down and click **Manage Account**.



2. From the Members tab, click the action menu in the row that corresponds to the user.



3. Click **Disassociate User** and click **Disassociate** to confirm.

Result

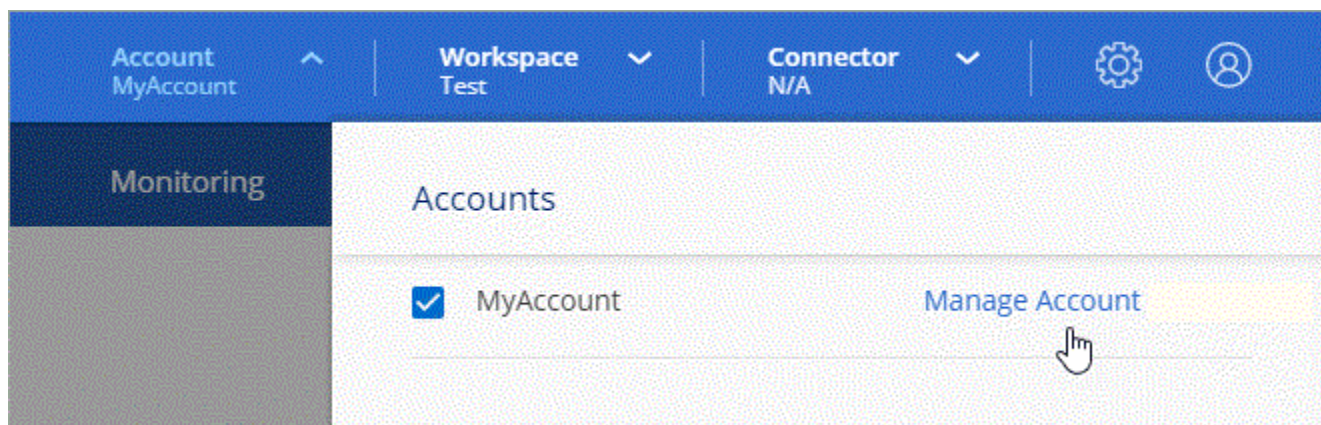
The user can no longer access the resources in this NetApp account.

Managing a Workspace Admin's workspaces

You can associate and disassociate Workspace Admins with workspaces at any time. Associating the user enables them to create and view the working environments in that workspace.









Steps

1. From the top of Cloud Manager, click the **Account** drop-down and click **Manage Account**.



2. From the Members tab, click the action menu in the row that corresponds to the user.

5 Members

Type	Name	Email	Role	Workspace
	Ben		 Account Admin	All Workspaces 
	Tom		 Account Admin	All Workspaces 
	Ben		Workspace Admin	Newone 

3. Click **Manage Workspaces**.

4. Select the workspaces to associate with the user and click **Apply**.

Result

The user can now access those workspaces from Cloud Manager, as long as the Connector was also associated with the workspaces.

Creating and managing service accounts

A service account acts as a "user" that can make authorized API calls to Cloud Manager for automation purposes. This makes it easier to manage automation because you don't need to build automation scripts based on a real person's user account who can leave the company at any time. And if you're using federation, you can create a token without generating a refresh token from the cloud.

You give permissions to a service account by assigning it a role, just like any other Cloud Manager user. You can also associate the service account with specific workspaces in order to control the working environments (resources) that the service can access.

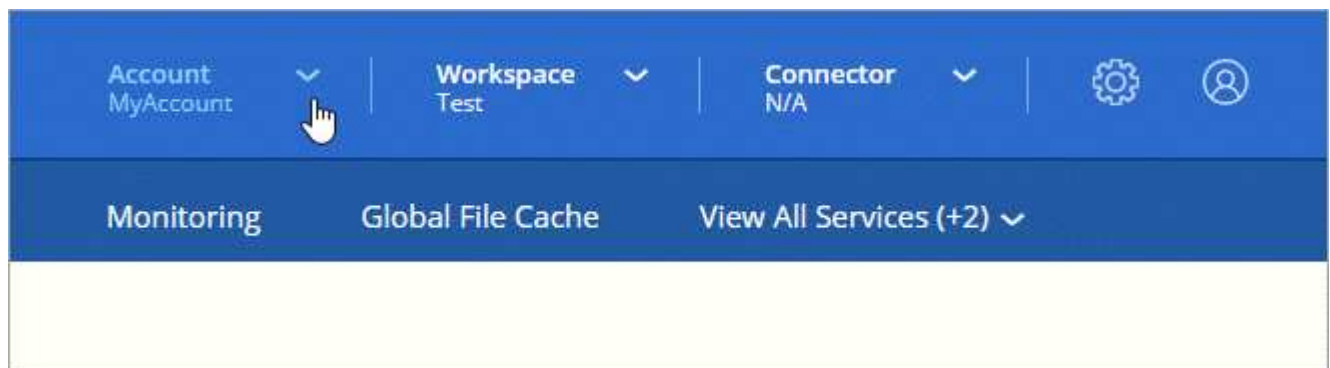
When you create the service account, Cloud Manager enables you to copy or download a client ID and client secret for the service account. This key pair is used for authentication with Cloud Manager.

Creating a service account

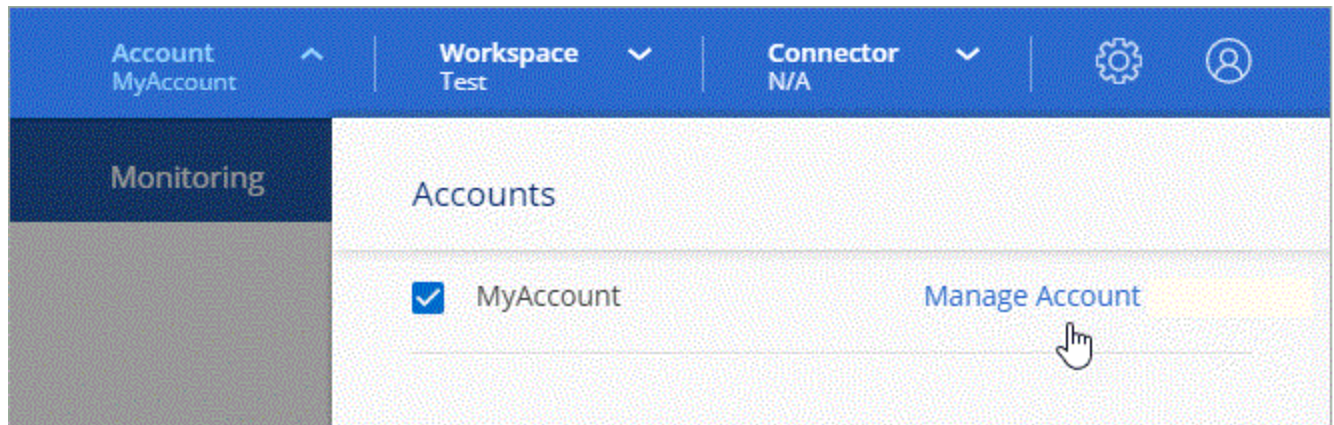
Create as many service accounts as you need to manage the resources in your working environments.

Steps

1. From the top of Cloud Manager, click the **Account** drop-down.



2. Click **Manage Account** next to the currently selected account.



3. From the Members tab, click **Create Service Account**.
4. Enter a name and select a role. If you chose a role other than Account Admin, choose the workspace to associate with this service account.
5. Click **Create**.
6. Copy or download the client ID and client secret.

The client secret is visible only once and is not stored anywhere by Cloud Manager. Copy or download the secret and store it safely.
7. Click **Close**.

Obtaining a bearer token for a service account

In order to make API calls to the [Tenancy API](#), you'll need to obtain a bearer token for a service account.

```
curl --location --request POST 'https://netapp-cloud-account.auth0.com/oauth/token' \
--header 'Content-Type: application/json' \
--data-raw '{
  "grant_type": "client_credentials",
  "client_secret": "<client secret>",
  "audience": "https://api.cloud.netapp.com",
  "client_id": "<client id>"
}'
```

Copying the client ID

You can copy a service account's client ID at any time.

Steps

1. From the Members tab, click the action menu in the row that corresponds to the service account.



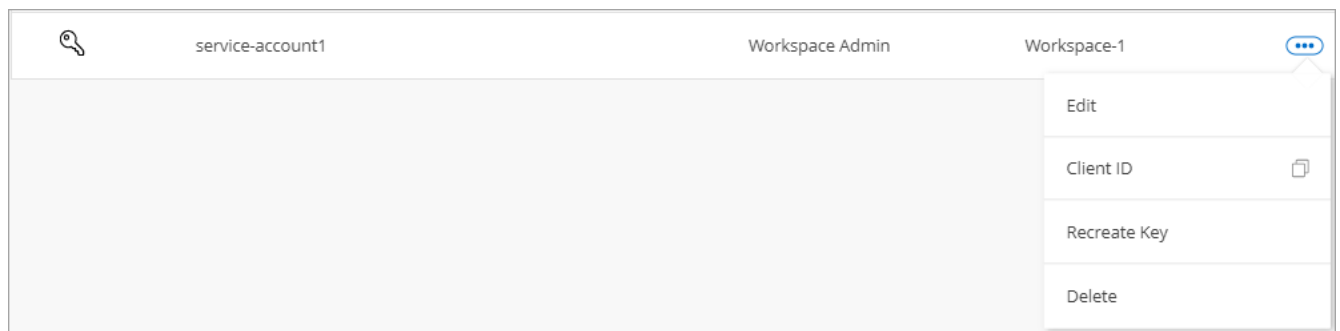
2. Click **Client ID**.
3. The ID is copied to your clipboard.

Recreating keys

Recreating the key will delete the existing key for this service account and then create a new key. You won't be able to use the previous key.

Steps

1. From the Members tab, click the action menu in the row that corresponds to the service account.



2. Click **Recreate Key**.
3. Click **Recreate** to confirm.
4. Copy or download the client ID and client secret.

The client secret is visible only once and is not stored anywhere by Cloud Manager. Copy or download the secret and store it safely.

5. Click **Close**.

Deleting a service account

Delete a service account if you no longer need to use it.

Steps

1. From the Members tab, click the action menu in the row that corresponds to the service account.



2. Click **Delete**.
3. Click **Delete** again to confirm.

Managing workspaces

Manage your workspaces by creating, renaming, and deleting them. Note that you can't delete a workspace if it contains any resources. It must be empty.

Steps

1. From the top of Cloud Manager, click the **Account** drop-down and click **Manage Account**.
2. Click **Workspaces**.
3. Choose one of the following options:
 - Click **Add New Workspace** to create a new workspace.
 - Click **Rename** to rename the workspace.
 - Click **Delete** to delete the workspace.

Managing a Connector's workspaces

You need to associate the Connector with workspaces so Workspace Admins can access those workspaces from Cloud Manager.

If you only have Account Admins, then associating the Connector with workspaces isn't required. Account Admins have the ability to access all workspaces in Cloud Manager by default.

[Learn more about users, workspaces, and Connectors.](#)

Steps

1. From the top of Cloud Manager, click the **Account** drop-down and click **Manage Account**.
2. Click **Connector**.
3. Click **Manage Workspaces** for the Connector that you want to associate.
4. Select the workspaces to associate with the Connector and click **Apply**.

Managing subscriptions

After you subscribe from a cloud provider's marketplace, each subscription is available from the Account Settings widget. You have the option to rename a subscription and to disassociate the subscription from one or more accounts.

For example, let's say that you have two accounts and each is billed through separate subscriptions. You might

disassociate a subscription from one of the accounts so the users in that account don't accidentally choose the wrong subscription when creating a Cloud Volume ONTAP working environment.

[Learn more about subscriptions.](#)

Steps

1. From the top of Cloud Manager, click the **Account** drop-down and click **Manage Account**.
2. Click **Subscriptions**.

You'll only see the subscriptions that are associated with the account that you're currently viewing.

3. Click the action menu in the row that corresponds to the subscription that you want to manage.



The screenshot shows a table titled "2 Subscriptions" with a search icon in the top right corner. The table has four columns: Name, Service, Cloud Provider, and Status. There are two rows of data. The first row is "QA Subscription" with Service "test-service", Cloud Provider "aws", and Status "Unsubscribed". The second row is "metering service subscription QA !!!!!" with Service "cloud-volumes-ontap", Cloud Provider "aws", and Status "Subscribed". An action menu is open for the second row, showing two options: "Rename Subscription" and "Manage Accounts".

Name	Service	Cloud Provider	Status
QA Subscription	test-service	aws	Unsubscribed
metering service subscription QA !!!!!	cloud-volumes-ontap	aws	Subscribed

4. Choose to rename the subscription or to manage the accounts that are associated with the subscription.

Changing your account name

Change you account name at any time to change it to something meaningful for you.

Steps

1. From the top of Cloud Manager, click the **Account** drop-down and click **Manage Account**.
2. In the **Overview** tab, click the edit icon next to the account name.
3. Type a new account name and click **Save**.

Allowing private previews

Allow private previews in your account to get access to new NetApp cloud services that are made available as a preview in Cloud Manager.

Services in private preview are not guaranteed to behave as expected and might sustain outages and be missing functionality.

Steps

1. From the top of Cloud Manager, click the **Account** drop-down and click **Manage Account**.
2. In the **Overview** tab, enable the **Allow Private Preview** setting.

Allowing third-party services

Allow third-party services in your account to get access to third-party services that are available in Cloud Manager. Third-party services are cloud services similar to the services that NetApp offers, but they're

managed and supported by third-party companies.

Steps

1. From the top of Cloud Manager, click the **Account** drop-down and click **Manage Account**.
2. In the **Overview** tab, enable the **Allow Third Party Services** setting.

Disabling the SaaS platform

We don't recommend disabling the SaaS platform unless you need to in order to comply with your company's security policies. Disabling the SaaS platform limits your ability to use NetApp's integrated cloud services.

The following services aren't available from Cloud Manager if you disable the SaaS platform:

- Cloud Data Sense
- Kubernetes
- Cloud Tiering
- Global File Cache

If you do disable the SaaS platform, you'll need to perform all tasks from [the local user interface that is available on a Connector](#).



This is an irreversible action that will prevent you from using the Cloud Manager SaaS platform. You'll need to perform actions from the local Connector. You won't have the ability to use many of NetApp's integrated cloud services, and re-enabling the SaaS platform will require the help of NetApp support.

Steps

1. From the top of Cloud Manager, click the **Account** drop-down and click **Manage Account**.
2. In the Overview tab, toggle the option to disable use of the SaaS platform.

Monitoring operations in your account

You can monitor the status of the operations that Cloud Manager is performing to see if there are any issues that you need to address. You can view the status in the Notification Center or in the Timeline.

This table provides a comparison of the Notification Center and the Timeline so you can understand what each has to offer.

Notification Center	Timeline
Shows high level status for events and actions	Provides details for each event or action for further investigation
Shows status for the current login session - the information won't appear in the Notification Center after you log off	Retains status for up to the last month
Shows only actions initiated in the user interface	Shows all actions from the UI or APIs

Notification Center	Timeline
Shows user-initiated actions	Shows all actions, whether user-initiated or system-initiated
Filter results by importance	Filter by service, action, user, status, and more

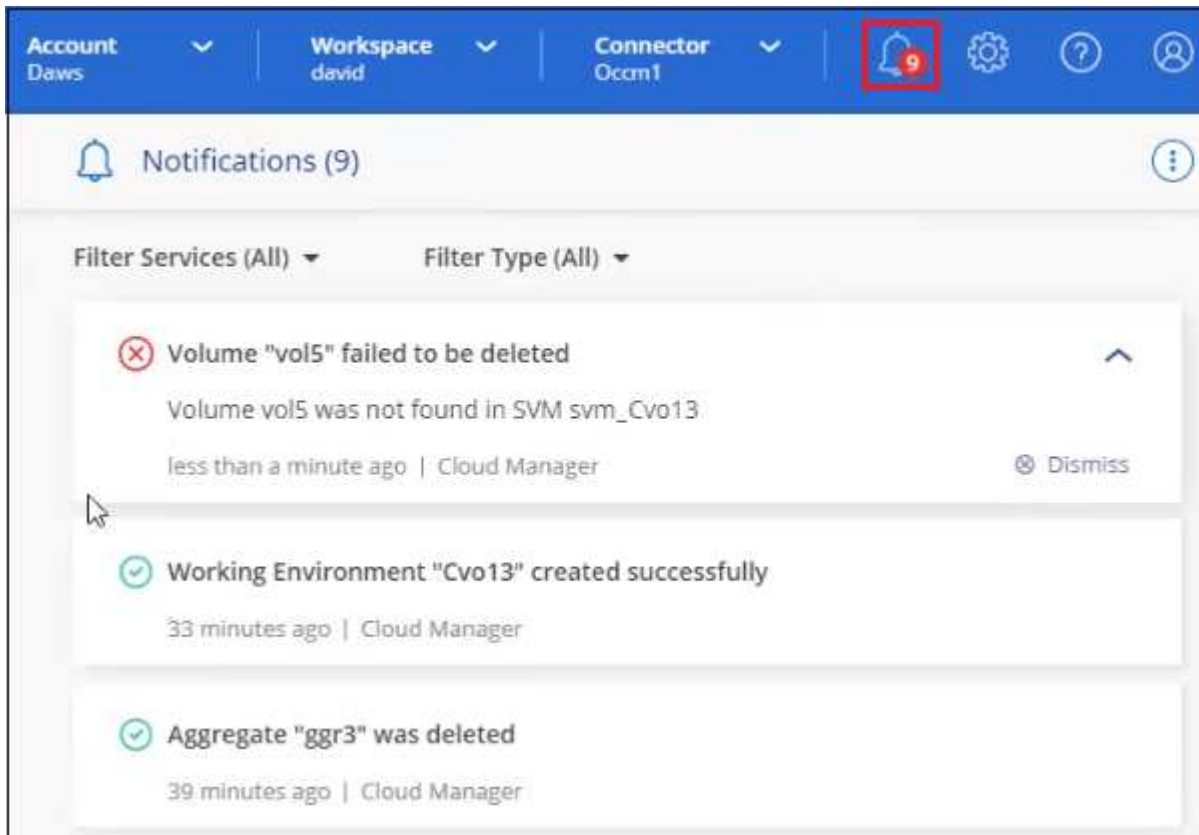
Monitoring operations status using the Notification Center

Notifications are like events where they track the progress of operations that you've initiated in Cloud Manager so you can verify whether the operation was successful, or if it failed. They enable you to view the status for Cloud Manager operations (and cloud services operations in the future) that you initiated during your current login session.

At this time, only notifications for creating and deleting the following Cloud Volumes ONTAP objects are supported:

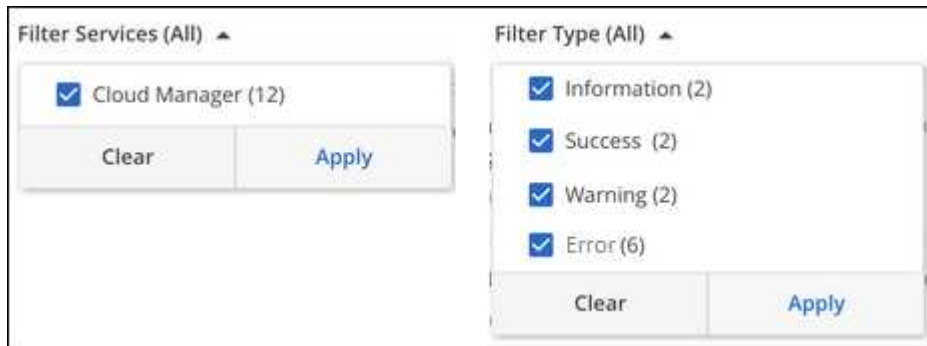
- working environments
- aggregates
- volumes

You display the notifications by clicking the notification bell (🔔) in the menu bar. The color of the little bubble in the bell indicates the highest level severity notification that is active. So if you see a red bubble, it means there's an important notification that you should look at.



Filtering notifications

By default you'll see all notifications. You can filter the notifications that you see in the Notification Center to show only those notifications that are important to you. You can filter by Cloud Manager "Service" and by notification "Type".

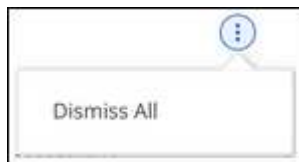


For example, if you want to see only "Error" and "Warning" notifications for Cloud Manager operations, select those entries and you'll see only those types of notifications.

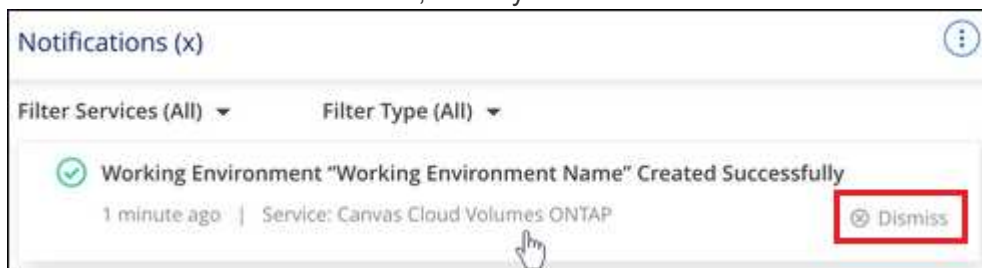
Dismissing notifications

You can remove notifications from the page if you no longer need to see them. You can dismiss all notifications at once, or you can dismiss individual notifications.

To dismiss all notifications, in the Notification Center, click  and select **Dismiss All**.



To dismiss individual notifications, hover your cursor over the notification and click **Dismiss**.



Auditing user activity in your account

The Timeline in Cloud Manager shows the actions that users completed to manage your account. This includes management actions such as associating users, creating workspaces, creating Connectors, and more.

Checking the Timeline can be helpful if you need to identify who performed a specific action, or if you need to identify the status of an action.

Steps

1. Click **All Services > Timeline**.
2. Under the Filters, click **Service**, enable **Tenancy**, and click **Apply**.

Result

The Timeline updates to show you account management actions.

Managing an HTTPS certificate for secure access

By default, Cloud Manager uses a self-signed certificate for HTTPS access to the web console. You can install a certificate signed by a certificate authority (CA), which provides better security protection than a self-signed certificate.

Before you get started

You need to create a Connector before you can change Cloud Manager settings. [Learn how](#).

Installing an HTTPS certificate

Install a certificate signed by a CA for secure access.

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **HTTPS Setup**.



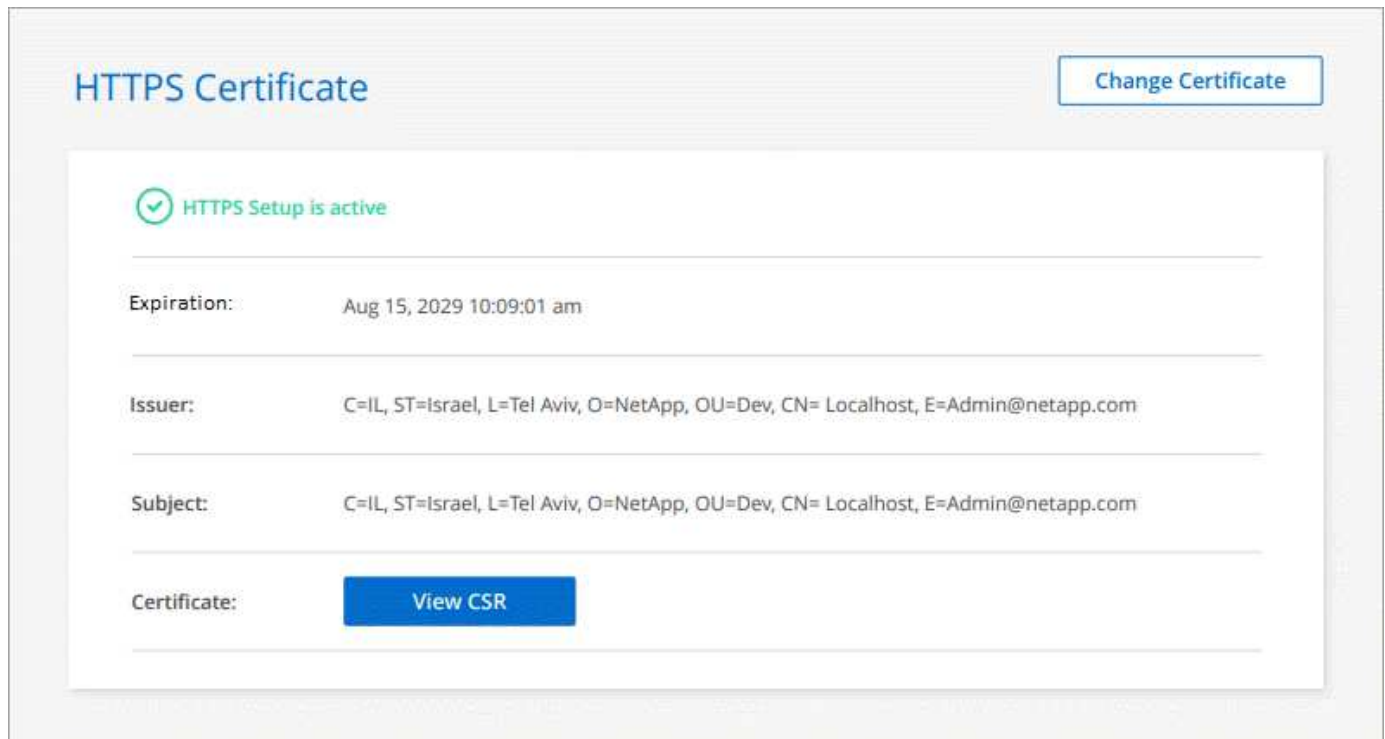
2. In the HTTPS Setup page, install a certificate by generating a certificate signing request (CSR) or by installing your own CA-signed certificate:

Option	Description
Generate a CSR	<ol style="list-style-type: none">a. Enter the host name or DNS of the Connector host (its Common Name), and then click Generate CSR. Cloud Manager displays a certificate signing request.b. Use the CSR to submit an SSL certificate request to a CA. The certificate must use the Privacy Enhanced Mail (PEM) Base-64 encoded X.509 format.c. Upload the certificate file and then click Install.
Install your own CA-signed certificate	<ol style="list-style-type: none">a. Select Install CA-signed certificate.b. Load both the certificate file and the private key and then click Install. The certificate must use the Privacy Enhanced Mail (PEM) Base-64 encoded X.509 format.

Result

Cloud Manager now uses the CA-signed certificate to provide secure HTTPS access. The following image

shows a Cloud Manager system that is configured for secure access:



Renewing the Cloud Manager HTTPS certificate

You should renew the Cloud Manager HTTPS certificate before it expires to ensure secure access to the Cloud Manager web console. If you do not renew the certificate before it expires, a warning appears when users access the web console using HTTPS.

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **HTTPS Setup**.

Details about the Cloud Manager certificate displays, including the expiration date.

2. Click **Change Certificate** and follow the steps to generate a CSR or install your own CA-signed certificate.

Result

Cloud Manager uses the new CA-signed certificate to provide secure HTTPS access.

Removing Cloud Volumes ONTAP working environments

The Account Admin can remove a Cloud Volumes ONTAP working environment to move it to another system or to troubleshoot discovery issues.

About this task

Removing a Cloud Volumes ONTAP working environment removes it from Cloud Manager. It does not delete the Cloud Volumes ONTAP system. You can later rediscover the working environment.

Removing a working environment from Cloud Manager enables you to do the following:

- Rediscover it in another workspace

- Rediscover it from another Cloud Manager system
- Rediscover it if you had problems during the initial discovery

Steps

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



2. From the Tools page, click **Launch**.
3. Select the Cloud Volumes ONTAP working environment that you want to remove.
4. On the Review and Approve page, click **Go**.

Result

Cloud Manager removes the working environment. Users can rediscover this working environment from the Canvas page at any time.

Configuring a Connector to use an HTTP proxy server

If your corporate policies require you to use a proxy server for all HTTP communication to the internet, then you must configure your Connectors to use that HTTP proxy server. The proxy server can be in the cloud or in your network.

Cloud Manager doesn't support using an HTTPS proxy with the Connector.

Enable a proxy on a Connector

When you configure a Connector to use a proxy server, that Connector and the Cloud Volumes ONTAP systems that it manages (including any HA mediators), all use the proxy server.

Note that this operation restarts the Connector. Ensure that the Connector isn't performing any operations before you proceed.

Steps

1. [Log in to the Cloud Manager SaaS interface](#) from a machine that has a network connection to the Connector instance.

If the Connector doesn't have a public IP address, you'll need a VPN connection or you'll need to connect from a jump host that's in the same network as the Connector.

2. Click the **Connector** drop-down and then click **Go to local UI** for a specific Connector.



The Cloud Manager interface running on the Connector loads in a new browser tab.

3. In the upper right of the Cloud Manager console, click the Settings icon, and select **Connector Settings**.



4. Under **General**, click **HTTP Proxy Configuration**.
5. Set up the proxy:
 - a. Click **Enable Proxy**.
 - b. Specify the server using the syntax `http://address:port`
 - c. Specify a user name and password if basic authentication is required for the server
 - d. Click **Save**.



Cloud Manager doesn't support passwords that include the @ character.

Result

After you specify the proxy server, new Cloud Volumes ONTAP systems are automatically configured to use the proxy server when sending AutoSupport messages. If you didn't specify the proxy server before users create Cloud Volumes ONTAP systems, then they must use System Manager to manually set the proxy server in the AutoSupport options for each system.

Enable direct API traffic

If you configured a proxy server, you can send API calls directly to Cloud Manager without going through the proxy. This option is supported with Connectors that are running in AWS, in Azure, or in Google Cloud.

Steps

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



2. Under **General**, click **Support Direct API Traffic**.
3. Click the checkbox to enable the option and then click **Save**.

Reference

Roles

The Account Admin, Workspace Admin, Compliance Viewer, and SnapCenter Admin roles provide specific permissions to users.

The Compliance Viewer role is for read-only Cloud Data Sense access.

Task	Account Admin	Workspace Admin	Compliance Viewer	SnapCenter Admin
Manage working environments	Yes	Yes	No	No
Enable services on working environments	Yes	Yes	No	No
View data replication status	Yes	Yes	No	No
View the timeline	Yes	Yes	No	No
Switch between workspaces	Yes	Yes	Yes	No
View Data Sense scan results	Yes	Yes	Yes	No
Delete working environments	Yes	No	No	No
Connect Kubernetes clusters to working environments	Yes	No	No	No
Receive the Cloud Volumes ONTAP report	Yes	No	No	No
Create Connectors	Yes	No	No	No

Task	Account Admin	Workspace Admin	Compliance Viewer	SnapCenter Admin
Manage NetApp accounts	Yes	No	No	No
Manage credentials	Yes	No	No	No
Modify Cloud Manager settings	Yes	No	No	No
View and manage the Support Dashboard	Yes	No	No	No
Remove working environments from Cloud Manager	Yes	No	No	No
Install an HTTPS certificate	Yes	No	No	No
Use the SnapCenter Service	Yes	Yes	No	Yes

Related links

- [Setting up workspaces and users in the NetApp account](#)
- [Managing workspaces and users in the NetApp account](#)

How Cloud Manager uses cloud provider permissions

Cloud Manager requires permissions to perform actions in your cloud provider. These permissions are included in [the policies provided by NetApp](#). You might want to understand what Cloud Manager does with these permissions.

What Cloud Manager does with AWS permissions

Cloud Manager uses an AWS account to make API calls to several AWS services, including EC2, S3, CloudFormation, IAM, the Security Token Service (STS), and the Key Management Service (KMS).

Actions	Purpose
"ec2:StartInstances", "ec2:StopInstances", "ec2:DescribeInstances", "ec2:DescribeInstanceStatus", "ec2:RunInstances", "ec2:TerminateInstances", "ec2:ModifyInstanceAttribute",	Launches a Cloud Volumes ONTAP instance and stops, starts, and monitors the instance.
"ec2:DescribeInstanceAttribute",	Verifies that enhanced networking is enabled for supported instance types.
"ec2:DescribeRouteTables", "ec2:DescribeImages",	Launches a Cloud Volumes ONTAP HA configuration.

Actions	Purpose
"ec2:CreateTags",	Tags every resource that Cloud Manager creates with the "WorkingEnvironment" and "WorkingEnvironmentId" tags. Cloud Manager uses these tags for maintenance and cost allocation.
"ec2:CreateVolume", "ec2:DescribeVolumes", "ec2:ModifyVolumeAttribute", "ec2:AttachVolume", "ec2>DeleteVolume", "ec2:DetachVolume",	Manages the EBS volumes that Cloud Volumes ONTAP uses as back-end storage.
"ec2:CreateSecurityGroup", "ec2>DeleteSecurityGroup", "ec2:DescribeSecurityGroups", "ec2:RevokeSecurityGroupEgress", "ec2:AuthorizeSecurityGroupEgress", "ec2:AuthorizeSecurityGroupIngress", "ec2:RevokeSecurityGroupIngress",	Creates predefined security groups for Cloud Volumes ONTAP.
"ec2:CreateNetworkInterface", "ec2:DescribeNetworkInterfaces", "ec2>DeleteNetworkInterface", "ec2:ModifyNetworkInterfaceAttribute",	Creates and manages network interfaces for Cloud Volumes ONTAP in the target subnet.
"ec2:DescribeSubnets", "ec2:DescribeVpcs",	Gets the list of destination subnets and security groups, which is needed when creating a new working environment for Cloud Volumes ONTAP.
"ec2:DescribeDhcpOptions",	Determines DNS servers and the default domain name when launching Cloud Volumes ONTAP instances.
"ec2:CreateSnapshot", "ec2>DeleteSnapshot", "ec2:DescribeSnapshots",	Takes snapshots of EBS volumes during initial setup and whenever a Cloud Volumes ONTAP instance is stopped.
"ec2:GetConsoleOutput",	Captures the Cloud Volumes ONTAP console, which is attached to AutoSupport messages.
"ec2:DescribeKeyPairs",	Obtains the list of available key pairs when launching instances.
"ec2:DescribeRegions",	Gets a list of available AWS regions.
"ec2>DeleteTags", "ec2:DescribeTags",	Manages tags for resources associated with Cloud Volumes ONTAP instances.
"cloudformation:CreateStack", "cloudformation>DeleteStack", "cloudformation:DescribeStacks", "cloudformation:DescribeStackEvents", "cloudformation:ValidateTemplate",	Launches Cloud Volumes ONTAP instances.

Actions	Purpose
"iam:PassRole", "iam:CreateRole", "iam:DeleteRole", "iam:PutRolePolicy", "iam:CreateInstanceProfile", "iam:DeleteRolePolicy", "iam:AddRoleToInstanceProfile", "iam:RemoveRoleFromInstanceProfile", "iam:DeleteInstanceProfile",	Launches a Cloud Volumes ONTAP HA configuration.
"iam:ListInstanceProfiles", "sts:DecodeAuthorizationMessage", "ec2:AssociateIamInstanceProfile", "ec2:DescribeIamInstanceProfileAssociations", "ec2:DisassociateIamInstanceProfile",	Manages instance profiles for Cloud Volumes ONTAP instances.
"s3:GetBucketTagging", "s3:GetBucketLocation", "s3:ListAllMyBuckets", "s3:ListBucket"	Obtains information about AWS S3 buckets so Cloud Manager can integrate with the NetApp Data Fabric Cloud Sync service.
"s3:CreateBucket", "s3:DeleteBucket", "s3:GetLifecycleConfiguration", "s3:PutLifecycleConfiguration", "s3:PutBucketTagging", "s3:ListBucketVersions", "s3:GetBucketPolicyStatus", "s3:GetBucketPublicAccessBlock", "s3:GetBucketAcl", "s3:GetBucketPolicy", "s3:PutBucketPublicAccessBlock"	Manages the S3 bucket that a Cloud Volumes ONTAP system uses as a capacity tier for data tiering.
"kms:List*", "kms:ReEncrypt*", "kms:Describe*", "kms:CreateGrant",	Enables data encryption of Cloud Volumes ONTAP using the AWS Key Management Service (KMS).
"ce:GetReservationUtilization", "ce:GetDimensionValues", "ce:GetCostAndUsage", "ce:GetTags"	Obtains AWS cost data for Cloud Volumes ONTAP.
"ec2:CreatePlacementGroup", "ec2:DeletePlacementGroup"	When you deploy an HA configuration in a single AWS Availability Zone, Cloud Manager launches the two HA nodes and the mediator in an AWS spread placement group.
"ec2:DescribeReservedInstancesOfferings"	Cloud Manager uses the permission as part of Cloud Data Sense deployment to choose which instance type to use.

Actions	Purpose
"ec2:CreateTags", "ec2:DeleteTags", "ec2:DescribeTags", "tag:getResources", "tag:getTagKeys", "tag:getTagValues", "tag:TagResources", "tag:UntagResources"	Enables you to manage tags on your AWS resources using the Cloud Manager Tagging service.
"s3:DeleteBucket", "s3:GetLifecycleConfiguration", "s3:PutLifecycleConfiguration", "s3:PutBucketTagging", "s3:ListBucketVersions", "s3:GetObject", "s3:ListBucket", "s3:ListAllMyBuckets", "s3:GetBucketTagging", "s3:GetBucketLocation", "s3:GetBucketPolicyStatus", "s3:GetBucketPublicAccessBlock", "s3:GetBucketAcl", "s3:GetBucketPolicy", "s3:PutBucketPublicAccessBlock"	Cloud Manager uses these permissions when you enable the Backup to S3 service.
"eks:ListClusters", "eks:DescribeCluster", "iam:GetInstanceProfile"	Enables discovery of Amazon EKS clusters.

What Cloud Manager does with Azure permissions

The Cloud Manager Azure policy includes the permissions that Cloud Manager needs to deploy and manage Cloud Volumes ONTAP in Azure.

Actions	Purpose
"Microsoft.Compute/locations/operations/read", "Microsoft.Compute/locations/vmSizes/read", "Microsoft.Compute/operations/read", "Microsoft.Compute/virtualMachines/instanceView/read", "Microsoft.Compute/virtualMachines/powerOff/action", "Microsoft.Compute/virtualMachines/read", "Microsoft.Compute/virtualMachines/restart/action", "Microsoft.Compute/virtualMachines/start/action", "Microsoft.Compute/virtualMachines/deallocate/action", "Microsoft.Compute/virtualMachines/vmSizes/read", "Microsoft.Compute/virtualMachines/write",	Creates Cloud Volumes ONTAP and stops, starts, deletes, and obtains the status of the system.
"Microsoft.Compute/images/write", "Microsoft.Compute/images/read",	Enables Cloud Volumes ONTAP deployment from a VHD.

Actions	Purpose
"Microsoft.Compute/disks/delete", "Microsoft.Compute/disks/read", "Microsoft.Compute/disks/write", "Microsoft.Storage/checknameavailability/read", "Microsoft.Storage/operations/read", "Microsoft.Storage/storageAccounts/listkeys/action", "Microsoft.Storage/storageAccounts/read", "Microsoft.Storage/storageAccounts/regeneratekey/action", "Microsoft.Storage/storageAccounts/write", "Microsoft.Storage/storageAccounts/delete", "Microsoft.Storage/usages/read",	Manages Azure storage accounts and disks, and attaches the disks to Cloud Volumes ONTAP.
"Microsoft.Storage/storageAccounts/blobServices/containers/read", "Microsoft.KeyVault/vaults/read", "Microsoft.KeyVault/vaults/accessPolicies/write"	Enables backups to Azure Blob storage and encryption of storage accounts
"Microsoft.Network/networkInterfaces/read", "Microsoft.Network/networkInterfaces/write", "Microsoft.Network/networkInterfaces/join/action",	Creates and manages network interfaces for Cloud Volumes ONTAP in the target subnet.
"Microsoft.Network/networkSecurityGroups/read", "Microsoft.Network/networkSecurityGroups/write", "Microsoft.Network/networkSecurityGroups/join/action",	Creates predefined network security groups for Cloud Volumes ONTAP.
"Microsoft.Resources/subscriptions/locations/read", "Microsoft.Network/locations/operationResults/read", "Microsoft.Network/locations/operations/read", "Microsoft.Network/virtualNetworks/read", "Microsoft.Network/virtualNetworks/checkIpAvailability/read", "Microsoft.Network/virtualNetworks/subnets/read", "Microsoft.Network/virtualNetworks/subnets/virtualMachines/read", "Microsoft.Network/virtualNetworks/virtualMachines/read", "Microsoft.Network/virtualNetworks/subnets/join/action",	Gets network information about regions, the target VNet and subnet, and adds Cloud Volumes ONTAP to VNets.
"Microsoft.Network/virtualNetworks/subnets/write", "Microsoft.Network/routeTables/join/action",	Enables VNet service endpoints for data tiering.
"Microsoft.Resources/deployments/operations/read", "Microsoft.Resources/deployments/read", "Microsoft.Resources/deployments/write",	Deploys Cloud Volumes ONTAP from a template.

Actions	Purpose
"Microsoft.Resources/deployments/operations/read", "Microsoft.Resources/deployments/read", "Microsoft.Resources/deployments/write", "Microsoft.Resources/resources/read", "Microsoft.Resources/subscriptions/operationresults/read", "Microsoft.Resources/subscriptions/resourceGroups/delete", "Microsoft.Resources/subscriptions/resourceGroups/read", "Microsoft.Resources/subscriptions/resourcegroups/resources/read", "Microsoft.Resources/subscriptions/resourceGroups/write",	Creates and manages resource groups for Cloud Volumes ONTAP.
"Microsoft.Compute/snapshots/write", "Microsoft.Compute/snapshots/read", "Microsoft.Compute/snapshots/delete", "Microsoft.Compute/disks/beginGetAccess/action",	Creates and manages Azure managed snapshots.
"Microsoft.Compute/availabilitySets/write", "Microsoft.Compute/availabilitySets/read",	Creates and manages availability sets for Cloud Volumes ONTAP.
"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreements/read", "Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreements/write",	Enables programmatic deployments from the Azure Marketplace.
"Microsoft.Network/loadBalancers/read", "Microsoft.Network/loadBalancers/write", "Microsoft.Network/loadBalancers/delete", "Microsoft.Network/loadBalancers/backendAddressPools/read", "Microsoft.Network/loadBalancers/backendAddressPools/join/action", "Microsoft.Network/loadBalancers/frontendIPConfigurations/read", "Microsoft.Network/loadBalancers/loadBalancingRules/read", "Microsoft.Network/loadBalancers/probes/read", "Microsoft.Network/loadBalancers/probes/join/action",	Manages an Azure load balancer for HA pairs.
"Microsoft.Authorization/locks/*",	Enables management of locks on Azure disks.
"Microsoft.Authorization/roleDefinitions/write", "Microsoft.Authorization/roleAssignments/write", "Microsoft.Web/sites/*"	Manages failover for HA pairs.

Actions	Purpose
"Microsoft.Network/privateEndpoints/write", "Microsoft.Storage/storageAccounts/PrivateEndpointConnectionsApproval/action", "Microsoft.Storage/storageAccounts/privateEndpointConnections/read", "Microsoft.Network/privateEndpoints/read", "Microsoft.Network/privateDnsZones/write", "Microsoft.Network/privateDnsZones/virtualNetworkLinks/write", "Microsoft.Network/virtualNetworks/join/action", "Microsoft.Network/privateDnsZones/A/write", "Microsoft.Network/privateDnsZones/read", "Microsoft.Network/privateDnsZones/virtualNetworkLinks/read",	Enables the management of private endpoints. Private endpoints are used when connectivity isn't provided to outside the subnet. Cloud Manager creates the storage account for HA with only internal connectivity within the subnet.
"Microsoft.NetApp/netAppAccounts/capacityPools/volumes/delete",	Enables Cloud Manager to delete volumes for Azure NetApp Files.
"Microsoft.Resources/deployments/operationStatuses/read"	Azure requires this permission for some virtual machine deployments (it depends on the underlying physical hardware that's used during deployment).
"Microsoft.Resources/deployments/operationStatuses/read", "Microsoft.Insights/Metrics/Read", "Microsoft.Compute/virtualMachines/extensions/write", "Microsoft.Compute/virtualMachines/extensions/read", "Microsoft.Compute/virtualMachines/extensions/delete", "Microsoft.Compute/virtualMachines/delete", "Microsoft.Network/networkInterfaces/delete", "Microsoft.Network/networkSecurityGroups/delete", "Microsoft.Resources/deployments/delete",	Enables you to use Global File Cache.
"Microsoft.Network/privateEndpoints/delete", "Microsoft.Compute/availabilitySets/delete",	Enables Cloud Manager to remove resources from a resource group that belong to Cloud Volumes ONTAP in case of deployment failure or deletion.
"Microsoft.Compute/diskEncryptionSets/read" "Microsoft.Compute/diskEncryptionSets/write", "Microsoft.Compute/diskEncryptionSets/delete" "Microsoft.KeyVault/vaults/deploy/action", "Microsoft.KeyVault/vaults/read", "Microsoft.KeyVault/vaults/accessPolicies/write",	Enables use of customer-managed encryption keys with Cloud Volumes ONTAP. This feature is supported using APIs.
"Microsoft.Resources/tags/read", "Microsoft.Resources/tags/write", "Microsoft.Resources/tags/delete"	Enables you to manage tags on your Azure resources using the Cloud Manager Tagging service.

Actions	Purpose
"Microsoft.Network/applicationSecurityGroups/write", "Microsoft.Network/applicationSecurityGroups/read", "Microsoft.Network/applicationSecurityGroups/joinIpC onfiguration/action", "Microsoft.Network/networkSecurityGroups/securityRu les/write", "Microsoft.Network/applicationSecurityGroups/delete", "Microsoft.Network/networkSecurityGroups/securityRu les/delete"	Enables Cloud Manager to configure an application security group for an HA pair, which isolates the HA interconnect and cluster network NICs.

What Cloud Manager does with GCP permissions

The Cloud Manager policy for GCP includes the permissions that Cloud Manager needs to deploy and manage Cloud Volumes ONTAP.

Actions	Purpose
- compute.disks.create - compute.disks.createSnapshot - compute.disks.delete - compute.disks.get - compute.disks.list - compute.disks.setLabels - compute.disks.use	To create and manage disks for Cloud Volumes ONTAP.
- compute.firewalls.create - compute.firewalls.delete - compute.firewalls.get - compute.firewalls.list	To create firewall rules for Cloud Volumes ONTAP.
- compute.globalOperations.get	To get the status of operations.
- compute.images.get - compute.images.getFromFamily - compute.images.list - compute.images.useReadOnly	To get images for VM instances.
- compute.instances.attachDisk - compute.instances.detachDisk	To attach and detach disks to Cloud Volumes ONTAP.
- compute.instances.create - compute.instances.delete	To create and delete Cloud Volumes ONTAP VM instances.
- compute.instances.get	To list VM instances.
- compute.instances.getSerialPortOutput	To get console logs.
- compute.instances.list	To retrieve the list of instances in a zone.
- compute.instances.setDeletionProtection	To set deletion protection on the instance.
- compute.instances.setLabels	To add labels.
- compute.instances.setMachineType - compute.instances.setMinCpuPlatform	To change the machine type for Cloud Volumes ONTAP.

Actions	Purpose
- compute.instances.setMetadata	To add metadata.
- compute.instances.setTags	To add tags for firewall rules.
- compute.instances.start - compute.instances.stop - compute.instances.updateDisplayDevice	To start and stop Cloud Volumes ONTAP.
- compute.machineTypes.get	To get the numbers of cores to check quotas.
- compute.projects.get	To support multi-projects.
- compute.snapshots.create - compute.snapshots.delete - compute.snapshots.get - compute.snapshots.list - compute.snapshots.setLabels	To create and manage persistent disk snapshots.
- compute.networks.get - compute.networks.list - compute.regions.get - compute.regions.list - compute.subnetworks.get - compute.subnetworks.list - compute.zoneOperations.get - compute.zones.get - compute.zones.list	To get the networking information needed to create a new Cloud Volumes ONTAP virtual machine instance.
- deploymentmanager.compositeTypes.get - deploymentmanager.compositeTypes.list - deploymentmanager.deployments.create - deploymentmanager.deployments.delete - deploymentmanager.deployments.get - deploymentmanager.deployments.list - deploymentmanager.manifests.get - deploymentmanager.manifests.list - deploymentmanager.operations.get - deploymentmanager.operations.list - deploymentmanager.resources.get - deploymentmanager.resources.list - deploymentmanager.typeProviders.get - deploymentmanager.typeProviders.list - deploymentmanager.types.get - deploymentmanager.types.list	To deploy the Cloud Volumes ONTAP virtual machine instance using Google Cloud Deployment Manager.
- logging.logEntries.list - logging.privateLogEntries.list	To get stack log drives.
- resourcemanager.projects.get	To support multi-projects.
- storage.buckets.create - storage.buckets.delete - storage.buckets.get - storage.buckets.list - storage.buckets.update	To create and manage a Google Cloud Storage bucket for data tiering.

Actions	Purpose
<ul style="list-style-type: none"> - cloudkms.cryptoKeyVersions.useToEncrypt - cloudkms.cryptoKeys.get - cloudkms.cryptoKeys.list - cloudkms.keyRings.list 	To use customer-managed encryption keys from the Cloud Key Management Service with Cloud Volumes ONTAP.
<ul style="list-style-type: none"> - compute.instances.setServiceAccount - iam.serviceAccounts.actAs - iam.serviceAccounts.getIamPolicy - iam.serviceAccounts.list - storage.objects.get - storage.objects.list 	To set a service account on the Cloud Volumes ONTAP instance. This service account provides permissions for data tiering to a Google Cloud Storage bucket.
<ul style="list-style-type: none"> - compute.addresses.list - compute.backendServices.create - compute.networks.updatePolicy - compute.regionBackendServices.create - compute.regionBackendServices.get - compute.regionBackendServices.list 	To deploy HA pairs.
<ul style="list-style-type: none"> - compute.subnetworks.use - compute.subnetworks.useExternalIp - compute.instances.addAccessConfig 	To enable Cloud Data Sense.
<ul style="list-style-type: none"> - container.clusters.get - container.clusters.list 	To discover Kubernetes clusters running in Google Kubernetes Engine.

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