Set up and administer Cloud Manager

Set up and administration

NetApp
September 14, 2022

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Set up and administer Cloud Manager

Release notes

What's new

Learn about what's new with Cloud Manager's administration features: NetApp accounts, Connectors, cloud provider credentials, and more.

31 July 2022

Connector 3.9.21

- We've introduced a new way to discover the existing cloud resources that you're not yet managing in Cloud Manager.

  On the Canvas, the **My Opportunities** tab provides a centralized location to discover existing resources that you can add to Cloud Manager for consistent data services and operations across your hybrid multicloud.

  In this initial release, My Opportunities enables you to discover existing FSx for ONTAP file systems in your AWS account.

  Learn how to discover FSx for ONTAP using My Opportunities

- This release of the Connector also includes Cloud Volumes ONTAP enhancements.

  Learn about Cloud Volumes ONTAP enhancements

15 July 2022

Policy changes

We updated the documentation by adding the Cloud Manager policies directly inside the docs. This means you can now view the required permissions for the Connector and Cloud Volumes ONTAP right alongside the steps that describe how to set them up. These policies were previously accessible from a page on the NetApp Support Site.

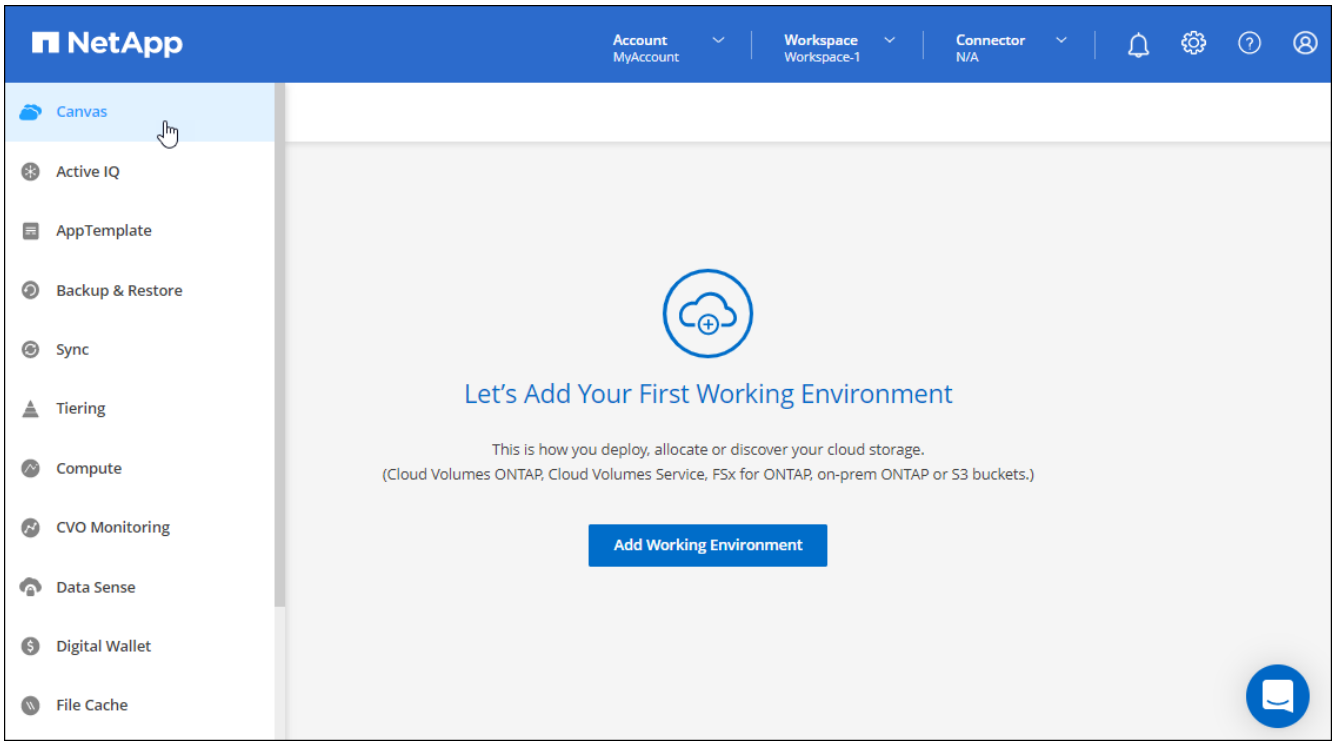
Here's an example that shows the AWS IAM role permissions used to create a Connector.

We also created a page that provides links to each of the policies. View the permissions summary for Cloud Manager.

3 July 2022

Connector 3.9.20

- We've introduced a new way to navigate to the growing list of features in the Cloud Manager interface. All the familiar Cloud Manager capabilities can now be easily found by hovering over the left panel.



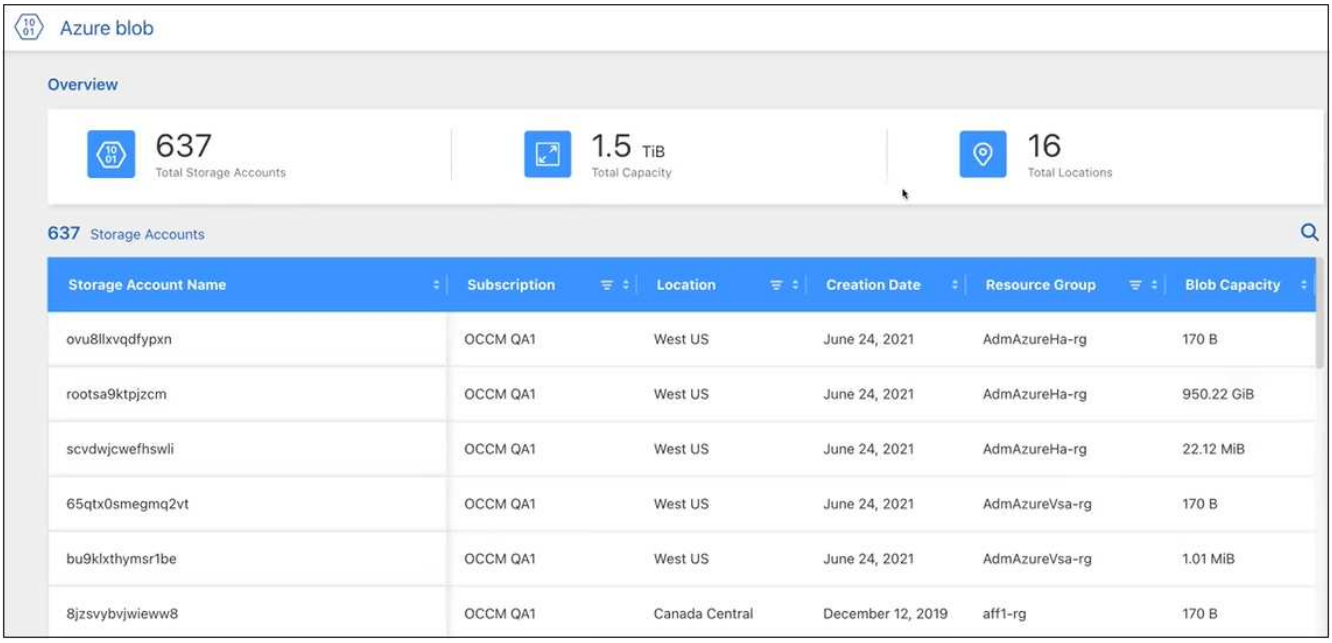
- You can now configure Cloud Manager to send notifications by email so you can be informed of important system activity even when you're not logged into the system.

  Learn more about monitoring operations in your account.

- Cloud Manager now supports Azure Blob storage and Google Cloud Storage as working environments, similar to Amazon S3 support.

  After you install a Connector in Azure or Google Cloud, Cloud Manager now automatically discovers information about Azure Blob storage in your Azure subscription or the Google Cloud Storage in the project where the Connector is installed. Cloud Manager displays the object storage as a working environment that you can open to view more detailed information.

  Here's an example of an Azure Blob working environment:



- We redesigned the resources page for an Amazon S3 working environment by providing more detailed information about S3 buckets, such as capacity, encryption details, and more.
- The Connector is now supported in the following Google Cloud regions:
  - Madrid (europe-southwest1)
  - Paris (europe-west9)
  - Warsaw (europe-central2)
- The Connector is now supported in the Azure West US 3 region.

  View the full list of supported regions

- This release of the Connector also includes Cloud Volumes ONTAP enhancements.

  Learn about Cloud Volumes ONTAP enhancements

28 June 2022

Log in with NetApp credentials

When new users sign up to Cloud Central, they can now select the **Log in with NetApp** option to log in with their NetApp Support Site credentials. This is an alternative to entering an email address and password.

Existing logins that use an email address and password need to keep using that login method. The Log in with NetApp option is available for new users who sign up.

7 June 2022

Connector 3.9.19

- The Connector is now supported in the AWS Jakarta region (ap-southeast-3).
- The Connector is now supported in the Azure Brazil Southeast region.

View the full list of supported regions

- This release of the Connector also includes Cloud Volumes ONTAP enhancements and on-prem ONTAP cluster enhancements.
  - Learn about Cloud Volumes ONTAP enhancements
  - Learn about ONTAP on-prem cluster enhancements

12 May 2022

Connector 3.9.18 patch

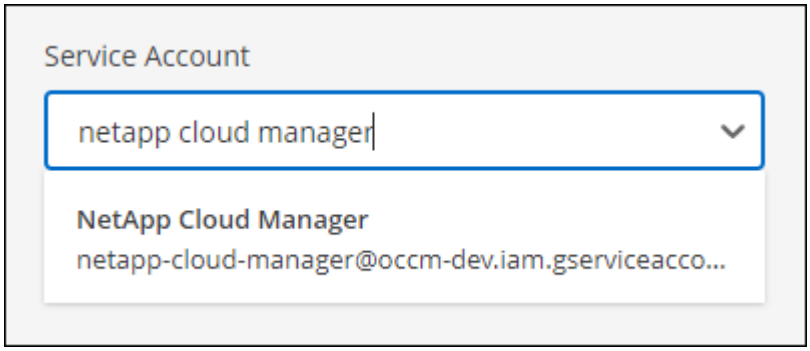
We updated the Connector to introduce bug fixes. The most notable fix is to an issue that affects Cloud Volumes ONTAP deployment in Google Cloud when the Connector is in a shared VPC.

2 May 2022

Connector 3.9.18

- The Connector is now supported in the following Google Cloud regions:
  - Delhi (asia-south2)
  - Melbourne (australia-southeast2)
  - Milan (europe-west8)
  - Santiago (southamerica-west1)

  View the full list of supported regions
- When you select the Google Cloud service account to use with the Connector, Cloud Manager now displays the email address that's associated with each service account. Viewing the email address can make it easier to distinguish between service accounts that share the same name.



- We have certified the Connector in Google Cloud on a VM instance with an OS that supports Shielded VM features
- This release of the Connector also includes Cloud Volumes ONTAP enhancements. Learn about those enhancements
- New AWS permissions are required for the Connector to deploy Cloud Volumes ONTAP.

  The following permissions are now required to create an AWS spread placement group when deploying an HA pair in a single Availability Zone (AZ):

```
"ec2:DescribePlacementGroups",
"iam:GetRolePolicy",
```

These permissions are now required to optimize how Cloud Manager creates the placement group.

Be sure to provide these permissions to each set of AWS credentials that you've added to Cloud Manager. View the latest IAM policy for the Connector.

3 April 2022

Connector 3.9.17

- You can now create a Connector by letting Cloud Manager assume an IAM role that you set up in your environment. This authentication method is more secure than sharing an AWS access key and secret key.

  Learn how to create a Connector using an IAM role.

- This release of the Connector also includes Cloud Volumes ONTAP enhancements. Learn about those enhancements

27 February 2022

Connector 3.9.16

- When you create a new Connector in Google Cloud, Cloud Manager will now display all of your existing firewall policies. Previously, Cloud Manager wouldn't display any policies that didn't have a target tag.
- This release of the Connector also includes Cloud Volumes ONTAP enhancements. Learn about those enhancements

30 January 2022

Connector 3.9.15

This release of the Connector includes Cloud Volumes ONTAP enhancements. Learn about those enhancements

2 January 2022

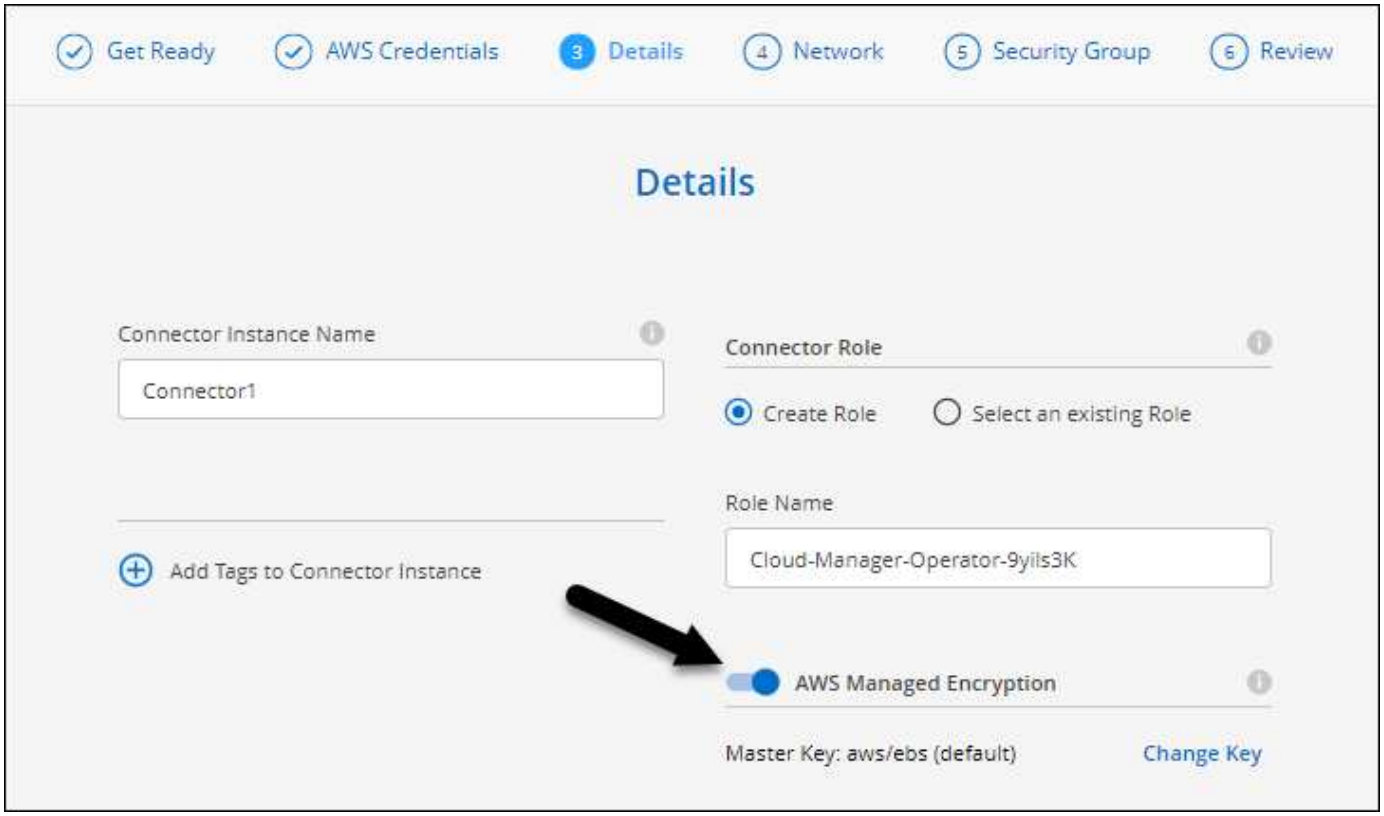
Reduced endpoints for the Connector

We reduced the number of endpoints that a Connector needs to contact in order to manage resources and processes within your public cloud environment.

View the list of required endpoints.

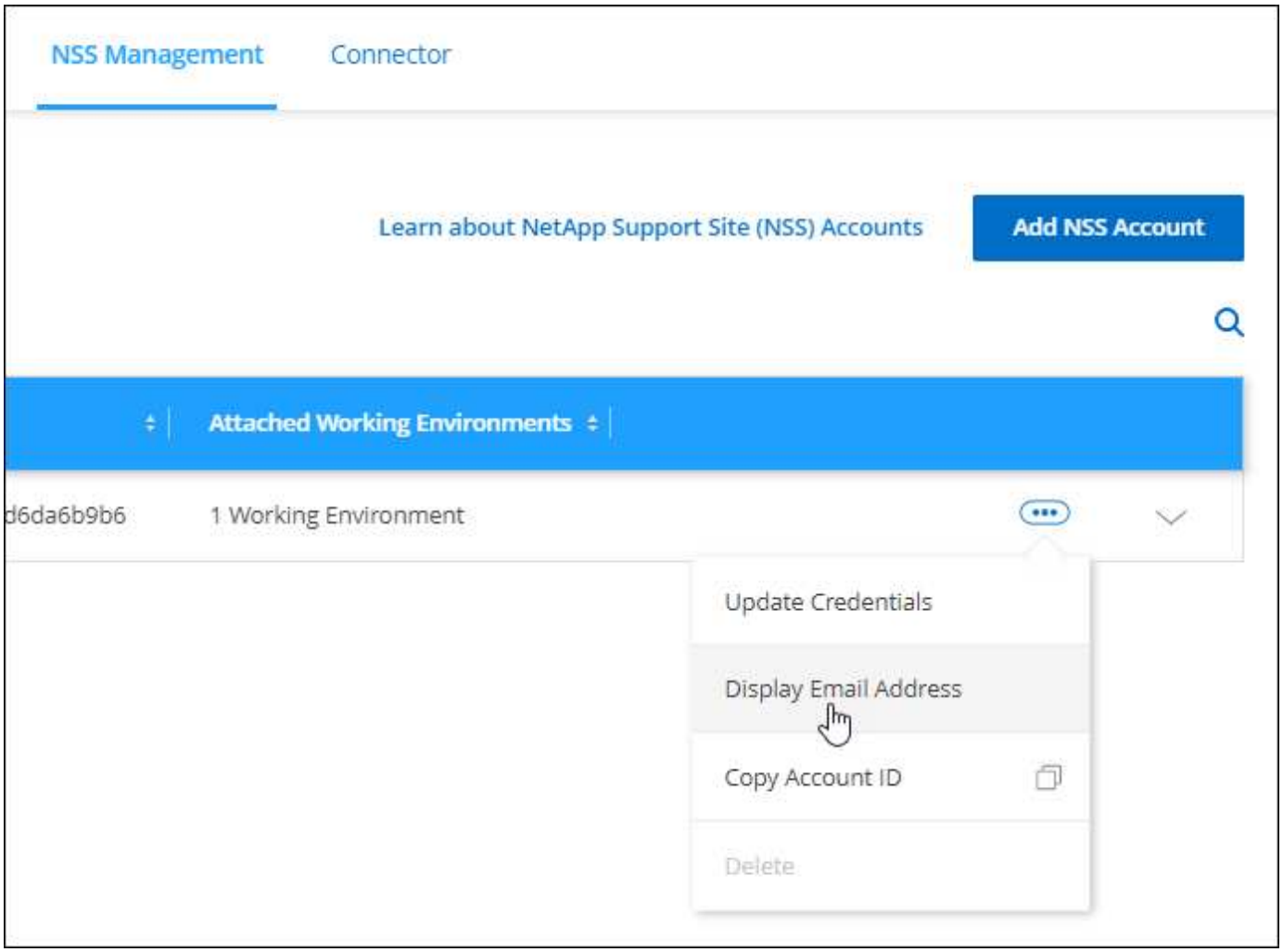
EBS disk encryption for the Connector

When you deploy a new Connector in AWS from Cloud Manager, you can now choose to encrypt the Connector's EBS disks using the default master key or a managed key.



Email address for NSS accounts

Cloud Manager can now display the email address that's associated with a NetApp Support Site account.



28 November 2021

Update required for NetApp Support Site accounts

Starting in December 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 NetApp Support Site accounts that you previously added.

If you haven't yet migrated your NSS account to IDaaS, you first need to migrate the account and then update your credentials in Cloud Manager.

- Learn how to update an NSS account to the new authentication method.
- Learn more about NetApp's use of Microsoft Azure AD for identity management

Change NSS accounts for Cloud Volumes ONTAP

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

Learn how to attach a working environment to a different NSS account.

4 November 2021

SOC 2 Type 2 certification

An independent certified public accountant firm and services auditor examined Cloud Manager, Cloud Sync, Cloud Tiering, Cloud Data Sense, and Cloud Backup (Cloud Manager platform), and affirmed that they have achieved SOC 2 Type 2 reports based on the applicable Trust Services criteria.

View NetApp's SOC 2 reports.

Connector no longer supported as a proxy

You can no longer use the Cloud Manager Connector as a proxy server to send AutoSupport messages from Cloud Volumes ONTAP. This functionality has been removed and is no longer supported. You will need to provide AutoSupport connectivity through a NAT instance or your environment's proxy services.

Learn more about verifying AutoSupport with Cloud Volumes ONTAP

31 October 2021

Authentication with service principal

When you create a new Connector in Microsoft Azure, you can now authenticate with an Azure service principal, rather than with Azure account credentials.

Learn how to authenticate with an Azure service principal.

Credentials enhancement

We redesigned the Credentials page for ease of use and to match the current look and feel of the Cloud Manager interface.

2 September 2021

A new Notification Service has been added

The Notification service has been introduced so you can view the status of Cloud Manager operations that you have initiated during your current login session. You can verify whether the operation was successful, or if it failed. See how to monitor operations in your account.

1 August 2021

RHEL 7.9 support with the Connector

The Connector is now supported on a host that's running Red Hat Enterprise Linux 7.9.

View system requirements for the Connector.

7 July 2021

Enhancements to Add Connector wizard

We redesigned the **Add Connector** wizard to add new options and to make it easier to use. You can now add

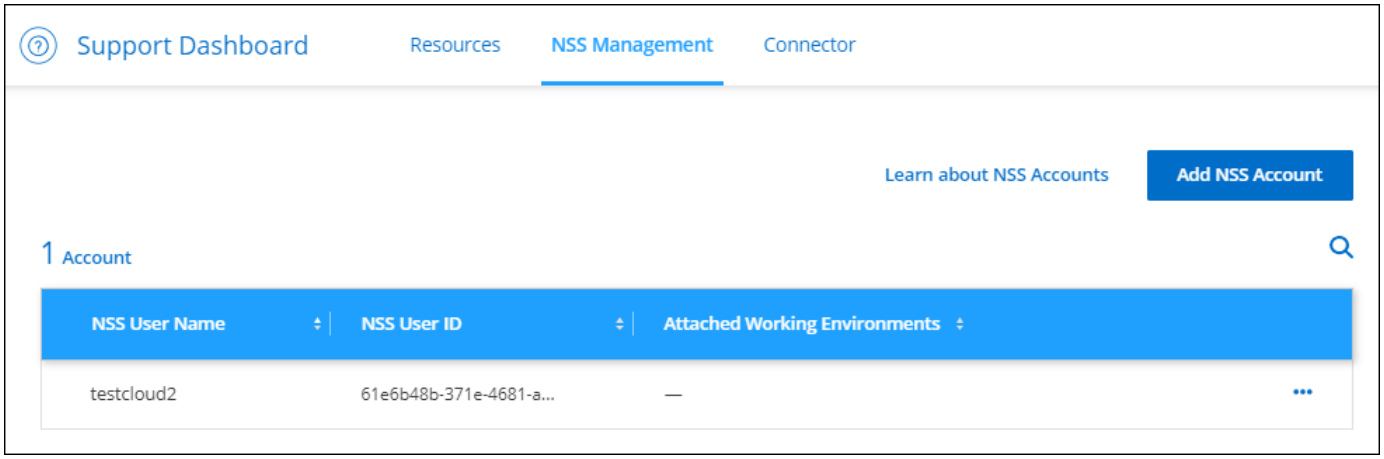
tags, specify a role (for AWS or Azure), upload a root certificate for a proxy server, view code for Terraform automation, view progress details, and more.

- Create a Connector in AWS
- Create a Connector in Azure
- Create a Connector in GCP

NSS account management from Support Dashboard

NetApp Support Site (NSS) accounts are now managed from the Support Dashboard, rather than from the Settings menu. This change makes it easier to find and manage all support-related information from a single location.

Learn how to manage NSS accounts.



5 May 2021

Accounts in the Timeline

The Timeline in Cloud Manager now shows actions and events related to account management. The actions include things like associating users, creating workspaces, and creating Connectors. 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.

Learn how to filter the Timeline to the Tenancy service.

11 April 2021

API calls directly to Cloud Manager

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

Learn more about this setting.

Service account users

You can now create a service account user.

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.

Learn more about using service accounts.

Private previews

You can now allow private previews in your account to get access to new NetApp cloud services as they are made available as a preview in Cloud Manager.

Learn more about this option.

Third-party services

You can also allow third-party services in your account to get access to third-party services that are available in Cloud Manager.

Learn more about this option.

9 February 2021

Support Dashboard improvements

We've updated the Support Dashboard by enabling you to add your NetApp Support Site credentials, which registers you for support. You can also initiate a NetApp Support case directly from the dashboard. Just click the Help icon and then **Support**.

Known limitations

Known limitations identify platforms, devices, or functions that are not supported by this release of the product, or that do not interoperate correctly with it. Review these limitations carefully.

These limitations are specific to Cloud Manager set up and administration: the Connector, the SaaS platform, and more.

Connector limitations

Possible conflict with IP addresses in the 172 range

Cloud Manager deploys the Connector with two interfaces that have IP addresses in the 172.17.0.0/16 and 172.18.0.0/16 ranges.

If your network has a subnet configured with either of these ranges, then you might experience connectivity failures from Cloud Manager. For example, discovering on-prem ONTAP clusters in Cloud Manager might fail.

See Knowledge Base article Cloud Manager Connector IP conflict with existing network for instructions on how to change the IP address of the Connector's interfaces.

Only an HTTP proxy server is supported

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.

SSL decryption isn't supported

Cloud Manager doesn't support firewall configurations that have SSL decryption enabled. If SSL decryption is enabled, error messages appear in Cloud Manager and the Connector instance displays as inactive.

For enhanced security, you have the option to install an HTTPS certificate signed by a certificate authority (CA).

Blank page when loading the local UI

If you load the local user interface for a Connector, the UI might fail to display sometimes, and you just get a blank page.

This issue is related to a caching problem. The workaround is to use an incognito or private web browser session.

Shared Linux hosts are not supported

The Connector isn't supported on a VM that is shared with other applications. The VM must be dedicated to the Connector software.

3rd-party agents and extensions

3rd-party agents or VM extensions are not supported on the Connector VM.

SaaS limitations

SaaS platform is disabled for Government regions

If you deploy a Connector in an AWS GovCloud region, an Azure Gov region, or an Azure DoD region, access to Cloud Manager is available only through a Connector's host IP address. Access to the SaaS platform is disabled for the entire account.

This means that only privileged users who can access the end-user internal VPC/VNet can use Cloud Manager's UI or API.

Note that the only services supported in these regions are Cloud Volumes ONTAP, Cloud Backup, Cloud Data Sense, and Replication. No other NetApp services are supported in Government regions.

Learn how to access the local UI on the Connector.

Marketplace limitations

Pay-as-you-go not available for Azure and Google Cloud partners

If you are a Microsoft Cloud Solution Provider (CSP) partner or a Google Cloud partner, NetApp pay-as-you-go

subscriptions are not available. You must purchase a license and deploy NetApp cloud solutions with a BYOL license.

Pay-as-you-go subscriptions are not available for the following NetApp cloud services:

- Cloud Volumes ONTAP
- Cloud Tiering
- Cloud Backup
- Cloud Data Sense

Get started

Learn about Cloud Manager

Cloud Manager enables IT experts and cloud architects to centrally manage their hybrid multi-cloud infrastructure using NetApp's cloud solutions.

Features

Cloud Manager is an enterprise-class, SaaS-based management platform that keeps you in control of your data no matter where it is.

- Set up and use Cloud Volumes ONTAP for efficient, multi-protocol data management across clouds.
- Set up and use file-storage services:
  - Azure NetApp Files
  - Amazon FSx for ONTAP
  - Cloud Volumes Service for AWS
  - Cloud Volumes Service for Google Cloud
- Discover and manage your on-prem ONTAP clusters by creating volumes, backing up to the cloud, replicating data across your hybrid cloud, and tiering cold data to the cloud.
- Enable integrated cloud services such as:
  - Cloud Data Sense
  - Cloud Insights
  - Cloud Backup

Learn more about Cloud Manager.

Supported object storage providers

Cloud Manager enables you to manage cloud storage and use cloud services in Amazon Web Services, Microsoft Azure, and Google Cloud.

Cost

Cloud Manager software is free of charge from NetApp.

For most tasks, Cloud Manager prompts you to deploy a Connector in your cloud network, which results in charges from your cloud provider for the compute instance and associated storage. You do have the option to run the Connector software on your premises.

Learn about the default configuration for the Connector.

How Cloud Manager works

Cloud Manager includes a SaaS-based interface that is integrated with NetApp Cloud Central, and Connectors that manage Cloud Volumes ONTAP and other cloud services.

Software-as-a-service

Cloud Manager is accessible through a SaaS-based user interface and APIs. This SaaS experience enables you to automatically access the latest features as they're released and to easily switch between your NetApp accounts and Connectors.

NetApp Cloud Central

NetApp Cloud Central provides a centralized location to access and manage NetApp cloud services. With centralized user authentication, you can use the same set of credentials to access Cloud Manager and other cloud services like Cloud Insights.

NetApp account

When you log in to Cloud Manager for the first time, you're prompted to create a *NetApp account*. This account provides multi-tenancy and enables you to organize users and resources in isolated *workspaces*.

Connectors

In most cases, a Cloud Manager Account Admin will need to deploy a *Connector* in your cloud or on-premises network. The Connector enables Cloud Manager to manage resources and processes within your public cloud environment.

A Connector should remain running at all times. It's important for the continued health and operation of the services that you enable.

For example, a Connector is a key component in the health and operation of Cloud Volumes ONTAP. If a Connector is powered down, Cloud Volumes ONTAP PAYGO systems with node-based licensing will shut down after losing communication with a Connector for longer than 14 days.

Learn more about when Connectors are required and how they work.

SOC 2 Type 2 certification

An independent certified public accountant firm and services auditor examined Cloud Manager, Cloud Sync, Cloud Tiering, Cloud Data Sense, and Cloud Backup (Cloud Manager platform), and affirmed that they have achieved SOC 2 Type 2 reports based on the applicable Trust Services criteria.

View NetApp's SOC 2 reports

Getting started checklist

Use this checklist to understand what's needed to get up and running with Cloud Manager in a typical deployment where the Connector has outbound internet access.

A NetApp Cloud Central login

You need to sign up to NetApp Cloud Central so that you can access Cloud Manager and other cloud services.

Network access from a web browser to several endpoints

The Cloud Manager user interface is accessible from a web browser. As you use the Cloud Manager user interface, it contacts several endpoints to complete data management tasks. The machine running the web browser must have connections to the following endpoints.

Endpoints	Purpose
http://cloudmanager.netapp.com	Your web browser contacts this URL when using the SaaS UI.
AWS services (amazonaws.com): • CloudFormation • Cognito • Elastic Compute Cloud (EC2) • Key Management Service (KMS) • Security Token Service (STS) • Simple Storage Service (S3)	Required to deploy a Connector from Cloud Manager in AWS. The exact endpoint depends on the region in which you deploy the Connector. Refer to AWS documentation for details.
https://management.azure.com https://login.microsoftonline.com	Required to deploy a Connector from Cloud Manager in most Azure regions.
https://management.microsoftazure.de https://login.microsoftonline.de	Required to deploy a Connector from Cloud Manager in Azure Germany regions.
https://management.usgovcloudapi.net https://login.microsoftonline.com	Required to deploy a Connector from Cloud Manager in Azure US Gov regions.
https://www.googleapis.com	Required to deploy a Connector from Cloud Manager in Google Cloud.
https://signin.b2c.netapp.com	Required to update NetApp Support Site (NSS) credentials or to add new NSS credentials to Cloud Manager.
https://netapp-cloud-account.auth0.com https://cdn.auth0.com https://services.cloud.netapp.com	Your web browser connects to these endpoints for centralized user authentication through NetApp Cloud Central.
https://widget.intercom.io	For in-product chat that enables you to talk to NetApp cloud experts.

Endpoints	Purpose
The Connector's IP address	In most cases, you should work with Cloud Manager from the SaaS UI, but if you use the local UI, then you must enter the host's IP address from a web browser. Depending on the connectivity to your cloud provider, use the private IP or a public IP assigned to the host: • A private IP works if you have a VPN and direct access to your virtual network • A public IP works in any networking scenario In either case, secure network access by ensuring that security group rules allow access from only authorized IPs or subnets.

Outbound networking for a Connector

After logging in to Cloud Manager, a Cloud Manager Account Admin will need to deploy a *Connector* in a cloud provider or in your on-premises network. The Connector enables Cloud Manager to manage resources and processes within your public cloud environment. A Connector isn't required for Azure NetApp Files, Cloud Volumes Service, or Cloud Sync, but it is required for all other services and features in Cloud Manager. Learn more about Connectors and how they work.

- The network location where you deploy the Connector must have an outbound internet connection.

  The Connector requires outbound internet access to contact the following endpoints in order to manage resources and processes within your public cloud environment.

Endpoints	Purpose
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://*.cloudmanager.cloud.netapp.com	To provide SaaS features and services within Cloud Manager.
https://cloudmanagerinfraprod.azurecr.io https://*.blob.core.windows.net	To upgrade the Connector and its Docker components.

- If you choose to manually install the Connector on your own Linux host (and not do so directly from the Cloud Manager interface), the installer for the Connector requires access to the following endpoints during the installation process:
  - https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm
  - https://s3.amazonaws.com/aws-cli/awscli-bundle.zip
  - https://*.blob.core.windows.net or https://hub.docker.com

    The host might try to update operating system packages during installation. The host can contact different mirroring sites for these OS packages.

- There's no incoming traffic to the Connector, unless you initiate it.

  HTTP (80) and HTTPS (443) provide access to the local UI, which you'll use in rare circumstances. SSH (22) is only needed if you need to connect to the host for troubleshooting.

Cloud provider permissions

You need an account that has permissions to deploy the Connector in your cloud provider directly from Cloud Manager.

There are alternate ways to create a Connector: you can create a Connector from the AWS Marketplace, the Azure Marketplace, or you can manually install the software.

Location	High-level steps	Detailed steps
AWS	1. Use a JSON file that includes the required permissions to create an IAM policy in AWS. 2. Attach the policy to an IAM role or IAM user. 3. When you create the Connector, provide Cloud Manager with the ARN of the IAM role or the AWS access key and secret key for the IAM user.	Click here to view detailed steps.
Azure	1. Use a JSON file that includes the required permissions to create a custom role in Azure. 2. Assign the role to the user who will create the Connector from Cloud Manager. 3. When you create the Connector, log in with the Microsoft account that has the required permissions (the login prompt that is owned and hosted by Microsoft).	Click here to view detailed steps.
Google Cloud	1. Use a YAML file that includes the required permissions to create a custom role in Google Cloud. 2. Attach that role to the user who will create the Connector from Cloud Manager. 3. If you plan to use Cloud Volumes ONTAP, set up a service account that has the required permissions. 4. Enable Google Cloud APIs. 5. When you create the Connector, log in with the Google account that has the required permissions (the login prompt is owned and hosted by Google).	Click here to view detailed steps.

Networking for individual services

Now that your setup is complete, you're ready to start using the services available from Cloud Manager. Note that each service has its own networking requirements. Refer to the following pages for more details.

- Cloud Volumes ONTAP for AWS
- Cloud Volumes ONTAP for Azure

- Cloud Volumes ONTAP for GCP
- Data replication between ONTAP systems
- Deploying Cloud Data Sense
- On-prem ONTAP clusters
- Cloud Tiering
- Cloud Backup

Signing up to NetApp Cloud Central

Sign up to NetApp Cloud Central so you can access NetApp's cloud services.

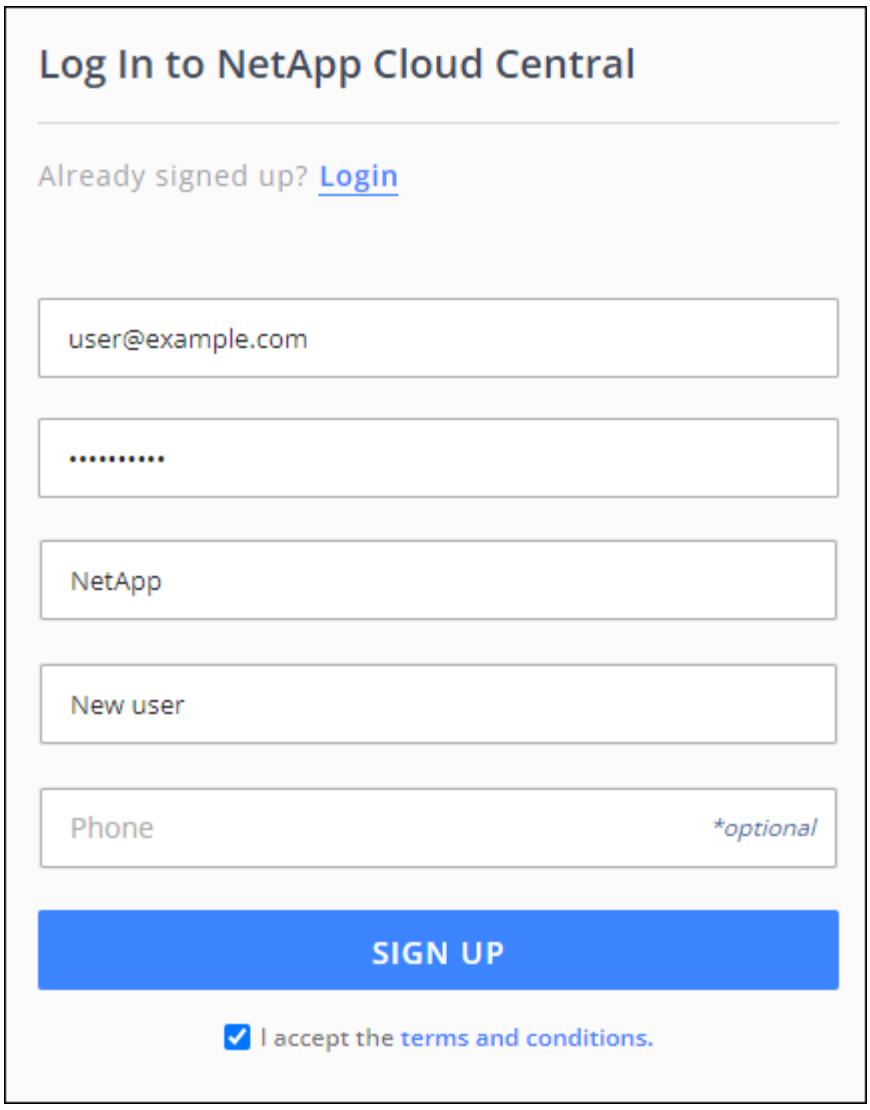
You can use single sign-on to log in using credentials from your corporate directory (federated identity). To learn more, go to the Cloud Central Help Center and then click **Cloud Central sign-in options**.

Requirements

Note that only English characters are allowed in the sign up form.

Steps

1. Open a web browser and go to NetApp Cloud Central
2. Click **Sign Up**.
3. You have two options:
   a. Fill out the form and click **Sign Up**.



b. If you have a registered NetApp Support Site account, click **Log in with NetApp** and then enter your NetApp Support Site credentials.

   Each time that you log in, you'll need to use the option that you chose during this sign up process.

   When you use the Log in with NetApp option, your NetApp Support Site (NSS) credentials are not added to Cloud Manager in the Support Dashboard. Adding your NSS credentials to Cloud Manager is required to enable key workflows for Cloud Volumes ONTAP and to enable predictive analytics and proactive support through Active IQ. Learn how to add your NSS credentials to Cloud Manager.

4. Wait for an email from NetApp Cloud Central.
5. Click the link in the email to verify your email address.

Result

You now have an active Cloud Central user login.

Logging in to Cloud Manager

The Cloud Manager interface is accessible through a SaaS-based user interface by going to https://cloudmanager.netapp.com.

If you're accessing Cloud Manager from a Government region or a site that doesn't have outbound internet access, then you need to log in to the local user interface running on the Connector. Learn how to access the local UI on the Connector.

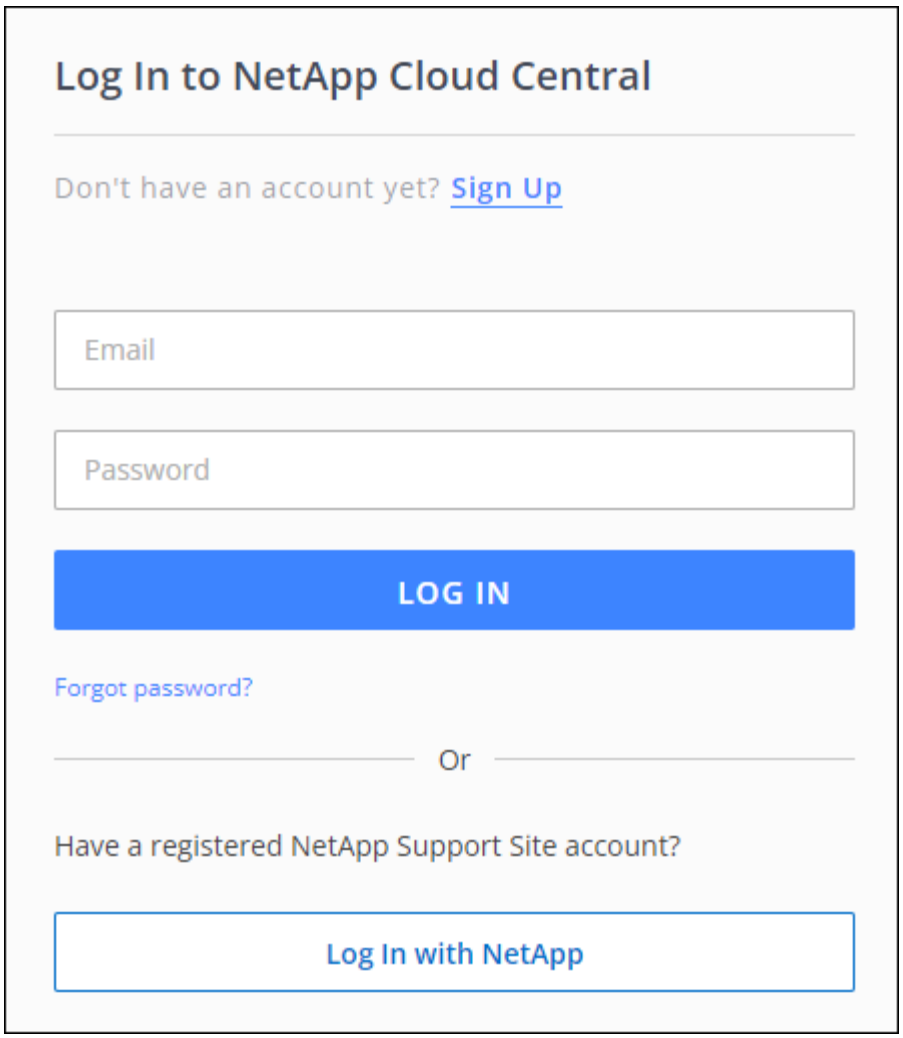
You can use single sign-on to log in using credentials from your corporate directory (federated identity). To learn more, go to the Cloud Central Help Center and then click **Cloud Central sign-in options**.

Steps

1. Open a web browser and go to https://cloudmanager.netapp.com.
2. Log in by entering your NetApp Cloud Central credentials or by clicking **Log in with NetApp** and entering your NetApp Support Site credentials.

   You need to choose the option that you used when you signed up to Cloud Central.

   - If you signed up by entering your email and password, then you need to enter those credentials each time that you log in.
   - If you registered by logging in with your NetApp Support Site credentials, then you need to use that log in option each time.



Result

You're now logged in and can start using Cloud Manager to manage your hybrid multi-cloud infrastructure.

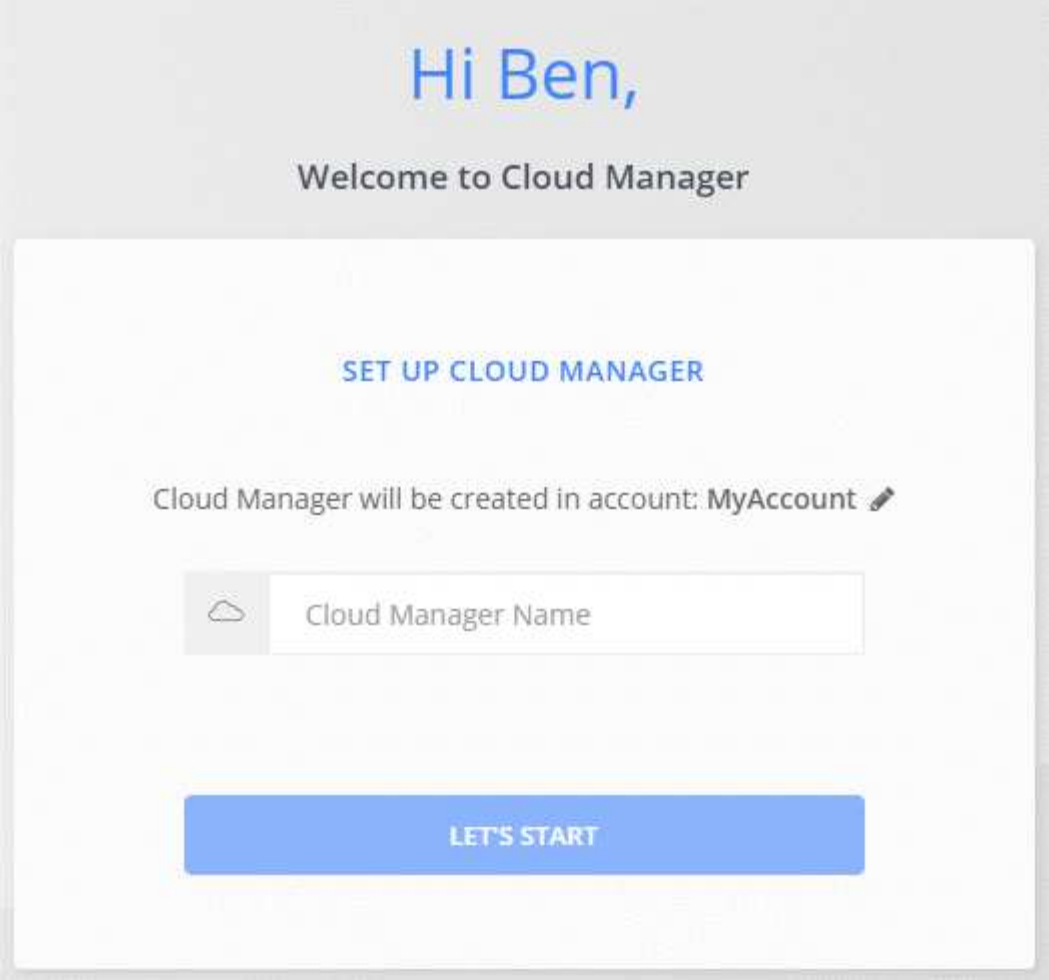
Set up a NetApp account

Learn about NetApp accounts

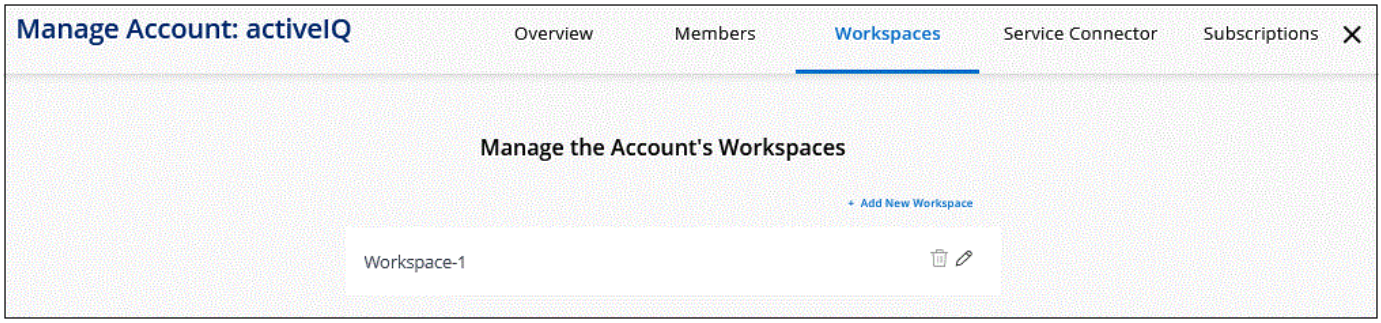
A *NetApp account* provides multi-tenancy and enables you to organize users and resources in isolated workspaces from within Cloud Manager.

For example, multiple users can deploy and manage Cloud Volumes ONTAP systems in isolated environments called *workspaces*. These workspaces are invisible to other users, unless they are shared.

When you first access Cloud Manager, you're prompted to select or create a NetApp account:



Cloud Manager Account Admins can then modify the settings for this account by managing users (members), workspaces, Connectors, and subscriptions:



For step-by-step instructions, see Setting up the NetApp account.

Account Settings

The Manage Account widget in Cloud Manager enables Account Admins to manage a NetApp account. If you just created your account, then you'll start from scratch. But if you've already set up an account, then you'll see *all* the users, workspaces, Connectors, and subscriptions that are associated with the account.

Overview

The Overview page shows the Account Name and the Account ID. You may need to provide your Account ID when registering some services. This page also includes some Cloud Manager configuration options.

Members

The members are NetApp Cloud Central users that you associate with your NetApp account. Associating a user with an account and one or more workspaces in that account enables those users to create and manage working environments in Cloud Manager.

When you associate a user, you assign them a role:

- *Account Admin*: Can perform any action in Cloud Manager.
- *Workspace Admin*: Can create and manage resources in the assigned workspace.
- *Compliance Viewer*: Can only view Cloud Data Sense compliance information and generate reports for systems 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.*

Learn more about these roles.

Workspaces

In Cloud Manager, a workspace isolates any number of *working environments* from other working environments. Workspace Admins can't access the working environments in a workspace unless the Account Admin associates the admin with that workspace.

A working environment represents a storage system:

- A single-node Cloud Volumes ONTAP system or an HA pair
- An on-premises ONTAP cluster in your network
- An ONTAP cluster in a NetApp Private Storage configuration

Learn how to add a workspace.

Connectors

A Connector enables Cloud Manager to manage resources and processes within your public cloud environment. The Connector runs on a virtual machine instance that you deploy in your cloud provider, or on an on-prem host that you configured.

You can use a Connector with more than one NetApp cloud data service. For example, if you already have a Connector for Cloud Manager, you can select it when you set up the Cloud Tiering service.

Learn more about Connectors.

Subscriptions

These are the NetApp subscriptions associated with the selected account.

When you subscribe to Cloud Manager from a cloud provider's marketplace, you're redirected to Cloud Central where you need to save your subscription and associate it with specific accounts.

After you've subscribed, each subscription is available from the Manage Account widget. You'll only see the subscriptions that are associated with the account that you're currently viewing.

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 how to manage subscriptions.

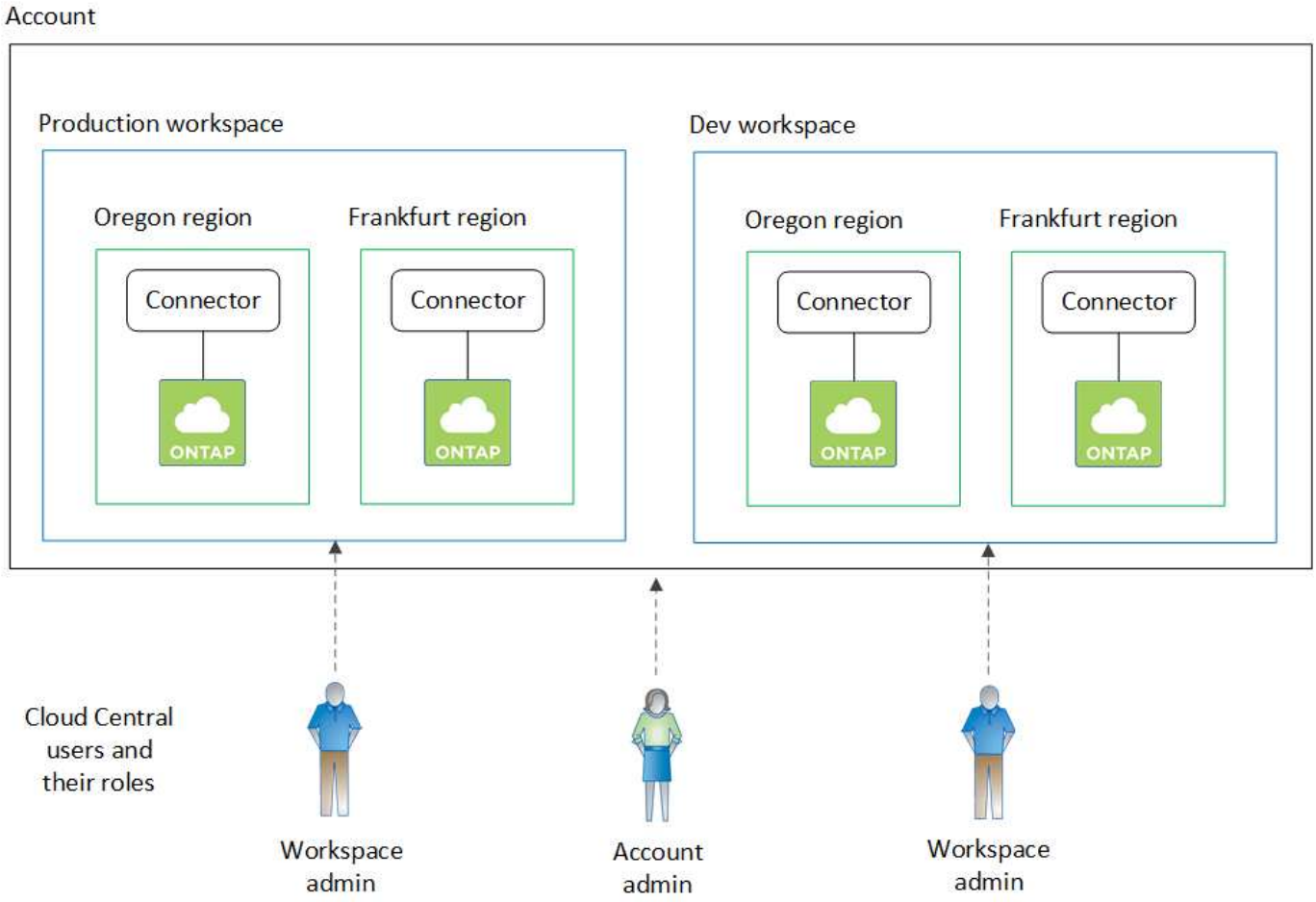
Examples

The following examples depict how you might set up your accounts.

> In both example images that follow, the Connector and the Cloud Volumes ONTAP systems don't actually reside *in* the NetApp account—they're running in a cloud provider. This is a conceptual representation of the relationship between each component.

Example 1

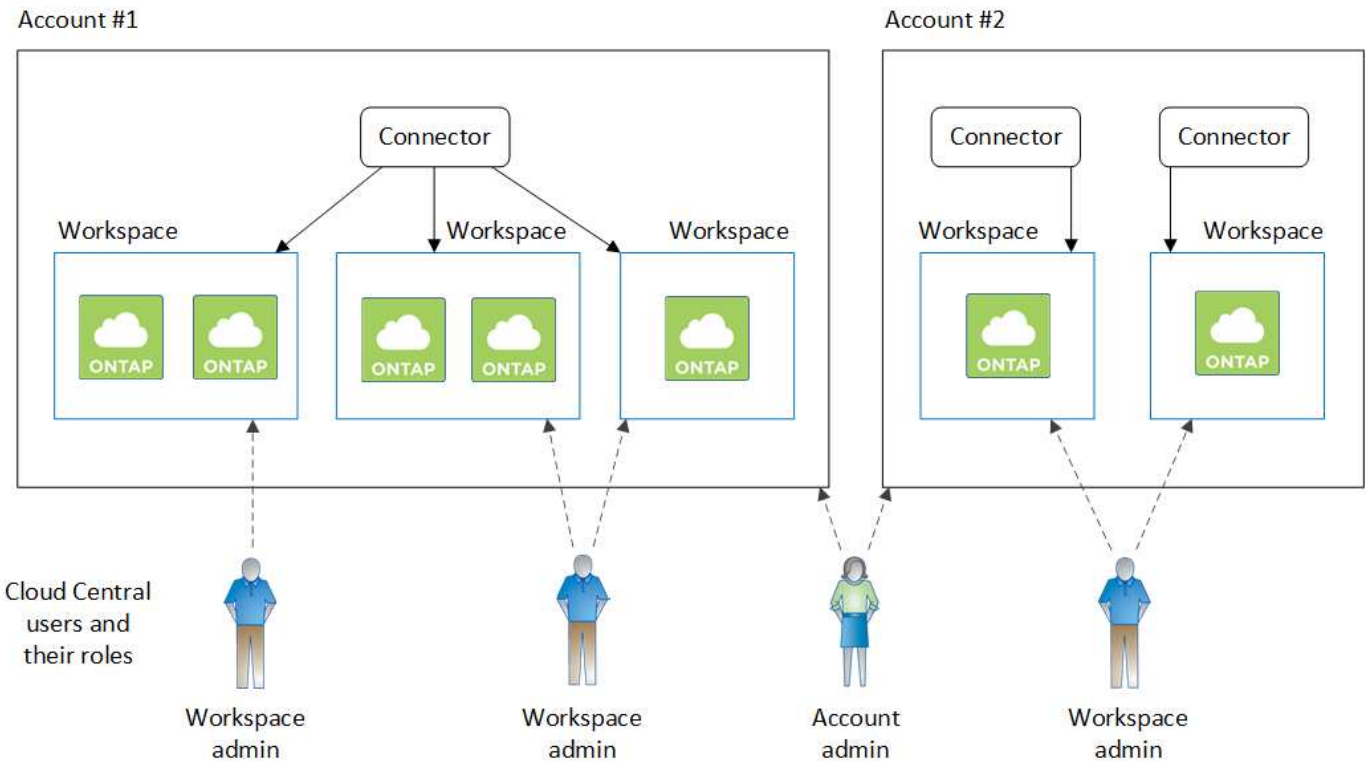
The following example shows an account that uses two workspaces to create isolated environments. The first workspace is for a production environment and the second is for a dev environment.



Example 2

Here's another example that shows the highest level of multi-tenancy by using two separate NetApp accounts. For example, a service provider might use Cloud Manager in one account to provide services for their customers, while using another account to provide disaster recovery for one of their business units.

Note that account 2 includes two separate Connectors. This might happen if you have systems in separate regions or in separate cloud providers.



Set up workspaces and users in your NetApp account

When you log in to Cloud Manager for the first time, you're prompted to create a *NetApp account*. This account provides multi-tenancy and enables you to organize users and resources in isolated *workspaces*.

Learn more about how NetApp accounts work.

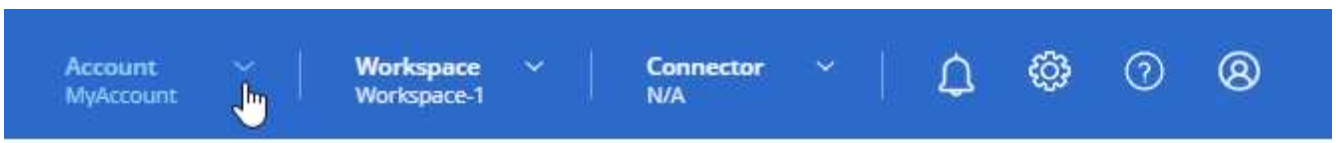
Set up your NetApp account so users can access Cloud Manager and access the working environments in a workspace. Just add a single user or add multiple users and workspaces.

Add workspaces

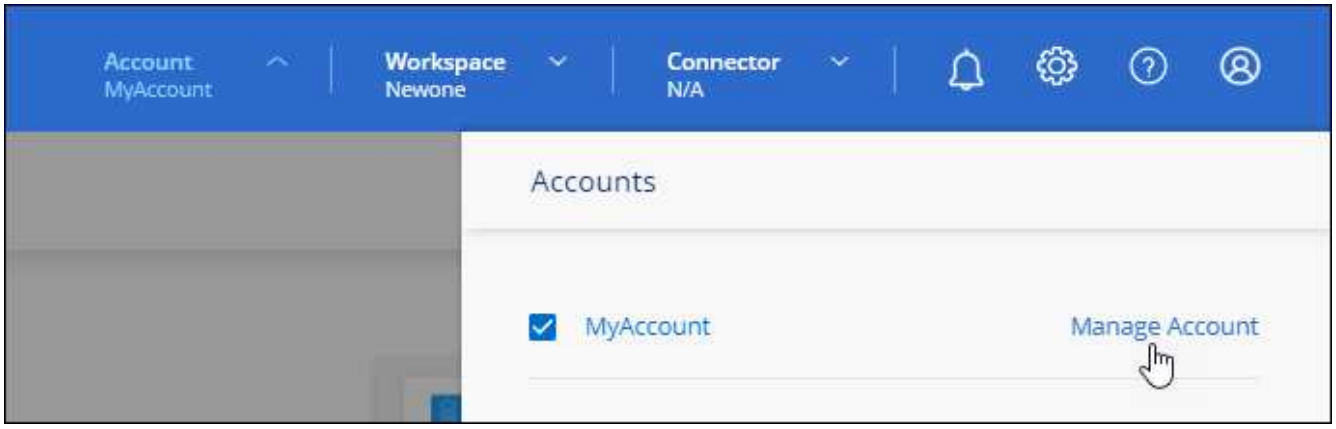
In Cloud Manager, workspaces enable you to isolate a set of working environments from other working environments and from other users. For example, you can create two workspaces and associate separate users with each workspace.

Steps

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



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



3. Click **Workspaces**.
4. Click **Add New Workspace**.
5. Enter a name for the workspace and click **Add**.

After you finish

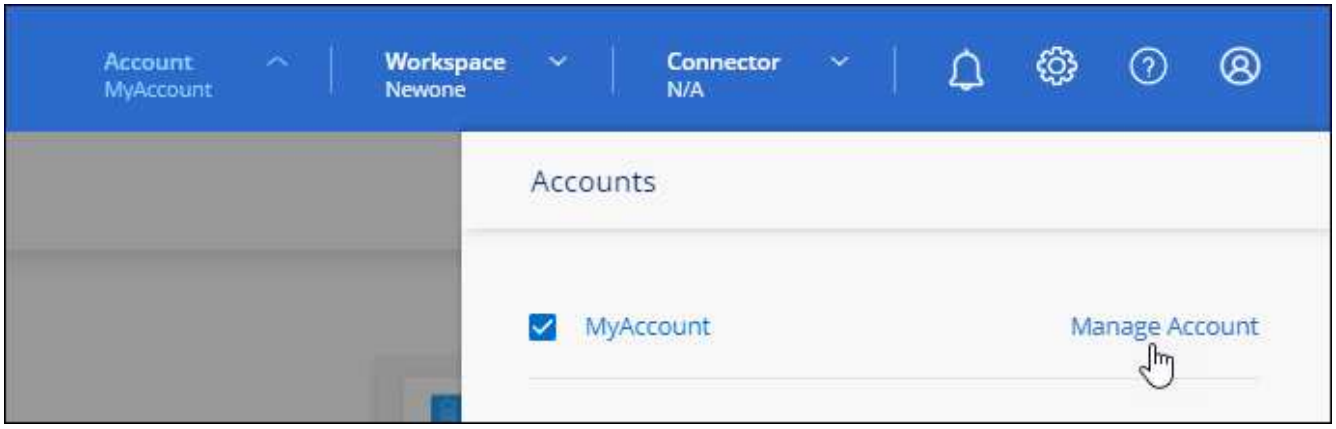
If a Workspace Admin needs access to this workspace, then you'll need to associate the user. You'll also need to associate Connectors with the workspace so Workspace Admins can use those Connectors.

Add 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 and click **Manage Account**.

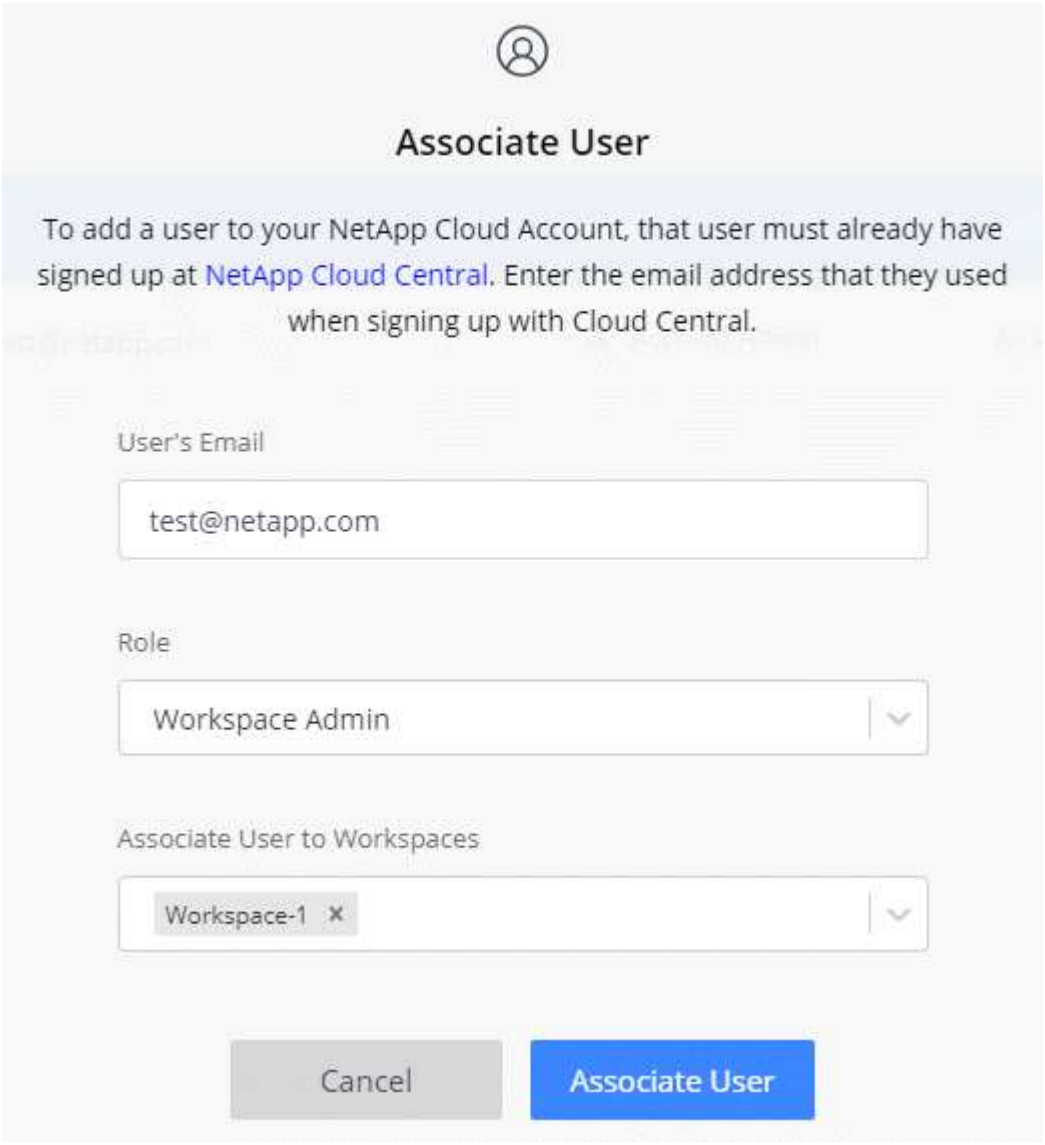


3. From the Members tab, click **Associate User**.
4. Enter the user's email address and select a role for the user:
   - **Account Admin**: Can perform any action in Cloud Manager.
   - **Workspace Admin**: Can create and manage resources in assigned workspaces.
   - **Compliance Viewer**: Can only view Cloud Data Sense governance and 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.

5. If you selected an account other than Account Admin, select one or more workspaces to associate with that user.



6. Click **Associate**.

Result

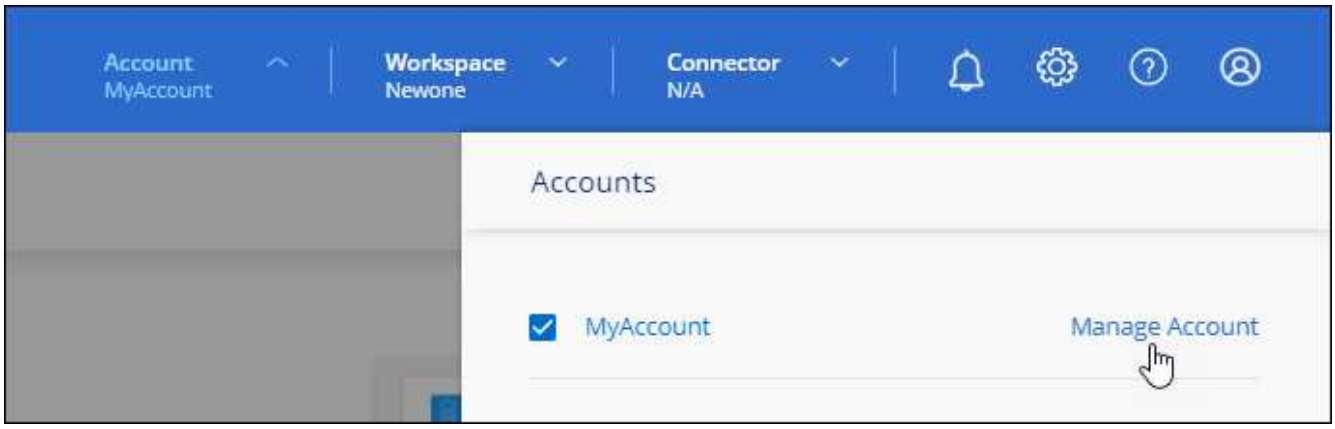
The user should receive an email from NetApp Cloud Central titled "Account Association." The email includes the information needed to access Cloud Manager.

Associate Workspace Admins with workspaces

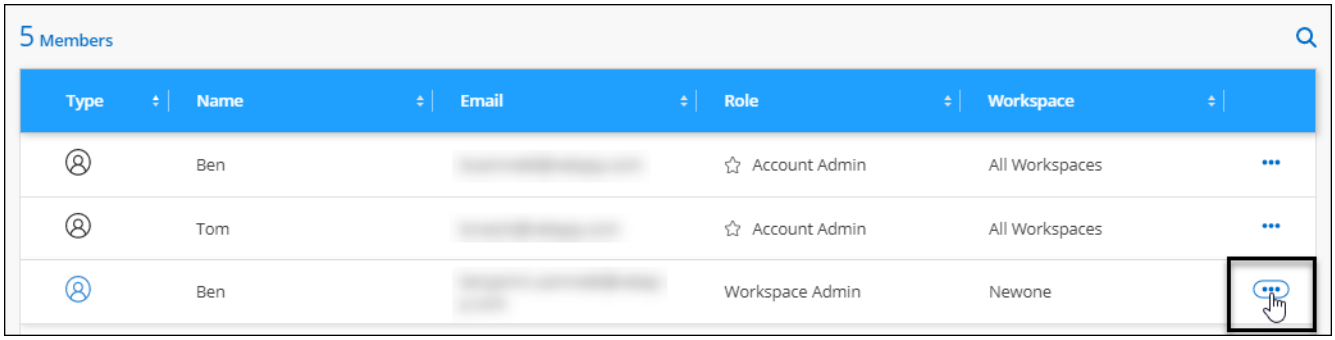
You can associate Workspace Admins with additional workspaces at any time. Associating the user enables them to create and view the working environments in that workspace.

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.



3. Click **Manage Workspaces**.
4. Select one or more workspaces 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.

Associate Connectors with workspaces

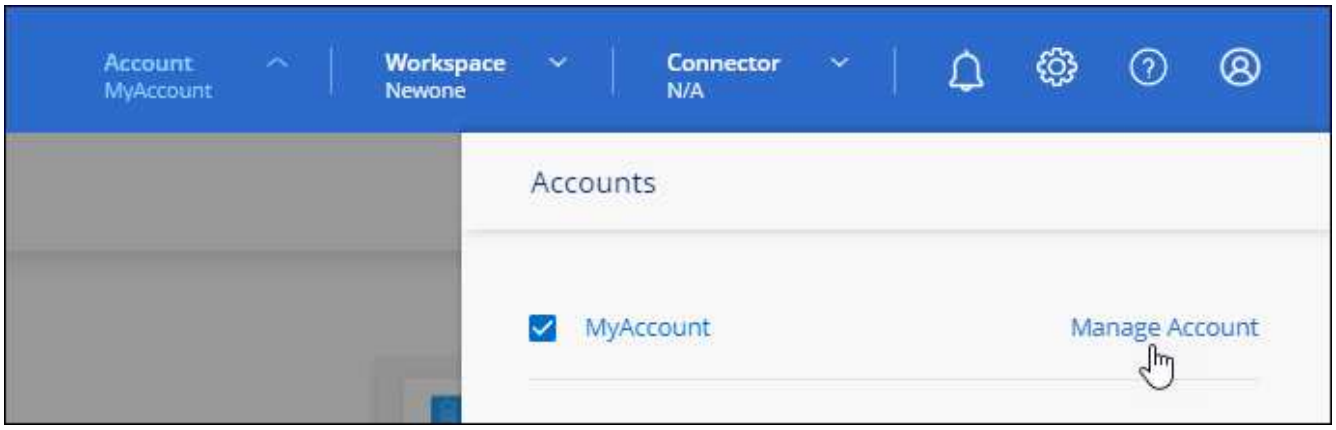
You need to associate a Connector with workspaces so Workspace Admins can use those Connectors to create Cloud Volumes ONTAP systems.

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 one or more workspaces and click **Apply**.

Result

Workspace Admins can now use those Connectors to create Cloud Volumes ONTAP systems.

What's next?

Now that you've set up your account, you can manage it any time by removing users, managing workspaces, Connectors, and subscriptions. Learn how to manage your account.

Set up a Connector

Learn about Connectors

In most cases, a Cloud Manager Account Admin will need to deploy a *Connector* in your cloud or on-premises network. The Connector is a crucial component for the day-to-day use of Cloud Manager. The Connector enables Cloud Manager to manage the resources and processes within your public cloud environment.

When a Connector is required

A Connector is required to use many of the features and services in Cloud Manager.

Services

- Amazon FSx for ONTAP management features
- Amazon S3 discovery
- Azure Blob discovery
- Cloud Backup
- Cloud Data Sense
- Cloud Tiering
- Cloud Volumes ONTAP
- Global File Cache

- Google Cloud Storage discovery
- Kubernetes clusters
- Monitoring
- On-premises ONTAP clusters

A Connector is ***not*** required for the following services:

- Active IQ Digital Advisor
- Amazon FSx for ONTAP working environment creation
  While a Connector isn't required to create a working environment, it is required to create and manage volumes, replicate data, and integrate FSx for ONTAP with NetApp cloud services, such as Data Sense and Cloud Sync.
- Azure NetApp Files

  While a Connector isn't required to set up and manage Azure NetApp Files, a Connector is required if you want to use Cloud Data Sense to scan Azure NetApp Files data.
- Cloud Volumes Service for Google Cloud
- Cloud Sync

Digital Wallet

In almost all cases, you can add a license to the Digital Wallet without a Connector.

The only time that a Connector is required to add a license to the Digital Wallet is for Cloud Volumes ONTAP *node-based* licenses. A Connector is required in this case because the data is taken from the licenses installed on Cloud Volumes ONTAP systems.

Supported locations

A Connector is supported in the following locations:

- Amazon Web Services
- Microsoft Azure
- Google Cloud
- On your premises
- On your premises, without internet access

Note about Azure deployments

If you deploy the Connector in Azure, it should be deployed in the same Azure region as the Cloud Volumes ONTAP systems that it manages, or in the Azure region pair for the Cloud Volumes ONTAP systems. This requirement ensures that an Azure Private Link connection is used between Cloud Volumes ONTAP and its associated storage accounts. Learn how Cloud Volumes ONTAP uses an Azure Private Link.

Note about Google Cloud deployments

If you want to create a Cloud Volumes ONTAP system in Google Cloud, then you must have a Connector that's running in Google Cloud as well. You can't use a Connector that's running in AWS, Azure, or on-prem.

Connectors should remain running

A Connector should remain running at all times. It's important for the continued health and operation of the services that you enable.

For example, a Connector is a key component in the health and operation of Cloud Volumes ONTAP. If a Connector is powered down, Cloud Volumes ONTAP PAYGO systems with node-based licensing will shut down after losing communication with a Connector for longer than 14 days.

How to create a Connector

A Cloud Manager Account Admin needs to create a Connector before a Workspace Admin can create a Cloud Volumes ONTAP working environment and use any of the other services listed above. An admin can create a Connector in a number of ways:

- Directly from Cloud Manager (recommended)
  - Create in AWS
  - Create in Azure
  - Create in GCP
- By manually installing the software on your own Linux host
  - On a host that has internet access
  - On an on-prem host that doesn't have internet access
- From your cloud provider's marketplace
  - AWS Marketplace
  - Azure Marketplace

Cloud Manager will prompt you to create a Connector if one is needed to complete an action.

Permissions

Specific permissions are needed to create the Connector and another set of permissions are needed for the Connector instance itself.

Permissions to create a Connector

The user who creates a Connector from Cloud Manager needs specific permissions to deploy the instance in your cloud provider of choice. Cloud Manager will remind you of the permissions requirements when you create a Connector.

- View the required AWS permissions
- View the required Azure permissions
- View the required Google Cloud permissions

Permissions for the Connector instance

The Connector needs specific cloud provider permissions to perform operations on your behalf. For example, to deploy and manage Cloud Volumes ONTAP.

When you create a Connector directly from Cloud Manager, Cloud Manager creates the Connector with the permissions that it needs. There's nothing that you need to do.

If you create the Connector yourself from the AWS Marketplace, the Azure Marketplace, or by manually installing the software, then you'll need to make sure that the right permissions are in place.

- Learn how the Connector uses AWS permissions
- Learn how the Connector uses Azure permissions
- Learn how the Connector uses Google Cloud permissions

Connector upgrades

We typically update the Connector software each month to introduce new features and to provide stability improvements. While most of the services and features in the Cloud Manager platform are offered through SaaS-based software, a few features and functionalities are dependent on the version of the Connector. That includes Cloud Volumes ONTAP management, on-prem ONTAP cluster management, settings, and help.

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

Number of working environments per Connector

A Connector can manage multiple working environments in Cloud Manager. The maximum number of working environments that a single Connector should manage varies. It depends on the type of working environments, the number of volumes, the amount of capacity being managed, and the number of users.

If you have a large-scale deployment, work with your NetApp representative to size your environment. If you experience any issues along the way, reach out to us by using the in-product chat.

When to use multiple Connectors

In some cases, you might only need one Connector, but you might find yourself needing two or more Connectors.

Here are a few examples:

- You're using a multi-cloud environment (AWS and Azure), so you have one Connector in AWS and another in Azure. Each manages the Cloud Volumes ONTAP systems running in those environments.
- A service provider might use one NetApp account to provide services for their customers, while using another account to provide disaster recovery for one of their business units. Each account would have separate Connectors.

Using multiple Connectors with the same working environment

You can manage a working environment with multiple Connectors at the same time for disaster recovery purposes. If one Connector goes down, you can switch to the other Connector to immediately manage the working environment.

To set up this configuration:

1. Switch to another Connector
2. Discover the existing working environment.
    - Add existing Cloud Volumes ONTAP systems to Cloud Manager
    - Discover ONTAP clusters

3. Set the Capacity Management Mode

   Only the main Connector should be set to **Automatic Mode**. If you switch to another Connector for DR purposes, then you can change the Capacity Management Mode as needed.

When to switch between Connectors

When you create your first Connector, Cloud Manager automatically uses that Connector for each additional working environment that you create. Once you create an additional Connector, you'll need to switch between them to see the working environments that are specific to each Connector.

Learn how to switch between Connectors.

The local user interface

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 if you install the Connector in an environment that doesn't have internet access, and for a few tasks that need to be performed from the Connector itself, instead of the SaaS interface:

- 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)

Learn how to access the local UI.

Set up networking for the Connector

Set up your networking so the Connector can manage resources and processes within your public cloud environment. The most important step is ensuring outbound internet access to various endpoints.

The information on this page is for a typical deployment where the Connector has outbound internet access.

If your network uses a proxy server for all communication to the internet, you can specify the proxy server from the Settings page. Refer to Configuring the Connector to use a proxy server.

Connection to target networks

A Connector requires a network connection to the type of working environment that you're creating and the services that you're planning to enable.

For example, if you install a Connector in your corporate network, then you must set up a VPN connection to the VPC or VNet in which you launch Cloud Volumes ONTAP.

Possible conflict with IP addresses in the 172 range

Cloud Manager deploys the Connector with two interfaces that have IP addresses in the 172.17.0.0/16 and 172.18.0.0/16 ranges.

If your network has a subnet configured with either of these ranges, then you might experience connectivity failures from Cloud Manager. For example, discovering on-prem ONTAP clusters in Cloud Manager might fail.

See Knowledge Base article Cloud Manager Connector IP conflict with existing network for instructions on how to change the IP address of the Connector's interfaces.

Outbound internet access

Outbound internet access is required from the Connector.

Endpoints to manage resources in your public cloud environment

The Connector requires outbound internet access to manage resources and processes within your public cloud environment.

Endpoints	Purpose
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://*.cloudmanager.cloud.netapp.com	To provide SaaS features and services within Cloud Manager.
https://cloudmanagerinfraprod.azurecr.io https://*.blob.core.windows.net	To upgrade the Connector and its Docker components.

Endpoints to install the Connector on a Linux host

You have the option to manually install the Connector software on your own Linux host. If you do, the installer for the Connector must access the following URLs during the installation process:

- https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm
- https://s3.amazonaws.com/aws-cli/awscli-bundle.zip
- https://*.blob.core.windows.net or https://hub.docker.com

The host might try to update operating system packages during installation. The host can contact different mirroring sites for these OS packages.

Ports and security groups

There's no incoming traffic to the Connector, unless you initiate it or if the Connector is used as a proxy for AutoSupport messages. HTTP and HTTPS provide access to the local UI, which you'll use in rare circumstances. SSH is only needed if you need to connect to the host for troubleshooting.

Proxy server for AutoSupport messages

If an outbound internet connection isn't available for Cloud Volumes ONTAP to send AutoSupport messages, Cloud Manager automatically configures Cloud Volumes ONTAP to use the Connector as a proxy server.

The only requirement is to ensure that the Connector's security group allows *inbound* connections over port 3128. You'll need to open this port after you deploy the Connector.

If you defined strict outbound rules for Cloud Volumes ONTAP, then you'll also need to ensure that the Cloud Volumes ONTAP security group allows *outbound* connections over port 3128.

Rules for the Connector in AWS

The security group for the Connector requires both inbound and outbound rules.

Inbound rules

Protocol	Port	Purpose
SSH	22	Provides SSH access to the Connector host
HTTP	80	Provides HTTP access from client web browsers to the local user interface
HTTPS	443	Provides HTTPS access from client web browsers to the local user interface, and connections from the Cloud Data Sense instance
TCP	3128	Provides Cloud Volumes ONTAP with internet access to send AutoSupport messages to NetApp Support. You must manually open this port after deployment. Learn more about the Connector's proxy server.
TCP	9060	Provides the ability to enable and use Cloud Data Sense (required only for GovCloud deployments)

Outbound rules

The predefined security group for the Connector opens all outbound traffic. If that is acceptable, follow the basic outbound rules. If you need more rigid rules, use the advanced outbound rules.

Basic outbound rules

The predefined security group for the Connector includes the following outbound rules.

Protocol	Port	Purpose
All TCP	All	All outbound traffic
All UDP	All	All outbound traffic

Advanced outbound rules

If you need rigid rules for outbound traffic, you can use the following information to open only those ports that are required for outbound communication by the Connector.

The source IP address is the Connector host.

Service	Protocol	Port	Destination	Purpose
API calls and AutoSupport	HTTPS	443	Outbound internet and ONTAP cluster management LIF	API calls to AWS and ONTAP, to Cloud Data Sense, to the Ransomware service, and sending AutoSupport messages to NetApp
API calls	TCP	3000	ONTAP HA mediator	Communication with the ONTAP HA mediator
	TCP	8088	Backup to S3	API calls to Backup to S3

Service	Protocol	Port	Destination	Purpose
DNS	UDP	53	DNS	Used for DNS resolve by Cloud Manager

Rules for the Connector in Azure

The security group for the Connector requires both inbound and outbound rules.

Inbound rules

Protocol	Port	Purpose
SSH	22	Provides SSH access to the Connector host
HTTP	80	Provides HTTP access from client web browsers to the local user interface
HTTPS	443	Provides HTTPS access from client web browsers to the local user interface, and connections from the Cloud Data Sense instance
TCP	3128	Provides Cloud Volumes ONTAP with internet access to send AutoSupport messages to NetApp Support. You must manually open this port after deployment. Learn more about the Connector's proxy server.
TCP	9060	Provides the ability to enable and use Cloud Data Sense (required only for Government Cloud deployments)

Outbound rules

The predefined security group for the Connector opens all outbound traffic. If that is acceptable, follow the basic outbound rules. If you need more rigid rules, use the advanced outbound rules.

Basic outbound rules

The predefined security group for the Connector includes the following outbound rules.

Protocol	Port	Purpose
All TCP	All	All outbound traffic
All UDP	All	All outbound traffic

Advanced outbound rules

If you need rigid rules for outbound traffic, you can use the following information to open only those ports that are required for outbound communication by the Connector.

The source IP address is the Connector host.

Service	Protocol	Port	Destination	Purpose
API calls and AutoSupport	HTTPS	443	Outbound internet and ONTAP cluster management LIF	API calls to Azure and ONTAP, to Cloud Data Sense, to the Ransomware service, and sending AutoSupport messages to NetApp
DNS	UDP	53	DNS	Used for DNS resolve by Cloud Manager

Rules for the Connector in GCP

The firewall rules for the Connector requires both inbound and outbound rules.

Inbound rules

Protocol	Port	Purpose
SSH	22	Provides SSH access to the Connector host
HTTP	80	Provides HTTP access from client web browsers to the local user interface
HTTPS	443	Provides HTTPS access from client web browsers to the local user interface
TCP	3128	Provides Cloud Volumes ONTAP with internet access to send AutoSupport messages to NetApp Support. You must manually open this port after deployment. Learn more about the Connector's proxy server.

Outbound rules

The predefined firewall rules for the Connector opens all outbound traffic. If that is acceptable, follow the basic outbound rules. If you need more rigid rules, use the advanced outbound rules.

Basic outbound rules

The predefined firewall rules for the Connector includes the following outbound rules.

Protocol	Port	Purpose
All TCP	All	All outbound traffic
All UDP	All	All outbound traffic

Advanced outbound rules

If you need rigid rules for outbound traffic, you can use the following information to open only those ports that are required for outbound communication by the Connector.

The source IP address is the Connector host.

Service	Protocol	Port	Destination	Purpose
API calls and AutoSupport	HTTPS	443	Outbound internet and ONTAP cluster management LIF	API calls to GCP and ONTAP, to Cloud Data Sense, to the Ransomware service, and sending AutoSupport messages to NetApp

Service	Protocol	Port	Destination	Purpose
DNS	UDP	53	DNS	Used for DNS resolve by Cloud Manager

Ports for the on-prem Connector

The Connector uses the following *inbound* ports when installed manually on an on-premises Linux host.

These inbound rules apply to both deployment models for the on-prem Connector: installed with internet access or without internet access.

Protocol	Port	Purpose
HTTP	80	Provides HTTP access from client web browsers to the local user interface
HTTPS	443	Provides HTTPS access from client web browsers to the local user interface

Create a Connector in AWS from Cloud Manager

A Cloud Manager Account Admin needs to deploy a *Connector* before you can use most Cloud Manager features. The Connector enables Cloud Manager to manage resources and processes within your public cloud environment. Learn when a Connector is required.

This page describes how to create a Connector in AWS directly from Cloud Manager. Learn about other ways to deploy a Connector.

These steps must be completed by a user who has the Account Admin role. A Workspace Admin can't create a Connector.

Set up AWS authentication

Cloud Manager needs to authenticate with AWS before it can deploy the Connector instance in your VPC. You can choose one of these authentication methods:

- Let Cloud Manager assume an IAM role that has the required permissions
- Provide an AWS access key and secret key for an IAM user who has the required permissions

With either option, you first need to start by creating an IAM policy that includes the required permissions.

Create an IAM policy

This policy contains only the permissions needed to launch the Connector instance in AWS from Cloud Manager. Don't use this policy for other situations.

When Cloud Manager creates the Connector, it applies a new set of permissions to the Connector instance that enables the Connector to manage the resources in your public cloud environment.

Steps

1. Go to the AWS IAM console.
2. Click **Policies > Create policy**.
3. Click **JSON**.

4. Copy and paste the following policy:

```
{
    "Version": "2012-10-17",
    "Statement": [{
            "Effect": "Allow",
            "Action": [
                "iam:CreateRole",
                "iam:DeleteRole",
                "iam:PutRolePolicy",
                "iam:CreateInstanceProfile",
                "iam:DeleteRolePolicy",
                "iam:AddRoleToInstanceProfile",
                "iam:RemoveRoleFromInstanceProfile",
                "iam:DeleteInstanceProfile",
                "iam:PassRole",
                "ec2:DescribeInstanceStatus",
                "ec2:RunInstances",
                "ec2:ModifyInstanceAttribute",
                "ec2:CreateSecurityGroup",
                "ec2:DeleteSecurityGroup",
                "ec2:DescribeSecurityGroups",
                "ec2:RevokeSecurityGroupEgress",
                "ec2:AuthorizeSecurityGroupEgress",
                "ec2:AuthorizeSecurityGroupIngress",
                "ec2:RevokeSecurityGroupIngress",
                "ec2:CreateNetworkInterface",
                "ec2:DescribeNetworkInterfaces",
                "ec2:DeleteNetworkInterface",
                "ec2:ModifyNetworkInterfaceAttribute",
                "ec2:DescribeSubnets",
                "ec2:DescribeVpcs",
                "ec2:DescribeDhcpOptions",
                "ec2:DescribeKeyPairs",
                "ec2:DescribeRegions",
                "ec2:DescribeInstances",
                "ec2:CreateTags",
                "ec2:DescribeImages",
                "cloudformation:CreateStack",
                "cloudformation:DeleteStack",
                "cloudformation:DescribeStacks",
                "cloudformation:DescribeStackEvents",
                "cloudformation:ValidateTemplate",
                "ec2:AssociateIamInstanceProfile",
                "ec2:DescribeIamInstanceProfileAssociations",
                "ec2:DisassociateIamInstanceProfile",
```

```
                "iam:GetRole",
                "iam:TagRole",
                "iam:ListRoles",
                "kms:ListAliases"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2:TerminateInstances"
            ],
            "Condition": {
                "StringLike": {
                    "ec2:ResourceTag/OCCMInstance": "*"
                }
            },
            "Resource": [
                "arn:aws:ec2:*:*:instance/*"
            ]
        }
    ]
}
```

5. Click **Next** and add tags, if needed.
6. Click **Next** and enter a name and description.
7. Click **Create policy**.

What's next?

Either attach the policy to an IAM role that Cloud Manager can assume or to an IAM user.

Set up an IAM role

Set up an IAM role that Cloud Manager can assume in order to deploy the Connector in AWS.

Steps

1. Go to the AWS 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 account: 952013314444
   - Select the policy that you created in the previous section.
3. After you create the role, copy the Role ARN so that you can paste it in Cloud Manager when you create the Connector.

Result

The IAM role now has the required permissions.

Set up permissions for an IAM user

When you create a Connector, you can provide an AWS access key and secret key for an IAM user who has the required permissions to deploy the Connector instance.

Steps

1. From the AWS IAM console, click **Users** and then select the user name.
2. Click **Add permissions > Attach existing policies directly**.
3. Select the policy that you created.
4. Click **Next** and then click **Add permissions**.
5. Ensure that you have access to an access key and secret key for the IAM user.

Result

The AWS user now has the permissions required to create the Connector from Cloud Manager. You'll need to specify AWS access keys for this user when you're prompted by Cloud Manager.

Create a Connector

Cloud Manager enables you to create a Connector in AWS directly from its user interface.

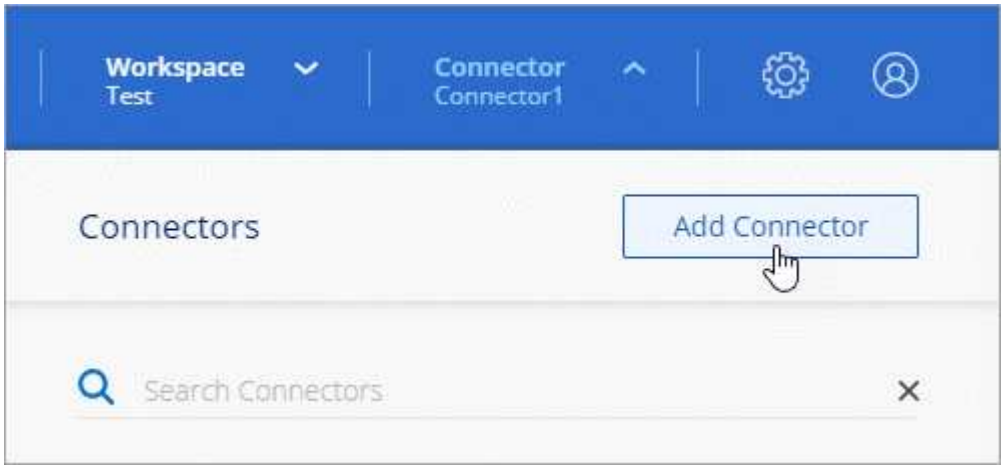
What you'll need

- An AWS authentication method: either the ARN of an IAM role that Cloud Manager can assume, or an AWS access key and secret key for an IAM user.
- A VPC, subnet, and keypair in your AWS region of choice.
- If you don't want Cloud Manager to automatically create an IAM role for the Connector, then you'll need to create your own using the policy on this page.

  These are the permissions that the Connector needs to manage resources in your public cloud environment. It's a different set of permissions than what you provided to create the Connector instance.

Steps

1. If you're creating your first Working Environment, click **Add Working Environment** and follow the prompts. Otherwise, click the **Connector** drop-down and select **Add Connector**.



2. Choose **Amazon Web Services** as your cloud provider and click **Continue**.

   Remember that the Connector must have a network connection to the type of working environment that you're creating and the services that you're planning to enable.

   Learn more about networking requirements for the Connector.

3. Follow the steps in the wizard to create the Connector:
   - **Get Ready**: Review what you'll need.
   - **AWS Credentials**: Specify your AWS region and then choose an authentication method, which is either an IAM role that Cloud Manager can assume or an AWS access key and secret key.

     If you choose **Assume Role**, you can create the first set of credentials from the Connector deployment wizard. Any additional set of credentials must be created from the Credentials page. They will then be available from the wizard in a drop-down list. Learn how to add additional credentials.

   - **Details**: Provide details about the Connector.
     - Enter a name for the instance.
     - Add custom tags (metadata) to the instance.
     - Choose whether you want Cloud Manager to create a new role that has the required permissions, or if you want to select an existing role that you set up with the required permissions.
     - Choose whether you want to encrypt the Connector's EBS disks. You have the option to use the default encryption key or to use a custom key.
   - **Network**: Specify a VPC, subnet, and key pair for the instance, choose whether to enable a public IP address, and optionally specify a proxy configuration.
   - **Security Group**: Choose whether to create a new security group or whether to select an existing security group that allows inbound HTTP, HTTPS, and SSH access.

     There's no incoming traffic to the Connector, unless you initiate it. HTTP and HTTPS provide access to the local UI, which you'll use in rare circumstances. SSH is only needed if you need to connect to the host for troubleshooting.

   - **Review**: Review your selections to verify that your set up is correct.
4. Click **Add**.

   The instance should be ready in about 7 minutes. You should stay on the page until the process is complete.

After you finish

You need to associate a Connector with workspaces so Workspace Admins can use those Connectors to create Cloud Volumes ONTAP systems. 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.

If you have Amazon S3 buckets in the same AWS account where you created the Connector, you'll see an Amazon S3 working environment appear on the Canvas automatically. Learn more about what you can do with this working environment.

Open port 3128 for AutoSupport messages

If you plan to deploy Cloud Volumes ONTAP systems in a subnet where an outbound internet connection won't be available, then Cloud Manager automatically configures Cloud Volumes ONTAP to use the Connector as a proxy server.

The only requirement is to ensure that the Connector's security group allows *inbound* connections over port 3128. You'll need to open this port after you deploy the Connector.

If you use the default security group for Cloud Volumes ONTAP, then no changes are needed to its security group. But if you plan to define strict outbound rules for Cloud Volumes ONTAP, then you'll also need to ensure that the Cloud Volumes ONTAP security group allows *outbound* connections over port 3128.

Create a Connector in Azure from Cloud Manager

A Cloud Manager Account Admin needs to deploy a *Connector* before you can use most Cloud Manager features. The Connector enables Cloud Manager to manage resources and processes within your public cloud environment. Learn when a Connector is required.

This page describes how to create a Connector in Azure directly from Cloud Manager. Learn about other ways to deploy a Connector.

These steps must be completed by a user who has the Account Admin role. A Workspace Admin can't create a Connector.

Overview

To deploy a Connector, you need to provide Cloud Manager with a login that has the required permissions to create the Connector VM in Azure.

You have two options:

1. Sign in with your Microsoft account when prompted. This account must have specific Azure permissions. This is the default option.

   Follow the steps below to get started.

2. Provide details about an Azure AD service principal. This service principal also requires specific permissions.

   Follow the steps below to get started.

A note about Azure regions

The Connector should be deployed in the same Azure region as the Cloud Volumes ONTAP systems that it manages, or in the Azure region pair for the Cloud Volumes ONTAP systems. This requirement ensures that an Azure Private Link connection is used between Cloud Volumes ONTAP and its associated storage accounts. Learn how Cloud Volumes ONTAP uses an Azure Private Link.

Create a Connector using your Azure account

The default way to create a Connector in Azure is by logging in with your Azure account when prompted. The login form is owned and hosted by Microsoft. Your credentials are not provided to NetApp.

Set up permissions for your Azure account

Before you can deploy a Connector from Cloud Manager, you need to ensure that your Azure account has the correct permissions.

Steps

1. Copy the required permissions for a new custom role in Azure and save them in a JSON file.

> This policy contains only the permissions needed to launch the Connector VM in Azure from Cloud Manager. Don't use this policy for other situations. When Cloud Manager creates the Connector, it applies a new set of permissions to the Connector VM that enables the Connector to manage the resources in your public cloud environment.

```
{
    "Name": "Azure SetupAsService",
    "Actions": [
        "Microsoft.Compute/disks/delete",
        "Microsoft.Compute/disks/read",
        "Microsoft.Compute/disks/write",
        "Microsoft.Compute/locations/operations/read",
        "Microsoft.Compute/operations/read",
        "Microsoft.Compute/virtualMachines/instanceView/read",
        "Microsoft.Compute/virtualMachines/read",
        "Microsoft.Compute/virtualMachines/write",
        "Microsoft.Compute/virtualMachines/delete",
        "Microsoft.Compute/virtualMachines/extensions/write",
        "Microsoft.Compute/virtualMachines/extensions/read",
        "Microsoft.Compute/availabilitySets/read",
        "Microsoft.Network/locations/operationResults/read",
        "Microsoft.Network/locations/operations/read",
        "Microsoft.Network/networkInterfaces/join/action",
        "Microsoft.Network/networkInterfaces/read",
        "Microsoft.Network/networkInterfaces/write",
        "Microsoft.Network/networkInterfaces/delete",
        "Microsoft.Network/networkSecurityGroups/join/action",
        "Microsoft.Network/networkSecurityGroups/read",
        "Microsoft.Network/networkSecurityGroups/write",

"Microsoft.Network/virtualNetworks/checkIpAddressAvailability/read",
        "Microsoft.Network/virtualNetworks/read",
        "Microsoft.Network/virtualNetworks/subnets/join/action",
        "Microsoft.Network/virtualNetworks/subnets/read",

"Microsoft.Network/virtualNetworks/subnets/virtualMachines/read",
        "Microsoft.Network/virtualNetworks/virtualMachines/read",
        "Microsoft.Network/publicIPAddresses/write",
        "Microsoft.Network/publicIPAddresses/read",
```

```
        "Microsoft.Network/publicIPAddresses/delete",
        "Microsoft.Network/networkSecurityGroups/securityRules/read",
        "Microsoft.Network/networkSecurityGroups/securityRules/write",
        "Microsoft.Network/networkSecurityGroups/securityRules/delete",
        "Microsoft.Network/publicIPAddresses/join/action",

"Microsoft.Network/locations/virtualNetworkAvailableEndpointServices/rea
d",
        "Microsoft.Network/networkInterfaces/ipConfigurations/read",
        "Microsoft.Resources/deployments/operations/read",
        "Microsoft.Resources/deployments/read",
        "Microsoft.Resources/deployments/delete",
        "Microsoft.Resources/deployments/cancel/action",
        "Microsoft.Resources/deployments/validate/action",
        "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",
        "Microsoft.Authorization/roleDefinitions/write",
        "Microsoft.Authorization/roleAssignments/write",

"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreem
ents/read",

"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreem
ents/write",
        "Microsoft.Network/networkSecurityGroups/delete",
        "Microsoft.Storage/storageAccounts/delete",
        "Microsoft.Storage/storageAccounts/write",
        "Microsoft.Resources/deployments/write",
        "Microsoft.Resources/deployments/operationStatuses/read",
        "Microsoft.Authorization/roleAssignments/read"
    ],
    "NotActions": [],
    "AssignableScopes": [],
    "Description": "Azure SetupAsService",
    "IsCustom": "true"
}
```

2. Modify the JSON by adding your Azure subscription ID to the assignable scope.

   Example

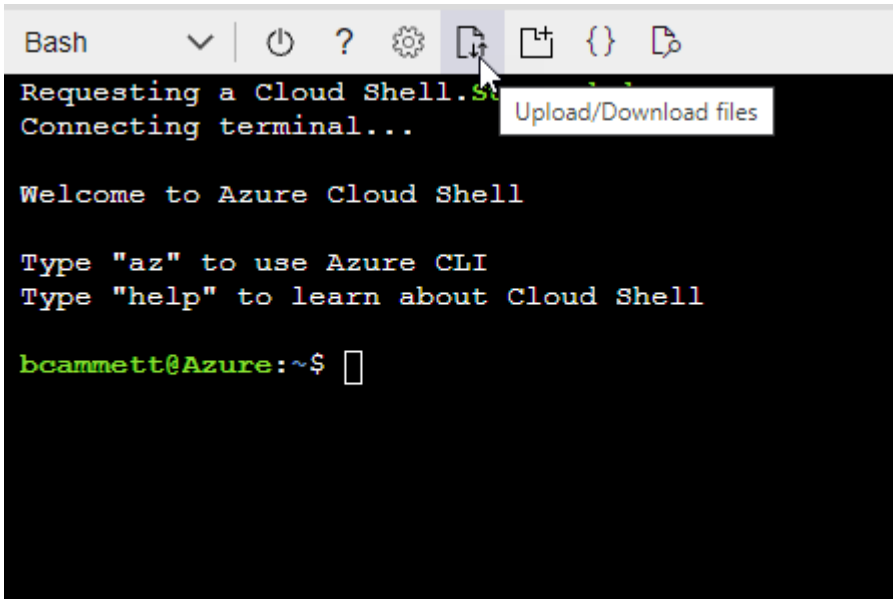
```
"AssignableScopes": [
"/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz"
],
```

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_Setup_As_Service_Azure.json
```

   You should now have a custom role called *Azure SetupAsService*.

4. Assign the role to the user who will deploy the Connector from Cloud Manager:

   a. Open the **Subscriptions** service and select the user's subscription.

   b. Click **Access control (IAM)**.

   c. Click **Add** > **Add role assignment** and then add the permissions:

      - Select the **Azure SetupAsService** role and click **Next**.

        Azure SetupAsService is the default name provided in the Connector deployment policy for Azure. If you chose a different name for the role, then select that name instead.

      - Keep **User, group, or service principal** selected.

- Click **Select members**, choose your user account, and click **Select**.
- Click **Next**.
- Click **Review + assign**.

Result

The Azure user now has the permissions required to deploy the Connector from Cloud Manager.

Create the Connector by logging in with your Azure account

Cloud Manager enables you to create a Connector in Azure directly from its user interface.

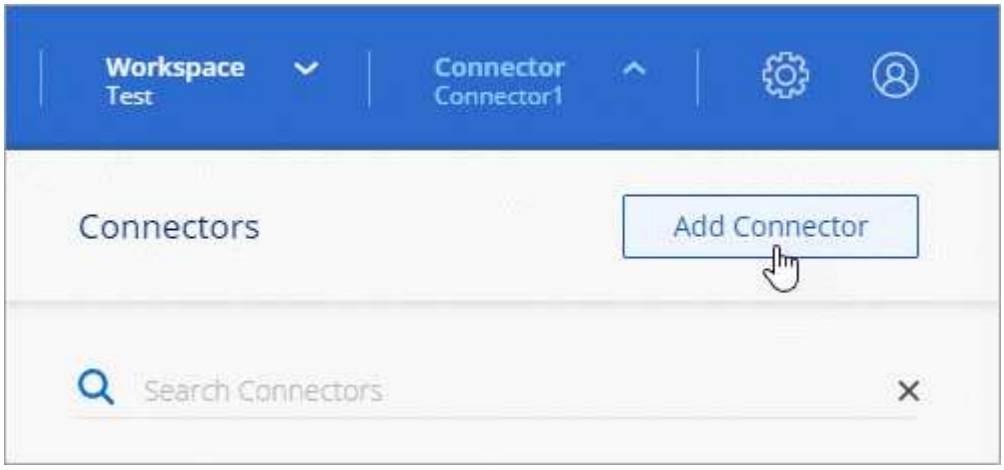
What you'll need

- An Azure subscription.
- A VNet and subnet in your Azure region of choice.
- If you don't want Cloud Manager to automatically create an Azure role for the Connector, then you'll need to create your own using the policy on this page.

  These permissions are for the Connector instance itself. It's a different set of permissions than what you previously set up to simply deploy the Connector.

Steps

1. If you're creating your first Working Environment, click **Add Working Environment** and follow the prompts. Otherwise, click the **Connector** drop-down and select **Add Connector**.



2. Choose **Microsoft Azure** as your cloud provider.

   Remember that the Connector must have a network connection to the type of working environment that you're creating and the services that you're planning to enable.

   Learn more about networking requirements for the Connector.

3. Follow the steps in the wizard to create the Connector:
   - **Get Ready**: Review what you'll need and click **Next**.
   - If you're prompted, log in to your Microsoft account, which should have the required permissions to create the virtual machine.

     The form is owned and hosted by Microsoft. Your credentials are not provided to NetApp.

If you're already logged in to an Azure account, then Cloud Manager will automatically use that account. If you have multiple accounts, then you might need to log out first to ensure that you're using the right account.

- **VM Authentication**: Choose an Azure subscription, a location, a new resource group or an existing resource group, and then choose an authentication method.
- **Details**: Enter a name for the instance, specify tags, and choose whether you want Cloud Manager to create a new role that has the required permissions, or if you want to select an existing role that you set up with the required permissions.

  Note that you can choose the subscriptions associated with this role. Each subscription that you choose provides the Connector with permissions to deploy Cloud Volumes ONTAP in those subscriptions.

- **Network**: Choose a VNet and subnet, whether to enable a public IP address, and optionally specify a proxy configuration.
- **Security Group**: Choose whether to create a new security group or whether to select an existing security group that allows inbound HTTP, HTTPS, and SSH access.

  There's no incoming traffic to the Connector, unless you initiate it. HTTP and HTTPS provide access to the local UI, which you'll use in rare circumstances. SSH is only needed if you need to connect to the host for troubleshooting.

- **Review**: Review your selections to verify that your set up is correct.

4. Click **Add**.

   The virtual machine should be ready in about 7 minutes. You should stay on the page until the process is complete.

After you finish

You need to associate a Connector with workspaces so Workspace Admins can use those Connectors to create Cloud Volumes ONTAP systems. 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.

If you have Azure Blob storage in the same Azure account where you created the Connector, you'll see an Azure Blob working environment appear on the Canvas automatically. Learn more about what you can do with this working environment.

Create a Connector using a service principal

Rather than logging in with you Azure account, you also have the option to provide Cloud Manager with the credentials for an Azure service principal that has the required permissions.

Granting Azure permissions using a service principal

Grant the required permissions to deploy a Connector in Azure by creating and setting up a service principal in Azure Active Directory and by obtaining the Azure credentials that Cloud Manager needs.

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.

Create an Azure Active Directory application

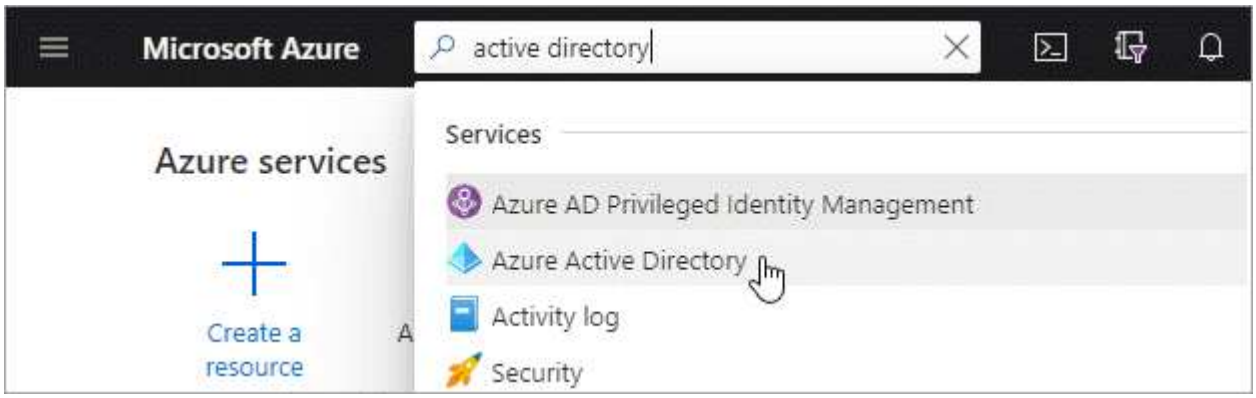
Create an Azure Active Directory (AD) application and service principal that Cloud Manager can use to deploy the Connector.

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.

Assign the application to a role

You must bind the service principal to the Azure subscription in which you plan to deploy the Connector and assign it the custom "Azure SetupAsService" role.

Steps

1. Copy the required permissions for a new custom role in Azure and save them in a JSON file.

This policy contains only the permissions needed to launch the Connector VM in Azure from Cloud Manager. Don't use this policy for other situations. When Cloud Manager creates the Connector, it applies a new set of permissions to the Connector VM that enables the Connector to manage the resources in your public cloud environment.

```
{
    "Name": "Azure SetupAsService",
    "Actions": [
        "Microsoft.Compute/disks/delete",
        "Microsoft.Compute/disks/read",
        "Microsoft.Compute/disks/write",
        "Microsoft.Compute/locations/operations/read",
        "Microsoft.Compute/operations/read",
        "Microsoft.Compute/virtualMachines/instanceView/read",
        "Microsoft.Compute/virtualMachines/read",
        "Microsoft.Compute/virtualMachines/write",
        "Microsoft.Compute/virtualMachines/delete",
        "Microsoft.Compute/virtualMachines/extensions/write",
        "Microsoft.Compute/virtualMachines/extensions/read",
        "Microsoft.Compute/availabilitySets/read",
        "Microsoft.Network/locations/operationResults/read",
        "Microsoft.Network/locations/operations/read",
        "Microsoft.Network/networkInterfaces/join/action",
        "Microsoft.Network/networkInterfaces/read",
        "Microsoft.Network/networkInterfaces/write",
        "Microsoft.Network/networkInterfaces/delete",
        "Microsoft.Network/networkSecurityGroups/join/action",
        "Microsoft.Network/networkSecurityGroups/read",
        "Microsoft.Network/networkSecurityGroups/write",

"Microsoft.Network/virtualNetworks/checkIpAddressAvailability/read",
        "Microsoft.Network/virtualNetworks/read",
        "Microsoft.Network/virtualNetworks/subnets/join/action",
        "Microsoft.Network/virtualNetworks/subnets/read",

"Microsoft.Network/virtualNetworks/subnets/virtualMachines/read",
        "Microsoft.Network/virtualNetworks/virtualMachines/read",
        "Microsoft.Network/publicIPAddresses/write",
        "Microsoft.Network/publicIPAddresses/read",
        "Microsoft.Network/publicIPAddresses/delete",
        "Microsoft.Network/networkSecurityGroups/securityRules/read",
        "Microsoft.Network/networkSecurityGroups/securityRules/write",
        "Microsoft.Network/networkSecurityGroups/securityRules/delete",
        "Microsoft.Network/publicIPAddresses/join/action",

"Microsoft.Network/locations/virtualNetworkAvailableEndpointServices/rea
```

```
d",
            "Microsoft.Network/networkInterfaces/ipConfigurations/read",
            "Microsoft.Resources/deployments/operations/read",
            "Microsoft.Resources/deployments/read",
            "Microsoft.Resources/deployments/delete",
            "Microsoft.Resources/deployments/cancel/action",
            "Microsoft.Resources/deployments/validate/action",
            "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",
            "Microsoft.Authorization/roleDefinitions/write",
            "Microsoft.Authorization/roleAssignments/write",

"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreem
ents/read",

"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreem
ents/write",
            "Microsoft.Network/networkSecurityGroups/delete",
            "Microsoft.Storage/storageAccounts/delete",
            "Microsoft.Storage/storageAccounts/write",
            "Microsoft.Resources/deployments/write",
            "Microsoft.Resources/deployments/operationStatuses/read",
            "Microsoft.Authorization/roleAssignments/read"
        ],
        "NotActions": [],
        "AssignableScopes": [],
        "Description": "Azure SetupAsService",
        "IsCustom": "true"
}
```

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

   Example

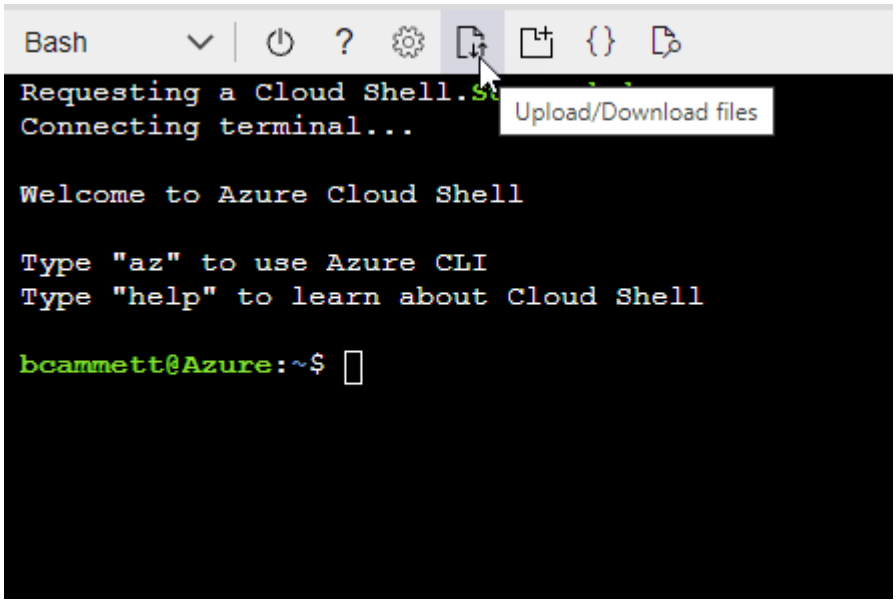
```
"AssignableScopes": [
"/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
```

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_Setup_As_Service_Azure.json
```

You should now have a custom role called *Azure SetupAsService*.

4. Assign the application to the role:

   a. From the Azure portal, open the **Subscriptions** service.

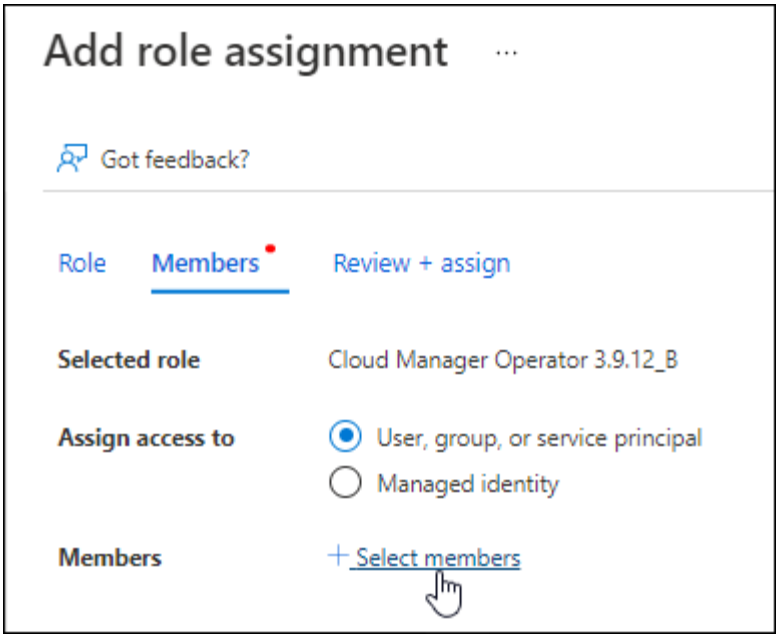
   b. Select the subscription.

   c. Click **Access control (IAM) > Add > Add role assignment**.

   d. In the **Role** tab, select the **Azure SetupAsService** role and click **Next**.

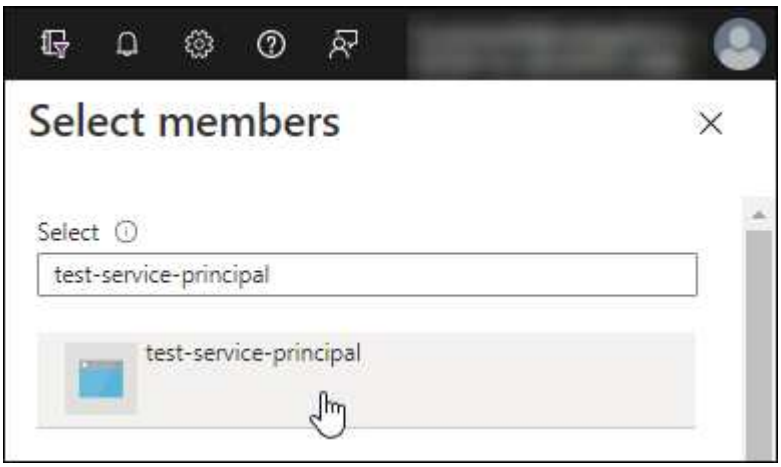
   e. In the **Members** tab, complete the following steps:

      - Keep **User, group, or service principal** selected.
      - Click **Select members**.



- Search for the name of the application.

  Here's an example:



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

f. Click **Review + assign**.

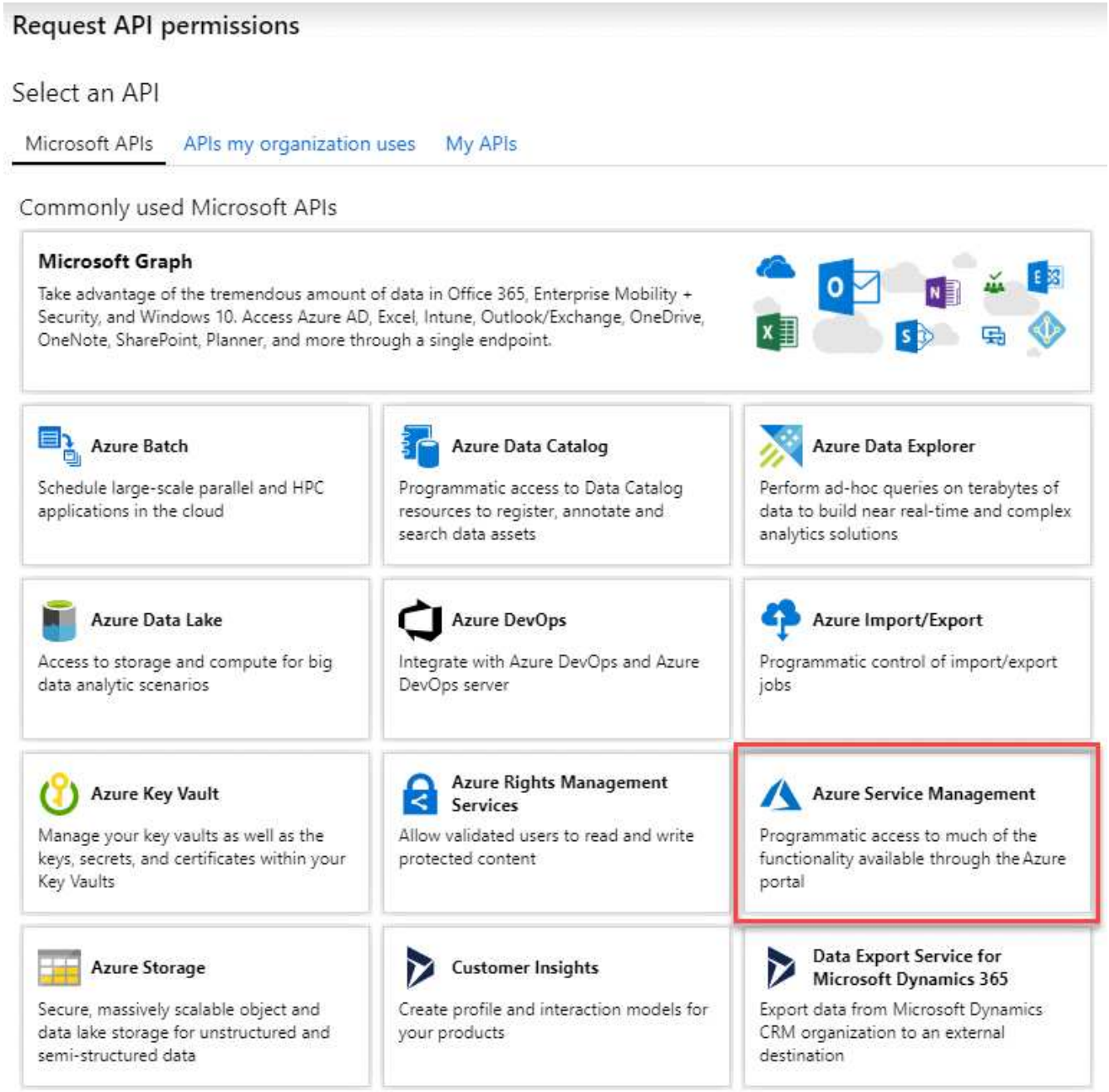
The service principal now has the required Azure permissions to deploy the Connector.

Add Windows Azure Service Management API permissions

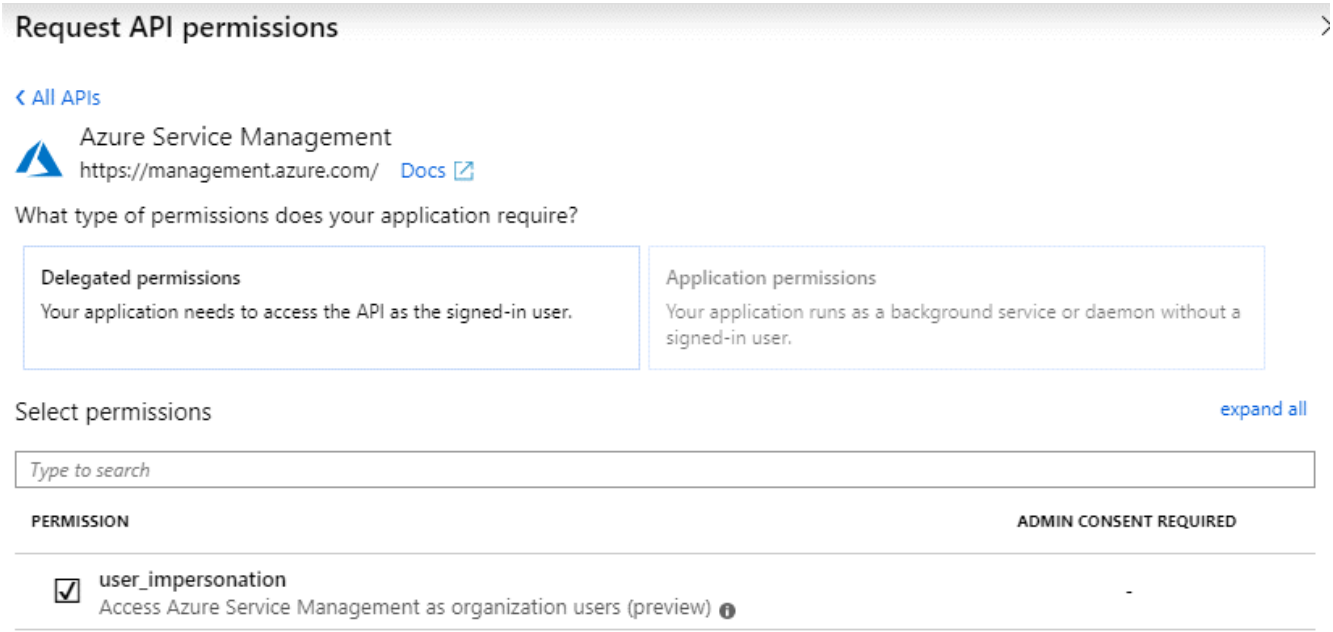
The service principal must have "Windows Azure Service Management API" permissions.

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**.



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

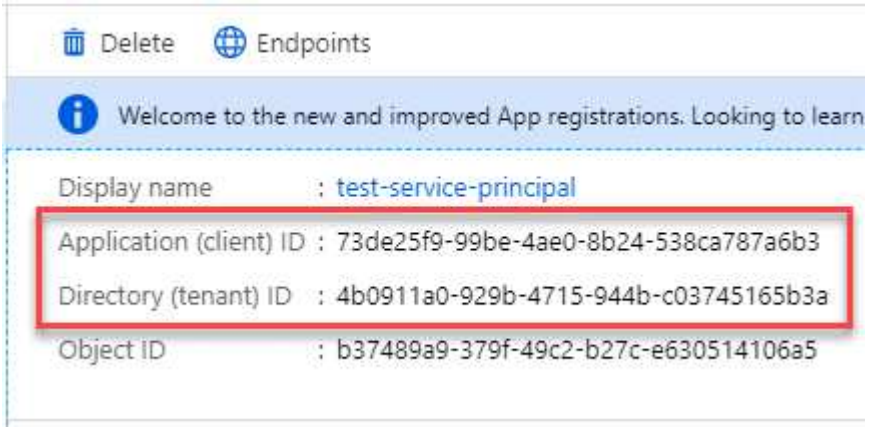


Get the application ID and directory ID

When you create the Connector from 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**.



Create 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.

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 create the Connector.

Create the Connector by logging in with the service principal

Cloud Manager enables you to create a Connector in Azure directly from its user interface.

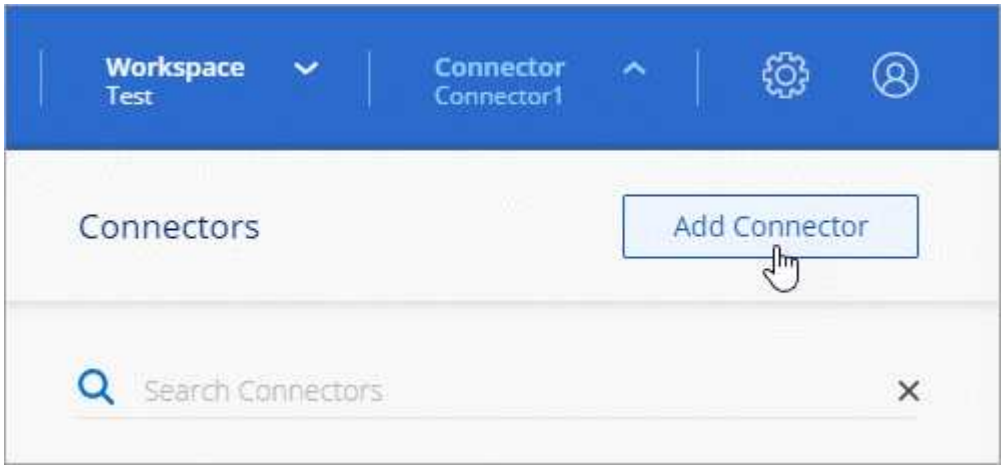
What you'll need

- An Azure subscription.
- A VNet and subnet in your Azure region of choice.
- If you don't want Cloud Manager to automatically create an Azure role for the Connector, then you'll need to create your own using the policy on this page.

  These permissions are for the Connector instance itself. It's a different set of permissions than what you previously set up to simply deploy the Connector.

Steps

1. If you're creating your first Working Environment, click **Add Working Environment** and follow the prompts. Otherwise, click the **Connector** drop-down and select **Add Connector**.



2. Choose **Microsoft Azure** as your cloud provider.

Remember that the Connector must have a network connection to the type of working environment that you're creating and the services that you're planning to enable.

Learn more about networking requirements for the Connector.

3. Follow the steps in the wizard to create the Connector:
   - **Get Ready**: Click **Azure AD service principal** and enter information about the Azure Active Directory service principal that grants the required permissions:
     - Application (client) ID: See Get the application ID and directory ID.
     - Directory (tenant) ID: See Get the application ID and directory ID.
     - Client Secret: See Create a client secret.
   - **VM Authentication**: Choose an Azure subscription, a location, a new resource group or an existing resource group, and then choose an authentication method.
   - **Details**: Enter a name for the instance, specify tags, and choose whether you want Cloud Manager to create a new role that has the required permissions, or if you want to select an existing role that you set up with the required permissions.

     Note that you can choose the subscriptions associated with this role. Each subscription that you choose provides the Connector with permissions to deploy Cloud Volumes ONTAP in those subscriptions.

   - **Network**: Choose a VNet and subnet, whether to enable a public IP address, and optionally specify a proxy configuration.
   - **Security Group**: Choose whether to create a new security group or whether to select an existing security group that allows inbound HTTP, HTTPS, and SSH access.

     There's no incoming traffic to the Connector, unless you initiate it. HTTP and HTTPS provide access to the local UI, which you'll use in rare circumstances. SSH is only needed if you need to connect to the host for troubleshooting.

   - **Review**: Review your selections to verify that your set up is correct.
4. Click **Add**.

   The virtual machine should be ready in about 7 minutes. You should stay on the page until the process is complete.

After you finish

You need to associate a Connector with workspaces so Workspace Admins can use those Connectors to create Cloud Volumes ONTAP systems. 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.

If you have Azure Blob storage in the same Azure account where you created the Connector, you'll see an Azure Blob working environment appear on the Canvas automatically. Learn more about what you can do with this working environment.

Open port 3128 for AutoSupport messages

If you plan to deploy Cloud Volumes ONTAP systems in a subnet where an outbound internet connection won't be available, then Cloud Manager automatically configures Cloud Volumes ONTAP to use the Connector as a

proxy server.

The only requirement is to ensure that the Connector's security group allows *inbound* connections over port 3128. You'll need to open this port after you deploy the Connector.

If you use the default security group for Cloud Volumes ONTAP, then no changes are needed to its security group. But if you plan to define strict outbound rules for Cloud Volumes ONTAP, then you'll also need to ensure that the Cloud Volumes ONTAP security group allows *outbound* connections over port 3128.

Create a Connector in Google Cloud from Cloud Manager

A Cloud Manager Account Admin needs to deploy a *Connector* before you can use most Cloud Manager features. Learn when a Connector is required. The Connector enables Cloud Manager to manage resources and processes within your public cloud environment.

This page describes how to create a Connector in Google Cloud directly from Cloud Manager. Learn about other ways to deploy a Connector.

These steps must be completed by a user who has the Account Admin role. A Workspace Admin can't create a Connector.

When you create your first Cloud Volumes ONTAP working environment, Cloud Manager will prompt you to create a Connector if you don't have one yet.

Set up permissions to deploy the Connector

Before you can deploy a Connector, you need to ensure that your Google Cloud account has the correct permissions.

Steps

1. Create a custom role that includes the following permissions:

```
title: Connector deployment policy
description: Permissions for the user who deploys the Connector from
Cloud Manager
stage: GA
includedPermissions:
- compute.disks.create
- compute.disks.get
- compute.disks.list
- compute.disks.setLabels
- compute.disks.use
- compute.firewalls.create
- compute.firewalls.delete
- compute.firewalls.get
- compute.firewalls.list
- compute.globalOperations.get
- compute.images.get
```

```
- compute.images.getFromFamily
- compute.images.list
- compute.images.useReadOnly
- compute.instances.attachDisk
- compute.instances.create
- compute.instances.get
- compute.instances.list
- compute.instances.setDeletionProtection
- compute.instances.setLabels
- compute.instances.setMachineType
- compute.instances.setMetadata
- compute.instances.setTags
- compute.instances.start
- compute.instances.updateDisplayDevice
- compute.machineTypes.get
- compute.networks.get
- compute.networks.list
- compute.networks.updatePolicy
- compute.projects.get
- compute.regions.get
- compute.regions.list
- compute.subnetworks.get
- compute.subnetworks.list
- compute.zoneOperations.get
- compute.zones.get
- compute.zones.list
- 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
- resourcemanager.projects.get
- compute.instances.setServiceAccount
- iam.serviceAccounts.list
```

2. Attach the custom role to the user who will deploy the Connector from Cloud Manager.

Result

The Google Cloud user now has the permissions required to create the Connector.

Set up a service account for the Connector

A service account is required to provide the Connector with the permission that it needs to manage resources in Google Cloud. You'll associate this service account with the Connector VM when you create it.

The permissions for the service account are different than the permissions that you set up in the previous section.

Steps

1. Create a custom role that includes the following permissions:

```
title: NetApp Cloud Manager
description: Permissions for the service account associated with the
Connector instance.
stage: GA
includedPermissions:
- iam.serviceAccounts.actAs
- compute.regionBackendServices.create
- compute.regionBackendServices.get
- compute.regionBackendServices.list
- compute.networks.updatePolicy
- compute.backendServices.create
- compute.addresses.list
- compute.disks.create
- compute.disks.createSnapshot
- compute.disks.delete
- compute.disks.get
- compute.disks.list
- compute.disks.setLabels
- compute.disks.use
- compute.firewalls.create
- compute.firewalls.delete
- compute.firewalls.get
- compute.firewalls.list
- compute.globalOperations.get
- compute.images.get
- compute.images.getFromFamily
- compute.images.list
- compute.images.useReadOnly
- compute.instances.addAccessConfig
- compute.instances.attachDisk
- compute.instances.create
- compute.instances.delete
```

```
- compute.instances.detachDisk
- compute.instances.get
- compute.instances.getSerialPortOutput
- compute.instances.list
- compute.instances.setDeletionProtection
- compute.instances.setLabels
- compute.instances.setMachineType
- compute.instances.setMetadata
- compute.instances.setTags
- compute.instances.start
- compute.instances.stop
- compute.instances.updateDisplayDevice
- compute.machineTypes.get
- compute.networks.get
- compute.networks.list
- compute.projects.get
- compute.regions.get
- compute.regions.list
- compute.snapshots.create
- compute.snapshots.delete
- compute.snapshots.get
- compute.snapshots.list
- compute.snapshots.setLabels
- compute.subnetworks.get
- compute.subnetworks.list
- compute.subnetworks.use
- compute.subnetworks.useExternalIp
- compute.zoneOperations.get
- compute.zones.get
- compute.zones.list
- compute.instances.setServiceAccount
- 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
- logging.logEntries.list
- logging.privateLogEntries.list
- resourcemanager.projects.get
- storage.buckets.create
- storage.buckets.delete
- storage.buckets.get
- storage.buckets.list
- cloudkms.cryptoKeyVersions.useToEncrypt
- cloudkms.cryptoKeys.get
- cloudkms.cryptoKeys.list
- cloudkms.keyRings.list
- storage.buckets.update
- iam.serviceAccounts.getIamPolicy
- iam.serviceAccounts.list
- storage.objects.get
- storage.objects.list
- monitoring.timeSeries.list
- storage.buckets.getIamPolicy
```

2. Create a Google Cloud service account and apply the custom role that you just created.
3. If you want to deploy Cloud Volumes ONTAP in other projects, grant access by adding the service account with the Cloud Manager role to that project. You'll need to repeat this step for each project.

Result

The service account for the Connector VM is set up.

Shared VPC permissions

If you are using a shared VPC to deploy resources into a service project, then the following permissions are required. This table is for reference and your environment should reflect the permissions table when IAM configuration is complete.

Identity	Creator	Hosted in	Service project permissions	Host project permissions	Purpose
Google account used to deploy the Connector	Custom	Service Project	• The permissions found in this section above	• compute.networkUser	Deploying the Connector in the service project

Identity	Creator	Hosted in	Service project permissions	Host project permissions	Purpose
Connector service account	Custom	Service project	• The permissions found in this section above	• compute.networkUser • deploymentmanager.editor	Deploying and maintaining Cloud Volumes ONTAP and services in the service project
Cloud Volumes ONTAP service account	Custom	Service project	• storage.admin • member: Cloud Manager service account as serviceAccount.user	N/A	(Optional) For data tiering and Cloud Backup
Google APIs service agent	Google Cloud	Service project	• (Default) Editor	• compute.networkUser	Interacts with Google Cloud APIs on behalf of deployment. Allows Cloud Manager to use the shared network.
Google Compute Engine default service account	Google Cloud	Service project	• (Default) Editor	• compute.networkUser	Deploys Google Cloud instances and compute infrastructure on behalf of deployment. Allows Cloud Manager to use the shared network.

Notes:

1. deploymentmanager.editor is only required at the host project if you are not passing firewall rules to the deployment and are choosing to let Cloud Manager create them for you. Cloud Manager will create a deployment in the host project which contains the VPC0 firewall rule if no rule is specified.
2. firewall.create and firewall.delete are only required if you are not passing firewall rules to the deployment and are choosing to let Cloud Manager create them for you. These permissions reside in the Cloud Manager service account .yaml file. If you are deploying an HA pair using a shared VPC, these permissions will be used to create the firewall rules for VPC1, 2 and 3. For all other deployments, these permissions will also be used to create rules for VPC0.
3. For data tiering, the tiering service account must have the serviceAccount.user role on the service account, not just at the project level. Currently if you assign serviceAccount.user at the project level, the permissions don't show when you query the service account with getIAMPolicy.

Enabling Google Cloud APIs

Several APIs are required to deploy the Connector and Cloud Volumes ONTAP.

Step

1. Enable the following Google Cloud APIs in your project.
    - Cloud Deployment Manager V2 API
    - Cloud Logging API

- Cloud Resource Manager API
- Compute Engine API
- Identity and Access Management (IAM) API

Creating a Connector in Google Cloud

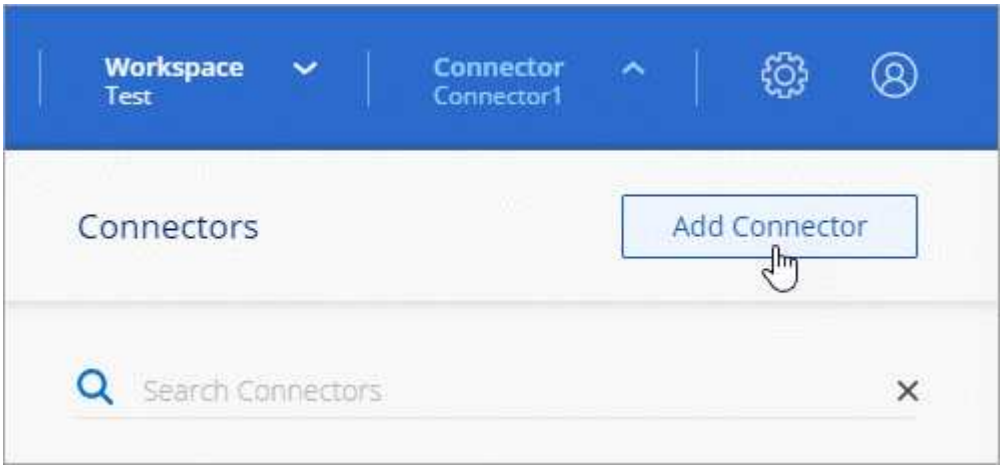
Create a Connector in Google Cloud directly from the Cloud Manager user interface or by using gcloud.

What you'll need

- The required permissions for your Google Cloud account, as described in the first section of this page.
- A Google Cloud project.
- A service account that has the required permissions to create and manage Cloud Volumes ONTAP, as described in the first section of this page.
- A VPC and subnet in your Google Cloud region of choice.

Cloud Manager

1. If you're creating your first Working Environment, click **Add Working Environment** and follow the prompts. Otherwise, click the **Connector** drop-down and select **Add Connector**.



2. Choose **Google Cloud Platform** as your cloud provider.

   Remember that the Connector must have a network connection to the type of working environment that you're creating and the services that you're planning to enable.

   Learn more about networking requirements for the Connector.

3. Follow the steps in the wizard to create the Connector:
   - **Get Ready**: Review what you'll need.
   - If you're prompted, log in to your Google account, which should have the required permissions to create the virtual machine instance.

     The form is owned and hosted by Google. Your credentials are not provided to NetApp.

   - **Basic Settings**: Enter a name for the virtual machine instance, specify tags, select a project, and then select the service account that has the required permissions (refer to the section above for details).
   - **Location**: Specify a region, zone, VPC, and subnet for the instance.
   - **Network**: Choose whether to enable a public IP address and optionally specify a proxy configuration.
   - **Firewall Policy**: Choose whether to create a new firewall policy or whether to select an existing firewall policy that allows inbound HTTP, HTTPS, and SSH access.

     There's no incoming traffic to the Connector, unless you initiate it. HTTP and HTTPS provide access to the local UI, which you'll use in rare circumstances. SSH is only needed if you need to connect to the host for troubleshooting.

   - **Review**: Review your selections to verify that your set up is correct.
4. Click **Add**.

   The instance should be ready in about 7 minutes. You should stay on the page until the process is complete.

gcloud

1. Log in to the gcloud SDK using your preferred methodology.

   In our examples, we'll use a local shell with the gcloud SDK installed, but you could use the native Google Cloud Shell in the Google Cloud console.

   For more information about the Google Cloud SDK, visit the Google Cloud SDK documentation page.

2. Verify that you are logged in as a user who has the required permissions that are defined in the section above:

   ```
   gcloud auth list
   ```

   The output should show the following where the * user account is the desired user account to be logged in as:

   ```
   Credentialed Accounts
   ACTIVE  ACCOUNT
        some_user_account@domain.com
   *    desired_user_account@domain.com
   To set the active account, run:
    $ gcloud config set account `ACCOUNT`
   Updates are available for some Cloud SDK components. To install
   them,
   please run:
   $ gcloud components update
   ```

3. Run the `gcloud compute instances create` command:

   ```
   gcloud compute instances create <instance-name>
     --machine-type=n2-standard-4
     --image-project=netapp-cloudmanager
     --image-family=cloudmanager
     --scopes=cloud-platform
     --project=<project>
     --service-account=<<service-account>
     --zone=<zone>
     --no-address
     --tags <network-tag>
     --network <network-path>
     --subnet <subnet-path>
     --boot-disk-kms-key <kms-key-path>
   ```

instance-name

The desired instance name for the VM instance.

project

(Optional) The project where you want to deploy the VM.

service-account

The service account specified in the output from step 2.

zone

The zone where you want to deploy the VM

no-address

(Optional) No external IP address is used (you need a cloud NAT or proxy to route traffic to the public internet)

network-tag

(Optional) Add network tagging to link a firewall rule using tags to the Connector instance

network-path

(Optional) Add the name of the network to deploy the Connector into (for a Shared VPC, you need the full path)

subnet-path

(Optional) Add the name of the subnet to deploy the Connector into (for a Shared VPC, you need the full path)

kms-key-path

(Optional) Add a KMS key to encrypt the Connector's disks (IAM permissions also need to be applied)

For more information about these flags, visit the Google Cloud compute SDK documentation.

Running the command deploys the Connector using the NetApp golden image. The Connector instance and software should be running in approximately five minutes.

4. Open a web browser from a host that has a connection to the Connector instance and enter the following URL:

   http://*ipaddress*:80

5. After you log in, set up the Connector:
   a. Specify the NetApp account to associate with the Connector.

      Learn about NetApp accounts.

   b. Enter a name for the system.

Result

The Connector is now installed and set up with your NetApp account. Cloud Manager will automatically use this Connector when you create new working environments. But if you have more than one Connector, you'll need to switch between them.

If you have Google Cloud Storage buckets in the same Google Cloud account where you created the Connector, you'll see a Google Cloud Storage working environment appear on the Canvas automatically. Learn more about what you can do with this working environment.

Open port 3128 for AutoSupport messages

If you plan to deploy Cloud Volumes ONTAP systems in a subnet where an outbound internet connection won't be available, then Cloud Manager automatically configures Cloud Volumes ONTAP to use the Connector as a proxy server.

The only requirement is to ensure that the Connector's security group allows *inbound* connections over port 3128. You'll need to open this port after you deploy the Connector.

If you use the default security group for Cloud Volumes ONTAP, then no changes are needed to its security group. But if you plan to define strict outbound rules for Cloud Volumes ONTAP, then you'll also need to ensure that the Cloud Volumes ONTAP security group allows *outbound* connections over port 3128.

Where to go next

Now that you've logged in and set up Cloud Manager, users can start creating and discovering working environments.

- Get started with Cloud Volumes ONTAP for AWS
- Get started with Cloud Volumes ONTAP for Azure
- Get started with Cloud Volumes ONTAP for Google Cloud
- Set up Azure NetApp Files
- Set up Amazon FSx for ONTAP
- Set up Cloud Volumes Service for AWS
- Discover an on-premises ONTAP cluster
- Discover your Amazon S3 buckets

Administer Cloud Manager

NetApp accounts

Managing your NetApp 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 Cloud Volumes ONTAP working environments.

View endpoints for the Tenancy API

Creating and managing users

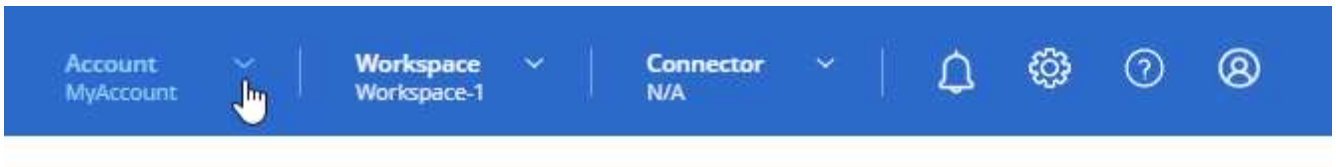
The user's in your account can access the manage the resources in your account's workspaces.

Adding users

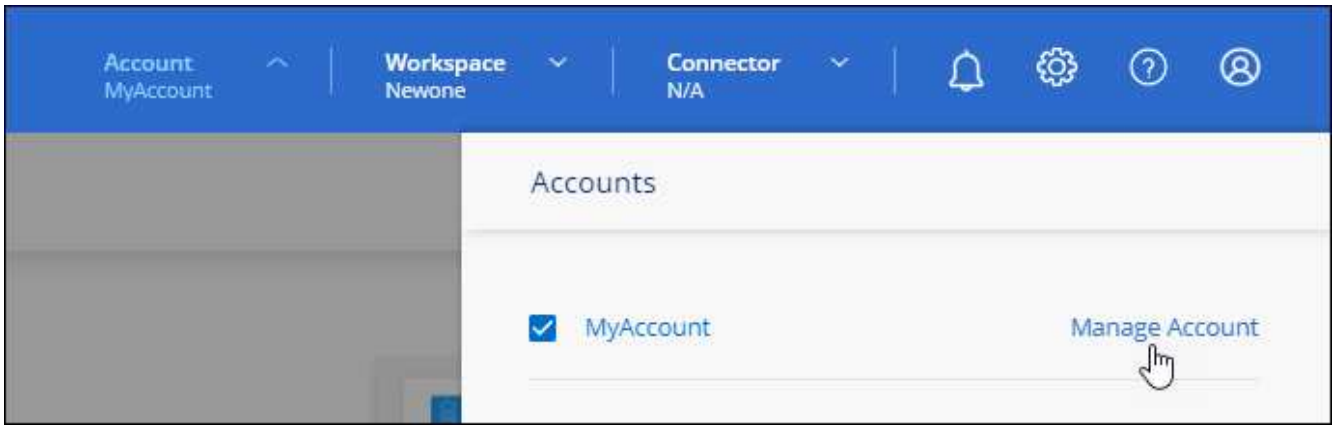
Associate Cloud Central users with the NetApp account so those users can create and manage working environments in Cloud Manager.

Steps

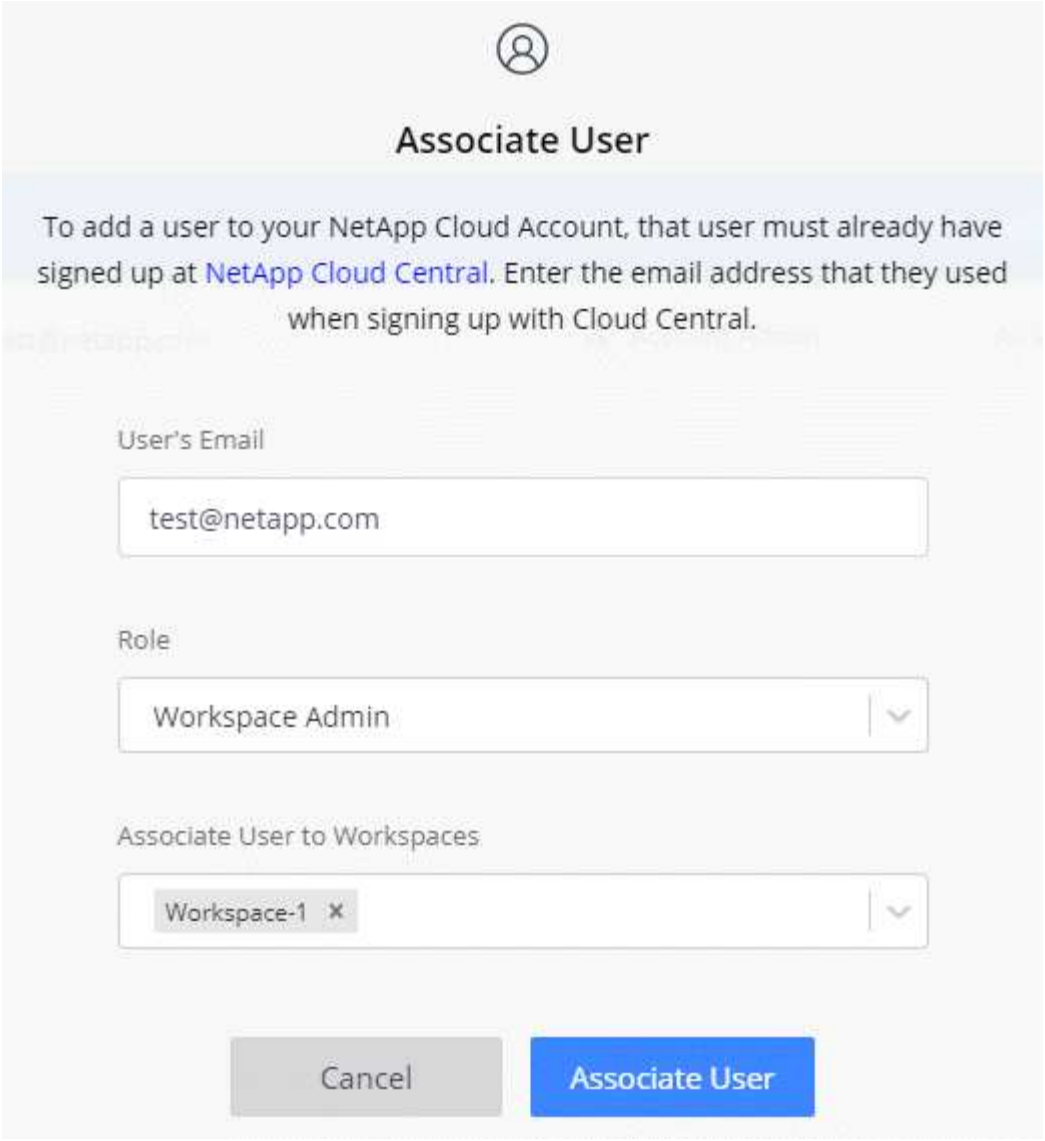
1. If the user hasn't already done so, ask the user to go to NetApp Cloud Central and sign up.
2. From the top of Cloud Manager, click the **Account** drop-down.



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.



7. Click **Associate**.

Result

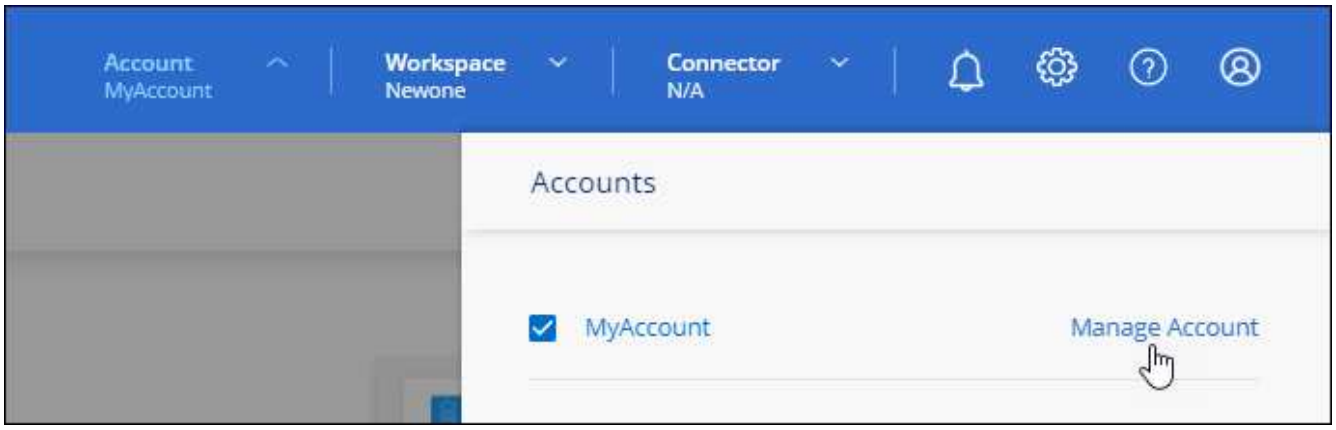
The user should receive an email from NetApp Cloud Central titled "Account Association." The email includes the information needed to access Cloud Manager.

Removing users

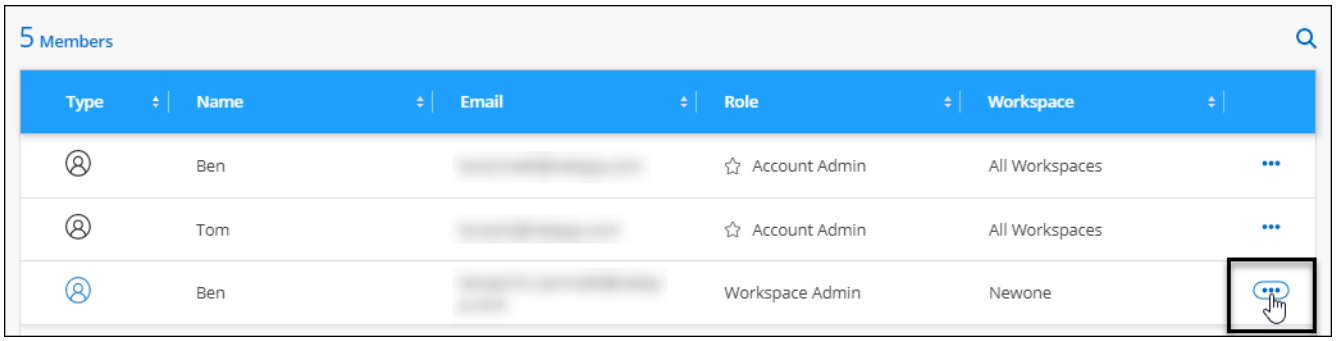
Disassociating a user makes it so they can no longer access the resources in a NetApp account.

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

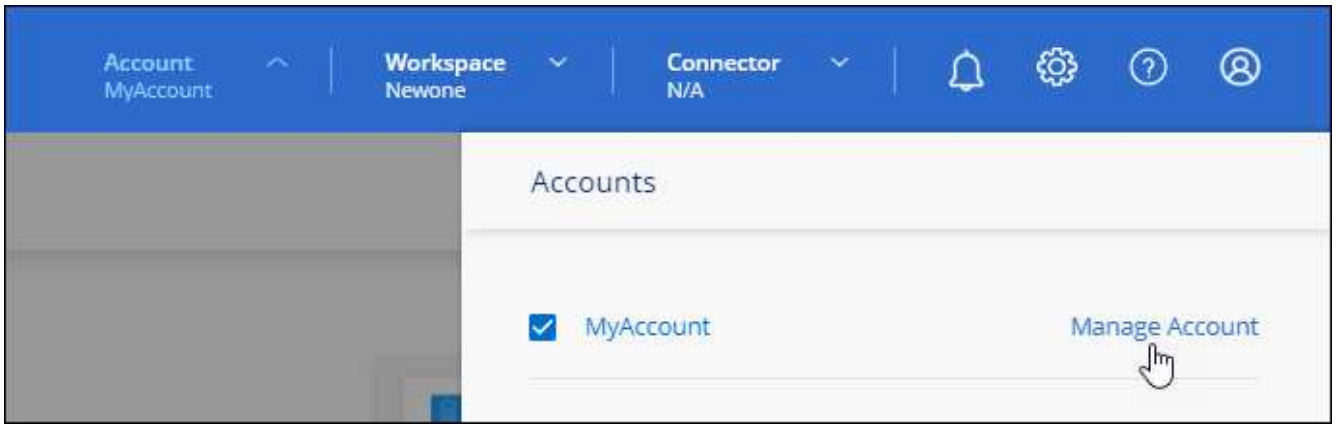
The user can no longer access the resources in this NetApp account.

Managing a Workspace Admin's workspaces

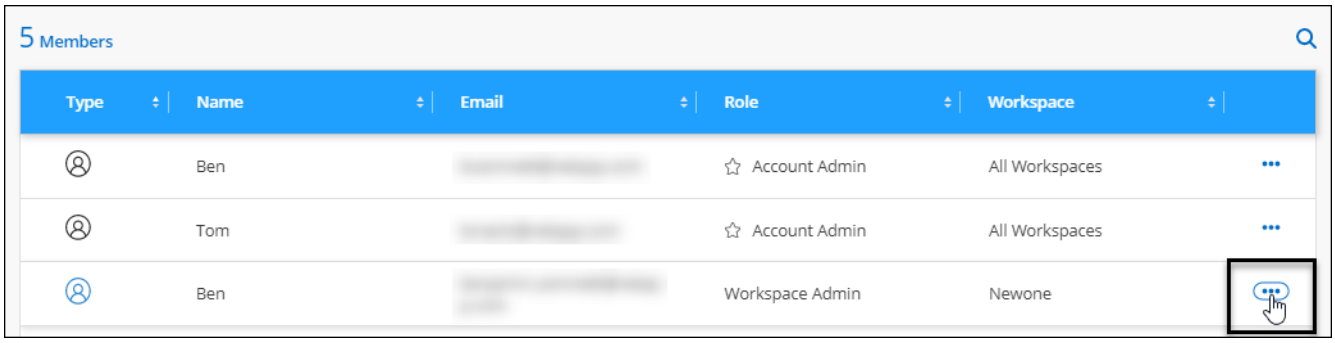
You can associate and disassociate Workspace Admins with workspaces at any time. Associating the user enables them to create and view the working environments in that workspace.

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.



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.

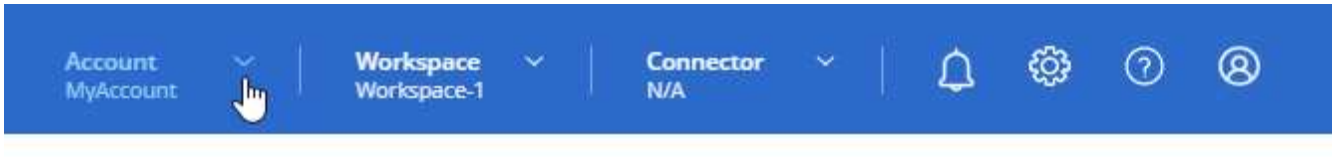
When you create the service account, Cloud Manager enables you to copy or download a client ID and client secret for the service account. This key pair is used for authentication with Cloud Manager.

Creating a service account

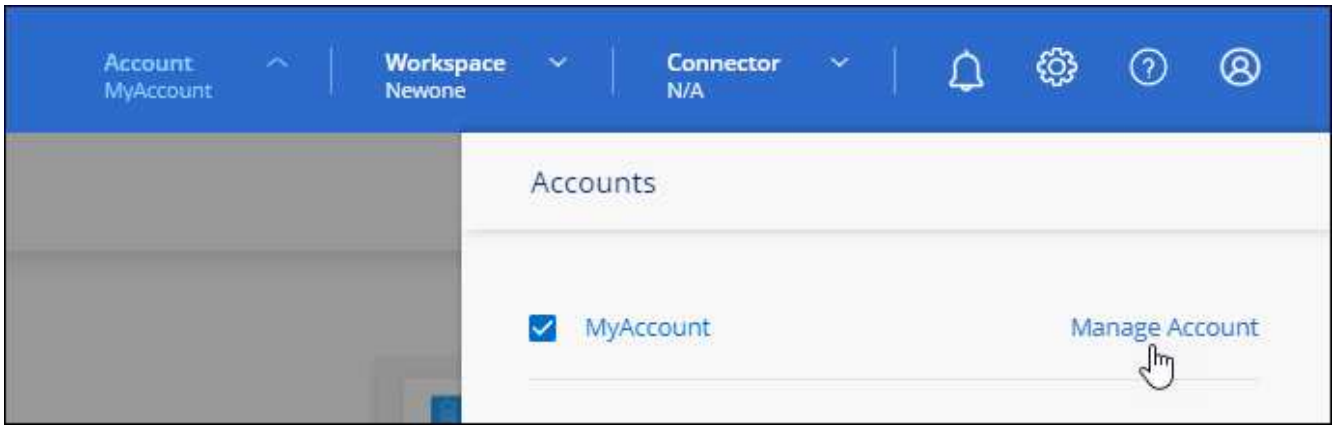
Create as many service accounts as you need to manage the resources in your working environments.

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.

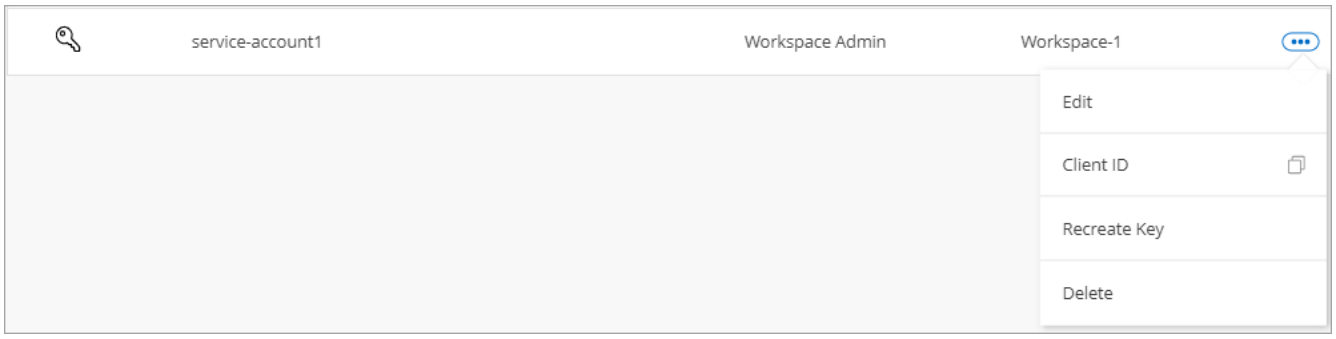
```
curl --location --request POST 'https://netapp-cloud-
account.auth0.com/oauth/token' \
--header 'Content-Type: application/json' \
--data-raw '{
    "grant_type": "client_credentials",
    "client_secret": "<client secret>",
    "audience": "https://api.cloud.netapp.com",
    "client_id": "<client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



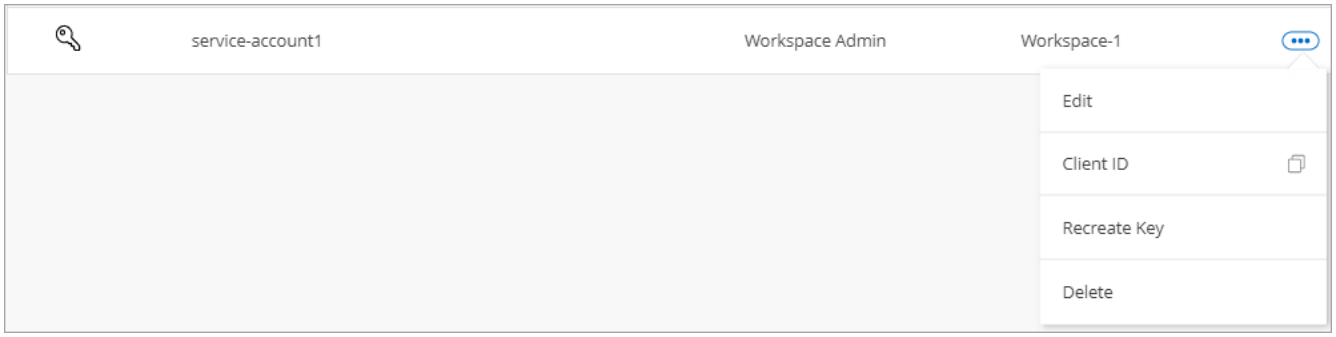
2. Click **Client ID**.
3. The ID is copied to your clipboard.

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.

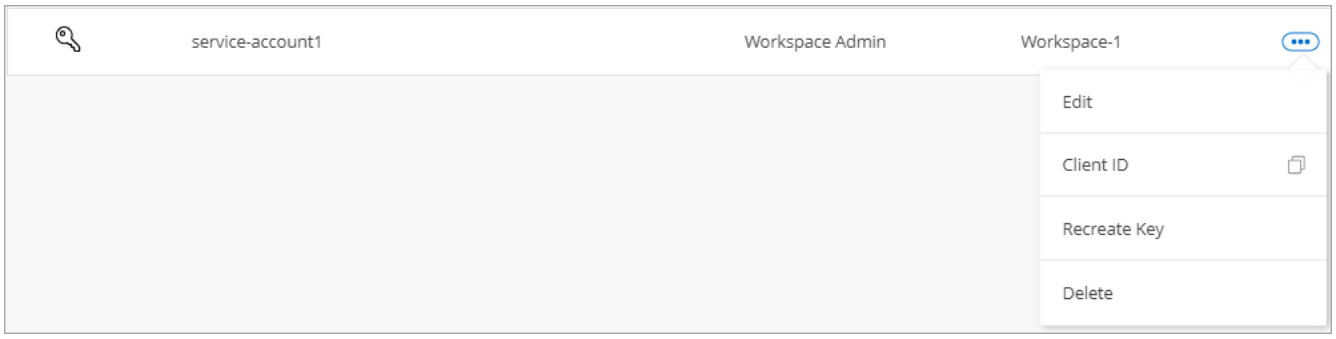
5. Click **Close**.

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.

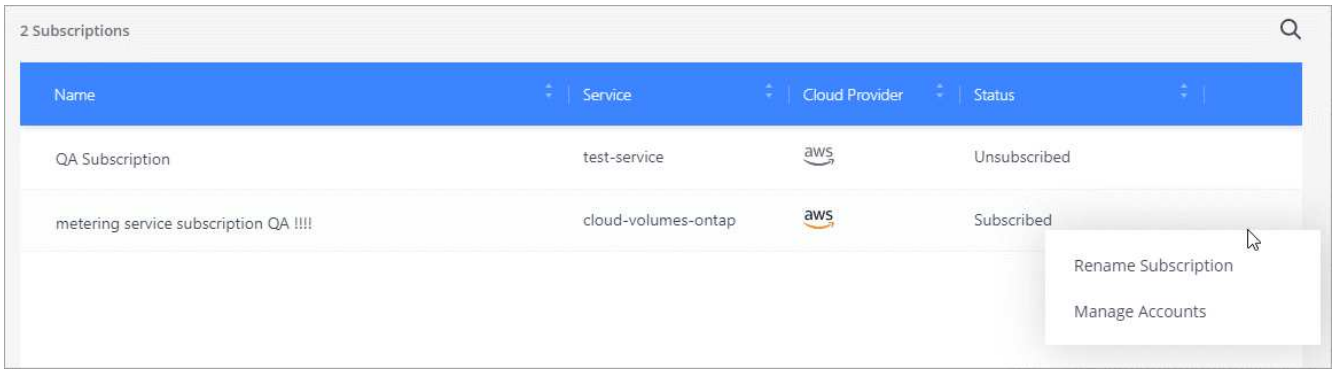
Learn more about subscriptions.

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.



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, in the Timeline, or have notifications sent to your email.

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

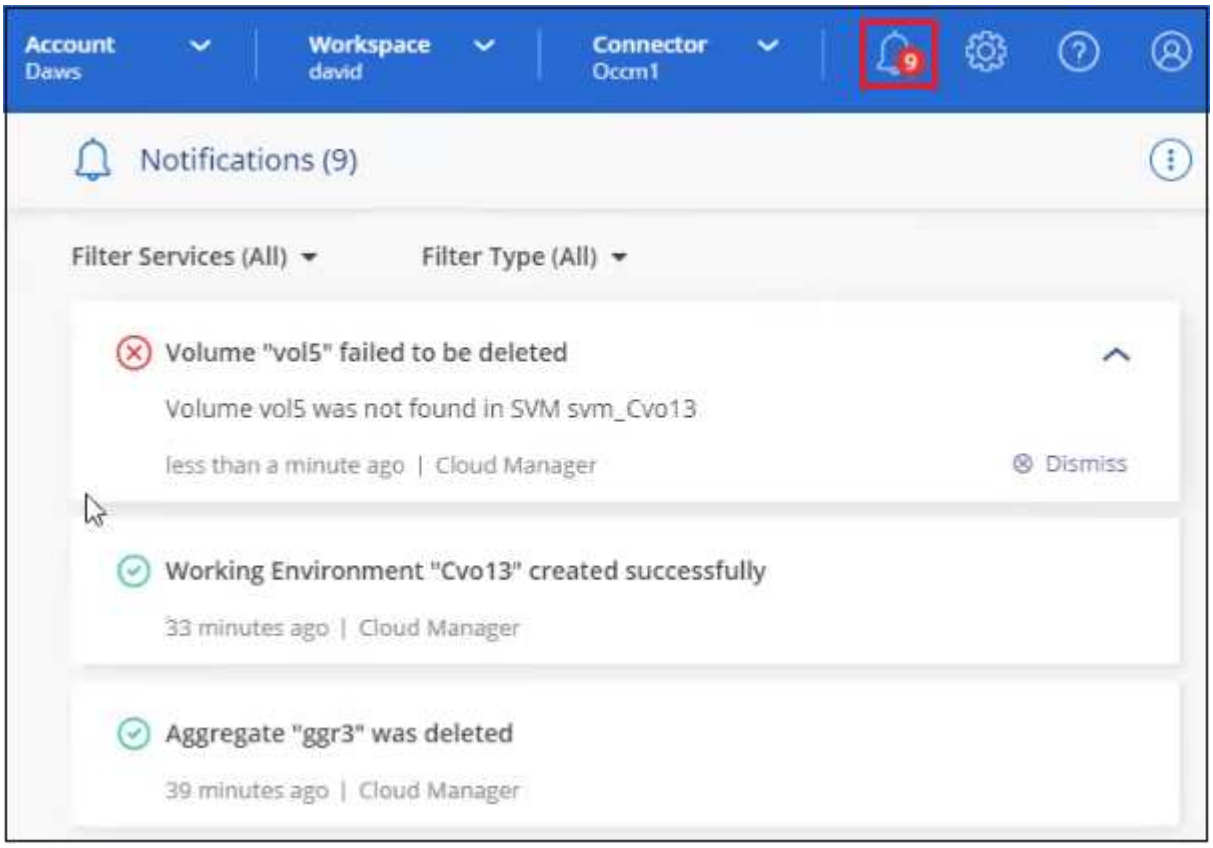
Notification Center	Timeline
Shows high level status for events and actions	Provides details for each event or action for further investigation
Shows status for the current login session - the information won't appear in the Notification Center after you log off	Retains status for the last month
Shows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

Notification Center	Timeline
Provides the ability to email notifications to Account users and to others	No email capability

Monitoring activities using the Notification Center

Notifications track the progress of operations that you've initiated in Cloud Manager so you can verify whether the operation was successful or not. They enable you to view the status for many Cloud Manager operations that you initiated during your current login session. Not all services report information into the Notification Center at this time.

You can 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.



You can also configure Cloud Manager to send notifications by email so you can be informed of important system activity even when you're not logged into the system. Emails can be sent to any Cloud Central users who are part of your NetApp Cloud Account, or to any other recipients who need to be aware of certain types of system activity. See Setting email notification settings below.

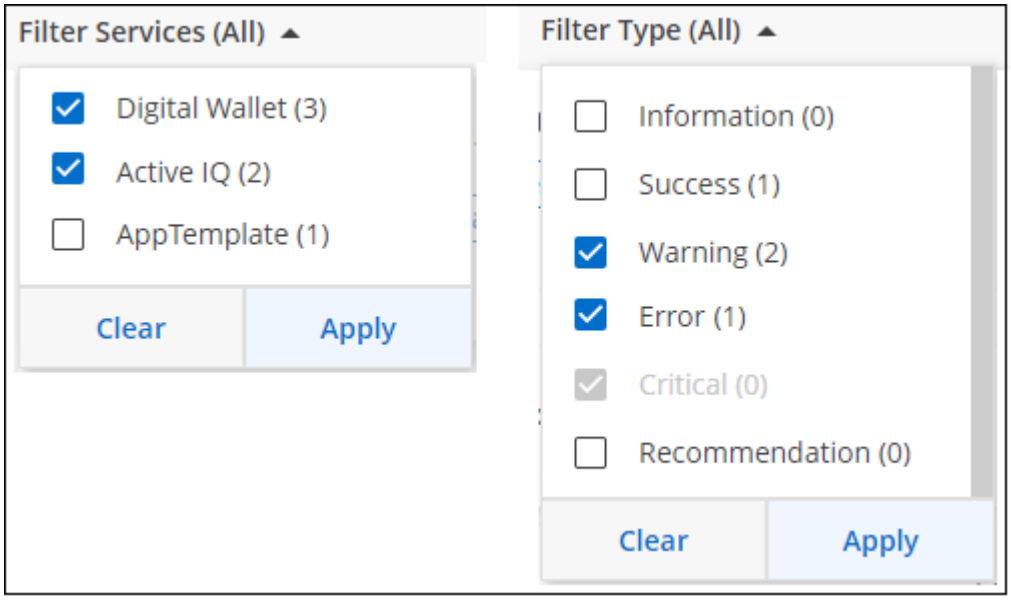
Notification types

Notifications are classified in the following categories:

Notification type	Description
Critical	A problem occurred that might lead to service disruption if corrective action is not taken immediately.
Error	An action or process ended with failure, or could lead to failure if corrective action is not taken.
Warning	An issue that you should be aware of to make sure it does not reach the critical severity. Notifications of this severity do not cause service disruption, and immediate corrective action might not be required.
Recommendation	A system recommendation for you to take an action to improve the system or a certain service; for example: costs saving, suggestion for new services, recommended security configuration, etc.
Information	A message that provides additional information about an action or process.
Success	An action or process completed successfully.

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.

Setting email notification settings

You can send specific types of notifications by email so you can be informed of important system activity even when you're not logged into Cloud Manager. Emails can be sent to any users who are part of your NetApp Account, or to any other recipients who need to be aware of certain types of system activity.

Note: Sending email notifications is not supported when the Connector is installed in a site without internet

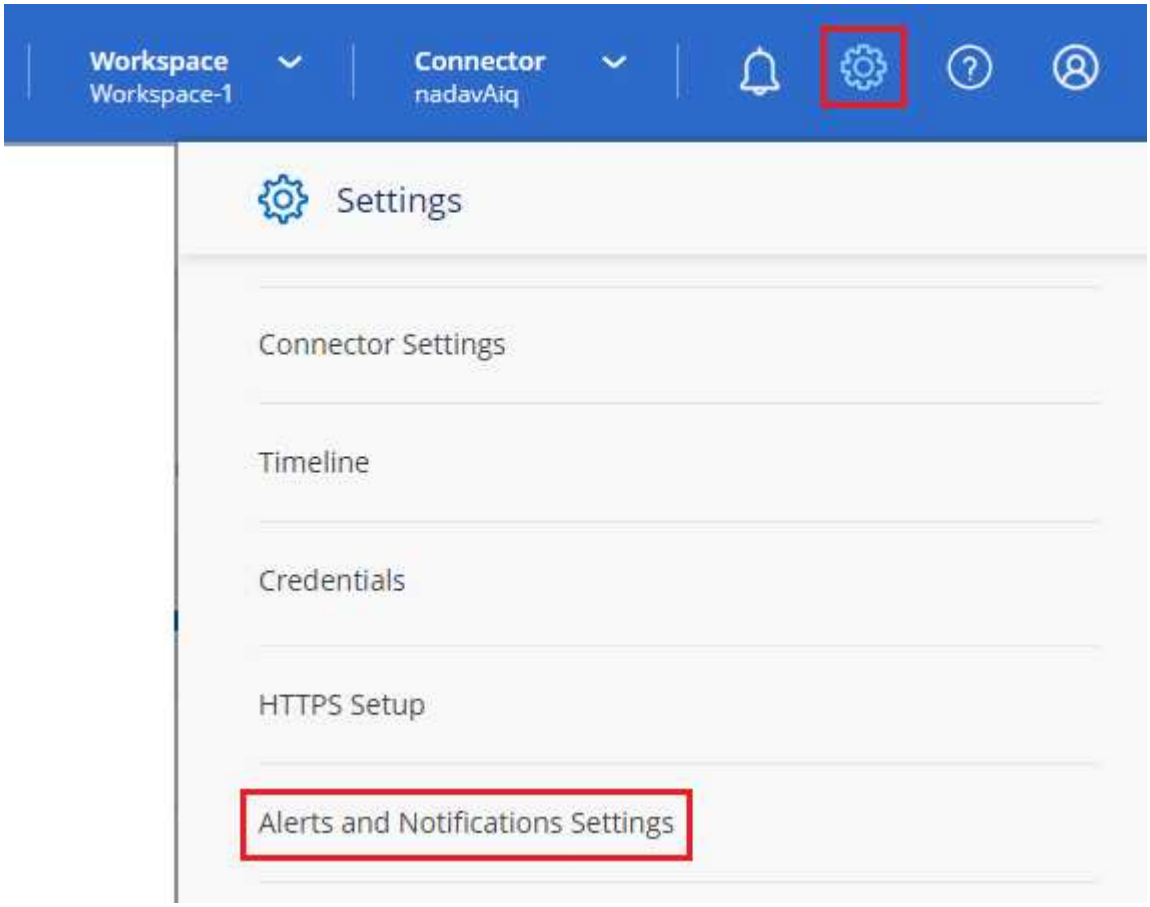
access.

By default, Cloud Manager Account Admins will receive emails for all "Critical" and "Recommendation" notifications. All other users and recipients are configured, by default, not to receive any notification emails.

You must be an Account Admin to customize the notifications settings.

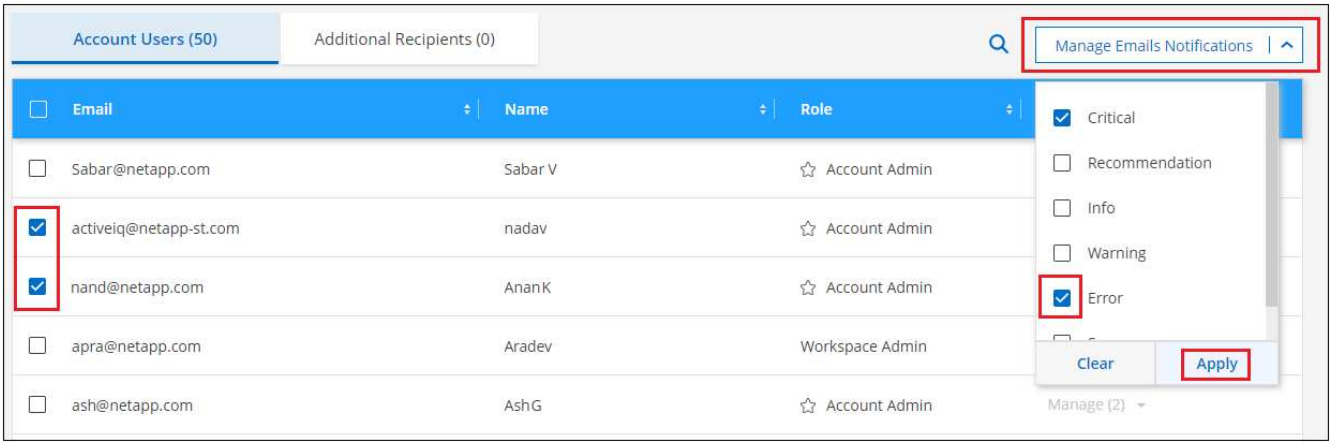
Steps

1. From the Cloud Manager menu bar, click **Settings > Alerts and Notifications Settings**.



2. Select a user, or multiple users, from either the *Account Users* tab or the *Additional Recipients* tab, and choose the type of notifications to be sent:

   - To make changes for a single user, click the menu in the Notifications column for that user, check the types of Notifications to be sent, and click **Apply**.
   - To make changes for multiple users, check the box for each user, click **Manage Email Notifications**, check the types of Notifications to be sent, and click **Apply**.

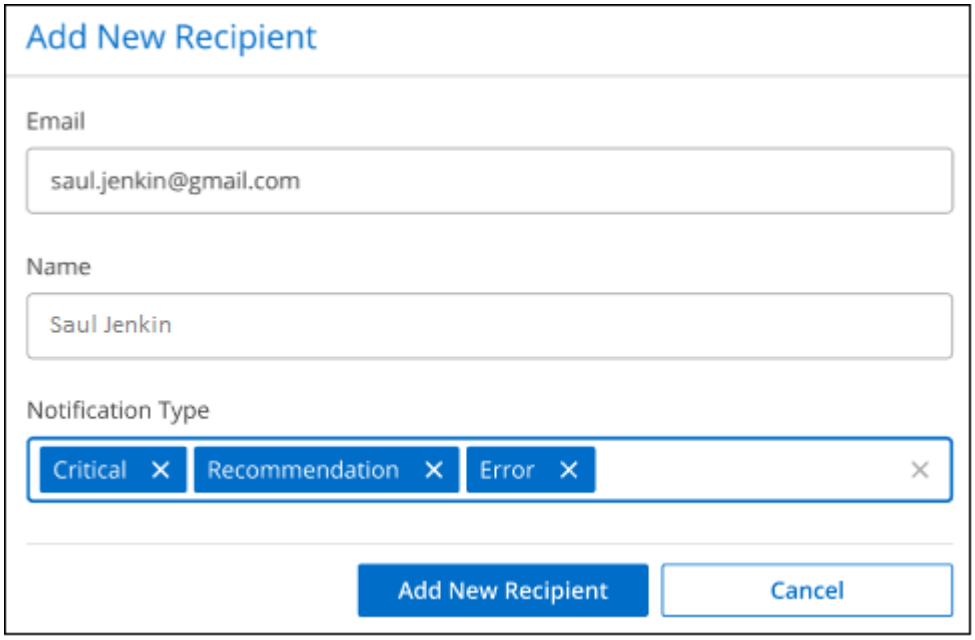


Adding additional email recipients

The users who appear in the *Account Users* tab are populated automatically from the users in your NetApp Account (from the Manage Account page). You can add email addresses in the *Additional Recipients* tab for other people, or groups, who do not have access to Cloud Manager, but who need to be notified about certain types of alerts and notifications.

Steps

1. From the Alerts and Notifications Settings page, click **Add New Recipients**.



2. Enter the name, email address, and select the types of Notifications that recipient will receive, and click **Add New Recipient**.

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. From the Cloud Manager menu bar, click **Settings > Timeline**.
2. Under the Filters, click **Service**, enable **Tenancy**, and click **Apply**.

Result

The Timeline updates to show you account management actions.

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

Task	Account Admin	Workspace Admin	Compliance Viewer	SnapCenter Admin
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
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

Connectors

Advanced deployment

Create a Connector from the AWS Marketplace

It's best to create a Connector directly from Cloud Manager, but you can launch a Connector from the AWS Marketplace, if you'd rather not specify AWS access keys. After you create and set up the Connector, Cloud Manager will automatically use it when you create new working environments.

Steps

1. Set up permissions in AWS:

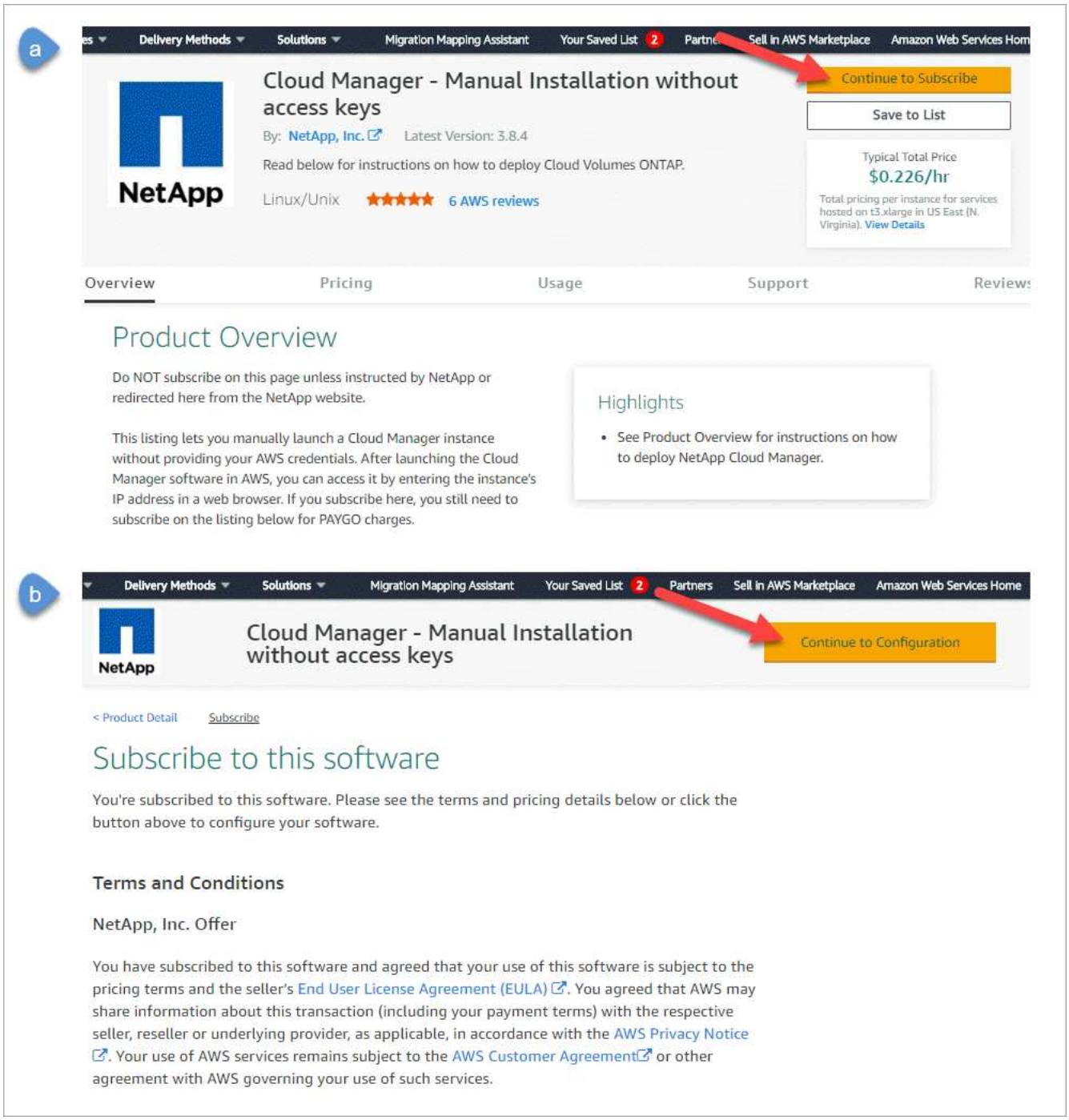
a. From the IAM console, create your own policy by copying and pasting the contents of the IAM policy for the Connector.

b. Create an IAM role with the role type Amazon EC2 and attach the policy that you created in the previous step to the role.

2. Now go to the Cloud Manager page on the AWS Marketplace to deploy Cloud Manager from an AMI.

   The IAM user must have AWS Marketplace permissions to subscribe and unsubscribe.

3. On the Marketplace page, click **Continue to Subscribe** and then click **Continue to Configuration**.



4. Change any of the default options and click **Continue to Launch**.

5. Under **Choose Action**, select **Launch through EC2** and then click **Launch**.

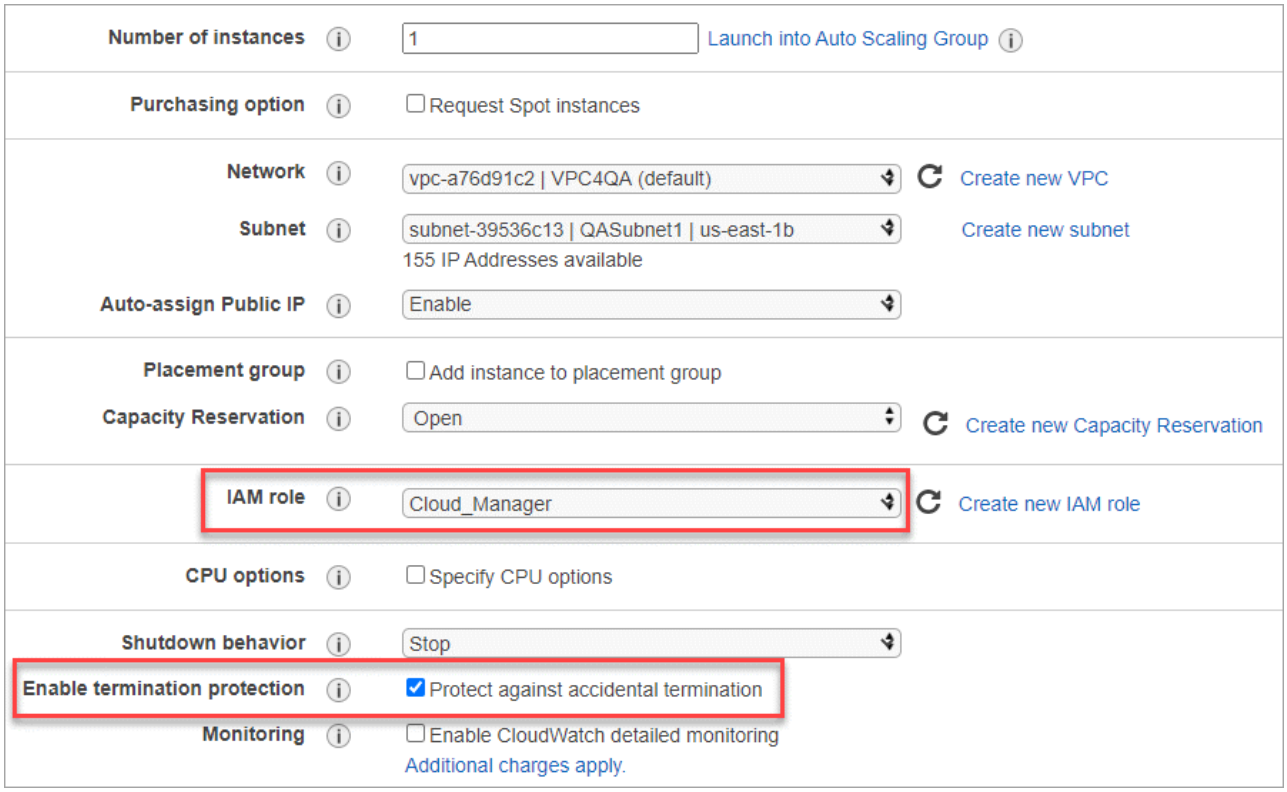
   These steps describe how to launch the instance from the EC2 Console because the console enables you to attach an IAM role to the Cloud Manager instance. This isn't possible using the **Launch from Website** action.

6. Follow the prompts to configure and deploy the instance:

   - **Choose Instance Type**: Depending on region availability, choose one of the supported instance types (t3.xlarge is recommended).

     Review the instance requirements.

   - **Configure Instance**: Select a VPC and subnet, choose the IAM role that you created in step 1, enable termination protection (recommended), and choose any other configuration options that meet your requirements.



   - **Add Storage**: Keep the default storage options.
   - **Add Tags**: Enter tags for the instance, if desired.
   - **Configure Security Group**: Specify the required connection methods for the Connector instance: SSH, HTTP, and HTTPS.
   - **Review**: Review your selections and click **Launch**.

     AWS launches the software with the specified settings. The Connector instance and software should be running in approximately five minutes.

7. Open a web browser from a host that has a connection to the Connector instance and enter the following URL:

   http://*ipaddress*:80

8. After you log in, set up the Connector:
    a. Specify the NetApp account to associate with the Connector.

        Learn about NetApp accounts.

    b. Enter a name for the system.

Result

The Connector is now installed and set up with your NetApp account. Cloud Manager will automatically use this Connector when you create new working environments. But if you have more than one Connector, you'll need to switch between them.

If you have Amazon S3 buckets in the same AWS account where you created the Connector, you'll see an Amazon S3 working environment appear on the Canvas automatically. Learn more about what you can do with this working environment.

After you finish

If you plan to deploy Cloud Volumes ONTAP systems in a subnet where an outbound internet connection won't be available, then Cloud Manager automatically configures Cloud Volumes ONTAP to use the Connector as a proxy server.

The only requirement is to ensure that the Connector's security group allows *inbound* connections over port 3128. You'll need to open this port after you deploy the Connector.

If you use the default security group for Cloud Volumes ONTAP, then no changes are needed to its security group. But if you plan to define strict outbound rules for Cloud Volumes ONTAP, then you'll also need to ensure that the Cloud Volumes ONTAP security group allows *outbound* connections over port 3128.

Create a Connector from the Azure Marketplace

It's best to create a Connector directly from Cloud Manager, but you can launch a Connector from the Azure Marketplace, if you prefer. After you create and set up the Connector, Cloud Manager will automatically use it when you create new working environments.

Creating a Connector in Azure

Deploy the Connector in Azure using the image in the Azure Marketplace and then log in to the Connector to specify your NetApp account.

Steps

1. Go to the NetApp Connector VM page in the Azure Marketplace.
   - Azure Marketplace page for commercial regions
   - Azure Marketplace page for Azure Government regions
2. Click **Get it now** and then click **Continue**.
3. From the Azure portal, click **Create** and follow the steps to configure the virtual machine.

   Note the following as you configure the VM:

   - Cloud Manager can perform optimally with either HDD or SSD disks.
   - Choose a VM size that meets CPU and RAM requirements. We recommend DS3 v2.

     Review the VM requirements.

   - For the network security group, the Connector requires inbound connections using SSH, HTTP, and HTTPS.

     Learn more about security group rules for the Connector.

   - Under **Management**, enable **System assigned managed identity** for the Connector by selecting **On**.

     This setting is important because a managed identity allows the Connector virtual machine to identify itself to Azure Active Directory without providing any credentials. Learn more about managed identities for Azure resources.

4. On the **Review + create** page, review your selections and click **Create** to start the deployment.

   Azure deploys the virtual machine with the specified settings. The virtual machine and Connector software should be running in approximately five minutes.

5. Open a web browser from a host that has a connection to the Connector virtual machine and enter the following URL:

   http://*ipaddress*:80

6. After you log in, set up the Connector:

a. Specify the NetApp account to associate with the Connector.

   Learn about NetApp accounts.

b. Enter a name for the system.

Result

The Connector is now installed and set up. You must grant Azure permissions before users can deploy Cloud Volumes ONTAP in Azure.

Granting Azure permissions

When you deployed the Connector in Azure, you should have enabled a system-assigned managed identity. You must now grant the required Azure permissions by creating a custom role and then by assigning the role to the Connector virtual machine for one or more subscriptions.

Steps

1. Create a custom role:
   a. Copy the contents of the custom role permissions for the Connector and save them in a JSON file.
   b. 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.

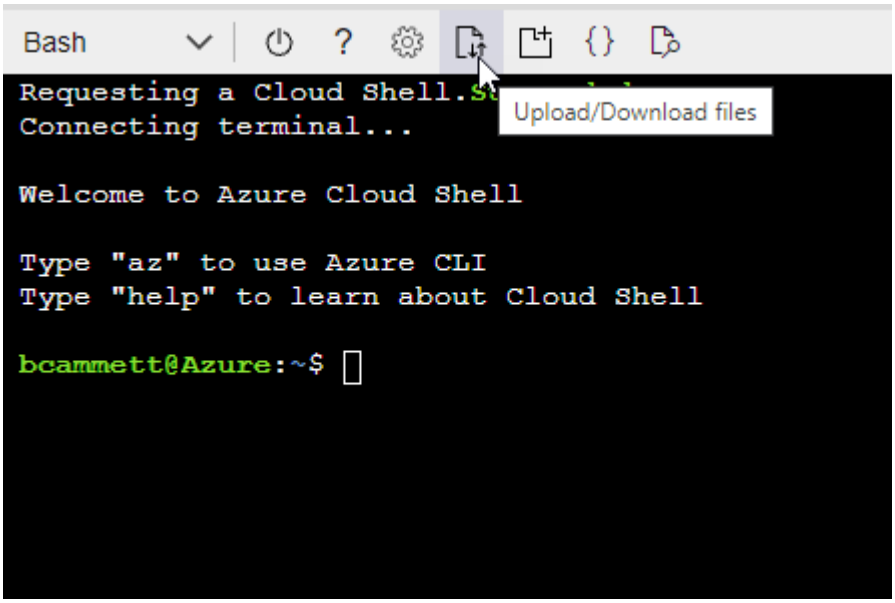
Example

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

c. 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.

- Start Azure Cloud Shell and choose the Bash environment.
- Upload the JSON file.



- Enter the following Azure CLI command:

```
az role definition create --role-definition
Policy_for_Setup_As_Service_Azure.json
```

You should now have a custom role called Cloud Manager Operator that you can assign to the Connector virtual machine.

2. Assign the role to the Connector virtual machine for one or more subscriptions:
   a. Open the **Subscriptions** service and then select the subscription in which you want to deploy Cloud Volumes ONTAP systems.
   b. Click **Access control (IAM)** > **Add** > **Add role assignment**.
   c. In the **Role** tab, select the **Cloud Manager Operator** role and click **Next**.

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.

d. In the **Members** tab, complete the following steps:
   - Assign access to a **Managed identity**.
   - Click **Select members**, select the subscription in which the Connector virtual machine was created, choose **Virtual machine**, and then select the Connector virtual machine.
   - Click **Select**.
   - Click **Next**.

e. Click **Review + assign**.

f. If you want to deploy Cloud Volumes ONTAP from additional subscriptions, switch to that subscription and then repeat these steps.

Result

The Connector now has the permissions that it needs to manage resources and processes within your public cloud environment. Cloud Manager will automatically use this Connector when you create new working environments. But if you have more than one Connector, you'll need to switch between them.

If you have Azure Blob storage in the same Azure account where you created the Connector, you'll see an Azure Blob working environment appear on the Canvas automatically. Learn more about what you can do with this working environment.

Open port 3128 for AutoSupport messages

If you plan to deploy Cloud Volumes ONTAP systems in a subnet where an outbound internet connection won't be available, then Cloud Manager automatically configures Cloud Volumes ONTAP to use the Connector as a proxy server.

The only requirement is to ensure that the Connector's security group allows *inbound* connections over port 3128. You'll need to open this port after you deploy the Connector.

If you use the default security group for Cloud Volumes ONTAP, then no changes are needed to its security group. But if you plan to define strict outbound rules for Cloud Volumes ONTAP, then you'll also need to ensure that the Cloud Volumes ONTAP security group allows *outbound* connections over port 3128.

Install the Connector on an existing Linux host that has internet access

The most common way to create a Connector is directly from Cloud Manager or from a cloud provider's marketplace. But you have the option to download and install the Connector software on an existing Linux host in your network or in the cloud. These steps are specific to hosts that have internet access.

Learn about other ways to deploy a Connector.

If you want to create a Cloud Volumes ONTAP system in Google Cloud, then you must have a Connector that's running in Google Cloud as well. You can't use a Connector that's running in AWS, Azure, or on-prem.

Verify host requirements

The Connector software must run on a host that meets specific operating system requirements, RAM requirements, port requirements, and so on.

A dedicated host is required

The Connector is not supported on a host that is shared with other applications. The host must be a dedicated host.

CPU

4 cores or 4 vCPUs

RAM

16 GB

AWS EC2 instance type

An instance type that meets the CPU and RAM requirements above. We recommend t3.xlarge.

Azure VM size

An instance type that meets the CPU and RAM requirements above. We recommend DS3 v2.

GCP machine type

An instance type that meets the CPU and RAM requirements above. We recommend n2-standard-4.

The Connector is supported in Google Cloud on a VM instance with an OS that supports Shielded VM features

Supported operating systems

- CentOS 7.6
- CentOS 7.7
- CentOS 7.8
- CentOS 7.9
- Red Hat Enterprise Linux 7.6
- Red Hat Enterprise Linux 7.7
- Red Hat Enterprise Linux 7.8
- Red Hat Enterprise Linux 7.9

  The Red Hat Enterprise Linux system must be registered with Red Hat Subscription Management. If it is not registered, the system cannot access repositories to update required 3rd party software during Connector installation.

  The Connector is supported on English-language versions of these operating systems.

Hypervisor

A bare metal or hosted hypervisor that is certified to run CentOS or Red Hat Enterprise Linux
Red Hat Solution: Which hypervisors are certified to run Red Hat Enterprise Linux?

Disk space in /opt

100 GiB of space must be available

Disk space in /var

20 GiB of space must be available

Outbound internet access

Outbound internet access is required to install the Connector and for the Connector to manage resources and processes within your public cloud environment. For a list of endpoints, see Networking requirements for the Connector.

Install the Connector

After you verify that you have a supported Linux host, you can obtain the Connector software and then install it.

Required privileges

Root privileges are required to install the Connector.

About this task

- The installation installs the AWS command line tools (awscli) to enable recovery procedures from NetApp support.

  If you receive a message that installing the awscli failed, you can safely ignore the message. The Connector can operate successfully without the tools.

- The installer that is available on the NetApp Support Site might be an earlier version. After installation, the Connector automatically updates itself if a new version is available.

Steps

1. Download the Cloud Manager software from the NetApp Support Site, and then copy it to the Linux host.

   For help with connecting and copying the file to an EC2 instance in AWS, see AWS Documentation: Connecting to Your Linux Instance Using SSH.

2. Assign permissions to run the script.

   ```
   chmod +x OnCommandCloudManager-V3.9.19.sh
   ```

3. Run the installation script.

   If you have a proxy server, you will need to enter the command parameters as shown below. The installer doesn't prompt you to provide information about a proxy.

   ```
    ./OnCommandCloudManager-V3.9.19.sh [silent] [proxy=ipaddress]
   [proxyport=port] [proxyuser=user_name] [proxypwd=password]
   ```

   silent runs the installation without prompting you for information.

   proxy is required if the host is behind a proxy server.

   proxyport is the port for the proxy server.

   proxyuser is the user name for the proxy server, if basic authentication is required.

   proxypwd is the password for the user name that you specified.

4. Unless you specified the silent parameter, enter **Y** to continue with the installation.

   Cloud Manager is now installed. At the end of the installation, the Cloud Manager service (occm) restarts twice if you specified a proxy server.

5. Open a web browser and enter the following URL:

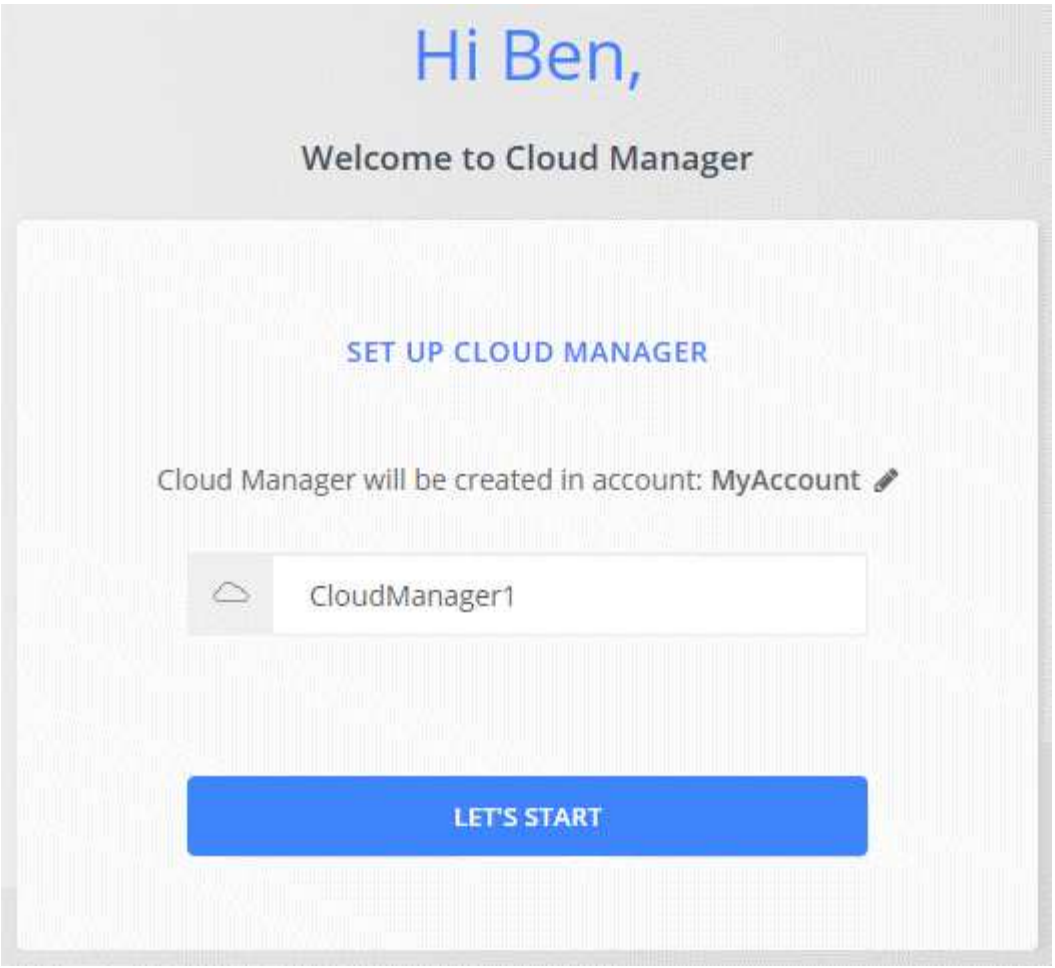
   https://*ipaddress*

   ipaddress can be localhost, a private IP address, or a public IP address, depending on the configuration of the host. For example, if the Connector is in the public cloud without a public IP address, you must enter a private IP address from a host that has a connection to the Connector host.

6. Sign up at NetApp Cloud Central or log in.
7. If you installed the Connector in Google Cloud, set up a service account that has the permissions that Cloud Manager needs to create and manage Cloud Volumes ONTAP systems in projects.
   a. Create a role in GCP that includes the permissions defined in the Connector policy for GCP.
   b. Create a GCP service account and apply the custom role that you just created.
   c. Associate this service account with the Connector VM.
   d. If you want to deploy Cloud Volumes ONTAP in other projects, grant access by adding the service account with the Cloud Manager role to that project. You'll need to repeat this step for each project.
8. After you log in, set up Cloud Manager:
   a. Specify the NetApp account to associate with the Connector.

      Learn about NetApp accounts.

   b. Enter a name for the system.



Result

The Connector is now installed and set up with your NetApp account. Cloud Manager will automatically use this Connector when you create new working environments.

After you finish

Set up permissions so Cloud Manager can manage resources and processes within your public cloud environment:

- AWS: Set up an AWS account and then add it to Cloud Manager
- Azure: Set up an Azure account and then add it to Cloud Manager
- Google Cloud: See step 7 above

Install the Connector on-prem without internet access

You can install the Connector on an on-premises Linux host that doesn't have internet access. You can then discover on-prem ONTAP clusters, replicate data between them, back up volumes using Cloud Backup, and scan them with Cloud Data Sense.

These installation instructions are specifically for the use case described above. Learn about other ways to deploy a Connector.

Verify host requirements

The Connector software must run on a host that meets specific operating system requirements, RAM requirements, port requirements, and so on.

A dedicated host is required

The Connector is not supported on a host that is shared with other applications. The host must be a dedicated host.

CPU

4 cores or 4 vCPUs

RAM

16 GB

Supported operating systems

- CentOS 7.6
- CentOS 7.7
- CentOS 7.8
- CentOS 7.9
- Red Hat Enterprise Linux 7.6
- Red Hat Enterprise Linux 7.7
- Red Hat Enterprise Linux 7.8
- Red Hat Enterprise Linux 7.9

  The Red Hat Enterprise Linux system must be registered with Red Hat Subscription Management. If it is not registered, the system cannot access repositories to update required 3rd party software during Connector installation.

  The Connector is supported on English-language versions of these operating systems.

Hypervisor

A bare metal or hosted hypervisor that is certified to run CentOS or Red Hat Enterprise Linux
Red Hat Solution: Which hypervisors are certified to run Red Hat Enterprise Linux?

Disk type

An SSD is required

Disk space in /opt

100 GiB of space must be available

Disk space in /var

20 GiB of space must be available

Docker Engine

Docker Engine version 19 or later is required on the host before you install the Connector. View installation instructions.

Install the Connector

After you verify that you have a supported Linux host, you can obtain the Connector software and then install it.

Required privileges

Root privileges are required to install the Connector.

Steps

1. Verify that docker is enabled and running.

```
sudo sysctl enable docker && sudo sysctl start docker
```

2. Download the Cloud Manager software from the NetApp Support Site.
3. Copy the installer to the Linux host.
4. Assign permissions to run the script.

```
chmod +x /path/cloud-manager-connector-offline-v3.9.19
```

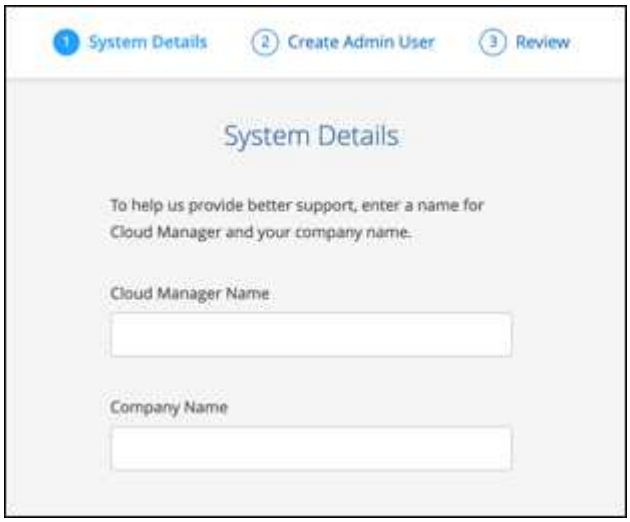
5. Run the installation script:

```
sudo /path/cloud-manager-connector-offline-v3.9.19
```

6. Open a web browser and enter https://*ipaddress* where *ipaddress* is the IP address of the Linux host.

   You should see the following screen.

7. Click **Set Up New Cloud Manager** and follow the prompts to set up the system.
   - **System Details**: Enter a name for the Cloud Manager system and your company name.



- **Create Admin User**: Create the admin user for the system.

  This user account runs locally on the system. There's no connection to NetApp Cloud Central.

- **Review**: Review the details, accept the license agreement, and then click **Set Up**.

8. Log in to Cloud Manager using the admin user that you just created.

Result

The Connector is now installed and you can start using the Cloud Manager features that are available in a dark site deployment.

What's next?

- Discover on-prem ONTAP clusters
- Replicate data between on-prem ONTAP clusters
- Back up on-prem ONTAP volume data to StorageGRID using Cloud Backup
- Scan on-prem ONTAP volume data using Cloud Data Sense

When new versions of the Connector software are available, they'll be posted to the NetApp Support Site. Learn how to upgrade the Connector.

Finding the system ID for a Connector

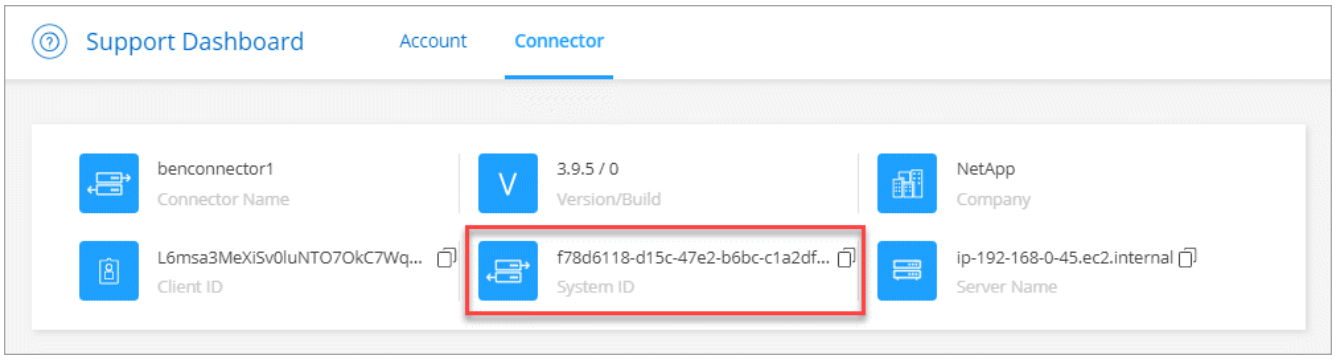
To help you get started, your NetApp representative might ask you for the system ID for a Connector. The ID is typically used for licensing and troubleshooting purposes.

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.

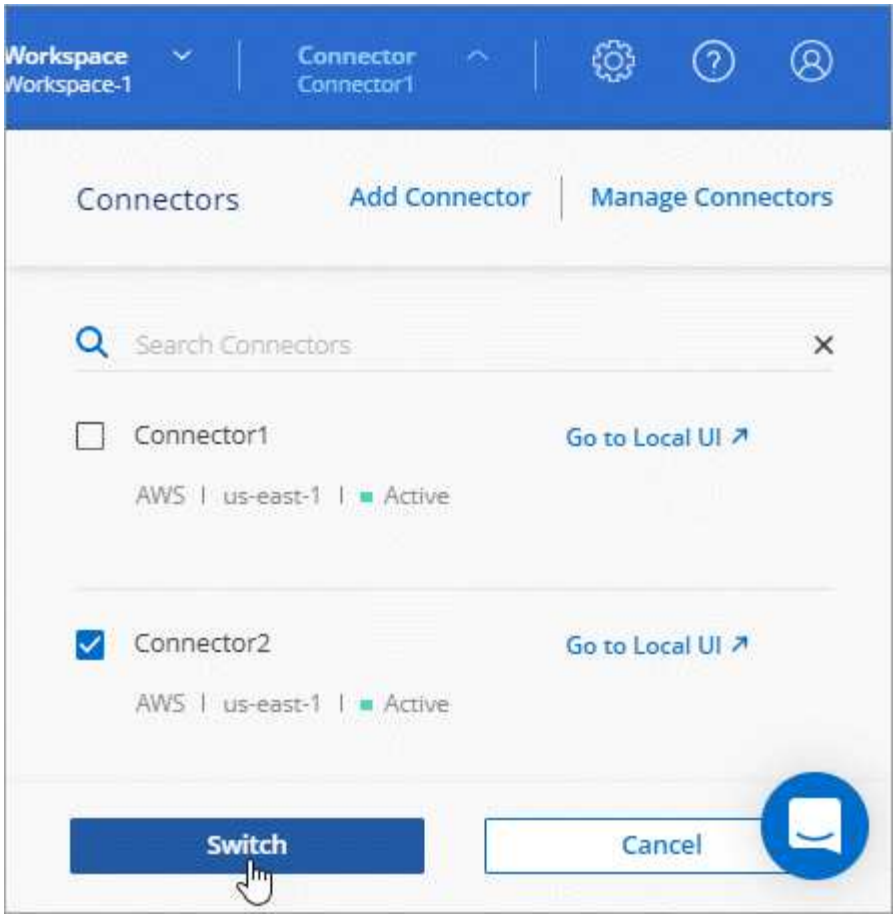
Switch between Connectors

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. If you're accessing Cloud Manager from a Government region or a site that doesn't have outbound internet access, then you need to use the local user interface running on the Connector.

Steps

1. Open a web browser and enter the following URL:

   https://*ipaddress*

   ipaddress can be localhost, a private IP address, or a public IP address, depending on the configuration of the host. For example, if the Connector is in the public cloud without a public IP address, you must enter a private IP address from a host that has a connection to the Connector host.

2. Enter your user name and password to log in.

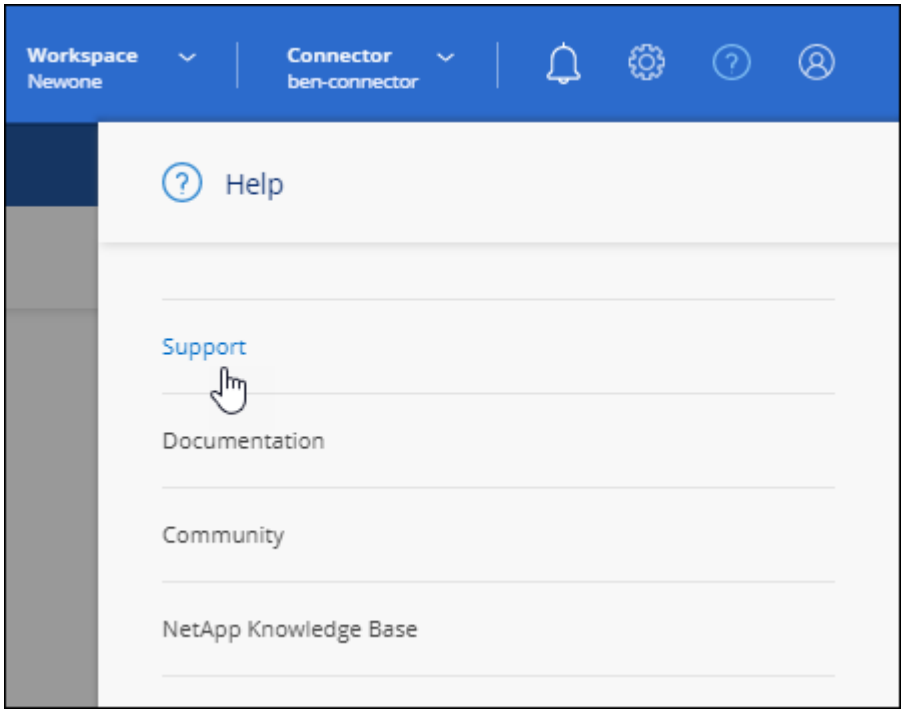
Download or send an AutoSupport message

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.

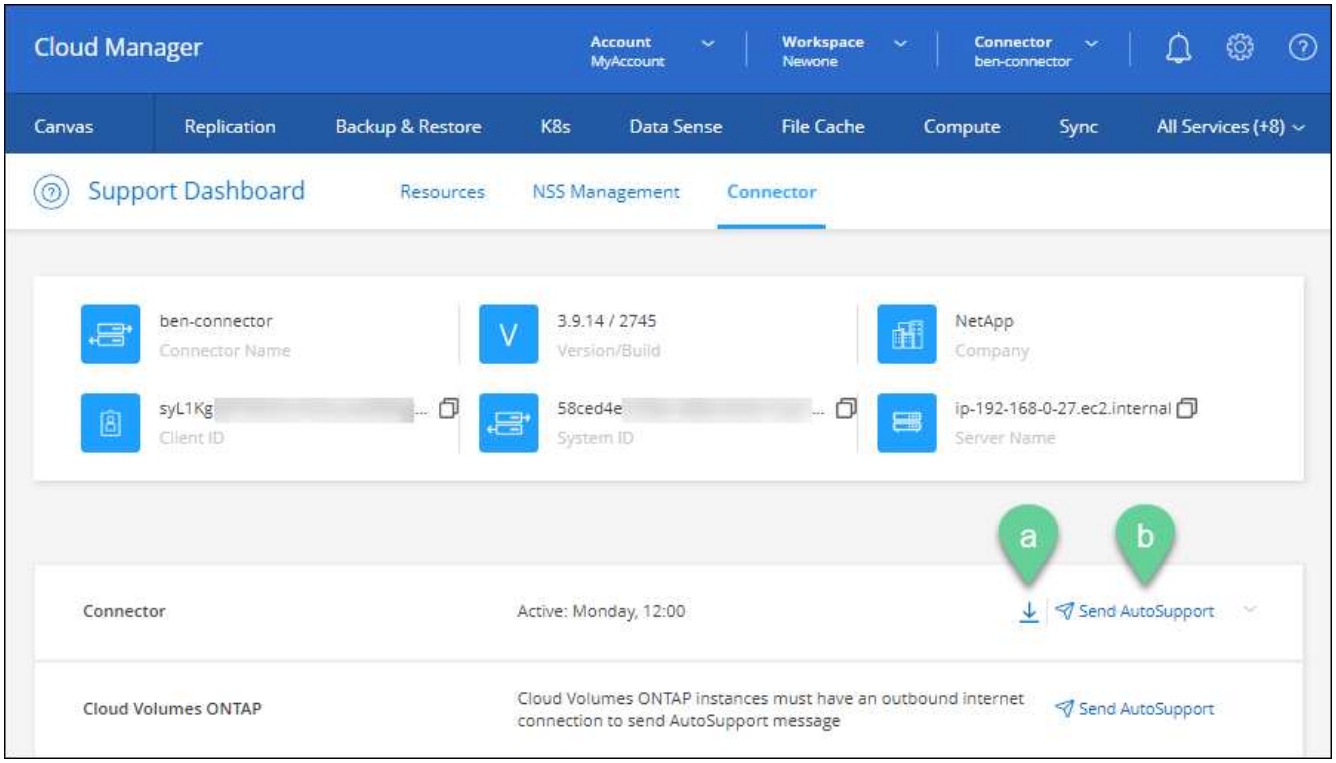
2. In the upper right of the Cloud Manager console, click the Help icon, and select **Support**.



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
```

Change the IP address for a Connector

If it's required for your business, you can change the internal IP address and public IP address of the Connector instance that is automatically assigned by your cloud provider.

Steps

1. Follow the instructions from your cloud provider to change the local IP address or public IP address (or both) for the Connector instance.
2. If you changed the public IP address and you need to connect to the local user interface running on the Connector, restart the Connector instance to register the new IP address with Cloud Manager.
3. If you changed the private IP address, update the backup location for Cloud Volumes ONTAP configuration files so that the backups are being sent to the new private IP address on the Connector.

a. Run the following command from the Cloud Volumes ONTAP CLI to remove the current backup target:

```
system configuration backup settings modify -destination ""
```

b. Go to Cloud Manager and open the working environment.

c. Click the menu and select **Advanced > Configuration Backups**.

d. Click **Set Backup Target**.

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

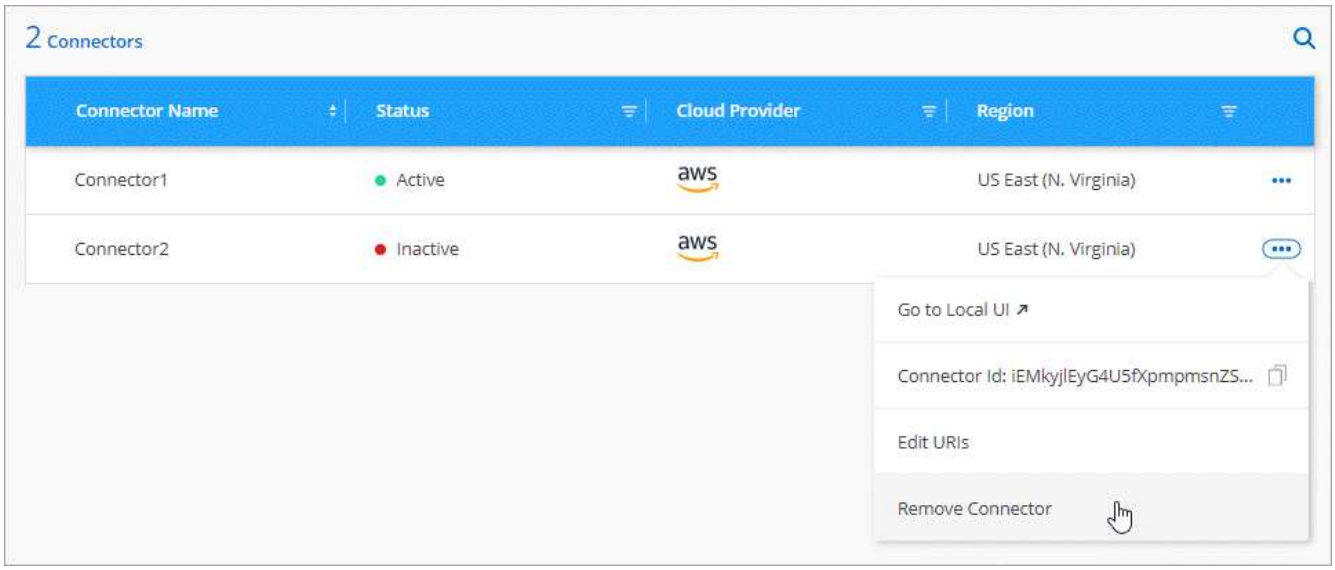
If a Connector is inactive, you can remove it from the list of Connectors in Cloud Manager. You might do this if you deleted the Connector virtual machine or if you uninstalled the Connector software.

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
```

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

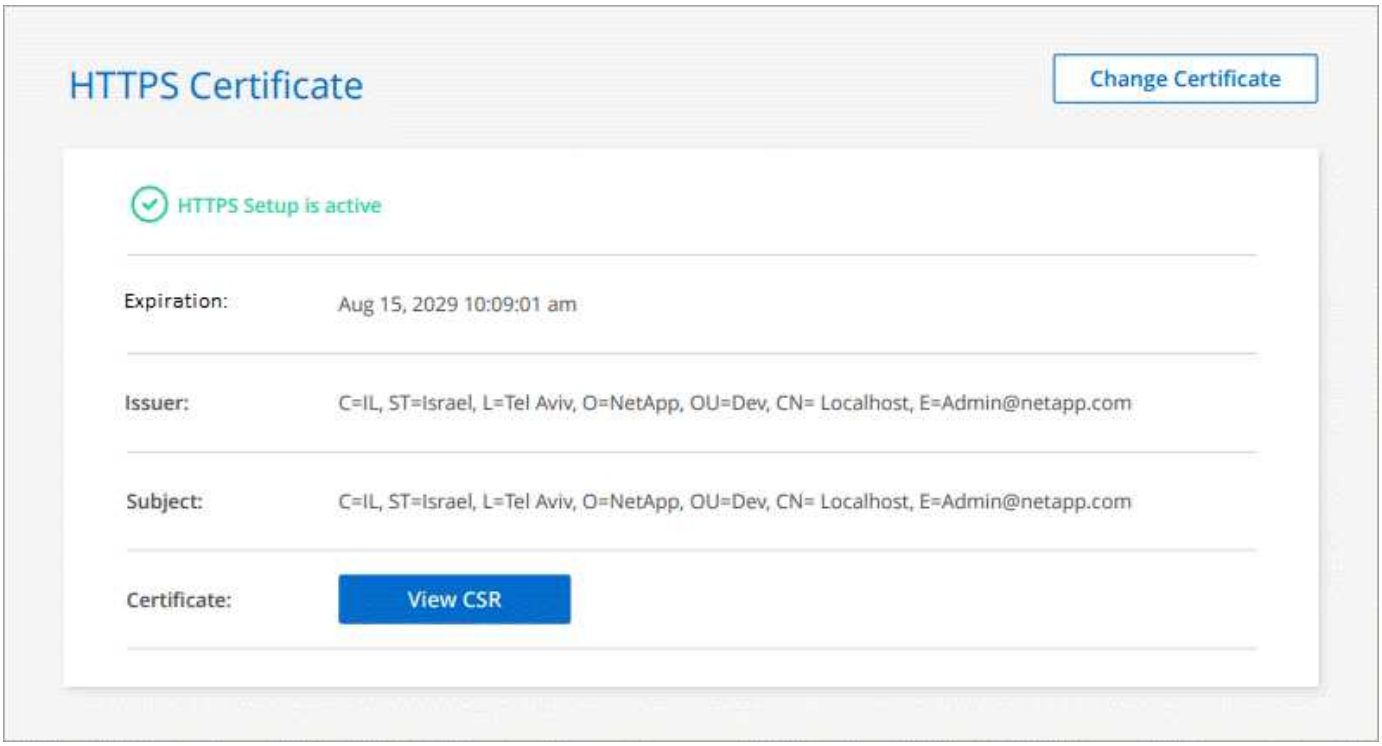
1. In the upper right of the Cloud Manager console, click the Settings icon, and select **HTTPS Setup**.

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	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	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.

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 an 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.

Configuring the Connector to use an HTTP proxy server provides outbound internet access if a public IP address or a NAT gateway isn't available. This proxy server provides only the Connector with an outbound connection. It doesn't provide any connectivity for Cloud Volumes ONTAP systems.

If Cloud Volumes ONTAP systems don't have an outbound internet connection to send AutoSupport messages, Cloud Manager automatically configures those Cloud Volumes ONTAP systems to use a proxy server that's

included with the Connector. Learn more about using a proxy server to send AutoSupport messages.

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.

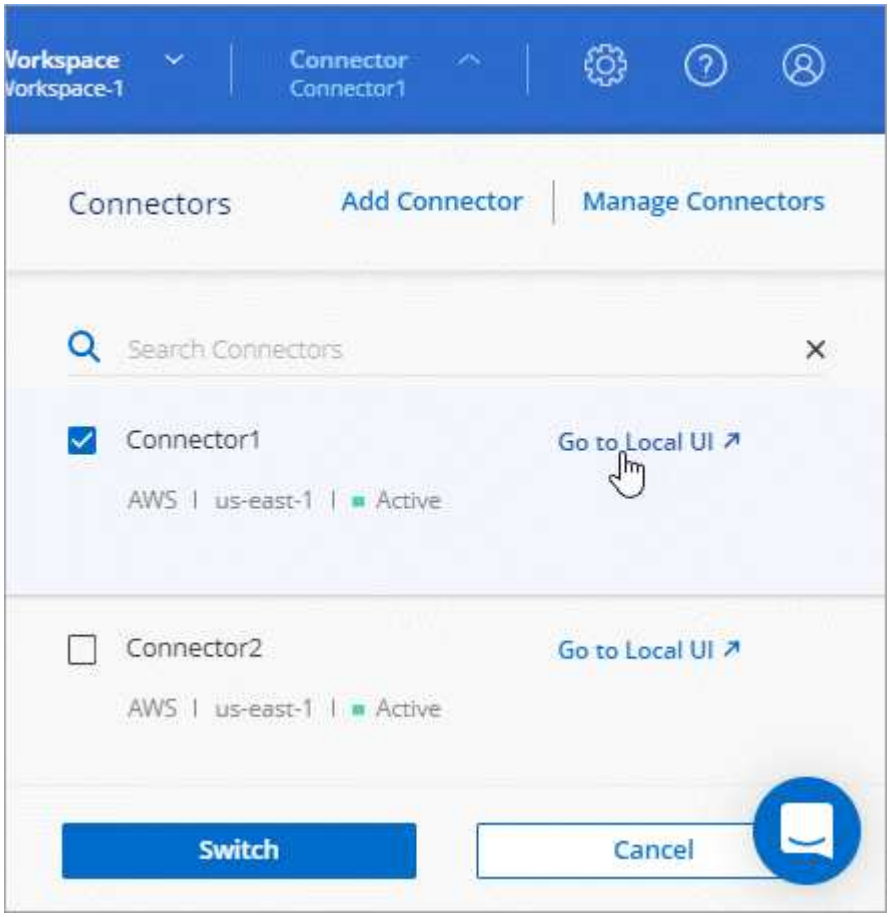
Note that this operation restarts the Connector. Ensure that the Connector isn't performing any operations before you proceed.

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.

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**.

Default configuration for the Connector

You might want to learn more about the Connector before you deploy it, or if you need to troubleshoot any issues.

Default configuration with internet access

The following configuration details apply if you deployed the Connector from Cloud Manager, from your cloud provider's marketplace, or if you manually installed the Connector on an on-premises Linux host that has internet access.

AWS details

If you deployed the Connector from Cloud Manager or from the cloud provider's marketplace, note the following:

- The EC2 instance type is t3.xlarge.
- The operating system for the image is Red Hat Enterprise Linux 7.6 (HVM).

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

- The user name for the EC2 Linux instance is ec2-user.
- The default system disk is a 100 GiB gp2 disk.

Azure details

If you deployed the Connector from Cloud Manager or from the cloud provider's marketplace, note the following:

- The VM type is DS3 v2.
- The operating system for the image is CentOS 7.6.

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

- The default system disk is a 100 GiB premium SSD disk.

Google Cloud details

If you deployed the Connector from Cloud Manager or from the cloud provider's marketplace, note the following:

- The VM instance is n2-standard-4.
- The operating system for the image is CentOS 7.9.

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

- The default system disk is a 100 GiB SSD persistent disk.

Installation folder

The Connector installation folder resides in the following location:

/opt/application/netapp/cloudmanager

Log files

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_occm/data/log

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

Connector service

- 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.

Packages

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

Ports

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

Discovered cloud storage

Viewing your Amazon S3 buckets

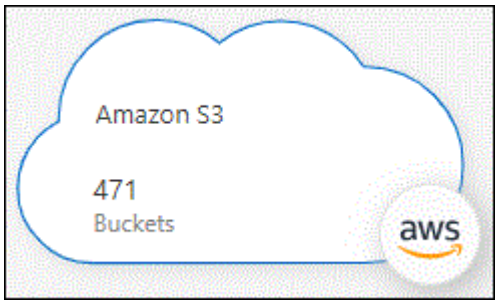
After you install a Connector in AWS, Cloud Manager can automatically discover information about the Amazon S3 buckets that reside in the AWS account where the Connector is installed. An Amazon S3 working environment is added to the Canvas so you can view this information.

You can see details about your S3 buckets, including the region, access policy, account, total and used capacity, and more. These buckets can be used as destinations for Cloud Backup, Cloud Tiering, or Cloud Sync operations. Additionally, you can use Cloud Data Sense to scan these buckets.

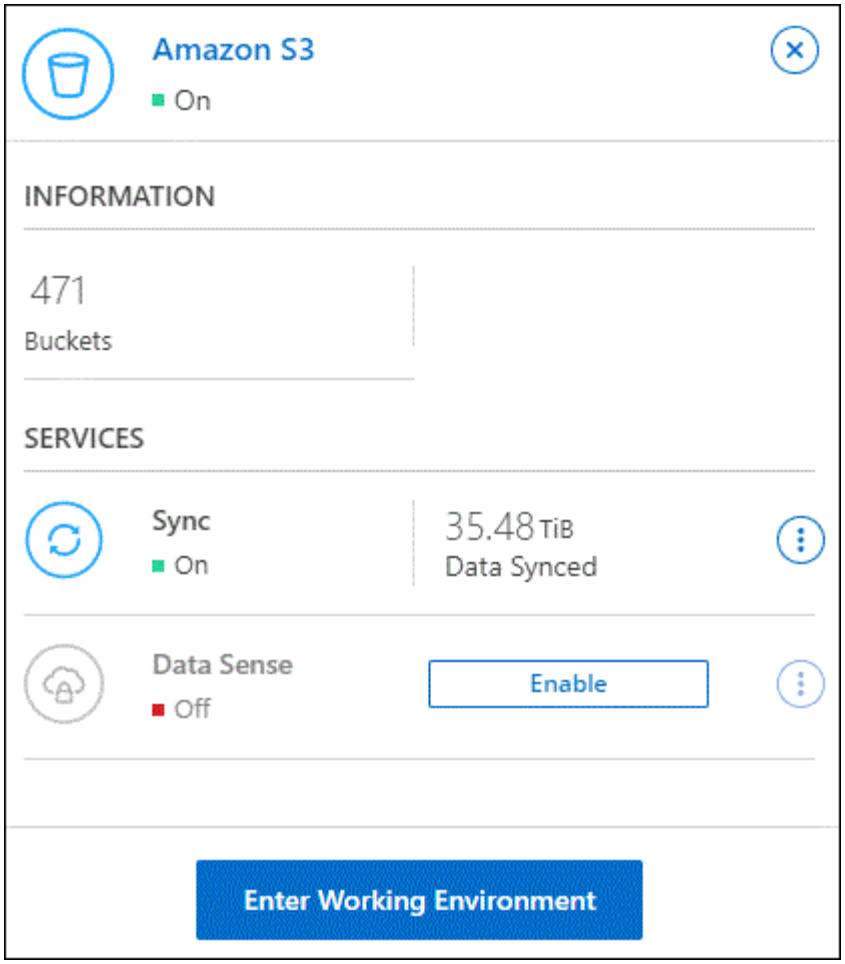
Steps

1. Install a Connector in the AWS account where you want to view your Amazon S3 buckets.

   You should automatically see an Amazon S3 working environment shortly after.

2. Click the working environment and select an action from the right pane.



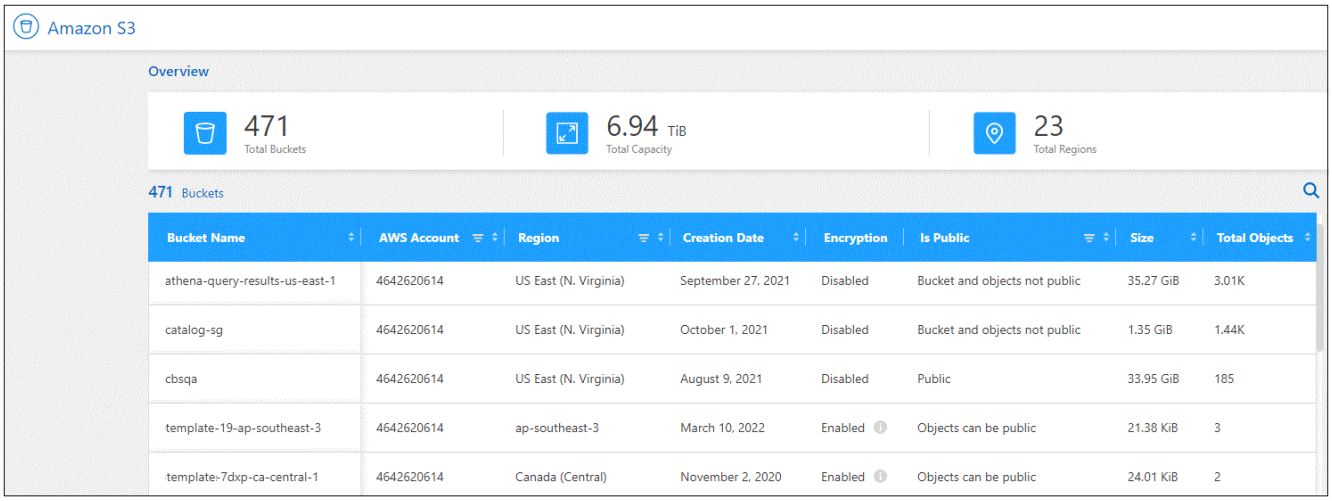
3. Click **Sync data** to synchronize data to or from S3 buckets.

   For more details, see the overview for the Cloud Sync service.

4. Click **Enable** if you want Cloud Data Sense to scan the S3 buckets for personal and sensitive data.

   For more details, see Getting started with Cloud Data Sense for Amazon S3.

5. Click **Enter Working Environment** to view details about the S3 buckets in your AWS account.



Bucket Name	AWS Account	Region	Creation Date	Encryption	Is Public	Size	Total Objects
athena-query-results-us-east-1	4642620614	US East (N. Virginia)	September 27, 2021	Disabled	Bucket and objects not public	35.27 GiB	3.01K
catalog-sg	4642620614	US East (N. Virginia)	October 1, 2021	Disabled	Bucket and objects not public	1.35 GiB	1.44K
cbsqa	4642620614	US East (N. Virginia)	August 9, 2021	Disabled	Public	33.95 GiB	185
template-19-ap-southeast-3	4642620614	ap-southeast-3	March 10, 2022	Enabled	Objects can be public	21.38 KiB	3
template-7dxp-ca-central-1	4642620614	Canada (Central)	November 2, 2020	Enabled	Objects can be public	24.01 KiB	2

Viewing your Azure Blob accounts

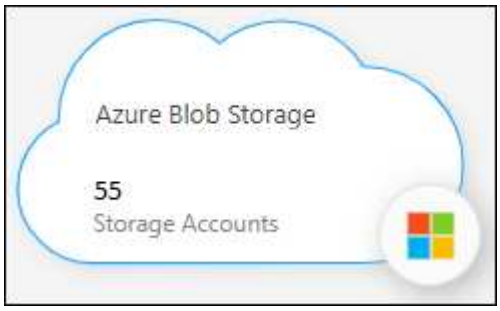
After you install a Connector in Azure, Cloud Manager can automatically discover information about the Azure storage accounts that reside in the Azure Subscriptions where the Connector is installed. An Azure Blob working environment is added to the Canvas so you can view this information.

You can see details about your Azure storage accounts, including the location, resource group, total and used capacity, and more. These accounts can be used as destinations for Cloud Backup, Cloud Tiering, or Cloud Sync operations.

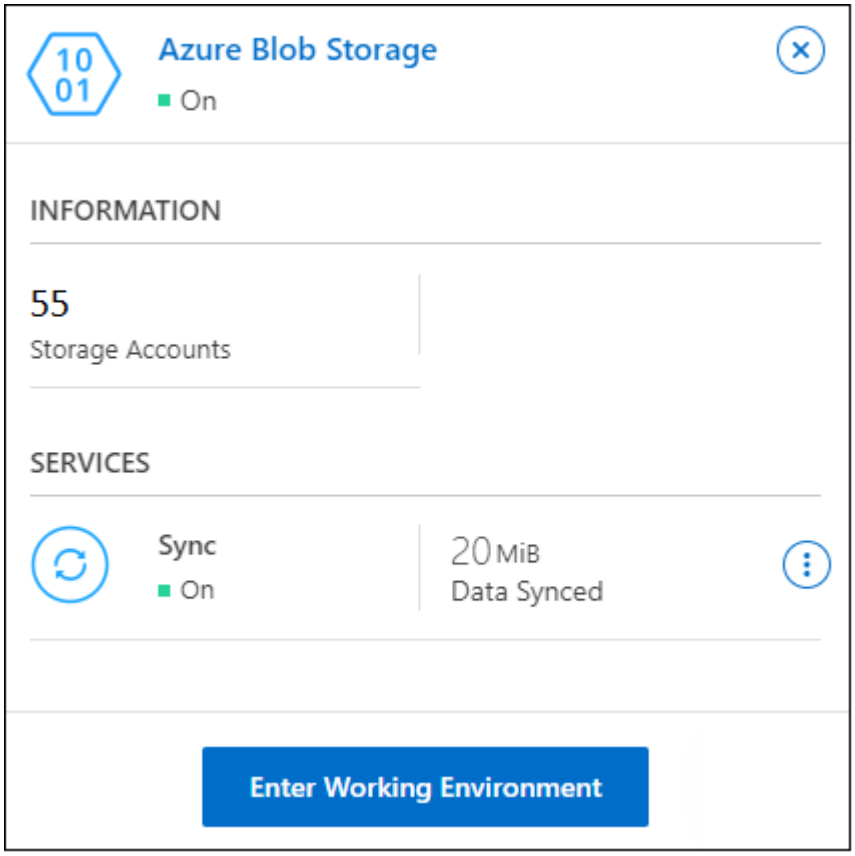
Steps

1. Install a Connector in the Azure account where you want to view your Azure storage accounts.

   You should automatically see an Azure Blob working environment shortly after.



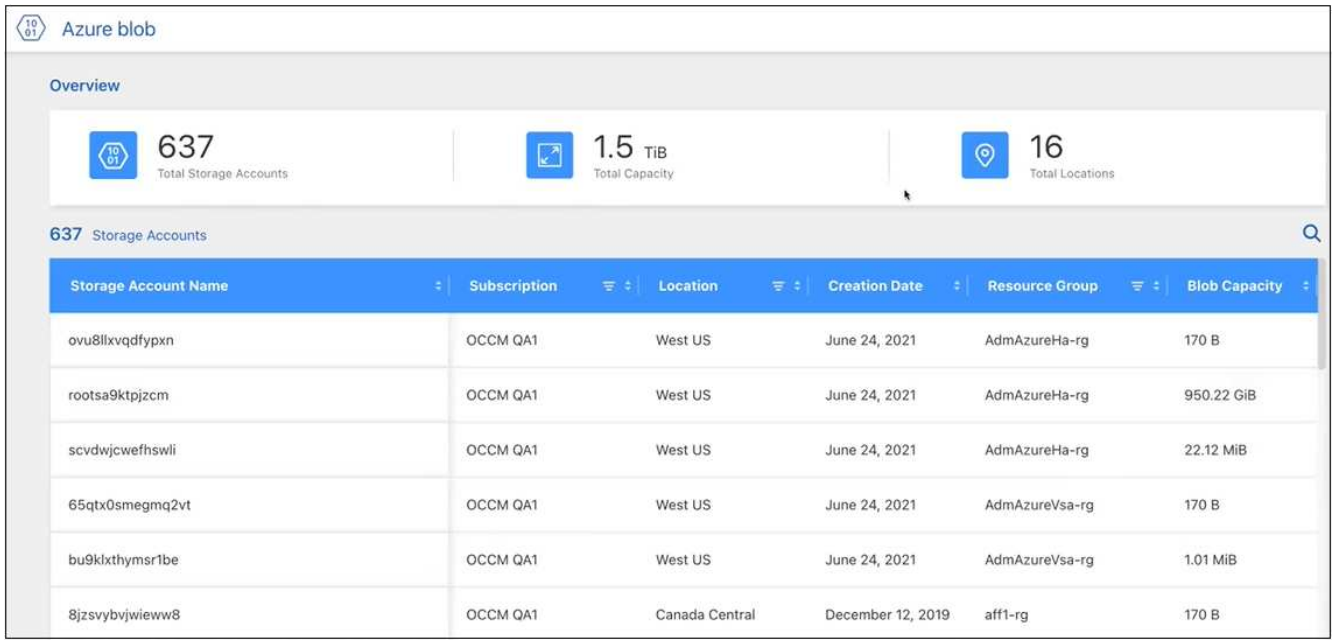
2. Click the working environment and select an action from the right pane.



3. Click **Sync data** to synchronize data to or from Azure Blob storage.

   For more details, see the overview for the Cloud Sync service.

4. Click **Enter Working Environment** to view details about the Azure storage accounts in your Azure Blobs.



Viewing your Google Cloud Storage buckets

After you install a Connector in Google Cloud, Cloud Manager can automatically discover information about the Google Cloud Storage buckets that reside in the Google account where the Connector is installed. A Google Cloud Storage working environment is added to the Canvas so you can view this information.

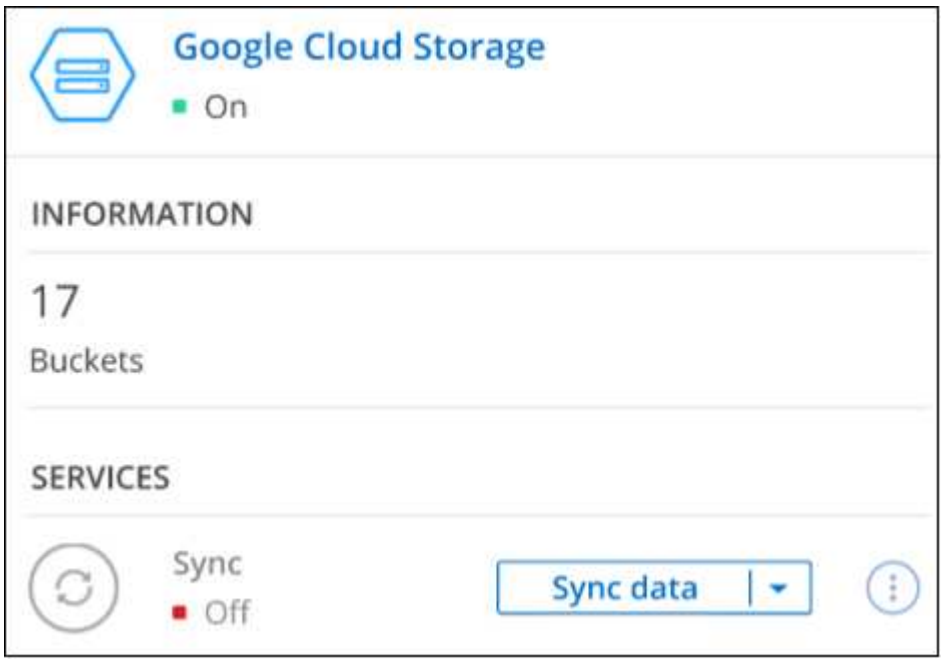
You can see details about your Google Cloud Storage buckets, including the location, access status, storage class, total and used capacity, and more. These buckets can be used as destinations for Cloud Backup, Cloud Tiering, or Cloud Sync operations.

Steps

1. Install a Connector in the Google account where you want to view your Google Cloud Storage buckets.

   You should automatically see a Google Cloud Storage working environment shortly after.

2. Click the working environment and select an action from the right pane.



3. Click **Sync data** to synchronize data to or from Google Cloud Storage buckets.

   For more details, see the overview for the Cloud Sync service.

4. Click **Enter Working Environment** to view details about the buckets in your Google account.

AWS credentials

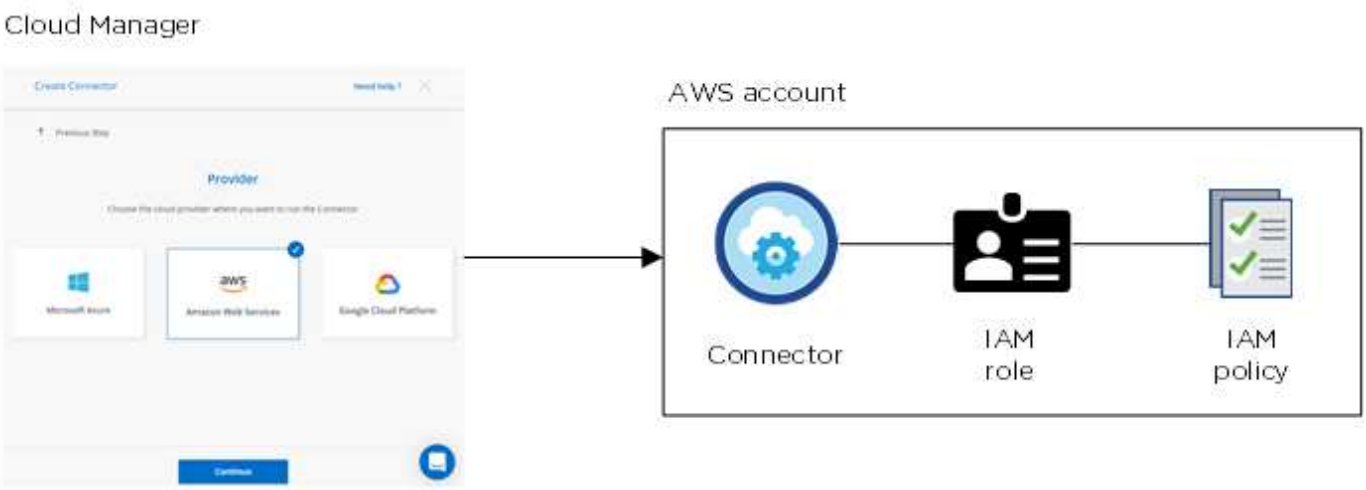
AWS credentials and permissions

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.

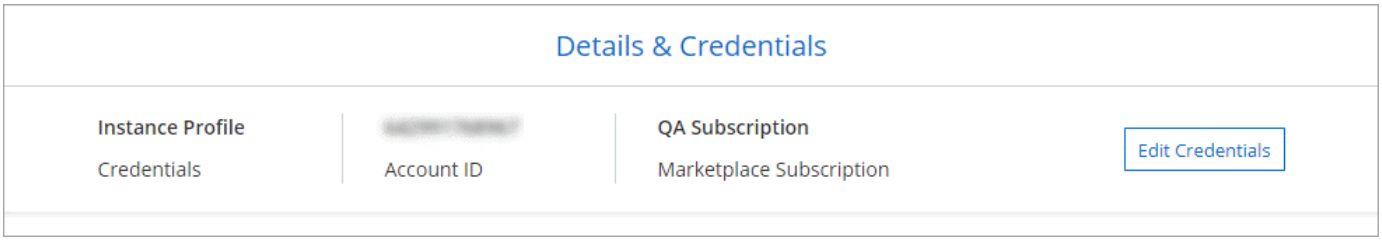
Initial AWS credentials

When you deploy a Connector from Cloud Manager, you need to provide the ARN of an IAM role or access keys for an IAM user. The authentication method that you use must have the required permissions to deploy the Connector instance in AWS. 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 the Connector with permissions to manage resources and processes within that AWS account. Review how Cloud Manager uses the permissions.



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

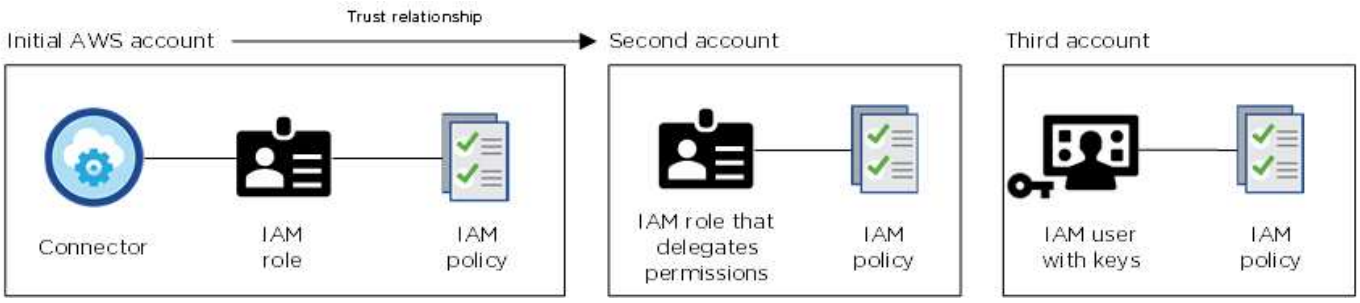


Additional AWS credentials

There are two ways to add additional AWS credentials.

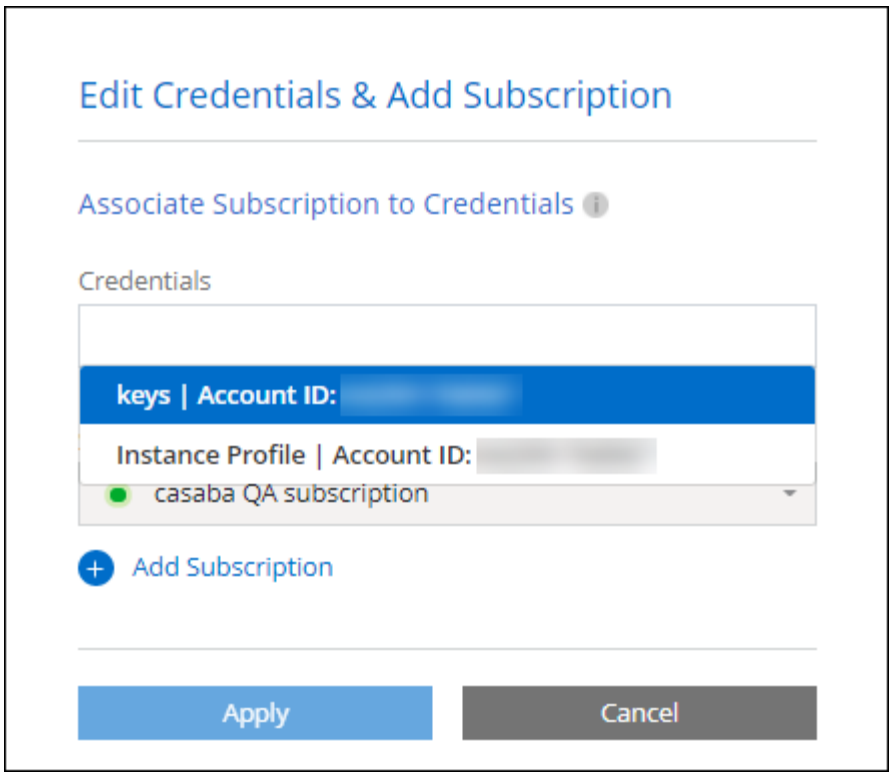
Add AWS credentials to an existing Connector

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:



Add AWS credentials directly to Cloud Manager

Adding new AWS credentials to Cloud Manager gives Cloud Manager the permissions needed to create and manage an FSx for ONTAP working environment or to create a Connector.

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 additional 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 to Cloud Manager for creating a Connector

  Adding new AWS credentials to Cloud Manager gives Cloud Manager the permissions needed to create a Connector. Learn how to add AWS credentials to Cloud Manager.

- Add AWS credentials to Cloud Manager for FSx for ONTAP

  Adding new AWS credentials to Cloud Manager gives Cloud Manager the permissions needed to create and manage FSx for ONTAP. Learn how to set up permissions for FSx for ONTAP

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 additional credentials to a Connector

Add AWS credentials to a Connector so that it can 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 by copying and pasting the contents of the IAM policy for the Connector.
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. From the IAM console, create a policy by copying and pasting the contents of the IAM policy for the Connector.

   AWS Documentation: Creating IAM Policies

2. 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**.

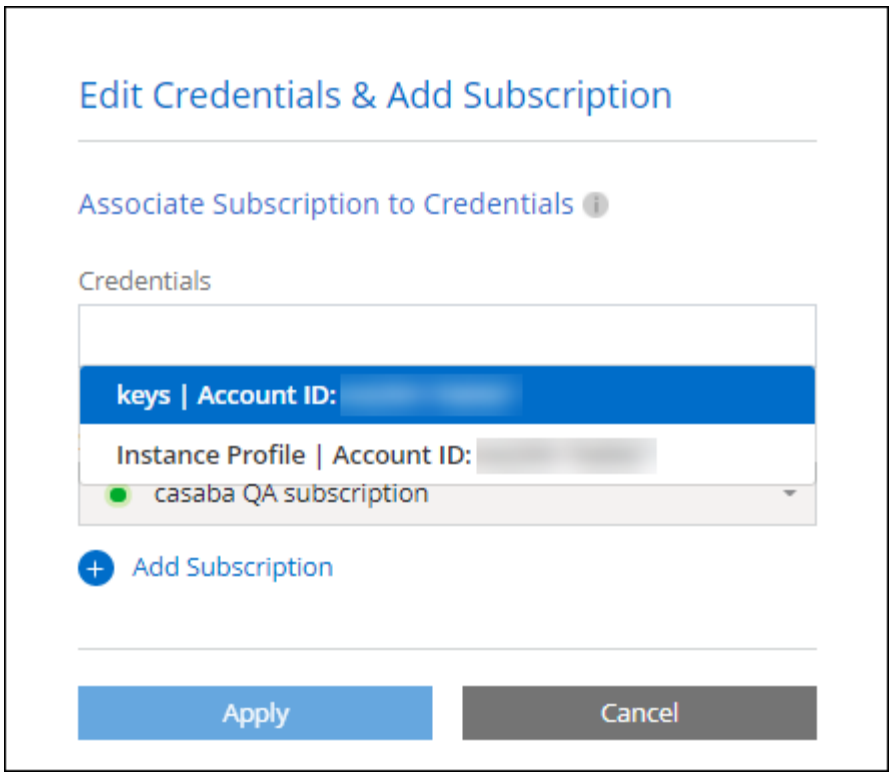
3. Click **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select **Amazon Web Services > Connector**.
   b. **Define Credentials**: Provide the ARN (Amazon Resource Name) of a trusted IAM role, or enter an AWS access key and secret key.
   c. **Marketplace Subscription**: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



Add credentials to Cloud Manager for creating a Connector

Add AWS credentials to Cloud Manager by providing the ARN of an IAM role that gives Cloud Manager the permissions needed to create a Connector. You can choose these credentials when creating a new Connector.

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 permissions required to create a Connector.
     - View the permissions needed for FSx for ONTAP
     - View the Connector deployment policy
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.
   a. **Credentials Location**: Select **Amazon Web Services > Cloud Manager**.
   b. **Define Credentials**: Provide the ARN (Amazon Resource Name) of the IAM role.
   c. **Review**: Confirm the details about the new credentials and click **Add**.

Result

You can now use the credentials when creating a new Connector.

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:

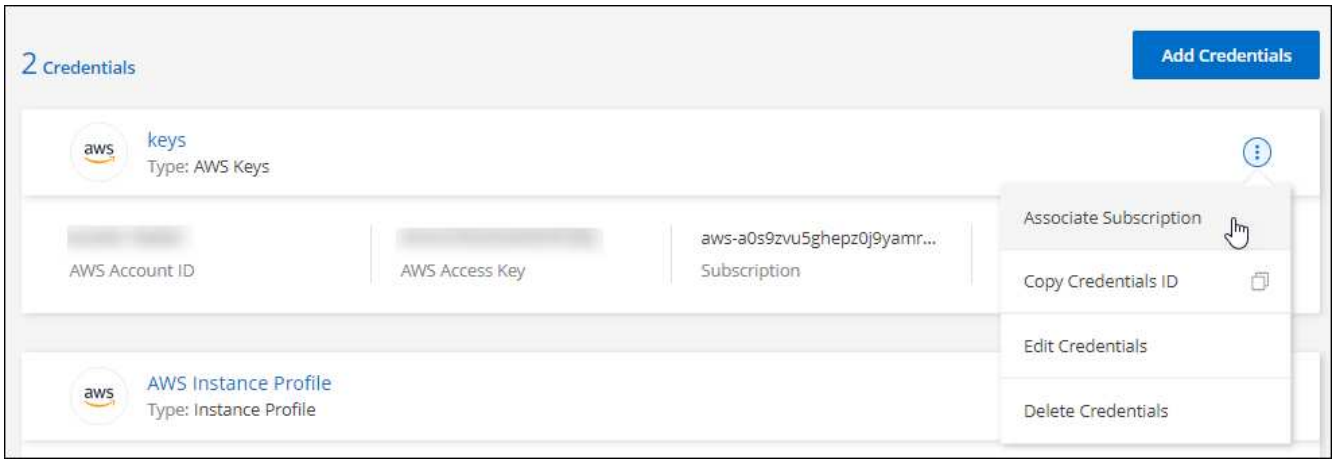
- You didn't associate a subscription when you initially added the credentials to Cloud Manager.
- You want to replace an existing AWS Marketplace subscription with a new subscription.

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/cloud-manager-setup-admin//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 credentials

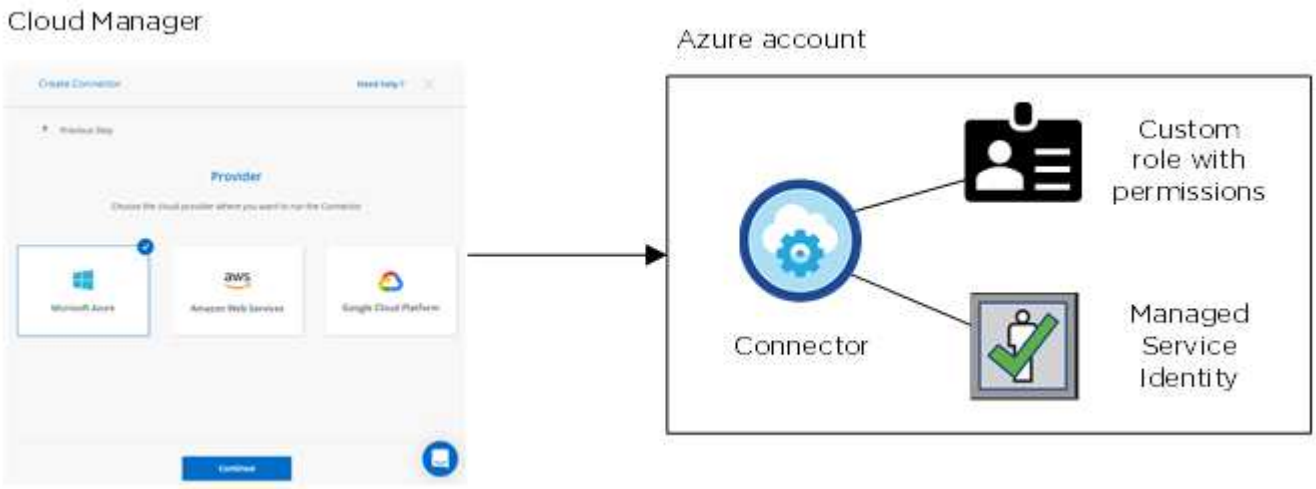
Azure credentials and permissions

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.

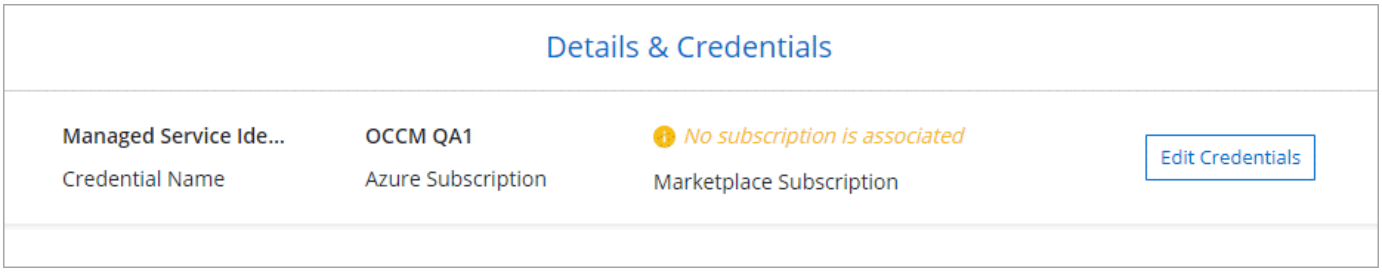
Initial Azure credentials

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



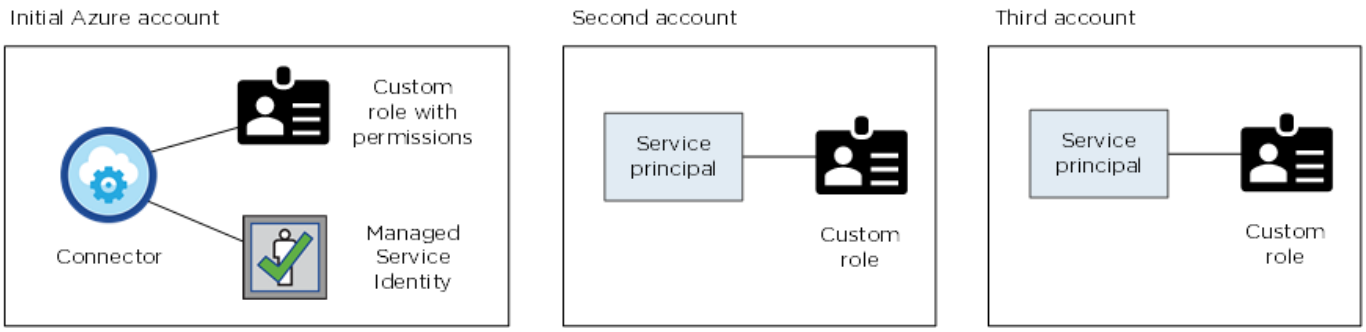
Additional Azure subscriptions for a managed identity

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

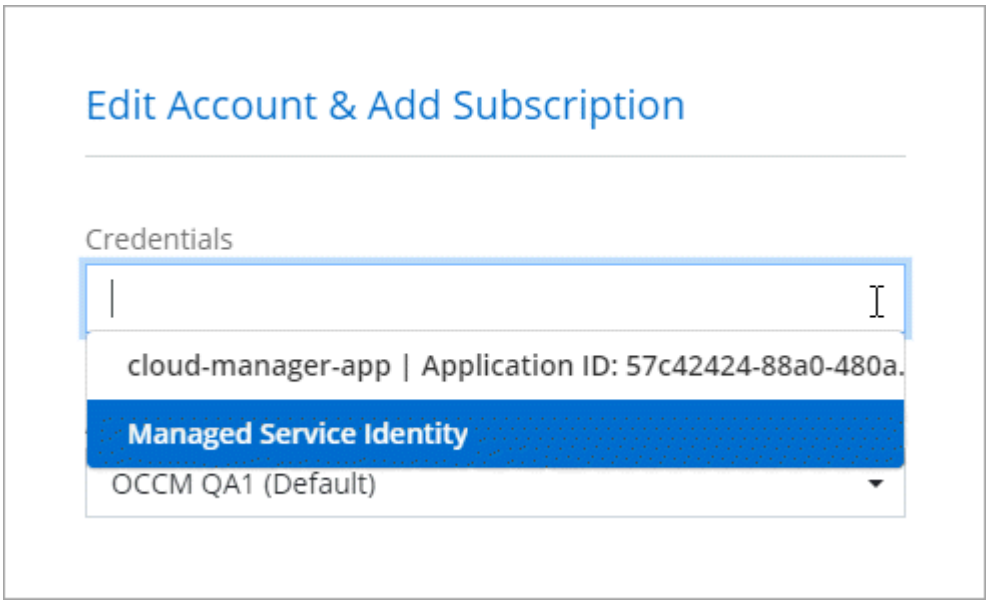
If you want to deploy Cloud Volumes ONTAP using different Azure credentials, then you must grant the required permissions by creating and setting up a service principal in Azure Active Directory for each Azure account. The following image shows two additional accounts, each set up with a service principal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

role that provides permissions:



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:



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

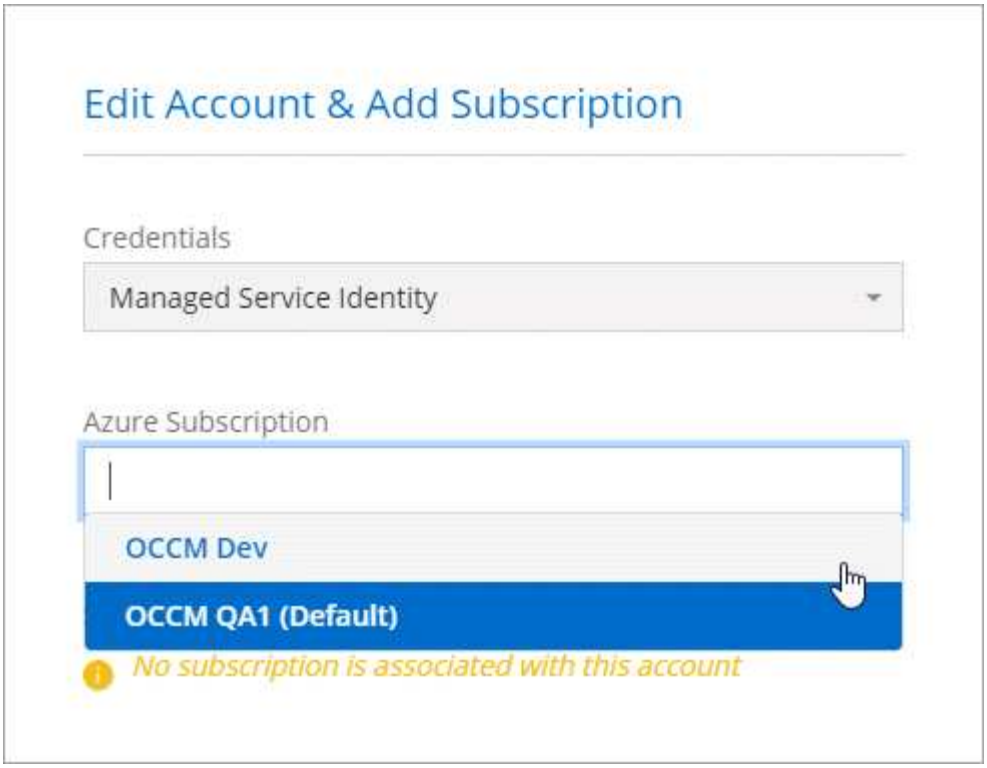
1. Log in to the Azure portal.
2. Open the **Subscriptions** service and then select the subscription in which you want to deploy Cloud Volumes ONTAP.
3. Click **Access control (IAM)**.
   a. Click **Add** > **Add role assignment** and then add the permissions:
      - Select the **Cloud Manager Operator**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

        Cloud Manager Operator is the default name provided in the Connector 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.



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.

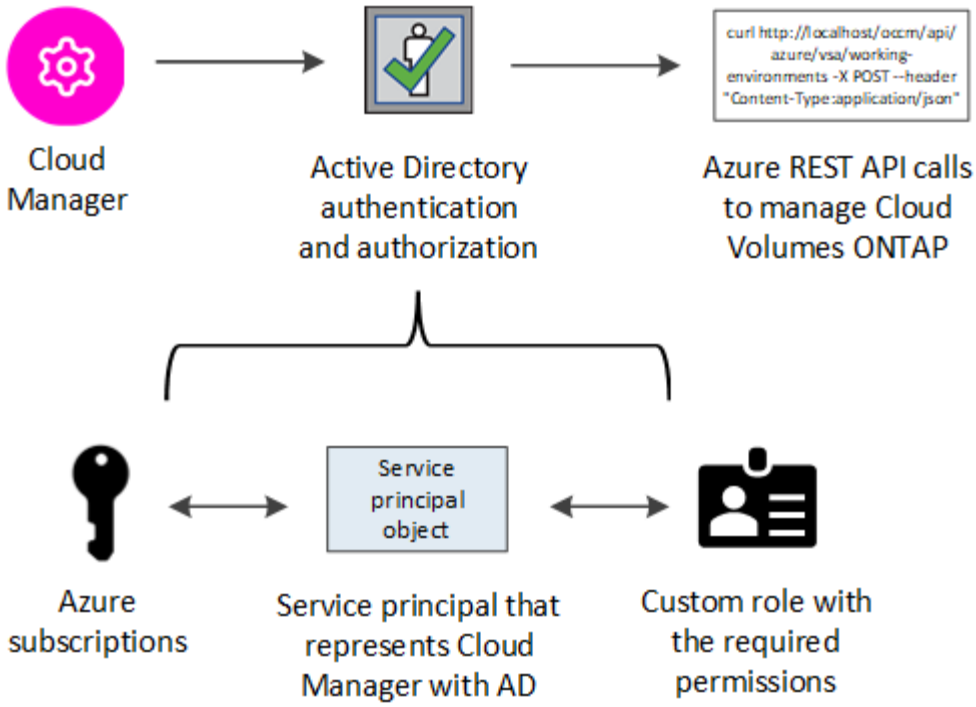
If you want to deploy Cloud Volumes ONTAP using *different* Azure credentials, then you must grant the required permissions by creating and setting up a service principal in Azure Active Directory for each Azure account. You can then add the new credentials to Cloud Manager.

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

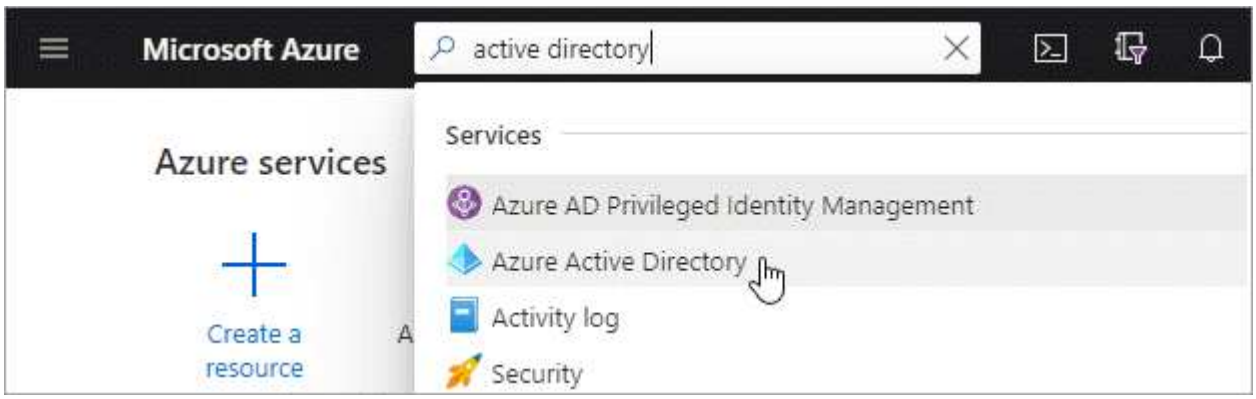
Create an Azure Active Directory (AD) application and service principal that Cloud Manager can use for role-based access control.

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. Create a custom role:
   a. Copy the contents of the custom role permissions for the Connector and save them in a JSON file.
   b. 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.

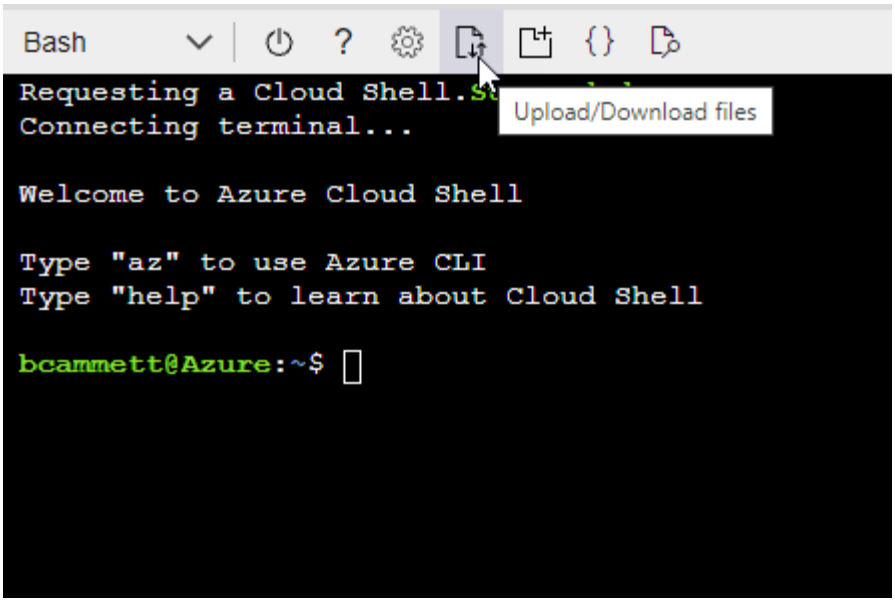
      Example

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

   c. 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.

      - Start Azure Cloud Shell and choose the Bash environment.
      - Upload the JSON file.

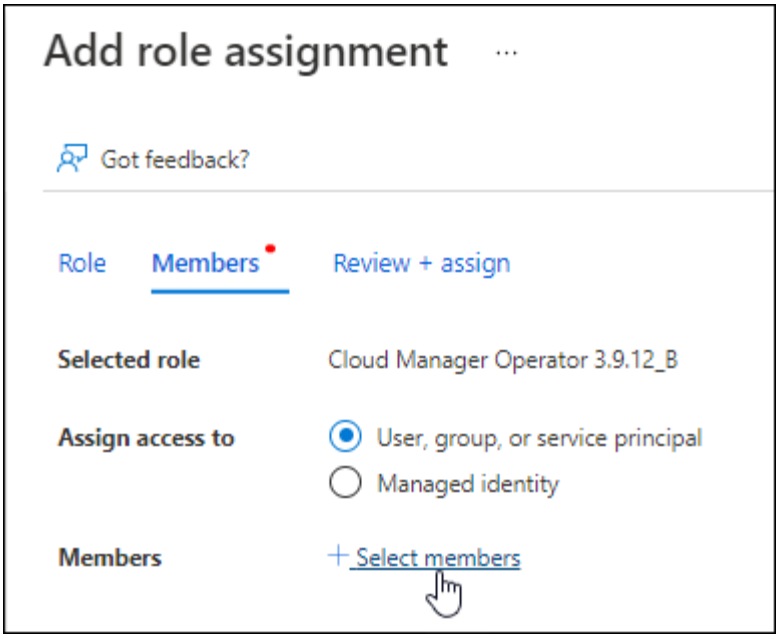


- Enter the following Azure CLI command:

```
az role definition create --role-definition
Policy_for_Setup_As_Service_Azure.json
```

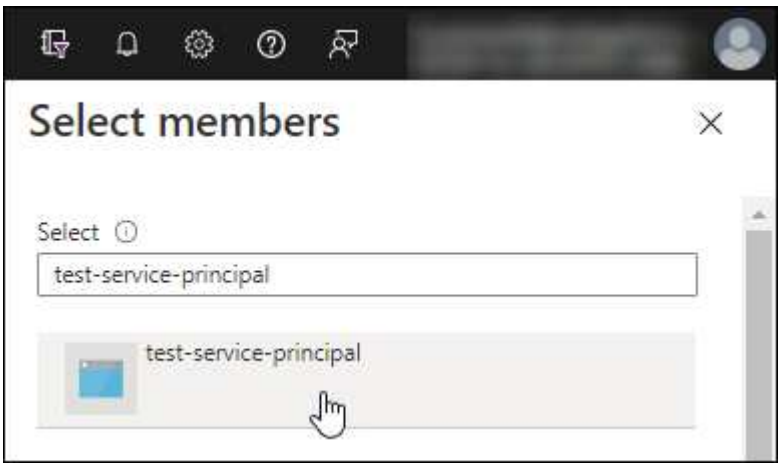
You should now have a custom role called Cloud Manager Operator that you can assign to the Connector virtual machine.

2. 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**.



- Search for the name of the application.

  Here's an example:



- 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.

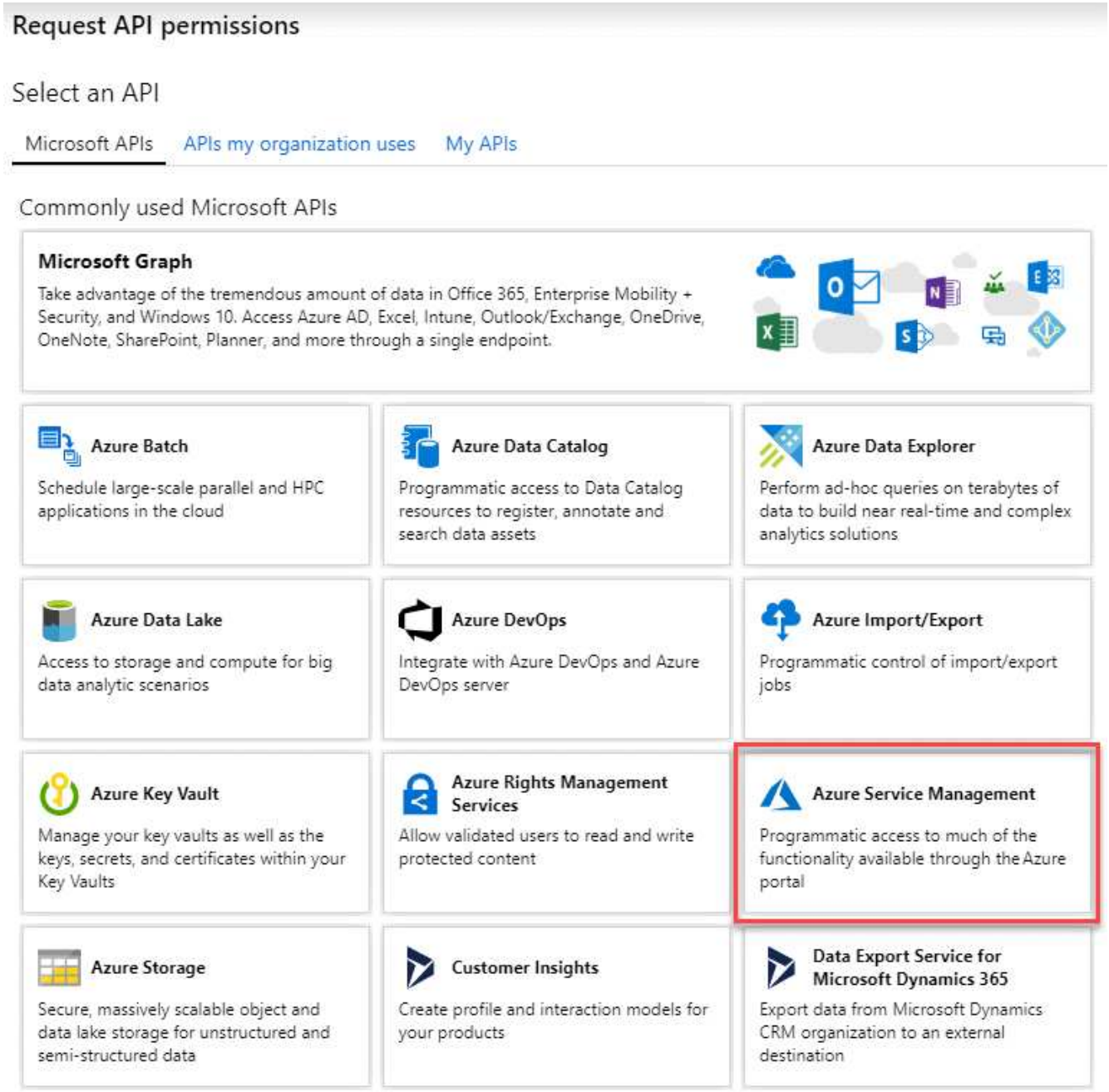
   If you want to deploy Cloud Volumes ONTAP from multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. Cloud Manager enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Adding Windows Azure Service Management API permissions

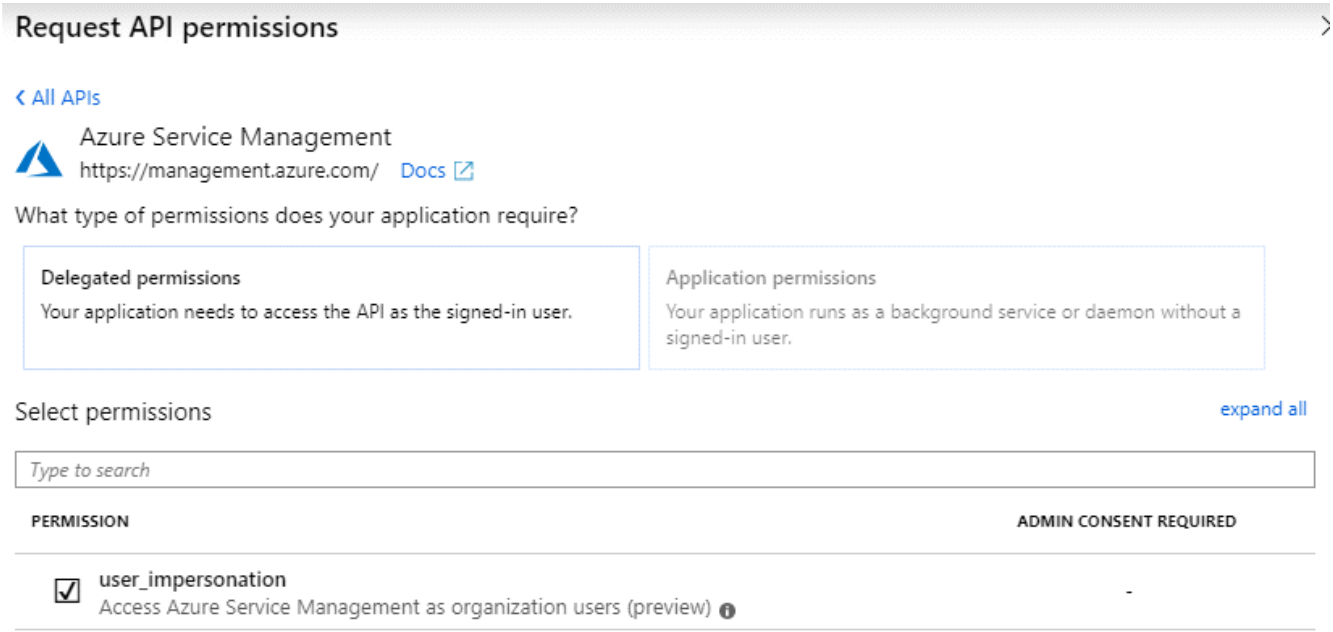
The service principal must have "Windows Azure Service Management API" permissions.

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**.



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

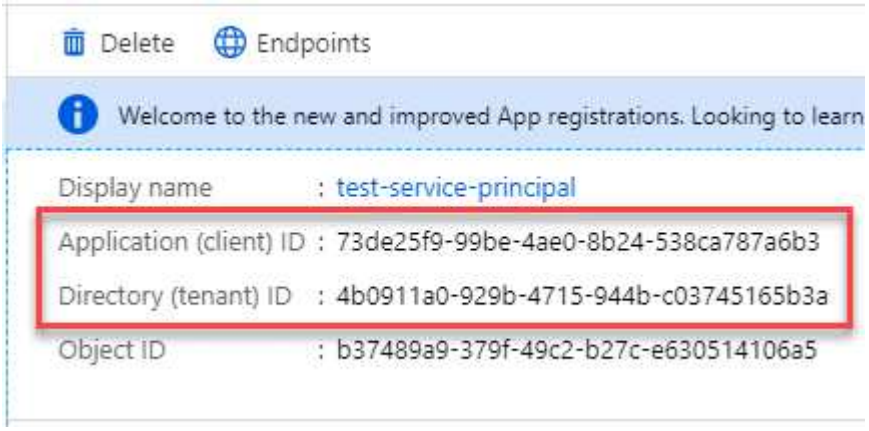


Getting the application ID and directory ID

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.

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**.

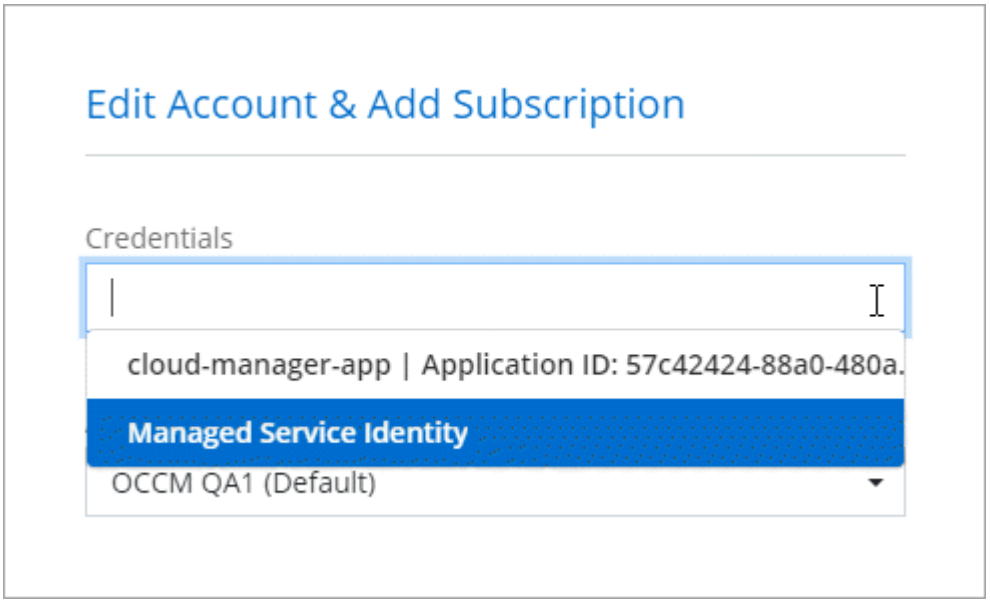
2. Click **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select **Microsoft Azure > Connector**.
   b. **Define Credentials**: Enter information about the Azure Active Directory service principal that grants the required permissions:
      - Application (client) 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:

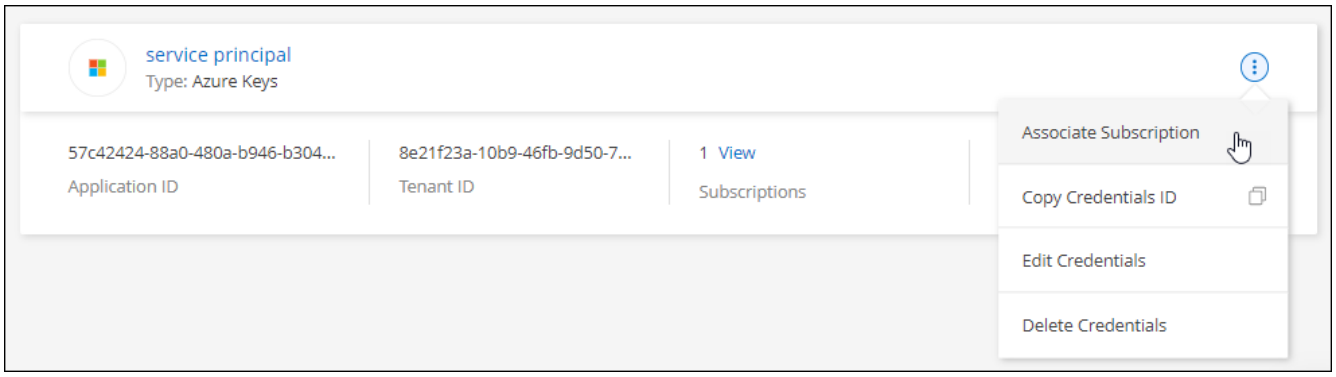
- You didn't associate a subscription when you initially added the credentials to Cloud Manager.
- You want to replace an existing Azure Marketplace subscription with a new subscription.

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/cloud-manager-setup-admin//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.

Google Cloud credentials

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

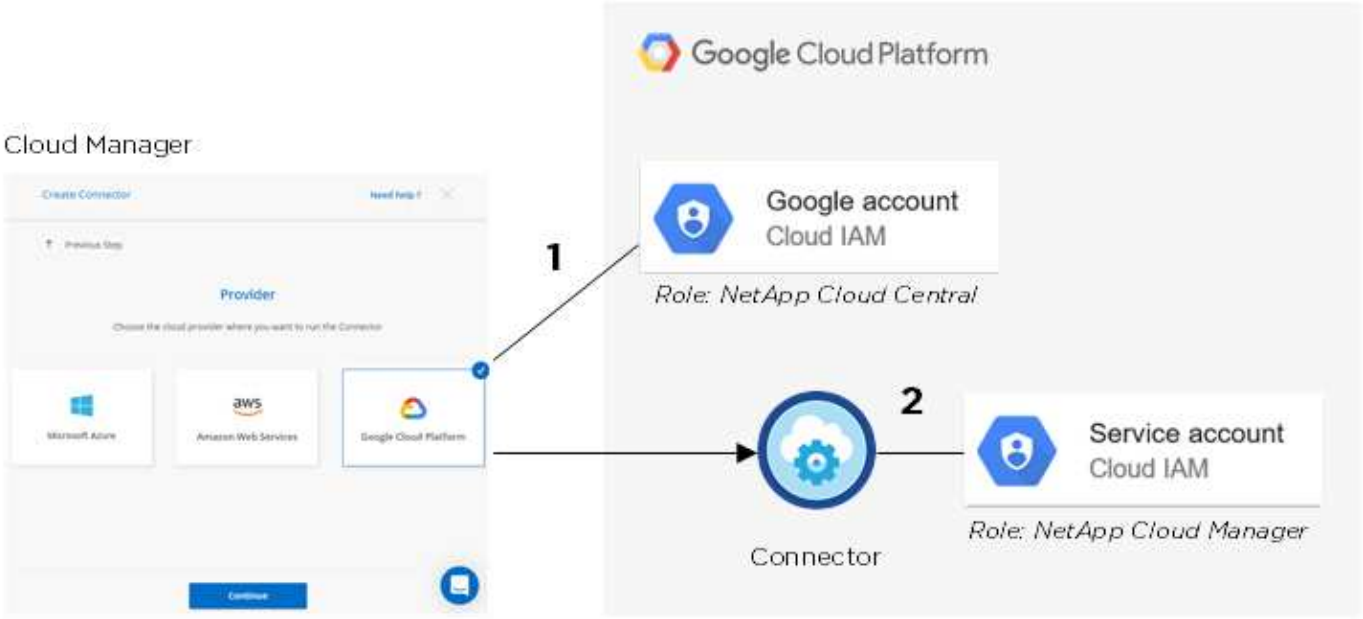
Before you can deploy Cloud Volumes ONTAP in Google Cloud, you must first deploy a Connector in a Google Cloud project. The Connector can't be running on your premises, or in a different cloud provider.

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
- Learn how to deploy Cloud Volumes ONTAP in GCP and select a project

Managing GCP credentials and subscriptions for Cloud Manager

You can manage the credentials that are associated with the Connector VM instance.

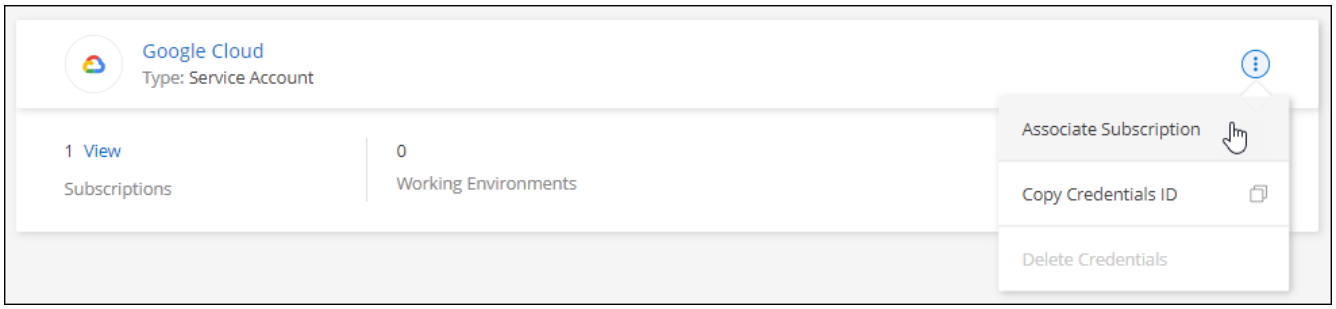
Associating a Marketplace subscription with GCP credentials

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.

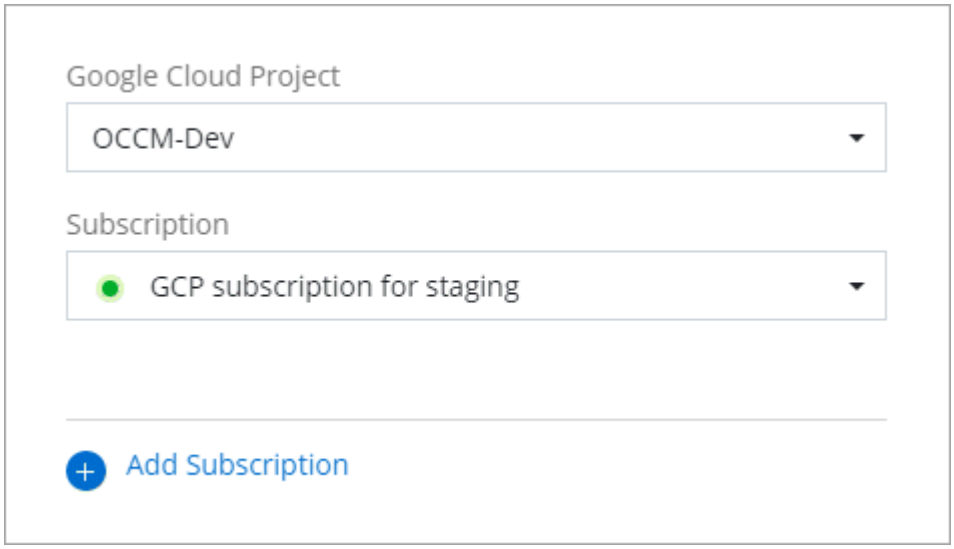
At any time, you can change the Marketplace subscription that's associated with these credentials. The subscription enables you to create a pay-as-you-go Cloud Volumes ONTAP system, and to use other NetApp cloud services.

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**.



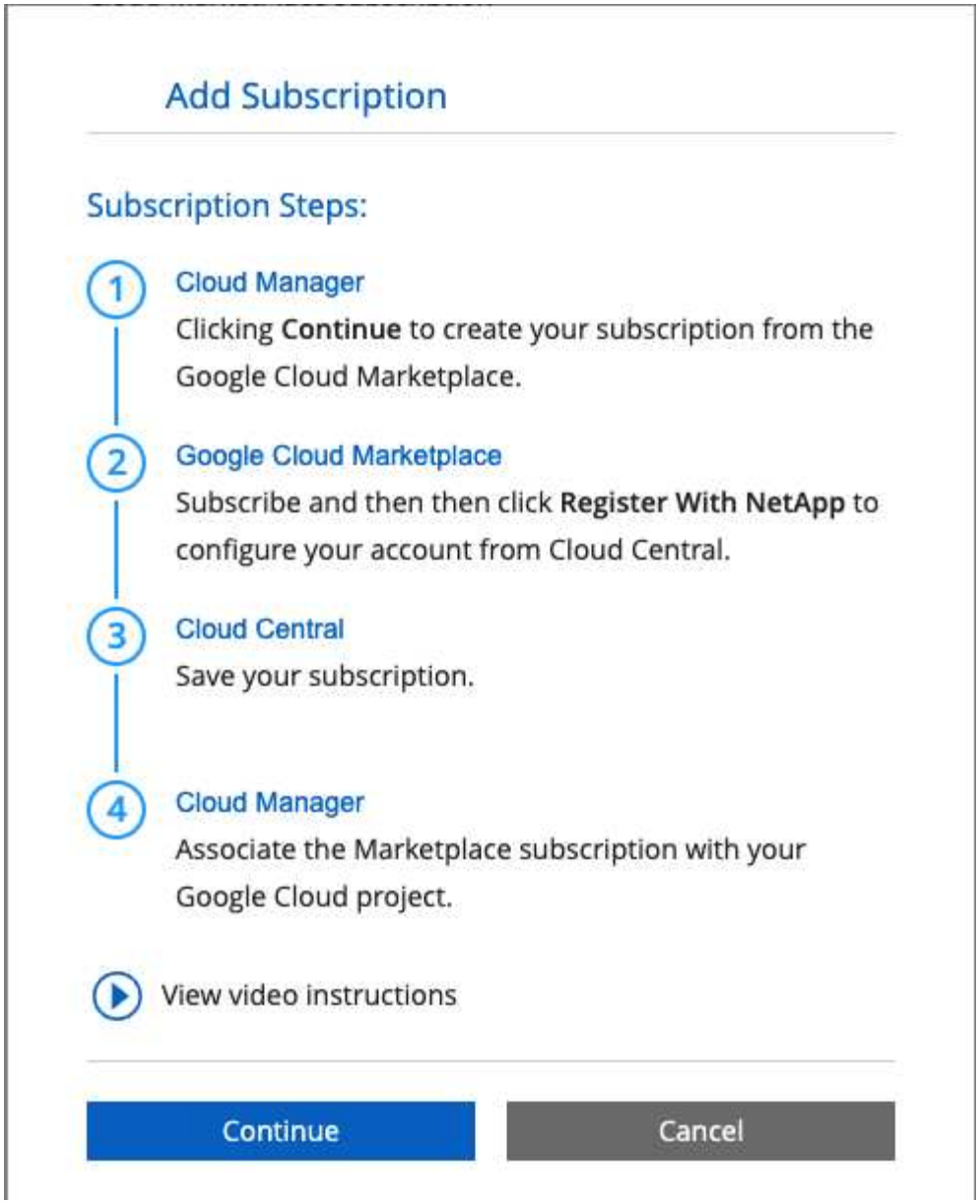
3. Select a Google Cloud project and subscription from the down-down list.



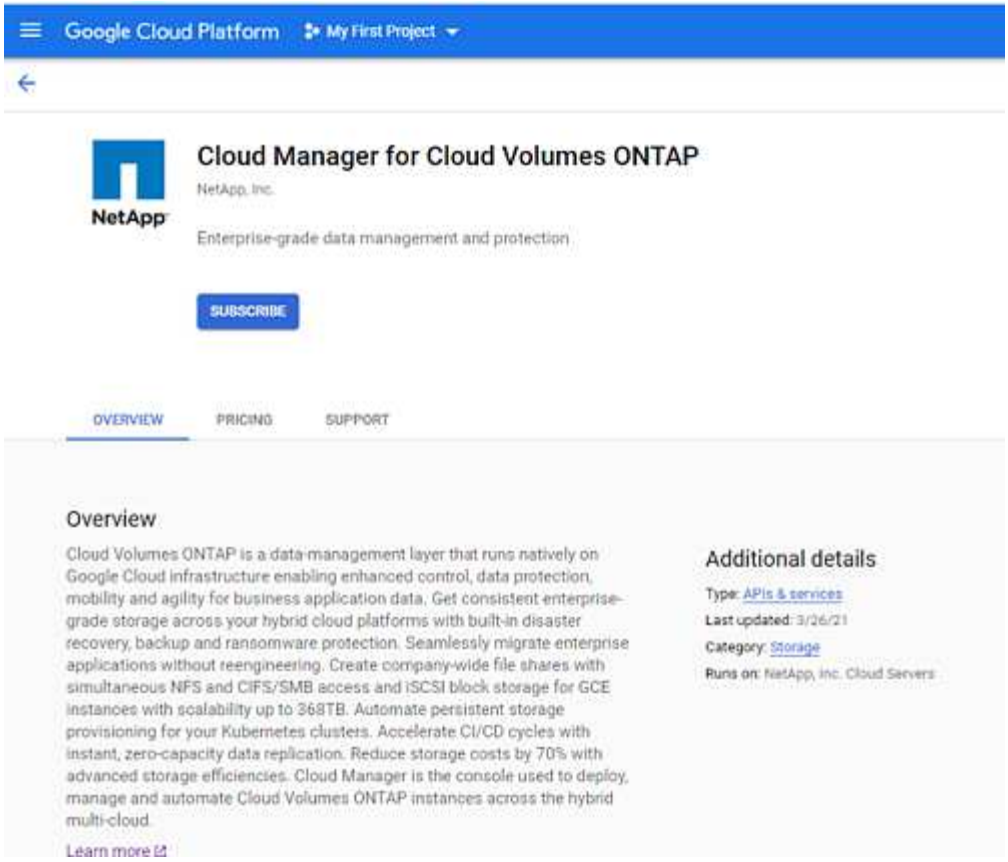
4. Click **Associate**.
5. If you don't already have a subscription, click **Add Subscription** and follow the steps to create a new subscription below.

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.

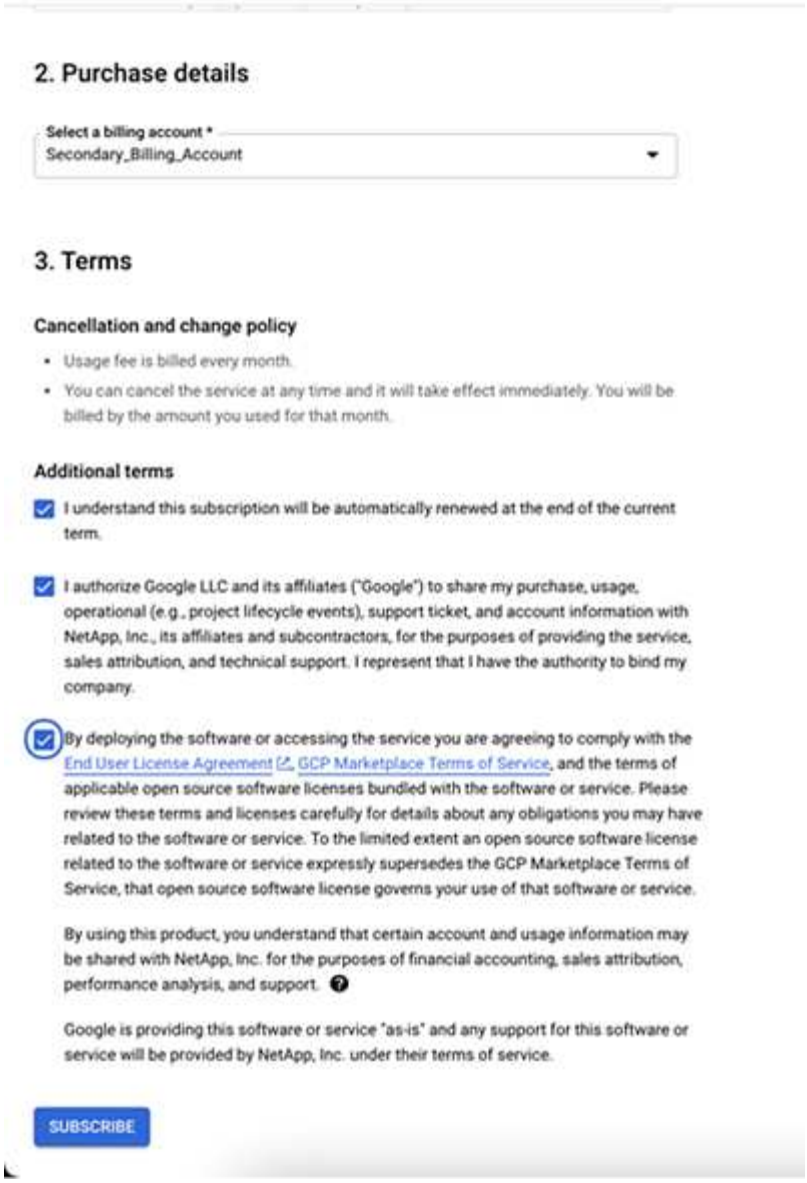
6. Reivew the subscription steps and click **Continue**.



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.



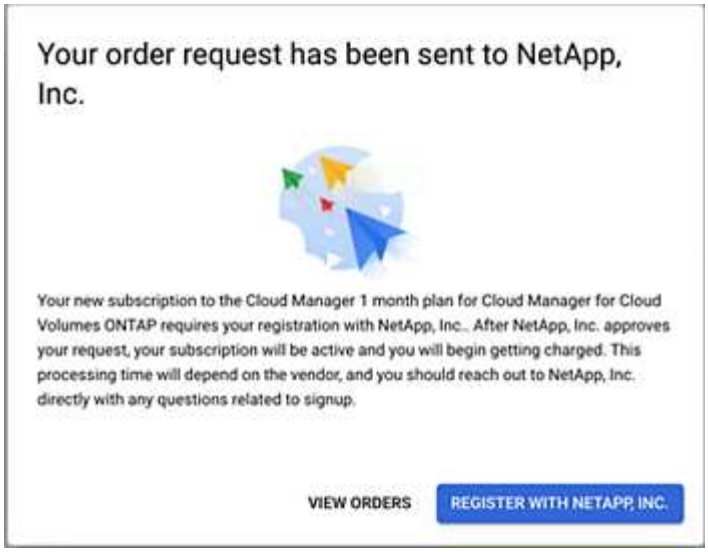
8. Click **Subscribe**.
9. Select the appropriate billing account and agree to the terms and conditions.



10. Click **Subscribe**.

    This step sends your transfer request to NetApp.

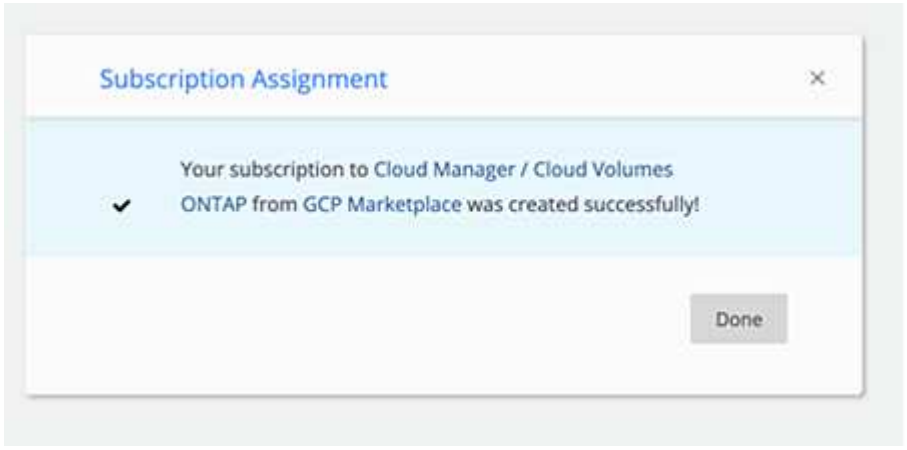
11. On the pop-up dialog box, click **Register with NetApp, Inc.** to be redirected to NetApp Cloud Central.



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.

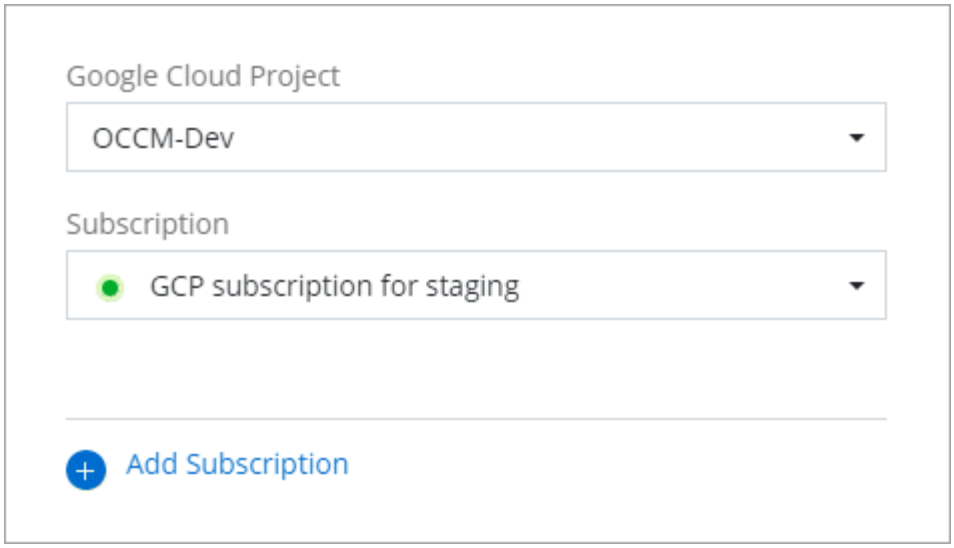
12. After you're redirected to Cloud Central, log in to NetApp Cloud Central or sign up, and then click **Done** to proceed.

    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.

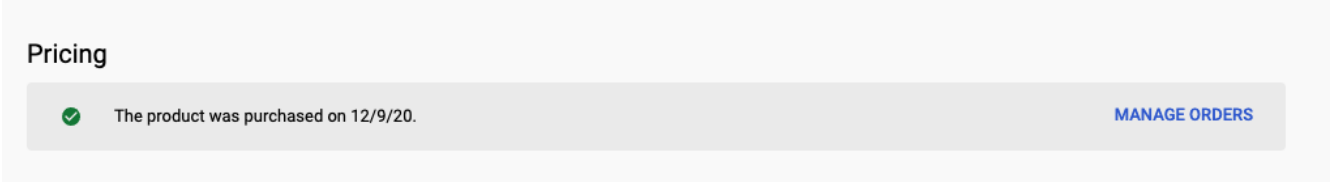


Troubleshooting the Marketplace subscription process

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**.



   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.

   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.

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.

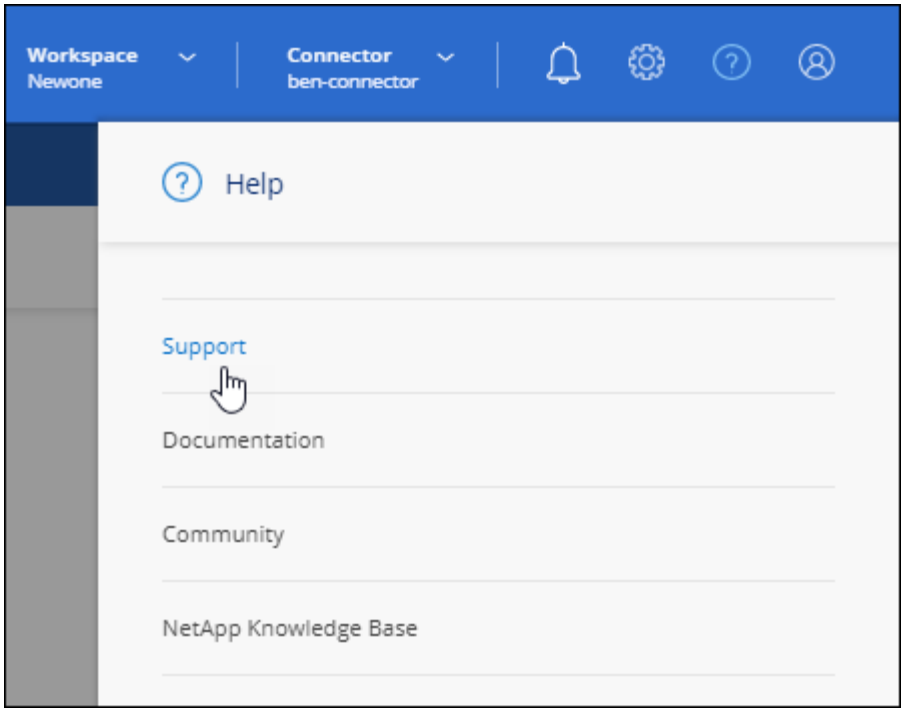
- To upgrade Cloud Volumes ONTAP software to the latest release
- To use Active IQ Digital Advisor from within Cloud Manager

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.

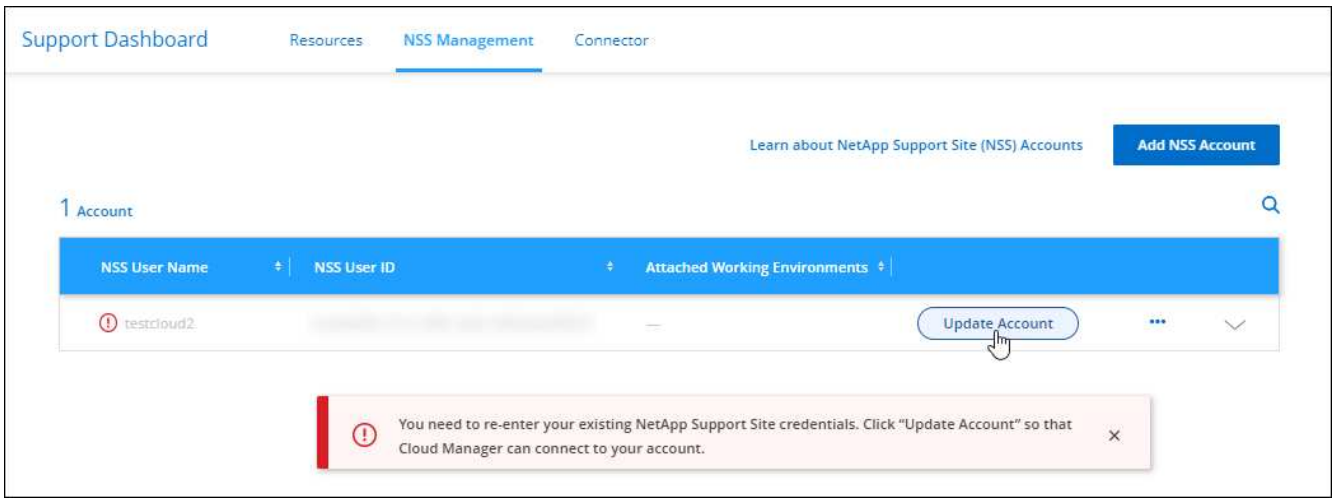
- Launching Cloud Volumes ONTAP in AWS
- Launching Cloud Volumes ONTAP in Azure
- Launching Cloud Volumes ONTAP in GCP
- Registering pay-as-you-go systems

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**.

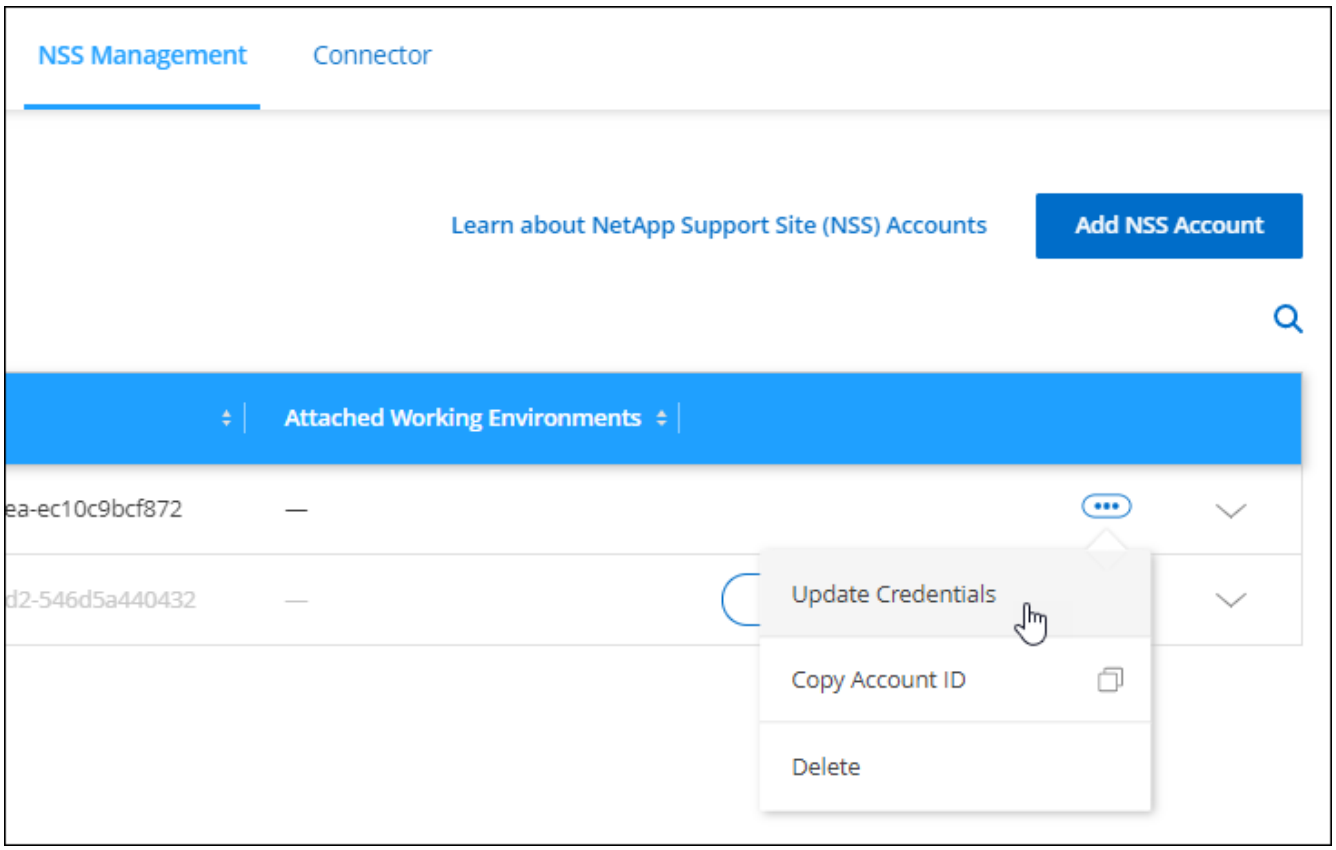
Update NSS credentials

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

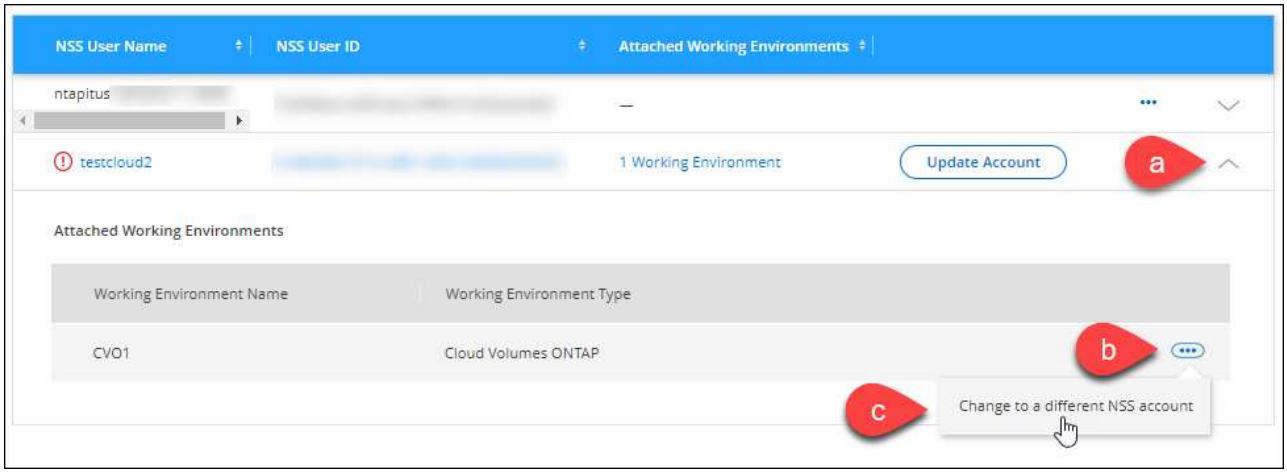
If your organization has multiple NetApp Support Site accounts, you can change which account is associated with a Cloud Volumes ONTAP system.

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**.

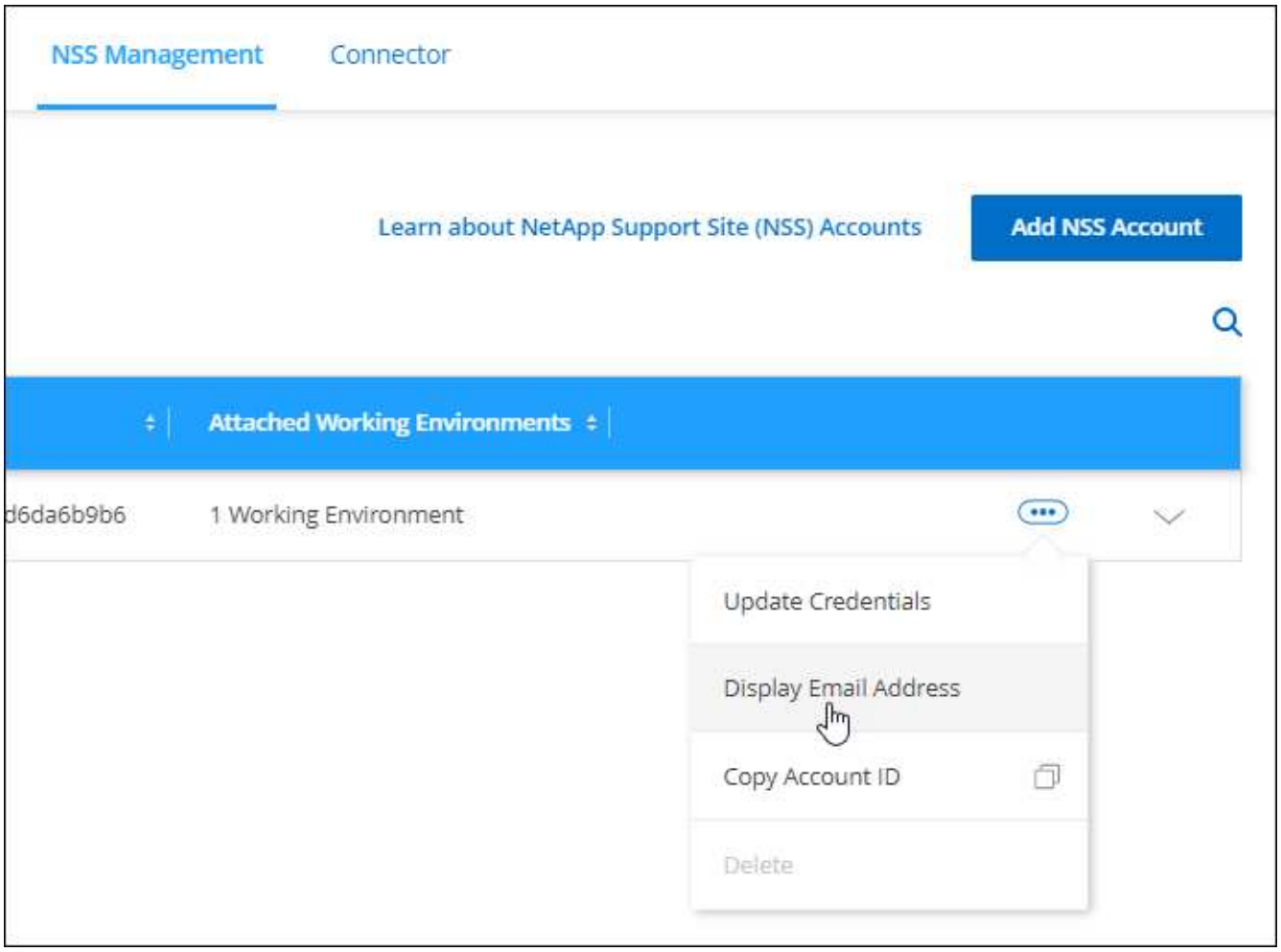
Display the email address for an NSS account

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.

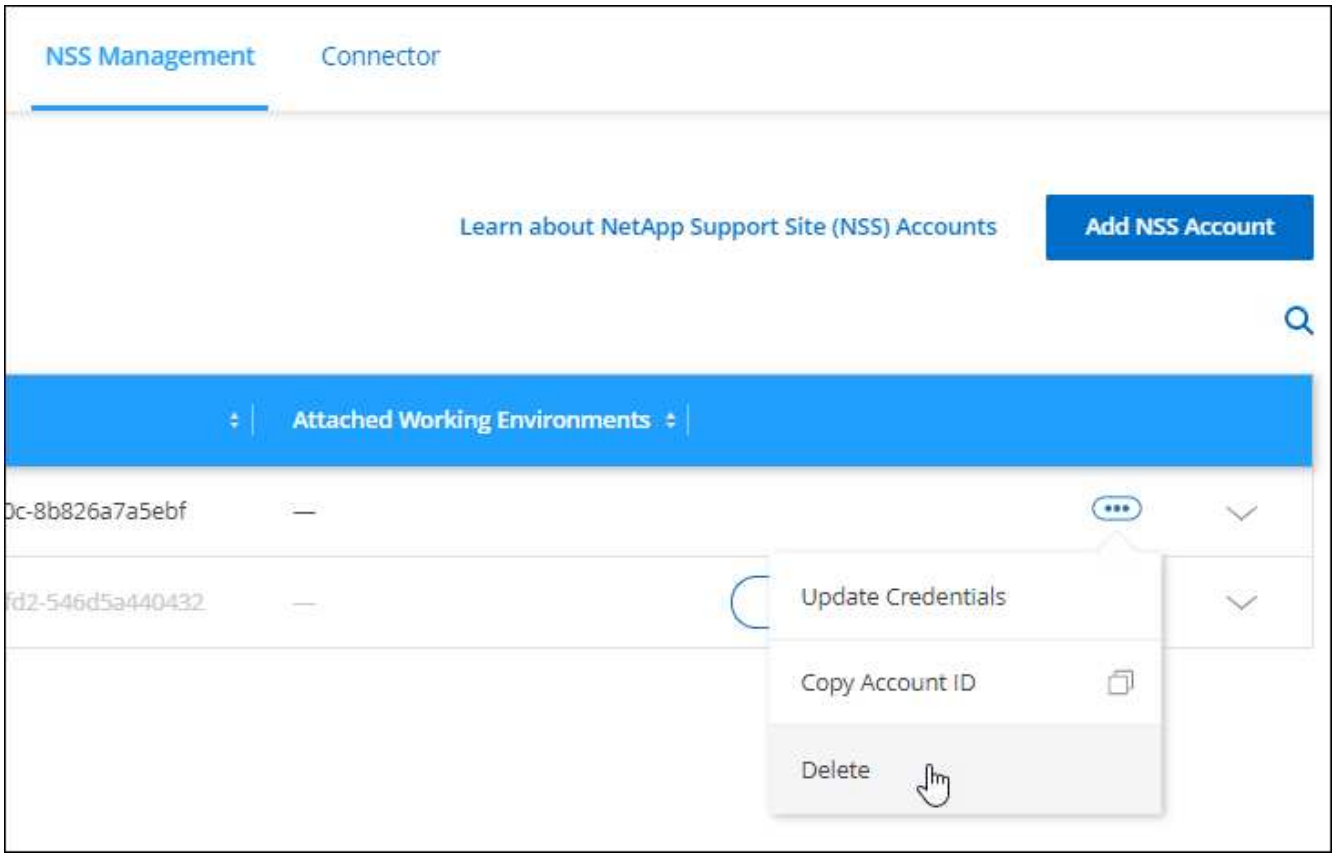
Remove an NSS account

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.

My Opportunities

On the Canvas, the **My Opportunities** tab provides a centralized location to discover existing resources that you can add to Cloud Manager for consistent data services and operations across your hybrid multicloud.

Currently, My Opportunities enables you to discover existing FSx for ONTAP file systems in your AWS account.

Learn how to discover FSx for ONTAP using My Opportunities

Reference

Permissions summary for Cloud Manager

In order to use the features and services in Cloud Manager, you'll need to provide permissions so that Cloud Manager can perform operations in your cloud environment. Use the links on this page to quickly access the permissions that you need based on your goal.

AWS permissions

Purpose	Description	Link
Connector deployment	The user who creates a Connector from Cloud Manager needs specific permissions to deploy the instance in AWS.	Create a Connector in AWS from Cloud Manager
Connector operation	When Cloud Manager launches the Connector, it attaches a policy to the instance that provides the permissions required to manage resources and processes in your AWS account. You need to set up the policy yourself if you launch a Connector from the marketplace or if you add more AWS credentials to a Connector. You also need to ensure that the policy is up to date as new permissions are added in subsequent releases.	AWS permissions for the Connector
Cloud Volumes ONTAP operation	An IAM role must be attached to each Cloud Volumes ONTAP node in AWS. The same is true for the HA mediator. The default option is to let Cloud Manager create the IAM roles for you, but you can use your own.	Learn how to set up the IAM roles yourself

Azure permissions

Purpose	Description	Link
Connector deployment	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 VM in Azure.	Create a Connector in Azure from Cloud Manager

Purpose	Description	Link
Connector operation	When Cloud Manager deploys the Connector VM in Azure, it creates a custom role that provides the permissions required to manage resources and processes within that Azure subscription. You need to set up the custom role yourself if you launch a Connector from the marketplace or if you add more Azure credentials to a Connector. You also need to ensure that the policy is up to date as new permissions are added in subsequent releases.	Azure permissions for the Connector

Google Cloud permissions

Purpose	Description	Link
Connector deployment	The Google Cloud user who deploys a Connector from Cloud Manager needs specific permissions to deploy the Connector in Google Cloud.	Set up permissions to deploy the Connector
Connector operation	The service account for the Connector VM instance must have specific permissions for day-to-day operations. You need to associate the service account with the Connector when you deploy it from Cloud Manager. You also need to ensure that the policy is up to date as new permissions are added in subsequent releases.	Set up a service account for the Connector

AWS permissions for the Connector

When Cloud Manager launches the Connector instance in AWS, it attaches a policy to the instance that provides the Connector with permissions to manage resources and processes within that AWS account. The Connector uses the permissions to make API calls to several AWS services, including EC2, S3, CloudFormation, IAM, the Key Management Service (KMS), and more.

IAM policy

The IAM policy shown below provides the permissions that a Connector needs to manage resources and processes within your public cloud environment based on your AWS region.

When you create a Connector directly from Cloud Manager, Cloud Manager automatically applies this policy to the Connector.

If you deploy the Connector from the AWS Marketplace or if you manually install the Connector on a Linux host, then you'll need to set up the policy yourself.

You also need to ensure that the policy is up to date as new permissions are added in subsequent releases.

Standard regions

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "cvoServicePolicy",
      "Effect": "Allow",
      "Action": [
        "ec2:DescribeInstances",
        "ec2:DescribeInstanceStatus",
        "ec2:RunInstances",
        "ec2:ModifyInstanceAttribute",
        "ec2:DescribeInstanceAttribute",
        "ec2:DescribeRouteTables",
        "ec2:DescribeImages",
        "ec2:CreateTags",
        "ec2:CreateVolume",
        "ec2:DescribeVolumes",
        "ec2:ModifyVolumeAttribute",
        "ec2:CreateSecurityGroup",
        "ec2:DescribeSecurityGroups",
        "ec2:RevokeSecurityGroupEgress",
        "ec2:AuthorizeSecurityGroupEgress",
        "ec2:AuthorizeSecurityGroupIngress",
        "ec2:RevokeSecurityGroupIngress",
        "ec2:CreateNetworkInterface",
        "ec2:DescribeNetworkInterfaces",
        "ec2:ModifyNetworkInterfaceAttribute",
        "ec2:DescribeSubnets",
        "ec2:DescribeVpcs",
        "ec2:DescribeDhcpOptions",
        "ec2:CreateSnapshot",
        "ec2:DescribeSnapshots",
        "ec2:GetConsoleOutput",
        "ec2:DescribeKeyPairs",
        "ec2:DescribeRegions",
        "ec2:DescribeTags",
        "cloudformation:CreateStack",
        "cloudformation:DescribeStacks",
        "cloudformation:DescribeStackEvents",
        "cloudformation:ValidateTemplate",
        "iam:PassRole",
        "iam:CreateRole",
        "iam:PutRolePolicy",
        "iam:CreateInstanceProfile",
```

```
        "iam:AddRoleToInstanceProfile",
        "iam:RemoveRoleFromInstanceProfile",
        "iam:ListInstanceProfiles",
        "sts:DecodeAuthorizationMessage",
        "ec2:AssociateIamInstanceProfile",
        "ec2:DescribeIamInstanceProfileAssociations",
        "ec2:DisassociateIamInstanceProfile",
        "s3:GetBucketTagging",
        "s3:GetBucketLocation",
        "s3:ListBucket",
        "s3:CreateBucket",
        "s3:GetLifecycleConfiguration",
        "s3:ListBucketVersions",
        "s3:GetBucketPolicyStatus",
        "s3:GetBucketPublicAccessBlock",
        "s3:GetBucketPolicy",
        "s3:GetBucketAcl",
        "kms:List*",
        "kms:ReEncrypt*",
        "kms:Describe*",
        "kms:CreateGrant",
        "ce:GetReservationUtilization",
        "ce:GetDimensionValues",
        "ce:GetCostAndUsage",
        "ce:GetTags",
        "ec2:CreatePlacementGroup",
        "ec2:DescribeReservedInstancesOfferings",
        "sts:AssumeRole",
        "ec2:AssignPrivateIpAddresses",
        "ec2:CreateRoute",
        "ec2:DescribeVpcs",
        "ec2:ReplaceRoute",
        "ec2:UnassignPrivateIpAddresses",
        "s3:PutObjectTagging",
        "s3:GetObjectTagging",
        "fsx:Describe*",
        "fsx:List*",
        "ec2:DeleteSecurityGroup",
        "ec2:DeleteNetworkInterface",
        "ec2:DeleteSnapshot",
        "ec2:DeleteTags",
        "ec2:DeleteRoute",
        "ec2:DeletePlacementGroup",
        "iam:DeleteRole",
        "iam:DeleteRolePolicy",
        "iam:DeleteInstanceProfile",
```

```
        "cloudformation:DeleteStack",
        "ec2:DescribePlacementGroups",
        "iam:GetRolePolicy",
            "s3:ListAllMyBuckets",
        "s3:GetObject",
        "iam:GetRole",
        "s3:DeleteObject",
        "s3:DeleteObjectVersion",
        "s3:PutObject",
            "ec2:ModifyVolume",
        "ec2:DescribeVolumesModifications",
            "s3:GetEncryptionConfiguration"
      ],
      "Resource": "*"
    },
    {
      "Sid": "backupPolicy",
      "Effect": "Allow",
      "Action": [
        "ec2:StartInstances",
        "ec2:StopInstances",
            "ec2:DescribeInstances",
        "ec2:DescribeInstanceStatus",
        "ec2:RunInstances",
        "ec2:TerminateInstances",
        "ec2:DescribeInstanceAttribute",
        "ec2:DescribeImages",
        "ec2:CreateTags",
        "ec2:CreateVolume",
        "ec2:CreateSecurityGroup",
        "ec2:DescribeSubnets",
        "ec2:DescribeVpcs",
        "ec2:DescribeRegions",
        "cloudformation:CreateStack",
        "cloudformation:DeleteStack",
        "cloudformation:DescribeStacks",
        "kms:List*",
        "kms:Describe*",
        "ec2:describeVpcEndpoints",
        "kms:ListAliases",
        "athena:StartQueryExecution",
        "athena:GetQueryResults",
        "athena:GetQueryExecution",
        "athena:StopQueryExecution",
        "glue:CreateDatabase",
        "glue:CreateTable",
```

```
            "glue:BatchDeletePartition"
        ],
        "Resource": "*"
    },
    {
        "Sid": "backupS3Policy",
        "Effect": "Allow",
        "Action": [
            "s3:GetBucketLocation",
            "s3:ListAllMyBuckets",
            "s3:ListBucket",
            "s3:CreateBucket",
            "s3:GetLifecycleConfiguration",
            "s3:PutLifecycleConfiguration",
            "s3:PutBucketTagging",
            "s3:ListBucketVersions",
            "s3:GetBucketAcl",
            "s3:PutBucketPublicAccessBlock",
            "s3:GetObject",
            "s3:PutEncryptionConfiguration",
            "s3:DeleteObject",
            "s3:DeleteObjectVersion",
            "s3:ListBucketMultipartUploads",
            "s3:PutObject",
            "s3:PutBucketAcl",
            "s3:AbortMultipartUpload",
            "s3:ListMultipartUploadParts",
            "s3:DeleteBucket",
                "s3:GetObjectVersionTagging",
                  "s3:GetObjectVersionAcl",
                "s3:GetObjectRetention",
                "s3:GetObjectTagging",
                "s3:GetObjectVersion",
                "s3:PutObjectVersionTagging",
                "s3:PutObjectRetention",
                "s3:DeleteObjectTagging",
                "s3:DeleteObjectVersionTagging",
                "s3:GetBucketObjectLockConfiguration",
                "s3:GetBucketVersioning",
                "s3:PutBucketObjectLockConfiguration",
                "s3:PutBucketVersioning",
                "s3:BypassGovernanceRetention"
        ],
        "Resource": [
            "arn:aws:s3:::netapp-backup-*"
        ]
```

```
    },
    {
      "Sid": "tagServicePolicy",
      "Effect": "Allow",
      "Action": [
        "ec2:CreateTags",
        "ec2:DeleteTags",
        "ec2:DescribeTags",
        "tag:getResources",
        "tag:getTagKeys",
        "tag:getTagValues",
        "tag:TagResources",
        "tag:UntagResources"
      ],
      "Resource": "*"
    },
    {
      "Sid": "fabricPoolS3Policy",
      "Effect": "Allow",
      "Action": [
        "s3:CreateBucket",
        "s3:GetLifecycleConfiguration",
        "s3:PutLifecycleConfiguration",
        "s3:PutBucketTagging",
        "s3:ListBucketVersions",
        "s3:GetBucketPolicyStatus",
        "s3:GetBucketPublicAccessBlock",
        "s3:GetBucketAcl",
        "s3:GetBucketPolicy",
        "s3:PutBucketPublicAccessBlock",
        "s3:DeleteBucket"
      ],
      "Resource": [
        "arn:aws:s3:::fabric-pool*"
      ]
    },
    {
      "Sid": "fabricPoolPolicy",
      "Effect": "Allow",
      "Action": [
        "ec2:DescribeRegions"
      ],
      "Resource": "*"
    },
    {
      "Effect": "Allow",
```

```
      "Action": [
        "ec2:StartInstances",
        "ec2:StopInstances",
        "ec2:TerminateInstances"
      ],
      "Condition": {
        "StringLike": {
          "ec2:ResourceTag/netapp-adc-manager": "*"
        }
      },
      "Resource": [
        "arn:aws:ec2:*:*:instance/*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "ec2:StartInstances",
        "ec2:TerminateInstances",
        "ec2:AttachVolume",
        "ec2:DetachVolume"
      ],
      "Condition": {
        "StringLike": {
          "ec2:ResourceTag/GFCInstance": "*"
        }
      },
      "Resource": [
        "arn:aws:ec2:*:*:instance/*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "ec2:StartInstances",
        "ec2:TerminateInstances",
        "ec2:AttachVolume",
        "ec2:DetachVolume",
        "ec2:StopInstances",
        "ec2:DeleteVolume"
      ],
      "Condition": {
        "StringLike": {
          "ec2:ResourceTag/WorkingEnvironment": "*"
        }
      },
```

```
      "Resource": [
        "arn:aws:ec2:*:*:instance/*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "ec2:AttachVolume",
        "ec2:DetachVolume"
      ],
      "Resource": [
        "arn:aws:ec2:*:*:volume/*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "ec2:DeleteVolume"
      ],
      "Condition": {
        "StringLike": {
          "ec2:ResourceTag/WorkingEnvironment": "*"
        }
      },
      "Resource": [
        "arn:aws:ec2:*:*:volume/*"
      ]
    },
    {
      "Sid": "K8sServicePolicy",
      "Effect": "Allow",
      "Action": [
        "ec2:DescribeRegions",
        "eks:ListClusters",
        "eks:DescribeCluster",
            "iam:GetInstanceProfiles"
      ],
      "Resource": "*"
    },
    {
      "Sid": "GFCservicePolicy",
      "Effect": "Allow",
      "Action": [
        "cloudformation:DescribeStacks",
        "cloudwatch:GetMetricStatistics",
        "cloudformation:ListStacks"
```

```
        ],
        "Resource": "*"
      }
    ]
}
```

GovCloud (US) regions

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "iam:ListInstanceProfiles",
                "iam:CreateRole",
                "iam:DeleteRole",
                "iam:PutRolePolicy",
                "iam:CreateInstanceProfile",
                "iam:DeleteRolePolicy",
                "iam:AddRoleToInstanceProfile",
                "iam:RemoveRoleFromInstanceProfile",
                "iam:DeleteInstanceProfile",
                "ec2:ModifyVolumeAttribute",
                "sts:DecodeAuthorizationMessage",
                "ec2:DescribeImages",
                "ec2:DescribeRouteTables",
                "ec2:DescribeInstances",
                "iam:PassRole",
                "ec2:DescribeInstanceStatus",
                "ec2:RunInstances",
                "ec2:ModifyInstanceAttribute",
                "ec2:CreateTags",
                "ec2:CreateVolume",
                "ec2:DescribeVolumes",
                "ec2:DeleteVolume",
                "ec2:CreateSecurityGroup",
                "ec2:DeleteSecurityGroup",
                "ec2:DescribeSecurityGroups",
                "ec2:RevokeSecurityGroupEgress",
                "ec2:AuthorizeSecurityGroupEgress",
                "ec2:AuthorizeSecurityGroupIngress",
                "ec2:RevokeSecurityGroupIngress",
                "ec2:CreateNetworkInterface",
                "ec2:DescribeNetworkInterfaces",
                "ec2:DeleteNetworkInterface",
```

```
                "ec2:ModifyNetworkInterfaceAttribute",
                "ec2:DescribeSubnets",
                "ec2:DescribeVpcs",
                "ec2:DescribeDhcpOptions",
                "ec2:CreateSnapshot",
                "ec2:DeleteSnapshot",
                "ec2:DescribeSnapshots",
                "ec2:StopInstances",
                "ec2:GetConsoleOutput",
                "ec2:DescribeKeyPairs",
                "ec2:DescribeRegions",
                "ec2:DeleteTags",
                "ec2:DescribeTags",
                "cloudformation:CreateStack",
                "cloudformation:DeleteStack",
                "cloudformation:DescribeStacks",
                "cloudformation:DescribeStackEvents",
                "cloudformation:ValidateTemplate",
                "s3:GetObject",
                "s3:ListBucket",
                "s3:ListAllMyBuckets",
                "s3:GetBucketTagging",
                "s3:GetBucketLocation",
                "s3:CreateBucket",
                "s3:GetBucketPolicyStatus",
                "s3:GetBucketPublicAccessBlock",
                "s3:GetBucketAcl",
                "s3:GetBucketPolicy",
                "kms:List*",
                "kms:ReEncrypt*",
                "kms:Describe*",
                "kms:CreateGrant",
                "ec2:AssociateIamInstanceProfile",
                "ec2:DescribeIamInstanceProfileAssociations",
                "ec2:DisassociateIamInstanceProfile",
                "ec2:DescribeInstanceAttribute",
                "ce:GetReservationUtilization",
                "ce:GetDimensionValues",
                "ce:GetCostAndUsage",
                "ce:GetTags",
                "ec2:CreatePlacementGroup",
                "ec2:DeletePlacementGroup"
            ],
            "Resource": "*"
        },
        {
```

```
            "Sid": "fabricPoolPolicy",
            "Effect": "Allow",
            "Action": [
                "s3:DeleteBucket",
                "s3:GetLifecycleConfiguration",
                "s3:PutLifecycleConfiguration",
                "s3:PutBucketTagging",
                "s3:ListBucketVersions",
                "s3:GetBucketPolicyStatus",
                "s3:GetBucketPublicAccessBlock",
                "s3:GetBucketAcl",
                "s3:GetBucketPolicy",
                "s3:PutBucketPublicAccessBlock"
            ],
            "Resource": [
                "arn:aws-us-gov:s3:::fabric-pool*"
            ]
        },
        {
            "Sid": "backupPolicy",
            "Effect": "Allow",
            "Action": [
                "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"
            ],
            "Resource": [
                "arn:aws-us-gov:s3:::netapp-backup-*"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2:StartInstances",
```

```
                "ec2:TerminateInstances",
                "ec2:AttachVolume",
                "ec2:DetachVolume"
            ],
            "Condition": {
                "StringLike": {
                    "ec2:ResourceTag/WorkingEnvironment": "*"
                }
            },
            "Resource": [
                "arn:aws-us-gov:ec2:*:*:instance/*"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2:AttachVolume",
                "ec2:DetachVolume"
            ],
            "Resource": [
                "arn:aws-us-gov:ec2:*:*:volume/*"
            ]
        }
    ]
}
```

C2S environment

```
{
    "Version": "2012-10-17",
    "Statement": [{
            "Effect": "Allow",
            "Action": [
                "ec2:DescribeInstances",
                "ec2:DescribeInstanceStatus",
                "ec2:RunInstances",
                "ec2:ModifyInstanceAttribute",
                "ec2:DescribeRouteTables",
                "ec2:DescribeImages",
                "ec2:CreateTags",
                "ec2:CreateVolume",
                "ec2:DescribeVolumes",
                "ec2:ModifyVolumeAttribute",
                "ec2:DeleteVolume",
                "ec2:CreateSecurityGroup",
                "ec2:DeleteSecurityGroup",
```

```
                "ec2:DescribeSecurityGroups",
                "ec2:RevokeSecurityGroupEgress",
                "ec2:RevokeSecurityGroupIngress",
                "ec2:AuthorizeSecurityGroupEgress",
                "ec2:AuthorizeSecurityGroupIngress",
                "ec2:CreateNetworkInterface",
                "ec2:DescribeNetworkInterfaces",
                "ec2:DeleteNetworkInterface",
                "ec2:ModifyNetworkInterfaceAttribute",
                "ec2:DescribeSubnets",
                "ec2:DescribeVpcs",
                "ec2:DescribeDhcpOptions",
                "ec2:CreateSnapshot",
                "ec2:DeleteSnapshot",
                "ec2:DescribeSnapshots",
                "ec2:GetConsoleOutput",
                "ec2:DescribeKeyPairs",
                "ec2:DescribeRegions",
                "ec2:DeleteTags",
                "ec2:DescribeTags",
                "cloudformation:CreateStack",
                "cloudformation:DeleteStack",
                "cloudformation:DescribeStacks",
                "cloudformation:DescribeStackEvents",
                "cloudformation:ValidateTemplate",
                "iam:PassRole",
                "iam:CreateRole",
                "iam:DeleteRole",
                "iam:PutRolePolicy",
                "iam:CreateInstanceProfile",
                "iam:DeleteRolePolicy",
                "iam:AddRoleToInstanceProfile",
                "iam:RemoveRoleFromInstanceProfile",
                "iam:DeleteInstanceProfile",
                "s3:GetObject",
                "s3:ListBucket",
                "s3:GetBucketTagging",
                "s3:GetBucketLocation",
                "s3:ListAllMyBuckets",
                "kms:List*",
                "kms:Describe*",
                "ec2:AssociateIamInstanceProfile",
                "ec2:DescribeIamInstanceProfileAssociations",
                "ec2:DisassociateIamInstanceProfile",
                "ec2:DescribeInstanceAttribute",
                "ec2:CreatePlacementGroup",
```

```
                "ec2:DeletePlacementGroup",
                "iam:ListinstanceProfiles"
            ],
            "Resource": "*"
        },
        {
            "Sid": "fabricPoolPolicy",
            "Effect": "Allow",
            "Action": [
                "s3:DeleteBucket",
                "s3:GetLifecycleConfiguration",
                "s3:PutLifecycleConfiguration",
                "s3:PutBucketTagging",
                "s3:ListBucketVersions"
            ],
            "Resource": [
                "arn:aws-iso:s3:::fabric-pool*"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2:StartInstances",
                "ec2:StopInstances",
                "ec2:TerminateInstances",
                "ec2:AttachVolume",
                "ec2:DetachVolume"
            ],
            "Condition": {
                "StringLike": {
                    "ec2:ResourceTag/WorkingEnvironment": "*"
                }
            },
            "Resource": [
                "arn:aws-iso:ec2:*:*:instance/*"
            ]
        },
        {
            "Effect": "Allow",
            "Action": [
                "ec2:AttachVolume",
                "ec2:DetachVolume"
            ],
            "Resource": [
                "arn:aws-iso:ec2:*:*:volume/*"
            ]
```

```
            }
        ]
}
```

How the AWS permissions are used

The following sections describe how the permissions are used for each NetApp cloud service. This information can be helpful if your corporate policies dictate that permissions are only provided as needed.

AppTemplate tags

The Connector makes the following API requests to manage tags on AWS resources when you use the AppTemplate Tagging service:

- ec2:CreateTags
- ec2:DeleteTags
- ec2:DescribeTags
- tag:getResources
- tag:getTagKeys
- tag:getTagValues
- tag:TagResources
- tag:UntagResources

Cloud Backup

The Connector makes the following API requests to deploy the restore instance for Cloud Backup:

- ec2:StartInstances
- ec2:StopInstances
- ec2:DescribeInstances
- ec2:DescribeInstanceStatus
- ec2:RunInstances
- ec2:TerminateInstances
- ec2:DescribeInstanceAttribute
- ec2:DescribeImages
- ec2:CreateTags
- ec2:CreateVolume
- ec2:CreateSecurityGroup
- ec2:DescribeSubnets
- ec2:DescribeVpcs
- ec2:DescribeRegions
- cloudformation:CreateStack

- cloudformation:DeleteStack
- cloudformation:DescribeStacks

The Connector makes the following API requests to manage backups in Amazon S3:

- s3:GetBucketLocation
- s3:ListAllMyBuckets
- s3:ListBucket
- s3:CreateBucket
- s3:GetLifecycleConfiguration
- s3:PutLifecycleConfiguration
- s3:PutBucketTagging
- s3:ListBucketVersions
- s3:GetBucketAcl
- s3:PutBucketPublicAccessBlock
- kms:List*
- kms:Describe*
- s3:GetObject
- ec2:describeVpcEndpoints
- kms:ListAliases
- s3:PutEncryptionConfiguration

The Connector makes the following API requests when you use the Search & Restore method to restore volumes and files:

- s3:CreateBucket
- s3:DeleteObject
- s3:DeleteObjectVersion
- s3:GetBucketAcl
- s3:ListBucket
- s3:ListBucketVersions
- s3:ListBucketMultipartUploads
- s3:PutObject
- s3:PutBucketAcl
- s3:PutLifecycleConfiguration
- s3:PutBucketPublicAccessBlock
- s3:AbortMultipartUpload
- s3:ListMultipartUploadParts
- athena:StartQueryExecutionc
- athena:GetQueryResults

- athena:GetQueryExecution
- athena:StopQueryExecution
- glue:CreateDatabase
- glue:CreateTable
- glue:BatchDeletePartition

The Connector makes the following API requests when you use DataLock and Ransomware protection for your volume backups:

- s3:GetObjectVersionTagging
- s3:GetBucketObjectLockConfiguration
- s3:GetObjectVersionAcl
- s3:PutObjectTagging
- s3:DeleteObject
- s3:DeleteObjectTagging
- s3:GetObjectRetention
- s3:DeleteObjectVersionTagging
- s3:PutObject
- s3:GetObject
- s3:PutBucketObjectLockConfiguration
- s3:GetLifecycleConfiguration
- s3:ListBucketByTags
- s3:GetBucketTagging
- s3:DeleteObjectVersion
- s3:ListBucketVersions
- s3:ListBucket
- s3:PutBucketTagging
- s3:GetObjectTagging
- s3:PutBucketVersioning
- s3:PutObjectVersionTagging
- s3:GetBucketVersioning
- s3:GetBucketAcl
- s3:BypassGovernanceRetention
- s3:PutObjectRetention
- s3:GetBucketLocation
- s3:GetObjectVersion

Cloud Data Sense

The Connector makes the following API requests to deploy the Cloud Data Sense instance:

- ec2:DescribeInstances
- ec2:DescribeInstanceStatus
- ec2:RunInstances
- ec2:TerminateInstances
- ec2:CreateTags
- ec2:CreateVolume
- ec2:AttachVolume
- ec2:CreateSecurityGroup
- ec2:DeleteSecurityGroup
- ec2:DescribeSecurityGroups
- ec2:CreateNetworkInterface
- ec2:DescribeNetworkInterfaces
- ec2:DeleteNetworkInterface
- ec2:DescribeSubnets
- ec2:DescribeVpcs
- ec2:CreateSnapshot
- ec2:DescribeRegions
- cloudformation:CreateStack
- cloudformation:DeleteStack
- cloudformation:DescribeStacks
- cloudformation:DescribeStackEvents
- iam:AddRoleToInstanceProfile
- ec2:AssociateIamInstanceProfile
- ec2:DescribeIamInstanceProfileAssociations

The Connector makes the following API requests to scan S3 buckets when you use Cloud Data Sense:

- iam:AddRoleToInstanceProfile
- ec2:AssociateIamInstanceProfile
- ec2:DescribeIamInstanceProfileAssociations
- s3:GetBucketTagging
- s3:GetBucketLocation
- s3:ListAllMyBuckets
- s3:ListBucket
- s3:GetBucketPolicyStatus
- s3:GetBucketPolicy
- s3:GetBucketAcl
- s3:GetObject

- iam:GetRole
- s3:DeleteObject
- s3:DeleteObjectVersion
- s3:PutObject
- sts:AssumeRole

Cloud Tiering

The Connector makes the following API requests to tier data to Amazon S3 when you use Cloud Tiering.

Action	Used for set up?	Used for daily operations?
s3:CreateBucket	Yes	No
s3:PutLifecycleConfiguration	Yes	No
s3:GetLifecycleConfiguration	Yes	Yes
ec2:DescribeRegions	Yes	Yes

Cloud Volumes ONTAP

The Connector makes the following API requests to deploy and manage Cloud Volumes ONTAP in AWS.

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Create and manage IAM roles and instance profiles for Cloud Volumes ONTAP instances	iam:ListInstanceProfiles	Yes	Yes	No
	iam:CreateRole	Yes	No	No
	iam:DeleteRole	No	Yes	Yes
	iam:PutRolePolicy	Yes	No	No
	iam:CreateInstanceProfile	Yes	No	No
	iam:DeleteRolePolicy	No	Yes	Yes
	iam:AddRoleToInstanceProfile	Yes	No	No
	iam:RemoveRoleFromInstanceProfile	No	Yes	Yes
	iam:DeleteInstanceProfile	No	Yes	Yes
	iam:PassRole	Yes	No	No
	ec2:AssociateIamInstanceProfile	Yes	Yes	No
	ec2:DescribeIamInstanceProfileAssociations	Yes	Yes	No
	ec2:DisassociateIamInstanceProfile	No	Yes	No
Decode authorization status messages	sts:DecodeAuthorizationMessage	Yes	Yes	No
Describe the specified images (AMIs) available to the account	ec2:DescribeImages	Yes	Yes	No
Describe the route tables in a VPC (required for HA pairs only)	ec2:DescribeRouteTables	Yes	No	No

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Stop, start, and monitor instances	ec2:StartInstances	Yes	Yes	No
	ec2:StopInstances	Yes	Yes	No
	ec2:DescribeInstances	Yes	Yes	No
	ec2:DescribeInstanceStatus	Yes	Yes	No
	ec2:RunInstances	Yes	No	No
	ec2:TerminateInstances	No	No	Yes
	ec2:ModifyInstanceAttribute	No	Yes	No
Verify that enhanced networking is enabled for supported instance types	ec2:DescribeInstanceAttribute	No	Yes	No
Tag resources with the "WorkingEnvironment" and "WorkingEnvironmentId" tags which are used for maintenance and cost allocation	ec2:CreateTags	Yes	Yes	No
Manage EBS volumes that Cloud Volumes ONTAP uses as back-end storage	ec2:CreateVolume	Yes	Yes	No
	ec2:DescribeVolumes	Yes	Yes	Yes
	ec2:ModifyVolumeAttribute	No	Yes	Yes
	ec2:AttachVolume	Yes	Yes	No
	ec2:DeleteVolume	No	Yes	Yes
	ec2:DetachVolume	No	Yes	Yes

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Create and manage security groups for Cloud Volumes ONTAP	ec2:CreateSecurityGroup	Yes	No	No
	ec2:DeleteSecurityGroup	No	Yes	Yes
	ec2:DescribeSecurityGroups	Yes	Yes	Yes
	ec2:RevokeSecurityGroupEgress	Yes	No	No
	ec2:AuthorizeSecurityGroupEgress	Yes	No	No
	ec2:AuthorizeSecurityGroupIngress	Yes	No	No
	ec2:RevokeSecurityGroupIngress	Yes	Yes	No
Create and manage network interfaces for Cloud Volumes ONTAP in the target subnet	ec2:CreateNetworkInterface	Yes	No	No
	ec2:DescribeNetworkInterfaces	Yes	Yes	No
	ec2:DeleteNetworkInterface	No	Yes	Yes
	ec2:ModifyNetworkInterfaceAttribute	No	Yes	No
Get the list of destination subnets and security groups	ec2:DescribeSubnets	Yes	Yes	No
	ec2:DescribeVpcs	Yes	Yes	No
Get DNS servers and the default domain name for Cloud Volumes ONTAP instances	ec2:DescribeDhcpOptions	Yes	No	No
Take snapshots of EBS volumes for Cloud Volumes ONTAP	ec2:CreateSnapshot	Yes	Yes	No
	ec2:DeleteSnapshot	No	Yes	Yes
	ec2:DescribeSnapshots	No	Yes	No
Capture the Cloud Volumes ONTAP console, which is attached to AutoSupport messages	ec2:GetConsoleOutput	Yes	Yes	No

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Get the list of available key pairs	ec2:DescribeKeyPairs	Yes	No	No
Get the list of available AWS regions	ec2:DescribeRegions	Yes	Yes	No
Manage tags for resources associated with Cloud Volumes ONTAP instances	ec2:DeleteTags	No	Yes	Yes
	ec2:DescribeTags	No	Yes	No
Create and manage stacks for AWS CloudFormation templates	cloudformation:CreateStack	Yes	No	No
	cloudformation:DeleteStack	Yes	No	No
	cloudformation:DescribeStacks	Yes	Yes	No
	cloudformation:DescribeStackEvents	Yes	No	No
	cloudformation:ValidateTemplate	Yes	No	No

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Create and manage an S3 bucket that a Cloud Volumes ONTAP system uses as a capacity tier for data tiering	s3:CreateBucket	Yes	Yes	No
	s3:DeleteBucket	No	Yes	Yes
	s3:GetLifecycleConfiguration	No	Yes	No
	s3:PutLifecycleConfiguration	No	Yes	No
	s3:PutBucketTagging	No	Yes	No
	s3:ListBucketVersions	No	Yes	No
	s3:GetBucketPolicyStatus	No	Yes	No
	s3:GetBucketPublicAccessBlock	No	Yes	No
	s3:GetBucketAcl	No	Yes	No
	s3:GetBucketPolicy	No	Yes	No
	s3:PutBucketPublicAccessBlock	No	Yes	No
	s3:GetBucketTagging	No	Yes	No
	s3:GetBucketLocation	No	Yes	No
	s3:ListAllMyBuckets	No	No	No
	s3:ListBucket	No	Yes	No
Enable data encryption of Cloud Volumes ONTAP using the AWS Key Management Service (KMS)	kms:List*	Yes	Yes	No
	kms:ReEncrypt*	Yes	No	No
	kms:Describe*	Yes	Yes	No
	kms:CreateGrant	Yes	Yes	No
Obtain AWS cost data for Cloud Volumes ONTAP	ce:GetReservationUtilization	No	Yes	No
	ce:GetDimensionValues	No	Yes	No
	ce:GetCostAndUsage	No	Yes	No
	ce:GetTags	No	Yes	No

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Create and manage an AWS spread placement group for two HA nodes and the mediator in a single AWS Availability Zone	ec2:CreatePlacementGroup	Yes	No	No
	ec2:DeletePlacementGroup	No	Yes	Yes
Create reports	fsx:Describe*	No	Yes	No
	fsx:List*	No	Yes	No
Create and manage aggregates that support the Amazon EBS Elastic Volumes feature	ec2:DescribeVolumesModifications	No	Yes	No
	ec2:ModifyVolume	No	Yes	No

Global File Cache

The Connector makes the following API requests to deploy Global File Cache instances during deployment:

- cloudformation:DescribeStacks
- cloudwatch:GetMetricStatistics
- cloudformation:ListStacks

FSx for ONTAP

The Connector makes the following API requests to manage FSx for ONTAP:

- ec2:DescribeInstances
- ec2:DescribeInstanceStatus
- ec2:DescribeInstanceAttribute
- ec2:DescribeRouteTables
- ec2:DescribeImages
- ec2:CreateTags
- ec2:DescribeVolumes
- ec2:DescribeSecurityGroups
- ec2:DescribeNetworkInterfaces
- ec2:DescribeSubnets
- ec2:DescribeVpcs
- ec2:DescribeDhcpOptions
- ec2:DescribeSnapshots
- ec2:DescribeKeyPairs
- ec2:DescribeRegions

- ec2:DescribeTags
- ec2:DescribeIamInstanceProfileAssociations
- ec2:DescribeReservedInstancesOfferings
- ec2:describeVpcEndpoints
- ec2:DescribeVpcs
- ec2:DescribeVolumesModifications
- ec2:DescribePlacementGroups
- kms:List*
- kms:Describe*
- kms:CreateGrant
- kms:ListAliases
- fsx:Describe*
- fsx:List*

Kubernetes

The Connector makes the following API requests to discover and manage Amazon EKS clusters:

- ec2:DescribeRegions
- eks:ListClusters
- eks:DescribeCluster
- iam:GetInstanceProfile

S3 bucket discovery

The Connector makes the following API request to discover Amazon S3 buckets:

s3:GetEncryptionConfiguration

Azure permissions for the Connector

When Cloud Manager launches the Connector VM in Azure, it attaches a custom role to the VM that provides the Connector with permissions to manage resources and processes within that Azure subscription. The Connector uses the permissions to make API calls to several Azure services.

Custom role permissions

The custom role shown below provides the permissions that a Connector needs to manage resources and processes within your Azure network.

When you create a Connector directly from Cloud Manager, Cloud Manager automatically applies this custom role to the Connector.

If you deploy the Connector from the Azure Marketplace or if you manually install the Connector on a Linux host, then you'll need to set up the custom role yourself.

You also need to ensure that the role is up to date as new permissions are added in subsequent releases.

```
{
    "Name": "Cloud Manager Operator",
    "Actions": [
       "Microsoft.Compute/disks/delete",
                        "Microsoft.Compute/disks/read",
                        "Microsoft.Compute/disks/write",
                        "Microsoft.Compute/locations/operations/read",
                        "Microsoft.Compute/locations/vmSizes/read",

"Microsoft.Resources/subscriptions/locations/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/deallocate/action",
                        "Microsoft.Compute/virtualMachines/start/action",
                        "Microsoft.Compute/virtualMachines/vmSizes/read",
                        "Microsoft.Compute/virtualMachines/write",
                        "Microsoft.Compute/images/write",
                        "Microsoft.Compute/images/read",

"Microsoft.Network/locations/operationResults/read",
                        "Microsoft.Network/locations/operations/read",
                        "Microsoft.Network/networkInterfaces/read",
                        "Microsoft.Network/networkInterfaces/write",
                        "Microsoft.Network/networkInterfaces/join/action",
                        "Microsoft.Network/networkSecurityGroups/read",
                        "Microsoft.Network/networkSecurityGroups/write",

"Microsoft.Network/networkSecurityGroups/join/action",
                        "Microsoft.Network/virtualNetworks/read",

"Microsoft.Network/virtualNetworks/checkIpAddressAvailability/read",
                        "Microsoft.Network/virtualNetworks/subnets/read",
                        "Microsoft.Network/virtualNetworks/subnets/write",

"Microsoft.Network/virtualNetworks/subnets/virtualMachines/read",

"Microsoft.Network/virtualNetworks/virtualMachines/read",
```

```
"Microsoft.Network/virtualNetworks/subnets/join/action",
                        "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",
                        "Microsoft.Storage/checknameavailability/read",
                        "Microsoft.Storage/operations/read",

"Microsoft.Storage/storageAccounts/listkeys/action",
                        "Microsoft.Storage/storageAccounts/read",
                        "Microsoft.Storage/storageAccounts/delete",

"Microsoft.Storage/storageAccounts/regeneratekey/action",
                        "Microsoft.Storage/storageAccounts/write",

"Microsoft.Storage/storageAccounts/blobServices/containers/read",
                        "Microsoft.Storage/usages/read",
                        "Microsoft.Compute/snapshots/write",
                        "Microsoft.Compute/snapshots/read",
                        "Microsoft.Compute/availabilitySets/write",
                        "Microsoft.Compute/availabilitySets/read",
                        "Microsoft.Compute/disks/beginGetAccess/action",

"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreemen
ts/read",

"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreemen
ts/write",
                        "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",
                        "Microsoft.Authorization/locks/*",
                        "Microsoft.Network/routeTables/join/action",
                        "Microsoft.NetApp/netAppAccounts/read",

"Microsoft.NetApp/netAppAccounts/capacityPools/read",

"Microsoft.NetApp/netAppAccounts/capacityPools/volumes/write",

"Microsoft.NetApp/netAppAccounts/capacityPools/volumes/read",

"Microsoft.NetApp/netAppAccounts/capacityPools/volumes/delete",
                        "Microsoft.Network/privateEndpoints/write",

"Microsoft.Storage/storageAccounts/PrivateEndpointConnectionsApproval/acti
on",

"Microsoft.Storage/storageAccounts/privateEndpointConnections/read",

"Microsoft.Storage/storageAccounts/managementPolicies/read",

"Microsoft.Storage/storageAccounts/managementPolicies/write",
                        "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",

"Microsoft.Resources/deployments/operationStatuses/read",
                        "Microsoft.Insights/Metrics/Read",

"Microsoft.Compute/virtualMachines/extensions/write",

"Microsoft.Compute/virtualMachines/extensions/delete",

"Microsoft.Compute/virtualMachines/extensions/read",
```

```
                        "Microsoft.Compute/virtualMachines/delete",
                        "Microsoft.Network/networkInterfaces/delete",
                        "Microsoft.Network/networkSecurityGroups/delete",
                        "Microsoft.Resources/deployments/delete",
                        "Microsoft.Compute/diskEncryptionSets/read",
                        "Microsoft.Compute/snapshots/delete",
                        "Microsoft.Network/privateEndpoints/delete",
                        "Microsoft.Compute/availabilitySets/delete",
                        "Microsoft.Network/loadBalancers/delete",
                        "Microsoft.KeyVault/vaults/read",
                        "Microsoft.KeyVault/vaults/accessPolicies/write",
                        "Microsoft.Compute/diskEncryptionSets/write",
                        "Microsoft.KeyVault/vaults/deploy/action",
                        "Microsoft.Compute/diskEncryptionSets/delete",
                        "Microsoft.Resources/tags/read",
                        "Microsoft.Resources/tags/write",
                        "Microsoft.Resources/tags/delete",

"Microsoft.Network/applicationSecurityGroups/write",

"Microsoft.Network/applicationSecurityGroups/read",

"Microsoft.Network/applicationSecurityGroups/joinIpConfiguration/action",

"Microsoft.Network/networkSecurityGroups/securityRules/write",

"Microsoft.Network/applicationSecurityGroups/delete",

"Microsoft.Network/networkSecurityGroups/securityRules/delete"
    ],
    "NotActions": [],
    "AssignableScopes": [],
    "Description": "Cloud Manager Permissions",
    "IsCustom": "true"
}
```

How Azure permissions are used

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.
"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.

Actions	Purpose
"Microsoft.Resources/subscriptions/locations/read", "Microsoft.Network/locations/operationResults/read", "Microsoft.Network/locations/operations/read", "Microsoft.Network/virtualNetworks/read", "Microsoft.Network/virtualNetworks/checkIpAddressAvailability/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.
"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.

Actions	Purpose
"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.
"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.

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

Google Cloud permissions for the Connector

Cloud Manager requires permissions to perform actions in Google Cloud. These permissions are included in a custom role provided by NetApp. You might want to understand what Cloud Manager does with these permissions.

Service account permissions

The custom role shown below provides the permissions that a Connector needs to manage resources and processes within your Google Cloud network.

You'll need to apply this custom role to a service account that gets attached to the Connector VM. View step-by-step instructions.

You also need to ensure that the role is up to date as new permissions are added in subsequent releases.

```
title: NetApp Cloud Manager
description: Permissions for the service account associated with the
Connector instance.
stage: GA
includedPermissions:
- iam.serviceAccounts.actAs
- compute.regionBackendServices.create
- compute.regionBackendServices.get
```

```
- compute.regionBackendServices.list
- compute.networks.updatePolicy
- compute.backendServices.create
- compute.addresses.list
- compute.disks.create
- compute.disks.createSnapshot
- compute.disks.delete
- compute.disks.get
- compute.disks.list
- compute.disks.setLabels
- compute.disks.use
- compute.firewalls.create
- compute.firewalls.delete
- compute.firewalls.get
- compute.firewalls.list
- compute.globalOperations.get
- compute.images.get
- compute.images.getFromFamily
- compute.images.list
- compute.images.useReadOnly
- compute.instances.addAccessConfig
- compute.instances.attachDisk
- compute.instances.create
- compute.instances.delete
- compute.instances.detachDisk
- compute.instances.get
- compute.instances.getSerialPortOutput
- compute.instances.list
- compute.instances.setDeletionProtection
- compute.instances.setLabels
- compute.instances.setMachineType
- compute.instances.setMetadata
- compute.instances.setTags
- compute.instances.start
- compute.instances.stop
- compute.instances.updateDisplayDevice
- compute.machineTypes.get
- compute.networks.get
- compute.networks.list
- compute.projects.get
- compute.regions.get
- compute.regions.list
- compute.snapshots.create
- compute.snapshots.delete
- compute.snapshots.get
- compute.snapshots.list
```

```
- compute.snapshots.setLabels
- compute.subnetworks.get
- compute.subnetworks.list
- compute.subnetworks.use
- compute.subnetworks.useExternalIp
- compute.zoneOperations.get
- compute.zones.get
- compute.zones.list
- compute.instances.setServiceAccount
- 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
- logging.logEntries.list
- logging.privateLogEntries.list
- resourcemanager.projects.get
- storage.buckets.create
- storage.buckets.delete
- storage.buckets.get
- storage.buckets.list
- cloudkms.cryptoKeyVersions.useToEncrypt
- cloudkms.cryptoKeys.get
- cloudkms.cryptoKeys.list
- cloudkms.keyRings.list
- storage.buckets.update
- iam.serviceAccounts.getIamPolicy
- iam.serviceAccounts.list
- storage.objects.get
- storage.objects.list
- monitoring.timeSeries.list
- storage.buckets.getIamPolicy
```

How Google Cloud permissions are used

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.
- 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 qoutas.
- 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.

Actions	Purpose
- 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.
- 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.
- 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.

Actions	Purpose
- compute.addresses.list - compute.backendServices.create - compute.networks.updatePolicy - compute.regionBackendServices.create - compute.regionBackendServices.get - compute.regionBackendServices.list	To deploy HA pairs.
- compute.subnetworks.use - compute.subnetworks.useExternalIp - compute.instances.addAccessConfig	To enable Cloud Data Sense.
- container.clusters.get - container.clusters.list	To discover Kubernetes clusters running in Google Kubernetes Engine.
- compute.instanceGroups.get - compute.addresses.get	To create and manage storage VMs on HA pairs.
- monitoring.timeSeries.list - storage.buckets.getIamPolicy	To discover information about Google Cloud Storage buckets.

Knowledge and support

Register for support

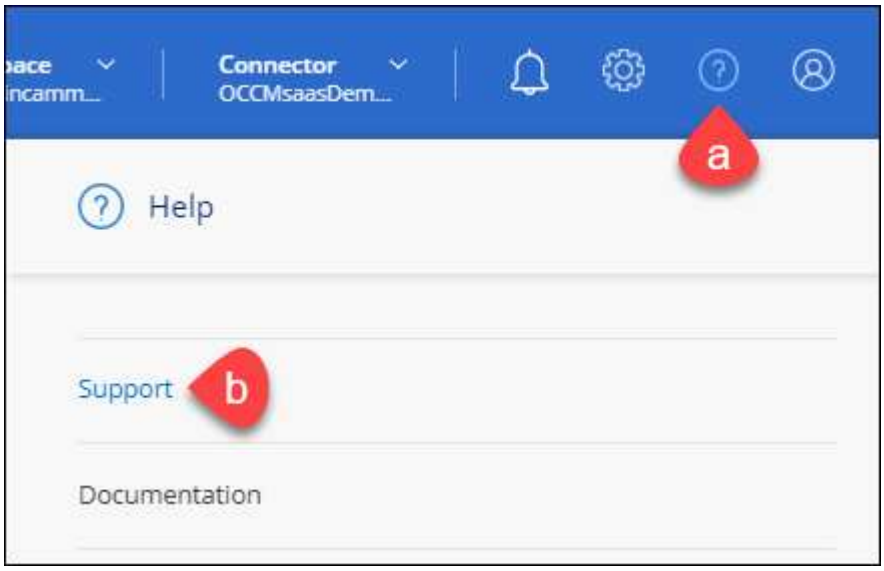
Before you can open a support case with NetApp technical support, you need to add a NetApp Support Site account to Cloud Manager and then register for support.

Add an NSS account

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

Steps

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



3. Click **NSS Management > Add NSS Account**.
4. When you're prompted, click **Continue** to be redirected to a Microsoft login page.

   NetApp uses Microsoft Azure Active Directory as the identity provider for authentication services specific to support and licensing.

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

   This action enables Cloud Manager to use your NSS account.

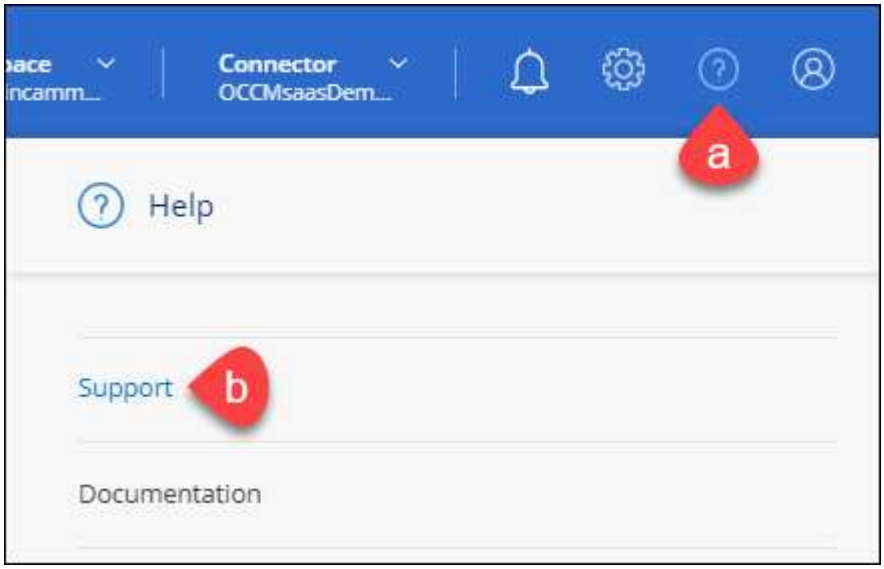
   Note the account must be a customer-level account (not a guest or temp account).

Register your account for support

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

Steps

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



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

Get help

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

Self support

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

- Knowledge base

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

- Communities

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

- Documentation

  The Cloud Manager documentation that you're currently viewing.

- Feedback email

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

NetApp support

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

Steps

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

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

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