Get started

Cloud Manager 3.7

NetApp
March 25, 2024

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Get started

Deployment overview

Before you get started, you might want to better understand your options for deploying Cloud Manager and Cloud Volumes ONTAP.

Cloud Manager installation

Cloud Manager software is required to deploy and manage Cloud Volumes ONTAP. You can deploy Cloud Manager in any of the following locations:

- Amazon Web Services (AWS)
- Microsoft Azure
- Google Cloud Platform

  Cloud Manager must be in Google Cloud Platform when deploying Cloud Volumes ONTAP in GCP.

- IBM Cloud
- In your own network

How you deploy Cloud Manager depends on which location you choose:

Location for Cloud Manager	How to deploy Cloud Manager
AWS	1. Deploy Cloud Manager from NetApp Cloud Central (recommended) 2. Deploy from the AWS Marketplace 3. Download and install the software on a Linux host
AWS C2S	Deploy Cloud Manager from the AWS Intelligence Community Marketplace
Azure generally available region	1. Deploy Cloud Manager from NetApp Cloud Central (recommended) 2. Deploy from the Azure Marketplace 3. Download and install the software on a Linux host
Azure Government	Deploy Cloud Manager from the Azure US Government Marketplace
Azure Germany	Download and install the software on a Linux host
Google Cloud Platform	1. Deploy Cloud Manager from NetApp Cloud Central (recommended) 2. Download and install the software on a Linux host You can’t deploy Cloud Manager in Google Cloud from the GCP Marketplace

Location for Cloud Manager	How to deploy Cloud Manager
IBM Cloud	Download and install the software on a Linux host
On-premises network	Download and install the software on a Linux host

Cloud Manager setup

You might want to perform additional setup after you install Cloud Manager, such as adding additional cloud provider accounts, installing an HTTPS certificate, and more.

- Setting up your Cloud Central account
- Adding AWS accounts to Cloud Manager
- Adding Azure accounts to Cloud Manager
- Installing an HTTPS certificate
- Setting up the AWS KMS

Cloud Volumes ONTAP deployment

After you get Cloud Manager up and running, you can start deploying Cloud Volumes ONTAP in your cloud provider.

Getting started in AWS, Getting started in Azure, and Getting started in GCP provide instructions for getting Cloud Volumes ONTAP up and running quickly. For additional help, refer to the following:

- Supported configurations for Cloud Volumes ONTAP 9.7 in AWS
- Supported configurations for Cloud Volumes ONTAP 9.7 in Azure
- Supported configurations for Cloud Volumes ONTAP 9.7 in GCP
- Planning your configuration
- Launching Cloud Volumes ONTAP in AWS
- Launching Cloud Volumes ONTAP in Azure
- Launching Cloud Volumes ONTAP in GCP

Getting started with Cloud Volumes ONTAP in AWS

Get started with Cloud Volumes ONTAP by setting up AWS and then launching Cloud Manager software from NetApp Cloud Central. A 30-day free trial is available for the first Cloud Volumes ONTAP system that you launch in AWS.

Set up your networking

a. Enable outbound internet access from the target VPC so Cloud Manager and Cloud Volumes ONTAP can contact several endpoints.

   This step is important because Cloud Manager can't deploy Cloud Volumes ONTAP without outbound internet access. If you need to limit outbound connectivity, refer to the list of endpoints for Cloud Manager and Cloud Volumes ONTAP.

b. Set up a VPC endpoint to the S3 service.

   A VPC endpoint is required if you want to tier cold data from Cloud Volumes ONTAP to low-cost object storage.

2 Provide the required AWS permissions

When you deploy Cloud Manager from NetApp Cloud Central, you need to use an AWS account that has permissions to deploy the instance.

a. Go to the AWS IAM console and create a policy by copying and pasting the contents of the NetApp Cloud Central policy for AWS.
b. Attach the policy to the IAM user.

3 Subscribe from the AWS Marketplace

Subscribe to Cloud Manager from the AWS Marketplace to ensure that there's no disruption of service after your free trial of Cloud Volumes ONTAP ends. You'll be charged from this subscription for every Cloud Volumes ONTAP PAYGO system that you create and each add-on feature that you enable.

If you're launching Cloud Volumes ONTAP by bringing your own license (BYOL), then you'll need to subscribe to that offering in the AWS Marketplace.

4 Launch Cloud Manager from NetApp Cloud Central

Cloud Manager software is required to deploy and manage Cloud Volumes ONTAP. It takes just a few minutes to launch a Cloud Manager instance from Cloud Central.

5 Launch Cloud Volumes ONTAP using Cloud Manager

Once Cloud Manager is ready, just click Create, select the type of system that you would like to launch, and complete the steps in the wizard. After 25 minutes, your first Cloud Volumes ONTAP system should be up and running.

Watch the following video for a walk through of these steps:

► https://docs.netapp.com/us-en/occm37//media/video_getting_started_aws.mp4 *(video)*

Related links

- Evaluating
- Networking requirements for Cloud Manager
- Networking requirements for Cloud Volumes ONTAP in AWS
- Security group rules for AWS
- Adding AWS accounts to Cloud Manager

- What Cloud Manager does with AWS permissions
- Launching Cloud Volumes ONTAP in AWS
- Launching Cloud Manager from the AWS Marketplace

Getting started with Cloud Volumes ONTAP in Azure

Get started with Cloud Volumes ONTAP by setting up Azure and then deploying Cloud Manager software from NetApp Cloud Central. Separate instructions are available to deploy Cloud Manager in Azure US Government regions and in Azure Germany regions.

1 Set up your networking

Enable outbound internet access from the target VNet so Cloud Manager and Cloud Volumes ONTAP can contact several endpoints.

This step is important because Cloud Manager cannot deploy Cloud Volumes ONTAP without outbound internet access. If you need to limit outbound connectivity, refer to the list of endpoints for Cloud Manager and Cloud Volumes ONTAP.

2 Provide the required Azure permissions

When you deploy Cloud Manager from NetApp Cloud Central, you need to use an Azure account that has permissions to deploy the Cloud Manager virtual machine.

a. Download the NetApp Cloud Central policy for Azure.
b. Modify the JSON file by adding your Azure subscription ID to the "AssignableScopes" field.
c. Use the JSON file to create a custom role in Azure named *Azure SetupAsService*.

   Example: **az role definition create --role-definition C:\Policy_for_Setup_As_Service_Azure.json**

d. From the Azure portal, assign the custom role to the user who will deploy Cloud Manager from Cloud Central.

3 Launch Cloud Manager from NetApp Cloud Central

Cloud Manager software is required to deploy and manage Cloud Volumes ONTAP. It takes just a few minutes to launch a Cloud Manager instance from Cloud Central.

4 Launch Cloud Volumes ONTAP using Cloud Manager

Once Cloud Manager is ready, just click Create, select the type of system that you would like to deploy, and complete the steps in the wizard. After 25 minutes, your first Cloud Volumes ONTAP system should be up and running.

Related links

- Evaluating
- Networking requirements for Cloud Manager
- Networking requirements for Cloud Volumes ONTAP in Azure
- Security group rules for Azure
- Adding Azure accounts to Cloud Manager
- What Cloud Manager does with Azure permissions
- Launching Cloud Volumes ONTAP in Azure
- Launching Cloud Manager from the Azure Marketplace

Getting started with Cloud Volumes ONTAP in Google Cloud Platform

Get started with Cloud Volumes ONTAP by setting up GCP and then deploying Cloud Manager software from NetApp Cloud Central.

Cloud Manager must be installed in Google Cloud Platform in order to deploy Cloud Volumes ONTAP in GCP.

1 Set up your networking

Enable outbound internet access from the target VPC so Cloud Manager and Cloud Volumes ONTAP can contact several endpoints.

This step is important because Cloud Manager can't deploy Cloud Volumes ONTAP without outbound internet access. If you need to limit outbound connectivity, refer to the list of endpoints for Cloud Manager and Cloud Volumes ONTAP.

2 Set up GCP permissions and projects

Make sure that two sets of permissions are in place:

a. Ensure that the GCP user who deploys Cloud Manager from NetApp Cloud Central has the permissions in the Cloud Central policy for GCP.

   You can create a custom role using the YAML file and then attach it to the user. You'll need to use the gcloud command line to create the role.

b. Set up a service account that has the permissions that Cloud Manager needs to create and manage Cloud Volumes ONTAP systems in projects.

   You'll associate this service account with the Cloud Manager VM in step 6.

   - Create a role in GCP that includes the permissions defined in the Cloud Manager policy for GCP. Again, you'll need to use the gcloud command line.

     The permissions contained in this YAML file are different than the permissions in step 2a.

   - Create a GCP service account and apply the custom role that you just created.

- 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.

3 Set up GCP for data tiering

Two requirements must be met to tier cold data from Cloud Volumes ONTAP 9.7 to low-cost object storage (a Google Cloud Storage bucket):

a. Create a service account that has the predefined Storage Admin role and the Cloud Manager service account as a user.

   You'll need to select this service account later when you create a Cloud Volumes ONTAP working environment. This service account is different from the service account that you created in step 2.

b. Configure the Cloud Volumes ONTAP subnet for Private Google Access.

If you want to use data tiering with Cloud Volumes ONTAP 9.6, then follow these steps.

4 Enable Google Cloud APIs

Enable the following Google Cloud APIs in your project. These APIs are required to deploy Cloud Manager and Cloud Volumes ONTAP.

- Cloud Deployment Manager V2 API
- Cloud Resource Manager API
- Compute Engine API
- Stackdriver Logging API

5 Subscribe from the GCP Marketplace

Subscribe to Cloud Volumes ONTAP from the GCP Marketplace to ensure that there's no disruption of service after your free trial ends. You'll be charged from this subscription for every Cloud Volumes ONTAP PAYGO system that you create.

6 Launch Cloud Manager from NetApp Cloud Central

Cloud Manager software is required to deploy and manage Cloud Volumes ONTAP. It takes just a few minutes to launch a Cloud Manager instance in GCP from Cloud Central.

When you choose GCP as the cloud provider, you're prompted by Google to log in to your account and to grant permissions. Clicking "Allow" grants access to the compute APIs needed to deploy Cloud Manager.

7 Launch Cloud Volumes ONTAP using Cloud Manager

Once Cloud Manager is ready, just click Create, select the type of system that you would like to deploy, and

complete the steps in the wizard. After 25 minutes, your first Cloud Volumes ONTAP system should be up and running.

Related links

- Evaluating
- Networking requirements for Cloud Manager
- Networking requirements for Cloud Volumes ONTAP in GCP
- Firewall rules for GCP
- What Cloud Manager does with GCP permissions
- Launching Cloud Volumes ONTAP in GCP
- Downloading and installing the Cloud Manager software on a Linux host

Set up Cloud Manager

Setting up workspaces and users in the Cloud Central account

Each Cloud Manager system is associated with a *NetApp Cloud Central account*. Set up the Cloud Central account associated with your Cloud Manager system so a user can access Cloud Manager and deploy Cloud Volumes ONTAP systems in workspaces. Just add a user or add multiple users and workspaces.

The account is maintained in Cloud Central, so any changes that you make are available to other Cloud Manager systems and to other NetApp cloud data services. Learn more about how Cloud Central accounts work.

Adding 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 the workspaces.

Steps

1. Click **Account Settings**.

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

After you finish

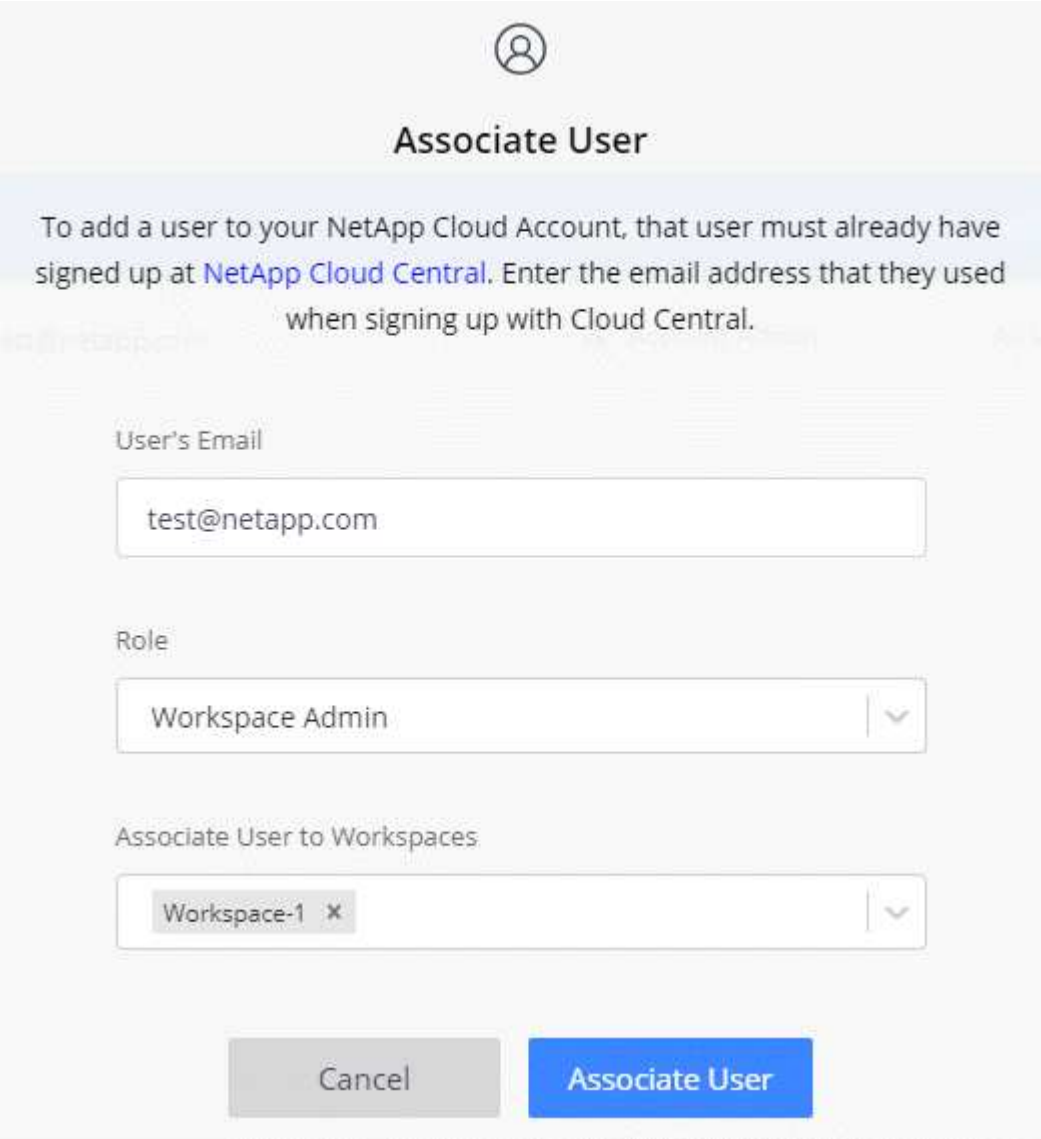
You can now associate users and service connectors with the workspace.

Adding users

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

Steps

1. If the user has not already done so, ask the user to go to NetApp Cloud Central and create an account.
2. In Cloud Manager, click **Account Settings**.
3. In the Users 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.
5. If you selected Workspace Admin, select one or more workspaces to associate with that user.



6. Click **Associate User**.

Result

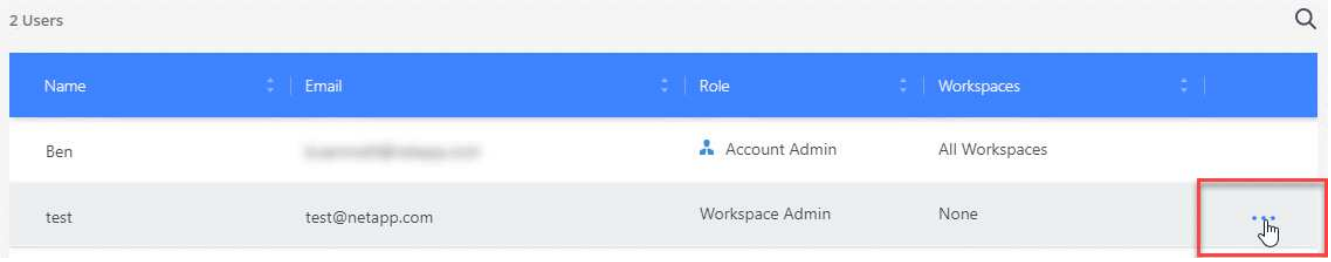
The user should receive an email from NetApp Cloud Central titled "Account Association." The email includes the information needed to access Cloud Manager.

Associating 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. Click **Account Settings**.
2. 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 service connector was also associated with the workspaces.

Associating service connectors with workspaces

A service connector is part of the Cloud Manager system. It runs on the virtual machine instance that was deployed in your cloud provider, or on an on-prem host that you configured. You need to associate this service connector with workspaces so Workspace Admins can access those workspaces from Cloud Manager.

If you only have Account Admins, then associating the service 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 service connectors.

Steps

1. Click **Account Settings**.
2. Click **Service Connector**.
3. Click **Manage Workspaces** for the service connector that you want to associate.
4. Select one or more workspaces and click **Apply**.

Result

Workspace Admins can now access the associated workspaces, as long as the user was also associated with the workspace.

Setting up and adding AWS accounts to Cloud Manager

If you want to deploy Cloud Volumes ONTAP in different AWS accounts, then you need to provide the required permissions and add the details to Cloud Manager. How you provide the permissions depends on whether you want to provide Cloud Manager with AWS keys or the ARN of a role in a trusted account.

> When you deploy Cloud Manager from Cloud Central, Cloud Manager automatically adds the AWS account in which you deployed Cloud Manager. An initial account is not added if you manually installed the Cloud Manager software on an existing system. Learn about AWS accounts and permissions.

Choices

- Granting permissions by providing AWS keys
- Granting permissions by assuming IAM roles in other accounts

Granting permissions by providing AWS keys

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

Steps

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

   AWS Documentation: Creating IAM Policies

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

Result

The account now has the required permissions. You can now add it to Cloud Manager.

Granting permissions by assuming IAM roles in other accounts

You can set up a trust relationship between the source AWS account in which you deployed the Cloud Manager 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 target account where you want to deploy Cloud Volumes ONTAP and create an IAM role by selecting **Another AWS account**.

   Be sure to do the following:

   - Enter the ID of the account where the Cloud Manager instance resides.

- Attach the Cloud Manager IAM policy, which is available from the Cloud Manager Policies page.

2. Go to the source account where the Cloud Manager instance resides and select the IAM role that is attached to the instance.
   a. Click **Trust Relationships > Edit trust relationship**.
   b. Add the "sts:AssumeRole" action and the ARN of the role that you created in the target account.

   Example

```
{
 "Version": "2012-10-17",
 "Statement": {
   "Effect": "Allow",
   "Action": "sts:AssumeRole",
   "Resource": "arn:aws:iam::ACCOUNT-B-ID:role/ACCOUNT-B-ROLENAME"
}
}
```

Result

The account now has the required permissions. You can now add it to Cloud Manager.

Adding AWS accounts to Cloud Manager

After you provide an AWS account with the required permissions, you can add the account to Cloud Manager. This enables you to launch Cloud Volumes ONTAP systems in that account.

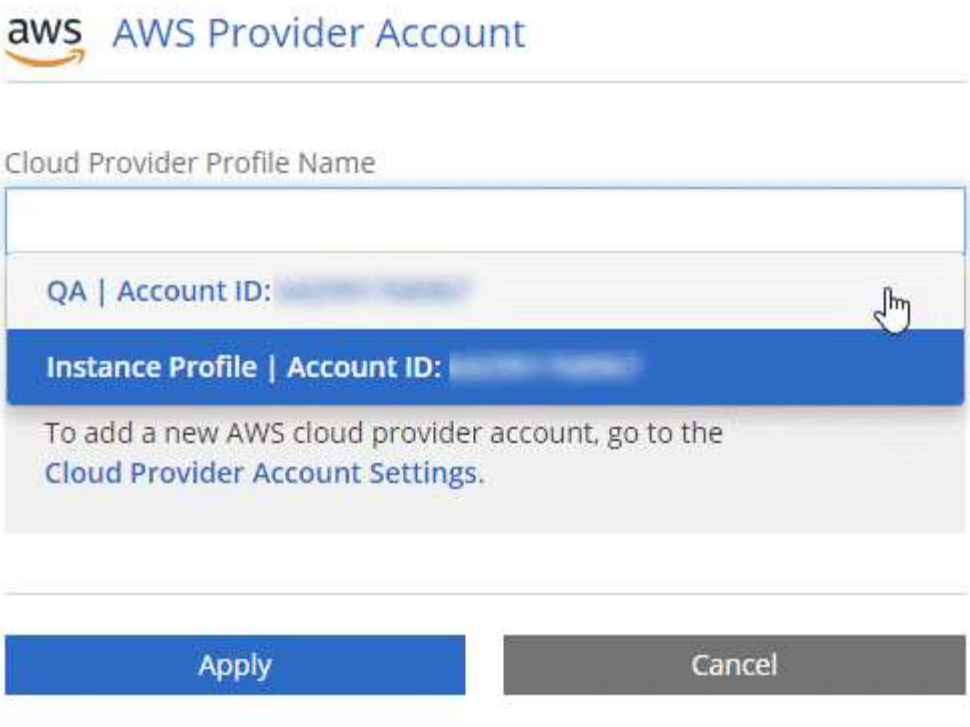
Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Cloud Provider & Support Accounts**.

2. Click **Add New Account** and select **AWS**.
3. Choose whether you want to provide AWS keys or the ARN of a trusted IAM role.
4. Confirm that the policy requirements have been met and then click **Create Account**.

Result

You can now switch to another account from the Details and Credentials page when creating a new working environment:



Setting up and adding Azure accounts to Cloud Manager

If you want to deploy Cloud Volumes ONTAP in different Azure accounts, then you need to provide the required permissions to those accounts and then add details about the accounts to Cloud Manager.

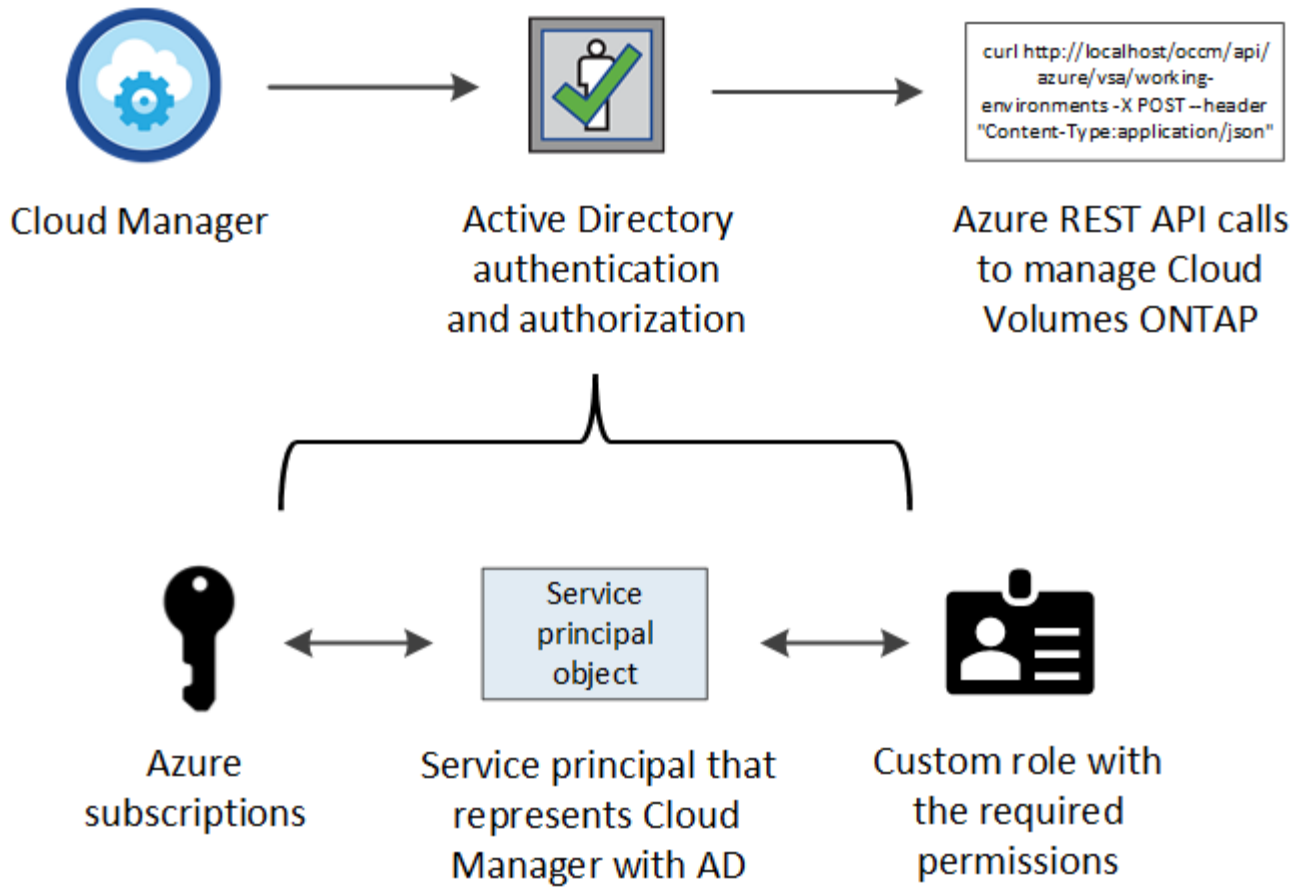
> When you deploy Cloud Manager from Cloud Central, Cloud Manager automatically adds the Azure account in which you deployed Cloud Manager. An initial account is not added if you manually installed the Cloud Manager software on an existing system. Learn about Azure accounts and permissions.

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

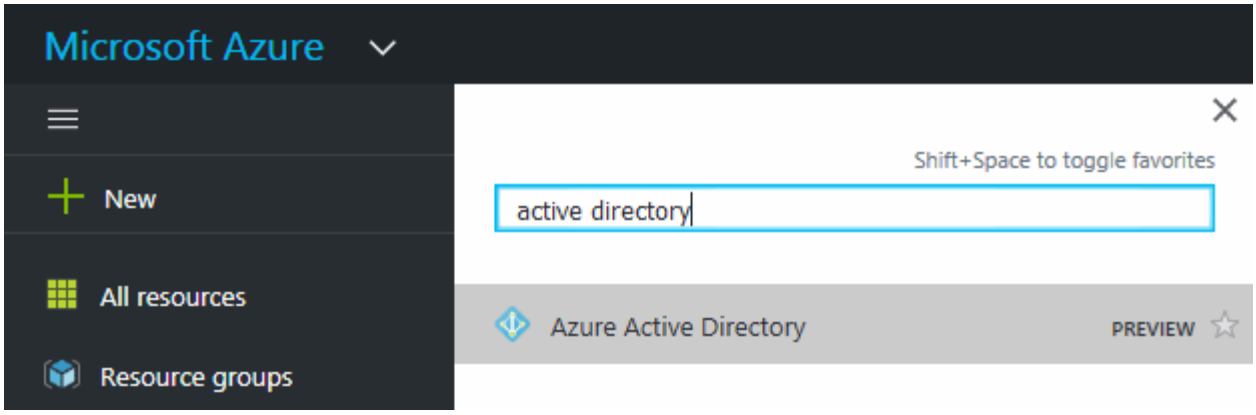
Create an Azure Active Directory (AD) application and service principal that Cloud Manager can use for role-based access control.

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**: Select **Web** and then enter any URL—for example, https://url
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. Download the Cloud Manager Azure policy.
   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"
      ```

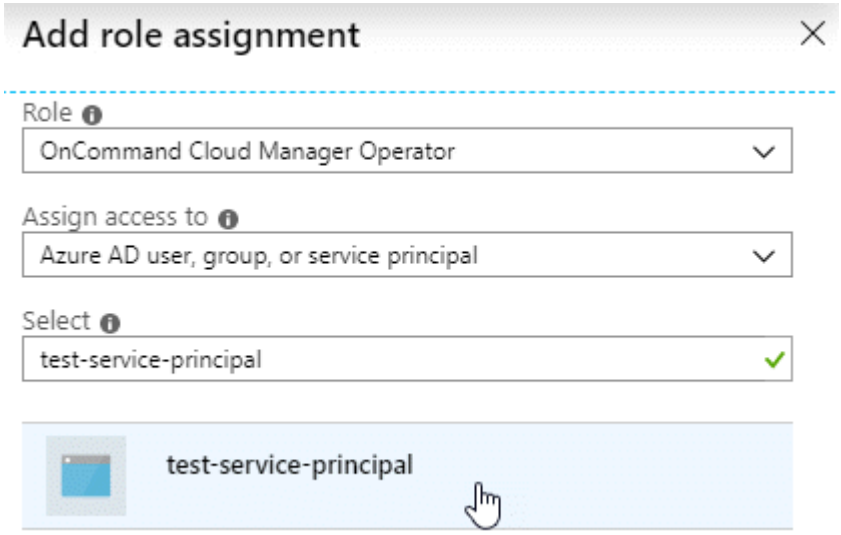
   c. Use the JSON file to create a custom role in Azure.

      The following example shows how to create a custom role using the Azure CLI 2.0:

      az role definition create --role-definition C:\Policy_for_cloud_Manager_Azure_3.7.4.json

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

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. Select the **OnCommand Cloud Manager Operator** role.
   e. Keep **Azure AD user, group, or service principal** selected.
   f. Search for the name of the application (you can't find it in the list by scrolling).



   g. Select the application and click **Save**.

      The service principal for Cloud Manager now has the required Azure permissions for that subscription.

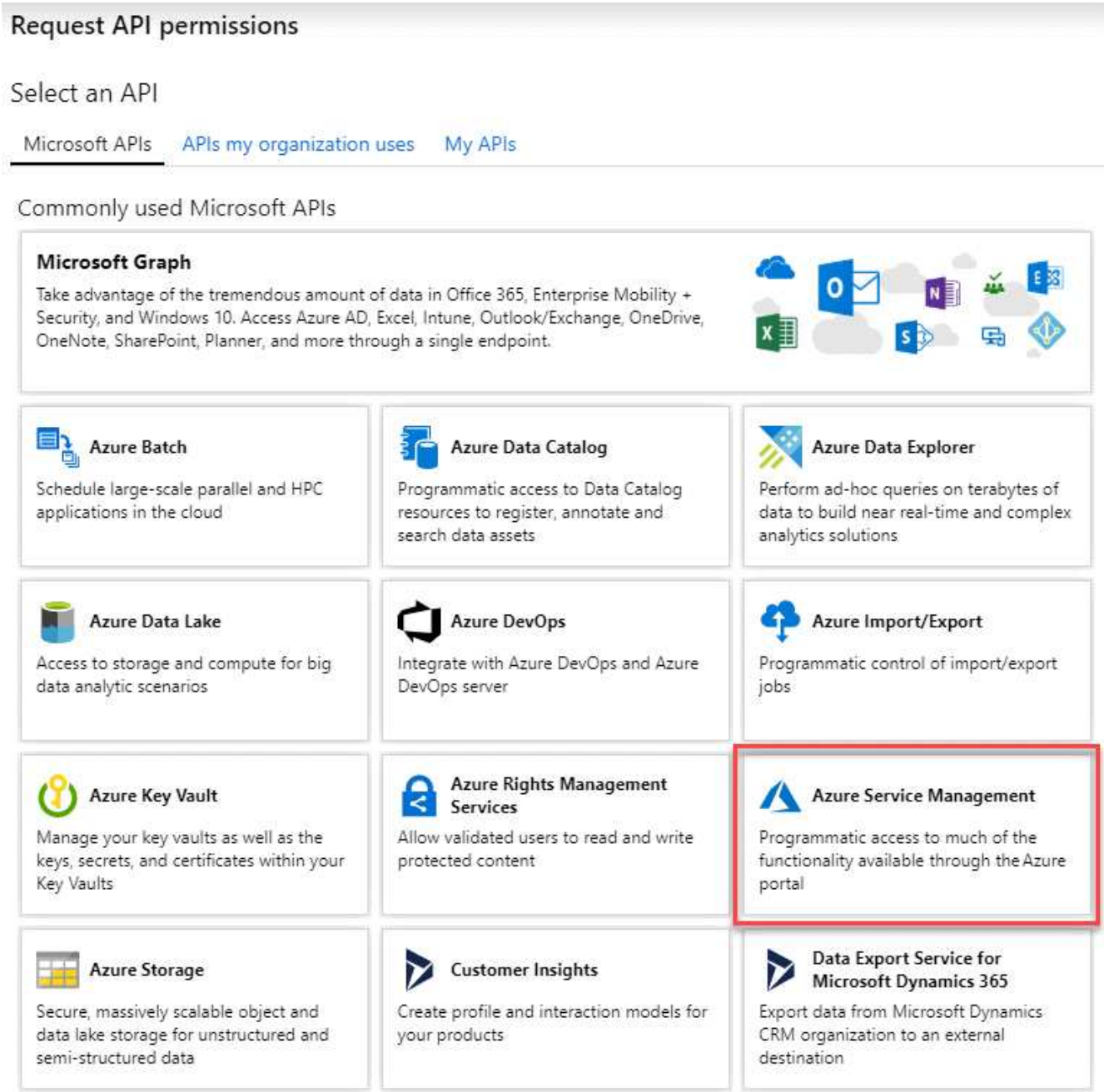
      If you want to deploy Cloud Volumes ONTAP from multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. Cloud Manager enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Adding Windows Azure Service Management API permissions

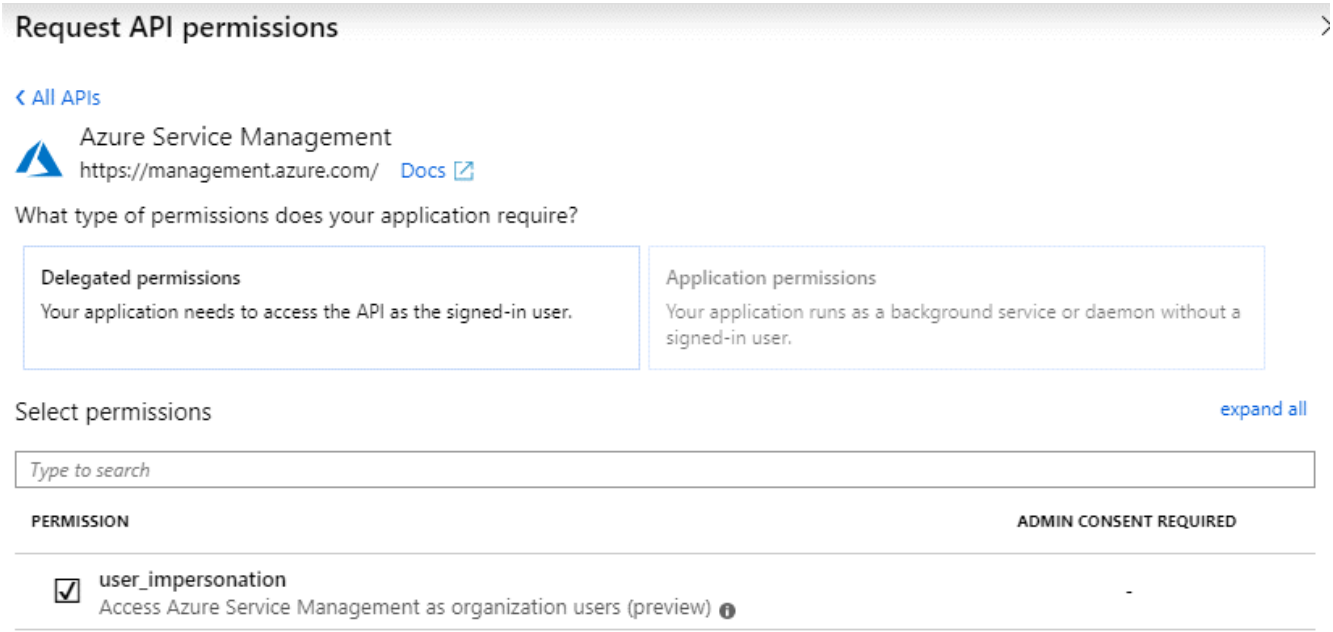
The service principal must have "Windows Azure Service Management API" permissions.

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**.

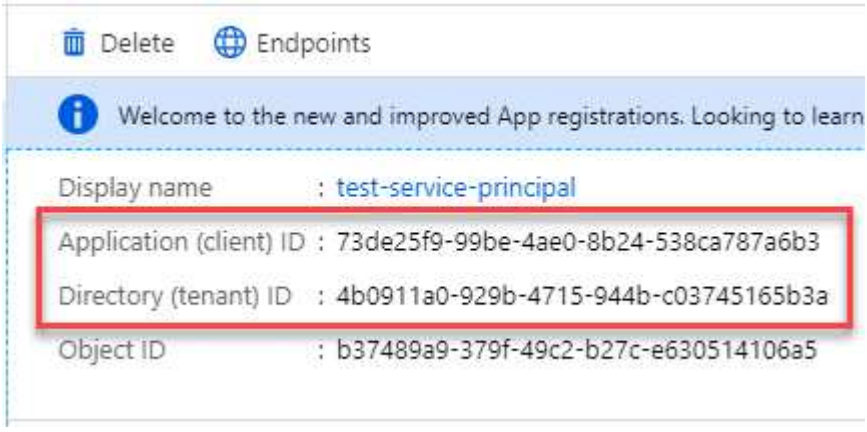


Getting the application ID and directory ID

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.

> When you add the account to Cloud Manager, Cloud Manager refers to the client secret as the Application Key.

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 Azure accounts to Cloud Manager

After you provide an Azure account with the required permissions, you can add the account to Cloud Manager. This enables you to launch Cloud Volumes ONTAP systems in that account.

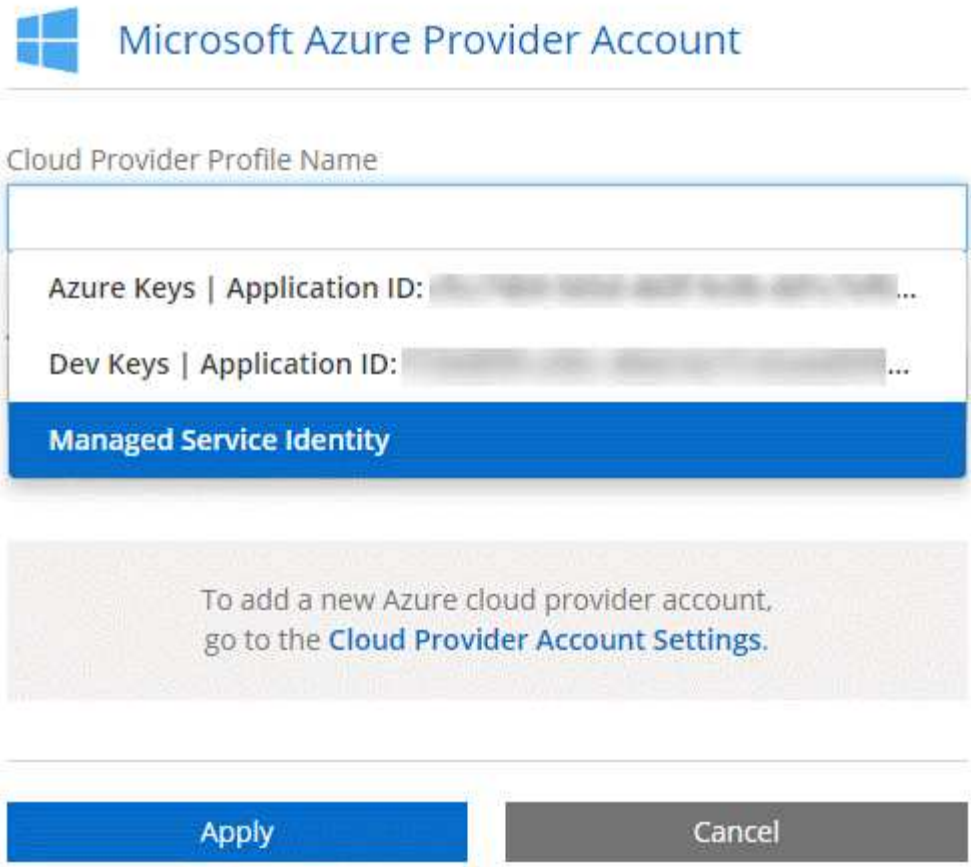
Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Cloud Provider & Support Accounts**.

2. Click **Add New Account** and select **Microsoft Azure**.
3. Enter information about the Azure Active Directory service principal that grants the required permissions:
   - Application ID: See Getting the application ID and directory ID.
   - Tenant ID (or Directory ID): See Getting the application ID and directory ID.
   - Application Key (the client secret): See Creating a client secret.
4. Confirm that the policy requirements have been met and then click **Create Account**.

Result

You can now switch to another account from the Details and Credentials page when creating a new working environment:



Associating additional Azure subscriptions with a managed identity

Cloud Manager enables you to choose the Azure account and 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 Cloud Manager from NetApp Cloud Central. When you deployed Cloud Manager, Cloud Central created the OnCommand Cloud Manager Operator role and assigned it to the Cloud Manager 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 systems.
3. Click **Access control (IAM)**.
   a. Click **Add** > **Add role assignment** and then add the permissions:
      - Select the **OnCommand Cloud Manager Operator** role.

        OnCommand Cloud Manager Operator is the default name provided in the Cloud Manager policy. If you chose a different name for the role, then select that name instead.

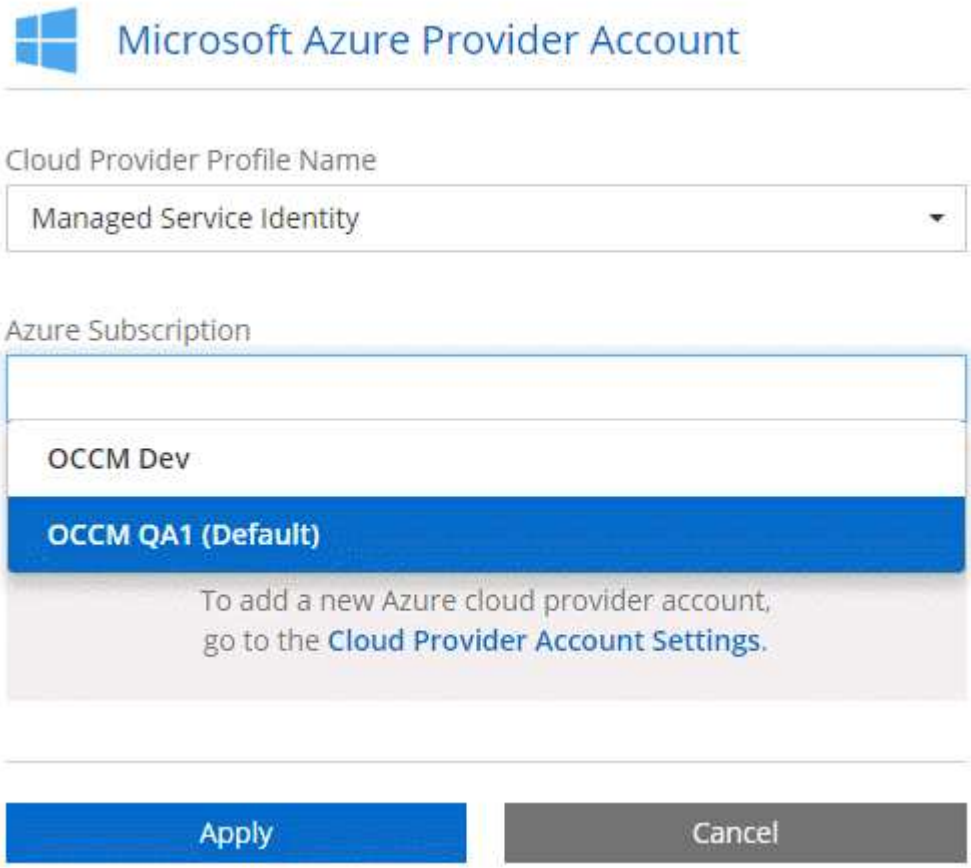
      - Assign access to a **Virtual Machine**.

- Select the subscription in which the Cloud Manager virtual machine was created.
- Select the Cloud Manager 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.



Setting up and adding GCP accounts to Cloud Manager

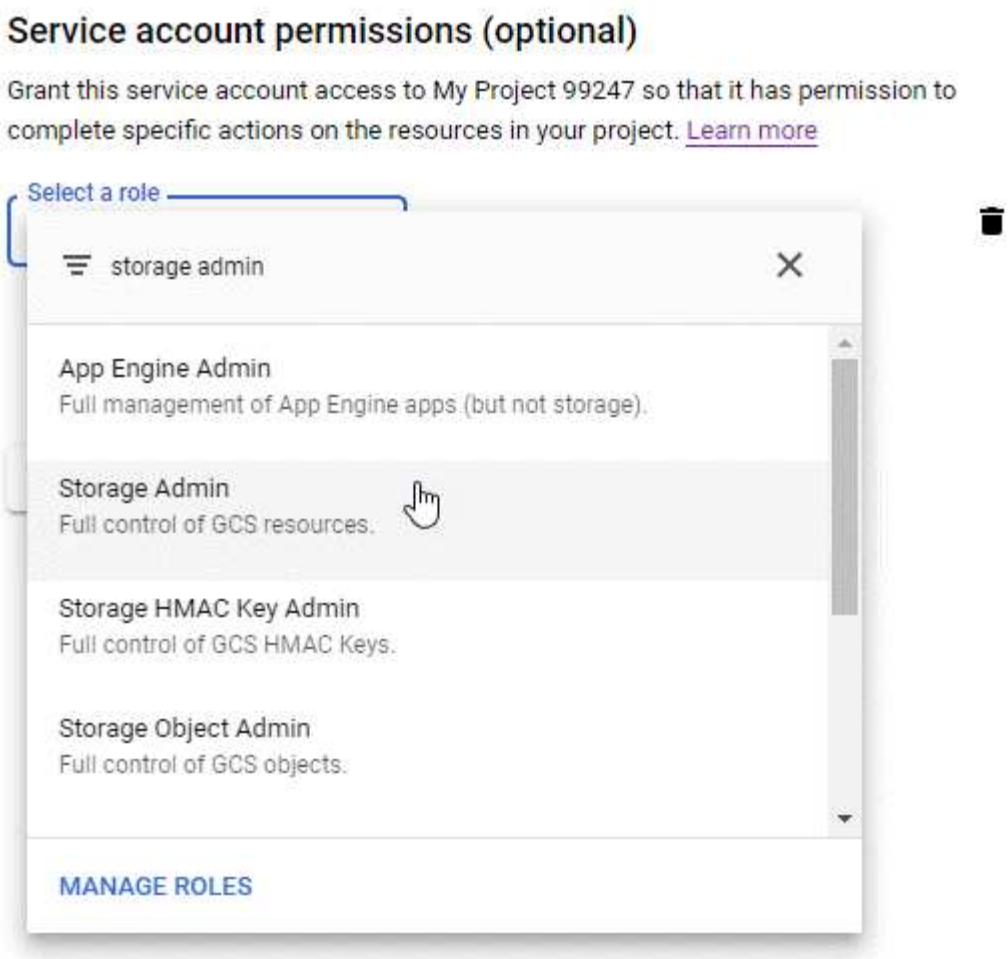
If you want to enable data tiering on a Cloud Volumes ONTAP system, you need to provide Cloud Manager with a storage access key for a service account that has Storage Admin permissions. Cloud Manager uses the access keys to set up and manage a Cloud Storage bucket for data tiering.

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

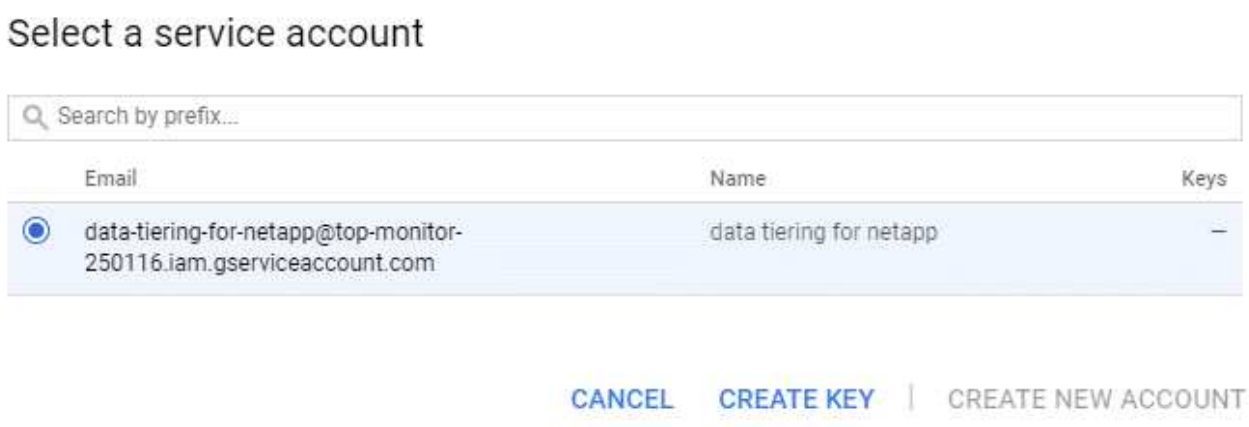
A service account enables Cloud Manager to authenticate and access Cloud Storage buckets used for data tiering. The keys are required so that Google Cloud Storage knows who is making the request.

Steps

1. Open the GCP IAM console and create a service account that has the Storage Admin role.



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



8. Click **Create Key**.

9. Copy the access key and secret.

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

Adding a GCP account to Cloud Manager

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

Steps

1. In the upper right of the Cloud Manager console, click the Settings icon, and select **Cloud Provider & Support Accounts**.

2. Click **Add New Account** and select **GCP**.
3. Enter the access key and secret for the service account.

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

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

What's next?

You can now enable data tiering on individual volumes when you create, modify, or replicate them. For details, see Tiering inactive data to low-cost object storage.

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

Adding NetApp Support Site accounts to Cloud Manager

Adding your NetApp Support Site account to Cloud Manager is required to deploy a BYOL system. It's also required to register pay-as-you-go systems and to upgrade ONTAP software.

Watch the following video to learn how to add NetApp Support Site accounts to Cloud Manager. Or scroll down to read the steps.

[] | *https://img.youtube.com/vi/V2fLTyztqYQ/maxresdefault.jpg*

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 Settings icon, and select **Cloud Provider & Support Accounts**.

3. Click **Add New Account** and select **NetApp Support Site**.
4. Specify a name for the account and then enter the user name and password.
   - The account must be a customer-level account (not a guest or temp account).
   - If you plan to deploy BYOL systems:
     - 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.
5. Click **Create Account.**

What's next?

Users can now select the account when creating new Cloud Volumes ONTAP systems and when registering existing systems.

- Launching Cloud Volumes ONTAP in AWS
- Launching Cloud Volumes ONTAP in Azure
- Registering pay-as-you-go systems
- Learn how Cloud Manager manages license files

Installing 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.

Steps

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

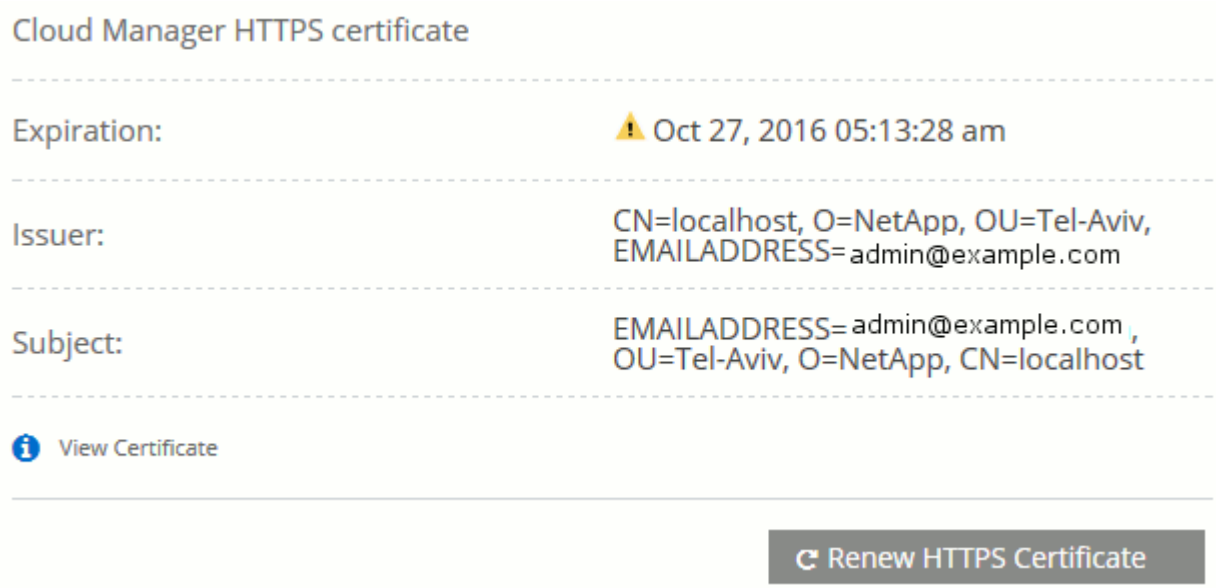
2. In the HTTPS Setup page, install a certificate by generating a certificate signing request (CSR) or by installing your own CA-signed certificate:

Option	Description
Generate a CSR	a. Enter the host name or DNS of the Cloud Manager 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. Copy the contents of the signed certificate, paste it in the Certificate field, and then click **Install**.

Option	Description
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:



Setting up the AWS KMS

If you want to use Amazon encryption with Cloud Volumes ONTAP, then you need to set up the AWS Key Management Service (KMS).

Steps

1. Ensure that an active Customer Master Key (CMK) exists.

   The CMK can be an AWS-managed CMK or a customer-managed CMK. It can be in the same AWS account as Cloud Manager and Cloud Volumes ONTAP or in a different AWS account.

   AWS Documentation: Customer Master Keys (CMKs)

2. Modify the key policy for each CMK by adding the IAM role that provides permissions to Cloud Manager as a *key user*.

   Adding the IAM role as a key user gives Cloud Manager permissions to use the CMK with Cloud Volumes ONTAP.

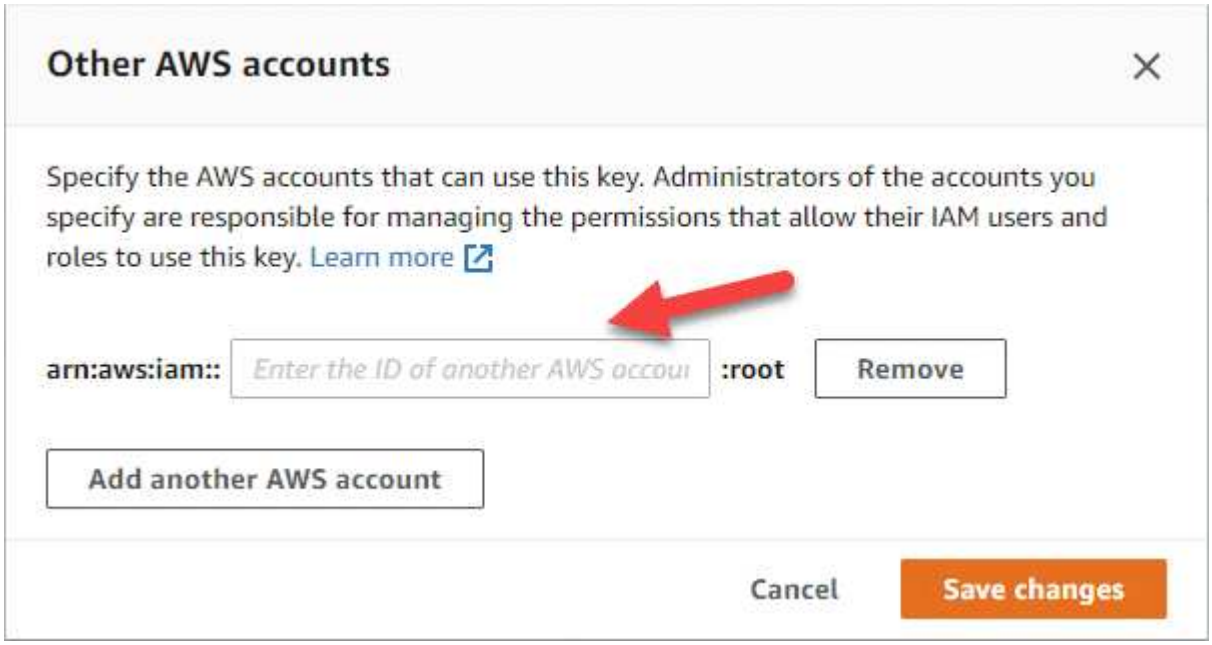
   AWS Documentation: Editing Keys

3. If the CMK is in a different AWS account, complete the following steps:
   a. Go to the KMS console from the account where the CMK resides.
   b. Select the key.
   c. In the **General configuration** pane, copy the ARN of the key.

      You'll need to provide the ARN to Cloud Manager when you create the Cloud Volumes ONTAP system.

   d. In the **Other AWS accounts** pane, add the AWS account that provides Cloud Manager with permissions.

      In most cases, this is the account where Cloud Manager resides. If Cloud Manager wasn't installed in AWS, it would be the account for which you provided AWS access keys to Cloud Manager.



   e. Now switch to the AWS account that provides Cloud Manager with permissions and open the IAM console.
   f. Create an IAM policy that includes the permissions listed below.
   g. Attach the policy to the IAM role or IAM user that provides permissions to Cloud Manager.

      The following policy provides the permissions that Cloud Manager needs to use the CMK from the external AWS account. Be sure to modify the region and account ID in the "Resource" sections.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "AllowUseOfTheKey",
            "Effect": "Allow",
            "Action": [
                "kms:Encrypt",
                "kms:Decrypt",
                "kms:ReEncrypt*",
                "kms:GenerateDataKey*",
                "kms:DescribeKey"
            ],
            "Resource": [
                "arn:aws:kms:us-east-
1:externalaccountid:key/externalkeyid"
            ]
        },
        {
            "Sid": "AllowAttachmentOfPersistentResources",
            "Effect": "Allow",
            "Action": [
                "kms:CreateGrant",
                "kms:ListGrants",
                "kms:RevokeGrant"
            ],
            "Resource": [
                "arn:aws:kms:us-east-
1:externalaccountid:key/externalaccountid"
            ],
            "Condition": {
                "Bool": {
                    "kms:GrantIsForAWSResource": true
                }
            }
        }
    ]
}
```

For additional details about this process, see AWS Documentation: Allowing External AWS Accounts to Access a CMK.

Network requirements

Networking requirements for Cloud Manager

Set up your networking so that Cloud Manager can deploy Cloud Volumes ONTAP systems in AWS, Microsoft Azure, or Google Cloud Platform. The most important step is ensuring outbound internet access to various endpoints.

> If your network uses a proxy server for all communication to the internet, Cloud Manager prompts you to specify the proxy during setup. You can also specify the proxy server from the Settings page. Refer to Configuring Cloud Manager to use a proxy server.

Connection to target networks

Cloud Manager requires a network connection to the VPCs and VNets in which you want to deploy Cloud Volumes ONTAP.

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

Outbound internet access

Cloud Manager requires outbound internet access to deploy and manage Cloud Volumes ONTAP. Outbound internet access is also required when accessing Cloud Manager from your web browser and when running the Cloud Manager installer on a Linux host.

The following sections identify the specific endpoints.

Endpoints to manage Cloud Volumes ONTAP in AWS

Cloud Manager requires outbound internet access to contact the following endpoints when deploying and managing Cloud Volumes ONTAP in AWS:

Endpoints	Purpose
AWS services (amazonaws.com): • CloudFormation • Elastic Compute Cloud (EC2) • Key Management Service (KMS) • Security Token Service (STS) • Simple Storage Service (S3) The exact endpoint depends on the region in which you deploy Cloud Volumes ONTAP. Refer to AWS documentation for details.	Enables Cloud Manager to deploy and manage Cloud Volumes ONTAP in AWS.
https://api.services.cloud.netapp.com:443	API requests to NetApp Cloud Central.
https://cloud.support.netapp.com.s3.us-west-1.amazonaws.com	Provides access to software images, manifests, and templates.

Endpoints	Purpose
https://cognito-idp.us-east-1.amazonaws.com https://cognito-identity.us-east-1.amazonaws.com	Enables Cloud Manager to access and download manifests, templates, and Cloud Volumes ONTAP upgrade images.
https://kinesis.us-east-1.amazonaws.com	Enables NetApp to stream data from audit records.
https://cloudmanager.cloud.netapp.com	Communication with the Cloud Manager service, which includes Cloud Central accounts.
https://netapp-cloud-account.auth0.com	Communication with NetApp Cloud Central for centralized user authentication.
https://w86yt021u5.execute-api.us-east-1.amazonaws.com/production/whitelist	Used to add your AWS account ID to the list of allowed users for Backup to S3.
https://support.netapp.com/aods/asupmessage https://support.netapp.com/asupprod/post/1.0/postAsup	Communication with NetApp AutoSupport.
https://support.netapp.com/svcgw https://support.netapp.com/ServiceGW/entitlement	Communication with NetApp for system licensing and support registration.
https://ipa-signer.cloudmanager.netapp.com	Enables Cloud Manager to generate licenses (for example, a FlexCache license for Cloud Volumes ONTAP)
https://packages.cloud.google.com/yum https://github.com/NetApp/trident/releases/download/	Required to connect Cloud Volumes ONTAP systems with a Kubernetes cluster. The endpoints enable installation of NetApp Trident.
Various third-party locations, for example: • https://repo1.maven.org/maven2 • https://oss.sonatype.org/content/repositories • https://repo.typesafe.org Third-party locations are subject to change.	During upgrades, Cloud Manager downloads the latest packages for third-party dependencies.

Endpoints to manage Cloud Volumes ONTAP in Azure

Cloud Manager requires outbound internet access to contact the following endpoints when deploying and managing Cloud Volumes ONTAP in Microsoft Azure:

Endpoints	Purpose
https://management.azure.com https://login.microsoftonline.com	Enables Cloud Manager to deploy and manage Cloud Volumes ONTAP in most Azure regions.
https://management.microsoftazure.de https://login.microsoftonline.de	Enables Cloud Manager to deploy and manage Cloud Volumes ONTAP in the Azure Germany regions.

Endpoints	Purpose
https://management.usgovcloudapi.net https://login.microsoftonline.com	Enables Cloud Manager to deploy and manage Cloud Volumes ONTAP in the Azure US Gov regions.
https://api.services.cloud.netapp.com:443	API requests to NetApp Cloud Central.
https://cloud.support.netapp.com.s3.us-west-1.amazonaws.com	Provides access to software images, manifests, and templates.
https://cognito-idp.us-east-1.amazonaws.com https://cognito-identity.us-east-1.amazonaws.com https://sts.amazonaws.com	Enables Cloud Manager to access and download manifests, templates, and Cloud Volumes ONTAP upgrade images.
https://kinesis.us-east-1.amazonaws.com	Enables NetApp to stream data from audit records.
https://cloudmanager.cloud.netapp.com	Communication with the Cloud Manager service, which includes Cloud Central accounts.
https://netapp-cloud-account.auth0.com	Communication with NetApp Cloud Central for centralized user authentication.
https://mysupport.netapp.com	Communication with NetApp AutoSupport.
https://support.netapp.com/svcgw https://support.netapp.com/ServiceGW/entitlement	Communication with NetApp for system licensing and support registration.
https://ipa-signer.cloudmanager.netapp.com	Enables Cloud Manager to generate licenses (for example, a FlexCache license for Cloud Volumes ONTAP)
https://packages.cloud.google.com/yum https://github.com/NetApp/trident/releases/download/	Required to connect Cloud Volumes ONTAP systems with a Kubernetes cluster. The endpoints enable installation of NetApp Trident.
Various third-party locations, for example: • https://repo1.maven.org/maven2 • https://oss.sonatype.org/content/repositories • https://repo.typesafe.org Third-party locations are subject to change.	During upgrades, Cloud Manager downloads the latest packages for third-party dependencies.

Endpoints to manage Cloud Volumes ONTAP in GCP

Cloud Manager requires outbound internet access to contact the following endpoints when deploying and managing Cloud Volumes ONTAP in GCP:

Endpoints	Purpose
https://www.googleapis.com	Enables Cloud Manager to contact Google APIs for deploying and managing Cloud Volumes ONTAP in GCP.
https://api.services.cloud.netapp.com:443	API requests to NetApp Cloud Central.

Endpoints	Purpose
https://cloud.support.netapp.com.s3.us-west-1.amazonaws.com	Provides access to software images, manifests, and templates.
https://cognito-idp.us-east-1.amazonaws.com https://cognito-identity.us-east-1.amazonaws.com https://sts.amazonaws.com	Enables Cloud Manager to access and download manifests, templates, and Cloud Volumes ONTAP upgrade images.
https://kinesis.us-east-1.amazonaws.com	Enables NetApp to stream data from audit records.
https://cloudmanager.cloud.netapp.com	Communication with the Cloud Manager service, which includes Cloud Central accounts.
https://netapp-cloud-account.auth0.com	Communication with NetApp Cloud Central for centralized user authentication.
https://mysupport.netapp.com	Communication with NetApp AutoSupport.
https://support.netapp.com/svcgw https://support.netapp.com/ServiceGW/entitlement	Communication with NetApp for system licensing and support registration.
https://ipa-signer.cloudmanager.netapp.com	Enables Cloud Manager to generate licenses (for example, a FlexCache license for Cloud Volumes ONTAP)
https://packages.cloud.google.com/yum https://github.com/NetApp/trident/releases/download/	Required to connect Cloud Volumes ONTAP systems with a Kubernetes cluster. The endpoints enable installation of NetApp Trident.
Various third-party locations, for example: • https://repo1.maven.org/maven2 • https://oss.sonatype.org/content/repositories • https://repo.typesafe.org Third-party locations are subject to change.	During upgrades, Cloud Manager downloads the latest packages for third-party dependencies.

Endpoints accessed from your web browser

Users must access Cloud Manager from a web browser. The machine running the web browser must have connections to the following endpoints:

Endpoints	Purpose
The Cloud Manager host	You must enter the host's IP address from a web browser to load the Cloud Manager console. Depending on your connectivity to your cloud provider, you can use the private IP or a public IP assigned to the host: • A private IP works if you have a VPN and direct connect access to your virtual network • A public IP works in any networking scenario In any case, you should secure network access by ensuring that security group rules allow access from only authorized IPs or subnets.
https://auth0.com https://cdn.auth0.com https://netapp-cloud-account.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 to install Cloud Manager on a Linux host

The Cloud Manager installer must access the following URLs during the installation process:

- http://dev.mysql.com/get/mysql-community-release-el7-5.noarch.rpm
- https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm
- https://s3.amazonaws.com/aws-cli/awscli-bundle.zip

Ports and security groups

- If you deploy Cloud Manager from Cloud Central or from the marketplace images, refer to the following:
  - Security group rules for Cloud Manager in AWS
  - Security group rules for Cloud Manager in Azure
  - Firewall rules for Cloud Manager in GCP
- If you install Cloud Manager on an existing Linux host, see Cloud Manager host requirements.

Networking requirements for Cloud Volumes ONTAP in AWS

Set up your AWS networking so Cloud Volumes ONTAP systems can operate properly.

General AWS networking requirements for Cloud Volumes ONTAP

The following requirements must be met in AWS.

Outbound internet access for Cloud Volumes ONTAP nodes

Cloud Volumes ONTAP nodes require outbound internet access to send messages to NetApp AutoSupport, which proactively monitors the health of your storage.

Routing and firewall policies must allow AWS HTTP/HTTPS traffic to the following endpoints so Cloud Volumes ONTAP can send AutoSupport messages:

- https://support.netapp.com/aods/asupmessage
- https://support.netapp.com/asupprod/post/1.0/postAsup

  If you have a NAT instance, you must define an inbound security group rule that allows HTTPS traffic from the private subnet to the internet.

Outbound internet access for the HA mediator

The HA mediator instance must have an outbound connection to the AWS EC2 service so it can assist with storage failover. To provide the connection, you can add a public IP address, specify a proxy server, or use a manual option.

The manual option can be a NAT gateway or an interface VPC endpoint from the target subnet to the AWS EC2 service. For details about VPC endpoints, refer to AWS Documentation: Interface VPC Endpoints (AWS PrivateLink).

Number of IP addresses

Cloud Manager allocates the following number of IP addresses to Cloud Volumes ONTAP in AWS:

- Single node: 6 IP addresses
- HA pairs in single AZs: 15 addresses
- HA pairs in multiple AZs: 15 or 16 IP addresses

  Note that Cloud Manager creates an SVM management LIF on single node systems, but not on HA pairs in a single AZ. You can choose whether to create an SVM management LIF on HA pairs in multiple AZs.

> A LIF is an IP address associated with a physical port. An SVM management LIF is required for management tools like SnapCenter.

Security groups

You do not need to create security groups because Cloud Manager does that for you. If you need to use your own, refer to Security group rules.

Connection from Cloud Volumes ONTAP to AWS S3 for data tiering

If you want to use EBS as a performance tier and AWS S3 as a capacity tier, you must ensure that Cloud Volumes ONTAP has a connection to S3. The best way to provide that connection is by creating a VPC Endpoint to the S3 service. For instructions, see AWS Documentation: Creating a Gateway Endpoint.

When you create the VPC Endpoint, be sure to select the region, VPC, and route table that corresponds to the Cloud Volumes ONTAP instance. You must also modify the security group to add an outbound HTTPS rule that enables traffic to the S3 endpoint. Otherwise, Cloud Volumes ONTAP cannot connect to the S3 service.

If you experience any issues, see AWS Support Knowledge Center: Why can't I connect to an S3 bucket using a gateway VPC endpoint?

Connections to ONTAP systems in other networks

To replicate data between a Cloud Volumes ONTAP system in AWS and ONTAP systems in other networks, you must have a VPN connection between the AWS VPC and the other network—for example, an Azure VNet or your corporate network. For instructions, see AWS Documentation: Setting Up an AWS VPN Connection.

DNS and Active Directory for CIFS

If you want to provision CIFS storage, you must set up DNS and Active Directory in AWS or extend your on-premises setup to AWS.

The DNS server must provide name resolution services for the Active Directory environment. You can configure DHCP option sets to use the default EC2 DNS server, which must not be the DNS server used by the Active Directory environment.

For instructions, refer to AWS Documentation: Active Directory Domain Services on the AWS Cloud: Quick Start Reference Deployment.

AWS networking requirements for Cloud Volumes ONTAP HA in multiple AZs

Additional AWS networking requirements apply to Cloud Volumes ONTAP HA configurations that use multiple Availability Zones (AZs). You should review these requirements before you launch an HA pair because you must enter the networking details in Cloud Manager.

To understand how HA pairs work, see High-availability pairs.

Availability Zones

This HA deployment model uses multiple AZs to ensure high availability of your data. You should use a dedicated AZ for each Cloud Volumes ONTAP instance and the mediator instance, which provides a communication channel between the HA pair.

Floating IP addresses for NAS data and cluster/SVM management

HA configurations in multiple AZs use floating IP addresses that migrate between nodes if failures occur. They are not natively accessible from outside the VPC, unless you set up an AWS transit gateway.

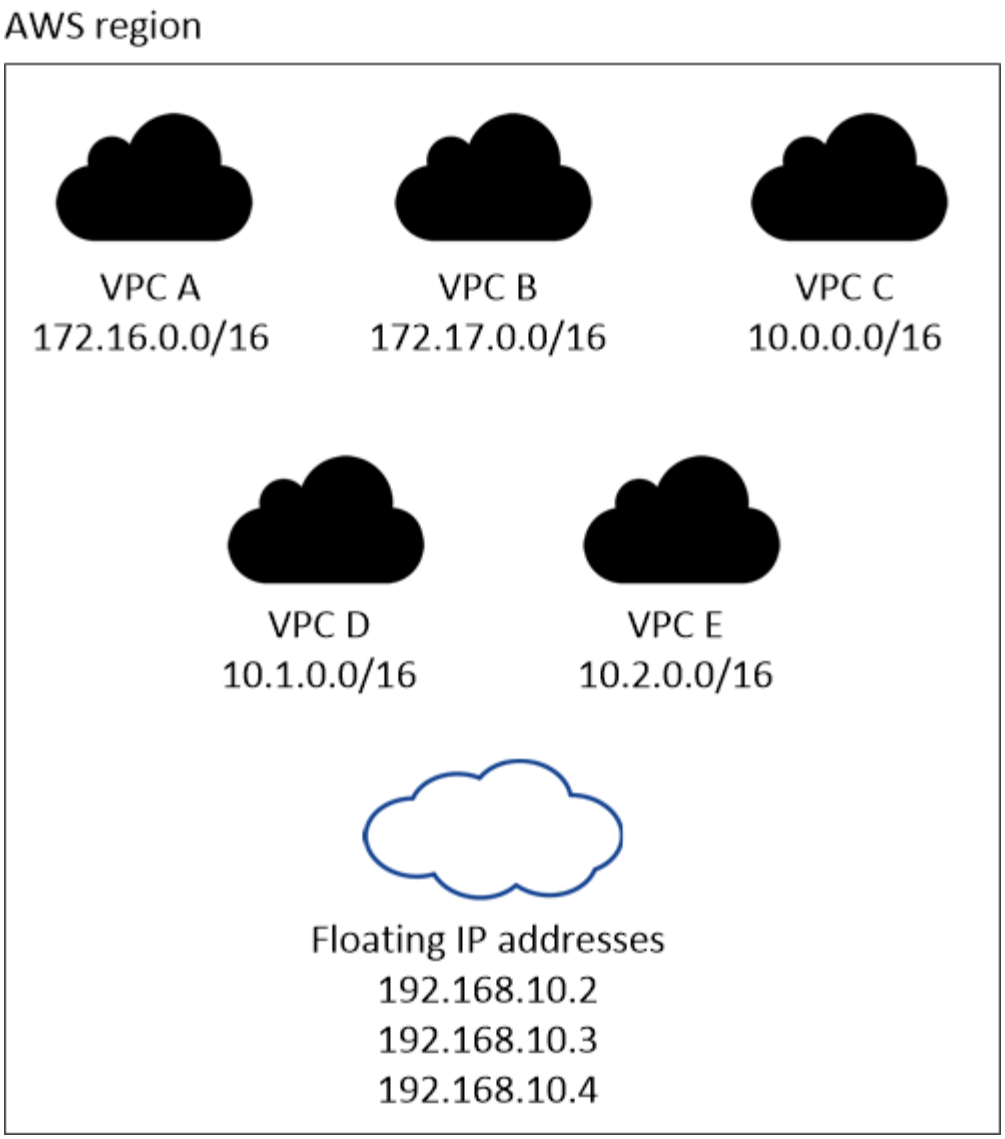
One floating IP address is for cluster management, one is for NFS/CIFS data on node 1, and one is for NFS/CIFS data on node 2. A fourth floating IP address for SVM management is optional.

> A floating IP address is required for the SVM management LIF if you use SnapDrive for Windows or SnapCenter with the HA pair. If you don't specify the IP address when you deploy the system, you can create the LIF later. For details, see Setting up Cloud Volumes ONTAP.

You need to enter the floating IP addresses in Cloud Manager when you create a Cloud Volumes ONTAP HA working environment. Cloud Manager allocates the IP addresses to the HA pair when it launches the system.

The floating IP addresses must be outside of the CIDR blocks for all VPCs in the AWS region in which you deploy the HA configuration. Think of the floating IP addresses as a logical subnet that's outside of the VPCs in your region.

The following example shows the relationship between floating IP addresses and the VPCs in an AWS region. While the floating IP addresses are outside the CIDR blocks for all VPCs, they're routable to subnets through route tables.



Cloud Manager automatically creates static IP addresses for iSCSI access and for NAS access from clients outside the VPC. You don't need to meet any requirements for these types of IP addresses.

Transit gateway to enable floating IP access from outside the VPC

Set up an AWS transit gateway to enable access to an HA pair's floating IP addresses from outside the VPC where the HA pair resides.

Route tables

After you specify the floating IP addresses in Cloud Manager, you need to select the route tables that should include routes to the floating IP addresses. This enables client access to the HA pair.

If you have just one route table for the subnets in your VPC (the main route table), then Cloud Manager automatically adds the floating IP addresses to that route table. If you have more than one route table, it's very important to select the correct route tables when launching the HA pair. Otherwise, some clients might not have access to Cloud Volumes ONTAP.

For example, you might have two subnets that are associated with different route tables. If you select route table A, but not route table B, then clients in the subnet associated with route table A can access the HA

pair, but clients in the subnet associated with route table B can't.

For more information about route tables, refer to AWS Documentation: Route Tables.

Connection to NetApp management tools

To use NetApp management tools with HA configurations that are in multiple AZs, you have two connection options:

1. Deploy the NetApp management tools in a different VPC and set up an AWS transit gateway. The gateway enables access to the floating IP address for the cluster management interface from outside the VPC.
2. Deploy the NetApp management tools in the same VPC with a similar routing configuration as NAS clients.

Example configuration

The following image shows an optimal HA configuration in AWS operating as an active-passive configuration:

Sample VPC configurations

To better understand how you can deploy Cloud Manager and Cloud Volumes ONTAP in AWS, you should review the most common VPC configurations.

- A VPC with public and private subnets and a NAT device
- A VPC with a private subnet and a VPN connection to your network

A VPC with public and private subnets and a NAT device

This VPC configuration includes public and private subnets, an internet gateway that connects the VPC to the internet, and a NAT gateway or NAT instance in the public subnet that enables outbound internet traffic from the private subnet. In this configuration, you can run Cloud Manager in a public subnet or private subnet, but the public subnet is recommended because it allows access from hosts outside the VPC. You can then launch Cloud Volumes ONTAP instances in the private subnet.

> Instead of a NAT device, you can use an HTTP proxy to provide internet connectivity.

For more details about this scenario, refer to AWS Documentation: Scenario 2: VPC with Public and Private Subnets (NAT).

The following graphic shows Cloud Manager running in a public subnet and single node systems running in a private subnet:

A VPC with a private subnet and a VPN connection to your network

This VPC configuration is a hybrid cloud configuration in which Cloud Volumes ONTAP becomes an extension of your private environment. The configuration includes a private subnet and a virtual private gateway with a VPN connection to your network. Routing across the VPN tunnel allows EC2 instances to access the internet through your network and firewalls. You can run Cloud Manager in the private subnet or in your data center. You would then launch Cloud Volumes ONTAP in the private subnet.

> You can also use a proxy server in this configuration to allow internet access. The proxy server can be in your data center or in AWS.

If you want to replicate data between FAS systems in your data center and Cloud Volumes ONTAP systems in AWS, you should use a VPN connection so that the link is secure.

For more details about this scenario, refer to AWS Documentation: Scenario 4: VPC with a Private Subnet Only and AWS Managed VPN Access.

The following graphic shows Cloud Manager running in your data center and single node systems running in a private subnet:

Setting up an AWS transit gateway for HA pairs in multiple AZs

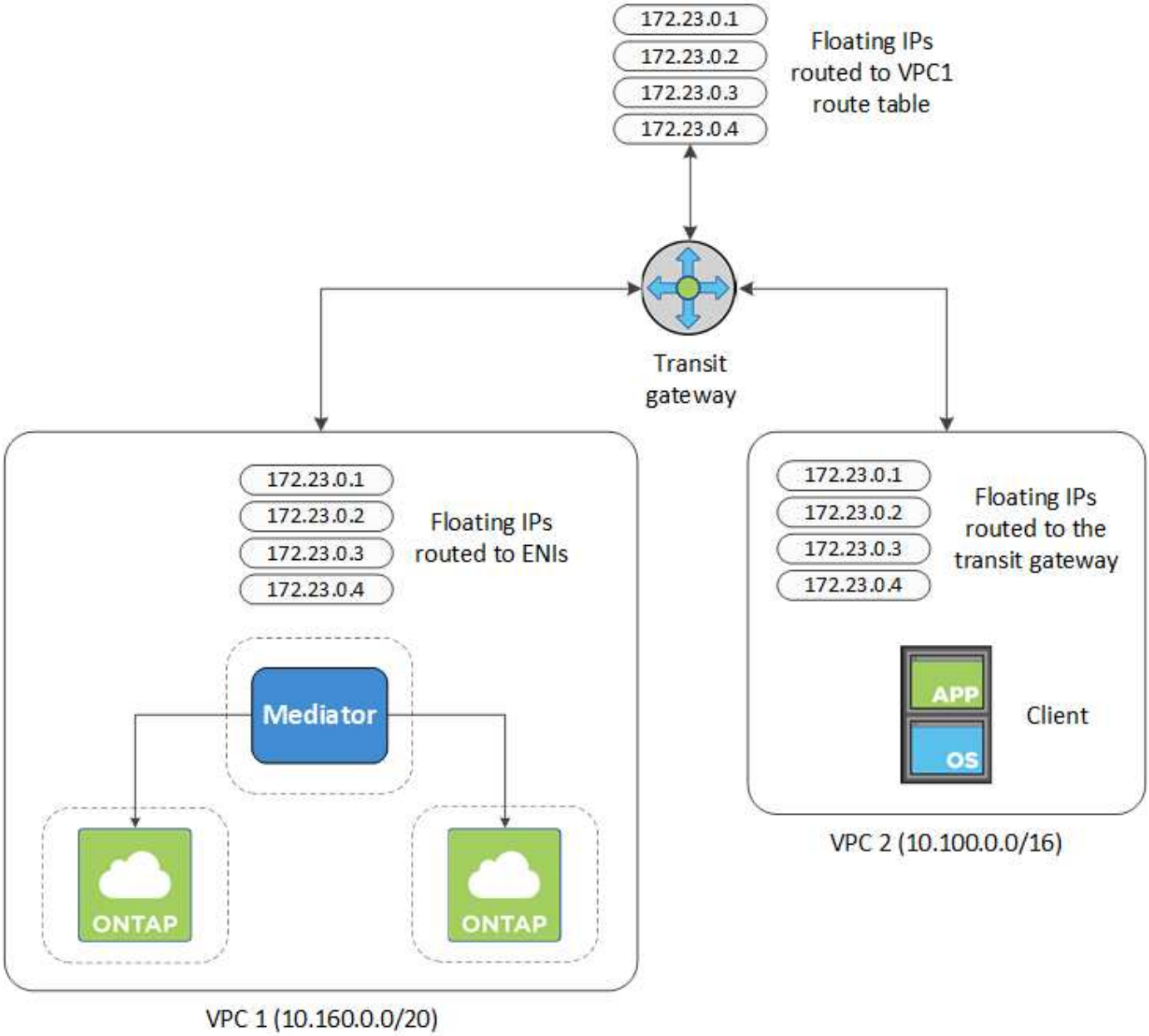
Set up an AWS transit gateway to enable access to an HA pair's floating IP addresses from outside the VPC where the HA pair resides.

When a Cloud Volumes ONTAP HA configuration is spread across multiple AWS Availability Zones, floating IP addresses are required for NAS data access from within the VPC. These floating IP addresses can migrate between nodes when failures occur, but they are not natively accessible from outside the VPC. Separate private IP addresses provide data access from outside the VPC, but they don't provide automatic failover.

Floating IP addresses are also required for the cluster management interface and the optional SVM management LIF.

If you set up an AWS transit gateway, you enable access to the floating IP addresses from outside the VPC where the HA pair resides. That means NAS clients and NetApp management tools outside the VPC can access the floating IPs.

Here's an example that shows two VPCs connected by a transit gateway. An HA system resides in one VPC, while a client resides in the other. You could then mount a NAS volume on the client using the floating IP address.

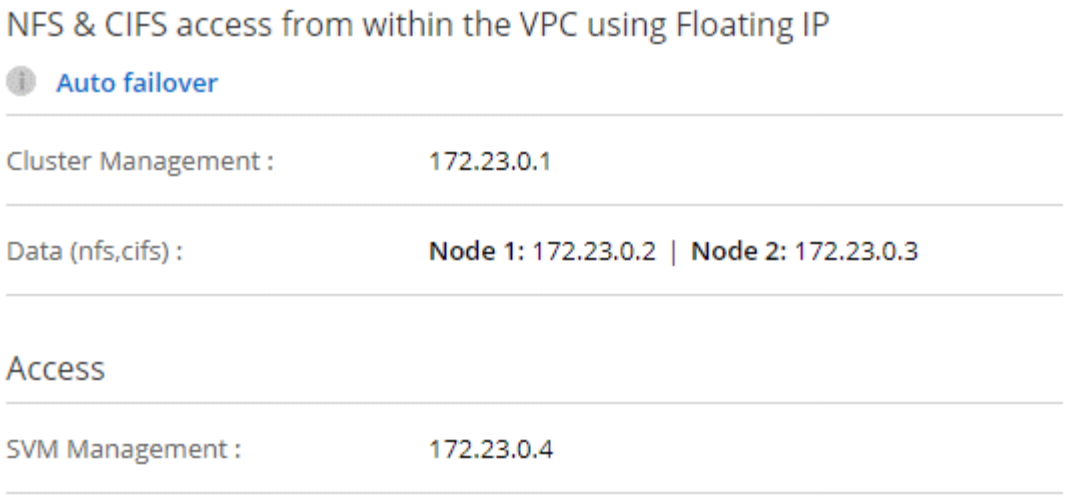


The following steps illustrate how to set up a similar configuration.

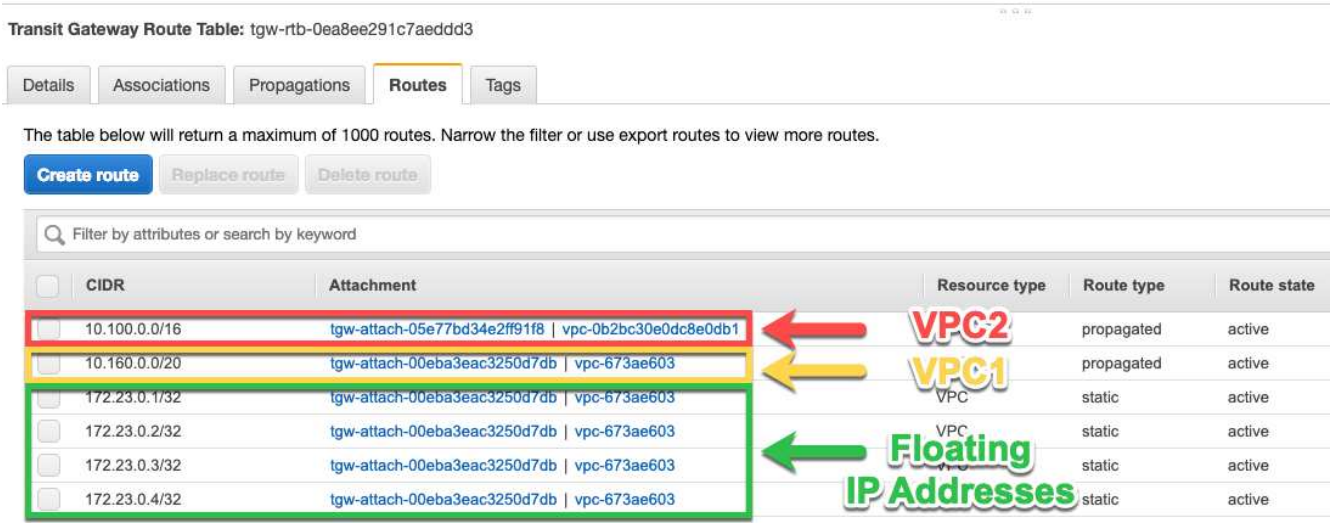
Steps

1. Create a transit gateway and attach the VPCs to the gateway.
2. Create routes in the transit gateway's route table by specifying the HA pair's floating IP addresses.

   You can find the floating IP addresses on the Working Environment Information page in Cloud Manager. Here's an example:

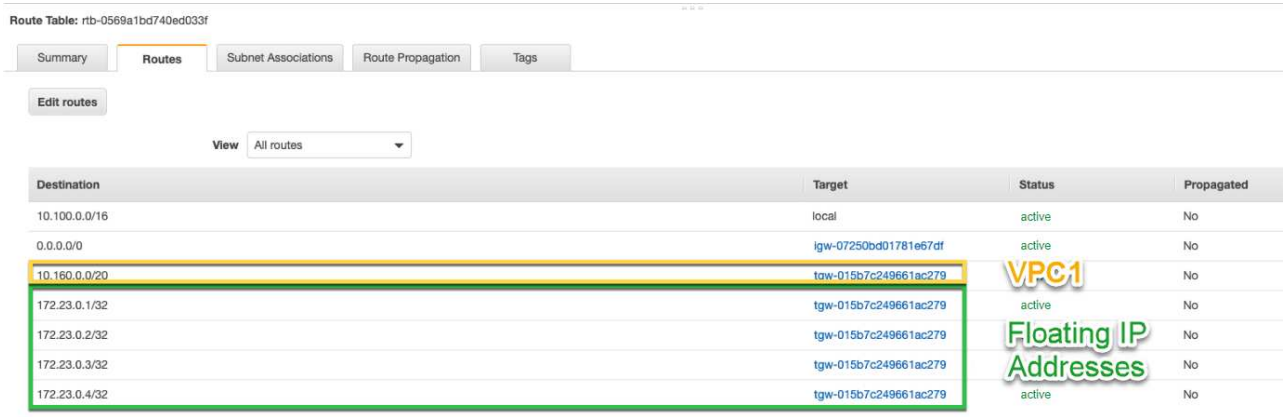


The following sample image shows the route table for the transit gateway. It includes routes to the CIDR blocks of the two VPCs and four floating IP addresses used by Cloud Volumes ONTAP.



3. Modify the route table of VPCs that need to access the floating IP addresses.
   a. Add route entries to the floating IP addresses.
   b. Add a route entry to the CIDR block of the VPC where the HA pair resides.

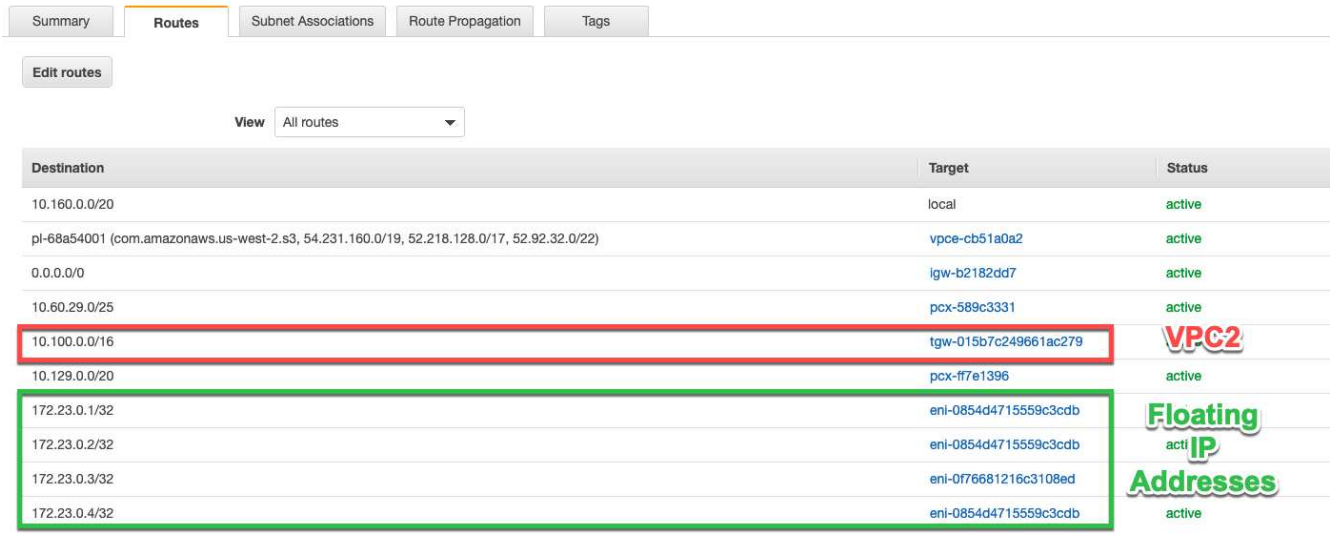
      The following sample image shows the route table for VPC 2, which includes routes to VPC 1 and the floating IP addresses.



4. Modify the route table for the HA pair's VPC by adding a route to the VPC that needs access to the floating IP addresses.

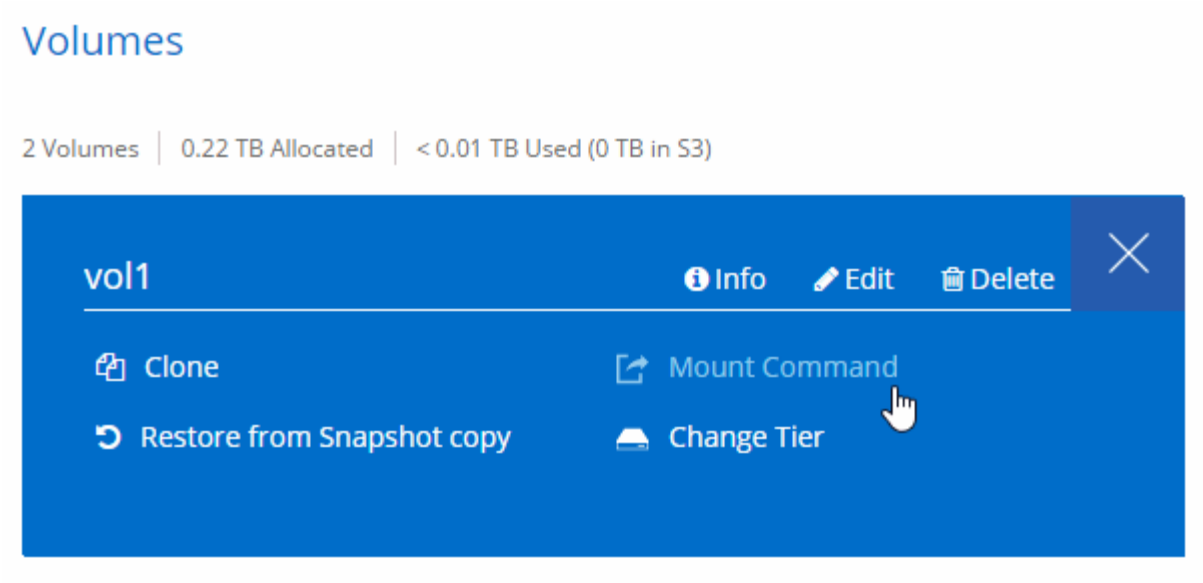
   This step is important because it completes the routing between the VPCs.

   The following sample image shows the route table for VPC 1. It includes a route to the floating IP addresses and to VPC 2, which is where a client resides. Cloud Manager automatically added the floating IPs to the route table when it deployed the HA pair.



5. Mount volumes to clients using the floating IP address.

   You can find the correct IP address in Cloud Manager by selecting a volume and clicking **Mount Command**.



Related links

- High-availability pairs in AWS
- Networking requirements for Cloud Volumes ONTAP in AWS

Networking requirements for Cloud Volumes ONTAP in Azure

Set up your Azure networking so Cloud Volumes ONTAP systems can operate properly.

Outbound internet access for Cloud Volumes ONTAP

Cloud Volumes ONTAP requires outbound internet access to send messages to NetApp AutoSupport, which proactively monitors the health of your storage.

Routing and firewall policies must allow HTTP/HTTPS traffic to the following endpoints so Cloud Volumes ONTAP can send AutoSupport messages:

- https://support.netapp.com/aods/asupmessage
- https://support.netapp.com/asupprod/post/1.0/postAsup

Security groups

You do not need to create security groups because Cloud Manager does that for you. If you need to use your own, refer to Security group rules.

Number of IP addresses

Cloud Manager allocates the following number of IP addresses to Cloud Volumes ONTAP in Azure:

- Single node: 5 IP addresses
- HA pair: 16 IP addresses

  Note that Cloud Manager creates an SVM management LIF on HA pairs, but not on single node systems in Azure.

A LIF is an IP address associated with a physical port. An SVM management LIF is required for management tools like SnapCenter.

Connection from Cloud Volumes ONTAP to Azure Blob storage for data tiering

If you want to tier cold data to Azure Blob storage, you don't need to set up a connection between the performance tier and the capacity tier as long as Cloud Manager has the required permissions. Cloud Manager enables a VNet service endpoint for you if the Cloud Manager policy has these permissions:

```
"Microsoft.Network/virtualNetworks/subnets/write",
"Microsoft.Network/routeTables/join/action",
```

These permissions are included in the latest Cloud Manager policy.

For details about setting up data tiering, see Tiering cold data to low-cost object storage.

Connections to ONTAP systems in other networks

To replicate data between a Cloud Volumes ONTAP system in Azure and ONTAP systems in other networks, you must have a VPN connection between the Azure VNet and the other network—for example, an AWS VPC or your corporate network.

For instructions, refer to Microsoft Azure Documentation: Create a Site-to-Site connection in the Azure portal.

Networking requirements for Cloud Volumes ONTAP in GCP

Set up your Google Cloud Platform networking so Cloud Volumes ONTAP systems can operate properly.

Shared VPC

Cloud Manager and Cloud Volumes ONTAP are supported in a Google Cloud Platform shared VPC.

A shared VPC enables you to configure and centrally manage virtual networks across multiple projects. You can set up shared VPC networks in the *host project* and deploy the Cloud Manager and Cloud Volumes ONTAP virtual machine instances in a *service project*. Google Cloud documentation: Shared VPC overview.

The only requirement is to provide the following permissions to the Cloud Manager service account in the shared VPC host project:

compute.firewalls.*
compute.networks.*
compute.subnetworks.*

Cloud Manager needs these permissions to query the firewalls, VPC, and subnets in the host project.

Outbound internet access for Cloud Volumes ONTAP

Cloud Volumes ONTAP requires outbound internet access to send messages to NetApp AutoSupport, which proactively monitors the health of your storage.

Routing and firewall policies must allow HTTP/HTTPS traffic to the following endpoints so Cloud Volumes ONTAP can send AutoSupport messages:

- https://support.netapp.com/aods/asupmessage
- https://support.netapp.com/asupprod/post/1.0/postAsup

Number of IP addresses

Cloud Manager allocates 5 IP addresses to Cloud Volumes ONTAP in GCP.

Note that Cloud Manager doesn't create an SVM management LIF for Cloud Volumes ONTAP in GCP.

> A LIF is an IP address associated with a physical port. An SVM management LIF is required for management tools like SnapCenter.

Firewall rules

You don't need to create firewall rules because Cloud Manager does that for you. If you need to use your own, refer to GCP firewall rules.

Connection from Cloud Volumes ONTAP to Google Cloud Storage for data tiering

If you want to tier cold data to a Google Cloud Storage bucket, the subnet in which Cloud Volumes ONTAP resides must be configured for Private Google Access. For instructions, refer to Google Cloud documentation: Configuring Private Google Access.

For additional steps required to set up data tiering in Cloud Manager, see Tiering cold data to low-cost object storage.

Connections to ONTAP systems in other networks

To replicate data between a Cloud Volumes ONTAP system in GCP and ONTAP systems in other networks, you must have a VPN connection between the VPC and the other network—for example, your corporate network.

For instructions, refer to Google Cloud documentation: Cloud VPN overview.

Additional deployment options

Cloud Manager host requirements

If you install Cloud Manager on your own host, then you must verify support for your configuration, which includes operating system requirements, port requirements, and so on.

> You can install Cloud Manager on your own host in GCP, but not in your on-premises network. Cloud Manager must be installed in GCP in order to deploy Cloud Volumes ONTAP in GCP.

A dedicated host is required

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

Supported AWS EC2 instance types

- t2.medium
- t3.medium (recommended)
- m4.large

- m5.xlarge
- m5.2xlarge
- m5.4xlarge
- m5.8xlarge

Supported Azure VM sizes

A2, D2 v2, or D2 v3 (based on availability)

Supported GCP machine types

A machine type with at least 2 vCPUs and 4 GB of memory.

Supported operating systems

- CentOS 7.2
- CentOS 7.3
- CentOS 7.4
- CentOS 7.5
- Red Hat Enterprise Linux 7.2
- Red Hat Enterprise Linux 7.3
- Red Hat Enterprise Linux 7.4
- Red Hat Enterprise Linux 7.5

  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 Cloud Manager installation.

  Cloud Manager 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?

CPU

2.27 GHz or higher with two cores

RAM

4 GB

Free disk space

50 GB

Outbound internet access

Outbound internet access is required when installing Cloud Manager and when using Cloud Manager to deploy Cloud Volumes ONTAP. For a list of endpoints, see Networking requirements for Cloud Manager.

Ports

The following ports must be available:

- 80 for HTTP access

- 443 for HTTPS access
- 3306 for the Cloud Manager database
- 8080 for the Cloud Manager API proxy

  If other services are using these ports, Cloud Manager installation fails.

  > There is a potential conflict with port 3306. If another instance of MySQL is running on the host, it uses port 3306 by default. You must change the port that the existing MySQL instance uses.

  You can change the default HTTP and HTTPS ports when you install Cloud Manager. You cannot change the default port for the MySQL database. If you change the HTTP and HTTPS ports, you must ensure that users can access the Cloud Manager web console from a remote host:

  - Modify the security group to allow inbound connections through the ports.
  - Specify the port when you enter the URL to the Cloud Manager web console.

Installing Cloud Manager on an existing Linux host

The most common way to deploy Cloud Manager is from Cloud Central or from a cloud provider's marketplace. But you have the option to download and install the Cloud Manager software on an existing Linux host in your network or in the cloud.

> You can install Cloud Manager on your own host in GCP, but not in your on-premises network. Cloud Manager must be installed in GCP in order to deploy Cloud Volumes ONTAP in GCP.

Before you begin

- A 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 Cloud Manager installation.
- The Cloud Manager installer accesses several URLs during the installation process. You must ensure that outbound internet access is allowed to those endpoints. Refer to Networking requirements for Cloud Manager.

About this task

- Root privileges are not required to install Cloud Manager.
- Cloud Manager 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. Cloud Manager can operate successfully without the tools.

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

Steps

1. Review networking requirements:
   - Networking requirements for Cloud Manager
   - Networking requirements for Cloud Volumes ONTAP in AWS

- Networking requirements for Cloud Volumes ONTAP in Azure
- Networking requirements for Cloud Volumes ONTAP in GCP

2. Review Cloud Manager host requirements.
3. Download the 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.

4. Assign permissions to execute the script.

   Example

   ```
   chmod +x OnCommandCloudManager-V3.7.0.sh
   ```

5. Run the installation script:

   ```
   ./OnCommandCloudManager-V3.7.0.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 Cloud Manager 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.

6. Unless you specified the silent parameter, type **Y** to continue the script, and then enter the HTTP and HTTPS ports when prompted.

   If you change the HTTP and HTTPS ports, you must ensure that users can access the Cloud Manager web console from a remote host:

   - Modify the security group to allow inbound connections through the ports.
   - Specify the port when you enter the URL to the Cloud Manager web console.

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

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

   https://*ipaddress*:*port*

   ipaddress can be localhost, a private IP address, or a public IP address, depending on the configuration of the Cloud Manager host. For example, if Cloud Manager 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 Cloud Manager host.

   port is required if you changed the default HTTP (80) or HTTPS (443) ports. For example, if the HTTPS

port was changed to 8443, you would enter https://*ipaddress*:8443

8. Sign up at NetApp Cloud Central or log in.
9. After you log in, set up Cloud Manager:
   a. Specify the Cloud Central account to associate with this Cloud Manager system.

      Learn about Cloud Central accounts.

   b. Enter a name for the system.

After you finish

Set up permissions so Cloud Manager can deploy Cloud Volumes ONTAP in your cloud provider:

- 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.
- GCP: Set up a service account that has the permissions that Cloud Manager needs to create and manage Cloud Volumes ONTAP systems in projects.
  1. Create a role in GCP that includes the permissions defined in the Cloud Manager policy for GCP.
  2. Create a GCP service account and apply the custom role that you just created.
  3. Associate this service account with the Cloud Manager VM.
  4. 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.

Launching Cloud Manager from the AWS Marketplace

It's best to launch Cloud Manager in AWS using NetApp Cloud Central, but you can launch it from the AWS Marketplace, if needed.

> If you launch Cloud Manager from the AWS Marketplace, Cloud Manager is still integrated with NetApp Cloud Central. Learn more about the integration.

About this task

The following 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 is not possible using the **Launch from Website** action.

Steps

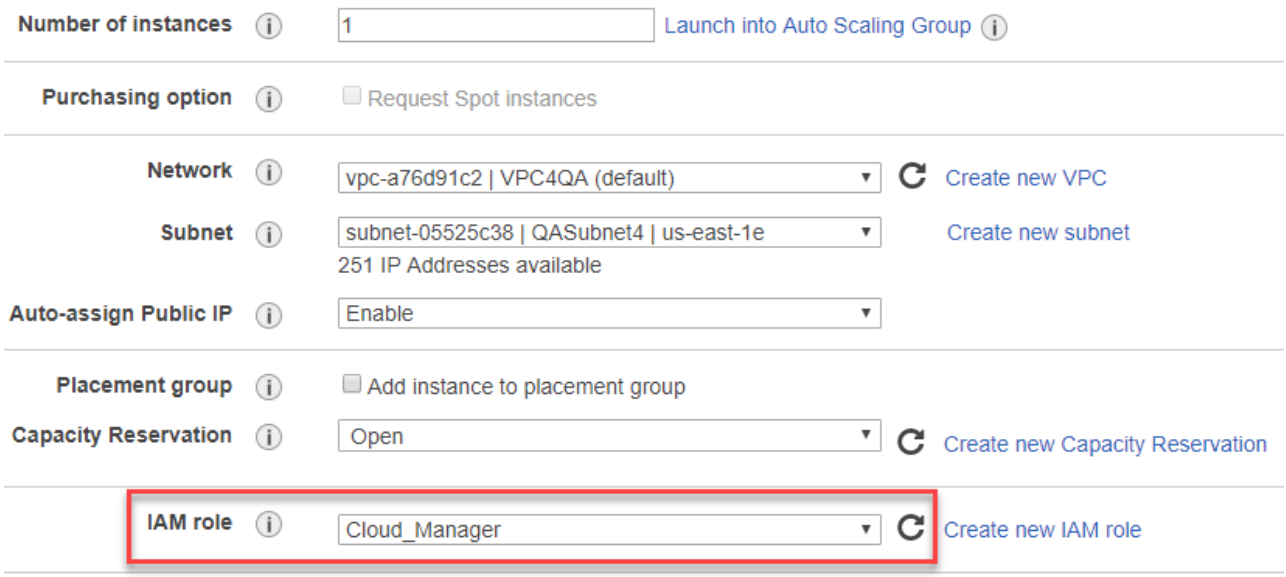
1. Create an IAM policy and role for the EC2 instance:
   a. Download the Cloud Manager IAM policy from the following location:

      NetApp Cloud Manager: AWS, Azure, and GCP Policies

   b. From the IAM console, create your own policy by copying and pasting the text from the Cloud Manager IAM policy.
   c. 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. Subscribe from the AWS Marketplace to ensure that there's no disruption of service after your free trial of Cloud Volumes ONTAP ends. You'll be charged from this subscription for every Cloud Volumes ONTAP 9.6 and later PAYGO system that you create and each add-on feature that you enable.
3. Now go to the Cloud Manager page on the AWS Marketplace to deploy Cloud Manager from an AMI.
4. On the Marketplace page, click **Continue to Subscribe** and then click **Continue to Configuration**.
5. Change any of the default options and click **Continue to Launch**.
6. Under **Choose Action**, select **Launch through EC2** and then click **Launch**.
7. Follow the prompts to configure and deploy the instance:
   - **Choose Instance Type**: Depending on region availability, choose one of the supported instance types (t3.medium is recommended).

     Review the list of supported instance types.

   - **Configure Instance**: Select a VPC and subnet, the IAM role that you created in step 1, and 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 Cloud Manager instance: SSH, HTTP, and HTTPS.
- **Review**: Review your selections and click **Launch**.

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

8. Open a web browser from a host that has a connection to the Cloud Manager virtual machine and enter the following URL:

   http://*ipaddress*:80

9. After you log in, set up Cloud Manager:
   a. Specify the Cloud Central account to associate with this Cloud Manager system.

      Learn about Cloud Central accounts.

   b. Enter a name for the system.

Result

Cloud Manager is now installed and set up.

Deploying Cloud Manager from the Azure Marketplace

It is best to deploy Cloud Manager in Azure using NetApp Cloud Central, but you can deploy it from the Azure Marketplace, if needed.

Separate instructions are available to deploy Cloud Manager in Azure US Government regions and in Azure Germany regions.

> If you deploy Cloud Manager from the Azure Marketplace, Cloud Manager is still integrated with NetApp Cloud Central. Learn more about the integration.

Deploying Cloud Manager in Azure

You need to install and set up Cloud Manager so you can use it to launch Cloud Volumes ONTAP in Azure.

Steps

1. Go to the Azure Marketplace page for Cloud Manager.
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 one of the recommended virtual machine sizes: A2, D2 v2, or D2 v3 (based on availability).
- For the network security group, Cloud Manager requires inbound connections using SSH, HTTP, and HTTPS.

  Learn more about security group rules for Cloud Manager.

- Under **Management**, enable **System assigned managed identity** for Cloud Manager by selecting **On**.

  This setting is important because a managed identity allows the Cloud Manager 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 Cloud Manager software should be running in approximately five minutes.

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

   http://*ipaddress*:80

6. After you log in, set up Cloud Manager:
   a. Specify the Cloud Central account to associate with this Cloud Manager system.

      Learn about Cloud Central accounts.

   b. Enter a name for the system.

Result

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

Granting Azure permissions to Cloud Manager

When you deployed Cloud Manager 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 Cloud Manager virtual machine for one or more subscriptions.

Steps

1. Create a custom role using the Cloud Manager policy:
   a. Download the Cloud Manager Azure policy.
   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 example shows how to create a custom role using the Azure CLI 2.0:

az role definition create --role-definition C:\Policy_for_cloud_Manager_Azure_3.7.4.json

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

2. Assign the role to the Cloud Manager 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)**.
   c. Click **Add** > **Add role assignment** and then add the permissions:
      - Select the **OnCommand Cloud Manager Operator** role.

      > OnCommand Cloud Manager Operator is the default name provided in the Cloud Manager policy. If you chose a different name for the role, then select that name instead.

      - Assign access to a **Virtual Machine**.
      - Select the subscription in which the Cloud Manager virtual machine was created.
      - Select the Cloud Manager virtual machine.
      - Click **Save**.
   d. If you want to deploy Cloud Volumes ONTAP from additional subscriptions, switch to that subscription and then repeat these steps.

Result

Cloud Manager now has the permissions that it needs to deploy and manage Cloud Volumes ONTAP in Azure.

Deploying Cloud Manager in an Azure US Government region

To get Cloud Manager up and running in a US Government region, first deploy Cloud Manager from the Azure Government Marketplace. Then provide the permissions that Cloud Manager needs to deploy and manage Cloud Volumes ONTAP systems.

For a list of supported Azure US Government regions, see Cloud Volumes Global Regions.

Deploying Cloud Manager from the Azure US Government Marketplace

Cloud Manager is available as an image in the Azure US Government Marketplace.

Steps

1. Ensure that the Azure Government Marketplace is enabled in your subscription:
   a. Log into the portal as an Enterprise Administrator.
   b. Navigate to **Manage**.
   c. Under **Enrollment Details**, click the pencil icon next to **Azure Marketplace**.

d. Select **Enabled**.

e. Click **Save**.

Microsoft Azure Documentation: Azure Government Marketplace

2. Search for OnCommand Cloud Manager in the Azure US Government portal.
3. Click **Create** and follow the steps to configure the virtual machine.

   Note the following as you configure the virtual machine:

   - Cloud Manager can perform optimally with either HDD or SSD disks.
   - You should choose one of the recommended virtual machine sizes: A2, D2 v2, or D2 v3 (based on availability).
   - For the network security group, it is best to choose **Advanced**.

     The **Advanced** option creates a new security group that includes the required inbound rules for Cloud Manager. If you choose Basic, refer to Security group rules for the list of required rules.

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

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

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

   http://*ipaddress*:80

6. After you log in, set up Cloud Manager:

   a. Specify the Cloud Central account to associate with this Cloud Manager system.

      Learn about Cloud Central accounts.

   b. Enter a name for the system.

Result

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

Granting Azure permissions to Cloud Manager using a managed identity

The easiest way to provide permissions is by enabling a managed identity on the Cloud Manager virtual machine and then by assigning the required permissions to the virtual machine. If preferred, an alternative way is to grant Azure permissions using a service principal.

Steps

1. Enable a managed identity on the Cloud Manager virtual machine:
   a. Navigate to the Cloud Manager virtual machine and select **Identity**.
   b. Under **System Assigned**, click **On** and then click **Save**.
2. Create a custom role using the Cloud Manager policy:
   a. Download the Cloud Manager Azure policy.
   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 example shows how to create a custom role using the Azure CLI 2.0:

   az role definition create --role-definition C:\Policy_for_cloud_Manager_Azure_3.7.4.json

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

3. Assign the role to the Cloud Manager 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)**.
   c. Click **Add**, click **Add role assignment**, and then add the permissions:
      - Select the **OnCommand Cloud Manager Operator** role.

        OnCommand Cloud Manager Operator is the default name provided in the Cloud Manager policy. If you chose a different name for the role, then select that name instead.

      - Assign access to a **Virtual Machine**.
      - Select the subscription in which the Cloud Manager virtual machine was created.
      - Type the name of the virtual machine and then select it.
      - Click **Save**.
   d. If you want to deploy Cloud Volumes ONTAP from additional subscriptions, switch to that subscription and then repeat these steps.

Result

Cloud Manager now has the permissions that it needs to deploy and manage Cloud Volumes ONTAP in Azure.

Installing Cloud Manager in an Azure Germany region

The Azure Marketplace is not available in the Azure Germany regions, so you must download the Cloud Manager installer from the NetApp Support Site and install it on an existing Linux host in the region.

Steps

1. Review networking requirements for Azure.
2. Review Cloud Manager host requirements.
3. Download and install Cloud Manager.
4. Grant Azure permissions to Cloud Manager using a service principal.

After you finish

Cloud Manager is now ready to deploy Cloud Volumes ONTAP in the Azure Germany region, just like any other region. However, you might want to perform additional setup first.

Keeping Cloud Manager up and running

Cloud Manager should remain running at all times.

Cloud Manager is a key component in the health and billing of Cloud Volumes ONTAP. If Cloud Manager is powered down, Cloud Volumes ONTAP systems will shut down after losing communication with Cloud Manager for longer than 4 days.