



Tier on-premises data to the cloud

Cloud Manager

NetApp
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Tier on-premises data to the cloud

Learn about Cloud Tiering

NetApp's Cloud Tiering service extends your data center to the cloud by automatically tiering inactive data from on-premises ONTAP clusters to object storage. This frees valuable space on the cluster for more workloads, without making changes to the application layer. Cloud Tiering can reduce costs in your data center and enables you to switch from a CAPEX model to an OPEX model.

The Cloud Tiering service leverages the capabilities of *FabricPool*. FabricPool is a NetApp Data Fabric technology that enables automated tiering of data to low-cost object storage. Active (hot) data remains on the local tier (on-premises ONTAP aggregates), while inactive (cold) data is moved to the cloud tier — all while preserving ONTAP data efficiencies.

Note: Starting with ONTAP 9.8 you can tier data from aggregates consisting of HDDs in addition to high-performance SSDs. Prior to that release you can tier data only from AFF systems or FAS systems with all-SSD aggregates. See [Requirements for using FabricPool](#) for details.

Features

Cloud Tiering offers automation, monitoring, reports, and a common management interface:

- Automation makes it easier to set up and manage data tiering from on-prem ONTAP clusters to the cloud
- You can choose the default cloud provider storage class/access tier, or use lifecycle management to move older tiered data to a more cost-effective tier
- A single pane of glass removes the need to independently manage FabricPool across several clusters
- Reports show the amount of active and inactive data on each cluster
- A tiering health status helps you identify and correct issues as they occur
- If you have Cloud Volumes ONTAP systems, you'll find them in the Cluster Dashboard so you get a full view of data tiering in your hybrid cloud infrastructure

For more details about the value that Cloud Tiering provides, [check out the Cloud Tiering page on NetApp Cloud Central](#).



Cloud Volumes ONTAP systems are read-only from Cloud Tiering. [You set up tiering for Cloud Volumes ONTAP from the working environment in Cloud Manager.](#)

Supported object storage providers

You can tier inactive data from an on-premises ONTAP cluster to the following object storage providers:

- Amazon S3
- Microsoft Azure Blob
- Google Cloud Storage
- S3-compatible object storage
- NetApp StorageGRID



You can tier data from NAS volumes to the public cloud or to private clouds, like StorageGRID. When tiering data that is accessed by SAN protocols, NetApp recommends using private clouds due to connectivity considerations.

Object storage tiers

Each ONTAP cluster tiers inactive data to a single object store. When you set up data tiering, you have the choice to add a new bucket/container or to select an existing bucket/container, along with a storage class or access tier.

- [Learn about supported AWS S3 storage classes](#)
- [Learn about supported Azure Blob access tiers](#)
- [Learn about supported Google Cloud storage classes](#)

Cloud Tiering uses the cloud provider default storage class/access tier for your inactive data. However, you can apply a lifecycle rule so that the data automatically transitions from the default storage class to another storage class after a certain number of days. This can help keep your costs down by moving very cold data to less expensive storage.



You can't select lifecycle rules for data tiered to StorageGRID or S3-compatible storage.

Pricing and licenses

Pay for Cloud Tiering through a pay-as-you-go subscription, a bring-your-own Cloud Tiering license, or a combination of both. A 30-day free trial is available for your first cluster if you don't have a license.

There are no charges when tiering data to StorageGRID. Neither a BYOL license or PAYGO registration is required.

[View pricing details.](#)

30-day free trial

If you don't have a Cloud Tiering license, a 30-day free trial of Cloud Tiering starts when you set up tiering to your first cluster. After that 30-day free trial ends, you'll need to pay for Cloud Tiering through a pay-as-you-go subscription, a BYOL license, or a combination of both.

If your free trial ends and you haven't subscribed or added a license, then ONTAP no longer tiers cold data to object storage, but existing data is still available for access.

Pay-as-you-go subscription

Cloud Tiering offers consumption-based licensing in a pay-as-you-go model. After subscribing through your cloud provider's marketplace, you pay per GB for data that's tiered—there's no up-front payment. You are billed by your cloud provider through your monthly bill.

You should subscribe even if you have a free trial or if you bring your own license (BYOL):

- Subscribing ensures that there's no disruption of service after your free trial ends.

When the trial ends, you'll be charged hourly according to the amount of data that you tier.

- If you tier more data than allowed by your BYOL license, then data tiering continues through your pay-as-you-go subscription.

For example, if you have a 10 TB license, all capacity beyond the 10 TB is charged through the pay-as-you-go subscription.

You won't be charged from your pay-as-you-go subscription during your free trial or if you haven't exceeded your Cloud Tiering BYOL license.

[Learn how to set up a pay-as-you-go subscription.](#)

Bring your own license

Bring your own license by purchasing a **Cloud Tiering** license from NetApp. You can purchase 2-, 12-, 24-, or 36-month term licenses and specify any amount of tiering capacity. The BYOL Cloud Tiering license is a *floating* license that you can use across multiple on-premises ONTAP clusters. The total tiering capacity that you define in your Cloud Tiering license can be used by all of your on-prem clusters.

After you purchase a Cloud Tiering license, you'll need use the Digital Wallet page in Cloud Manager to add the license. [See how to use a Cloud Tiering BYOL license.](#)

As noted above, we recommend that you set up a pay-as-you-go subscription, even if you have purchased a BYOL license.



Starting August 21, 2021 the old **FabricPool** license is being replaced by the **Cloud Tiering** license. [Read more about how the Cloud Tiering license is different than the FabricPool license.](#)

How Cloud Tiering works

Cloud Tiering is a NetApp-managed service that uses FabricPool technology to automatically tier inactive (cold) data from your on-premises ONTAP clusters to object storage in your public cloud or private cloud. Connections to ONTAP take place from a Connector.

The following image shows the relationship between each component:



At a high level, Cloud Tiering works like this:

1. You discover your on-prem cluster from Cloud Manager.
2. You set up tiering by providing details about your object storage, including the bucket/container, a storage class or access tier, and lifecycle rules for the tiered data.
3. Cloud Manager configures ONTAP to use the object storage provider and discovers the amount of active and inactive data on the cluster.
4. You choose the volumes to tier and the tiering policy to apply to those volumes.
5. ONTAP starts tiering inactive data to the object store as soon as the data has reached the thresholds to be considered inactive (see [Volume tiering policies](#)).
6. If you have applied a lifecycle rule to the tiered data (only available for some providers), older tiered data is moved to a more cost-effective tier after a certain number of days.

Volume tiering policies

When you select the volumes that you want to tier, you choose a *volume tiering policy* to apply to each volume. A tiering policy determines when or whether the user data blocks of a volume are moved to the cloud.

You can also adjust the **cooling period**. This is the number of days that user data in a volume must remain inactive before it is considered "cold" and moved to object storage. For tiering policies that allow you to adjust the cooling period, the valid values are 2 to 183 days when using ONTAP 9.8 and later, and 2 to 63 days for earlier ONTAP versions; 2 to 63 is the recommended best practice.

No Policy (None)

Keeps the data on a volume in the performance tier, preventing it from being moved to the cloud tier.

Cold snapshots (Snapshot only)

ONTAP tiers cold Snapshot blocks in the volume that are not shared with the active file system to object storage. If read, cold data blocks on the cloud tier become hot and are moved to the performance tier.

Data is tiered only after an aggregate has reached 50% capacity and when the data has reached the cooling period. The default number of cooling days is 2, but you can adjust this number.



Re-heated data is written back to the performance tier only if there is space. If the performance tier capacity is more than 70% full, blocks continue to be accessed from the cloud tier.

Cold user data & snapshots (Auto)

ONTAP tiers all cold blocks in the volume (not including metadata) to object storage. The cold data includes not just Snapshot copies, but also cold user data from the active file system.

If read by random reads, cold data blocks on the cloud tier become hot and are moved to the performance tier. If read by sequential reads, such as those associated with index and antivirus scans, cold data blocks on the cloud tier stay cold and are not written to the performance tier. This policy is available starting with ONTAP 9.4.

Data is tiered only after an aggregate has reached 50% capacity and when the data has reached the cooling period. The default number of cooling days is 31, but you can adjust this number.



Re-heated data is written back to the performance tier only if there is space. If the performance tier capacity is more than 70% full, blocks continue to be accessed from the cloud tier.

All user data (All)

All data (not including metadata) is immediately marked as cold and tiered to object storage as soon as possible. There is no need to wait 48 hours for new blocks in a volume to become cold. Note that blocks located in the volume prior to the All policy being set require 48 hours to become cold.

If read, cold data blocks on the cloud tier stay cold and are not written back to the performance tier. This policy is available starting with ONTAP 9.6.

Take the following into consideration before you choose this tiering policy:

- Tiering data immediately reduces storage efficiencies (inline only).
- You should use this policy only if you are confident that cold data on the volume will not change.
- Object storage is not transactional and will result in significant fragmentation if subjected to change.
- Consider the impact of SnapMirror transfers before assigning the All tiering policy to source volumes in data protection relationships.

Because data is tiered immediately, SnapMirror will read data from the cloud tier rather than the performance tier. This will result in slower SnapMirror operations—possibly slowing other SnapMirror operations later in queue—even if they are using different tiering policies.

- Cloud Backup is similarly affected by volumes set with a tiering policy. [See tiering policy considerations with Cloud Backup.](#)

All DP user data (Backup)

All data on a data protection volume (not including metadata) is immediately moved to the cloud tier. If read, cold data blocks on the cloud tier stay cold and are not written back to the performance tier (starting with ONTAP 9.4).



This policy is available for ONTAP 9.5 or earlier. It was replaced with the **All** tiering policy starting with ONTAP 9.6.

Get started

Tiering data from on-premises ONTAP clusters to Amazon S3

Free space on your on-prem ONTAP clusters by tiering inactive data to Amazon S3.

Quick start

Get started quickly by following these steps, or scroll down to the remaining sections for full details.

1

Prepare to tier data to Amazon S3

You need the following:

- An on-prem ONTAP cluster that's running ONTAP 9.2 or later and has an HTTPS connection to Amazon S3. [Learn how to discover a cluster.](#)
- An AWS account that has an access key and [the required permissions](#) so the ONTAP cluster can tier inactive data in and out of S3.
- A Connector installed in an AWS VPC or on your premises.
- Networking for the Connector that enables an outbound HTTPS connection to the ONTAP cluster, to S3 storage, and to the Cloud Tiering service.

2

Set up tiering

In Cloud Manager, select an on-prem working environment, click **Enable** for the Tiering service, and follow the prompts to tier data to Amazon S3.

3

Set up licensing

After your free trial ends, pay for Cloud Tiering through a pay-as-you-go subscription, an ONTAP Cloud Tiering BYOL license, or a combination of both:

- To subscribe from the AWS Marketplace, [go to the Cloud Manager Marketplace offering](#), click **Subscribe**, and then follow the prompts.
- To pay using a Cloud Tiering BYOL license, [contact us if you need to purchase one](#), and then [add it to your account from the Cloud Manager Digital Wallet](#).

Requirements

Verify support for your ONTAP cluster, set up your networking, and prepare your object storage.

The following image shows each component and the connections that you need to prepare between them:



Communication between a Connector and S3 is for object storage setup only. The Connector can reside on your premises, instead of in the cloud.

Preparing your ONTAP clusters

Your ONTAP clusters must meet the following requirements when tiering data to Amazon S3.

Supported ONTAP platforms

- When using ONTAP 9.8 and later: You can tier data from AFF systems, or FAS systems with all-SSD aggregates or all-HDD aggregates.
- When using ONTAP 9.7 and earlier: You can tier data from AFF systems, or FAS systems with all-SSD aggregates.

Supported ONTAP version

ONTAP 9.2 or later

Cluster networking requirements

- The ONTAP cluster initiates an HTTPS connection over port 443 to Amazon S3.

ONTAP reads and writes data to and from object storage. The object storage never initiates, it just responds.

Although AWS Direct Connect provides better performance and lower data transfer charges, it's not required between the ONTAP cluster and S3. But doing so is the recommended best practice.

- An inbound connection is required from the Connector, which can reside in an AWS VPC or on your premises.

A connection between the cluster and the Cloud Tiering service is not required.

- An intercluster LIF is required on each ONTAP node that hosts the volumes you want to tier. The LIF must be associated with the *IPspace* that ONTAP should use to connect to object storage.

When you set up data tiering, Cloud Tiering prompts you for the IPspace to use. You should choose the IPspace that each LIF is associated with. That might be the "Default" IPspace or a custom IPspace that you created. Learn more about [LIFs](#) and [IPspaces](#).

Supported volumes and aggregates

The total number of volumes that Cloud Tiering can tier might be less than the number of volumes on your ONTAP system. That's because volumes can't be tiered from some aggregates. Refer to ONTAP documentation for [functionality or features not supported by FabricPool](#).



Cloud Tiering supports FlexGroup volumes, starting with ONTAP 9.5. Setup works the same as any other volume.

Discovering an ONTAP cluster

You need to create an on-prem ONTAP working environment in Cloud Manager before you can start tiering cold data.

[Learn how to discover a cluster.](#)

Creating or switching Connectors

A Connector is required to tier data to the cloud. When tiering data to AWS S3, you can use a Connector that's in an AWS VPC or on your premises. You'll either need to create a new Connector or make sure that the currently selected Connector resides in AWS or on-prem.

- [Learn about Connectors](#)
- [Creating a Connector in AWS](#)
- [Installing the Connector on an existing Linux host](#)
- [Switching between Connectors](#)

Preparing networking for the Connector

Ensure that the Connector has the required networking connections. A Connector can be installed on-prem or in AWS.

Steps

1. Ensure that the network where the Connector is installed enables the following connections:
 - An outbound internet connection to the Cloud Tiering service over port 443 (HTTPS)
 - An HTTPS connection over port 443 to S3
 - An HTTPS connection over port 443 to your ONTAP clusters

2. If needed, enable a VPC Endpoint to S3.

A VPC Endpoint to S3 is recommended if you have a Direct Connect or VPN connection from your ONTAP cluster to the VPC and you want communication between the Connector and S3 to stay in your AWS internal network.

Preparing Amazon S3

When you set up data tiering to a new cluster, you're prompted to create an S3 bucket or to select an existing S3 bucket in the AWS account where the Connector is set up. The AWS account must have permissions and an access key that you can enter in Cloud Tiering. The ONTAP cluster uses the access key to tier data in and out of S3.

The S3 bucket must be in a [region that supports Cloud Tiering](#).



If you are planning to configure Cloud Tiering to use a lower cost storage class where your tiered data will transition to after a certain number of days, you must not select any life cycle rules when setting up the bucket in your AWS account. Cloud Tiering manages the life cycle transitions.

Steps

1. Provide the following permissions to the IAM user:

```
"s3:ListAllMyBuckets",  
"s3:ListBucket",  
"s3:GetBucketLocation",  
"s3:GetObject",  
"s3:PutObject",  
"s3:DeleteObject"
```

[AWS Documentation: Creating a Role to Delegate Permissions to an IAM User](#)

2. Create or locate an access key.

Cloud Tiering passes the access key on to the ONTAP cluster. The credentials are not stored in the Cloud Tiering service.

[AWS Documentation: Managing Access Keys for IAM Users](#)

Tiering inactive data from your first cluster to Amazon S3

After you prepare your AWS environment, start tiering inactive data from your first cluster.

What you'll need

- [An on-premises working environment](#).
- An AWS access key for an IAM user who has the required S3 permissions.

Steps

1. Select an on-prem cluster.

2. Click **Enable** for the Tiering service.



3. **Choose your provider:** This page appears only when using an on-prem Connector. Select **Amazon Web Services** and click **Continue**.
4. Complete the steps on the **Tiering Setup** page:

- a. **S3 Bucket:** Add a new S3 bucket or select an existing S3 bucket that starts with the prefix *fabric-pool* and click **Continue**.

When using an on-prem Connector, you must enter the AWS Account ID that provides access to the existing S3 bucket or new S3 bucket that will be created.

The *fabric-pool* prefix is required because the IAM policy for the Connector enables the instance to perform S3 actions on buckets named with that exact prefix. For example, you could name the S3 bucket *fabric-pool-AFF1*, where AFF1 is the name of the cluster.

- b. **Storage Class Life Cycle:** Cloud Tiering manages the life cycle transitions of your tiered data. Data starts in the *Standard* class, but you can create a rule to move the data to another class after a certain number of days.

Select the S3 storage class that you want to transition the tiered data to and the number of days before the data will be moved, and click **Continue**. For example, the screenshot below shows that tiered data is moved from the *Standard* class to the *Standard-IA* class after 45 days in object storage.

If you choose **Keep data in this storage class**, then the data remains in the *Standard* storage class and no rules are applied. [See supported storage classes](#).

Storage Class Life Cycle Management

We'll move the tiered data through the access tiers that you include in the life cycle. [Learn more about Amazon S3 storage classes.](#)

STORAGE CLASS SETUP ⓘ

Standard

☒ Move data from Standard after days

☐ Keep data in this storage class

↓

No Time Limit

- Standard-IA
- Intelligent-Tiering
- One Zone-IA


Note that the life cycle rule is applied to all objects in the selected bucket.

- c. **Credentials:** Enter the access key ID and secret key for an IAM user who has the required S3 permissions, and click **Continue**.

The IAM user must be in the same AWS account as the bucket that you selected or created on the **S3 Bucket** page.

- d. **Cluster Network:** Select the IPspace that ONTAP should use to connect to object storage, and click **Continue**.

Selecting the correct IPspace ensures that Cloud Tiering can set up a connection from ONTAP to your cloud provider's object storage.

5. On the *Tier Volumes* page, select the volumes that you want to configure tiering for and launch the Tiering Policy page:
- To select all volumes, check the box in the title row (☒ Volume Name) and click **Configure volumes**.
 - To select multiple volumes, check the box for each volume (☒ Volume_1) and click **Configure volumes**.
 - To select a single volume, click the row (or  icon) for the volume.
6. In the *Tiering Policy* dialog, select a tiering policy, optionally adjust the cooling days for the selected volumes, and click **Apply**.

[Learn more about volume tiering policies and cooling days.](#)



Result

You've successfully set up data tiering from volumes on the cluster to S3 object storage.

What's next?

Be sure to [subscribe to the Cloud Tiering service](#).

You can also add additional clusters or review information about the active and inactive data on the cluster. For details, see [Managing data tiering from your clusters](#).

Tiering data from on-premises ONTAP clusters to Azure Blob storage

Free space on your on-prem ONTAP clusters by tiering inactive data to Azure Blob storage.

Quick start

Get started quickly by following these steps, or scroll down to the remaining sections for full details.

1

Prepare to tier data to Azure Blob storage

You need the following:

- An on-prem ONTAP cluster that's running ONTAP 9.4 or later and has an HTTPS connection to Azure Blob storage. [Learn how to discover a cluster](#).
- A Connector installed in an Azure VNet or on your premises.
- Networking for a Connector that enables an outbound HTTPS connection to the ONTAP cluster in your data center, to Azure storage, and to the Cloud Tiering service.

2

Set up tiering

In Cloud Manager, select an on-prem working environment, click **Enable** for the Tiering service, and follow the prompts to tier data to Azure Blob storage.

3

Set up licensing

After your free trial ends, pay for Cloud Tiering through a pay-as-you-go subscription, an ONTAP Cloud Tiering BYOL license, or a combination of both:

- To subscribe from the Azure Marketplace, [go to the Cloud Manager Marketplace offering](#), click **Subscribe**, and then follow the prompts.
- To pay using a Cloud Tiering BYOL license, [contact us if you need to purchase one](#), and then [add it to your account from the Cloud Manager Digital Wallet](#).

Requirements

Verify support for your ONTAP cluster, set up your networking, and prepare your object storage.

The following image shows each component and the connections that you need to prepare between them:



Communication between the Connector and Blob storage is for object storage setup only. The Connector can reside on your premises, instead of in the cloud.

Preparing your ONTAP clusters

Your ONTAP clusters must meet the following requirements when tiering data to Azure Blob storage.

Supported ONTAP platforms

- When using ONTAP 9.8 and later: You can tier data from AFF systems, or FAS systems with all-SSD aggregates or all-HDD aggregates.

- When using ONTAP 9.7 and earlier: You can tier data from AFF systems, or FAS systems with all-SSD aggregates.

Supported ONTAP version

ONTAP 9.4 or later

Cluster networking requirements

- The ONTAP cluster initiates an HTTPS connection over port 443 to Azure Blob storage.

ONTAP reads and writes data to and from object storage. The object storage never initiates, it just responds.

Although ExpressRoute provides better performance and lower data transfer charges, it's not required between the ONTAP cluster and Azure Blob storage. But doing so is the recommended best practice.

- An inbound connection is required from the Connector, which can reside in an Azure VNet or on your premises.

A connection between the cluster and the Cloud Tiering service is not required.

- An intercluster LIF is required on each ONTAP node that hosts the volumes you want to tier. The LIF must be associated with the *IPspace* that ONTAP should use to connect to object storage.

When you set up data tiering, Cloud Tiering prompts you for the IPspace to use. You should choose the IPspace that each LIF is associated with. That might be the "Default" IPspace or a custom IPspace that you created. Learn more about [LIFs](#) and [IPspaces](#).

Supported volumes and aggregates

The total number of volumes that Cloud Tiering can tier might be less than the number of volumes on your ONTAP system. That's because volumes can't be tiered from some aggregates. Refer to ONTAP documentation for [functionality or features not supported by FabricPool](#).



Cloud Tiering supports FlexGroup volumes, starting with ONTAP 9.5. Setup works the same as any other volume.

Discovering an ONTAP cluster

You need to create an on-prem ONTAP working environment in Cloud Manager before you can start tiering cold data.

[Learn how to discover a cluster.](#)

Creating or switching Connectors

A Connector is required to tier data to the cloud. When tiering data to Azure Blob storage, you can use a Connector that's in an Azure VNet or on your premises. You'll either need to create a new Connector or make sure that the currently selected Connector resides in Azure or on-prem.

- [Learn about Connectors](#)
- [Creating a Connector in Azure](#)
- [Connector host requirements](#)
- [Installing the Connector on an existing Linux host](#)

- [Switching between Connectors](#)

Verify that you have the necessary Connector permissions

If you created the Connector using Cloud Manager version 3.9.7 or greater, then you're all set.

If you created the Connector using an earlier version of Cloud Manager, then you'll need to edit the permission list to add 2 required permissions:

```
Microsoft.Storage/storageAccounts/managementPolicies/read  
Microsoft.Storage/storageAccounts/managementPolicies/write
```

Preparing networking for the Connector

Ensure that the Connector has the required networking connections. A Connector can be installed on-prem or in Azure.

Steps

1. Ensure that the network where the Connector is installed enables the following connections:
 - An outbound internet connection to the Cloud Tiering service over port 443 (HTTPS)
 - An HTTPS connection over port 443 to Azure Blob storage
 - An HTTPS connection over port 443 to your ONTAP clusters
2. If needed, enable a VNet service endpoint to Azure storage.

A VNet service endpoint to Azure storage is recommended if you have an ExpressRoute or VPN connection from your ONTAP cluster to the VNet and you want communication between the Connector and Blob storage to stay in your virtual private network.

Preparing Azure Blob storage

When you set up tiering, you need to identify the resource group you want to use, and the storage account and Azure container that belong to the resource group. A storage account enables Cloud Tiering to authenticate and access the Blob container used for data tiering.

Cloud Tiering supports only the General Purpose v2 and Premium Block Blob types of storage accounts.

The Blob container must be in a [region that supports Cloud Tiering](#).



If you are planning to configure Cloud Tiering to use a lower cost access tier where your tiered data will transition to after a certain number of days, you must not select any life cycle rules when setting up the container in your Azure account. Cloud Tiering manages the life cycle transitions.

Tiering inactive data from your first cluster to Azure Blob storage

After you prepare your Azure environment, start tiering inactive data from your first cluster.

What you'll need

[An on-premises working environment](#).

Steps

1. Select an on-prem cluster.
2. Click **Enable** for the Tiering service.



3. **Choose your provider:** This page appears only when using an on-prem Connector. Select **Microsoft Azure** and click **Continue**.
4. Complete the steps on the **Tiering Setup** page:
 - a. **Resource Group:** Select a resource group where an existing container is managed, or where you would like to create a new container for tiered data, and click **Continue**.
 - b. **Azure Container:** Add a new Blob container to a storage account, or select an existing container, and click **Continue**.

When using an on-prem Connector, you must enter the Azure Subscription that provides access to the existing container or new container that will be created.

The storage account and containers that appear in this step belong to the resource group that you selected in the previous step.

- c. **Access Tier Life Cycle:** Cloud Tiering manages the life cycle transitions of your tiered data. Data starts in the *Hot* class, but you can create a rule to move the data to the *Cool* class after a certain number of days.

Select the access tier that you want to transition the tiered data to and the number of days before the data will be moved, and click **Continue**. For example, the screenshot below shows that tiered data is moved from the *Hot* class to the *Cool* class after 45 days in object storage.

If you choose **Keep data in this access tier**, then the data remains in the *Hot* access tier and no rules are applied. [See supported access tiers](#).

Note that the life cycle rule is applied to all blob containers in the selected storage account.

[Verify that you have the necessary Connector permissions](#) for the life cycle management feature.

- d. **Cluster Network:** Select the IPspace that ONTAP should use to connect to object storage, and click **Continue**.

Selecting the correct IPspace ensures that Cloud Tiering can set up a connection from ONTAP to your cloud provider's object storage.

5. On the *Tier Volumes* page, select the volumes that you want to configure tiering for and launch the Tiering Policy page:

- To select all volumes, check the box in the title row (☒ Volume Name) and click **Configure volumes**.
- To select multiple volumes, check the box for each volume (☒ Volume_1) and click **Configure volumes**.
- To select a single volume, click the row (or  icon) for the volume.

6. In the *Tiering Policy* dialog, select a tiering policy, optionally adjust the cooling days for the selected volumes, and click **Apply**.

[Learn more about volume tiering policies and cooling days](#).



Result

You've successfully set up data tiering from volumes on the cluster to Azure Blob object storage.

What's next?

Be sure to [subscribe to the Cloud Tiering service](#).

You can also add additional clusters or review information about the active and inactive data on the cluster. For details, see [Managing data tiering from your clusters](#).

Tiering data from on-premises ONTAP clusters to Google Cloud Storage

Free space on your on-prem ONTAP clusters by tiering inactive data to Google Cloud Storage.

Quick start

Get started quickly by following these steps, or scroll down to the remaining sections for full details.

1

Prepare to tier data to Google Cloud Storage

You need the following:

- An on-prem ONTAP cluster that's running ONTAP 9.6 or later and has an HTTPS connection to Google Cloud Storage. [Learn how to discover a cluster](#).
- A service account that has the predefined Storage Admin role and storage access keys.
- A Connector installed in a Google Cloud Platform VPC.
- Networking for the Connector that enables an outbound HTTPS connection to the ONTAP cluster in your data center, to Google Cloud Storage, and to the Cloud Tiering service.

2

Set up tiering

In Cloud Manager, select an on-prem working environment, click **Enable** for the Tiering service, and follow the

prompts to tier data to Google Cloud Storage.

3

Set up licensing

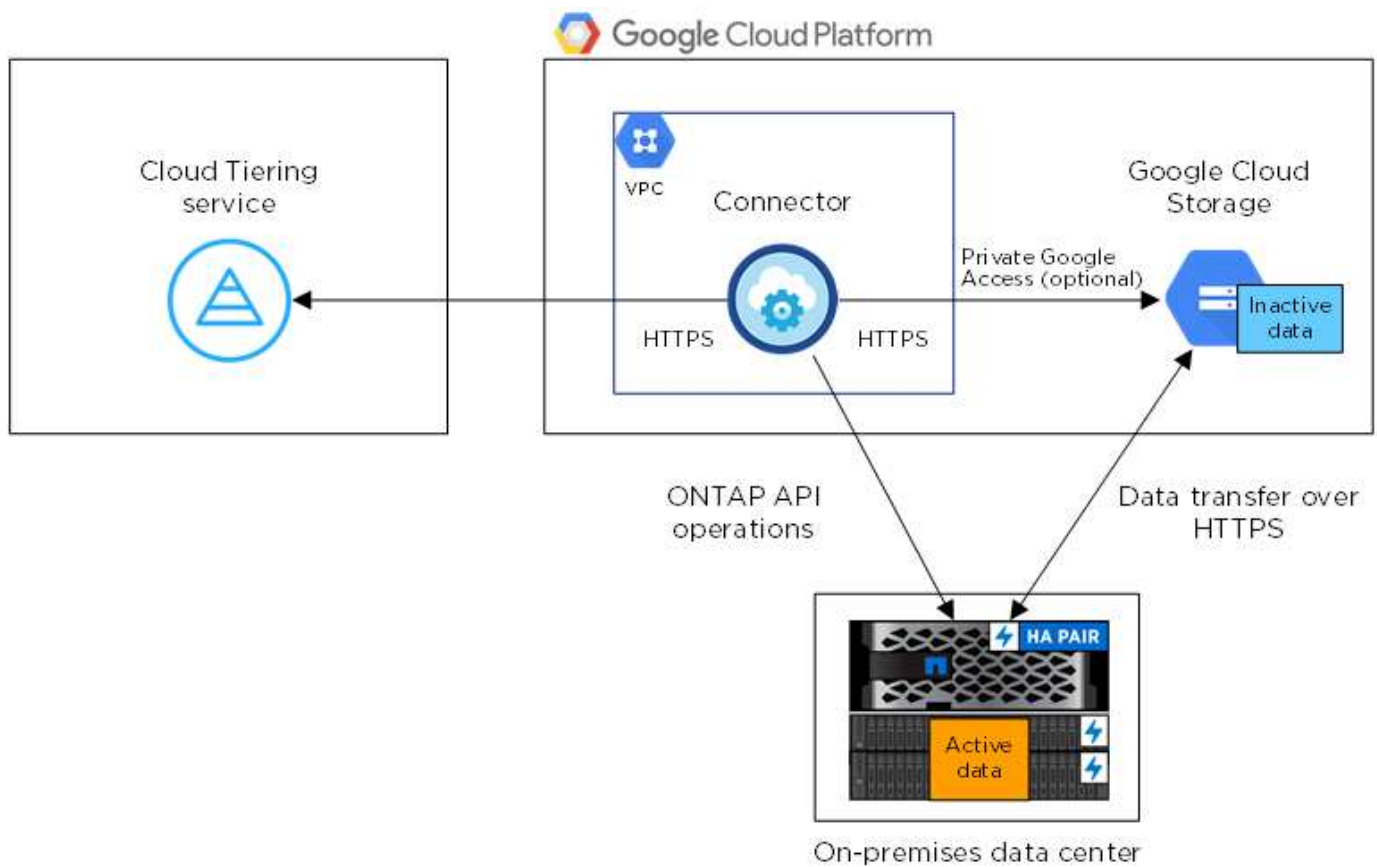
After your free trial ends, pay for Cloud Tiering through a pay-as-you-go subscription, an ONTAP Cloud Tiering BYOL license, or a combination of both:

- To subscribe from the GCP Marketplace, [go to the Cloud Manager Marketplace offering](#), click **Subscribe**, and then follow the prompts.
- To pay using a Cloud Tiering BYOL license, [contact us if you need to purchase one](#), and then [add it to your account from the Cloud Manager Digital Wallet](#).

Requirements

Verify support for your ONTAP cluster, set up your networking, and prepare your object storage.

The following image shows each component and the connections that you need to prepare between them:



Communication between the Connector and Google Cloud Storage is for object storage setup only.

Preparing your ONTAP clusters

Your ONTAP clusters must meet the following requirements when tiering data to Google Cloud Storage.

Supported ONTAP platforms

- When using ONTAP 9.8 and later: You can tier data from AFF systems, or FAS systems with all-SSD aggregates or all-HDD aggregates.
- When using ONTAP 9.7 and earlier: You can tier data from AFF systems, or FAS systems with all-SSD aggregates.

Supported ONTAP versions

ONTAP 9.6 or later

Cluster networking requirements

- The ONTAP cluster initiates an HTTPS connection over port 443 to Google Cloud Storage.

ONTAP reads and writes data to and from object storage. The object storage never initiates, it just responds.

Although a Google Cloud Interconnect provides better performance and lower data transfer charges, it's not required between the ONTAP cluster and Google Cloud Storage. But doing so is the recommended best practice.

- An inbound connection is required from the Connector, which resides in a Google Cloud Platform VPC.

A connection between the cluster and the Cloud Tiering service is not required.

- An intercluster LIF is required on each ONTAP node that hosts the volumes you want to tier. The LIF must be associated with the *IPspace* that ONTAP should use to connect to object storage.

When you set up data tiering, Cloud Tiering prompts you for the IPspace to use. You should choose the IPspace that each LIF is associated with. That might be the "Default" IPspace or a custom IPspace that you created. Learn more about [LIFs](#) and [IPspaces](#).

Supported volumes and aggregates

The total number of volumes that Cloud Tiering can tier might be less than the number of volumes on your ONTAP system. That's because volumes can't be tiered from some aggregates. Refer to ONTAP documentation for [functionality or features not supported by FabricPool](#).



Cloud Tiering supports FlexGroup volumes. Setup works the same as any other volume.

Discovering an ONTAP cluster

You need to create an on-prem ONTAP working environment in Cloud Manager before you can start tiering cold data.

[Learn how to discover a cluster.](#)

Creating or switching Connectors

A Connector is required to tier data to the cloud. When tiering data to Google Cloud Storage, a Connector must be available in a Google Cloud Platform VPC. You'll either need to create a new Connector or make sure that the currently selected Connector resides in GCP.

- [Learn about Connectors](#)
- [Creating a Connector in GCP](#)

- [Switching between Connectors](#)

Preparing networking for the Connector

Ensure that the Connector has the required networking connections.

Steps

1. Ensure that the VPC where the Connector is installed enables the following connections:
 - An outbound internet connection to the Cloud Tiering service over port 443 (HTTPS)
 - An HTTPS connection over port 443 to Google Cloud Storage
 - An HTTPS connection over port 443 to your ONTAP clusters
2. Optional: Enable Private Google Access on the subnet where you plan to deploy the Connector.

[Private Google Access](#) is recommended if you have a direct connection from your ONTAP cluster to the VPC and you want communication between the Connector and Google Cloud Storage to stay in your virtual private network. Note that Private Google Access works with VM instances that have only internal (private) IP addresses (no external IP addresses).

Preparing Google Cloud Storage

When you set up tiering, you need to provide storage access keys for a service account that has Storage Admin permissions. A service account enables Cloud Tiering 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.

The Cloud Storage buckets must be in a [region that supports Cloud Tiering](#).



If you are planning to configure Cloud Tiering to use lower cost storage classes where your tiered data will transition to after a certain number of days, you must not select any life cycle rules when setting up the bucket in your GCP account. Cloud Tiering manages the life cycle transitions.

Steps

1. [Create a service account that has the predefined Storage Admin role](#).
2. Go to [GCP Storage Settings](#) and create access keys for the service account:
 - a. Select a project, and click **Interoperability**. If you haven't already done so, click **Enable interoperability access**.
 - b. Under **Access keys for service accounts**, click **Create a key for a service account**, select the service account that you just created, and click **Create Key**.

You'll need to enter the keys later when you set up Cloud Tiering.

Tiering inactive data from your first cluster to Google Cloud Storage

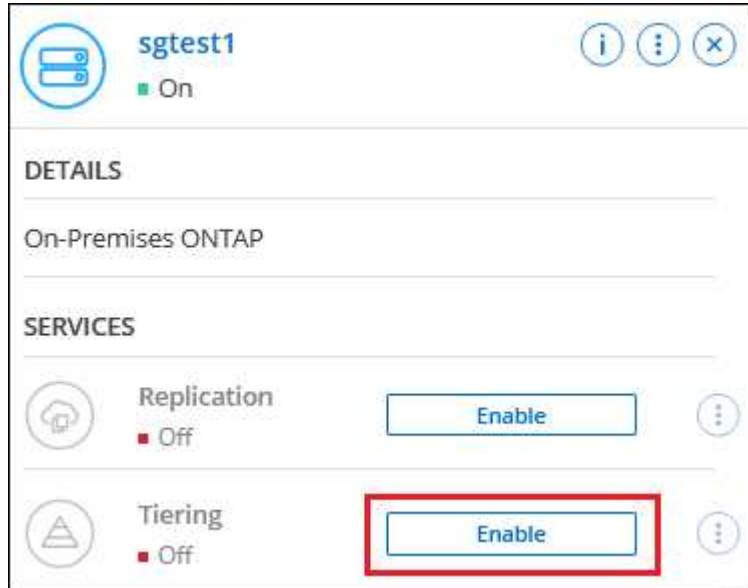
After you prepare your Google Cloud environment, start tiering inactive data from your first cluster.

What you'll need

- [An on-premises working environment](#).
- Storage access keys for a service account that has the Storage Admin role.

Steps

1. Select an on-prem cluster.
2. Click **Enable** for the Tiering service.



3. Complete the steps on the **Tiering Setup** page:
 - a. **Bucket:** Add a new Google Cloud Storage bucket or select an existing bucket.
 - b. **Storage Class Life Cycle:** Cloud Tiering manages the life cycle transitions of your tiered data. Data starts in the *Standard* class, but you can create rules to move the data to other classes after a certain number of days.

Select the Google Cloud storage class that you want to transition the tiered data to and the number of days before the data will be moved, and click **Continue**. For example, the screenshot below shows that tiered data is moved from the *Standard* class to the *Nearline* class after 30 days in object storage, and then to the *Coldline* class after 60 days in object storage.

If you choose **Keep data in this storage class**, then the data remains in the that storage class. [See supported storage classes](#).

Storage Class Life Cycle Management

We'll move the tiered data through the storage classes that you include in the life cycle. [Learn more about Google Cloud Storage classes.](#)

STORAGE CLASS SETUP ⓘ

Standard

☒ Move data from Standard to Nearline after days
☐ Keep data in this storage class

↓

Nearline

☒ Move data from Nearline to Coldline after days
☐ Keep data in this storage class

↓

Coldline

☐ Move data from Coldline to Archive after days
☒ Keep data in this storage class

↓

Archive

No Time Limit

Note that the life cycle rule is applied to all objects in the selected bucket.

- c. **Credentials:** Enter the storage access key and secret key for a service account that has the Storage Admin role.
- d. **Cluster Network:** Select the IPspace that ONTAP should use to connect to object storage.

Selecting the correct IPspace ensures that Cloud Tiering can set up a connection from ONTAP to your cloud provider's object storage.

4. Click **Continue** to select the volumes that you want to tier.
5. On the *Tier Volumes* page, select the volumes that you want to configure tiering for and launch the Tiering Policy page:
 - To select all volumes, check the box in the title row (☒ Volume Name) and click **Configure volumes**.
 - To select multiple volumes, check the box for each volume (☒ Volume_1) and click **Configure volumes**.
 - To select a single volume, click the row (or  icon) for the volume.
6. In the *Tiering Policy* dialog, select a tiering policy, optionally adjust the cooling days for the selected volumes, and click **Apply**.

[Learn more about volume tiering policies and cooling days.](#)



Result

You've successfully set up data tiering from volumes on the cluster to Google Cloud object storage.

What's next?

[Be sure to subscribe to the Cloud Tiering service.](#)

You can also add additional clusters or review information about the active and inactive data on the cluster. For details, see [Managing data tiering from your clusters](#).

Tiering data from on-premises ONTAP clusters to StorageGRID

Free space on your on-prem ONTAP clusters by tiering inactive data to StorageGRID.

Quick start

Get started quickly by following these steps, or scroll down to the remaining sections for full details.

1

Prepare to tier data to StorageGRID

You need the following:

- An on-prem ONTAP cluster that's running ONTAP 9.4 or later, and a connection over a user-specified port to StorageGRID. [Learn how to discover a cluster.](#)
- StorageGRID 10.3 or later with AWS access keys that have S3 permissions.
- A Connector installed on your premises.
- Networking for the Connector that enables an outbound HTTPS connection to the ONTAP cluster, to StorageGRID, and to the Cloud Tiering service.

2

Set up tiering

In Cloud Manager, select an on-prem working environment, click **Enable** for the Tiering service, and follow the prompts to tier data to StorageGRID.

Requirements

Verify support for your ONTAP cluster, set up your networking, and prepare your object storage.

The following image shows each component and the connections that you need to prepare between them:



Communication between the Connector and StorageGRID is for object storage setup only.

Preparing your ONTAP clusters

Your ONTAP clusters must meet the following requirements when tiering data to StorageGRID.

Supported ONTAP platforms

- When using ONTAP 9.8 and later: You can tier data from AFF systems, or FAS systems with all-SSD aggregates or all-HDD aggregates.
- When using ONTAP 9.7 and earlier: You can tier data from AFF systems, or FAS systems with all-SSD aggregates.

Supported ONTAP version

ONTAP 9.4 or later

Licensing

A Cloud Tiering license isn't required in your Cloud Manager account, nor is a FabricPool license required on the ONTAP cluster, when tiering data to StorageGRID.

Cluster networking requirements

- The ONTAP cluster initiates an HTTPS connection over a user-specified port to StorageGRID (the port is configurable during tiering setup).

ONTAP reads and writes data to and from object storage. The object storage never initiates, it just responds.

- An inbound connection is required from the Connector, which must reside on your premises.

A connection between the cluster and the Cloud Tiering service is not required.

- An intercluster LIF is required on each ONTAP node that hosts the volumes you want to tier. The LIF must be associated with the *IPspace* that ONTAP should use to connect to object storage.

When you set up data tiering, Cloud Tiering prompts you for the IPspace to use. You should choose the IPspace that each LIF is associated with. That might be the "Default" IPspace or a custom IPspace that you created. Learn more about [LIFs](#) and [IPspaces](#).

Supported volumes and aggregates

The total number of volumes that Cloud Tiering can tier might be less than the number of volumes on your ONTAP system. That's because volumes can't be tiered from some aggregates. Refer to ONTAP documentation for [functionality or features not supported by FabricPool](#).



Cloud Tiering supports FlexGroup volumes, starting with ONTAP 9.5. Setup works the same as any other volume.

Discovering an ONTAP cluster

You need to create an on-prem ONTAP working environment in the Cloud Manager Canvas before you can start tiering cold data.

[Learn how to discover a cluster.](#)

Preparing StorageGRID

StorageGRID must meet the following requirements.

Supported StorageGRID versions

StorageGRID 10.3 and later is supported.

S3 credentials

When you set up tiering to StorageGRID, you need to provide Cloud Tiering with an S3 access key and secret key. Cloud Tiering uses the keys to access your buckets.

These access keys must be associated with a user who has the following permissions:

```
"s3:ListAllMyBuckets",  
"s3:ListBucket",  
"s3:GetObject",  
"s3:PutObject",  
"s3:DeleteObject",  
"s3:CreateBucket"
```

Object versioning

You must not enable StorageGRID object versioning on the object store bucket.

Creating or switching Connectors

A Connector is required to tier data to the cloud. When tiering data to StorageGRID, a Connector must be available on your premises. You'll either need to install a new Connector or make sure that the currently selected Connector resides on-prem.

- [Learn about Connectors](#)
- [Connector host requirements](#)
- [Installing the Connector on an existing Linux host](#)
- [Switching between Connectors](#)

Preparing networking for the Connector

Ensure that the Connector has the required networking connections.

Steps

1. Ensure that the network where the Connector is installed enables the following connections:
 - An outbound internet connection to the Cloud Tiering service over port 443 (HTTPS)
 - An HTTPS connection over port 443 to StorageGRID
 - An HTTPS connection over port 443 to your ONTAP cluster

Tiering inactive data from your first cluster to StorageGRID

After you prepare your environment, start tiering inactive data from your first cluster.

What you'll need

- [An on-premises working environment.](#)
- The FQDN of the StorageGRID server and the port that will be used for HTTPS communications.
- An AWS access key that has the required S3 permissions.

Steps

1. Select an on-prem cluster.
2. Click **Enable** for the Tiering service.



3. **Choose your provider:** Select **StorageGRID** and click **Continue**.

4. Complete the steps on the **Tiering Setup** page:

- a. **Server:** Enter the FQDN of the StorageGRID server, the port that ONTAP should use for HTTPS communication with StorageGRID, and the access key and secret key for an account that has the required S3 permissions.
- b. **Bucket:** Add a new bucket or select an existing bucket that starts with the prefix *fabric-pool* and click **Continue**.

The *fabric-pool* prefix is required because the IAM policy for the Connector enables the instance to perform S3 actions on buckets named with that exact prefix. For example, you could name the S3 bucket *fabric-pool-AFF1*, where AFF1 is the name of the cluster.

- c. **Cluster Network:** Select the IPspace that ONTAP should use to connect to object storage and click **Continue**.

Selecting the correct IPspace ensures that Cloud Tiering can set up a connection from ONTAP to StorageGRID object storage.

5. On the *Tier Volumes* page, select the volumes that you want to configure tiering for and launch the Tiering Policy page:

- To select all volumes, check the box in the title row (☒ Volume Name) and click **Configure volumes**.
- To select multiple volumes, check the box for each volume (☒ Volume_1) and click **Configure volumes**.
- To select a single volume, click the row (or  icon) for the volume.

6. In the *Tiering Policy* dialog, select a tiering policy, optionally adjust the cooling days for the selected volumes, and click **Apply**.

[Learn more about volume tiering policies and cooling days.](#)



Result

You've successfully set up data tiering from volumes on the cluster to StorageGRID.

What's next?

You can add additional clusters or review information about the active and inactive data on the cluster. For details, see [Managing data tiering from your clusters](#).

Tiering data from on-premises ONTAP clusters to S3 object storage

Free space on your on-prem ONTAP clusters by tiering inactive data to any object storage service which uses the Simple Storage Service (S3) protocol.



Customers who want to use object stores that are not officially supported as a cloud tier can do so using these instructions. Customers must test and confirm that the object store meets their requirements.

NetApp does not support nor is liable for any issues arising from any third-party Object Store Service, specifically where it does not have agreed support arrangements with the third party with whom the product originated. It is acknowledged and agreed that NetApp shall not be liable for any associated damage or otherwise be required to provide support on that third-party product.

Quick start

Get started quickly by following these steps, or scroll down to the remaining sections for full details.



Prepare to tier data to S3-compatible object storage

You need the following:

- An on-prem ONTAP cluster that's running ONTAP 9.8 or later, and a connection over a user-specified port to the S3-compatible object storage. [Learn how to discover a cluster](#).
- The FQDN, Access Key, and Secret Key for the object storage server so that the ONTAP cluster can

access the bucket.

- A Connector installed on your premises.
- Networking for the Connector that enables an outbound HTTPS connection to the ONTAP cluster, to the S3-compatible object storage, and to the Cloud Tiering service.

2

Set up tiering

In Cloud Manager, select an on-prem working environment, click **Enable** for the Tiering service, and follow the prompts to tier data to S3-compatible object storage.

3

Set up licensing

Pay for Cloud Tiering through a pay-as-you-go subscription from your cloud provider, a NetApp Cloud Tiering bring-your-own-license, or a combination of both:

- To subscribe to the Cloud Manager PAYGO offering from the [AWS Marketplace](#), [Azure Marketplace](#), or [GCP Marketplace](#), click **Subscribe** and follow the prompts.
- To pay using a Cloud Tiering BYOL license, [contact us if you need to purchase one](#), and then [add it to your account from the Cloud Manager Digital Wallet](#).

Requirements

Verify support for your ONTAP cluster, set up your networking, and prepare your object storage.

The following image shows each component and the connections that you need to prepare between them:



Communication between the Connector and the S3-compatible object storage server is for object storage setup only.

Preparing your ONTAP clusters

Your ONTAP clusters must meet the following requirements when tiering data to S3-compatible object storage.

Supported ONTAP platforms

You can tier data from AFF systems, or FAS systems with all-SSD aggregates or all-HDD aggregates.

Supported ONTAP version

ONTAP 9.8 or later

Cluster networking requirements

- The ONTAP cluster initiates an HTTPS connection over a user-specified port to S3-compatible object storage (the port is configurable during tiering setup).

ONTAP reads and writes data to and from object storage. The object storage never initiates, it just responds.

- An inbound connection is required from the Connector, which must reside on your premises.

A connection between the cluster and the Cloud Tiering service is not required.

- An intercluster LIF is required on each ONTAP node that hosts the volumes you want to tier. The LIF must be associated with the *IPspace* that ONTAP should use to connect to object storage.

When you set up data tiering, Cloud Tiering prompts you for the IPspace to use. You should choose the IPspace that each LIF is associated with. That might be the "Default" IPspace or a custom IPspace that you created. Learn more about [LIFs](#) and [IPspaces](#).

Supported volumes and aggregates

The total number of volumes that Cloud Tiering can tier might be less than the number of volumes on your ONTAP system. That's because volumes can't be tiered from some aggregates. Refer to ONTAP documentation for [functionality or features not supported by FabricPool](#).



Cloud Tiering supports both FlexVol and FlexGroup volumes.

Discovering an ONTAP cluster

You need to create an on-prem ONTAP working environment in the Cloud Manager Canvas before you can start tiering cold data.

[Learn how to discover a cluster.](#)

Preparing S3-compatible object storage

S3-compatible object storage must meet the following requirements.

S3 credentials

When you set up tiering to S3-compatible object storage, you're prompted to create an S3 bucket or to select an existing S3 bucket. You need to provide Cloud Tiering with an S3 access key and secret key. Cloud Tiering uses the keys to access your bucket.

These access keys must be associated with a user who has the following permissions:

```
"s3:ListAllMyBuckets",  
"s3:ListBucket",  
"s3:GetObject",  
"s3:PutObject",  
"s3:DeleteObject",  
"s3:CreateBucket"
```

Creating or switching Connectors

A Connector is required to tier data to the cloud. When tiering data to S3-compatible object storage, a Connector must be available on your premises. You'll either need to install a new Connector or make sure that the currently selected Connector resides on-prem.

- [Learn about Connectors](#)
- [Connector host requirements](#)
- [Installing the Connector on an existing Linux host](#)
- [Switching between Connectors](#)

Preparing networking for the Connector

Ensure that the Connector has the required networking connections.

Steps

1. Ensure that the network where the Connector is installed enables the following connections:
 - An outbound internet connection to the Cloud Tiering service over port 443 (HTTPS)
 - An HTTPS connection over port 443 to S3-compatible object storage
 - An HTTPS connection over port 443 to your ONTAP cluster

Tiering inactive data from your first cluster to S3-compatible object storage

After you prepare your environment, start tiering inactive data from your first cluster.

What you'll need

- [An on-premises working environment.](#)
- The FQDN of the S3-compatible object storage server and the port that will be used for HTTPS communications.
- An access key and secret key that has the required S3 permissions.

Steps

1. Select an on-prem cluster.
2. In the right panel, click **Enable** for the Tiering service.



3. **Choose your provider:** Select **S3 Compatible** and click **Continue**.


4. Complete the steps on the **Tiering Setup** page:

- Server:** Enter the FQDN of the S3-compatible object storage server, the port that ONTAP should use for HTTPS communication with the server, and the access key and secret key for an account that has the required S3 permissions.
- Bucket:** Add a new bucket or select an existing bucket and click **Continue**.
- Cluster Network:** Select the IPspace that ONTAP should use to connect to object storage and click **Continue**.

Selecting the correct IPspace ensures that Cloud Tiering can set up a connection from ONTAP to your S3-compatible object storage.

5. On the *Success* page click **Continue** to set up your volumes now.

6. On the *Tier Volumes* page, select the volumes that you want to configure tiering for and click **Continue**:

- To select all volumes, check the box in the title row (☒ Volume Name) and click **Configure volumes**.
- To select multiple volumes, check the box for each volume (☒ Volume_1) and click **Configure volumes**.
- To select a single volume, click the row (or  icon) for the volume.



7. In the *Tiering Policy* dialog, select a tiering policy, optionally adjust the cooling days for the selected volumes, and click **Apply**.

[Learn more about volume tiering policies and cooling days.](#)



Result

You've successfully set up data tiering from volumes on the cluster to S3-compatible object storage.

What's next?

[Be sure to subscribe to the Cloud Tiering service.](#)

You can add additional clusters or review information about the active and inactive data on the cluster. For details, see [Managing data tiering from your clusters](#).

Set up licensing for Cloud Tiering

A 30-day free trial of Cloud Tiering starts when you set up tiering from your first cluster. After the free trial ends, you'll need to pay for Cloud Tiering through a pay-as-you-go Cloud Manager subscription from your cloud provider's marketplace, a BYOL license from NetApp, or a combination of both.

A few notes before you read any further:

- If you've already subscribed to the Cloud Manager subscription (PAYGO) in your cloud provider's marketplace, then you're automatically subscribed to Cloud Tiering from on-premises ONTAP systems as well. You'll see an active subscription in the Cloud Tiering **Licensing** tab. You won't need to subscribe again.
- The BYOL Cloud Tiering license is a *floating* license that you can use across multiple on-premises ONTAP clusters in your Cloud Manager account. This is different than in the past where you purchased a *FabricPool* license for each cluster.
- There are no charges when tiering data to StorageGRID, so neither a BYOL license or PAYGO registration is required. This tiered data doesn't count against the capacity purchased in your license.

[Learn more about how licensing works for Cloud Tiering.](#)

Use a Cloud Tiering PAYGO subscription

Pay-as-you-go subscriptions from your cloud provider's marketplace enable you to license the use of Cloud Volumes ONTAP systems and many Cloud Data Services, such as Cloud Tiering.

Subscribing from the AWS Marketplace

Subscribe to Cloud Tiering from the AWS Marketplace to set up a pay-as-you-go subscription for data tiering from ONTAP clusters to AWS S3.

Steps

1. In Cloud Manager, click **Tiering > Licensing**.
2. Click **Subscribe** under AWS Marketplace and then click **Continue**.
3. Subscribe from the [AWS Marketplace](#), and then log back in to Cloud Central to complete the registration.

The following video shows the process:

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

Subscribing from the Azure Marketplace

Subscribe to Cloud Tiering from the Azure Marketplace to set up a pay-as-you-go subscription for data tiering from ONTAP clusters to Azure Blob storage.

Steps

1. In Cloud Manager, click **Tiering > Licensing**.
2. Click **Subscribe** under Azure Marketplace and then click **Continue**.
3. Subscribe from the [Azure Marketplace](#), and then log back in to Cloud Central to complete the registration.

The following video shows the process:

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

Subscribing from the GCP Marketplace

Subscribe to Cloud Tiering from the GCP Marketplace to set up a pay-as-you-go subscription for data tiering from ONTAP clusters to Google Cloud storage.

Steps

1. In Cloud Manager, click **Tiering > Licensing**.
2. Click **Subscribe** under GCP Marketplace and then click **Continue**.
3. Subscribe from the [GCP Marketplace](#), and then log back in to Cloud Central to complete the registration.

The following video shows the process:

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

Use a Cloud Tiering BYOL license

Bring-your-own licenses from NetApp provide 2-, 12-, 24-, or 36-month terms. The BYOL **Cloud Tiering** license is a *floating* license that you can use across multiple on-premises ONTAP clusters in your Cloud Manager account. The total tiering capacity defined in your Cloud Tiering license is shared among **all** of your on-prem clusters, making initial licensing and renewal easy.

If you don't have a Cloud Tiering license, contact us to purchase one:

- [Send email to purchase a license.](#)
- Click the chat icon in the lower-right of Cloud Manager to request a license.

Optionally, if you have an unassigned node-based license for Cloud Volumes ONTAP that you won't be using, you can convert it to a Cloud Tiering license with the same dollar-equivalence and the same expiration date. [Go here for details.](#)

You use the Digital Wallet page in Cloud Manager to manage Cloud Tiering BYOL licenses. You can add new licenses and update existing licenses.

New Cloud Tiering BYOL licensing starting August 21, 2021

The new **Cloud Tiering** license was introduced on August 21, 2021 for tiering configurations that are supported within Cloud Manager using the Cloud Tiering service. The **FabricPool** license that you may have used in the past to tier on-premises ONTAP data to the cloud is being retained only for configurations that aren't supported within Cloud Manager.

If you have one of these configurations, you'll continue to use a FabricPool license on each cluster (managed using System Manager or the CLI):

- ONTAP installations in the GovCloud or in Dark Sites
- ONTAP clusters in a MetroCluster configuration
- ONTAP clusters using FabricPool Mirror functionality
- ONTAP clusters that are tiering data to IBM Cloud Object Storage or Alibaba Cloud Object Storage

Cloud Manager currently supports tiering to the following cloud storage: Amazon S3, Azure Blob storage, Google Cloud Storage, and S3-compatible object storage.

Note that tiering to StorageGRID does not require a FabricPool or Cloud Tiering license.

If you are currently using FabricPool licensing, you're not affected until your FabricPool license reaches its expiration date or maximum capacity. Contact NetApp when you need to update your license, or earlier to make sure there is no interruption in your ability to tier data to the cloud.

- If you're using a configuration that is supported in Cloud Manager, your FabricPool licenses will be converted to Cloud Tiering licenses and they'll appear in the Digital Wallet. When those initial licenses expire, you'll need to update the Cloud Tiering licenses.
- If you're using a configuration that is not supported in Cloud Manager, then you'll continue using a FabricPool license. [See how to license tiering using System Manager.](#)

Here are some things you need to know about the two licenses:

Cloud Tiering license	FabricPool license
It is a <i>floating</i> license that you can use across multiple on-premises ONTAP clusters.	It is a per-cluster license that you purchase and license for <i>every</i> cluster.
It is registered in Cloud Manager in the Digital Wallet.	It is applied to individual clusters using System Manager or the ONTAP CLI.
Tiering configuration and management is done through the Cloud Tiering service in Cloud Manager.	Tiering configuration and management is done through System Manager or the ONTAP CLI.
Once configured, you can use the tiering service without a license for 30 days using the free trial.	Once configured, you can tier the first 10 TB of data for free.

Obtain your Cloud Tiering license file

After you have purchased your Cloud Tiering license, you activate the license in Cloud Manager by entering the Cloud Tiering serial number and NSS account, or by uploading the NLF license file. The steps below show how to get the NLF license file if you plan to use that method.

Steps

1. Sign in to the [NetApp Support Site](#) and click **Systems > Software Licenses**.
2. Enter your Cloud Tiering license serial number.

Software Licenses

Serial Number

Serial #	Cluster SN	License Name	License Key	Host ID	Value	End Date
4810		SUBS-CLD-DAT-SENSE-TB-2Y	Get NetApp License File		100	12/31/9998

3. Under **License Key**, click **Get NetApp License File**.
4. Enter your Cloud Manager Account ID (this is called a Tenant ID on the support site) and click **Submit** to download the license file.

Get License

SERIAL NUMBER: 4810

LICENSE: SUBS-CLD-DAT-SENSE-TB-2Y

SALES ORDER: 3005

TENANT ID:
 Example: account-xxxxxxx

[Cancel](#) [Submit](#)

You can find your Cloud Manager Account ID by selecting the **Account** drop-down from the top of Cloud Manager, and then clicking **Manage Account** next to your account. Your Account ID is in the Overview tab.

Add Cloud Tiering BYOL licenses to your account

After you purchase a Cloud Tiering license for your Cloud Manager account, you need to add the license to Cloud Manager to use the Cloud Tiering service.

Steps

1. Click **All Services > Digital Wallet > Data Services Licenses**.

2. Click **Add License**.

3. In the *Add License* dialog, enter the license information and click **Add License**:

- If you have the tiering license serial number and know your NSS account, select the **Enter Serial Number** option and enter that information.

If your NetApp Support Site account isn't available from the drop-down list, [add the NSS account to Cloud Manager](#).

- If you have the tiering license file, select the **Upload License File** option and follow the prompts to attach the file.

The image displays two screenshots of the 'Add License' dialog box in Cloud Manager. The left screenshot shows the 'Enter Serial Number' option selected, with a text field for the 'Serial Number' and a dropdown menu for the 'NetApp Support Site Account'. The right screenshot shows the 'Upload License File' option selected, with instructions for obtaining the license file and an 'Upload' button to attach the file. Both screenshots have red boxes highlighting the selected options and the 'Add License' button.

Result

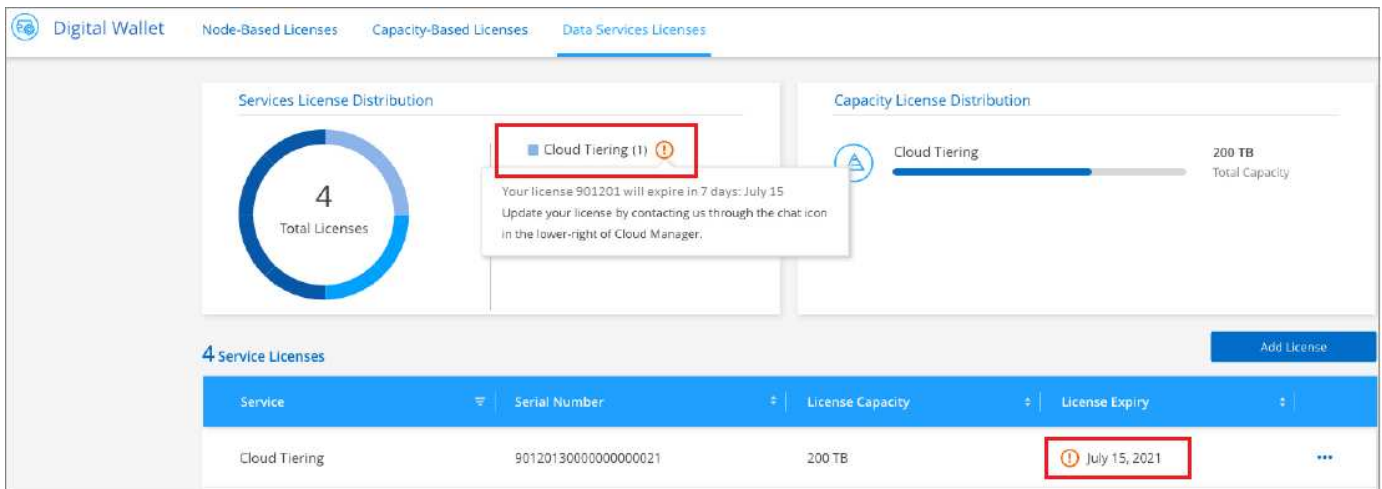
Cloud Manager adds the license so that your Cloud Tiering service is active.

Update a Cloud Tiering BYOL license

If your licensed term is nearing the expiration date, or if your licensed capacity is reaching the limit, you'll be notified in Cloud Tiering.



This status also appears in the Digital Wallet page.



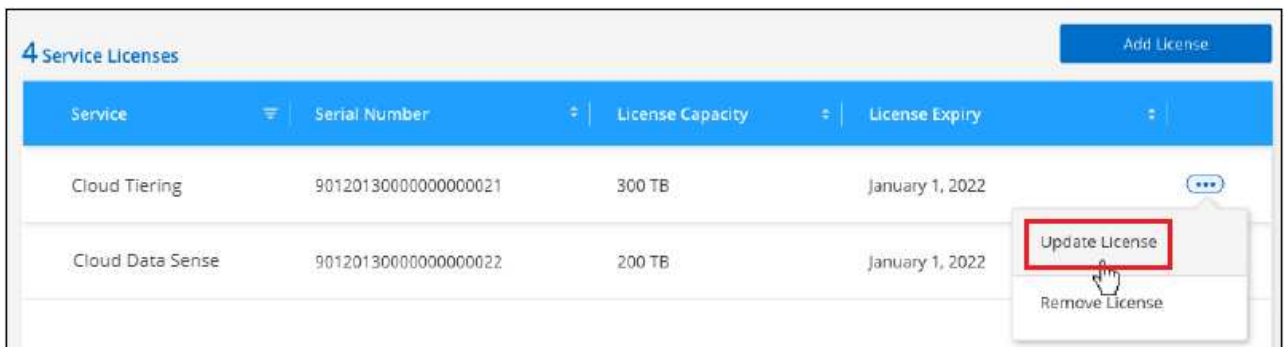
You can update your Cloud Tying license before it expires so that there is no interruption in your ability to tier your data to the cloud.

Steps

1. Click the chat icon in the lower-right of Cloud Manager to request an extension to your term or additional capacity to your Cloud Tying license for the particular serial number.

After you pay for the license and it is registered with the NetApp Support Site, Cloud Manager automatically updates the license in the Digital Wallet and the Data Services Licenses page will reflect the change in 5 to 10 minutes.

2. If Cloud Manager can't automatically update the license, then you'll need to manually upload the license file.
 - a. You can [obtain the license file from the NetApp Support Site](#).
 - b. On the Digital Wallet page in the *Data Services Licenses* tab, click **...** for the service serial number you are updating, and click **Update License**.



- c. In the *Update License* page, upload the license file and click **Update License**.

Result

Cloud Manager updates the license so that your Cloud Tying service continues to be active.

Measure network latency and throughput performance

Run a Cloud Performance Test to measure network latency and throughput performance from an ONTAP cluster to an object store before and after setting up data tiering. The test

also identifies any failures that occurred.

Here are sample performance results:

Your cluster performance results

Node: aff-01

Last check: 01/13/2021 04:25 pm

Recheck performance

Operation	Size	Avg. Latency (ms)	Throughput
PUT	4 MB	502	408.06 MB
GET	4 KB	79	15.05 MB
GET	8 KB	197	28.35 MB
GET	32 KB	291	109.71 MB
GET	256 KB	361	714.39 MB

Before you get started

It's best to run this check when the cluster is under 50% CPU utilization.

Steps for a cluster that hasn't been set up for tiering

1. At the top of Cloud Manager, click **Tiering**.
2. From the **Cluster Dashboard**, click the menu icon for a cluster and select **Cloud Performance Test**.
3. Review the details and click **Continue**.
4. Follow the prompts to provide the required information.

The information that you need to provide is the same as if you were setting up tiering on the cluster.

5. Optionally continue to the Tier Volumes wizard to complete the setup.

Steps for a cluster that has been set up for tiering

1. At the top of Cloud Manager, click **Tiering**.
2. From the **Cluster Dashboard**, click the menu icon for a cluster and select **Cloud Performance Test**.
3. Select a node from the drop-down list.
4. View the results or recheck the performance.

Managing data tiering from your clusters

Now that you've set up data tiering from your on-prem ONTAP clusters, you can tier data from additional volumes, change a volume's tiering policy, discover additional clusters,

and more.

Tiering data from additional volumes

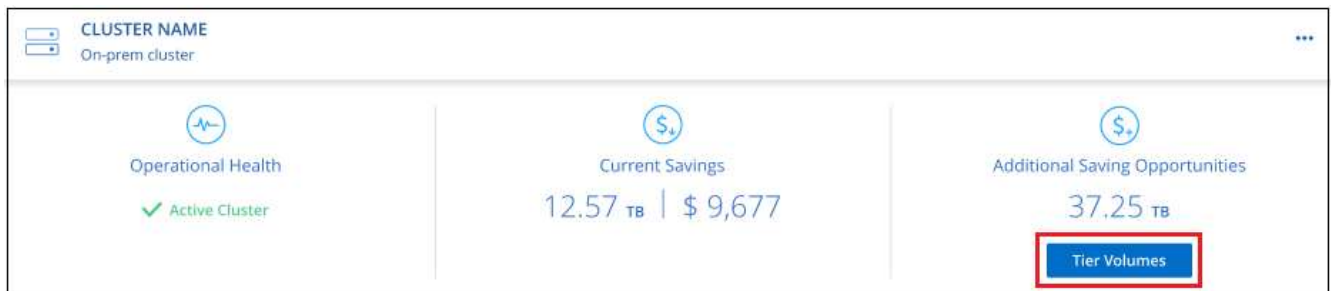
Set up data tiering for additional volumes at any time—for example, after creating a new volume.



You don't need to configure the object storage because it was already configured when you initially set up tiering for the cluster. ONTAP will tier inactive data from any additional volumes to the same object store.

Steps

1. At the top of Cloud Manager, click **Tiering**.
2. From the **Cluster Dashboard**, click **Tier Volumes** for the cluster.



3. On the *Tier Volumes* page, select the volumes that you want to configure tiering for and launch the Tiering Policy page:
 - To select all volumes, check the box in the title row (☒ Volume Name) and click **Configure volumes**.
 - To select multiple volumes, check the box for each volume (☒ Volume_1) and click **Configure volumes**.
 - To select a single volume, click the row (or  icon) for the volume.
4. In the *Tiering Policy* dialog, select a tiering policy, optionally adjust the cooling days for the selected volumes, and click **Apply**.

[Learn more about volume tiering policies and cooling days.](#)



Result

The selected volumes start to have their data tiered to the cloud.

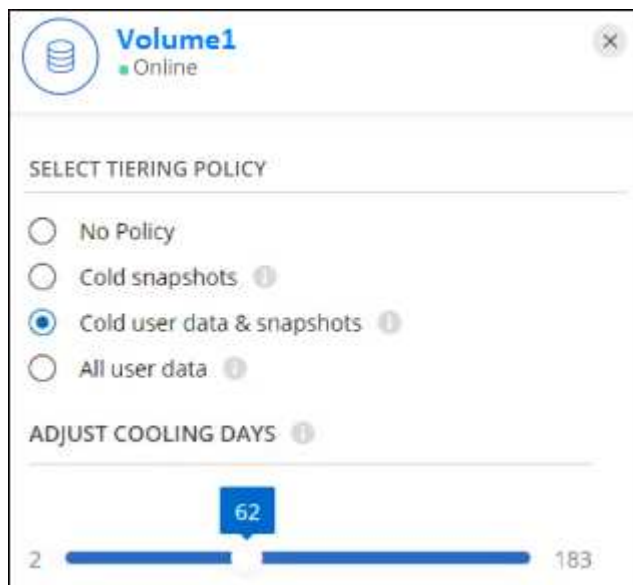
Changing a volume's tiering policy

Changing the tiering policy for a volume changes how ONTAP tiers cold data to object storage. The change starts from the moment that you change the policy. It changes only the subsequent tiering behavior for the volume—it does not retroactively move data to the cloud tier.

Steps

1. At the top of Cloud Manager, click **Tiering**.
2. From the **Cluster Dashboard**, click **Tier Volumes** for the cluster.
3. Click the row for a volume, select a tiering policy, optionally adjust the cooling days, and click **Apply**.

[Learn more about volume tiering policies and cooling days.](#)



Note: If you see options to "Retrieve Tiered Data", see [Migrating data from the cloud tier back to the performance tier](#) for details.

Result

The tiering policy is changed and data begins to be tiered based on the new policy.

Migrating data from the cloud tier back to the performance tier

Tiered data that is accessed from the cloud may be "re-heated" and moved back to the performance tier. However, if you want to proactively promote data to the performance tier from the cloud tier, you can do this in the *Tiering Policy* dialog. This capability is available when using ONTAP 9.8 and greater.

You might do this if you want to stop using tiering on a volume, or if you decide to keep all user data on the performance tier, but keep Snapshot copies on the cloud tier.

There are two options:

Option	Description	Affect on Tiering Policy
Bring back all data	Retrieves all volume data and Snapshot copies tiered in the cloud and promotes them to the performance tier.	Tiering policy is changed to "No policy".
Bring back active file system	Retrieves only active file system data tiered in the cloud and promotes it to the performance tier (Snapshot copies remain in the cloud).	Tiering policy is changed to "Cold snapshots".



You may be charged by your cloud provider based on that amount of data transferred off the cloud.

Steps

Make sure you have enough space in the performance tier for all the data that is being moved from the cloud.

1. At the top of Cloud Manager, click **Tiering**.
2. From the **Cluster Dashboard**, click **Tier Volumes** for the cluster.
3. Click the  icon for the volume, choose the retrieval option you want to use, and click **Apply**.

Volume1
Online

SELECT TIERING POLICY

- ☐ No Policy
- ☐ Cold snapshots ⓘ
- ☒ Cold user data & snapshots ⓘ
- ☐ All user data ⓘ

ADJUST COOLING DAYS ⓘ

2 63

RETRIEVE TIERED DATA

- ☐ Bring back all data ⓘ
- ☒ Bring back active file system ⓘ

Result

The tiering policy is changed and the tiered data starts to be migrated back to the performance tier. Depending on the amount of data in the cloud, the transfer process could take some time.

Managing tiering settings on aggregates

Each aggregate in your on-prem ONTAP systems has two settings that you can adjust: the tiering fullness threshold and whether inactive data reporting is enabled.

Tiering fullness threshold

Setting the threshold to a lower number reduces the amount of data required to be stored on the performance tier before tiering takes place. This might be useful for large aggregates that contain little active data.

Setting the threshold to a higher number increases the amount of data required to be stored on the performance tier before tiering takes place. This might be useful for solutions designed to tier only when aggregates are near maximum capacity.

Inactive data reporting

Inactive data reporting (IDR) uses a 31-day cooling period to determine which data is considered inactive. The amount of cold data that is tiered is dependent on the tiering policies set on volumes. This amount might be different than the amount of cold data detected by IDR using a 31-day cooling period.



It's best to keep IDR enabled because it helps to identify your inactive data and savings opportunities. IDR must remain enabled if data tiering was enabled on an aggregate.

Steps

1. At the top of Cloud Manager, click **Tiering**.

2. From the **Cloud Tiering** page, click the menu icon for a cluster and select **Manage Aggregates**.



3. On the **Manage Aggregates** page, click the  icon for an aggregate in the table.
4. Modify the fullness threshold and choose whether to enable or disable inactive data reporting.



5. Click **Apply**.

Reviewing tiering info for a cluster

You might want to see how much data is in the cloud tier and how much data is on disks. Or, you might want to see the amount of hot and cold data on the cluster's disks. Cloud Tiering provides this information for each cluster.

Steps

1. At the top of Cloud Manager, click **Tiering**.
2. From the **Cluster Dashboard**, click the menu icon for a cluster and select **Cluster info**.
3. Review details about the cluster.

Here's an example:



Fixing operational health

Failures can happen. When they do, Cloud Tying displays a "Failed" operational health status on the Cluster Dashboard. The health reflects the status of the ONTAP system and Cloud Manager.

Steps

1. Identify any clusters that have an operational health of "Failed."



2. Hover over the **i** icon to see the failure reason.
3. Correct the issue:
 - a. Verify that the ONTAP cluster is operational and that it has an inbound and outbound connection to your object storage provider.
 - b. Verify that Cloud Manager has outbound connections to the Cloud Tying service, to the object store, and to the ONTAP clusters that it discovers.

Discovering additional clusters from Cloud Tying

You can add your undiscovered on-prem ONTAP clusters to Cloud Manager from the Tiering *Cluster Dashboard* so that you can enable tiering for the cluster.

Note that buttons also appear on the Tiering *On-Prem Overview* page for you to discover additional clusters.

Steps

1. From Cloud Tying, click the **Cluster Dashboard** tab.

2. To see any undiscovered clusters, click **Show Undiscovered Clusters**.



If your NSS credentials are saved in Cloud Manager, the clusters in your account are displayed in the list.

If your NSS credentials are not saved in Cloud Manager, you are first prompted to add your credentials before you can see the undiscovered clusters.

3. Scroll down the page to locate the clusters.



4. Click **Discover Cluster** for the cluster that you want to manage through Cloud Manager and implement data tiering.
5. On the *Choose a Location* page **On-Premises ONTAP** is pre-selected, so just click **Continue**.
6. On the *ONTAP Cluster Details* page, enter the password for the admin user account and click **Add**.

Note that the cluster management IP address is populated based on information from your NSS account.

7. On the *Details & Credentials* page the cluster name is added as the Working Environment Name, so just click **Go**.

Result

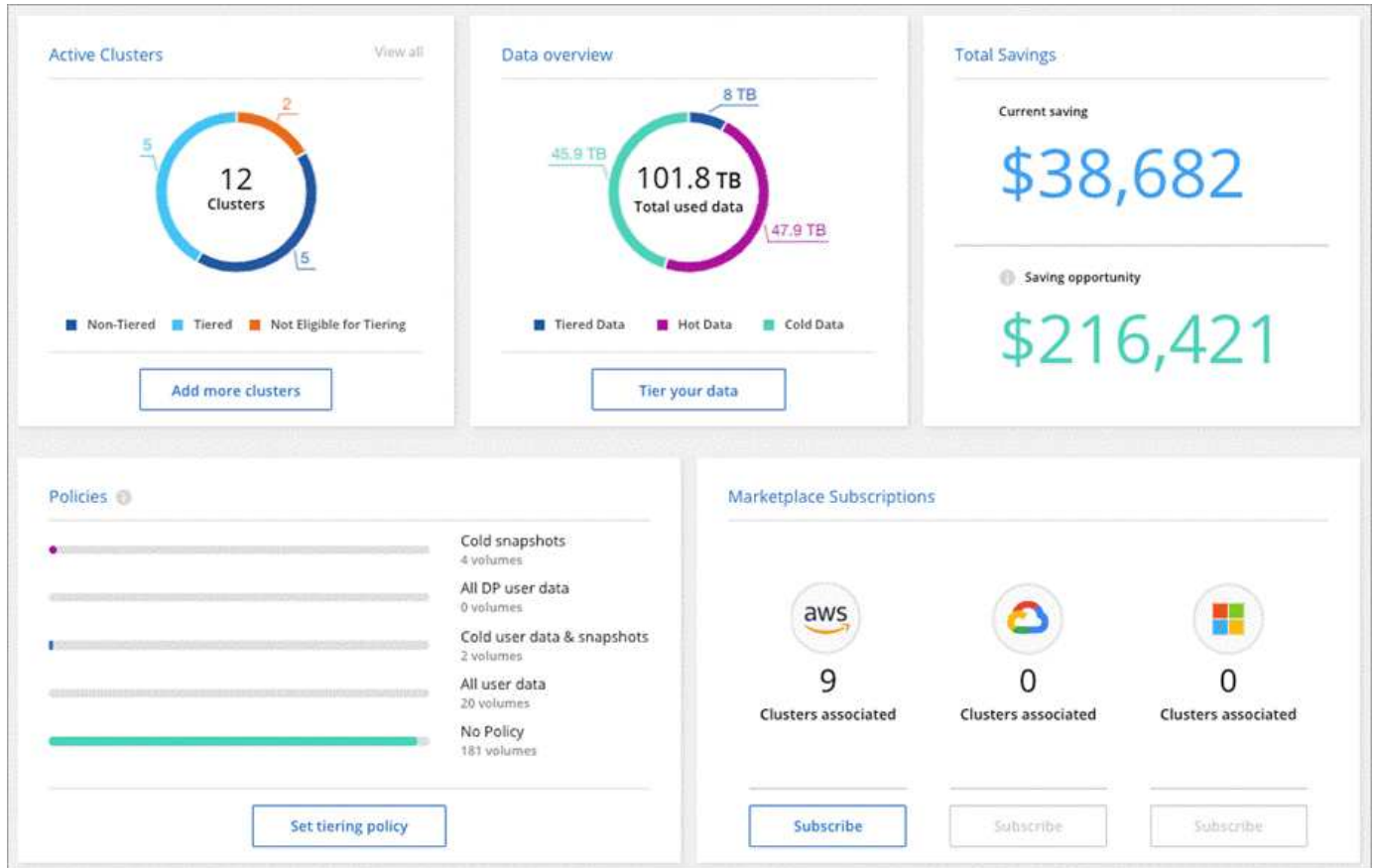
Cloud Manager discovers the cluster and adds it to a working environment in the Canvas using the cluster name as the working environment name.

You can enable the Tiering service or other services for this cluster in the right panel.

Get an overview of data tiering from your clusters

Cloud Tiering provides an aggregated view of data tiering from each of your on-premises clusters. This overview provides a clear picture of your environment and enables you to take proper actions.

Cloud Tiering provides the following details about your environment:



Active Clusters

The number of clusters that are currently tiering data to the cloud, the clusters that aren't tiering data to the cloud, and the number of clusters that don't support data tiering.

Data Overview

The amount of data that was tiered to the cloud, and the amount of hot and cold data on the cluster.

Total Savings

The amount of money that you've saved by tiering data to the cloud, as well as the amount of money that you could save by tiering more data to the cloud.

Policies

The number of times that each tiering policy has been applied to a volume.

Marketplace Subscriptions

The number of clusters associated with each type of Marketplace Subscription and an indication about your subscription status.

Steps

1. Click [Tiering > On-Prem Overview](#).

Cloud Tiering technical FAQ

This FAQ can help if you're just looking for a quick answer to a question.

ONTAP

The following questions relate to ONTAP.

What are the requirements for my ONTAP cluster?

It depends on where you tier the cold data. Refer to the following:

- [Tiering data from on-premises ONTAP clusters to Amazon S3](#)
- [Tiering data from on-premises ONTAP clusters to Azure Blob storage](#)
- [Tiering data from on-premises ONTAP clusters to Google Cloud Storage](#)
- [Tiering data from on-premises ONTAP clusters to StorageGRID](#)
- [Tiering data from on-premises ONTAP clusters to S3 object storage](#)

Does Cloud Tiering enable inactive data reporting?

Yes, Cloud Tiering enables inactive data reporting on each aggregate. This setting enables us to identify the amount of inactive data that can be tiered to low-cost object storage.



Cloud Tiering enables inactive data reporting on HDD aggregates if the cluster is running ONTAP 9.6 or later.

Can I tier data from NAS volumes and SAN volumes?

You can tier data from NAS volumes to the public cloud or to private clouds, like StorageGRID. When tiering data that is accessed by SAN protocols, NetApp recommends using private clouds due to connectivity considerations.

What about Cloud Volumes ONTAP?

If you have Cloud Volumes ONTAP systems, you'll find them in the Cluster Dashboard so you get a full view of data tiering in your hybrid cloud infrastructure.

From the Cluster Dashboard, you can view tiering information similar to an on-prem ONTAP cluster: operational health, current savings, savings opportunities, details about volumes and aggregates, and more.

Cloud Volumes ONTAP systems are read-only from Cloud Tiering. You can't set up data tiering on Cloud Volumes ONTAP from Cloud Tiering. [You set up tiering for Cloud Volumes ONTAP from the working environment in Cloud Manager](#).

Object storage

The following questions relate to object storage.

Which object storage providers are supported?

Amazon S3, Azure Blob storage, Google Cloud Storage, NetApp StorageGRID, and S3-compatible object storage providers are supported.

Can I use my own bucket/container?

Yes, you can. When you set up data tiering, you have the choice to add a new bucket/container or to select an existing bucket/container.

Which regions are supported?

- [Supported AWS regions](#)
- [Supported Azure regions](#)
- [Supported Google Cloud regions](#)

Which S3 storage classes are supported?

Cloud Tiering supports data tiering to the *Standard*, *Standard-Infrequent Access*, *One Zone-IA*, or *Intelligent* storage classes. See [Supported S3 storage classes](#) for more details.

Which Azure Blob access tiers are supported?

Cloud Tiering supports data tiering to the *Hot* or *Cool* access tiers for your inactive data. See [Supported Azure Blob access tiers](#) for more details.

Which storage classes are supported for Google Cloud Storage?

Cloud Tiering supports data tiering to the *Standard*, *Nearline*, *Coldline*, and *Archive* storage classes. See [Supported Google Cloud storage classes](#) for more details.

Does Cloud Tiering use one object store for the entire cluster or one per aggregate?

One object store for the entire cluster.

Can I apply policies to my object store to move data around independent of tiering?

Yes. You can enable life cycle management so that Cloud Tiering transitions data from the default storage class/access tier to a more cost-effective tier after a certain number of days.

The life cycle rule is applied to all objects in the selected bucket for Amazon S3 and Google Cloud storage, and to all containers in the selected storage account for Azure Blob.

Connectors

The following questions relate to Connectors.

Where does the Connector need to be installed?

- When tiering data to S3, the Connector can reside in an AWS VPC or on your premises.
- When tiering data to Blob storage, the Connector can reside in an Azure VNet or on your premises.
- When tiering data to Google Cloud Storage, the Connector must reside in a Google Cloud Platform VPC.

- When tiering data to StorageGRID or other S3-Compatible storage providers, the Connector must reside on your premises.

Networking

The following questions relate to networking.

What are the networking requirements?

- The ONTAP cluster initiates an HTTPS connection over port 443 to your object storage provider.

ONTAP reads and writes data to and from object storage. The object storage never initiates, it just responds.

- For StorageGRID, the ONTAP cluster initiates an HTTPS connection over a user-specified port to StorageGRID (the port is configurable during tiering setup).
- A Connector needs an outbound HTTPS connection over port 443 to your ONTAP clusters, to the object store, and to the Cloud Tiering service.

For more details, see:

- [Tiering data from on-premises ONTAP clusters to Amazon S3](#)
- [Tiering data from on-premises ONTAP clusters to Azure Blob storage](#)
- [Tiering data from on-premises ONTAP clusters to Google Cloud Storage](#)
- [Tiering data from on-premises ONTAP clusters to StorageGRID](#)
- [Tiering data from on-premises ONTAP clusters to S3 object storage](#)

Permissions

The following questions relate to permissions.

What permissions are required in AWS?

Permissions are required [to manage the S3 bucket](#).

What permissions are required in Azure?

No extra permissions are needed outside of the permissions that you need to provide to Cloud Manager.

What permissions are required in Google Cloud Platform?

Storage Admin permissions are needed for a [service account that has storage access keys](#).

What permissions are required for StorageGRID?

[S3 permissions are needed](#).

What permissions are required for S3-compatible object storage?

[S3 permissions are needed](#).

Reference

Supported S3 storage classes and regions

Cloud Tiering supports several S3 storage classes and most regions.

Supported S3 storage classes

When you set up data tiering to AWS, Cloud Tiering automatically uses the *Standard* storage class for your inactive data. Cloud Tiering can apply a lifecycle rule so the data transitions from the *Standard* storage class to another storage class after a certain number of days. You can choose from the following storage classes:

- Standard-Infrequent Access
- One Zone-IA
- Intelligent-Tiering (where AWS automatically moves data between two tiers — Frequent Access and Infrequent Access - when access patterns change)

If you do not choose another storage class, then the data remains in the *Standard* storage class and no rules are applied.

When you configure a Cloud Tiering lifecycle rule, you must not configure any lifecycle rules when setting up the bucket in your AWS account.

[Learn about S3 storage classes.](#)

Supported AWS regions

Cloud Tiering supports the following AWS regions.

Asia Pacific

- Mumbai
- Seoul
- Singapore
- Sydney
- Tokyo

Europe

- Frankfurt
- Ireland
- London
- Paris
- Stockholm

North America

- Canada Central
- US East (N. Virginia)

- US East (Ohio)
- US West (N. California)
- US West (Oregon)

South America

- São Paulo

Supported Azure Blob access tiers and regions

Cloud Tiering supports two access tiers and most regions.

Supported Azure Blob access tiers

When you set up data tiering to Azure, Cloud Tiering automatically uses the *Hot* access tier for your inactive data. Cloud Tiering can apply a lifecycle rule so the data transitions from the *Hot* access tier to the *Cool* access tier after a certain number of days.

If you do not choose the *Cool* access tier, then the data remains in the *Hot* access tier and no rules are applied.

When you configure a Cloud Tiering lifecycle rule, you must not configure any lifecycle rules when setting up the container in your Azure account.

[Learn about Azure Blob access tiers.](#)

Supported Azure regions

Cloud Tiering supports the following Azure regions.

Africa

- South Africa North

Asia Pacific

- Australia East
- Australia Southeast
- East Asia
- Japan East
- Japan West
- Korea Central
- Korea South
- Southeast Asia

Europe

- France Central
- Germany West Central

- Germany North
- North Europe
- UK South
- UK West
- West Europe

North America

- Canada Central
- Canada East
- Central US
- East US
- East US 2
- North Central US
- South Central US
- West US
- West US 2
- West Central US

South America

- Brazil South

Supported Google Cloud storage classes and regions

Cloud Tiering supports several Google Cloud storage classes and most regions.

Supported GCP storage classes

When you set up data tiering to GCP, Cloud Tiering automatically uses the *Standard* storage class for your inactive data. Cloud Tiering can apply a lifecycle rule so the data transitions from the *Standard* storage class to other storage classes after a certain number of days. You can choose from the following storage classes:

- Nearline
- Coldline
- Archive

If you do not choose another storage class, then the data remains in the *Standard* storage class and no rules are applied.

When you configure a Cloud Tiering lifecycle rule, you must not configure any lifecycle rules when setting up the bucket in your Google account.

[Learn about Google Cloud Storage classes.](#)

Supported Google Cloud regions

Cloud Tiering supports the following regions.

Americas

- Iowa
- Los Angeles
- Montreal
- N. Virginia
- Oregon
- Sao-Paulo
- South Carolina

Asia Pacific

- Hong Kong
- Mumbai
- Osaka
- Singapore
- Sydney
- Taiwan
- Tokyo

Europe

- Belgium
- Finland
- Frankfurt
- London
- Netherlands
- Zurich

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