Technical Report

Cloud Sync with NetApp E-Series Systems

Solution Deployment

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Abstract

This document describes a solution in which you can establish a NetApp® Cloud Sync relationship between two remote NetApp E-Series systems using a basic setup of an NFS server with Windows 2016 and Red Hat 7.9.

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Overview of Cloud Sync and E-Series systems

Cloud Sync is a data migration tool offered by NetApp that supports platforms such as AWS, Azure, Google Cloud, IBM Cloud Object Storage, NetApp® ONTAP®, NFS, and SMB. It can be accessed via a GUI, REST API, or the CLI.

There are a number of approaches to moving data between storage systems. Cloud Sync is one such approach that is supported by NetApp. It is an efficient, user-friendly tool that works with a variety of storage systems and storage system vendors.

To use Cloud Sync with NetApp E-Series systems, you must perform extra steps at the host level. This document describes how to get an NFS server running for both Windows 2016 and Red Hat 7.9 and then connect to NetApp E-Series storage systems.

Use cases

Although Cloud Sync is a generic solution that can be used in many different solutions, a solution may already exist for certain specific use cases. These specialized solutions may offer better tuning for a better experience.

With Cloud Sync, you can perform tasks such as the following:

- Moving data from a file system backed by an E-Series system to cloud backup, such as AWS Glacier.
- Moving data from a file system backed by an E-Series system to a NetApp StorageGRID® object store.
- Moving data from a cloud backup to an off-site E-Series system.

  Note: NetApp E-Series has native support for Asynchronous Remote Volume Mirroring (ARVM), which may be better suited to this task.

Technology

Cloud Sync is a software-as-a-service (SaaS) solution that consists of a data broker, a cloud-based platform, a source, and a target. The data broker syncs the data from the source to the target, acting as a middleman for the transactions. The data broker software can be installed in AWS, Azure, or Google Cloud, or on a Linux system on the premises.

Figure 1 shows the relationship between Cloud Sync components.

Figure 1) Cloud Sync overview.

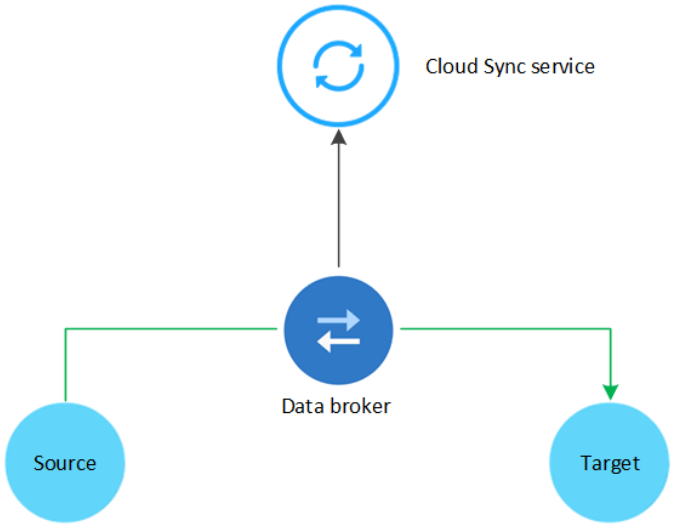
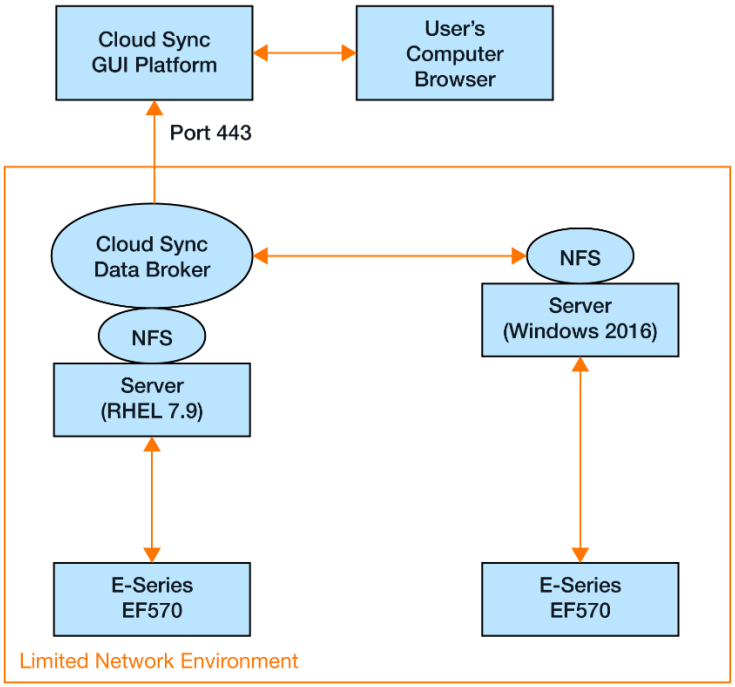


Figure 2 shows one possible configuration, with NetApp E-Series storage systems serving as both the source and the target. Because the data broker must be able to connect to both the target and the source, you might want to optionally install Cloud Sync onto the same system as the NFS server. The Cloud Sync Data Broker service should be installed on the Linux server inside the limited network environment, and an outbound connection should be allowed on port 443. This makes it possible to use the GUI outside of the environment while interacting with the connections inside the limited network environment.

Figure 2) Solution overview.



Pricing

You can select one of two pricing models for the Cloud Sync services:

- Hourly rate that is based on a maximum number of host relationships
- Annual payment

For current pricing information and information about how to acquire a license, go to How Cloud Sync licenses work.

Install NFS

This solution demonstrates how to establish a simple synchronization relation between an NFS server on Windows 2016 and an NFS server running on Red Hat 7.9. This is a generic solution to get Cloud Sync working with NetApp E-Series systems.

Requirements

This section covers the technology requirements for the primary use case.

Network

You must have outbound internet access over port 443 to communicate with the Cloud Sync service for the data broker. The browser for initiating the synchronization relationship must also have port 443 open.

This solution describes a limited-network environment with internet access, but with limited inbound services. Therefore, a specific type of data broker is used to alleviate this pain point.

For full information about endpoints, go to Endpoints that are required for Cloud Sync.

Hardware

This solution uses two hosts and two storage systems. The models of the storage systems and hosts do not have to be the ones addressed in Table 1. You simply need two systems that are attached to the E-Series system and that have a network path to communicate. Although this particular solution can be used on two Dell R720s or two NetApp HCI H615Cs, we opted to use both systems in the relationship to ensure correct functionality.

The following list shows the hardware components that are required to implement the use case described in this document.

List 1) Hardware requirements.

NetApp HCI H615C (Model H615-75031): Quantity 1 • Two Intel Xeon Gold 6242 processors @ 2.8GHz • 512GB RAM • iSCSI protocol used the base networking 2x 10/25Gbe (Mellanox Connect-X 4)
Dell R720: Quantity 1 • Two Intel Xeon CPU E5-2620 0 @ 2.00GHz • 32GB RAM • iSCSI protocol used the base networking 2x 10/25Gbe (Mellanox Connect-X 4)
NetApp EF280 all-flash array: Quantity 2 • 25Gb iSCSI HICs for the iSCSI solution • Built-in 16Gb FC baseboard ports for the FC solution • 24 MZILS15THMLS-0G4 - 15TB SSD drives • One disk pool spanning all drives • 8 volumes presented to host

Software

This solution can be used on different operating systems, but the steps may vary. Guides are available to create an NFS server for most operating systems.

List 2 contains the list of software components that are required to implement the exact use case described in this document.

List 2) Hardware requirements.

NetApp Cloud Sync License: Quantity 1

Windows 2016 OS License: Quantity 1 • Installed on the NetApp HCI VM
VMware ESXi 6.5.0 Update 3: Quantity 1 • Installed on the NetApp HCI VM
Red Hat Enterprise Linux 7.9: Quantity 1 • Installed on Dell 720

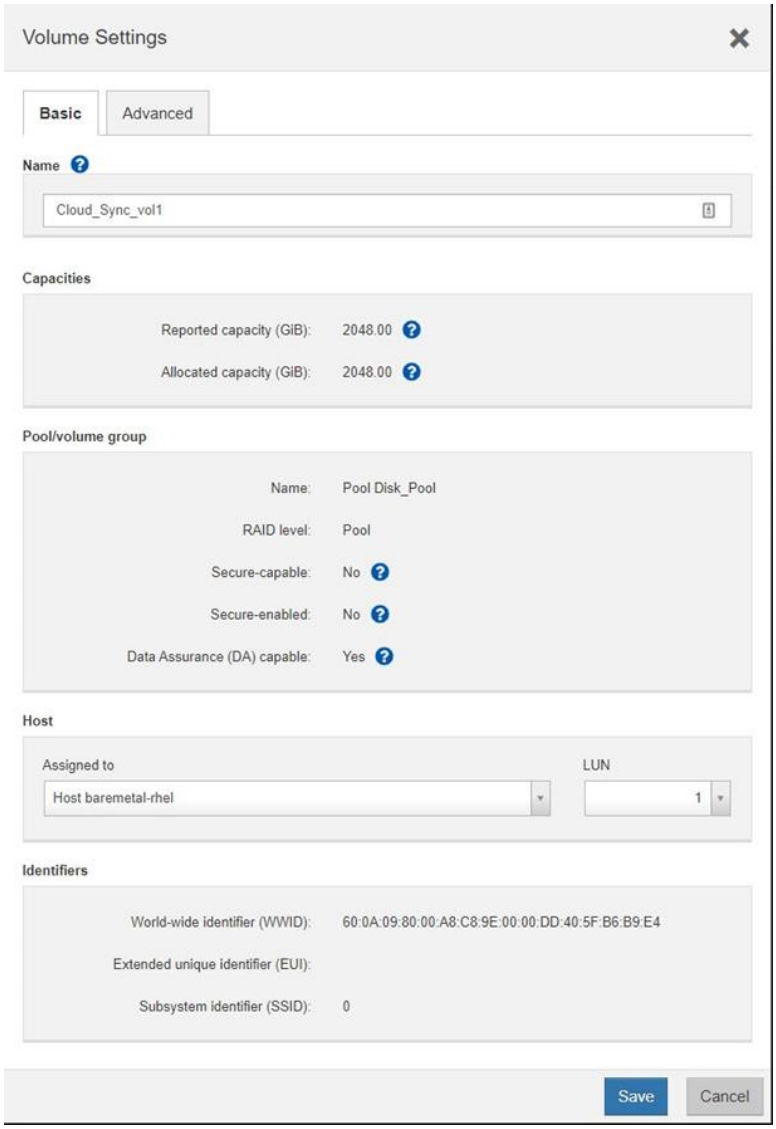
NFS for RHEL installation

The following instructions assume that the NetApp E-Series system has already been cabled and connected.

Note: The cabling and configuration of the NetApp E-Series system to the server is out of scope of this document. Refer to the appropriate guide for configuration.

To install NFS for RHEL, follow these steps.

1. Locate the block device to use.
   a. To find the specific volume ID, open NetApp SANtricity® System Manager. Go to Storage > Volumes. Click the desired volume and then select View/Edit settings. The WWID and EUI appear under Identifiers.



b. You can then match that ID on the Red Hat server, as shown in the following example.

```
[root@localhost ~]# multipath -ll
…

3600a098000a8c89e0000dd405fb6b9e4 dm-27 NETAPP  ,INF-01-00
size=2.0T features='4 queue_if_no_path pg_init_retries 50 retain_attached_hw_handle' hwhandler='1
alua' wp=rw
`-+- policy='service-time 0' prio=50 status=active
  `- 10:0:0:2 sdh 8:112 active ready running

…
```

2. Create a file system on the block device. You can use EXT4 or XFS. You must make a directory for it, mount that directory to the file system, and then give it higher permissions.

```
# mkfs.xfs /dev/mapper/<BLOCK_DEVICE>
mkfs.xfs /dev/mapper/3600a098000a8c89e0000dd405fb6b9e4
#mkdir  /mnt/<DIRECTORY_NAME>
mkdir  /mnt/data

#mount /dev/mapper/<BLOCK_DEVCIE> /mnt/<DIRECTORY_NAME>
mount /dev/mapper/3600a098000a8c89e0000dd405fb6b9e4 /mnt/data
```



```
#chmod 777 /mnt/<DIRECTORY_NAME>
chmod 777 /mnt/data/
```

3. Make sure that the file system is mounted in case the system were to lose power or be rebooted. The `_netdev` attribute tells the system to wait for the network to establish before it is remounted.

   WARNING: Make sure that the connection is created and established before `fstab` is called (for example, iSCSI sessions have been established).

```
# echo '/dev/mapper/<BLOCK_DEVICE> /mnt/<DIRECTORY_NAME> <FILESYSTEM> _netdev 0 0' >> /etc/fstab
echo '/dev/mapper/3600a098000a8c89e0000dd405fb6b9e4 /mnt/data xfs _nevdev 0 0' >> /etc/fstab
```

4. Install `nfs-utils`.

```
yum install nfs-utils
```

5. Set up the NFS export.

   Note: If you have other file systems, you may need to change your `fsid` to an unused number. You should also understand the implications of the sync option, which ensures that data is written to persistent memory before being acknowledged. This option leads to a performance impact at the cost of ensuring that files are secure in various unexpected events such as a power outage. For this reason, NetApp strongly recommends using sync.

```
#bash -c 'echo "/mnt/<DIRECTORY_NAME>    *(rw,sync,fsid=1,no_subtree_check,no_root_squash)" >>
/etc/exports'
bash -c 'echo "/mnt/data    *(rw,sync,fsid=1,no_subtree_check,no_root_squash)" >> /etc/exports'
exportfs -a
```

6. Enable the services to come up on reboot.

```
systemctl enable --now rpcbind
systemctl enable --now nfs-server
```

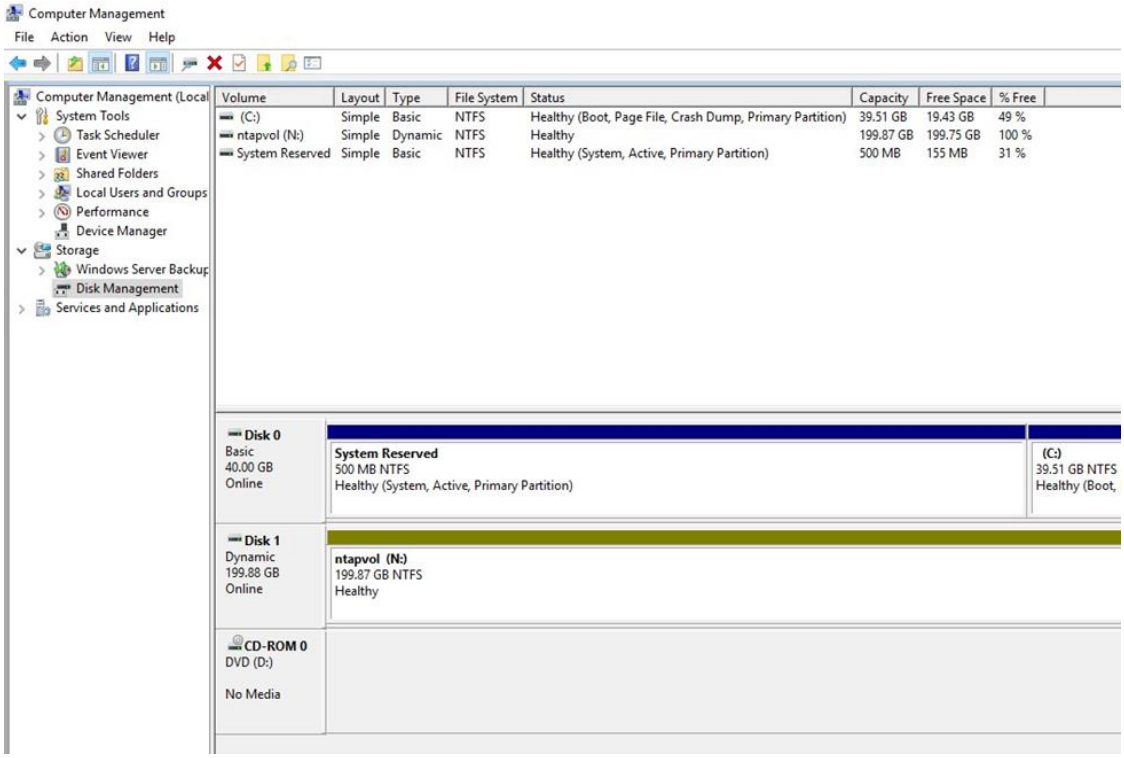
7. Test whether the mount can be written to. If the following can be executed without errors, you are finished.

```
mkdir /mnt/data_via_nfs
chmod 777 /mnt/data_via_nfs
mount -t nfs -overs=4.1 localhost:/mnt/data /mnt/data_via_nfs/
touch /mnt/data_via_nfs/test_file
```

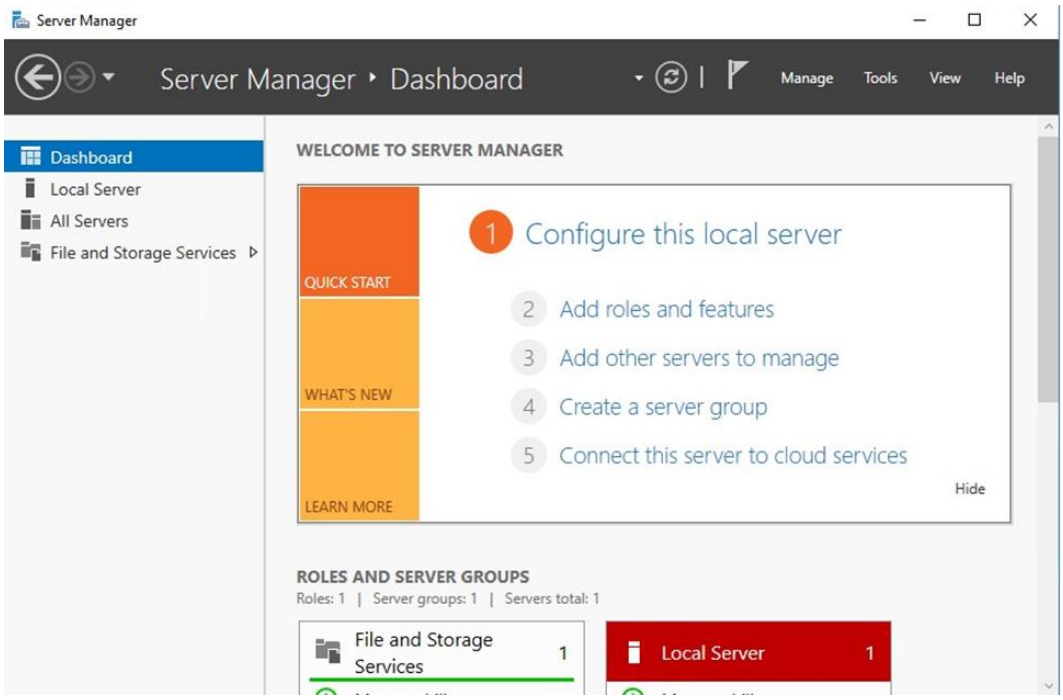
NFS for Windows installation

To install NFS for Windows, follow these steps.

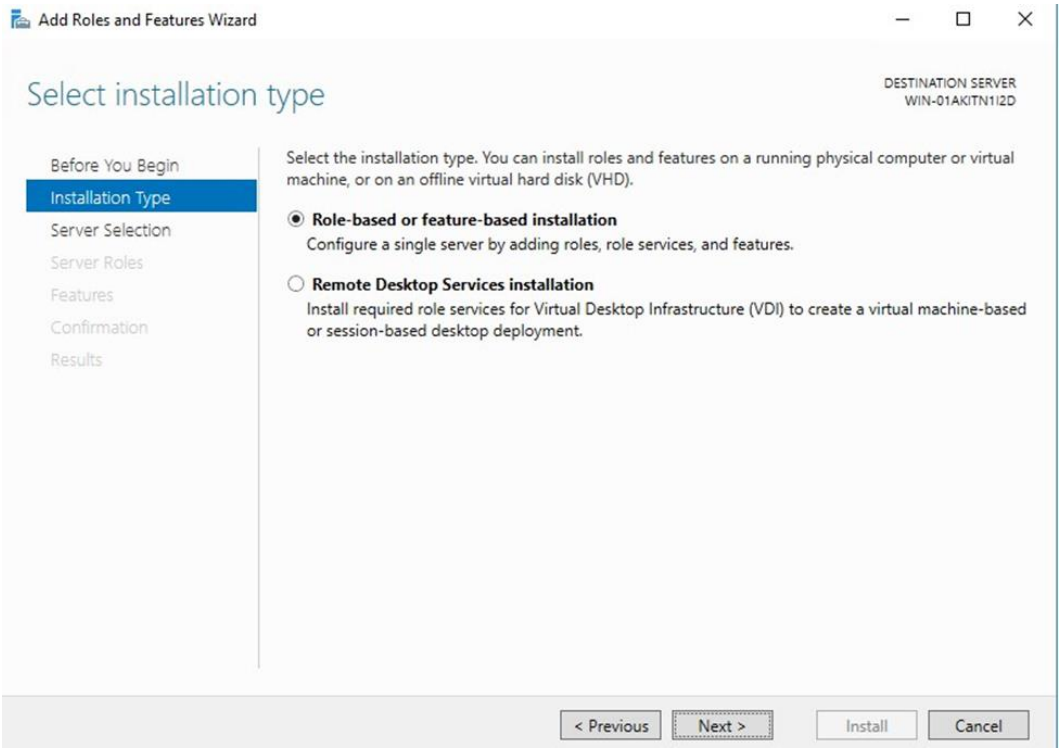
1. In Windows Disk Management, locate the disk to use. Right-click the disk and format it into an NTFS file system.



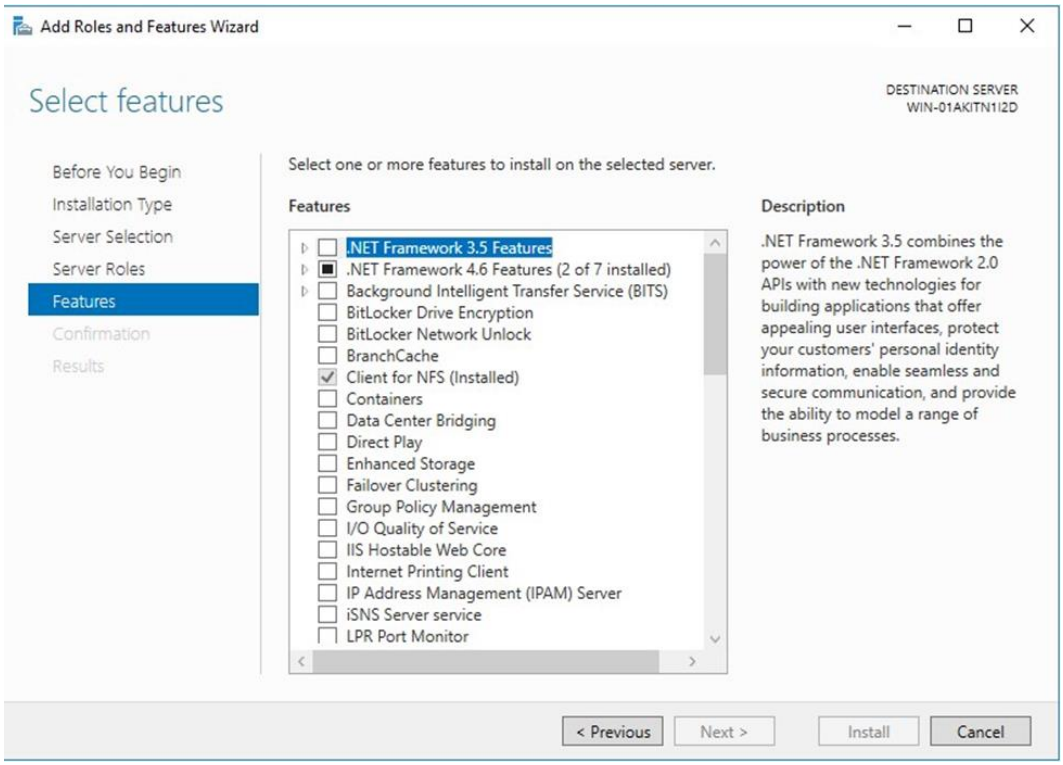
2. To install the NFS Client, go to the Windows Server Manager and click Add Roles and Features.



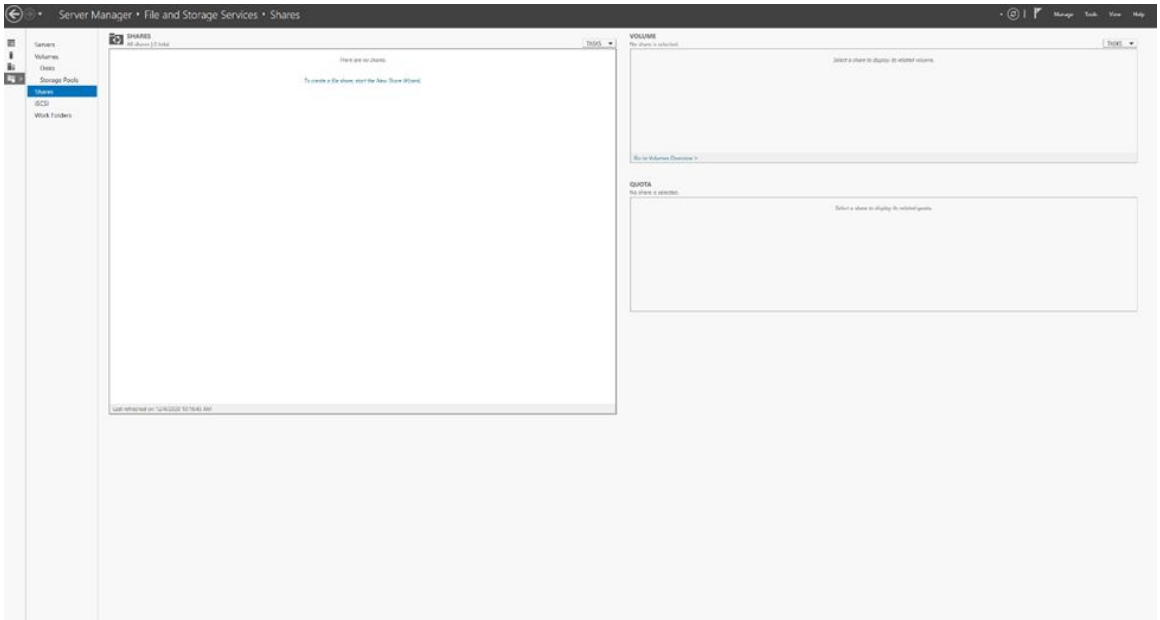
3. In the wizard, select Role-Based or Feature-Based Installation.



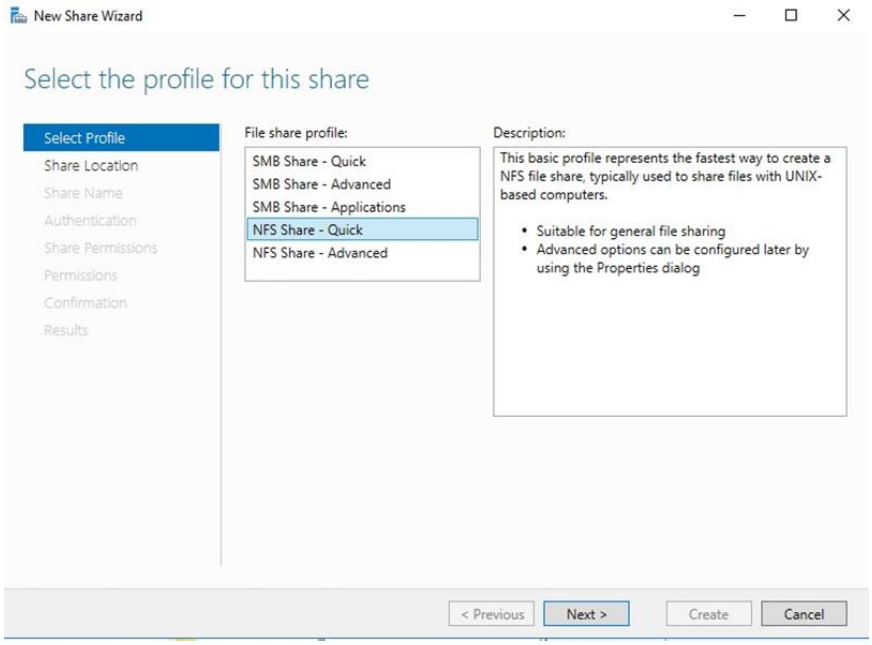
4. Skip Server Roles and move on to features. Check Client for NFS (Installed), click Next, and then click Install.



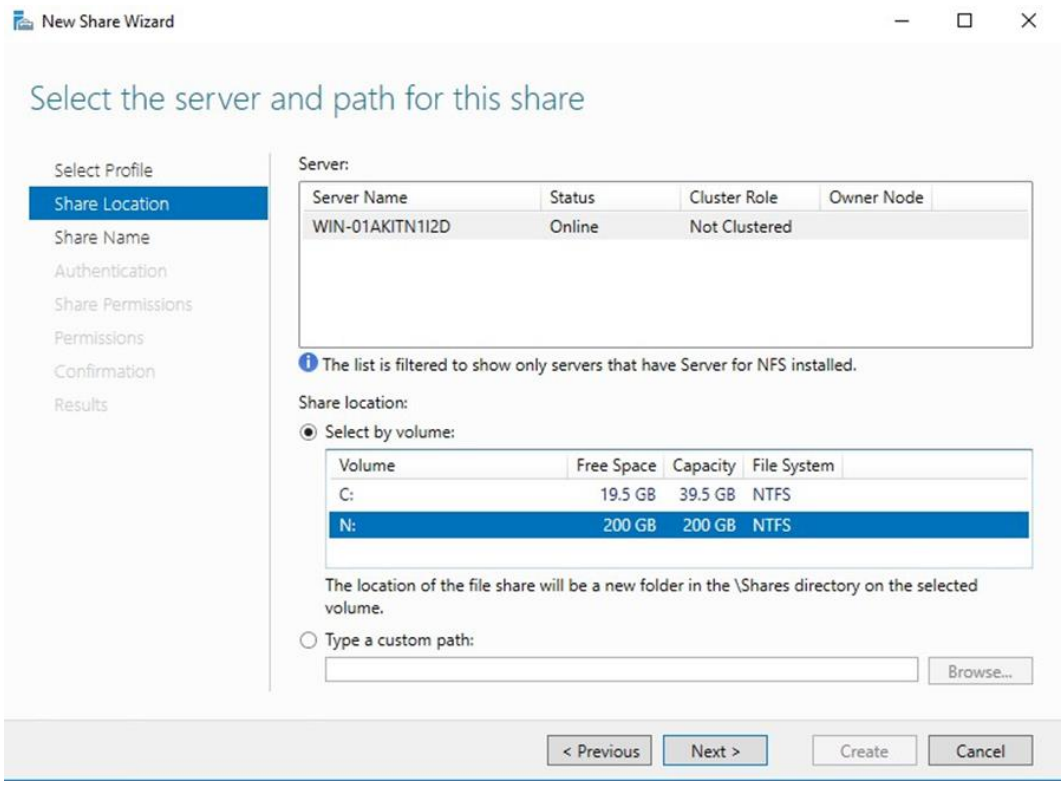
5. After installing the necessary tools, return to Server Manager, select File and Storage Service, and then select Shares.



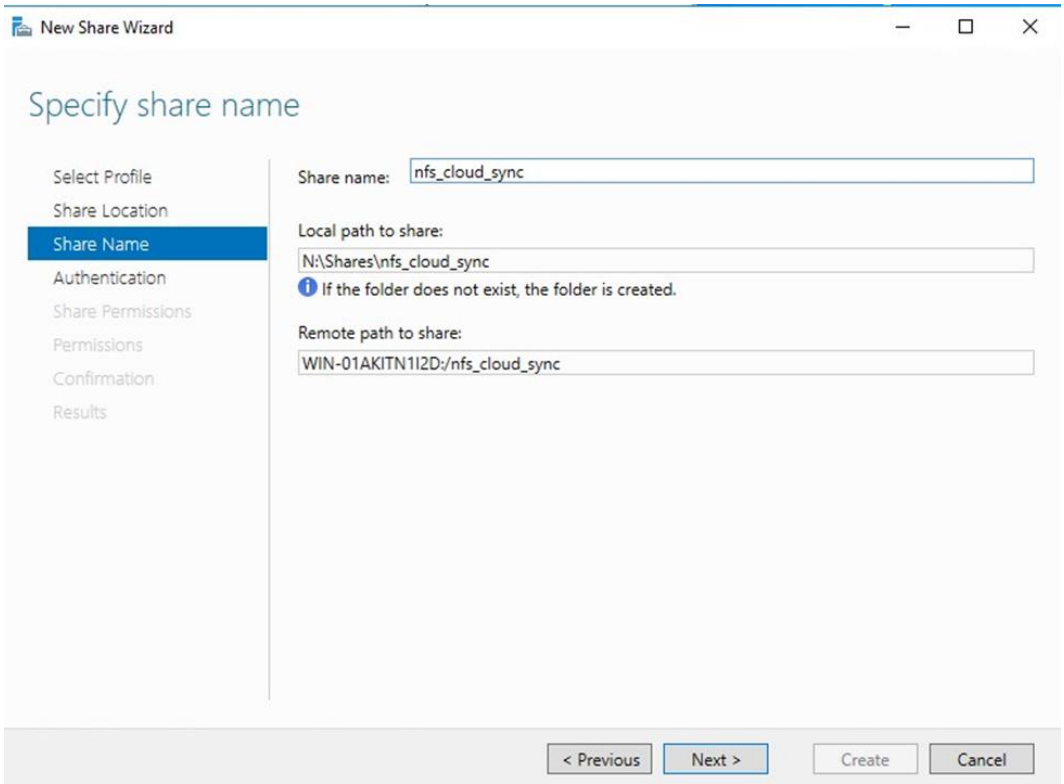
6. To start the file share wizard, open the Tasks drop-down menu or click the link “To create a file share, start the New Share Wizard.”
7. Use NFS Share - Quick profile. These settings are generally fine for most setups; advanced settings can be done through the Share properties.



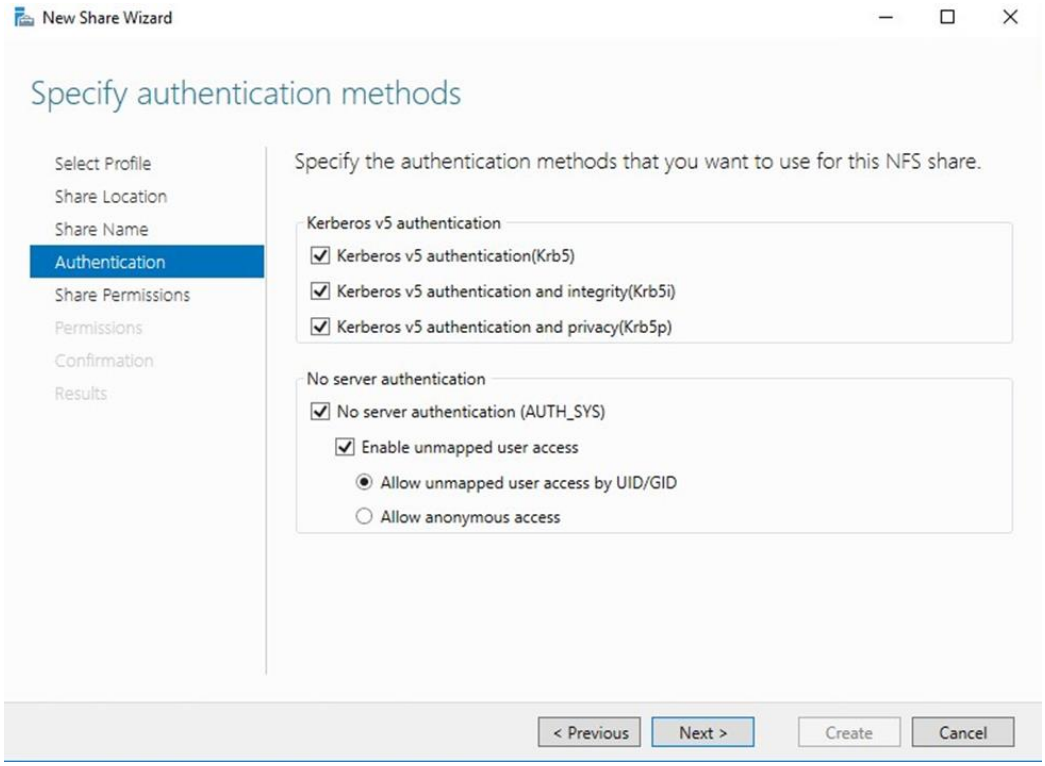
8. Locate and highlight your server and the appropriate file system. In this case, put the file system that represents the NetApp E-Series volume in volume N:.



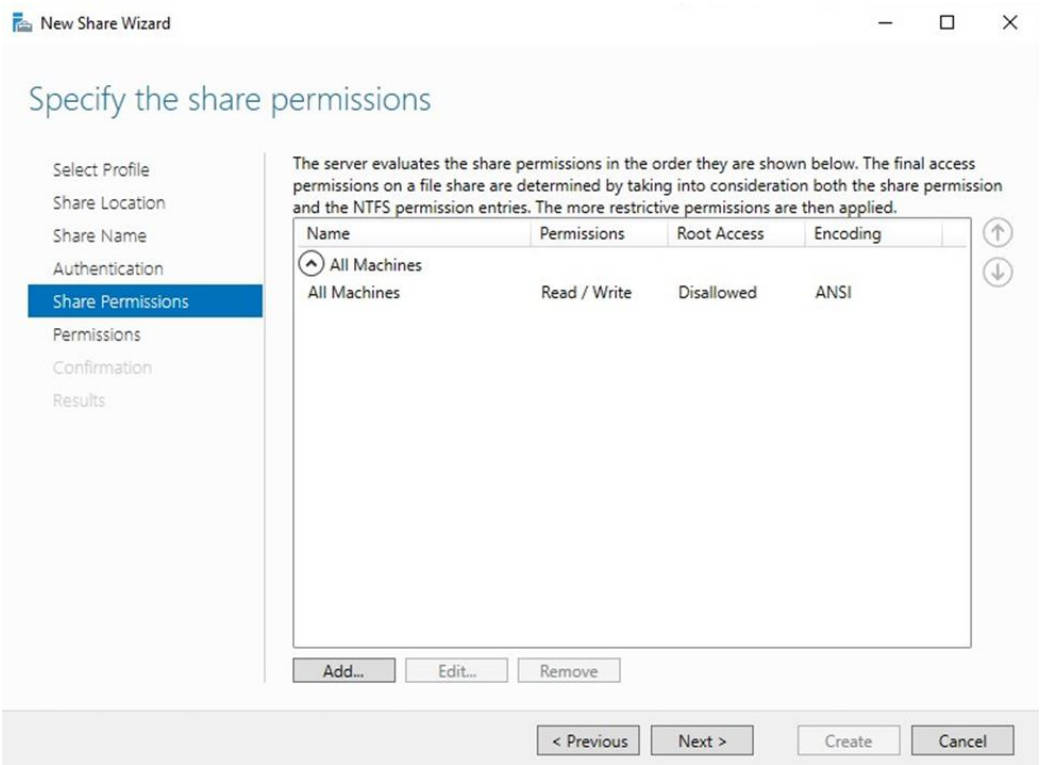
9. Give the share a name.



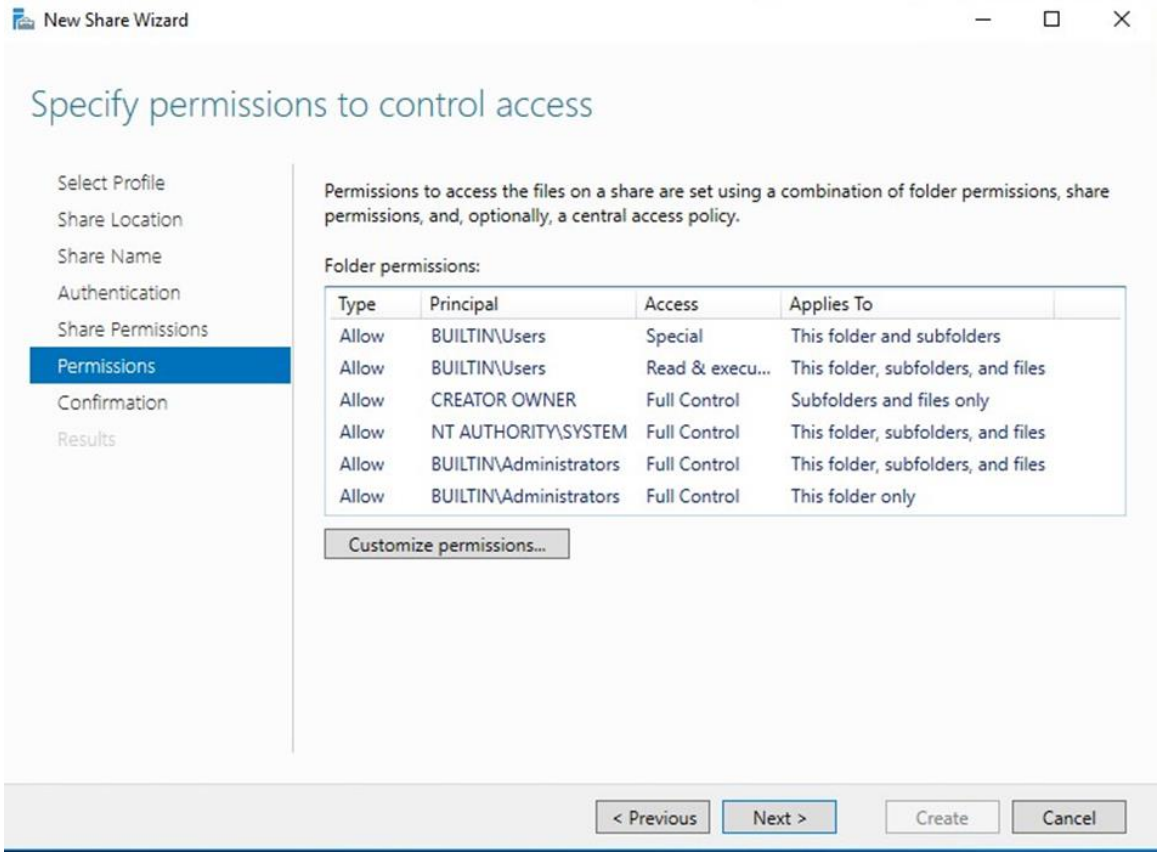
10. Change the next settings as desired. In this case, you can allow unmapped users to authenticate to the NFS server for ease of use.



11. Allow all machines Read/Write access for this example. This access can vary based on how the permissions are structured in the environment.

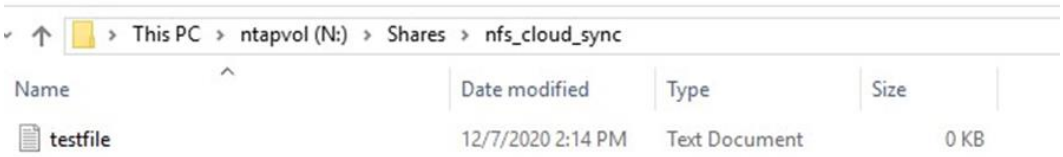


12. Use the default permissions; these can differ based on the environment.



13. (Optional) To test whether files can be easily written, go to Share and make an empty file. The Share will be in the following directory:

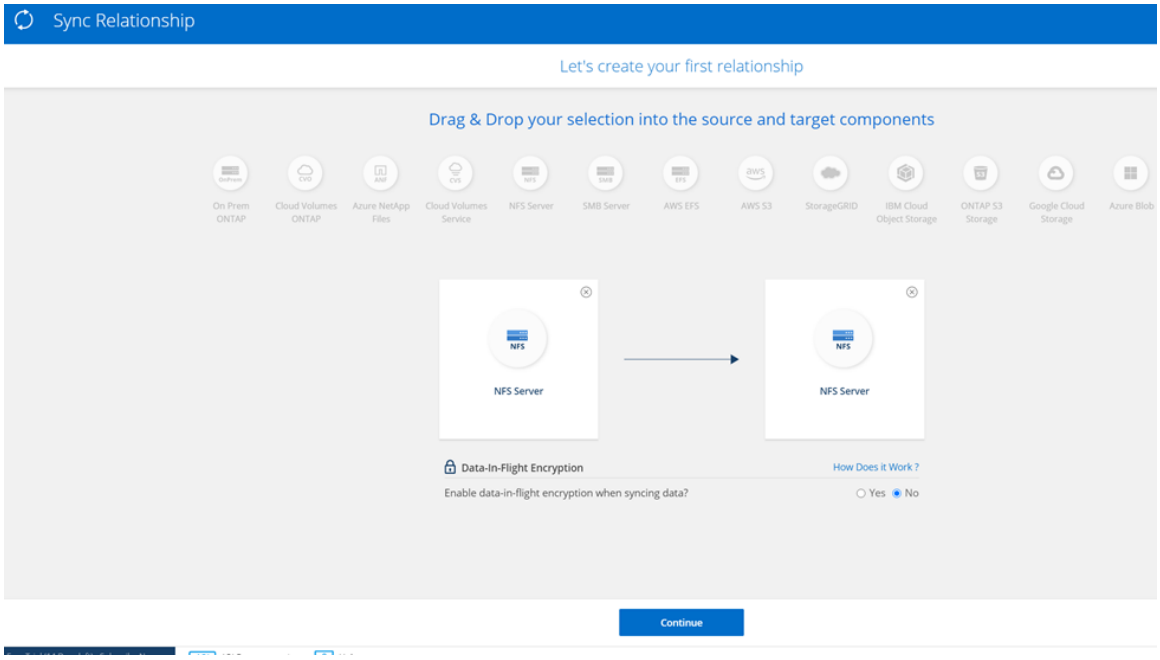
```
'specified directory/Shares/Name' E.G. N:/Shares/nfs_cloud_sync
```



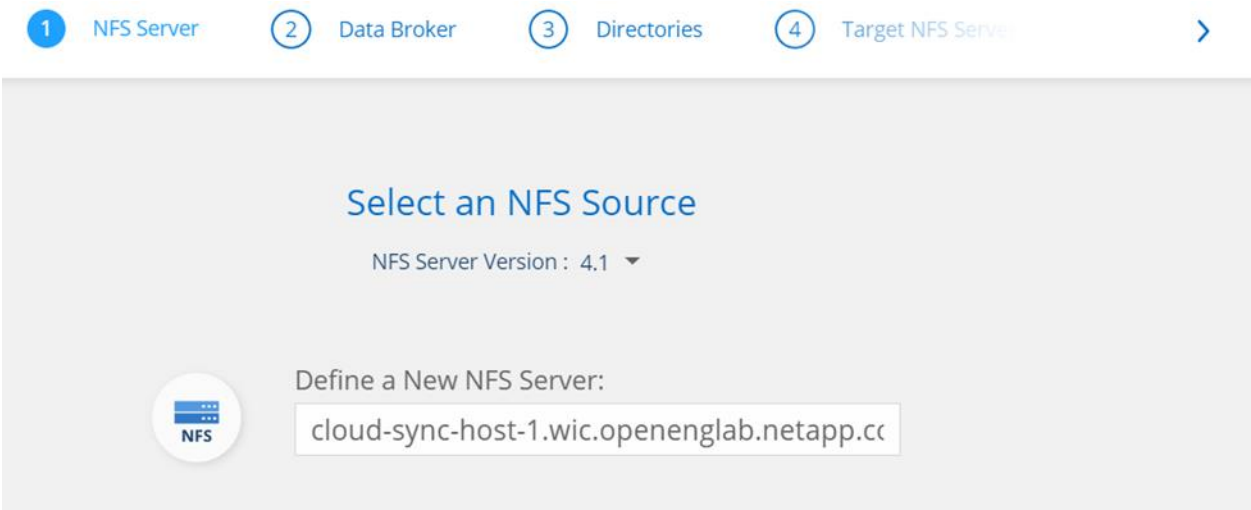
Create a sync relationship

After creating the NFS source and NFS targets, follow these steps to create the relationship.

1. Log into `https://www.cloudsync.netapp.com`.
2. Drag the NFS Server button onto Drag Source Here and Drag Target Here. For this example, do not enable in-flight encryption.

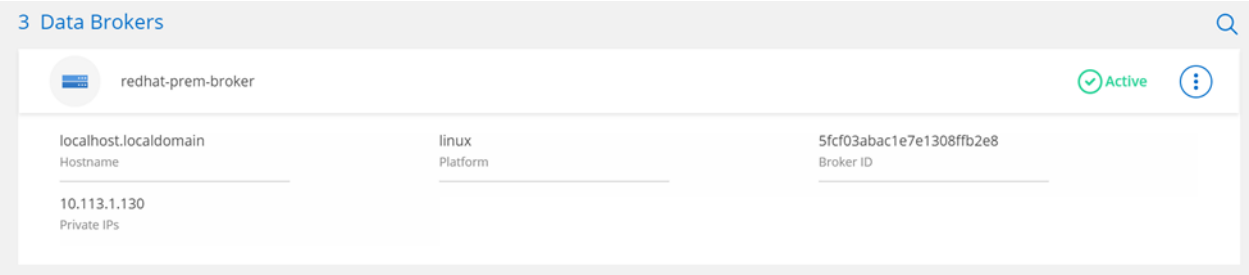


3. Specify which system is the NFS source and select the NFS version. In virtually all cases, you should specify the latest version that can be supported. In this case, up to NFS 4.1 is supported.

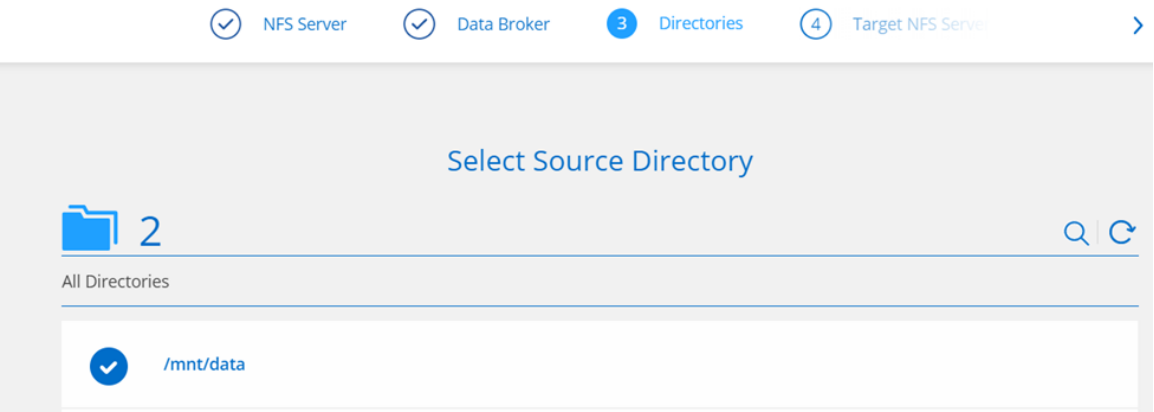


4. Select a data broker.

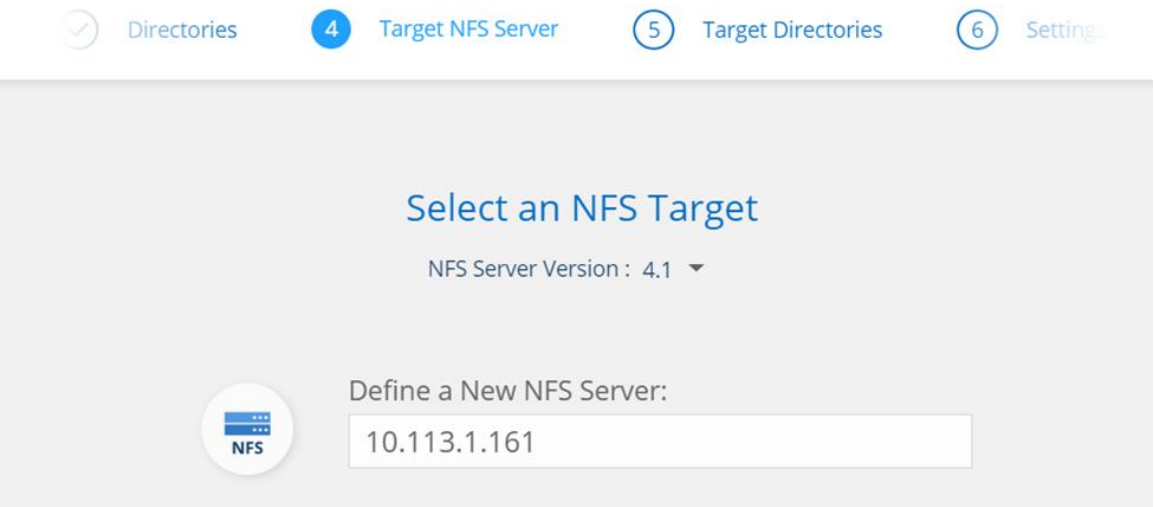
   For this example, there are two NetApp E-Series systems in a limited-network environment. The data broker will be installed on the Linux server in the environment so that the data broker can communicate to both servers in the limited-network environment. Refer to “Install the Data Broker,” later in this document, to understand and install the data broker that best fits your needs.



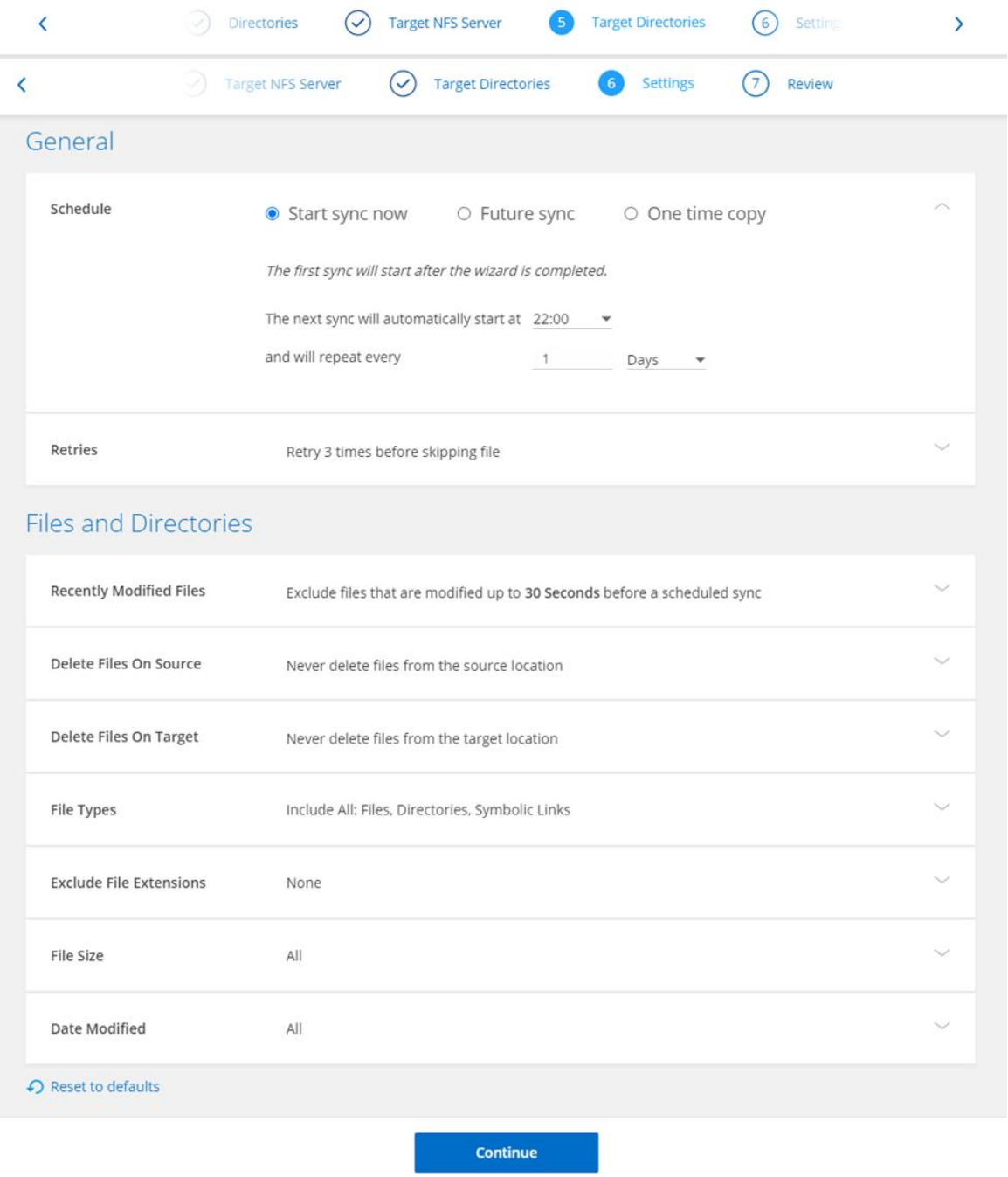
5. Select the directory for the sync.



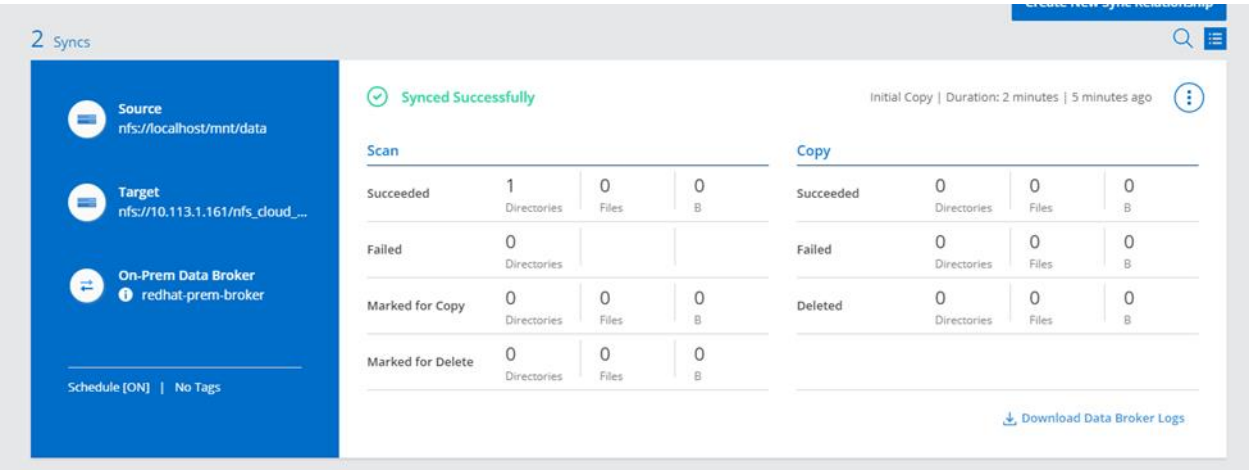
6. Select the target NFS server. In this case, use an IP address instead for the latest NFS version that can be supported.



7. Select the target directory.
8. Select the settings to edit. For example, we will set this operation to sync now and schedule a sync every day at 10:00 PM. In addition, we will look to never delete files on the source or target if a particular file is missing.



On the dashboard, you should see Synced Successfully.



9. (Optional) You can do some testing by creating a large file, for example with the following command, and rerunning the sync. Click the three dots and then click Sync Now.

   Note: There is a setting to exclude files that are modified up to 30 seconds before the scheduled sync.

```
truncate -s 100G /mnt/data/test_file.txt

# Create 100MB file with non-human readable data
dd if=/dev/urandom of=file.txt bs=1048576 count=100
```

Install the data broker

On-Prem Data Broker

An On-Prem Data Broker is useful in environments with limited network access and if the user does not have or won't need an Amazon Web Services account or service.

Requirements

Make sure that your environment meets the following requirements:

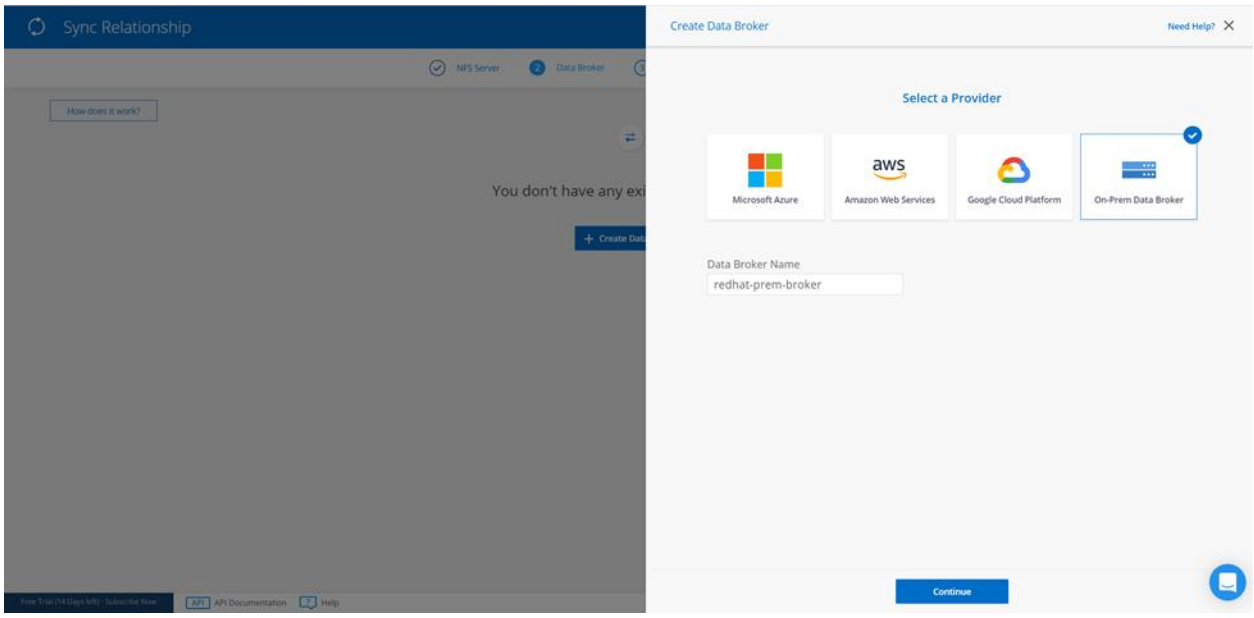
- Centos 7.0, 7.7, 8.0
- Red Hat Enterprise Linux 7 and 8.0
- Ubuntu Server 20.04 LTS
- SUSE 15 SP1
- Internet access with outbound port 443 open
- 16GB RAM, 4 CPUs
- OpenSSL is installed
- The data broker must have access to both the source and the target

For additional information, see Installing the data broker on a Linux host.

Installation

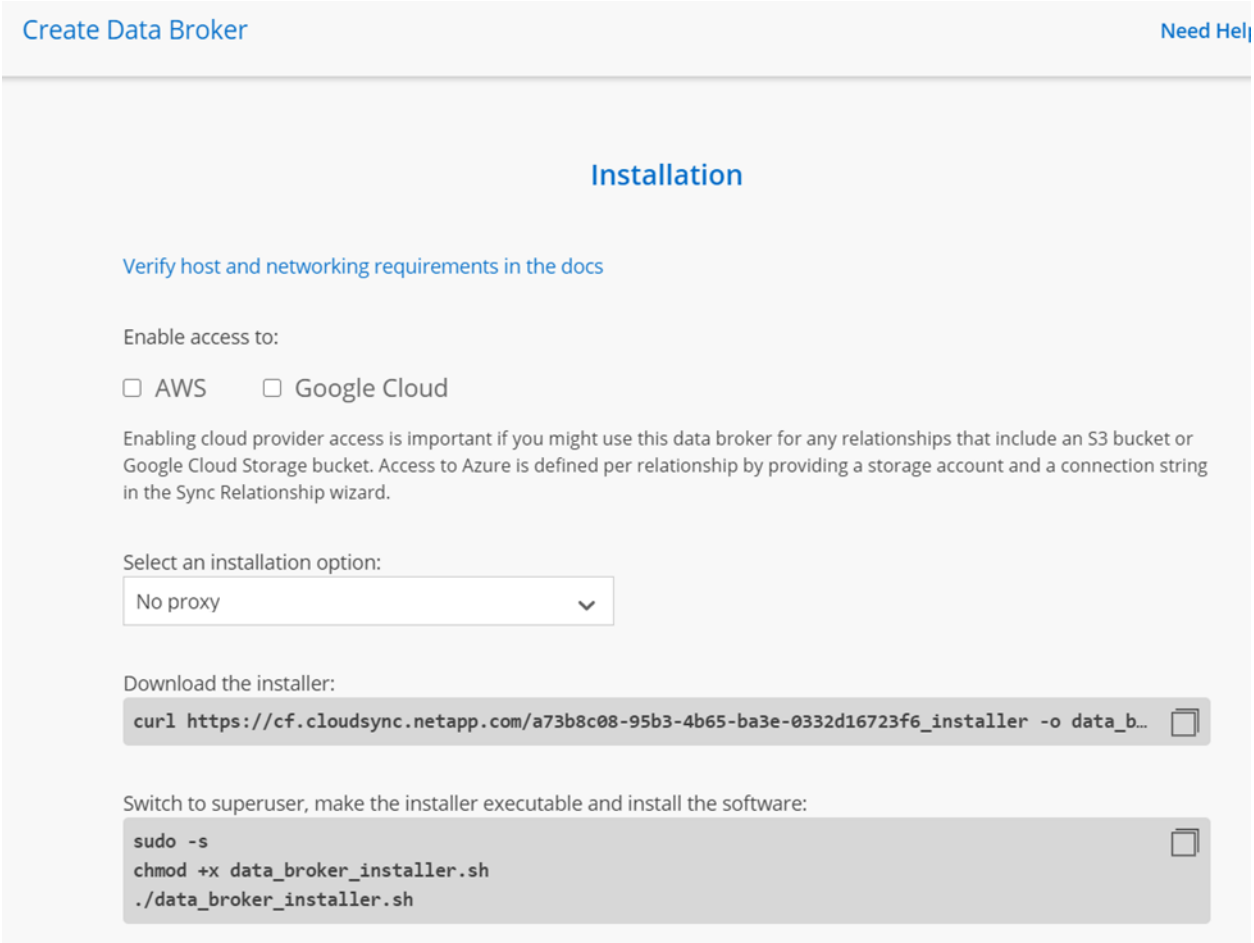
To install the data broker, follow these steps.

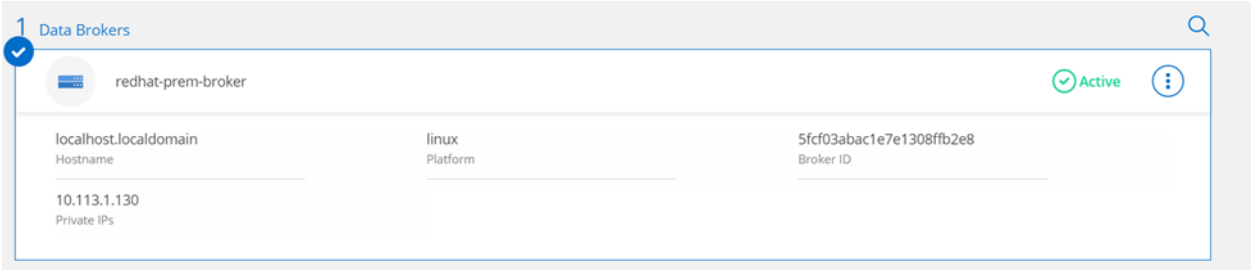
1. Create a data broker. This example shows a data broker on the Red Hat server, which is needed for its closed environment. In this closed environment, you need 443 open as an outbound port.



2. Click Create Data Broker and then click Continue. These steps create a personalized installer and instructions to set up the broker. When you have completed the steps, click Continue.

   You should see the following screen.





Note: If you see issues, make sure that `pm2-root` is started.

```
[root@localhost]# systemctl status pm2-root

● pm2-root.service - PM2 process manager
   Loaded: loaded (/etc/systemd/system/pm2-root.service; enabled; vendor preset: disabled)
   Active: active (running) since Mon 2020-12-07 22:46:20 CST; 1s ago
     Docs: https://pm2.keymetrics.io/
  Process: 22726 ExecStart=/usr/lib/node_modules/pm2/bin/pm2 resurrect (code=exited,
status=0/SUCCESS)
 Main PID: 34315 (node)
```

3. Complete the pages in the wizard to create the new sync relationship.

On-Prem Data Broker with AWS

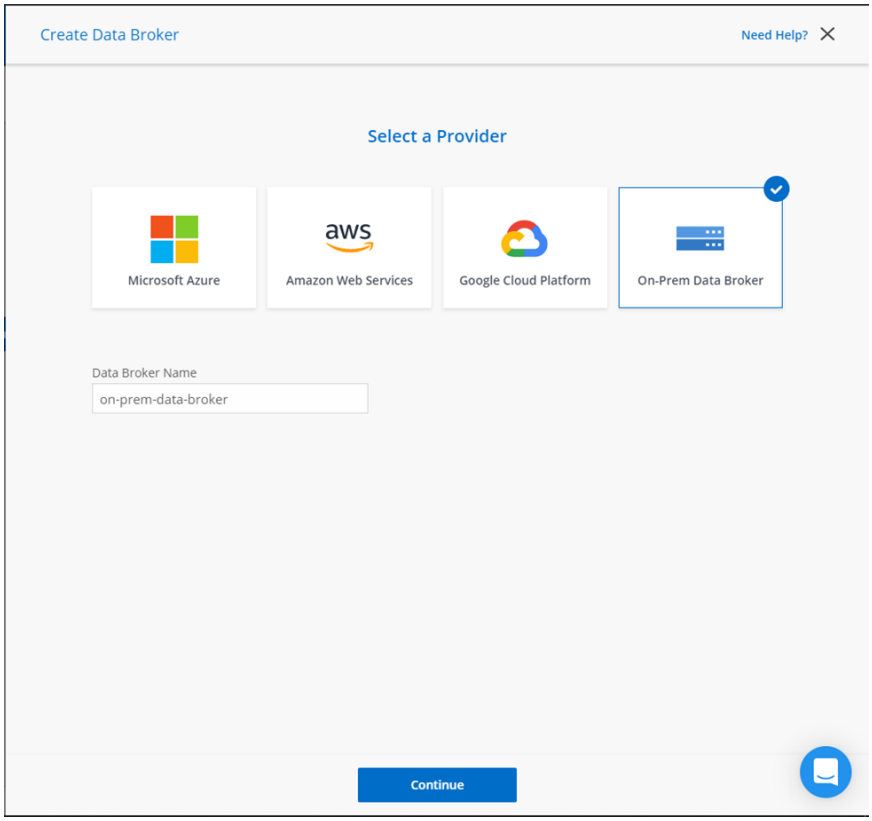
If you have a limited networking environment and want to have access to an external AWS data source or target, follow these instructions.

Requirements

To enable access to AWS, see Enabling access to AWS.

Installation

On the Data Broker page, click Create Data Broker and then select On-Prem Data Broker.



4. Enter a name for the data broker and click Continue.
5. On the instructions page:
   a. Enable access to AWS.
   b. Specify No Proxy.
   c. Execute the following commands:

```
#download the custom installer script
curl https://cf.cloudsync.netapp.com/<Unique_Key_ Installer> -o data_broker_installer.sh
#ignore if root
sudo -s
#assign executable permissions to installer script
chmod +x data_broker_installer.sh
#run installer script
./data_broker_installer.sh -a <aws_access_key> -s <aws_secret_key>
```

   d. Complete the pages in the wizard to create the new sync relationship.

AWS Data Broker

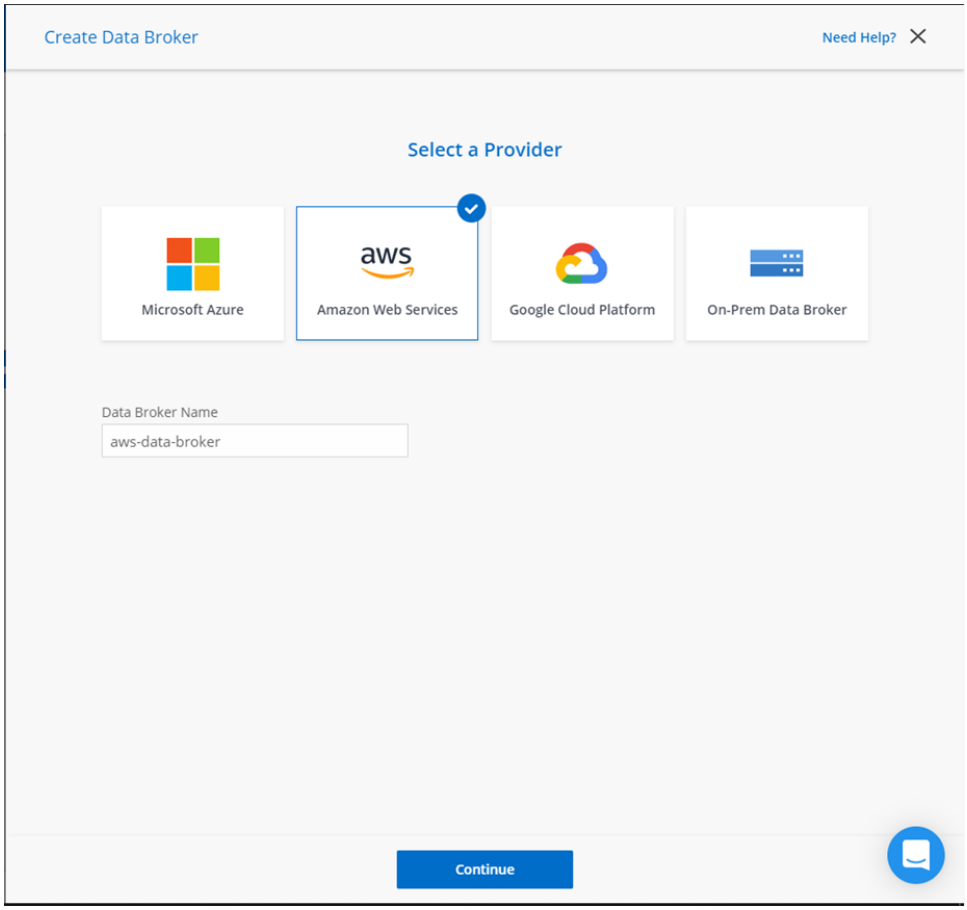
If you have an open network environment, follow these instructions. You are required to set up your Amazon Web Services account. This is a convenient data broker, which is easy to set up and maintain, and is generally the recommended method for an open network environment.

Requirements

For supported AWS regions, networking requirements, and permissions, see Installing the data broker in AWS.

Installation

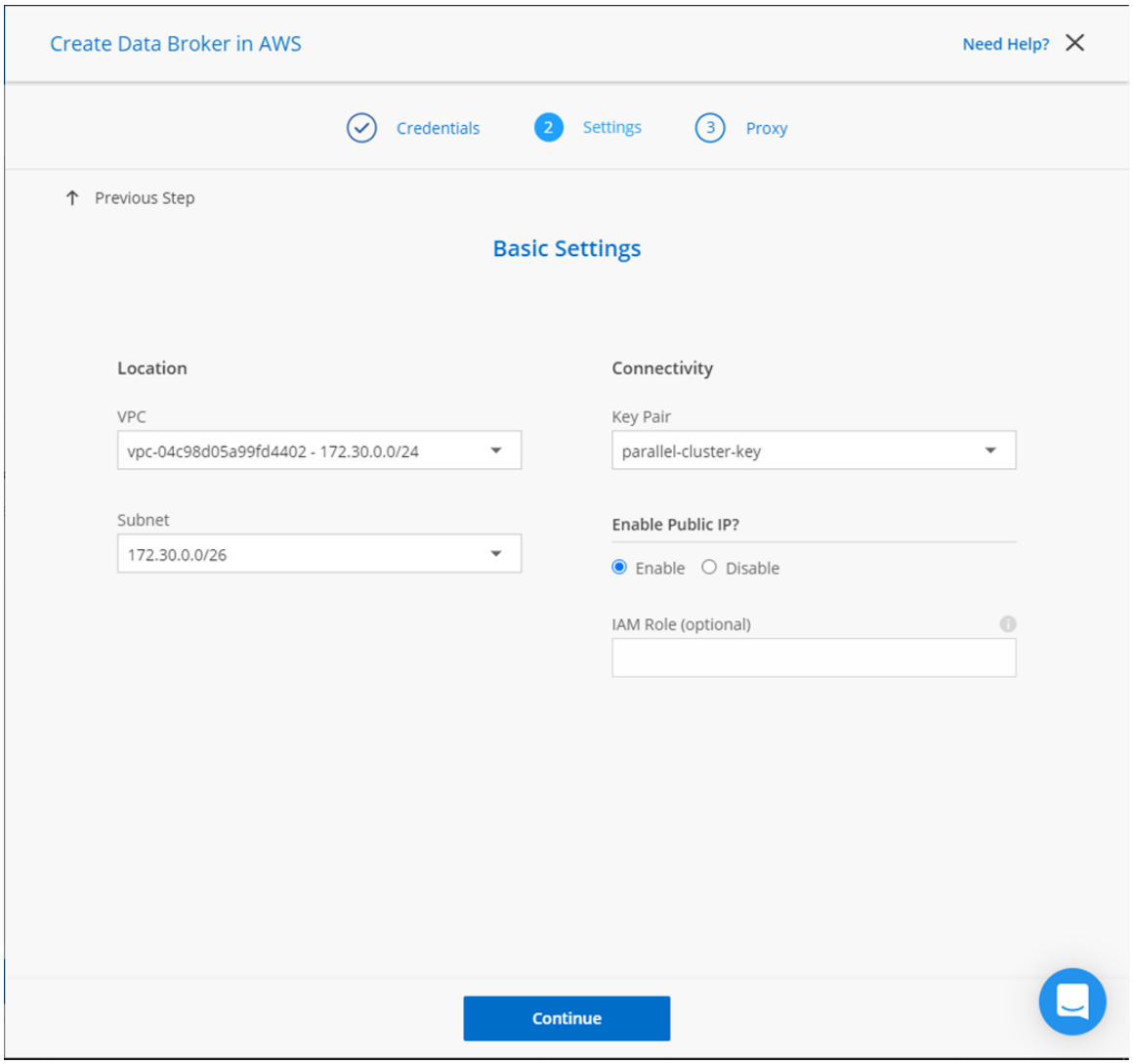
1. On the Data Broker page, click Create Data Broker and then select Amazon Web Services.



2. Enter a name for the data broker and click Continue.
3. Use one of the following two methods for deploying a data broker to your AWS account.

   First method for deploying a data broker to your AWS account:

   a. Enter an AWS access key so that Cloud Sync can create the data broker in AWS.
   b. Select a location for the instance, select a key pair, choose whether to enable a public IP address, and then select an existing IAM role. Or leave the field blank so that Cloud Sync creates the role for you.
   c. If a proxy is required for internet access in the VPC, specify a proxy configuration.

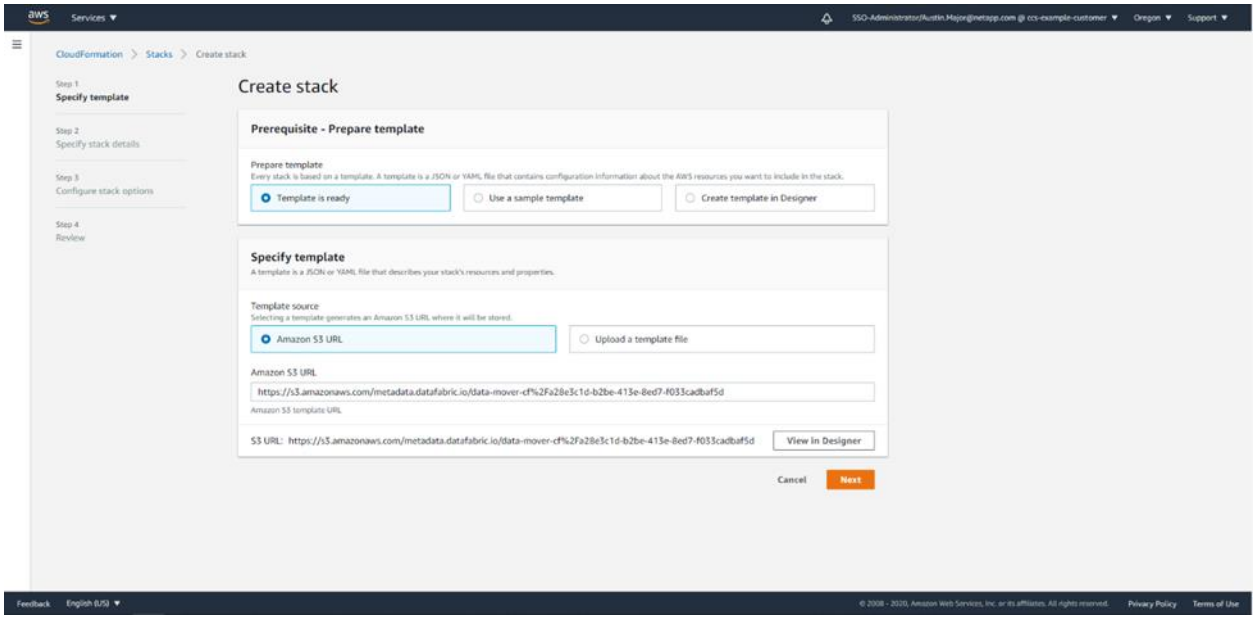


d. When the data broker is available, click Continue in Cloud Sync.

e. Complete the pages in the wizard to create the new sync relationship.

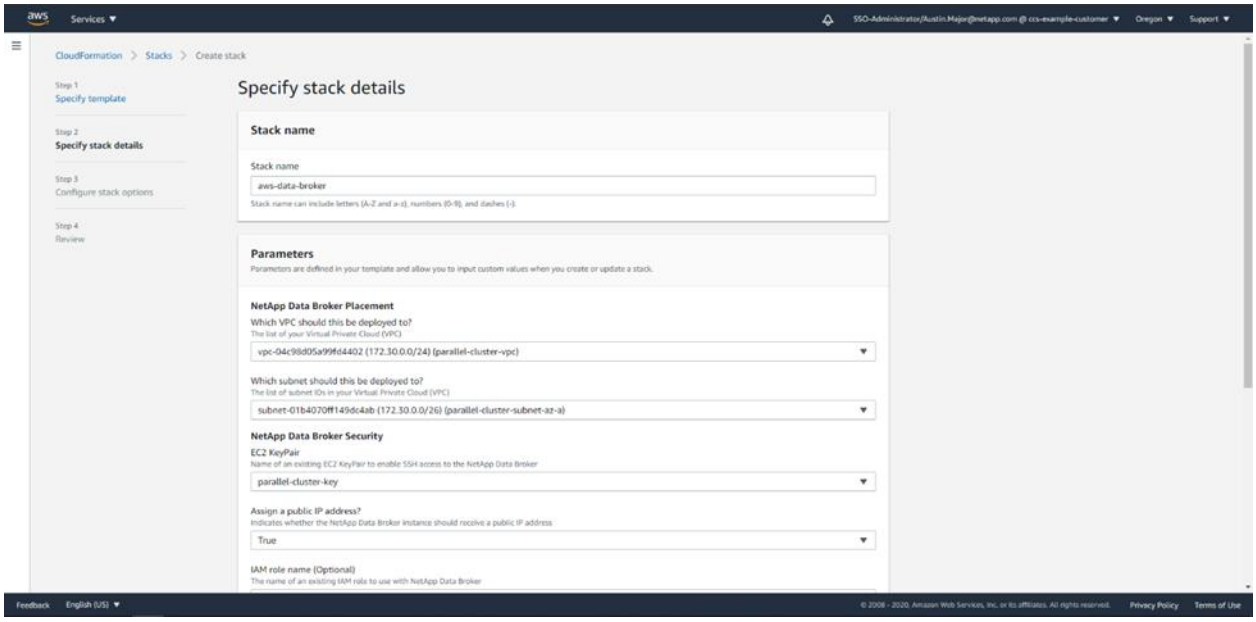
Second method for deploying a data broker to your AWS account:

If you would prefer not to provide access keys, click the link at the bottom of the page to use a CloudFormation template instead. When you use this option, you do not need to provide credentials because you are logging in directly to AWS.

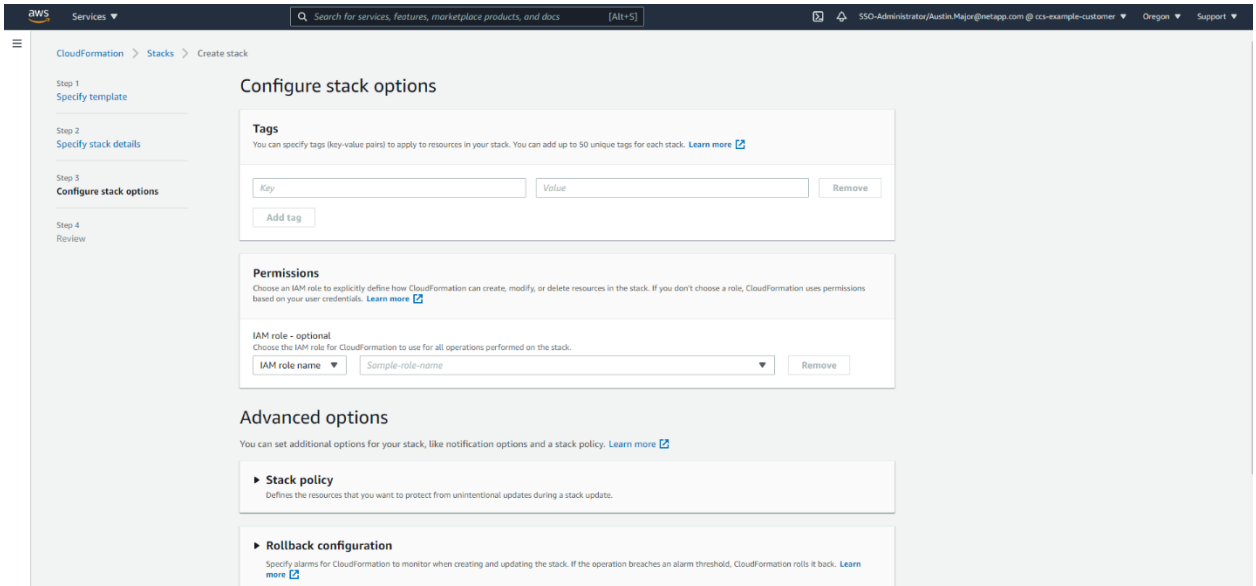


a. The necessary information has already been filled in for you. Click Next.

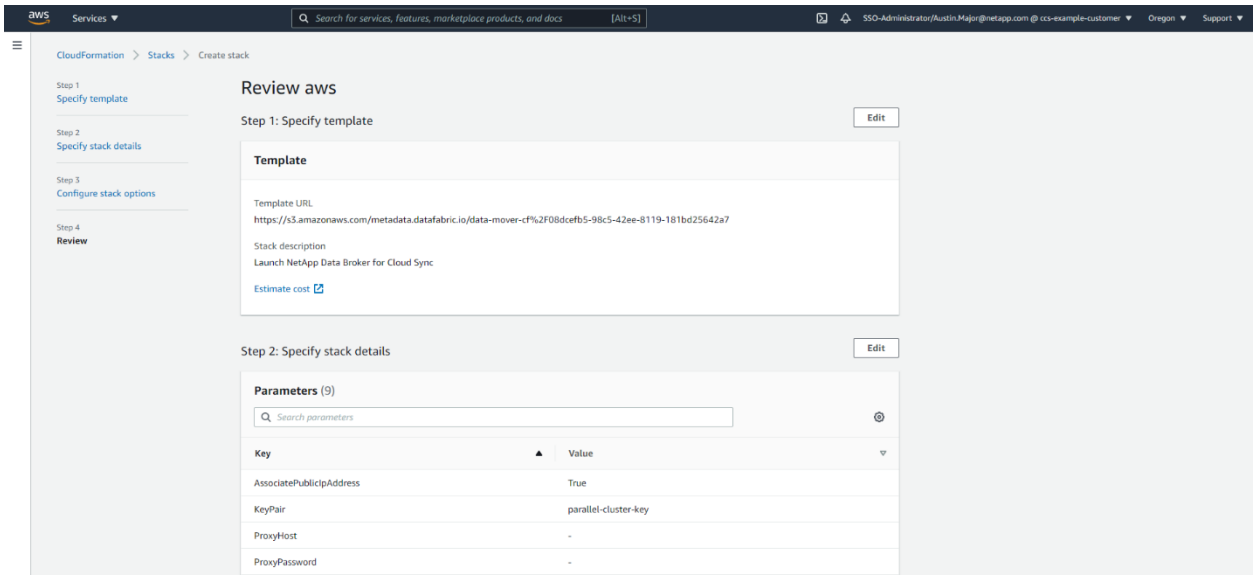
b. Select a VPC, subnet, and EC2 KeyPair. You do not need to configure anything under Assign a Public IP Address. Click Next.



c. You do not need to configure anything under Configure Stack Options. Click Next.

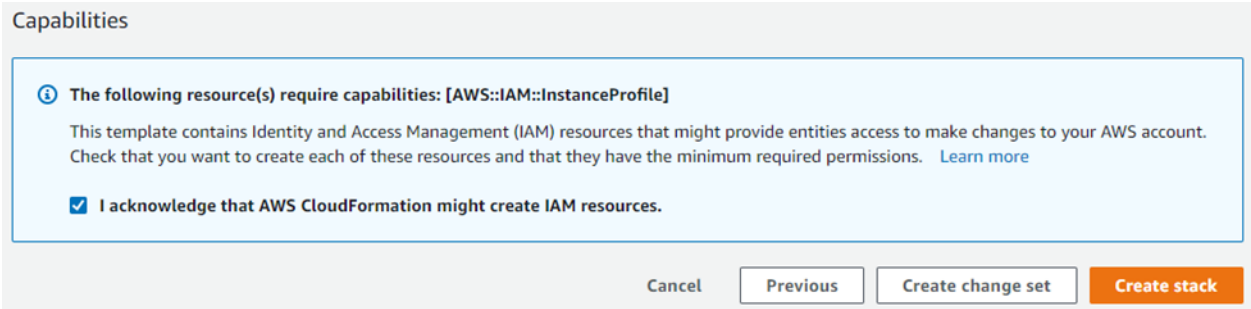


d. You do not need to configure anything under Review.



e. Select the option that specifies that AWS CloudFormation might create IAM resources.

f. Click Create Stack.



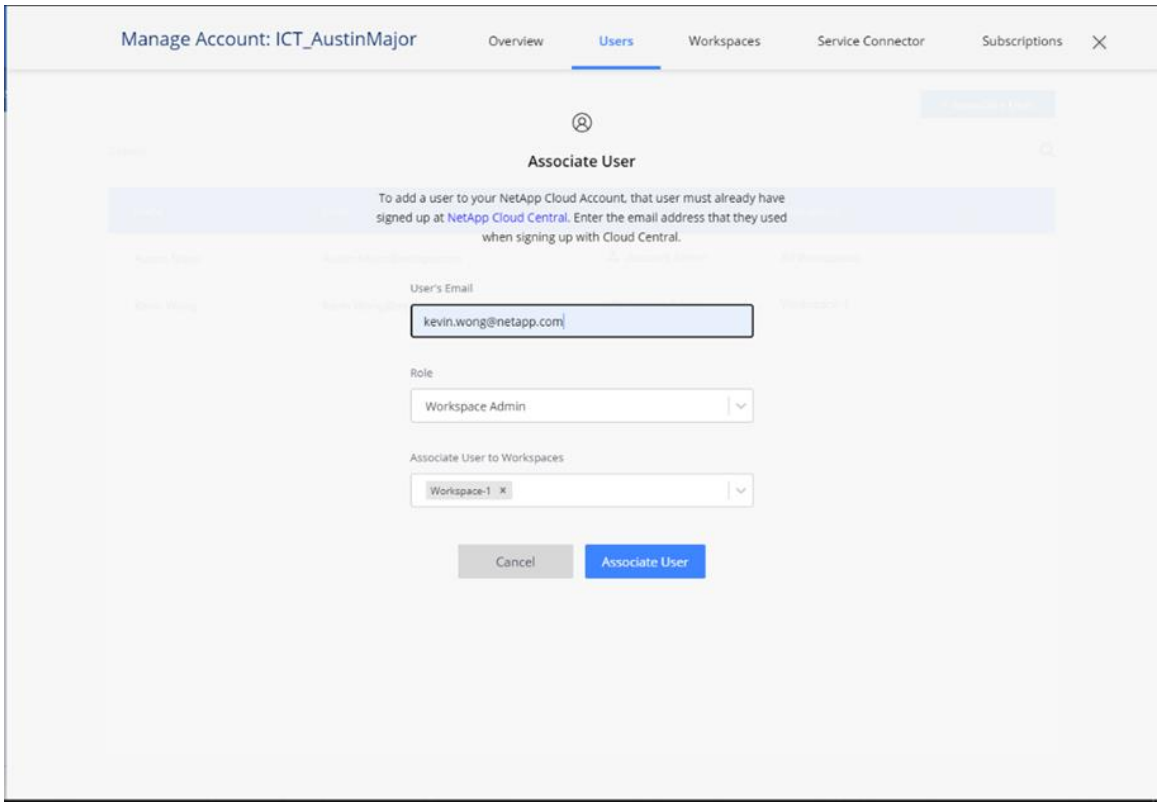
g. When the data broker is available, click Continue in Cloud Sync.

h. Complete the pages in the wizard to create the new sync relationship.

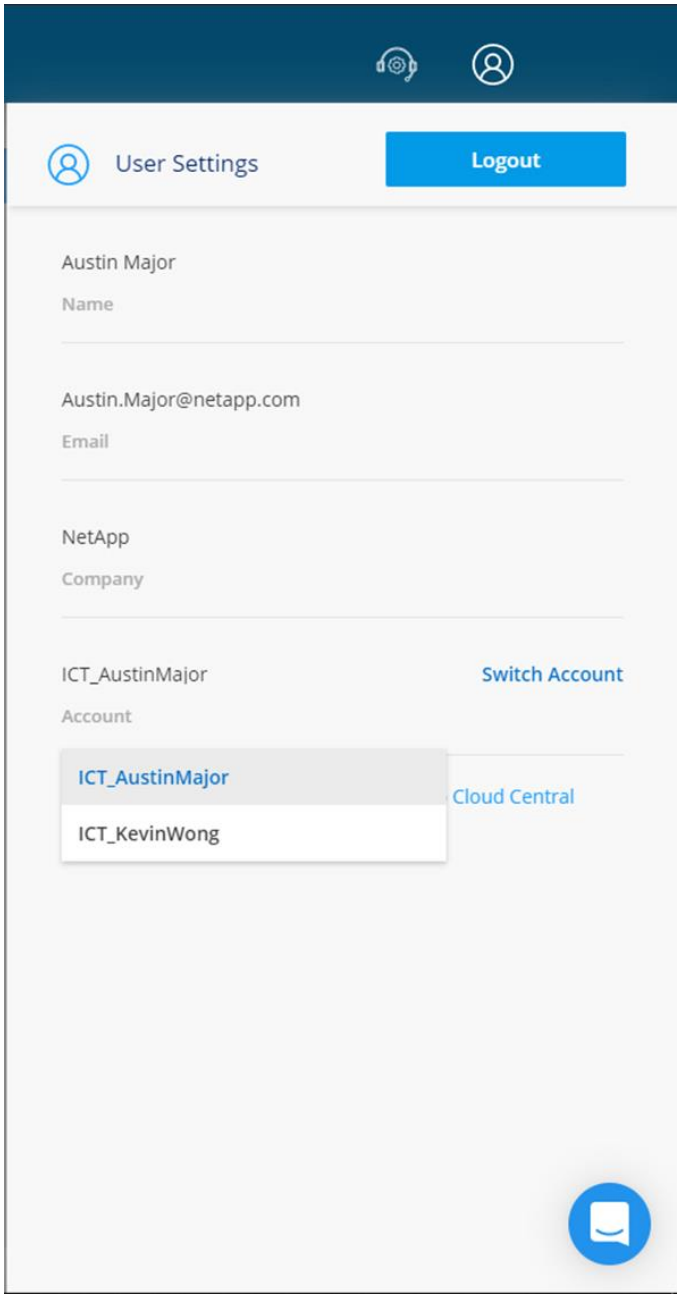
Share the data broker

If you have multiple users and want to share an instance of cloud sync with others, you might need to perform the following steps.

1. Go to https://cloudmanager.netapp.com/.
2. Go to Accounts > Manage Account > Users > Associate User > Enter User's Email > Select Role > Select Workspaces > Associate User.
   a. To share NetApp cloud services such as Cloud Sync, provide only a Workspace Admin role.



   b. Go to https://cloudsync.netapp.com.
   c. On the top right, the "person" icon is the profile button. Click the icon, and then click Switch Account.



Uninstall the data broker

You can have only one data broker per Linux environment. It is directly tied to your cloud-based platform and cannot be managed by another user's Cloud Sync platform. The Installer is not idempotent and must be uninstalled.

1. Find a bash script in `/opt/netapp/uninstall.sh`.
2. Provide `chmod +x permissions` and execute the bash script.
3. When completed, check /`opt/netapp/*` and delete any remaining directories, if desired.
4. For more information, see Uninstalling the data broker.

Conclusion

Using a basic setup of an NFS server with Windows 2016 and Red Hat 7.9, it is relatively easy to establish a Cloud Sync relationship between two remote NetApp E-Series systems. With Cloud Sync, you can now establish data mobility between NetApp E-Series systems and a number of data targets such as AWS S3, Azure, Google Cloud, NetApp ONTAP, and more.

Where to find additional information

To learn more about the information that is described in this document, review the following documents and/or websites:

- E-Series and SANtricity 11 Documentation Center
  https://docs.netapp.com/ess-11/index.jsp
- E-Series and SANtricity documentation resources
  https://www.netapp.com/documentation/eseries-santricity/
- NetApp Product Documentation
  https://docs.netapp.com/us-en/cloudsync/

Version history

Version	Date	Document Version History
Version 1.0	January 2021	Initial release.

Refer to the Interoperability Matrix Tool (IMT) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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