Guest Connected storage for VMC

NetApp Solutions

NetApp
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NetApp Guest Connected Storage Options for AWS

AWS supports guest connected NetApp storage with the native FSx service (FSx ONTAP) or with Cloud Volumes ONTAP (CVO).

FSx ONTAP

Amazon FSx for NetApp ONTAP is a fully managed service that provides highly reliable, scalable, high-performing, and feature-rich file storage built on NetApp's popular ONTAP file system. FSx for ONTAP combines the familiar features, performance, capabilities, and API operations of NetApp file systems with the agility, scalability, and simplicity of a fully managed AWS service.

FSx for ONTAP provides feature-rich, fast, and flexible shared file storage that's broadly accessible from Linux, Windows, and macOS compute instances running in AWS or on premises. FSx for ONTAP offers high-performance solid state drive (SSD) storage with submillisecond latencies. With FSx for ONTAP, you can achieve SSD levels of performance for your workload while paying for SSD storage for only a small fraction of your data.

Managing your data with FSx for ONTAP is easier because you can snapshot, clone, and replicate your files with the click of a button. In addition, FSx for ONTAP automatically tiers your data to lower-cost, elastic storage, lessening the need for you to provision or manage capacity.

FSx for ONTAP also provides highly available and durable storage with fully managed backups and support for cross-Region disaster recovery. To make it easier to protect and secure your data, FSx for ONTAP supports popular data security and antivirus applications.

FSx ONTAP as guest connected storage

Configure Amazon FSx for NetApp ONTAP with VMware Cloud on AWS

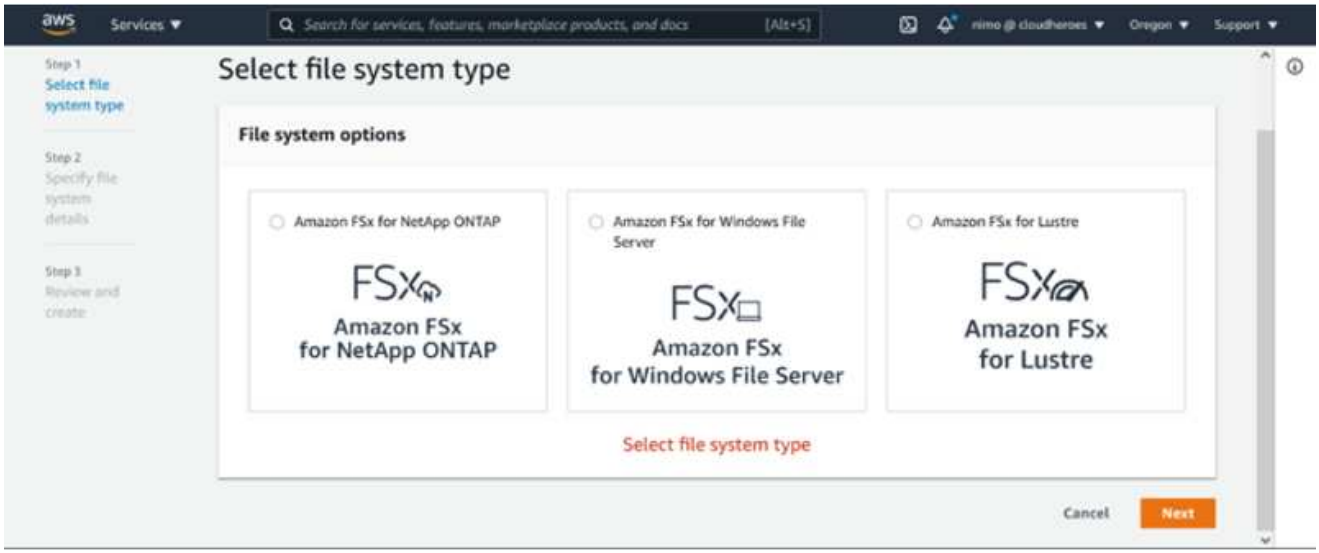
Amazon FSx for NetApp ONTAP files shares and LUNs can be mounted from VMs that are created within the VMware SDDC environment at VMware Cloud at AWS. The volumes can also be mounted on the Linux client and mapped on the Windows client using the NFS or SMB protocol, and LUNS can be accessed on Linux or Windows clients as block devices when mounted over iSCSI. Amazon FSx for the NetApp ONTAP file system can be set up quickly with the following steps.

> Amazon FSx for NetApp ONTAP and VMware Cloud on AWS must be in the same availability zone to achieve better performance and avoid data transfer charges between availability zones.

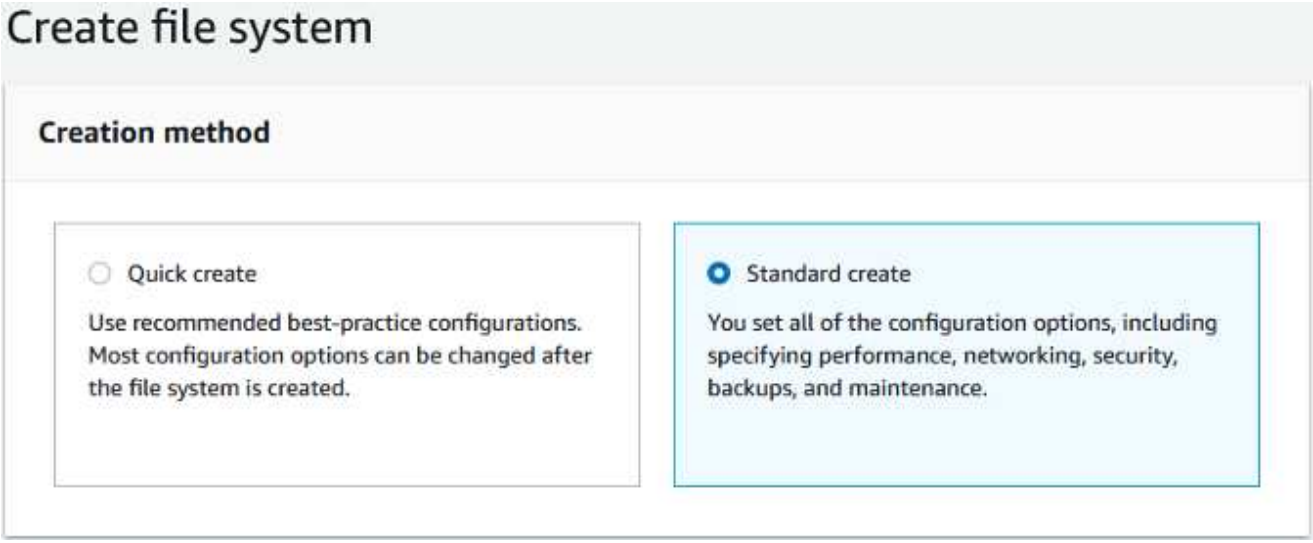
Create and mount Amazon FSx for ONTAP volumes

To create and mount Amazon FSx for NetApp ONTAP file system, complete the following steps:

1. Open the Amazon FSx console and choose Create file system to start the file system creation wizard.
2. On the Select File System Type page, choose Amazon FSx for NetApp ONTAP, and then choose Next. The Create File System page appears.



1. In the Networking section, for Virtual Private Cloud (VPC), choose the appropriate VPC and preferred subnets along with the route table. In this case, vmcfsx2.vpc is selected from the dropdown.



1. For the creation method, choose Standard Create. You can also choose Quick Create, but this document uses the Standard create option.

File system details

File system name - optional Info

vmcfsxval2

Maximum of 256 Unicode letters, whitespace, and numbers, plus + - = . _ : /

SSD storage capacity Info

1024

Minimum 1024 GB; Maximum 192 TB.

Provisioned SSD IOPS

Amazon FSx provides 3 IOPS per GB of storage capacity. You can also provision additional SSD IOPS as needed.

- (●) Automatic (3 IOPS per GB of SSD storage)
- ( ) User-provisioned

Throughput capacity Info

The sustained speed at which the file server hosting your file system can serve data. The file server can also burst to higher speeds for periods of time.

512 MB/s (Recommended)

1. In the Networking section, for Virtual Private Cloud (VPC), choose the appropriate VPC and preferred subnets along with the route table. In this case, vmcfsx2.vpc is selected from the dropdown.

Network & security

Virtual Private Cloud (VPC) Info

Specify the VPC from which your file system is accessible.

vmcfsx2.vpc | vpc-0d1c764bcc495e805

VPC Security Groups Info

Specify VPC Security Groups to associate with your file system's network interface.

Choose VPC security group(s)

sg-018896ea218164ccb (default) ×

Preferred subnet Info

Specify the preferred subnet for your file system.

subnet02.sn | subnet-013675849a5b99b3c (us-west-2b)

Standby subnet

subnet01.sn | subnet-0ef956cebf539f970 (us-west-2a)

VPC route tables

Specify the VPC route tables associated with your file system.

- (●) VPC's default route table
- ( ) Select one or more VPC route tables

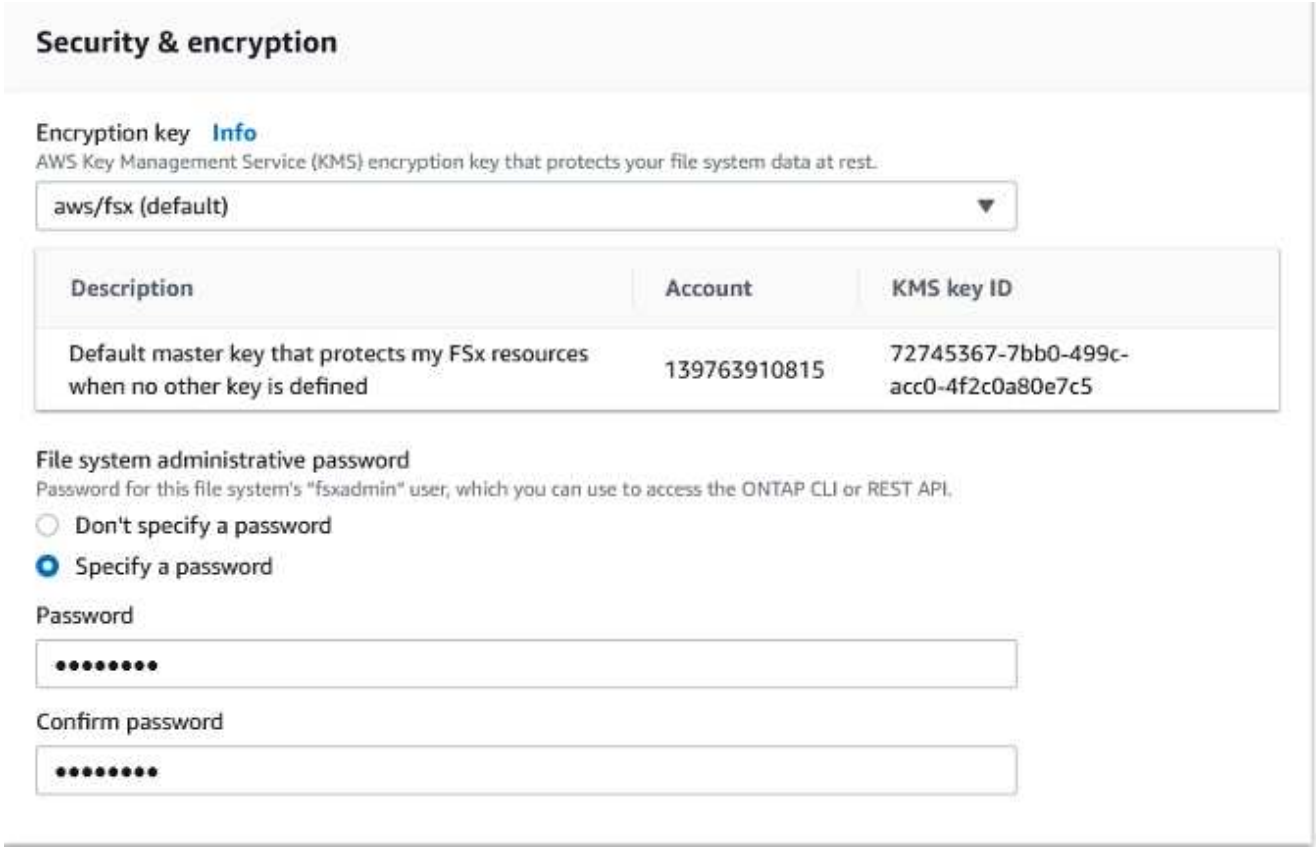
Endpoint IP address range

Specify the IP address range in which the endpoints to access your file system will be created

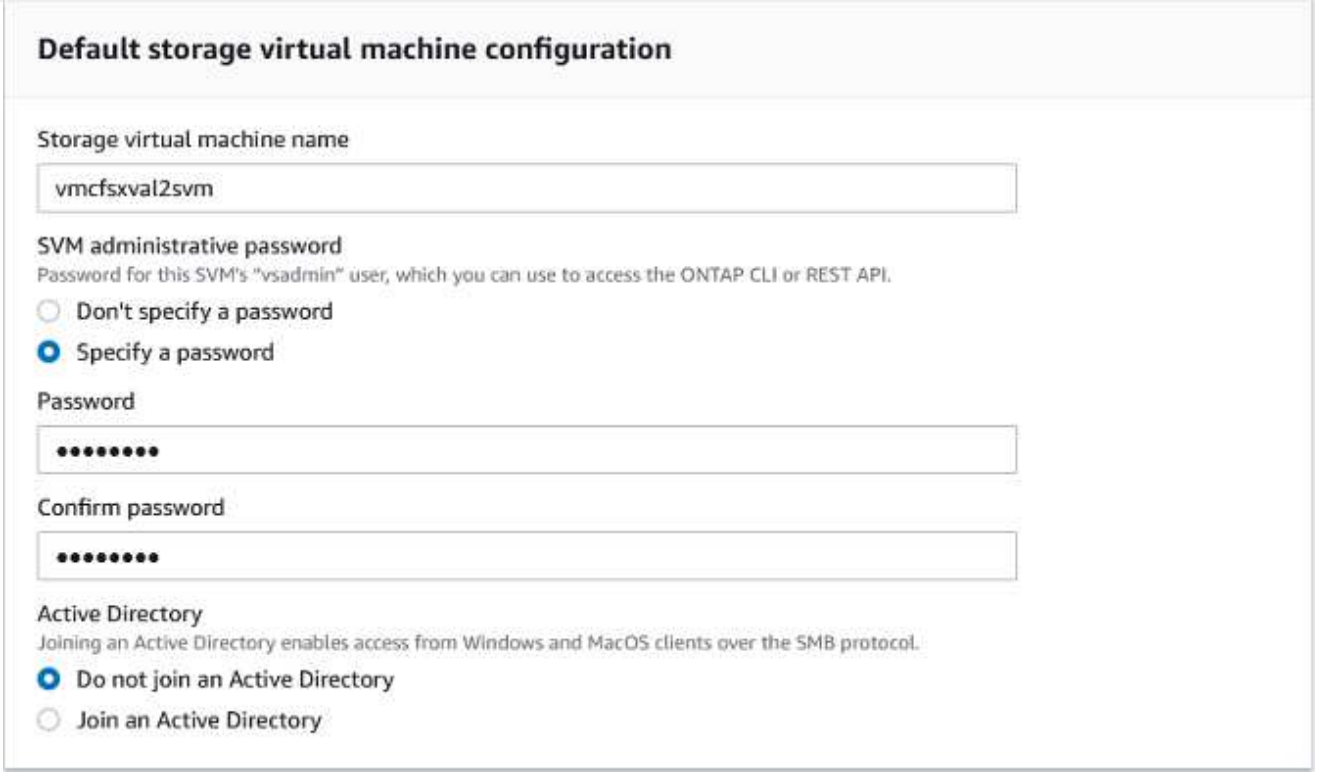
- (●) No preference
- ( ) Select an IP address range

In the Networking section, for Virtual Private Cloud (VPC), choose the appropriate VPC and preferred subnets along with the route table. In this case, vmcfsx2.vpc is selected from the dropdown.

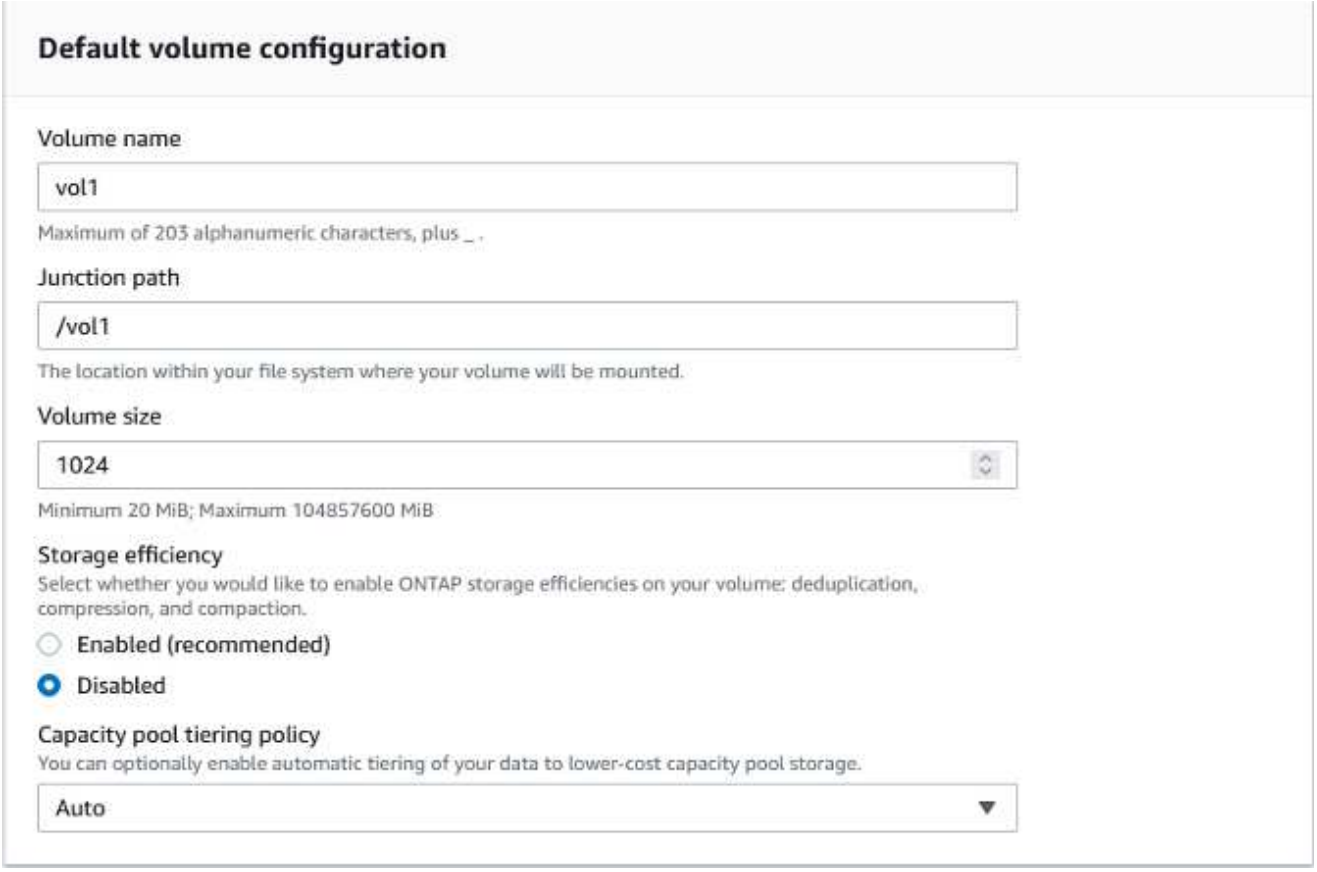
1. In the Security & Encryption section, for the Encryption Key, choose the AWS Key Management Service (AWS KMS) encryption key that protects the file system's data at rest. For the File System Administrative Password, enter a secure password for the fsxadmin user.



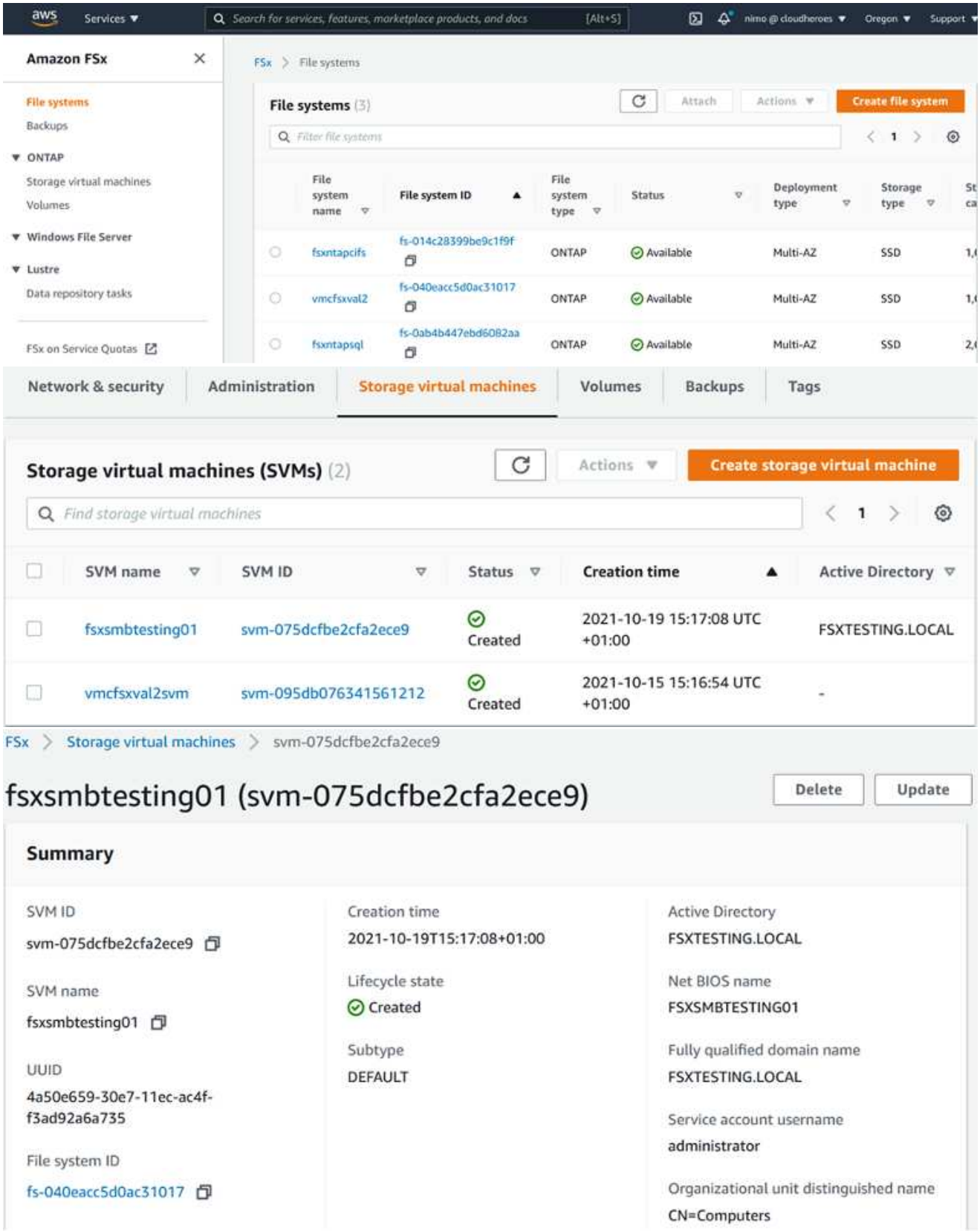
1. In virtual machine and specify the password to use with vsadmin for administering ONTAP using REST APIs or the CLI. If no password is specified, a fsxadmin user can be used for administering the SVM. In the Active Directory section, make sure to join Active Directory to the SVM for provisioning SMB shares. In the Default Storage Virtual Machine Configuration section, provide a name for the storage in this validation, SMB shares are provisioned using a self-managed Active Directory domain.



1. In the Default Volume Configuration section, specify the volume name and size. This is an NFS volume. For Storage Efficiency, choose Enabled to turn on the ONTAP storage efficiency features (compression, deduplication, and compaction) or Disabled to turn them off.



1. Review the file system configuration shown on the Create File System page.
2. Click Create File System.

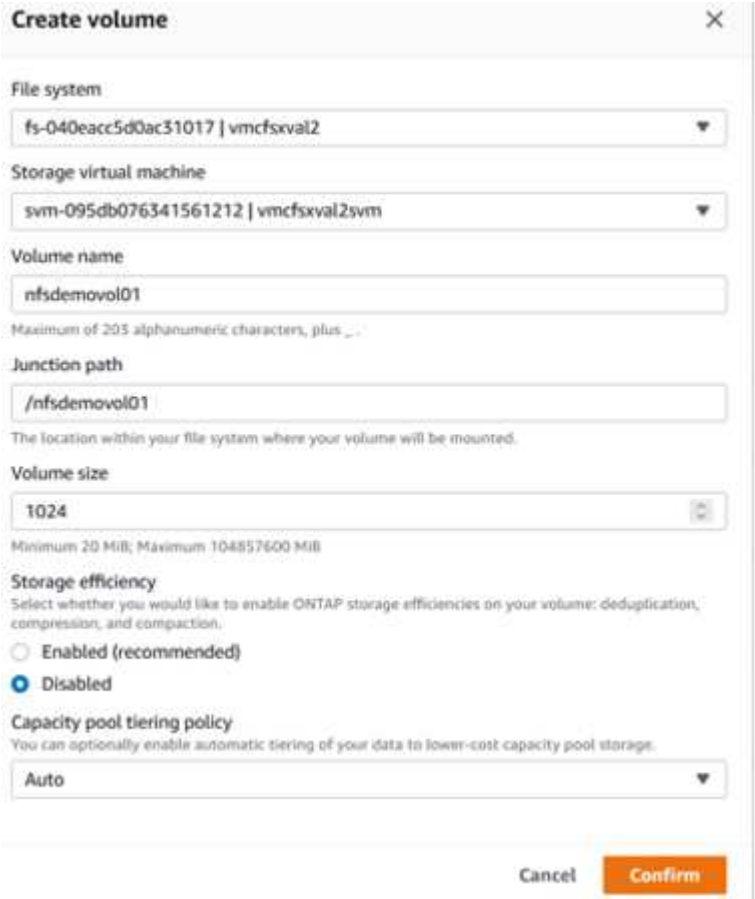


For more detailed information, see Getting started with Amazon FSx for NetApp ONTAP.

After the file system is created as above, create the volume with the required size and protocol.

1. Open the Amazon FSx console.
2. In the left navigation pane, choose File systems, and then choose the ONTAP file system that you want to create a volume for.
3. Select the Volumes tab.
4. Select the Create Volume tab.
5. The Create Volume dialog box appears.

For demo purposes, an NFS volume is created in this section that can be easily mounted on VMs running on VMware cloud on AWS. nfsdemovol01 is created as depicted below:



Mount FSx ONTAP volume on Linux client

To mount the FSx ONTAP volume created in the previous step. from the Linux VMs within VMC on AWS SDDC, complete the following steps:

1. Connect to the designated Linux instance.
2. Open a terminal on the instance using Secure Shell (SSH) and log in with the appropriate credentials.
3. Make a directory for the volume's mount point with the following command:

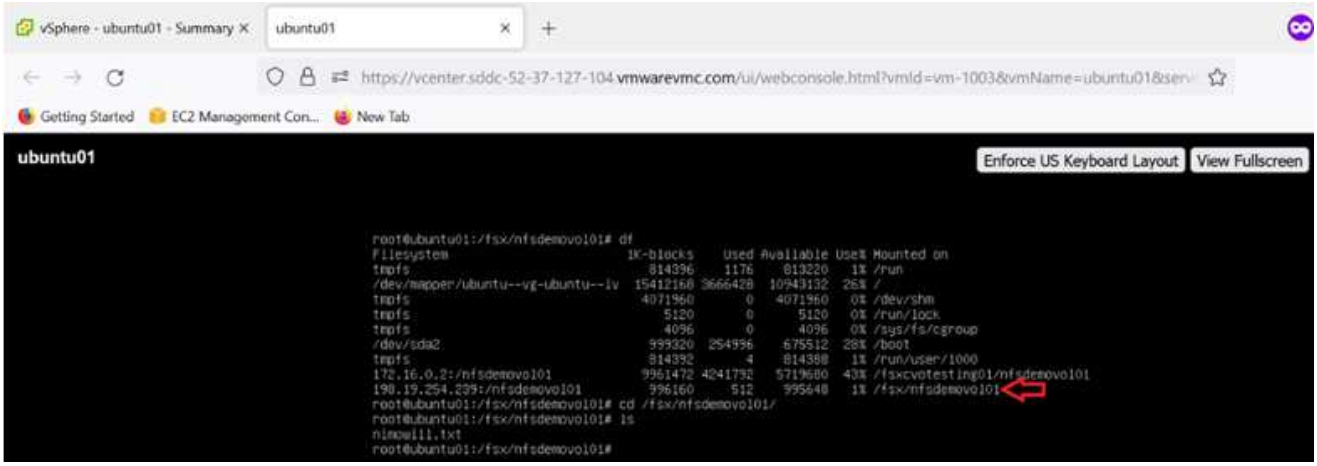
```
$ sudo mkdir /fsx/nfsdemovol01
```

4. Mount the Amazon FSx for NetApp ONTAP NFS volume to the directory that is created in the previous step.

```
sudo mount -t nfs nfsvers=4.1,198.19.254.239:/nfsdemovol01
/fsx/nfsdemovol01
```

```
root@ubuntu01:/fsx/nfsdemovol01# mount -t nfs 198.19.254.239:/nfsdemovol01 /fsx/nfsdemovol01
```

1. Once executed, run the df command to validate the mount.



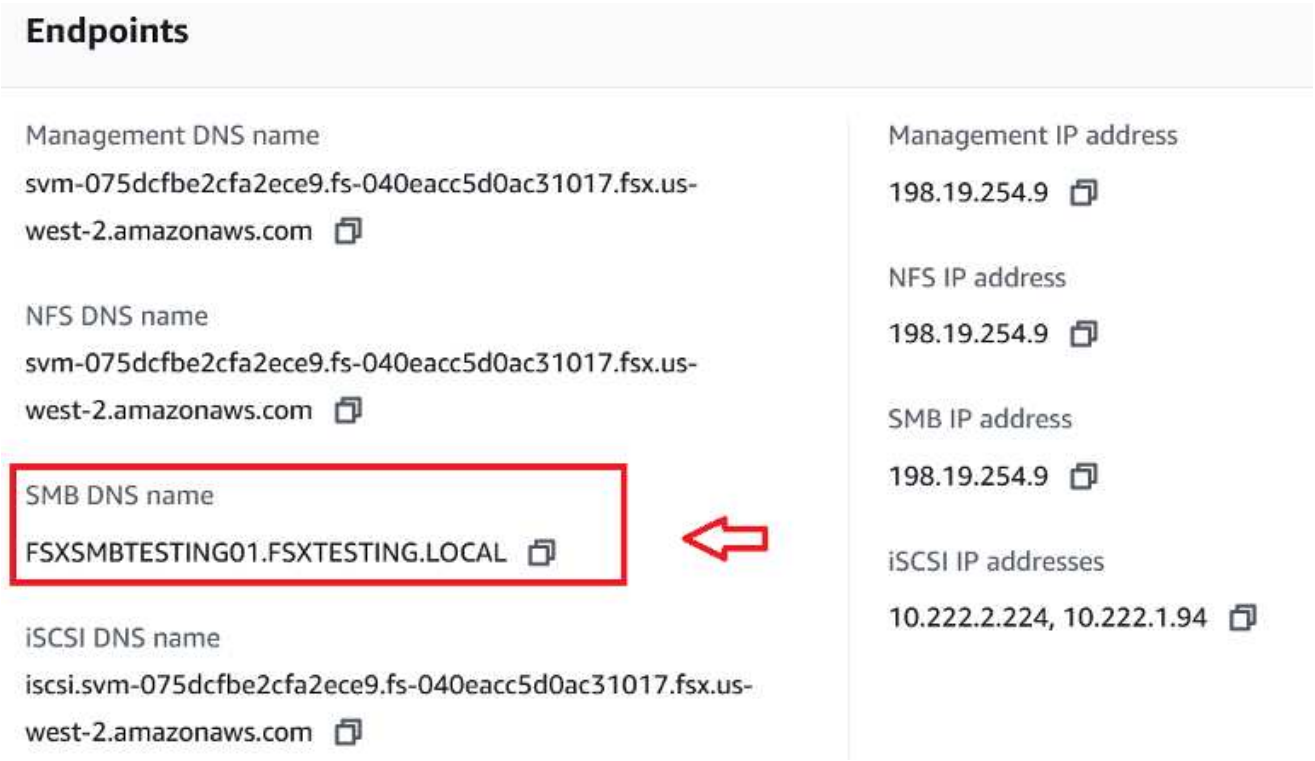
Mount FSx ONTAP volume on Linux client

Attach FSx ONTAP volumes to Microsoft Windows clients

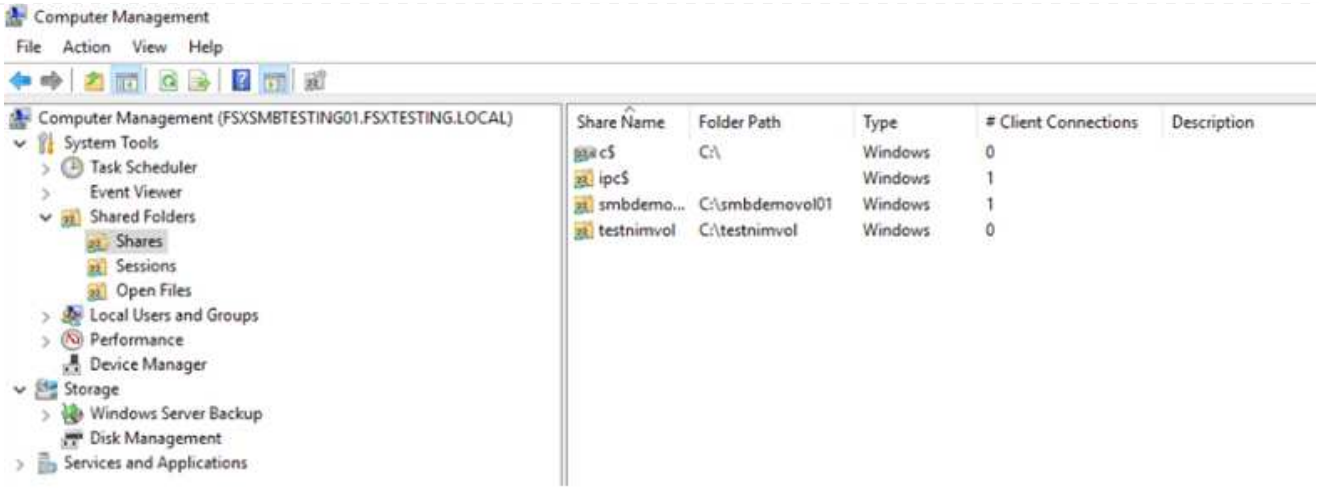
To manage and map file shares on an Amazon FSx file system, the Shared Folders GUI must be used.

1. Open the Start menu and run fsmgmt.msc using Run As Administrator. Doing this opens the Shared Folders GUI tool.
2. Click Action > All tasks and choose Connect to Another Computer.
3. For Another Computer, enter the DNS name for the storage virtual machine (SVM). For example, FSXSMBTESTING01.FSXTESTING.LOCAL is used in this example.

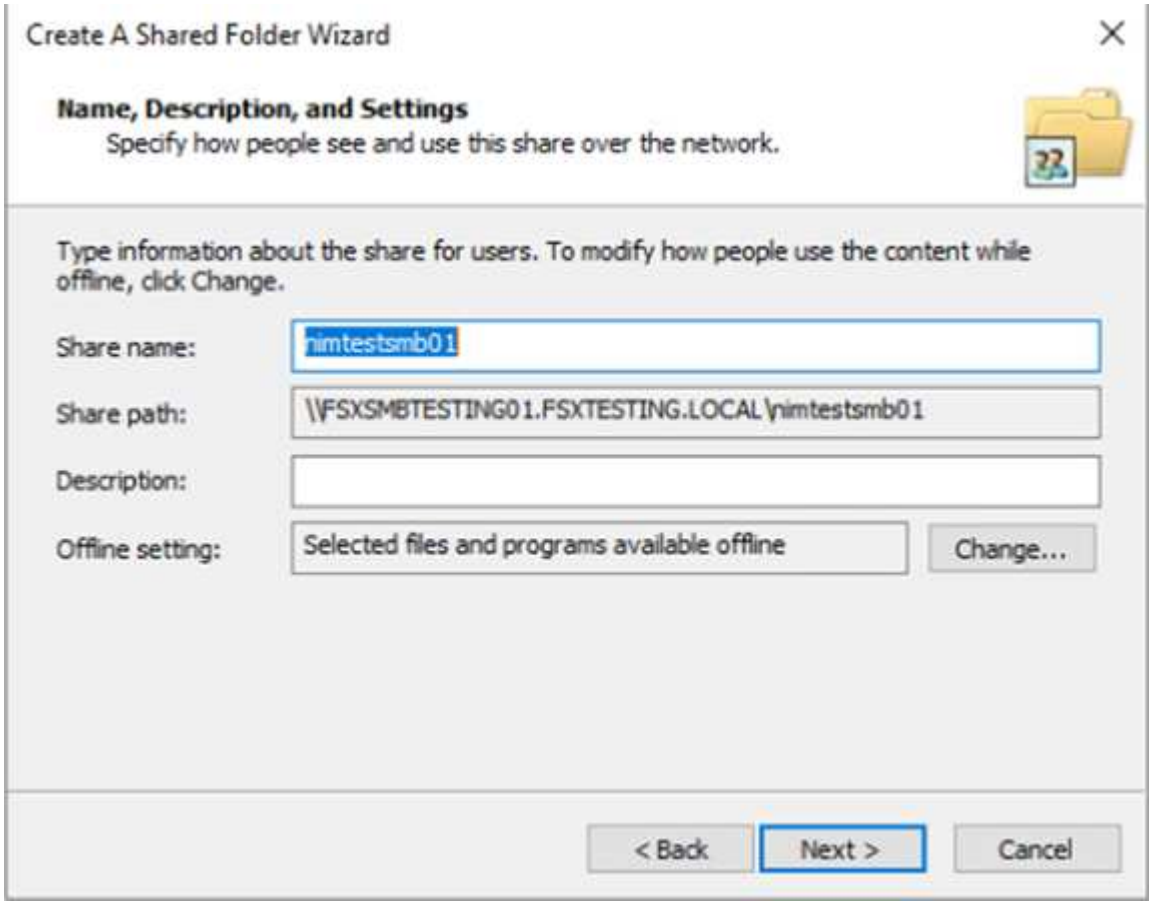
> Tp find the SVM's DNS name on the Amazon FSx console, choose Storage Virtual Machines, choose SVM, and then scroll down to Endpoints to find the SMB DNS name. Click OK. The Amazon FSx file system appears in the list for the Shared Folders.



1. In the Shared Folders tool, choose Shares in the left pane to see the active shares for the Amazon FSx file system.

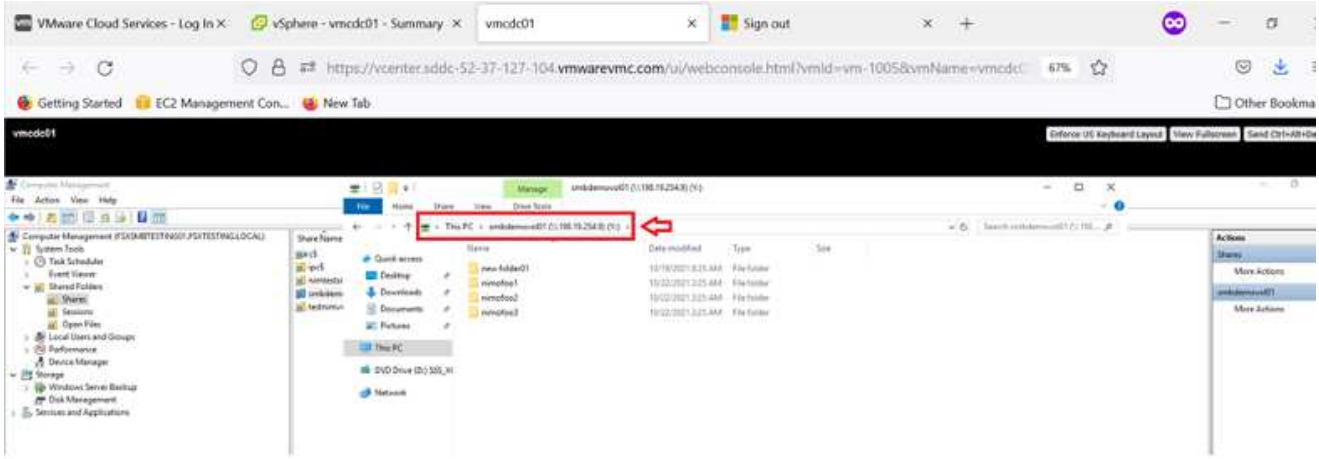


1. Now choose a new share and complete the Create a Shared Folder wizard.



To learn more about creating and managing SMB shares on an Amazon FSx file system, see Creating SMB Shares.

1. After connectivity is in place, the SMB share can be attached and used for application data. To accomplish this, Copy the share path and use the Map Network Drive option to mount the volume on the VM running on VMware Cloud on the AWS SDDC.



Connect a FSx for NetApp ONTAP LUN to a host using iSCSI

Connect a FSx for NetApp ONTAP LUN to a host using iSCSI

iSCSI traffic for FSx traverses the VMware Transit Connect/AWS Transit Gateway via the routes provided in the previous section. To configure a LUN in Amazon FSx for NetApp ONTAP, follow the documentation found here.

On Linux clients, make sure that the iSCSI daemon is running. After the LUNs are provisioned, refer to the detailed guidance on iSCSI configuration with Ubuntu (as an example) here.

In this paper, connecting the iSCSI LUN to a Windows host is depicted:

Provision a LUN in FSx for NetApp ONTAP:

1. Access the NetApp ONTAP CLI using the management port of the FSx for the ONTAP file system.
2. Create the LUNs with the required size as indicated by the sizing output.

```
FsxId040eacc5d0ac31017::> lun create -vserver vmcfsxval2svm -volume
nimfsxscsivol -lun nimofsxlun01 -size 5gb -ostype windows -space
-reserve enabled
```

In this example, we created a LUN of size 5g (5368709120).

1. Create the necessary igroups to control which hosts have access to specific LUNs.

```
FsxId040eacc5d0ac31017::> igroup create -vserver vmcfsxval2svm -igroup
winIG -protocol iscsi -ostype windows -initiator iqn.1991-
05.com.microsoft:vmcdc01.fsxtesting.local

FsxId040eacc5d0ac31017::> igroup show

Vserver   Igroup       Protocol OS Type  Initiators

--------- ------------ -------- --------
------------------------------------

vmcfsxval2svm

          ubuntu01     iscsi    linux    iqn.2021-
10.com.ubuntu:01:initiator01

vmcfsxval2svm

          winIG        iscsi    windows  iqn.1991-
05.com.microsoft:vmcdc01.fsxtesting.local
```

Two entries were displayed.

1. Map the LUNs to igroups using the following command:

```
FsxId040eacc5d0ac31017::> lun map -vserver vmcfsxval2svm -path
/vol/nimfsxscsivol/nimofsxlun01 -igroup winIG

FsxId040eacc5d0ac31017::> lun show

Vserver   Path                            State   Mapped   Type
Size

--------- ------------------------------- ------- -------- --------
--------

vmcfsxval2svm

          /vol/blocktest01/lun01          online  mapped   linux
5GB

vmcfsxval2svm

          /vol/nimfsxscsivol/nimofsxlun01 online  mapped   windows
5GB
```

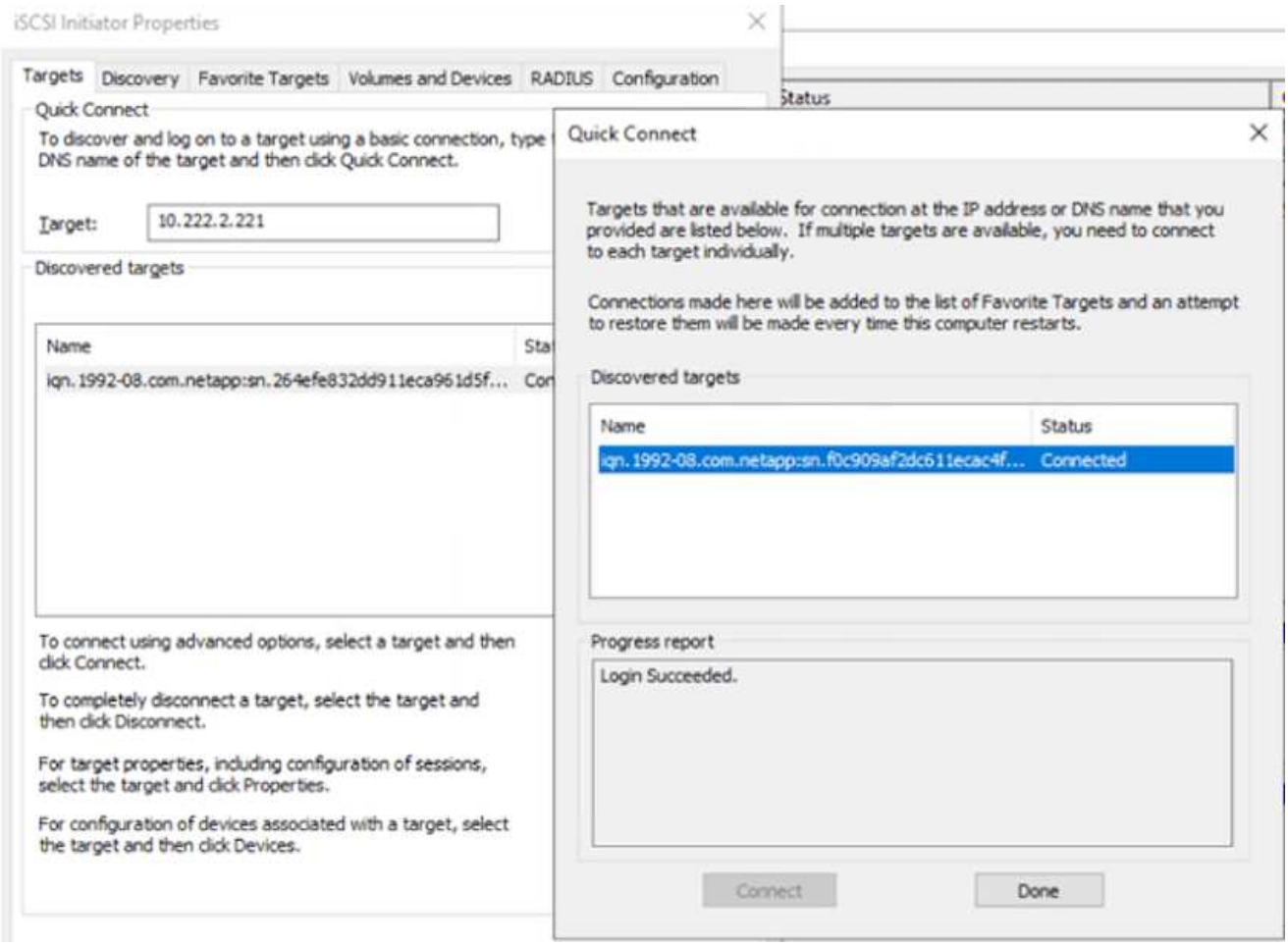
Two entries were displayed.

1. Connect the newly provisioned LUN to a Windows VM:

To connect the new LUN tor a Windows host residing on VMware cloud on AWS SDDC, complete the following steps:

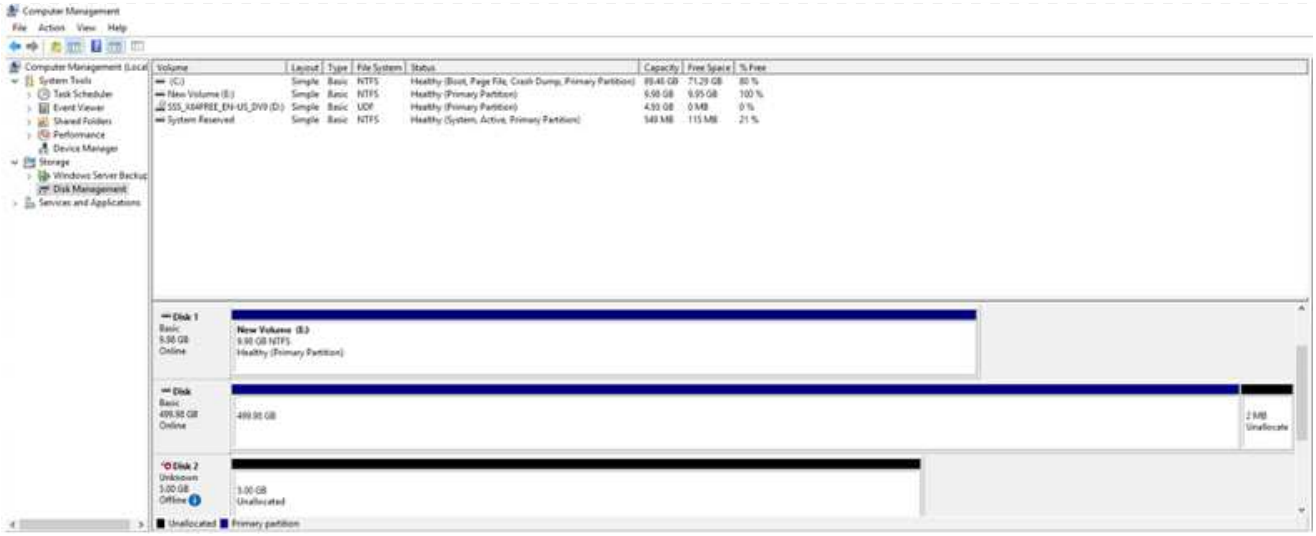
a. RDP to the Windows VM hosted on the VMware Cloud on AWS SDDC.
b. Navigate to Server Manager > Dashboard > Tools > iSCSI Initiator to open the iSCSI Initiator Properties dialog box.
c. From the Discovery tab, click Discover Portal or Add Portal and then enter the IP address of the iSCSI target port.
d. From the Targets tab, select the target discovered and then click Log On or Connect.
e. Select Enable Multipath, and then select “Automatically Restore This Connection When the Computer Starts” or “Add This Connection to the List of Favorite Targets”. Click Advanced.

> The Windows host must have an iSCSI connection to each node in the cluster. The native DSM selects the best paths to use.



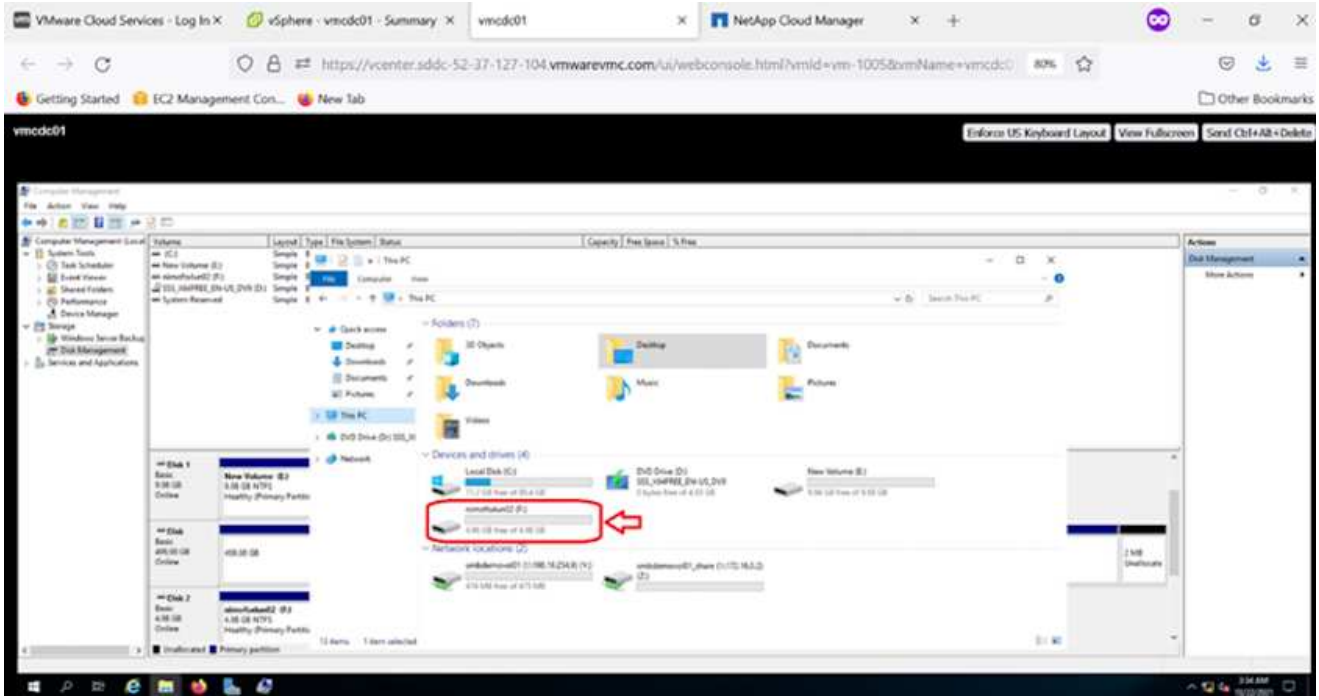
LUNs on the storage virtual machine (SVM) appear as disks to the Windows host. Any new disks that are added are not automatically discovered by the host. Trigger a manual rescan to discover the disks by completing the following steps:

1. Open the Windows Computer Management utility: Start > Administrative Tools > Computer Management.
2. Expand the Storage node in the navigation tree.
3. Click Disk Management.
4. Click Action > Rescan Disks.



When a new LUN is first accessed by the Windows host, it has no partition or file system. Initialize the LUN and, optionally, format the LUN with a file system by completing the following steps:

1. Start Windows Disk Management.
2. Right-click the LUN, and then select the required disk or partition type.
3. Follow the instructions in the wizard. In this example, drive F: is mounted.



Cloud Volumes ONTAP (CVO)

Cloud volumes ONTAP, or CVO, is the industry-leading cloud data management solution built on NetApp's ONTAP storage software, available natively on Amazon Web Services (AWS), Microsoft Azure and Google Cloud Platform (GCP).

It is a software-defined version of ONTAP that consumes cloud-native storage, allowing you to have the same

storage software in the cloud and on-premises, reducing the need to retrain you IT staff in all-new methods to manage your data.

CVO gives customers the ability to seamlessly move data from the edge, to the data center, to the cloud and back, bringing your hybrid cloud together — all managed with a single-pane management console, NetApp Cloud Manager.

By design, CVO delivers extreme performance and advanced data management capabilities to satisfy even your most demanding applications in the cloud

Cloud Volumes ONTAP (CVO) as guest connected storage

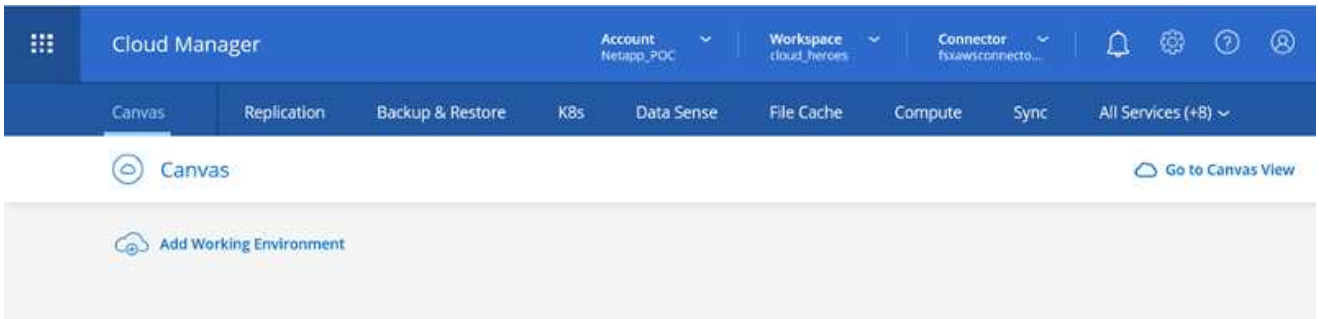
Deploy new Cloud Volumes ONTAP instance in AWS (do it yourself)

Cloud Volumes ONTAP shares and LUNs can be mounted from VMs that are created in the VMware Cloud on AWS SDDC environment. The volumes can also be mounted on native AWS VM Linux Windows clients, and LUNS can be accessed on Linux or Windows clients as block devices when mounted over iSCSI because Cloud Volumes ONTAP supports iSCSI, SMB, and NFS protocols. Cloud Volumes ONTAP volumes can be set up in a few simple steps.

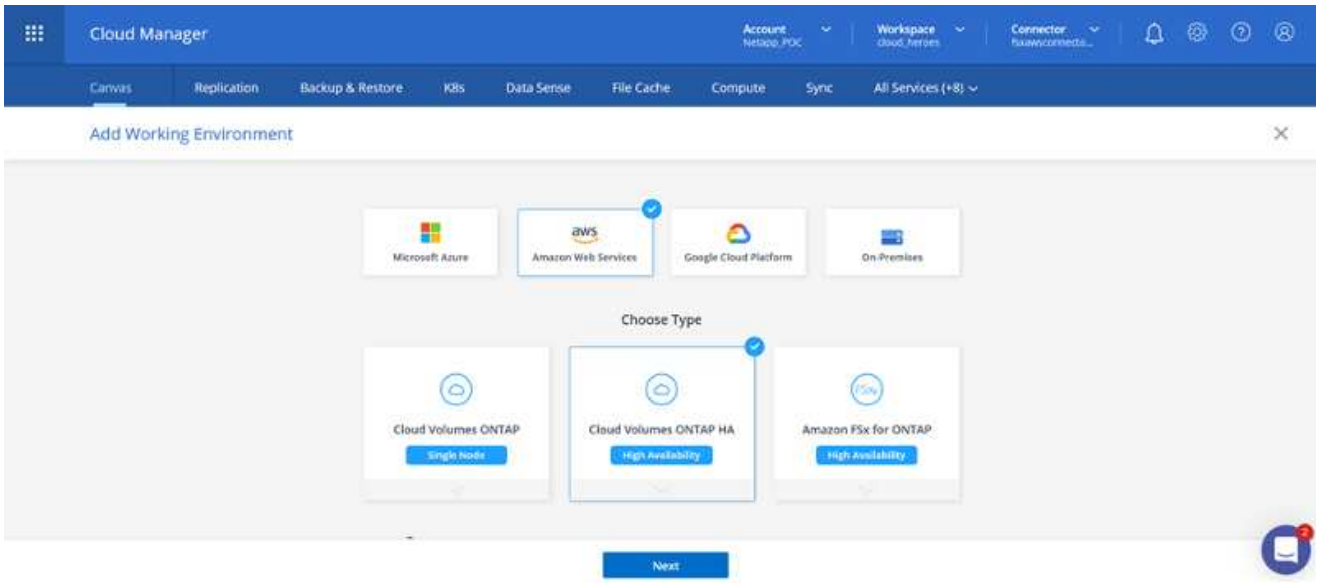
To replicate volumes from an on-premises environment to the cloud for disaster recovery or migration purposes, establish network connectivity to AWS, either using a site-to-site VPN or DirectConnect. Replicating data from on-premises to Cloud Volumes ONTAP is outside the scope of this document. To replicate data between on-premises and Cloud Volumes ONTAP systems, see Setting up data replication between systems.

> Use the Cloud Volumes ONTAP sizer to accurately size the Cloud Volumes ONTAP instances. Also, monitor on-premises performance to use as inputs in the Cloud Volumes ONTAP sizer.

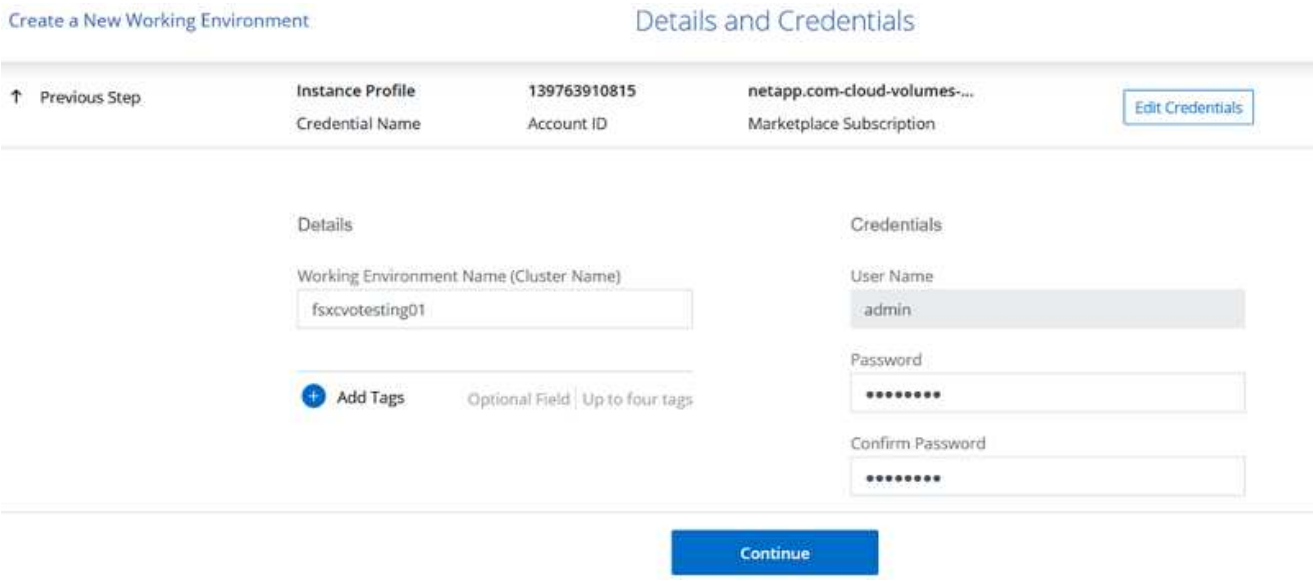
1. Log into NetApp Cloud Central; the Fabric View screen is displayed. Locate the Cloud Volumes ONTAP tab and select Go to Cloud Manager. After you are logged in, the Canvas screen is displayed.



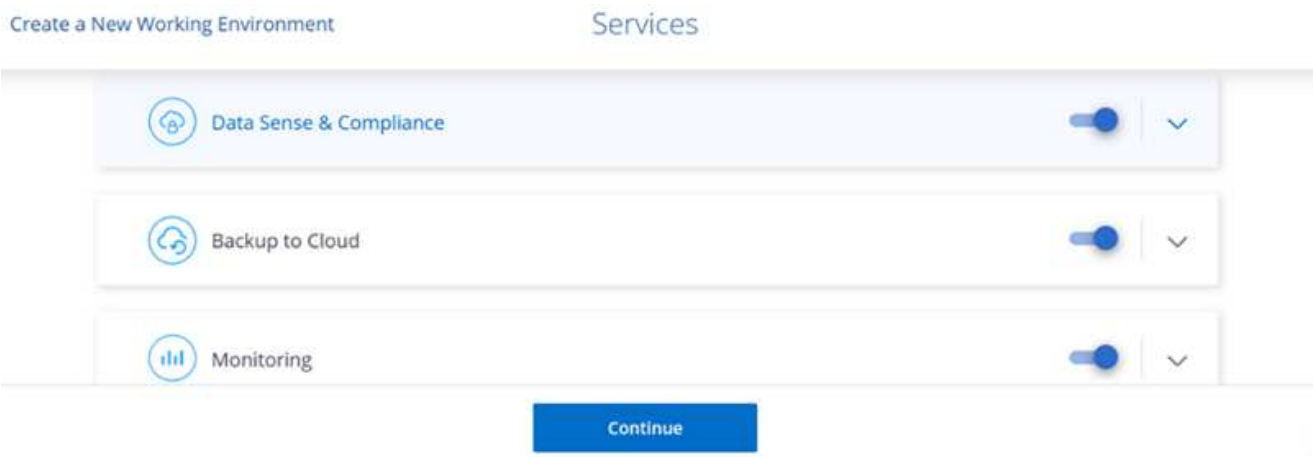
1. On the Cloud Manager home page, click Add a Working Environment and then select AWS as the cloud and the type of the system configuration.



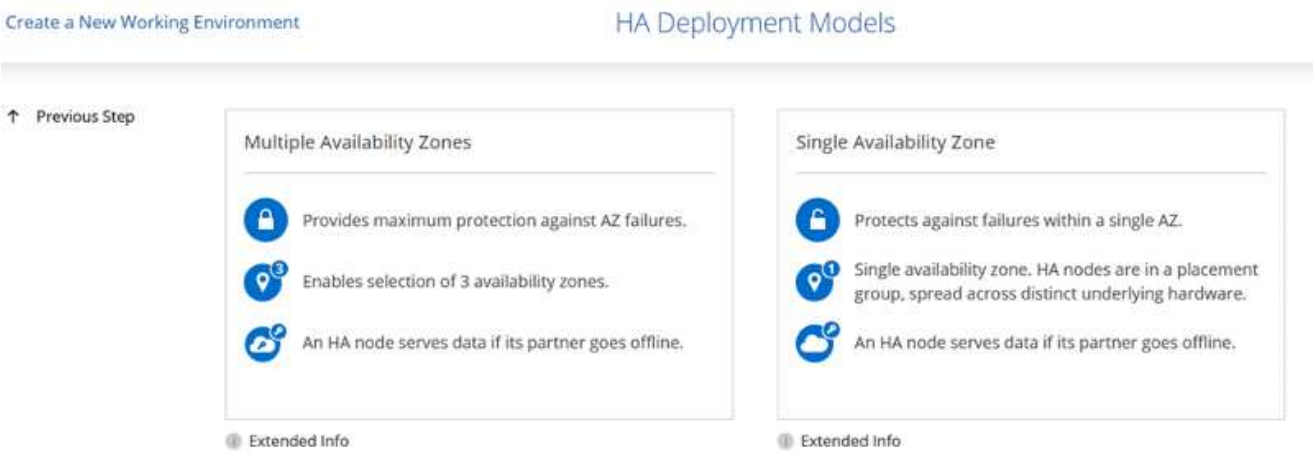
1. Provide the details of the environment to be created including the environment name and admin credentials. Click Continue.



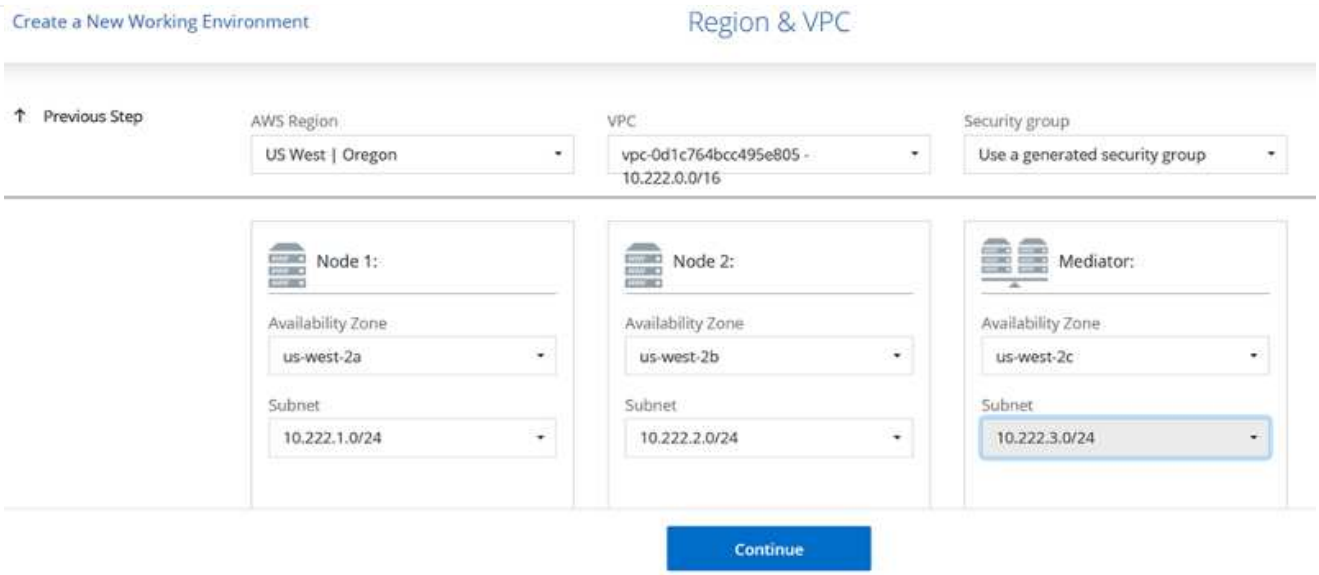
1. Select the add-on services for Cloud Volumes ONTAP deployment, including BlueXP Classification, BlueXP backup and recovery, and Cloud Insights. Click Continue.



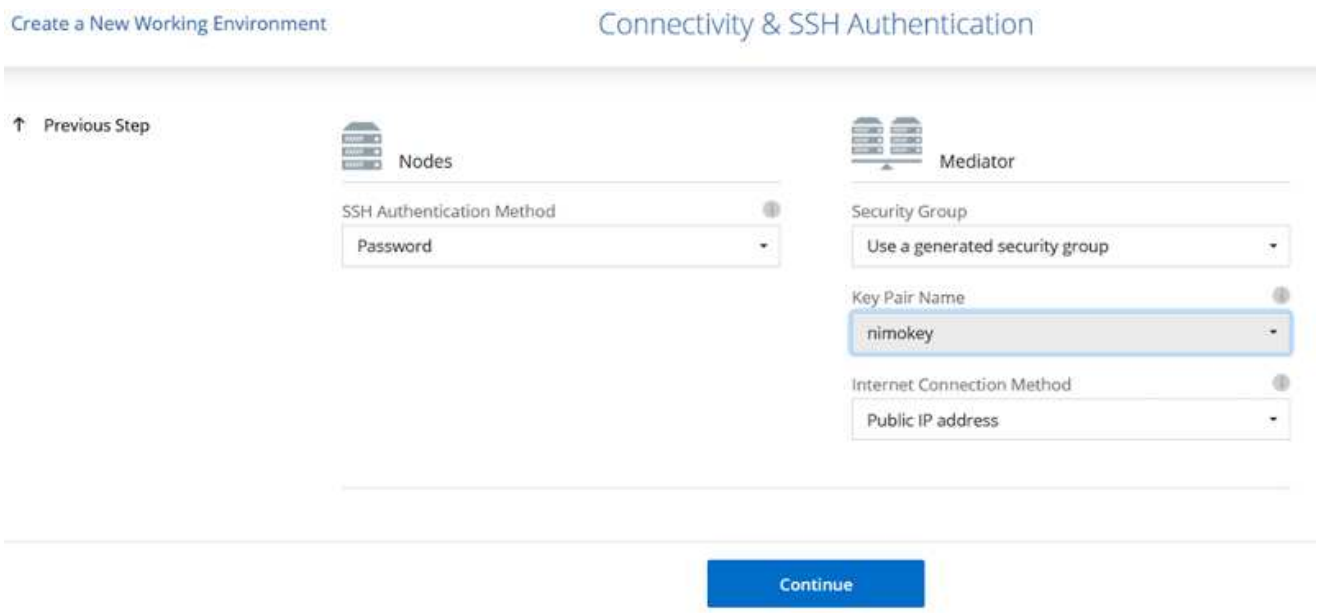
1. On the HA Deployment Models page, choose the Multiple Availability Zones configuration.



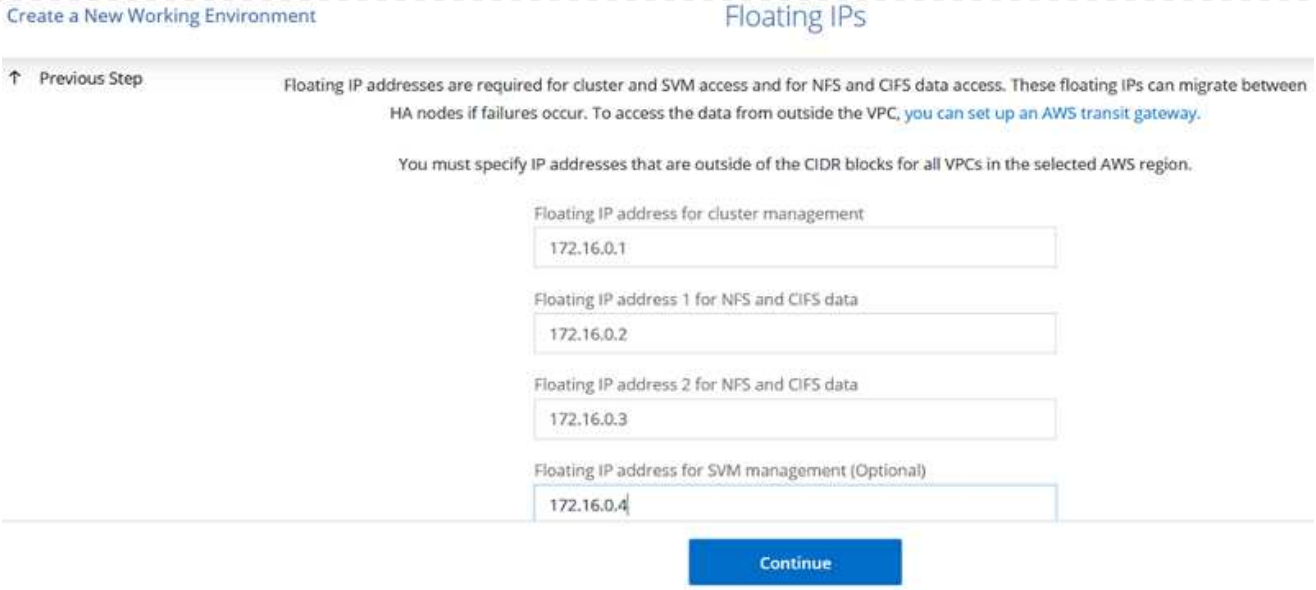
1. On the Region & VPC page, enter the network information and then click Continue.



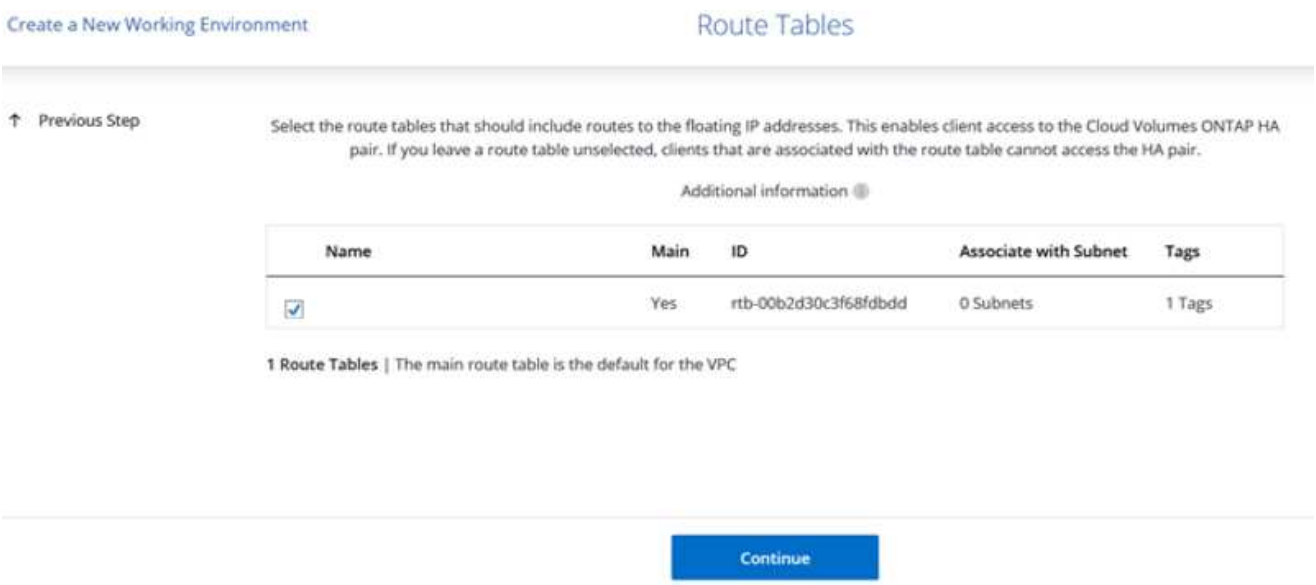
1. On the Connectivity and SSH Authentication page, choose connection methods for the HA pair and the mediator.



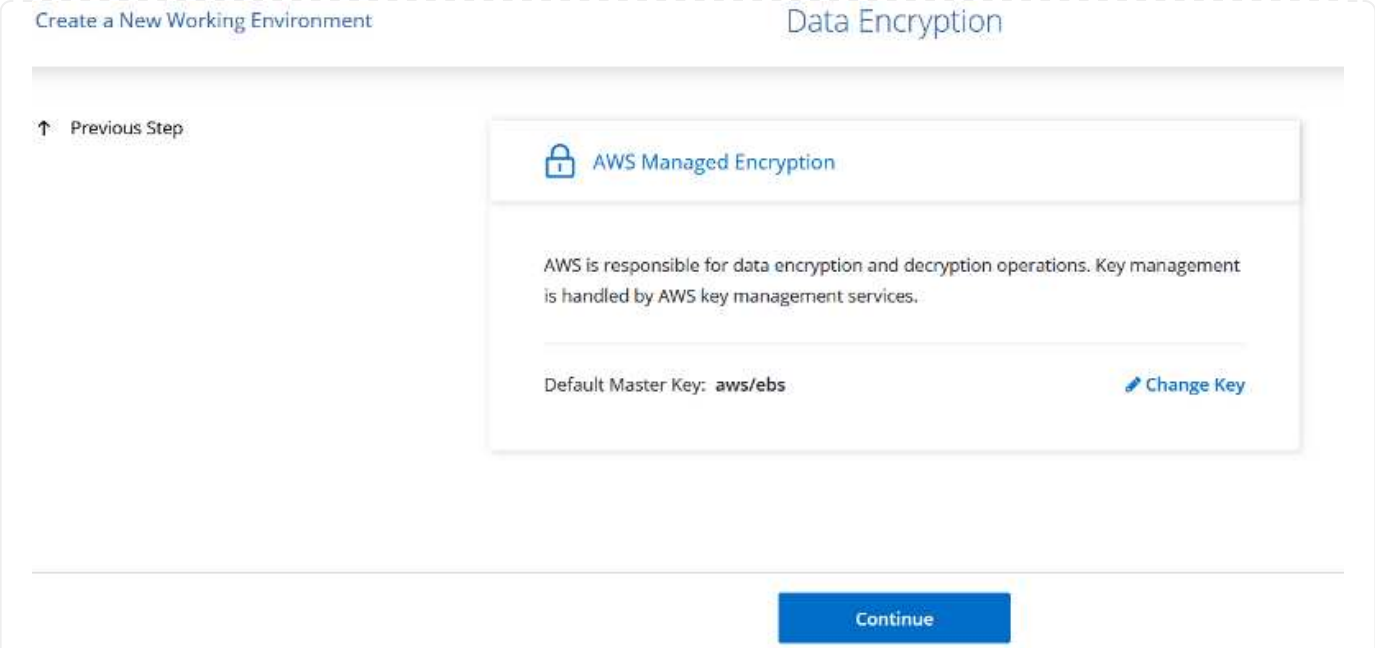
1. Specify the floating IP addresses and then click Continue.



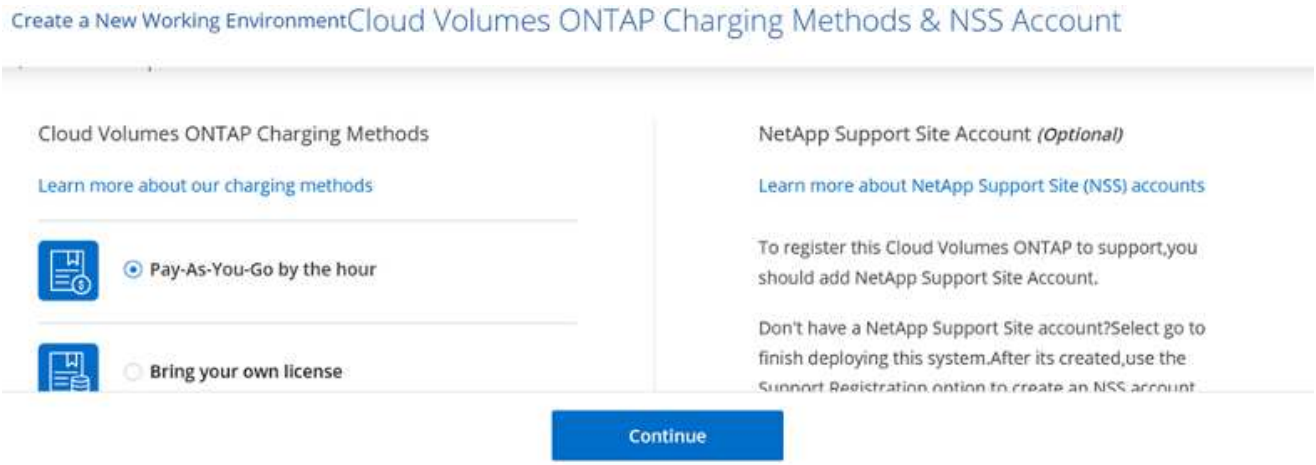
1. Select the appropriate route tables to include routes to the floating IP addresses and then click Continue.



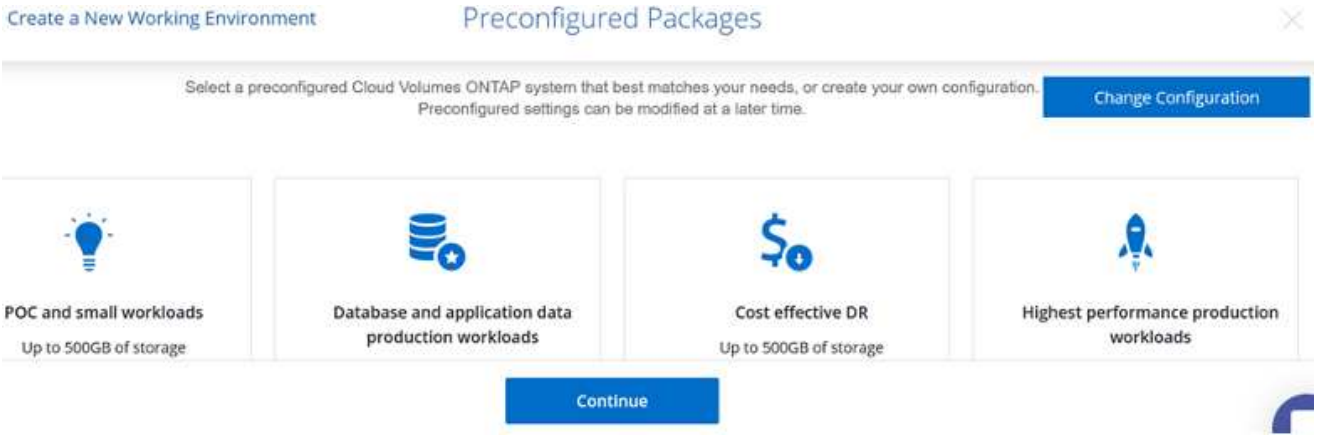
1. On the Data Encryption page, choose AWS-managed encryption.



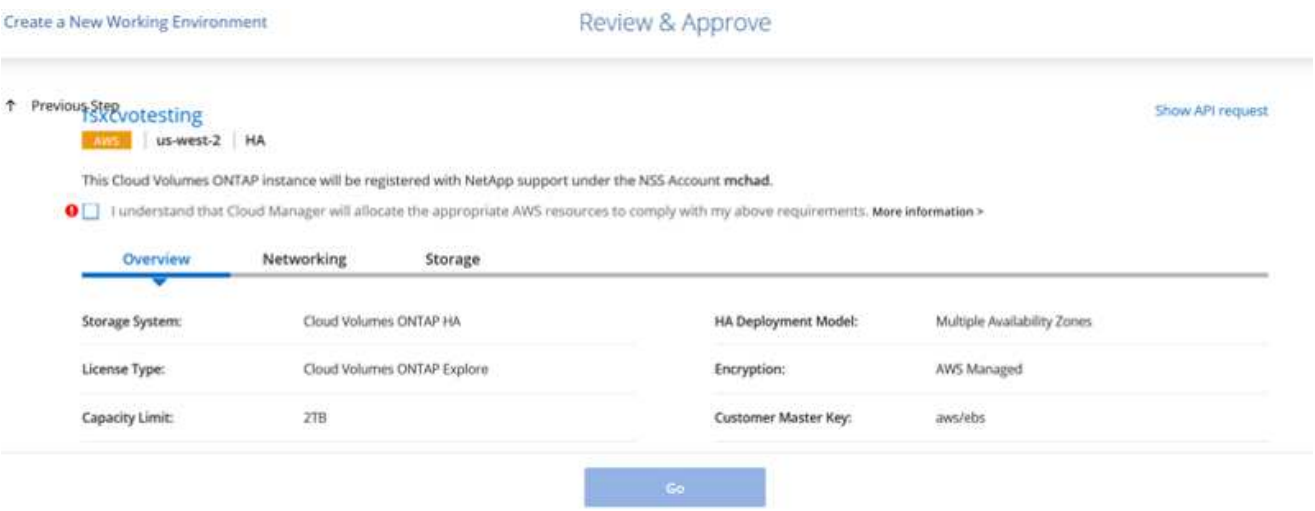
1. Select the license option: Pay-As-You-Go or BYOL for using an existing license. In this example, the Pay-As-You-Go option is used.



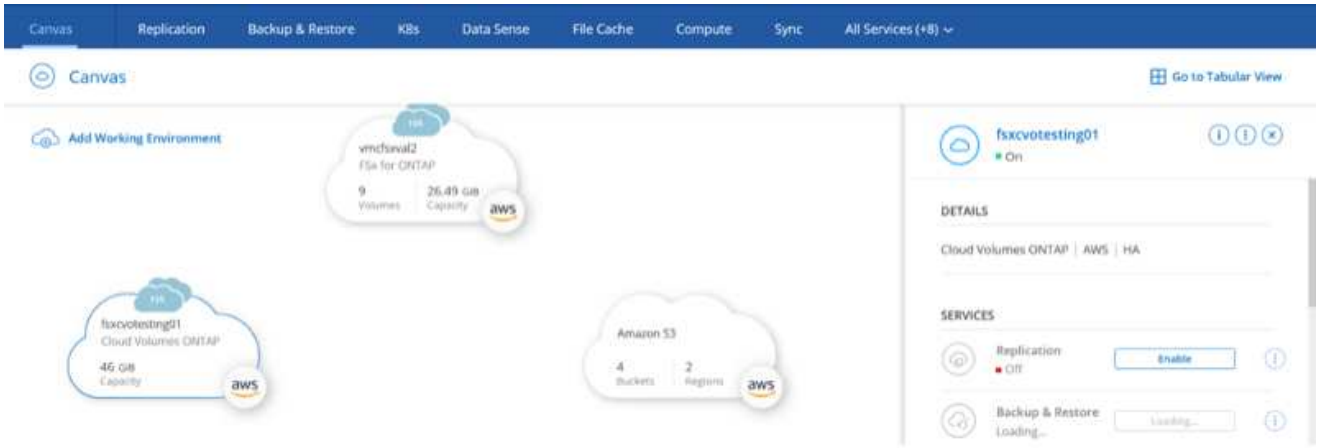
1. Select between several preconfigured packages available based on the type of workload to be deployed on the VMs running on the VMware cloud on AWS SDDC.



1. On the Review & Approve page, review and confirm the selections.To create the Cloud Volumes ONTAP instance, click Go.

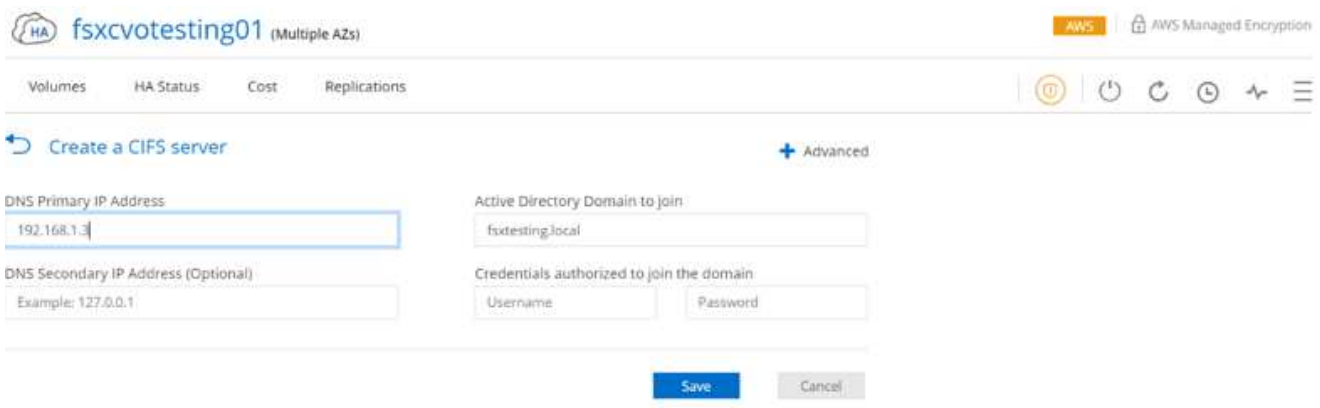


1. After Cloud Volumes ONTAP is provisioned, it is listed in the working environments on the Canvas page.

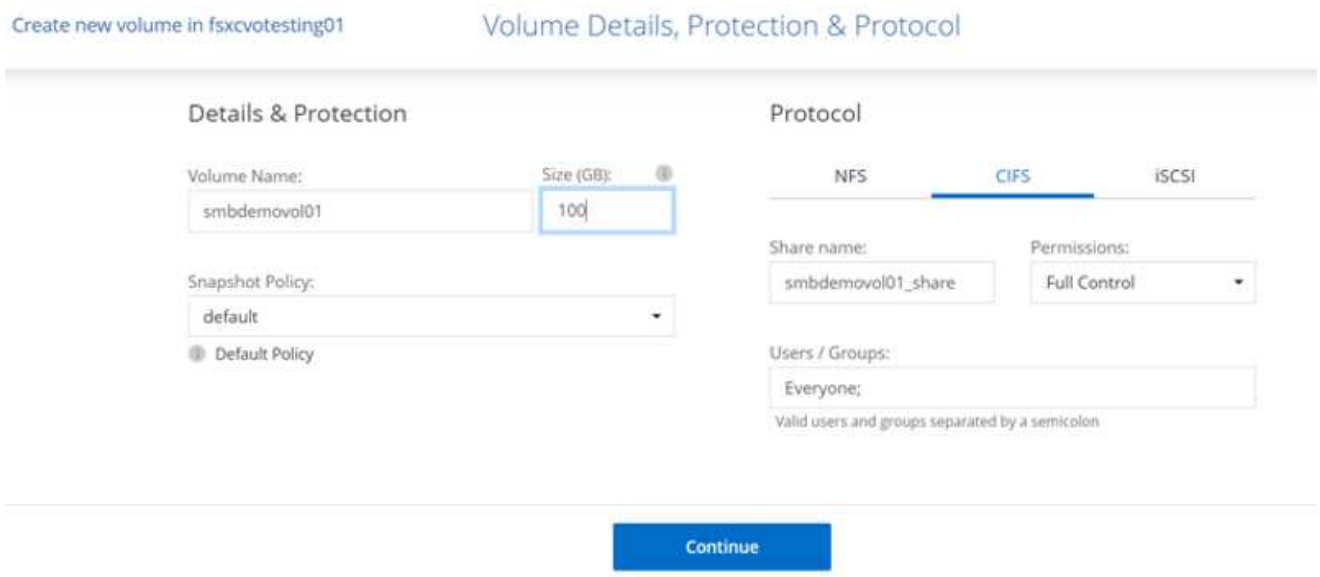


Additional configurations for SMB volumes

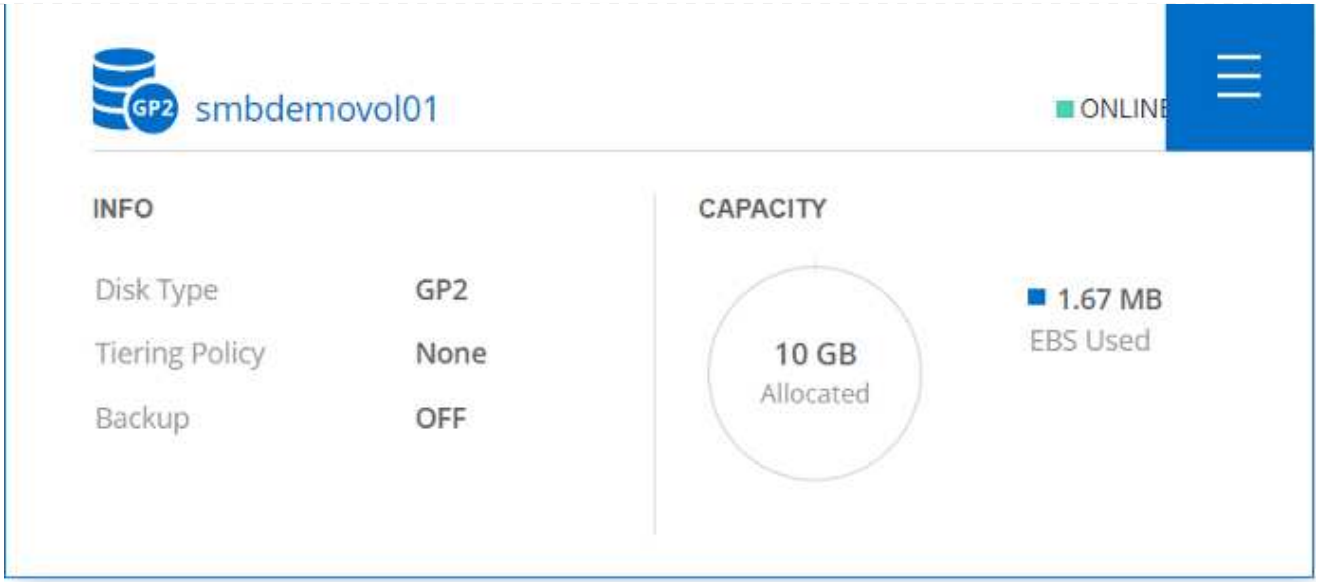
1. After the working environment is ready, make sure the CIFS server is configured with the appropriate DNS and Active Directory configuration parameters. This step is required before you can create the SMB volume.



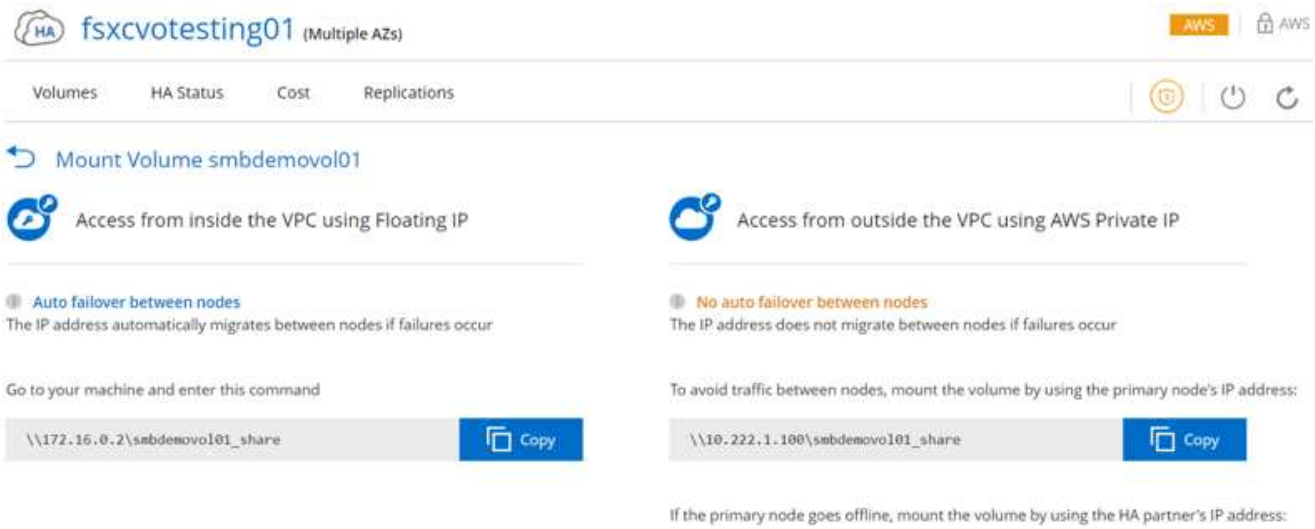
1. Select the CVO instance to create the volume and click the Create Volume option. Choose the appropriate size and cloud manager chooses the containing aggregate or use advanced allocation mechanism to place on a specific aggregate. For this demo, SMB is selected as the protocol.

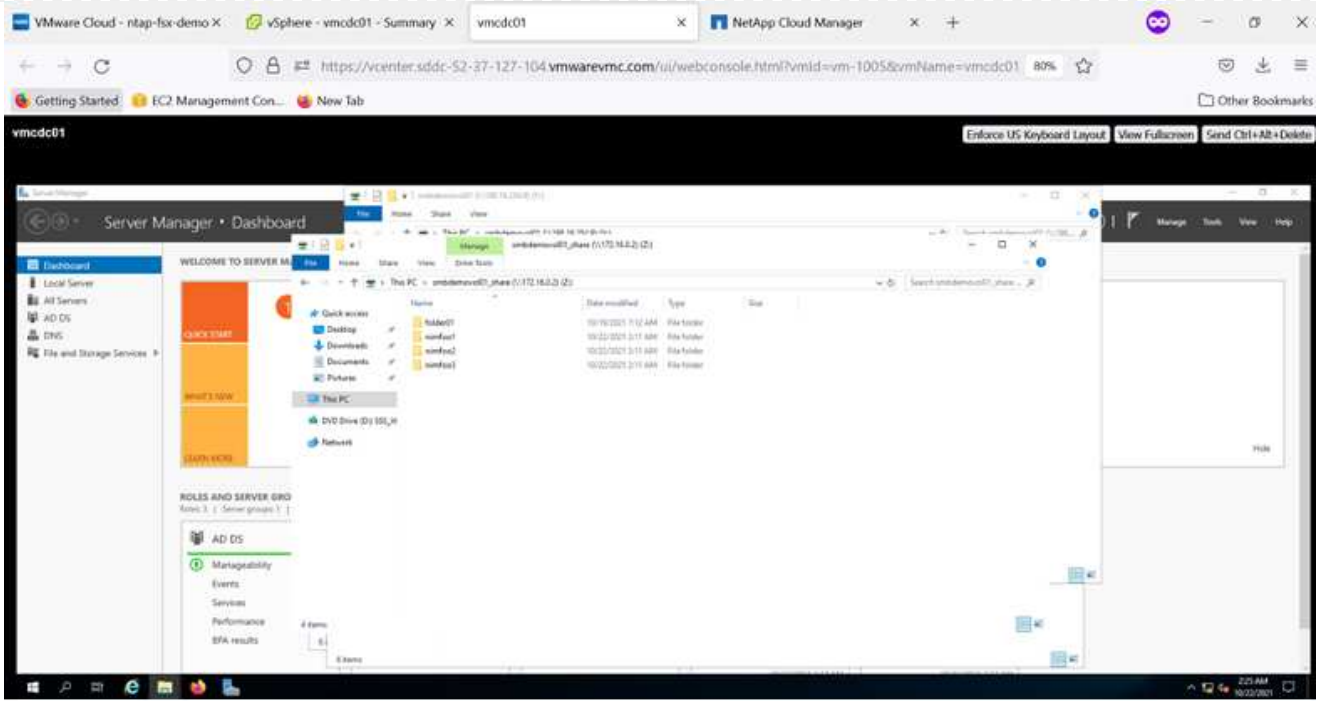


1. After the volume is provisioned, it is availabe under the Volumes pane. Because a CIFS share is provisioned, you should give your users or groups permission to the files and folders and verify that those users can access the share and create a file.



1. After the volume is created, use the mount command to connect to the share from the VM running on the VMware Cloud in AWS SDDC hosts.
2. Copy the following path and use the Map Network Drive option to mount the volume on the VM running on the VMware Cloud in AWS SDDC.

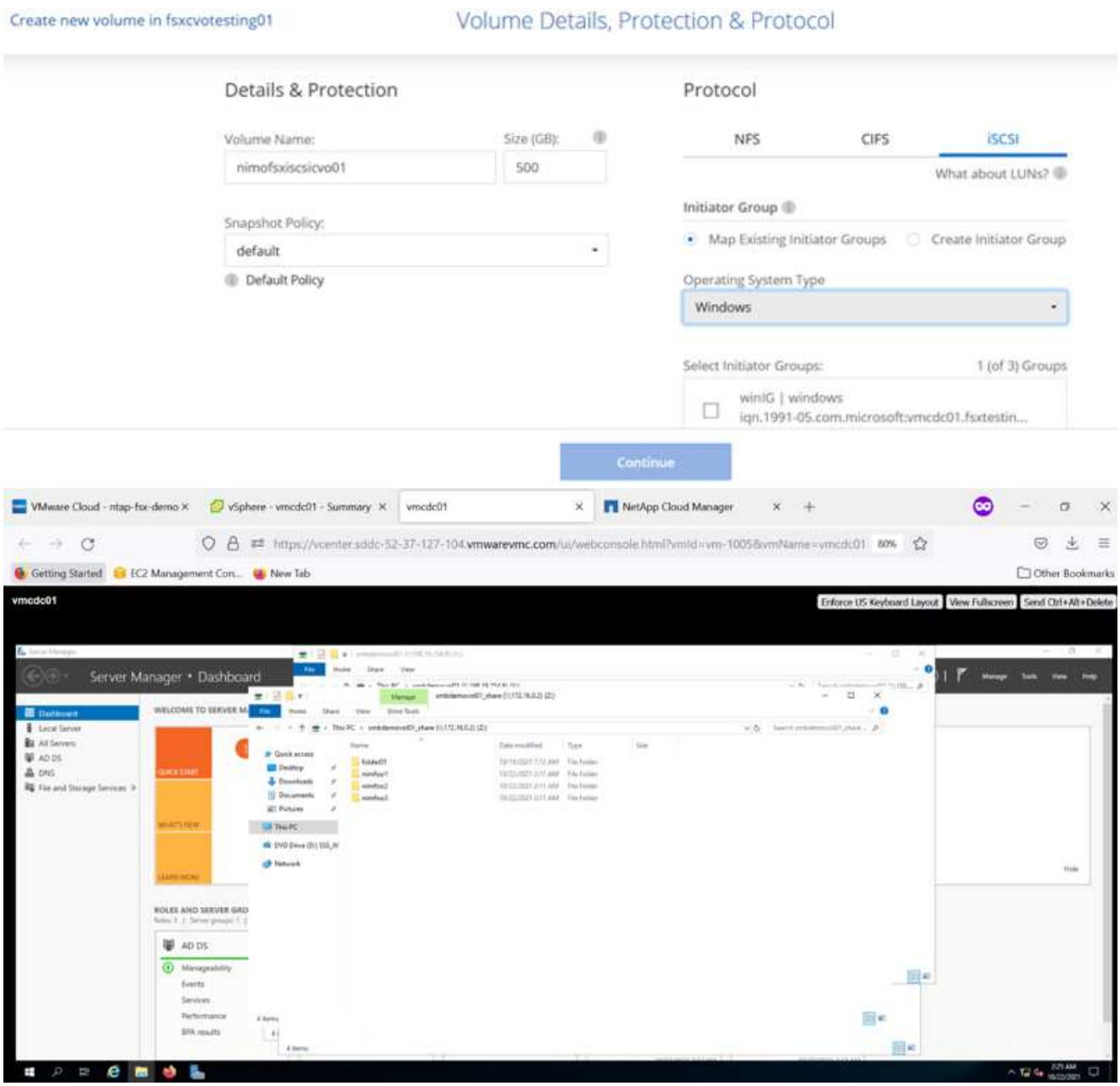



VMware Cloud - ntap-fsx-demo
vSphere - vmcdc01 - Summary
vmcdc01
NetApp Cloud Manager
https://vcenter.sddc-52-37-127-104.vmwarevmc.com/ui/webconsole.html?vmId=vm-1005&vmName=vmcdc01
Getting Started
EC2 Management Con...
New Tab
Other Bookmarks
vmcdc01
Enforce US Keyboard Layout
View Fullscreen
Send Ctrl+Alt+Delete
Server Manager • Dashboard
Dashboard
Local Server
All Servers
AD DS
DNS
File and Storage Services
AD DS
Manageability
Events
Services
Performance
BPA results

Connect the LUN to a host

To connect the Cloud Volumes ONTAP LUN to a host, complete the following steps:

1. On the Cloud Manager Canvas page, double-click the Cloud Volumes ONTAP working environment to create and manage volumes.
2. Click Add Volume > New Volume, select iSCSI, and click Create Initiator Group. Click Continue.



1. After the volume is provisioned, select the volume, and then click Target IQN. To copy the iSCSI Qualified Name (IQN), click Copy. Set up an iSCSI connection from the host to the LUN.

To accomplish the same for the host residing on the VMware Cloud on AWS SDDC, complete the following steps:

a. RDP to the VM hosted on VMware cloud on AWS.

b. Open the iSCSI Initiator Properties dialog box: Server Manager > Dashboard > Tools > iSCSI Initiator.

c. From the Discovery tab, click Discover Portal or Add Portal and then enter the IP address of the iSCSI target port.

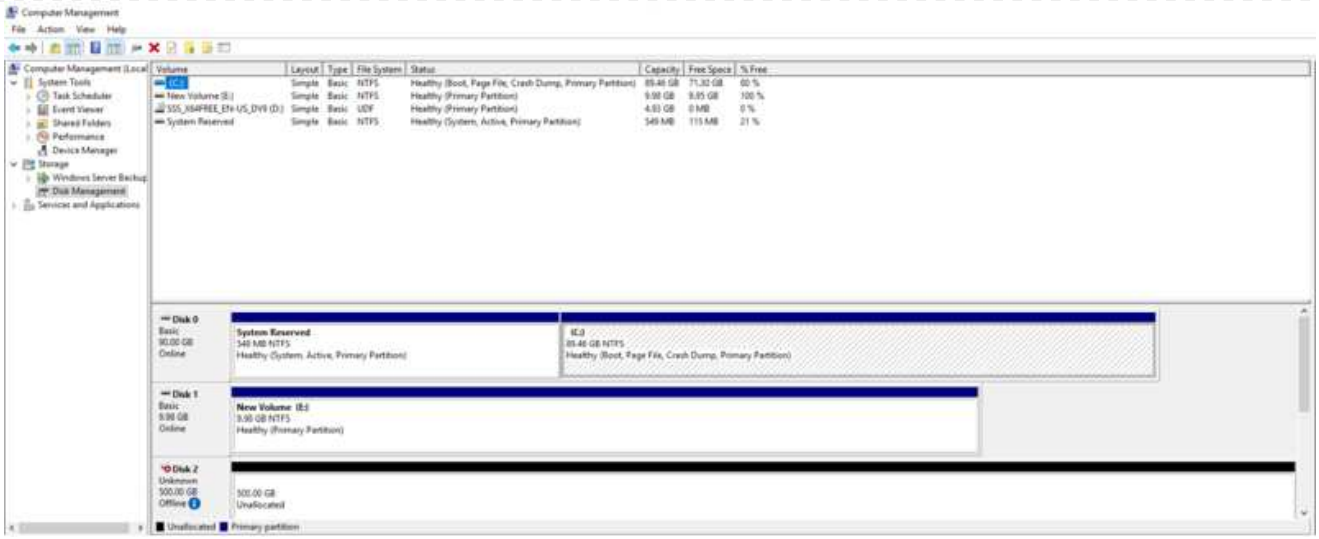
d. From the Targets tab, select the target discovered and then click Log On or Connect.

e. Select Enable Multipath, and then select Automatically Restore This Connection When the Computer Starts or Add This Connection to the List of Favorite Targets. Click Advanced.

> The Windows host must have an iSCSI connection to each node in the cluster. The native DSM selects the best paths to use.

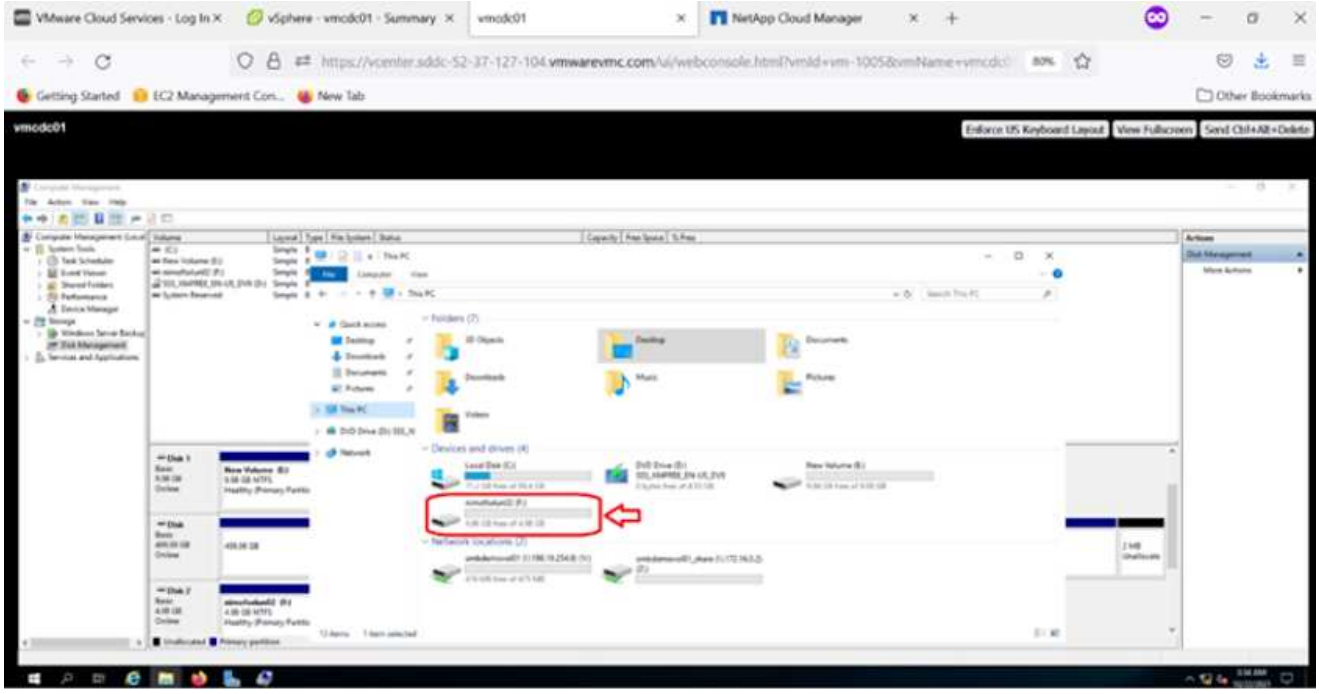
LUNs from the SVM appear as disks to the Windows host. Any new disks that are added are not automatically discovered by the host. Trigger a manual rescan to discover the disks by completing the following steps:

1. Open the Windows Computer Management utility: Start > Administrative Tools > Computer Management.
2. Expand the Storage node in the navigation tree.
3. Click Disk Management.
4. Click Action > Rescan Disks.



When a new LUN is first accessed by the Windows host, it has no partition or file system. Initialize the LUN; and optionally, format the LUN with a file system by completing the following steps:

1. Start Windows Disk Management.
2. Right-click the LUN, and then select the required disk or partition type.
3. Follow the instructions in the wizard. In this example, drive F: is mounted.



On the Linux clients, ensure the iSCSI daemon is running. After the LUNs are provisioned, refer to the detailed guidance on iSCSI configuration for your Linux distribution. For example, Ubuntu iSCSI configuration can be found here. To verify, run lsblk cmd from the shell.

Mount Cloud Volumes ONTAP NFS volume on Linux client

To mount the Cloud Volumes ONTAP (DIY) file system from VMs within VMC on AWS SDDC, complete the following steps:

1. Connect to the designated Linux instance.
2. Open a terminal on the instance using secure shell (SSH) and log in with the appropriate credentials.
3. Make a directory for the volume's mount point with the following command.

```
$ sudo mkdir /fsxcvotesting01/nfsdemovol01
```

4. Mount the Amazon FSx for NetApp ONTAP NFS volume to the directory that is created in the previous step.

```
sudo mount -t nfs nfsvers=4.1,172.16.0.2:/nfsdemovol01
/fsxcvotesting01/nfsdemovol01
```