

## **VMware for Public Cloud**

**NetApp Solutions** 

NetApp September 13, 2024

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## VMware for Public Cloud

## **Overview of NetApp Hybrid Multicloud with VMware**

Most IT organizations follow the hybrid cloud-first approach. These organizations are in a transformation phase and customers are evaluating their current IT landscape and then migrating their workloads to the cloud based on the assessment and discovery exercise.

The factors for customers migrating to the cloud can include elasticity and burst, data center exit, data center consolidation, end-of-life scenarios, mergers, acquisitions, and so on. The reason for this migration can vary based on each organization and their respective business priorities. When moving to the hybrid cloud, choosing the right storage in the cloud is very important in order to unleash the power of cloud deployment and elasticity.

#### VMware Cloud options in Public Cloud

This section describes how each of the cloud providers support a VMware Software Defined Data Center (SDDC) and/or VMware Cloud Foundation (VCF) stack within their respective public cloud offerings.

#### **Azure VMware Solution**



Azure VMware Solution is a hybrid cloud service that allows for fully functioning VMware SDDCs within the Microsoft Azure public cloud. Azure VMware Solution is a first-party solution fully managed and supported by Microsoft, verified by VMware leveraging Azure infrastructure. This means that when Azure VMware Solution is deployed, customer's get VMware's ESXi for compute virtualization, vSAN for hyper-converged storage, and NSX for networking and security, all while taking advantage of Microsoft Azure's global presence, class-leading data center facilities and proximity to the rich ecosystem of native Azure services and solutions.

#### VMware Cloud on AWS



**vm**ware<sup>®</sup>

VMware Cloud on AWS brings VMware's enterprise-class SDDC software to the AWS Cloud with optimized access to native AWS services. Powered by VMware Cloud Foundation, VMware Cloud on AWS integrates VMware's compute, storage, and network virtualization products (VMware vSphere, VMware vSAN, and VMware NSX) along with VMware vCenter Server management, optimized to run on dedicated, elastic, bare-metal AWS infrastructure.

#### **Google Cloud VMware Engine**



Google Cloud VMware Engine is an infrastructure-as-a-service (laaS) offering built on Google Cloud's highly performant scalable infrastructure and VMware Cloud Foundation stack – VMware vSphere, vCenter, vSAN, and NSX-T. This service enables a fast path to the cloud, seamlessly migrating or extending existing VMware

workloads from on-premises environments to Google Cloud Platform without the cost, effort ,or risk of rearchitecting applications or retooling operations. It is a service sold and supported by Google, working closely with VMware.



SDDC private cloud and NetApp Cloud Volumes colocation provides the best performance with minimal network latency.

#### Did you know?

Regardless of the cloud used, when a VMware SDDC is deployed, the initial cluster includes the following products:

- VMware ESXi hosts for compute virtualization with a vCenter Server appliance for management
- VMware vSAN hyper-converged storage incorporating the physical storage assets of each ESXi host
- VMware NSX for virtual networking and security with an NSX Manager cluster for management

#### Storage configuration

For customers planning to host storage-intensive workloads and scale out on any cloud-hosted VMware solution, the default hyper-converged infrastructure dictates that the expansion should be on both the compute and storage resources.

By integrating with NetApp Cloud Volumes, such as Azure NetApp Files, Amazon FSx for NetApp ONTAP, Cloud Volumes ONTAP (available in all three major hyperscalers), and Cloud Volumes Service for Google Cloud, customers now have options to independently scale their storage separately, and only add compute nodes to the SDDC cluster as needed.

#### Notes:

- VMware does not recommend unbalanced cluster configurations, hence expanding storage means adding more hosts, which implies more TCO.
- Only one vSAN environment is possible. Therefore, all storage traffic will compete directly with production workloads.
- There is no option to provide multiple performance tiers to align application requirements, performance, and cost.
- It is very easy to reach the limits of storage capacity of vSAN built on top of the cluster hosts. Use NetApp Cloud Volumes to scale storage to either host active datasets or tier cooler data to persistent storage.

Azure NetApp Files, Amazon FSx for NetApp ONTAP, Cloud Volumes ONTAP (available in all three major hyperscalers), and Cloud Volumes Service for Google Cloud can be used in conjunction with guest VMs. This hybrid storage architecture consists of a vSAN datastore that holds the guest operating system and application binary data. The application data is attached to the VM through a guest-based iSCSI initiator or the NFS/SMB mounts that communicate directly with Amazon FSx for NetApp ONTAP, Cloud Volume ONTAP, Azure NetApp Files and Cloud Volumes Service for Google Cloud respectively. This configuration allows you to easily overcome challenges with storage capacity as with vSAN, the available free space depends on the slack space and storage policies used.

Let's consider a three-node SDDC cluster on VMware Cloud on AWS:

- The total raw capacity for a three-node SDDC = 31.1TB (roughly 10TB for each node).
- The slack space to be maintained before additional hosts are added = 25% = (.25 x 31.1TB) = 7.7TB.

- The usable raw capacity after slack space deduction = 23.4TB
- The effective free space available depends on the storage policy applied.

For example:

- RAID 0 = effective free space = 23.4TB (usable raw capacity/1)
- RAID 1 = effective free space = 11.7TB (usable raw capacity/2)
- RAID 5 = effective free space = 17.5TB (usable raw capacity/1.33)

Thus, using NetApp Cloud Volumes as guest-connected storage would help in expanding the storage and optimizing the TCO while meeting the performance and data protection requirements.



In-guest storage was the only available option at the time this document was written. As supplemental NFS datastore support becomes available, additional documentation will be available here.

#### Points to Remember

- In hybrid storage models, place tier 1 or high priority workloads on vSAN datastore to address any specific latency requirements because they are part of the host itself and within proximity. Use in-guest mechanisms for any workload VMs for which transactional latencies are acceptable.
- Use NetApp SnapMirror® technology to replicate the workload data from the on-premises ONTAP system to Cloud Volumes ONTAP or Amazon FSx for NetApp ONTAP to ease migration using block-level mechanisms. This does not apply to Azure NetApp Files and Cloud Volumes Services. For migrating data to Azure NetApp Files or Cloud Volumes Services, use NetApp XCP, BlueXP Copy and Sync, rysnc or robocopy depending on the file protocol used.
- Testing shows 2-4ms additional latency while accessing storage from the respective SDDCs. Factor this additional latency into the application requirements when mapping the storage.
- For mounting guest-connected storage during test failover and actual failover, make sure iSCSI initiators are reconfigured, DNS is updated for SMB shares, and NFS mount points are updated in fstab.
- Make sure that in-guest Microsoft Multipath I/O (MPIO), firewall, and disk timeout registry settings are configured properly inside the VM.



This applies to guest connected storage only.

#### Benefits of NetApp cloud storage

NetApp cloud storage offers the following benefits:

- Improves compute-to-storage density by scaling storage independently of compute.
- Allows you to reduce the host count, thus reducing the overall TCO.
- Compute node failure does not impact storage performance.
- The volume reshaping and dynamic service-level capability of Azure NetApp Files allows you to optimize cost by sizing for steady-state workloads, and thus preventing over provisioning.
- The storage efficiencies, cloud tiering, and instance-type modification capabilities of Cloud Volumes ONTAP allow optimal ways of adding and scaling storage.
- Prevents over provisioning storage resources are added only when needed.

- Efficient Snapshot copies and clones allow you to rapidly create copies without any performance impact.
- Helps address ransomware attacks by using quick recovery from Snapshot copies.
- Provides efficient incremental block transfer-based regional disaster recovery and integrated backup block level across regions provides better RPO and RTOs.

#### Assumptions

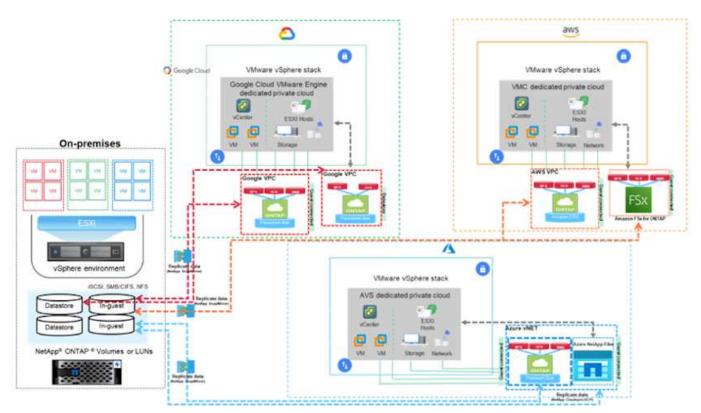
- SnapMirror technology or other relevant data migration mechanisms are enabled. There are many connectivity options, from on-premises to any hyperscaler cloud. Use the appropriate path and work with the relevant networking teams.
- In-guest storage was the only available option at the time this document was written. As supplemental NFS datastore support becomes available, additional documentation will be available here.



Engage NetApp solution architects and respective hyperscaler cloud architects for planning and sizing of storage and the required number of hosts. NetApp recommends identifying the storage performance requirements before using the Cloud Volumes ONTAP sizer to finalize the storage instance type or the appropriate service level with the right throughput.

#### **Detailed architecture**

From a high-level perspective, this architecture (shown in the figure below) covers how to achieve hybrid Multicloud connectivity and app portability across multiple cloud providers using NetApp Cloud Volumes ONTAP, Cloud Volumes Service for Google Cloud and Azure NetApp Files as an additional in-guest storage option.



## **NetApp Solutions for VMware in Hyperscalers**

Learn more about the capabilities that NetApp brings to the three (3) primary hyperscalers - from NetApp as a guest connected storage device or a supplemental NFS datastore to migrating workflows, extending/bursting to the cloud, backup/restore and disaster recovery.

Pick your cloud and let NetApp do the rest!



**(i)** 

To see the capabilities for a specific hyperscaler, click on the appropriate tab for that hyperscaler.

Jump to the section for the desired content by selecting from the following options:

- VMware in the Hyperscalers Configuration
- NetApp Storage Options
- NetApp / VMware Cloud Solutions

#### VMware in the Hyperscalers Configuration

As with on-premises, planning a cloud based virtualization environment is critical for a successful productionready environment for creating VMs and migration.

#### AWS / VMC

This section describes how to set up and manage VMware Cloud on AWS SDDC and use it in combination with the available options for connecting NetApp storage.



In-guest storage is the only supported method of connecting Cloud Volumes ONTAP to AWS VMC.

The setup process can be broken down into the following steps:

- Deploy and Configure VMware Cloud for AWS
- Connect VMware Cloud to FSx ONTAP

View the detailed configuration steps for VMC.

#### Azure / AVS

This section describes how to set up and manage Azure VMware Solution and use it in combination with the available options for connecting NetApp storage.



In-guest storage is the only supported method of connecting Cloud Volumes ONTAP to Azure VMware Solution.

The setup process can be broken down into the following steps:

- · Register the resource provider and create a private cloud
- · Connect to a new or existing ExpressRoute virtual network gateway
- · Validate the network connectivity and access the private cloud

View the detailed configuration steps for AVS.

#### GCP / GCVE

This section describes how to set up and manage GCVE and use it in combination with the available options for connecting NetApp storage.



In-guest storage is the only supported method of connecting Cloud Volumes ONTAP and Cloud Volumes Services to GCVE.

The setup process can be broken down into the following steps:

- · Deploy and Configure GCVE
- Enable Private Access to GCVE

View the detailed configuration steps for GCVE.

#### **NetApp Storage Options**

NetApp storage can be utilized in several ways - either as guest connected or as a supplemental NFS datastore - within each of the 3 major hyperscalers.

Please visit Supported NetApp Storage Options for more information.

#### AWS / VMC

AWS supports NetApp storage in the following configurations:

- · FSx ONTAP as guest connected storage
- Cloud Volumes ONTAP (CVO) as guest connected storage
- FSx ONTAP as a supplemental NFS datastore

View the detailed guest connect storage options for VMC. View the detailed supplemental NFS datastore options for VMC.

#### Azure / AVS

Azure supports NetApp storage in the following configurations:

- Azure NetApp Files (ANF) as guest connected storage
- Cloud Volumes ONTAP (CVO) as guest connected storage
- Azure NetApp Files (ANF) as a supplemental NFS datastore

View the detailed guest connect storage options for AVS. View the detailed supplemental NFS datastore options for AVS.

#### GCP / GCVE

Google Cloud supports NetApp storage in the following configurations:

- Cloud Volumes ONTAP (CVO) as guest connected storage
- · Cloud Volumes Service (CVS) as guest connected storage
- · Cloud Volumes Service (CVS) as a supplemental NFS datastore

View the detailed guest connect storage options for GCVE.

Read more about NetApp Cloud Volumes Service datastore support for Google Cloud VMware Engine (NetApp blog) or How to use NetApp CVS as datastores for Google Cloud VMware Engine (Google blog)

#### NetApp / VMware Cloud Solutions

With NetApp and VMware cloud solutions, many use cases are simple to deploy in your hyperscaler of choice. VMware defines the primary cloud workload use-cases as:

- Protect (includes both Disaster Recovery and Backup / Restore)
- Migrate
- Extend

AWS / VMC Browse the NetApp solutions for AWS / VMC
Azure / AVS Browse the NetApp solutions for Azure / AVS
GCP / GCVE Browse the NetApp solutions for Google Cloud Platform (GCP) / GCVE

# Supported Configurations for NetApp Hybrid Multicloud with VMware

Understanding the combinations for NetApp storage support in the major hyperscalers.

	Guest Connected	Supplemental NFS Datastore
AWS	CVO FSx ONTAP Details	FSx ONTAP Details
Azur e	CVO ANF Details	ANF Details
GCP	CVO CVS Details	CVS Details

### VMware in the Hyperscalers Configuration

#### Configuring the virtualization environment in the cloud provider

Details for how to configure the virtualization environment in each of the supported hyperscalers are covered here.

#### AWS / VMC

This section describes how to set up and manage VMware Cloud on AWS SDDC and use it in combination with the available options for connecting NetApp storage.



In-guest storage is the only supported method of connecting Cloud Volumes ONTAP to AWS VMC.

The setup process can be broken down into the following steps:

- Deploy and Configure VMware Cloud for AWS
- Connect VMware Cloud to FSx ONTAP

View the detailed configuration steps for VMC.

#### Azure / AVS

This section describes how to set up and manage Azure VMware Solution and use it in combination with the available options for connecting NetApp storage.



In-guest storage is the only supported method of connecting Cloud Volumes ONTAP to Azure VMware Solution.

The setup process can be broken down into the following steps:

- Register the resource provider and create a private cloud
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View the detailed configuration steps for AVS.

#### GCP / GCVE

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In-guest storage is the only supported method of connecting Cloud Volumes ONTAP and Cloud Volumes Services to GCVE.

The setup process can be broken down into the following steps:

- Deploy and Configure GCVE
- Enable Private Access to GCVE

View the detailed configuration steps for GCVE.

#### Deploy and configure the Virtualization Environment on AWS

As with on-premises, planning VMware Cloud on AWS is critical for a successful production-ready environment for creating VMs and migration.

This section describes how to set up and manage VMware Cloud on AWS SDDC and use it in combination with the available options for connecting NetApp storage.



In-guest storage is currently the only supported method of connecting Cloud Volumes ONTAP (CVO) to AWS VMC.

The setup process can be broken down into the following steps:

VMware Cloud on AWS provides for a cloud native experience for VMware based workloads in the AWS ecosystem. Each VMware Software-Defined Data Center (SDDC) runs in an Amazon Virtual Private Cloud (VPC) and provides a full VMware stack (including vCenter Server), NSX-T software-defined networking, vSAN software-defined storage, and one or more ESXi hosts that provide compute and storage resources to your workloads.

This section describes how to set up and manage VMware Cloud on AWS and use it in combination with Amazon FSx for NetApp ONTAP and/or Cloud Volumes ONTAP on AWS with in-guest storage.



In-guest storage is currently the only supported method of connecting Cloud Volumes ONTAP (CVO) to AWS VMC.

The setup process can be broken down into three parts:

#### **Register for an AWS Account**

Register for an Amazon Web Services Account.

You need an AWS account to get started, assuming there isn't one created already. New or existing, you need administrative privileges in the account for many steps in this procedure. See this link for more information regarding AWS credentials.

#### **Register for a My VMware Account**

Register for a My VMware account.

For access to VMware's cloud portfolio (including VMware Cloud on AWS), you need a VMware customer account or a My VMware account. If you have not already done so, create a VMware account here.

After the VMware account is configured and proper sizing is performed, deploying a Software-Defined Data Center is the obvious next step for using the VMware Cloud on AWS service. To create an SDDC, pick an AWS region to host it, give the SDDC a name, and specify how many ESXi hosts you want the SDDC to contain. If you don't already have an AWS account, you can still create a starter configuration SDDC that contains a single ESXi host.

1. Log into the VMware Cloud Console using your existing or newly created VMware credentials.

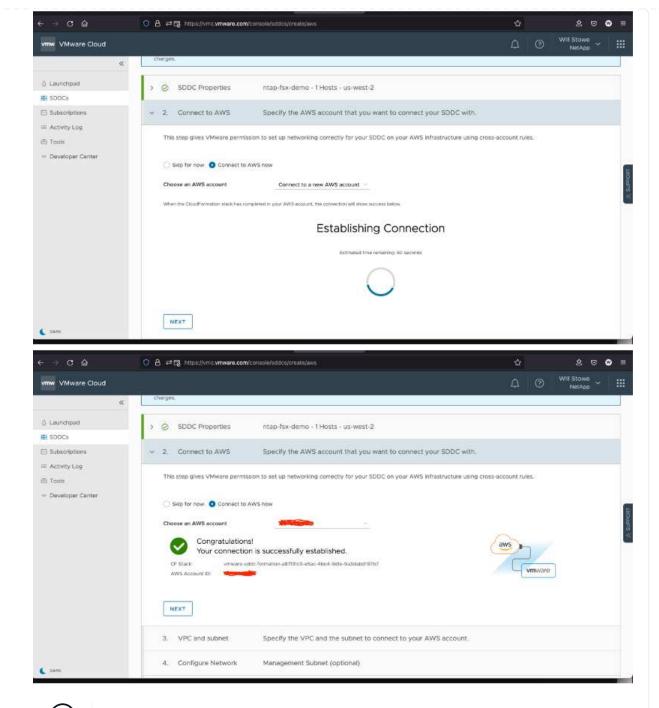
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2. Configure the AWS region, deployment, and host type and the SDDC name:

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å Launchped	v 1. SDDC Properties	Give your SDDC a name, choose a size, and specify the AWS region where it will be created.			
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Dated	2. Connect to AWS	Specify the AWS account that you want to connect your SDDC with.			

3. Connect to the desired AWS account and execute the AWS Cloud Formation stack.

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Single-host configuration is used in this validation.

4. Select the desired AWS VPC to connect the VMC environment with.

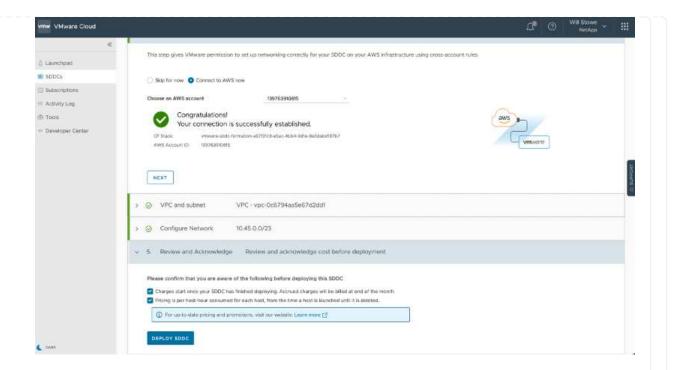
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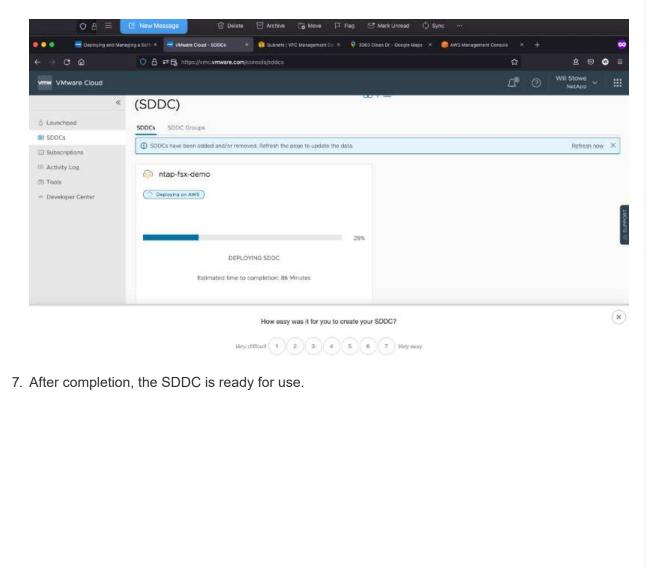
5. Configure the VMC Management Subnet; this subnet contains VMC-managed services like vCenter, NSX, and so on. Do not choose an overlapping address space with any other networks that need connectivity to the SDDC environment. Finally, follow the recommendations for CIDR size notated below.

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	Specify a private subnet range (RFC 1918) to be used for vCenter Server, NSX A     Choose a range that will not overlap with other networks or SDDC group memb     Minimum CIDR sizes: /23 for up to 27 hosts, /26 for up to 25 hosts, /16 for up to     Reserved CIDRs: 10.0.0.01/5, 172.310.0/h6.  Menagement Subnet     CIDR Intek     Default: 10.3.0.016  NEXT	ers that connect to this SDDC.	
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6. Review and acknowledge the SDDC configuration, and then click deploy the SDDC.



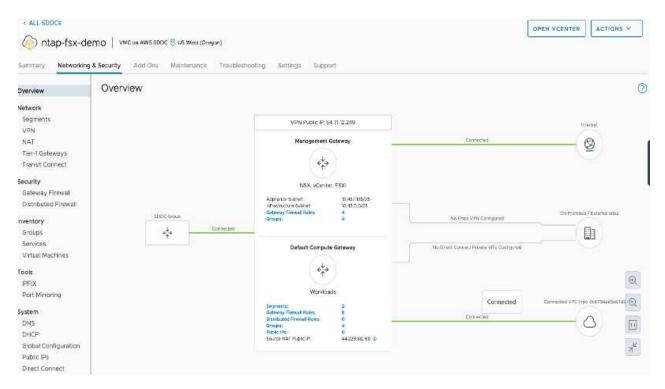
The deployment process typically takes approximately two hours to complete.



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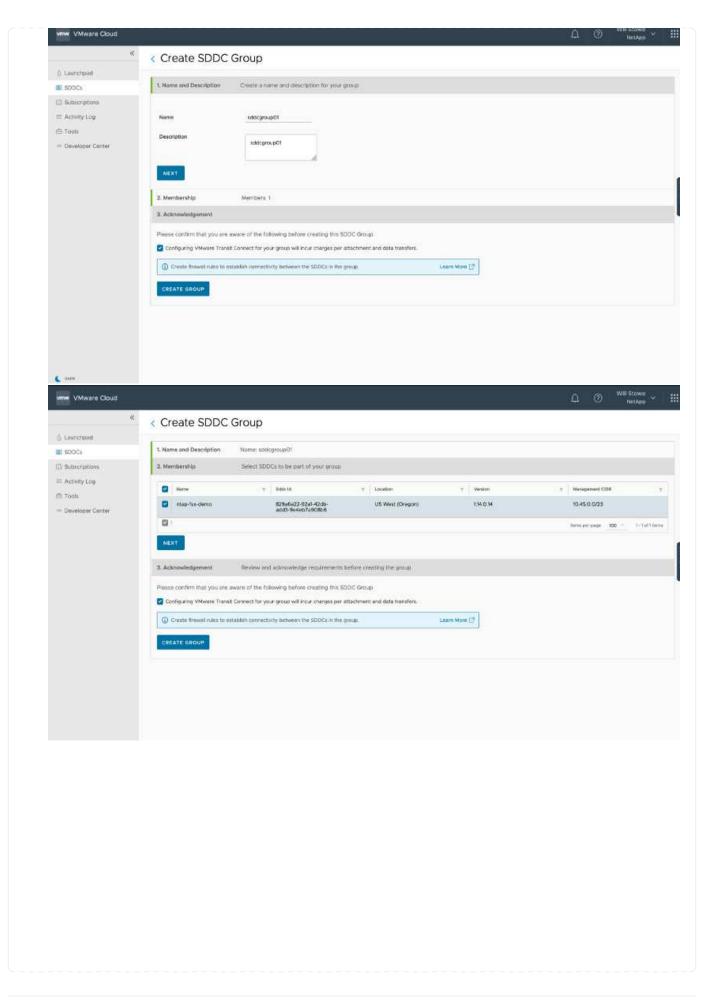
To connect VMware Cloud to FSx ONTAP, complete the following steps:

 With VMware Cloud deployment completed and connected to AWS VPC, you must deploy Amazon FSx for NetApp ONTAP into a new VPC rather than the original connected VPC (see the screenshot below). FSx (NFS and SMB floating IPs) is not accessible if it is deployed in the connected VPC. Keep in mind that ISCSI endpoints like Cloud Volumes ONTAP work just fine from the connected VPC.



2. Deploy an additional VPC in the same region, and then deploy Amazon FSx for NetApp ONTAP into the new VPC.

Configuration of an SDDC group in the VMware Cloud console enables the networking configuration options required to connect to the new VPC where FSx is deployed. In step 3, verify that "Configuring VMware Transit Connect for your group will incur charges per attachment and data transfers" is checked, and then choose Create Group. The process can take a few minutes to complete.



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3. Attach the newly created VPC to the just created SDDC group. Select the External VPC tab and follow the instructions for attaching an External VPC to the group. This process can take 10 to 15 minutes to complete.

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4. As part of the external VPC process, you are prompted through the AWS console to a new shared resource via the Resource Access Manager. The shared resource is the AWS Transit Gateway managed by VMware Transit Connect.

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	Use cases Manage resources centrally in a multi-	Your AZ ID AZ IDs provides a consistent way of identifying the location of a resource across all your accounts. This makes it easier for you to provision resources centrally in a single account and share them across multiple

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5. Create the Transit Gateway Attachment.

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Select and configure your VPC attachment		
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vpc-0d1c764bcc495e805 (vmcfsx2.vpc)	•	

6. Back on the VMC Console, Accept the VPC attachment. This process can take approximately 10 minutes to complete.

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- 7. While in the External VPC tab, click the edit icon in the Routes column and add in the following required routes:
  - A route for the floating IP range for Amazon FSx for NetApp ONTAP floating IPs.
  - A route for the floating IP range for Cloud Volumes ONTAP (if applicable).
  - A route for the newly created external VPC address space.

I All SDDC Simular       Sufficiency Vicenter Linking Direct Compact External VPC External TGW Routing Support         IS Subscriptions       Activity Log         Activity Log       Sufficiency Vicenter Linking Direct Compact External VPC External TGW Routing Support         IT Subscriptions       Activity Log         Developer Center       Activity Compact Sufficiency Vicenter Linking Support         If Tools       Activity Compact Sufficiency Vicenter Linking Support         If Tools       Activity Compact Sufficiency Vicenter Vicenter Sufficiency Vicenter Vicent Vicenter Vicenter Vicenter Vicent Vicenter	ctions ~
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	ι.Ε.

8. Finally, allow bidirectional traffic firewall rules for access to FSx/CVO. Follow these detailed steps for compute gateway firewall rules for SDDC workload connectivity.

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(1997) 1		Edit Routes ×	
		Set of routes pointing to this attachment	
		The profiles can be detinded by comma, space or a new line \$ 1004, 0 mild	
		CANCEL	

9. After the firewall groups are configured for both the Management and Compute gateway, the vCenter can be accessed as follows:

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		-										

The next step is to verify that Amazon FSx ONTAP or Cloud Volumes ONTAP is configured depending on your requirements and that the volumes are provisioned to offload storage components from vSAN to optimize the deployment.

#### Deploy and configure the Virtualization Environment on Azure

As with on-premises, planning Azure VMware Solution is critical for a successful production-ready environment for creating VMs and migration.

This section describes how to set up and manage Azure VMware Solution and use it in combination with the available options for connecting NetApp storage.

The setup process can be broken down into the following steps:

To use Azure VMware Solution, first register the resource provider within the identified subscription:

- 1. Sign in to the Azure portal.
- 2. On the Azure portal menu, select All Services.
- 3. In the All Services dialog box, enter the subscription and then select Subscriptions.
- 4. To view, select the subscription from the subscription list.
- 5. Select Resource Providers and enter Microsoft.AVS into the search.
- 6. If the resource provider is not registered, select Register.

Home > Subscriptions >					
Subscriptions « NetApp (cloudcontrolproduction.com)	Subscription		Resource providers		×
+ Add 📋 Manage Policies	P Search (Ctrl+/)		< Register 🏷 Unregister 🕐 Refresh		
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to manage Azure resources. To view subscriptions for which you have billing	III Resources				
access, click here Showing subscriptions in NetApp directory.	Preview features		Provider	Status	
Don't see a subscription? Switch directories	🗮 Usage + quotas		Microsoft.AVS	Registering	
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Provider	Status
Microsoft.OperationsManagement	Registered
Microsoft.Compute	Registered
Microsoft.ContainerService	Registered
Microsoft.ManagedIdentity	🖉 Registered
Microsoft.AVS	Registered
Microsoft.OperationalInsights	🧿 Registered
Microsoft.GuestConfiguration	Registered

- 7. After the resource provider is registered, create an Azure VMware Solution private cloud by using the Azure portal.
- 8. Sign in to the Azure portal.
- 9. Select Create a New Resource.
- 10. In the Search the Marketplace text box, enter Azure VMware Solution and select it from the results.
- 11. On the Azure VMware Solution page, select Create.
- 12. From the Basics tab, enter the values in the fields and select Review + Create.

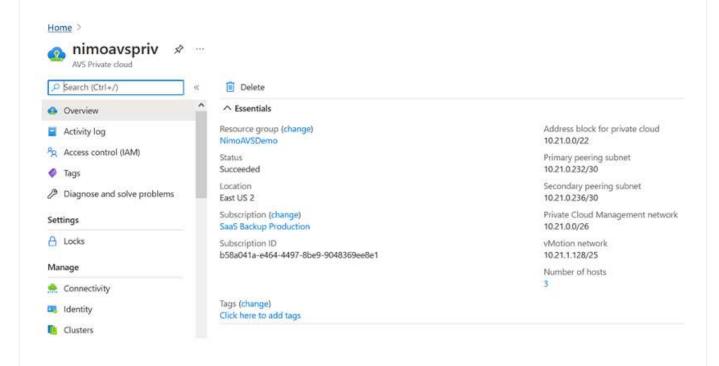
Notes:

- For a quick start, gather the required information during the planning phase.
- Select an existing resource group or create a new resource group for the private cloud. A resource group is a logical container in which the Azure resources are deployed and managed.
- Make sure the CIDR address is unique and does not overlap with other Azure Virtual Networks or onpremises networks. The CIDR represents the private cloud management network and is used for the cluster management services, such as vCenter Server and NSX-T Manager. NetApp recommends using a /22 address space. In this example, 10.21.0.0/22 is used.

Prerequisities "Basics Tags	Review and Create	
Project details		
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other Azure vnets or on-premise ne		

The provisioning process takes approximately 4–5 hours. After the process is complete, verify that the deployment was successful by accessing the private cloud from the Azure portal. A status of Succeeded is displayed when the deployment is complete.

An Azure VMware Solution private cloud requires an Azure Virtual Network. Because Azure VMware Solution doesn't support on-premises vCenter, additional steps are required to integrate with an existing on-premises environment. Setting up an ExpressRoute circuit and a virtual network gateway is also required. While waiting for the cluster provisioning to complete, create a new virtual network or use an existing one to connect to Azure VMware Solution.



To create a new Azure Virtual Network (VNet), select the Azure VNet Connect tab. Alternatively, you can create one manually from the Azure portal by using the Create Virtual Network wizard:

- 1. Go to Azure VMware Solution private cloud and access Connectivity under the Manage option.
- 2. Select Azure VNet Connect.
- 3. To create a new VNet, select the Create New option.

This feature allows a VNet to be connected to the Azure VMware Solution private cloud. The VNet enables communication between workloads in this virtual network by automatically creating required components (for example, jump box, shared services such as Azure NetApp Files, and Cloud Volume ONTAP) to the private cloud created in Azure VMware Solution over ExpressRoute.

Note: The VNet address space should not overlap with the private cloud CIDR.

₽ Search (Ctrl+/)	«	🖫 Save 🕐 Refresh			
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Activity log					
Access control (IAM)		This is an optional feature that allows private cloud. A vNet enables the cor			
Tags		Jumpbox) to the private cloud create subnet 'GatewaySubnet' should be se	d in Azure VMware	Solution over ExpressRoute. Or	nly a vNet with a valid
Diagnose and solve problems		address space does not overlap with network.			
Settings		Virtual network			~
A Locks			Create new		
Manage		Address block for vnet	3K		
🌨 Connectivity		Address block for private cloud	10.21.0.0/2	22	C
Identity					
Clusters					

4. Provide or update the information for the new VNet and select OK.

Azur defa 172.1	e VMware Solution over a ult address range and sub 16.0.0/16), Step 2: Add a s	he communication between workloads in this virtual n an Express route. A default address range and a subne anet of this virtual network, follow these steps. Step 1: subnet under "Subnets" with the name as "GatewaySu re about virtual networks Cf	t is selected for this virtual network. For changing Change the "Address Range" to desired range (e.e.	the g.
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Add	ress space			
The	virtual network's address	space specified as one or more address prefixes in CIE	R notation (e.g. 10.0.0.0/16).	
	Address range	Addresses	Overlap	
	172.24.0.0/16	172.24.0.4 - 172.24.255.254 (65531 addresses)	None	Ē
		(0 Addresses)	None	
Sub	nets			
The:	subnet's address range in	CIDR notation (e.g. 10.0.0.0/24). It must be contained	by the address space of the virtual network.	
	Subnet name	Address range	Addresses	
	GatewaySubnet	172.24.0.0/24	172.24.0.4 - 172.24.0.254 (251 addresses)	Û
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The VNet with the provided address range and gateway subnet is created in the designated subscription and resource group.

If you create a VNet manually, create a virtual network gateway with the appropriate SKU and ExpressRoute as the gateway type. After the deployment is complete, connect the ExpressRoute connection to the virtual network gateway containing Azure VMware Solution private cloud using the authorization key. For more information, see Configure networking for your VMware private cloud in Azure.

 $(\mathbf{i})$ 

#### Validate the network connect and access to Azure VMware Solution private cloud

Azure VMware Solution does not allow you to manage a private cloud with on-premises VMware vCenter. Instead, jump host is required to connect to the Azure VMware Solution vCenter instance. Create a jump host in the designated resource group and sign in to the Azure VMware Solution vCenter. This jump host should be a Windows VM on the same virtual network that was created for connectivity and should provide access to both vCenter and the NSX Manager.

Creat	e a vi	rtual mad	chine					
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After the virtual machine is provisioned, use the Connect option to access RDP.

Virtual machine	st …
	▲ To improve security, enable just-in-time access on this VM, $\rightarrow$
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	To connect to your virtual machine via RDP, select an IP address, optionally change the port number, and download the RDP file.
Diagnose and solve problems	
Diagnose and solve problems	RDP file.
Diagnose and solve problems	RDP file. IP address *
<ul> <li>Diagnose and solve problems</li> <li>Settings</li> <li>Networking</li> </ul>	RDP file. IP address * Public IP address (52:138:103:135)
<ul> <li>Diagnose and solve problems</li> <li>Settings</li> <li>Networking</li> </ul>	RDP file.  IP address *  Public IP address (52:138.103.135)  Port number *

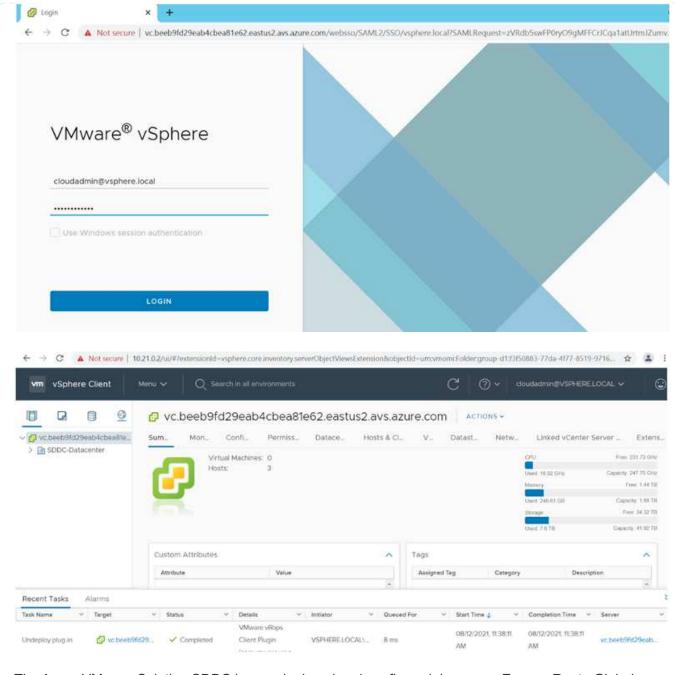
Sign in to vCenter from this newly created jump host virtual machine by using the cloud admin user . To access the credentials, go to the Azure portal and navigate to Identity (under the Manage option within the private cloud). The URLs and user credentials for the private cloud vCenter and NSX-T Manager can be copied from here.

Search (Ctrl+/)	« Login credentials		
Access control (IAM)	<ul> <li>vCenter credentials</li> </ul>		
🖉 Tags	Web client URL ①	https://10.21.0.2/	D
Diagnose and solve problems	Admin username ③	cloudadmin@vsphere.local	D
Settings	Admin password 🛈	D	
A Locks	Certificate thumbprint ①	AE26B15A5CE38DC069D35F045F088CA6343475EC	D
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Placement policies (preview)	Admin password ③		
+ Add-ons	Certificate thumbprint ①	B2B722EA683958283EE159007246D5166D0509D3	Ð

In the Windows virtual machine, open a browser and navigate to the vCenter web client URL ("https://10.21.0.2/") and use the admin user name as **cloudadmin@vsphere.local** and paste the copied password. Similarly, NSX-T manager can also be accessed using the web client URL ("https://10.21.0.3/") and use the admin user name and paste the copied password to create new segments or modify the existing tier gateways.



The web client URLs are different for each SDDC provisioned.



The Azure VMware Solution SDDC is now deployed and configured. Leverage ExpressRoute Global Reach to connect the on-premises environment to Azure VMware Solution private cloud. For more information, see Peer on-premises environments to Azure VMware Solution.

# Deploy and configure the Virtualization Environment on Google Cloud Platform (GCP)

As with on-premises, planning Google Cloud VMware Engine (GCVE) is critical for a successful production-ready environment for creating VMs and migration.

This section describes how to set up and manage GCVE and use it in combination with the available options for connecting NetApp storage.

The setup process can be broken down into the following steps:

To configure a GCVE environment on GCP, login to the GCP console and access the VMware Engine portal.

Click on the "New Private Cloud" button and enter the desired configuration for the GCVE Private Cloud. On "Location", make sure to deploy the private cloud in the same Region/Zone where CVS/CVO is deployed, to ensure the best performance and lowest latency.

Pre-requisites:

- Setup VMware Engine Service Admin IAM role
- Enable VMWare Engine API access and node quota
- Make sure that the CIDR range doesn't overlap with any of your on-premises or cloud subnets. The CIDR range must be /27 or higher.

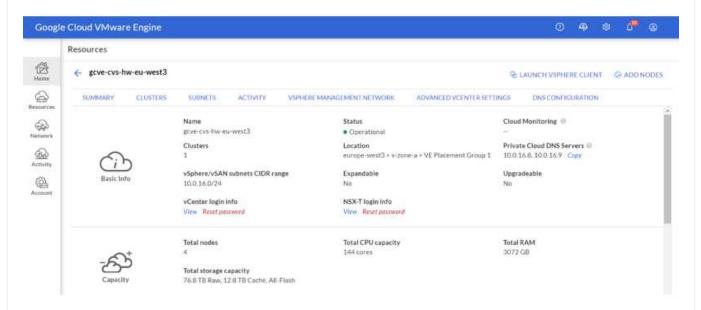
	<ul> <li>Create Private Cloud ①</li> </ul>	
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esources	Location *	
<b>A</b>	us-east4 > v-zone-a > VE Placement Group 2	•
4etwork	Node type *	
<b>A</b>	ve1-standard-72	
Activity (Q)	2x2.6 GHz, 36 Cores (72 HT), 768 GB RAM 19.2 TB Raw, 3.2 TB Cache (All-Flash)	
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	(3to3)	
	vSphere/vSAN subnets CIDR range *	
	192.168.100.0	/ 22 •
	IP Range: 192.168.100.0 - 192.168.103.255	
	HCX Deployment Network CIDR range	
	192.168.104.0	/ 26 •
	IP Range: 192.168.104.0 - 192.168.104.63	

Once the Private Cloud is provisioned, configure private access to the Private Cloud for high-throughput and low-latency data-path connection.

This will ensure that the VPC network where Cloud Volumes ONTAP instances are running is able to communicate with the GCVE Private Cloud. To do so, follow the GCP documentation. For the Cloud Volume Service, establish a connection between VMware Engine and Cloud Volumes Service by performing a one-time peering between the tenant host projects. For detailed steps, follow this link.

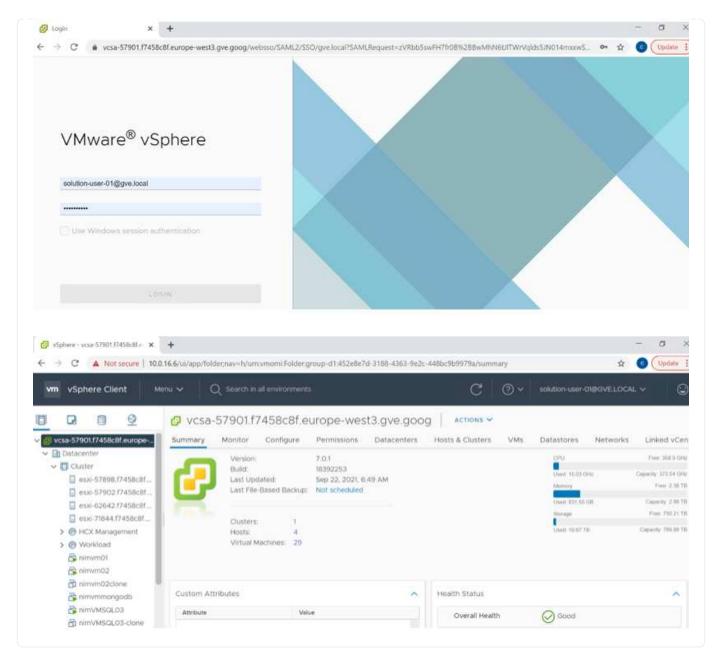
Tenant P 🕅 🗍 🖨	Service	÷	Region	$\frac{1}{2}$	Routing Mode	$\frac{d}{T}$	Peered Project ID 🌐	Peered VPC	÷,	VPC Peering Sta ≑	<b>Region Status</b>
ke841388caa56b	VPC Network		europe-west3		Global		cv-performance-te	cloud-volumes-vpc		<ul> <li>Active</li> </ul>	Connected
jbd729510b3ebbf	NetApp CVS		europe-west3		Global		y2b6c17202af6dc	netapp-tenant-vpc		Active	<ul> <li>Connected</li> </ul>

Sign in to vcenter using the CloudOwner@gve.local user. To access the credentials, go to the VMware Engine portal, Go to Resources, and select the appropriate private cloud. In the Basic info section, click the View link for either vCenter login info (vCenter Server, HCX Manager) or NSX-T login info (NSX Manager).



In a Windows virtual machine, open a browser and navigate to the vCenter web client URL ("https://10.0.16.6/") and use the admin user name as CloudOwner@gve.local and paste the copied password. Similarly, NSX-T manager can also be accessed using the web client URL ("https://10.0.16.11/") and use the admin user name and paste the copied password to create new segments or modify the existing tier gateways.

For connecting from an on-premises network to VMware Engine private cloud, leverage cloud VPN or Cloud Interconnect for appropriate connectivity and make sure the required ports are open. For detailed steps, follow this link.



#### Deploy NetApp Cloud Volume Service supplemental datastore to GCVE

Refer Procedure to deploy supplemental NFS datastore with NetApp CVS to GCVE

# **NetApp Storage in Hyperscaler Clouds**

# **NetApp Storage options for Public Cloud Providers**

Explore the options for NetApp as storage in the three major hyperscalers.

#### AWS / VMC

AWS supports NetApp storage in the following configurations:

- FSx ONTAP as guest connected storage
- Cloud Volumes ONTAP (CVO) as guest connected storage
- FSx ONTAP as a supplemental NFS datastore

View the detailed guest connect storage options for VMC. View the detailed supplemental NFS datastore options for VMC.

## Azure / AVS

Azure supports NetApp storage in the following configurations:

- Azure NetApp Files (ANF) as guest connected storage
- Cloud Volumes ONTAP (CVO) as guest connected storage
- Azure NetApp Files (ANF) as a supplemental NFS datastore

View the detailed guest connect storage options for AVS. View the detailed supplemental NFS datastore options for AVS.

### GCP / GCVE

Google Cloud supports NetApp storage in the following configurations:

- Cloud Volumes ONTAP (CVO) as guest connected storage
- Cloud Volumes Service (CVS) as guest connected storage
- · Cloud Volumes Service (CVS) as a supplemental NFS datastore

View the detailed guest connect storage options for GCVE.

Read more about NetApp Cloud Volumes Service datastore support for Google Cloud VMware Engine (NetApp blog) or How to use NetApp CVS as datastores for Google Cloud VMware Engine (Google blog)

# TR-4938: Mount Amazon FSx for ONTAP as a NFS datastore with VMware Cloud on AWS

This document outlines how to mount Amazon FSx for ONTAP as a NFS datastore with VMware Cloud on AWS.

Niyaz Mohamed, NetApp

# Introduction

Every successful organization is on a path of transformation and modernization. As part of this process, companies typically use their existing VMware investments to leverage cloud benefits and exploring how to migrate, burst, extend, and provide disaster recovery for processes as seamlessly as possible. Customers migrating to the cloud must evaluate the use cases for elasticity and burst, data-center exit, data-center consolidation, end-of-life scenarios, mergers, acquisitions, and so on.

Although VMware Cloud on AWS is the preferred option for the majority of the customers because it delivers

unique hybrid capabilities to a customer, limited native storage options have restricted its usefulness for organizations with storage-heavy workloads. Because storage is directly tied to hosts, the only way to scale storage is to add more hosts, which can increase costs by 35-40% or more for storage intensive workloads. These workloads need additional storage and segregated performance, not additional horsepower, but that means paying for additional hosts. This is where the recent integration of FSx for ONTAP comes in handy for storage and performance intensive workloads with VMware Cloud on AWS.

Let's consider the following scenario: a customer requires eight hosts for horsepower (vCPU/vMem), but they also have a substantial requirement for storage. Based on their assessment, they require 16 hosts to meet storage requirements. This increases the overall TCO because they must buy all that additional horsepower when all they really need is more storage. This is applicable for any use case, including migration, disaster recovery, bursting, dev/test, and so on.

This document walks you through the steps necessary to provision and attach FSx for ONTAP as a NFS datastore for VMware Cloud on AWS.



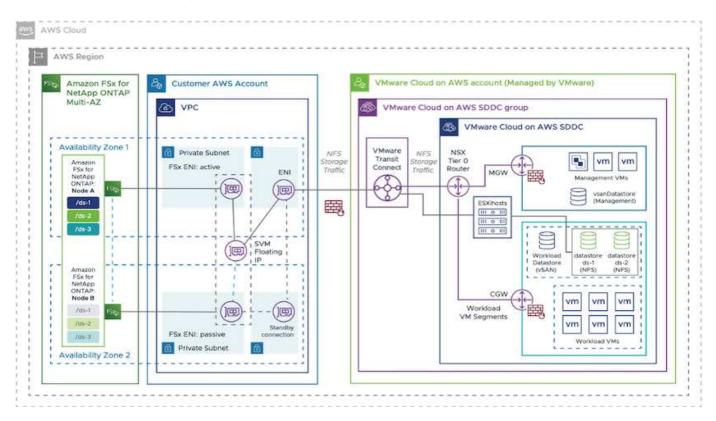
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This solution is also available from VMware. Please visit the VMware Cloud Tech Zone for more information.

# **Connectivity options**

VMware Cloud on AWS supports both multi-AZ and single-AZ deployments of FSx for ONTAP.

This section describes the high-level connectivity architecture along with the steps needed to implement the solution to expand the storage in a SDDC cluster without the need for adding additional hosts.



The high-level deployment steps are as follows:

1. Create Amazon FSx for ONTAP in a new designated VPC.

- 2. Create an SDDC group.
- 3. Create VMware Transit Connect and a TGW attachment.
- 4. Configure routing (AWS VPC and SDDC) and security groups.
- 5. Attach an NFS volume as a datastore to the SDDC cluster.

Before you provision and attach FSx for ONTAP as a NFS datastore, you must first set up a VMware on Cloud SDDC environment or get an existing SDDC upgraded to v1.20 or above. For more information, see the Getting Started With VMware Cloud on AWS.



FSx for ONTAP is not currently supported with stretched clusters.

# Conclusion

This document covers the steps necessary to configure Amazon FSx for ONTAP with VMware cloud on AWS. Amazon FSx for ONTAP provides excellent options to deploy and manage application workloads along with file services while reducing the TCO by making data requirements seamless to the application layer. Whatever the use case, choose VMware Cloud on AWS along with Amazon FSx for ONTAP for rapid realization of cloud benefits, consistent infrastructure, and operations from on-premises to AWS, bidirectional portability of workloads, and enterprise-grade capacity and performance. It is the same familiar process and procedures used to connect storage. Remember, it is just the position of the data that changed along with new names; the tools and processes all remain the same, and Amazon FSx for ONTAP helps to optimize the overall deployment.

To learn more about this process, feel free to follow the detailed walkthrough video.

Amazon FSX for Ontap VMware Cloud

# **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, highperforming, 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.

#### 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.

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.

Step 1 Select file system type	Select file system type			^ (
Step 2 Specify file	File system options			
system details Step 3 Review and create	Amazon F5x for NetApp ONTAP	Amazon FSx for Windows File Server FSX Amazon FSx for Windows File Server	Amazon FSx for Lustre	
		Select file system type		

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.

eation method	
<ul> <li>Quick create</li> <li>Use recommended best-practice configurations.</li> <li>Most configuration options can be changed after the file system is created.</li> </ul>	Standard create You set all of the configuration options, including specifying performance, networking, security, backups, and maintenance.

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

File system name - optional Info		
vmcfsxval2		
Maximum of 256 Unicode letters, whitespa	e, and numbers, plus + - = : /	
SSD storage capacity Info		
1024 0		
Minimum 1024 GB; Maximum 192 TB.		
Provisioned SSD IOPS Amazon FSx provides 3 IOPS per GB of stor needed.	ige capacity. You can also provision additional SSD IOPS a	5
<ul> <li>Automatic (3 IOPS per GB of SSD</li> </ul>	storage)	
User-provisioned		
Throughput capacity Info The sustained speed at which the file server burst to higher speeds for periods of time.	hosting your file system can serve data. The file server ca	n also

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.

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)	
5g-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.

ncryption key Info NS Key Management Service (KMS) encryption key that protects	your file system data at re	st.
aws/fsx (default)		•
Description	Account	KMS key ID
Default master key that protects my FSx resources when no other key is defined	139763910815	72745367-7bb0-499c- acc0-4f2c0a80e7c5
le system administrative password ssword for this file system's "fsxadmin" user, which you can use t	o access the ONTAP CLI o	r REST API.
le system administrative password issword for this file system's "fsxadmin" user, which you can use t Don't specify a password	to access the ONTAP CLI o	r REST API.
issword for this file system's "fsxadmin" user, which you can use t	o access the ONTAP CLI o	r REST API.
assword for this file system's "fsxadmin" user, which you can use t Don't specify a password	o access the ONTAP CLI o	r REST API.
<ul> <li>assword for this file system's "fsxadmin" user, which you can use to Don't specify a password</li> <li>Specify a password</li> </ul>	o access the ONTAP CLI o	r REST API.
assword for this file system's "fsxadmin" user, which you can use to Don't specify a password Specify a password assword	o access the ONTAP CLI o	r REST API.

 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.

Storage virtual machine name	
vmcfsxval2svm	
SVM administrative password Password for this SVM's "vsadmin" user, which you can use to access the ONTAP CLI or REST API.	
O Don't specify a password	
O Specify a password	
Password	
•••••	
Confirm password	
******	
Active Directory Joining an Active Directory enables access from Windows and MacOS clients over the SMB protocol.	
<ul> <li>Do not join an Active Directory</li> </ul>	
Join an Active Directory	

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.

Volume name	
vol1	
Maximum of 203 alphanumeric characters, plus	
Junction path	
/vol1	
The location within your file system where your volume will be mounted.	
Volume size	
1024	0
Minimum 20 MiB; Maximum 104857600 MiB	
Storage efficiency Select whether you would like to enable ONTAP storage efficiencies on your volume: deduplicatio compression, and compaction.	n,
<ul> <li>Enabled (recommended)</li> </ul>	
O Disabled	
Capacity pool tiering policy You can optionally enable automatic tiering of your data to lower-cost capacity pool storage.	
Auto	v

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

	FSx > File sys	stems						
File systems	File syste	<b>ms</b> (3)			C Attach	Actions ¥	Create file sys	tem
Backups	Q. Filter fi	le systems					< 1 >	0
ONTAP								
Storage virtual machines Volumes	File syst nam	em File syst	em ID 🔺	File system type ⊽	Status	v Deployment type	Storage	7
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	O vmc	fsxval2	0447ebd6082aa	ONTAP	⊘ Available	Multi-AZ	SSD	
FSx on Service Quotas [2]	O fsxn	tapsql 🗗	944700008234	ONTAP	Available	Multi-AZ	SSD	
Network & security Ad	ministration	Storage virt	tual machines	Volu	imes Backi	ips Tags		
Storage virtual machir	nes (SVMs)	(2)	C	Acti	ons 🔻 🔽 Ci	eate storage vir	tual machin	e
<b>Q</b> Find storage virtual mac	hines					<	1 >	0
SVM name 🛛	SVM ID	V	Status 🔻	Crea	ation time	▲ Act	ive Directory	1 5
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				200	:00			
vmcfsxval2svm		76341561212	⊘ Created		1-10-15 15:16:54	ч итс		
Storage virtual machine xsmbtesting01	es 🗦 svm-075	dcfbe2cfa2ece9	Created	202 +01:	1-10-15 15:16:54	UTC -	Upd	ate
> Storage virtual machine	es 🗦 svm-075	dcfbe2cfa2ece9	Created	202 +01:	1-10-15 15:16:54	•	Upd	ate
Storage virtual machine xsmbtesting01	es 🗦 svm-075	dcfbe2cfa2ece9 <b>75dcfbe</b> Creation time	Created	202 +01: ce9)	1-10-15 15:16:54 :00 Active D	Delete	Upd	ate
Storage virtual machine xsmbtesting01 Summary	es 🗦 svm-075	dcfbe2cfa2ece9 75dcfbe	Created	202 +01: ce9)	1-10-15 15:16:54 :00 Active D	Delete	Upd	ate
> Storage virtual machine xsmbtesting01 Summary SVM ID svm-075dcfbe2cfa2ece9 @	es 🗦 svm-075	dcfbe2cfa2ece9 <b>75dcfbe</b> Creation time	Created 2cfa2e	202 +01: ce9)	1-10-15 15:16:54 :00 Active D	Delete	Upd	ate
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Storage virtual machine xsmbtesting01 Summary SVM ID svm-075dcfbe2cfa2ece9 SVM name	es 🗦 svm-075	dcfbe2cfa2ece9 75dcfbe Creation time 2021-10-19T1 Lifecycle state	Created 2cfa2e	202 +01: ce9)	1-10-15 15:16:54 :00 Active D FSXTEST Net BIO: FSXSMB Fully qua	irectory 'ING.LOCAL		ate
Storage virtual machine Summary SVM ID Svm-075dcfbe2cfa2ece9 SVM name fsxsmbtesting01 UUID 4a50e659-30e7-11ec-ac4f-	es 🗦 svm-075	dcfbe2cfa2ece9 75dcfbe Creation time 2021-10-19T1 Lifecycle state ⊘ Created Subtype	Created 2cfa2e	202 +01: ce9)	1-10-15 15:16:54 :00 Active D FSXTEST Net BIO: FSXSMB Fully qua FSXTEST	irectory ING.LOCAL S name TESTING01 alified domain nam	me	ate
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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:

	2
File system	
fs-040eacc5d0ac31017   vmcfsxval2	
Storage virtual machine	
svm-095db076341561212   vmcfsxval2svm	
Volume name	
nfsdemovol01	
Maximum of 205 alphanumeric characters, plus	
Junction path	
/nfsdemovol01	
The location within your file system where your volume will be mounted.	
Volume size	
1024	(0
Minimum 20 MiB; Maximum 104857600 MiB	
실행 이 10 M <u>10</u> M 2010	a substant dark after that
Storage efficiency Select whether you would like to enable ONTAP storage efficiencies on yo compression, and compaction.	ur rouante, oeospinación,
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Select whether you would like to enable ONTAP storage efficiencies on yo compression, and compaction. C Enabled (recommended)	ar aquarre, cenagarcación,
Select whether you would like to enable ONTAP storage efficiencies on yo compression, and compaction.	

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
```

roat@ubuntu01:/fsx/nfsdemovol01# mount —t nfs 198.19.254.239:/nfsdemovol01 /fsx/nfsdemovol01

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

Sphere - ubuntu01 - Summary ×	ubuntu01 ×	+	C
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	root@ubuntu01:/fsk/n Filesystem tmofs /dev/mapper/ubuntu tmofs tmofs /dev/sda2. tmpfs 172.16.0.2:/nfsdemov 198.19.254.205/nfsd root@ubuntu01:/fsk/n nimewill.txt	IK-blocks Used Available 814396 1176 813220. vg-ubuntulv 15412168 3666428 10943132 4071960 0 4071950 5120 0 5120 4096 0 4096 993320 254956 675512 814392 4 814398 1951472 4241792 5719600 196165 512 95648 19660 512 95648	25% / 0% //un/lock 0% //un/lock 0% //scgroup 2% //bock 1% //un/user/1000 4% //scv0testing01/nfgdemovo101

Mount FSx ONTAP volume on Linux client

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.

Management IP address

198.19.254.9

198.19.254.9

SMB IP address

198.19.254.9

iSCSI IP addresses

10.222.2.224, 10.222.1.94

NFS IP address

# Endpoints

Management DNS name

svm-075dcfbe2cfa2ece9.fs-040eacc5d0ac31017.fsx.us-

west-2.amazonaws.com

NFS DNS name

svm-075dcfbe2cfa2ece9.fs-040eacc5d0ac31017.fsx.us-

west-2.amazonaws.com

SMB DNS name

FSXSMBTESTING01.FSXTESTING.LOCAL

**iSCSI DNS** name

iscsi.svm-075dcfbe2cfa2ece9.fs-040eacc5d0ac31017.fsx.us-

west-2.amazonaws.com	D
	the second se

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

🕈 🏟 📶 🙆 🕞 📓 🛅 就					
<ul> <li>Computer Management (FSXSMBTESTING01.FSXTESTING.LOCAL)</li> <li>System Tools</li> <li>Task Scheduler</li> <li>Event Viewer</li> <li>Shared Folders</li> <li>Shares</li> <li>Sessions</li> <li>Open Files</li> <li>Modulation of the session of the ses</li></ul>	Share Name	Folder Path C:\ C:\smbdernovol01 C:\testnimvol	Type Windows Windows Windows	# Client Connections 0 1 1 0	Descriptio
1. Now choose a new share and complete	the Create	a Shared Fol	der wizar	d.	
Create A Shared Folder Wizard				×	
Name, Description, and Settings Specify how people see and use this sha	re over the r	atuork		23	

Type information about the share for users. To modify how people use the content while offline, click Change.

hare path:	\\FSXSMBTESTING01.FSXTESTING.LOCAL\nimtestsm	b01
escription:		
ffine setting:	Selected files and programs available offline	Change
	-	

reate A Shared Folder Wizard		×
	Sharing was Successful	
	Status:	
22	You have successfully completed the Share a Folder Wizard.	0
	Summary:	
	You have selected the following share settings on \ \FSXSMBTESTING01.FSXTESTING.LOCAL: Folder path: C:\nimtestsmb01 Share name: nimtestsmb01 Share path: \FSXSMBTESTING01.FSXTESTING.LOCAL \nimtestsmb01	< >
	When I click Finish, run the wizard again to share and folder	ther
	To dose this wizard, dick Finish.	
	Finish	ncel

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.

← → C Q A == https://vcenter.addc-52-37-127- & Getting Started ■ EC2 Management Con  New Tab	7-104 vmwarevmc.com/ui/webconsole.html?vmld=vm-10058.vmName=vmcdct 67% 🟠 🖸	ð 🛃
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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:

- 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 ign.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:

	acc5d0ac31017::> lun map -vserve sxscsivol/nimofsxlun01 -igroup w		val2svm -	path
FsxId040e	acc5d0ac31017::> lun show			
Vserver Size	Path	State	Mapped	Туре
vmcfsxval	2svm			
5gb	/vol/blocktest01/lun01	online	mapped	linux
vmcfsxval	2svm			
5gb	/vol/nimfsxscsivol/nimofsxlun01	online	mapped	windows

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.

	New York and the second s			
Quick Conne	ect		Ştatus	
	r and log on to a target usin of the target and then dick		Quick Connect	3
Iarget:	10.222.2.221			tion at the IP address or DNS name that you targets are available, you need to connect
Discovered	targets		to each target individually.	
			Connections made here will be addee	to the list of Favorite Targets and an attempt
			to restore them will be made every t	ime this computer restarts.
Name		Sta	and the state of the second	
ign. 1992-0	08.com.netapp:sn.264efe8.	32dd911eca951d5f Cor	Discovered targets	
			Name	Status
			ign. 1992-08.com.netapp:sn.f0c90	Ref2dr611erar4f Connerted
		look a second and share		
To connect click Conne	using advanced options, se	lect a target and then	Progress report	
dick Conne	ct. ely disconnect a target, sele		Progress report Login Succeeded.	
dick Conne To complete then dick D For target ;	ct. ely disconnect a target, sele	ect the target and	NUMBER OF CONTRACTORS	

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.

	p				12000	-	-	12000			
1 G Task Scheduler	← (C)) ← New Volume (I SSS_xS4PRE_0 ← System Reserve	1 9-05,0V9(0)	Simple Ba Simple Ba	ic NTFS ic UDP	s) (Boha, Hoatty (Biol, Page File, Crail: Curry, Pareney PartBoot Heatty (Franzy PartBoot) Heatty (Franzy PartBoot) Heatty (System, Active, Primary PartBoot)	95.45 GB 9.98 GB 4.93 GB	9.95 GB 0 MB	5 Free 2015 2015 2015 2115		 	
	-Dia 1 Baic 8.55 GB Online	New Yohane S.H. (B.HTF) Healthy (Prim		i.							
	un Disk Basic 495.55 CB Oxfore	499.9t GB									2 MB Unaffect

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.

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# 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

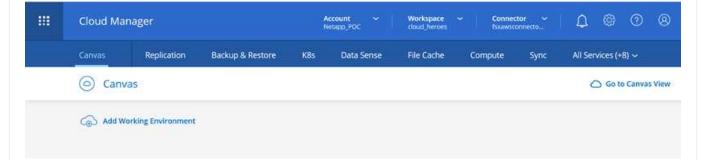
Cloud Volumes ONTAP shares and LUNs can be mounted from VMs that are created in the VMware Cloud on AWS SDDC environment. The volumes can also be mounted on native AWS VM Linux Windows clients, and LUNS can be accessed on Linux or Windows clients as block devices when mounted over iSCSI because Cloud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

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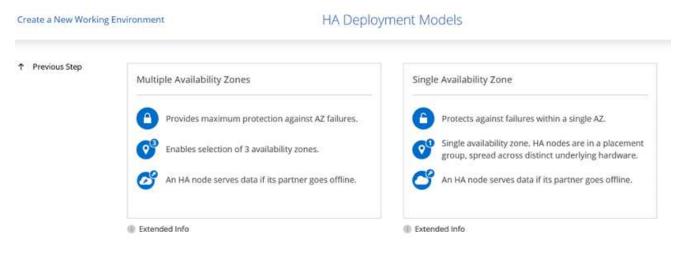
1. Provide the details of the environment to be created including the environment name and admin credentials. Click Continue.

Previous Step	Instance Profile 139763910815 Credential Name Account ID	netapp.com-cloud-volumes Marketplace Subscription	Edit Credentials
	Details	Credentials	
	Working Environment Name (Cluster Name)	User Name	
	fsxcvotesting01	admin	
		Password	
	Add Tags Optional Field Up to four tags	••••••	
		Confirm Password	
		*******	

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

Data Sense & Compliance	e	<b>•</b> •
Backup to Cloud		<b>•</b>
(III) Monitoring		-

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.

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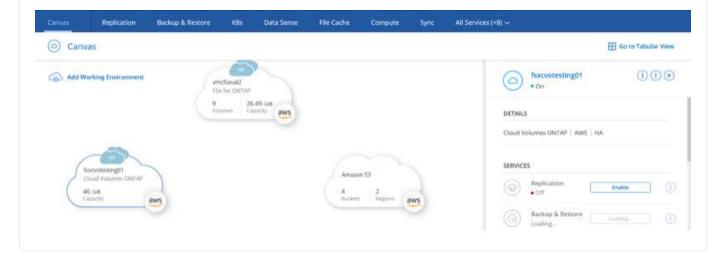
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1. On the Review & Approve page, review and confirm the selections. To create the Cloud Volumes ONTAP instance, click Go.

vevious Step TSXCvotesting us-west-2	на		Show /	API request
	TAP instance will be registered with NetApp support unde	r the NSS Account mchad.		
	Cloud Manager will allocate the appropriate AWS resources		e information >	
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Overview	Networking Storage Cloud Volumes ONTAP HA	HA Deployment Model:	Multiple Availability Zones	
		HA Deployment Model: Encryption:	Multiple Availability Zones AWS Managed	

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



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.

Volumes HA Status Cost Replications			0	C	٩	*	Ξ
Create a CIFS server		+ Advanced					
DNS Primary IP Address	Active Directory Domain to join						
192.168.1.3	fsxtestinglocal						
DNS Secondary IP Address (Optional)	Credentials authorized to join the domain						
Example: 127.0.0.1	Username Pastword						

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.

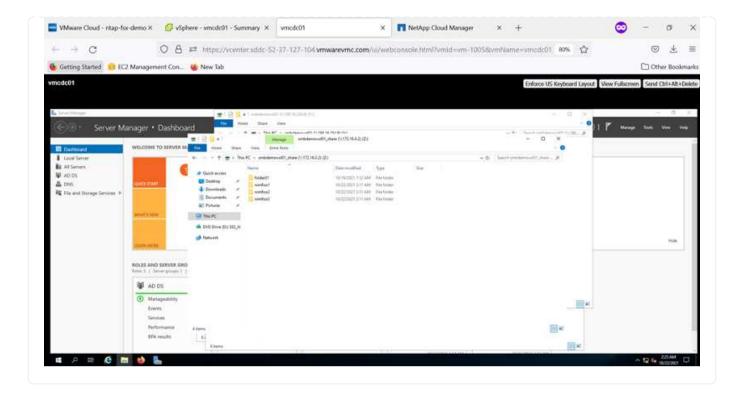
Details & Protection			Protocol		
Volume Name:	Size (G8):	0	NFS	CIFS	iSCSI
smbdemovol01	100	-			
			Share name:	Permissions	
Snapshot Policy:			smbdemovol01_share	Full Contro	• Io
default		-			
Default Policy			Users / Groups:		
			Everyone;		
			Valid users and groups separa	ted by a semicolon	

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.

INFO		CAPACITY	
Disk Type	GP2		<b>1.67 MB</b>
Tiering Policy	None	10 GB	EBS Used
Backup	OFF	Allocated	

- 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.

(HA) fsxcvotesting01 (Multiple AZs)	Aws 品 Aws
Volumes HA Status Cost Replications	S (U) (0)
Mount Volume smbdemovol01	
Access from inside the VPC using Floating IP	Access from outside the VPC using AWS Private IP
Auto failover between nodes	No auto failover between nodes
The IP address automatically migrates between nodes if failures occur	The IP address does not migrate between nodes if failures occur
Go to your machine and enter this command	To avoid traffic between nodes, mount the volume by using the primary node's IP address:
\\172.16.0.2\smbdemovol01_share	\\10.222.1.100\smbdemovo101_share
	If the primary node ones offline, mount the volume by using the HA partner's IP address:



#### 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.

	Det	tails & Pro	otection				P	rotocol			
	Volu	me Name:			Size (GB):	0		NFS	CIFS	iscs	1
	nîn	nofsxiscsicvo	01		500					What about I	UNs? 🕕
	Snat	shot Policy:					In	tiator Group 🛞			
		fault					۲	Map Existing Initi	ator Groups ု	Create Initiate	r Group
	() D	efault Policy					Op	perating System Typ	pe		_
								Windows			
							50	lect Initiator Group		1 (of 3	) Groups
								winiG   wine ign.1991-05.	dows .com.microsoft:vrr	cdc01.fsxtestir	here
		ere - vmcdc01 - 5 ==== https://vce		vmcdc01		1.354	rtApp Cloud N e.htmi?emid	Manager × +		<b>3</b>	- a © 4
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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.

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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.

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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.

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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.

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.

	-t nfs nfs ting01/nfsc		72.16.0.	2:/nfsc	demovol01	
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# **Overview of ANF Datastore Solutions**

Every successful organization is on a path of transformation and modernization. As part of this process, companies typically use their existing VMware investments while leveraging cloud benefits and exploring how to make migration, burst, extend, and disaster recovery processes as seamless as possible. Customers migrating to the cloud must evaluate the issues of elasticity and burst, data center exit, data center consolidation, end- of- life scenarios, mergers, acquisitions, and so on. The approach adopted by each organization can vary based on their respective business priorities. When choosing cloud-based operations, selecting a low- cost model with appropriate performance and minimal hindrance is a critical goal. Along with choosing the right platform, storage and workflow orchestration is particularly important to unleash the power of cloud deployment and elasticity.

# Use Cases

Although the Azure VMware solution delivers unique hybrid capabilities to a customer, limited native storage options have restricted its usefulness for organizations with storage-heavy workloads. Because storage is directly tied to hosts, the only way to scale storage is to add more hosts, which can increase costs by 35-40% or more for storage intensive workloads. These workloads need additional storage, not additional horsepower, but that means paying for additional hosts.

Let's consider the following scenario; a customer requires six hosts for horsepower (vCPU/vMem), but they also have a substantial requirement for storage. Based on their assessment, they require 12 hosts to meet storage requirements. This increases the overall TCO because they must buy all that additional horsepower when all they really need is more storage. This is applicable for any use case, including migration, disaster recovery, bursting, dev/test, and so on.

Another common use case for Azure VMware Solution is disaster recovery (DR). Most organizations do not have a fool- proof DR strategy, or they might struggle to justify running a ghost datacenter just for DR. Administrators might explore zero- footprint DR options with a pilot- light cluster or an on-demand cluster. They could then scale the storage without adding additional hosts, potentially an attractive option.

So, to summarize, the use cases can be classified in two ways:

- · Scaling storage capacity using ANF datastores
- Using ANF datastores as a disaster recovery target for a cost- optimized recovery workflow from onpremises or within Azure regions between the software-defined datacenters (SDDCs). This guide provides insight into using Azure NetApp Files to provide optimized storage for datastores (currently in public preview) along with best-in-class data protection and DR capabilities in an Azure VMware solution, which enables you to offload storage capacity from vSAN storage.



Contact NetApp or Microsoft solution architects in your region for additional information on using ANF datastores.

# VMware Cloud options in Azure

#### **Azure VMware Solution**

The Azure VMware Solution (AVS) is a hybrid cloud service that provides fully functioning VMware SDDCs within a Microsoft Azure public cloud. AVS is a first-party solution fully managed and supported by Microsoft and verified by VMware that uses Azure infrastructure. Therefore, customers get VMware ESXi for compute virtualization, vSAN for hyper-converged storage, and NSX for networking and security, all while taking advantage of Microsoft Azure's global presence, class-leading data center facilities, and proximity to the rich ecosystem of native Azure services and solutions. A combination of Azure VMware Solution SDDC and Azure NetApp Files provides the best performance with minimal network latency.

Regardless of the cloud used, when a VMware SDDC is deployed, the initial cluster includes the following components:

- VMware ESXi hosts for compute virtualization with a vCenter server appliance for management.
- VMware vSAN hyper-converged storage incorporating the physical storage assets of each ESXi host.
- VMware NSX for virtual networking and security with an NSX Manager cluster for management.

#### Conclusion

Whether you are targeting all-cloud or hybrid cloud, Azure NetApp files provide excellent options to deploy and

manage the application workloads along with file services while reducing the TCO by making the data requirements seamless to the application layer. Whatever the use case, choose Azure VMware Solution along with Azure NetApp Files for rapid realization of cloud benefits, consistent infrastructure, and operations across on-premises and multiple clouds, bi-directional portability of workloads, and enterprise-grade capacity and performance. It is the same familiar process and procedures used to connect the storage. Remember, it is just the position of the data that changed along with new names; the tools and processes all remain the same, and Azure NetApp Files helps in optimizing the overall deployment.

# Takeaways

The key points of this document include:

- You can now use Azure NetApp Files as a datastore on AVS SDDC.
- Boost the application response times and deliver higher availability to provide access workload data when and where it is needed.
- Simplify the overall complexity of the vSAN storage with simple and instant resizing capabilities.
- Guaranteed performance for mission-critical workloads using dynamic reshaping capabilities.
- If Azure VMware Solution Cloud is the destination, Azure NetApp Files is the right storage solution for optimized deployment.

# Where to find additional information

To learn more about the information described in this document, refer to the following website links:

• Azure VMware Solution documentation

https://docs.microsoft.com/en-us/azure/azure-vmware/

Azure NetApp Files documentation

https://docs.microsoft.com/en-us/azure/azure-netapp-files/

• Attach Azure NetApp Files datastores to Azure VMware Solution hosts (Preview)

https://docs.microsoft.com/en-us/azure/azure-vmware/attach-azure-netapp-files-to-azure-vmware-solution-hosts?tabs=azure-portal/

# NetApp Guest Connected Storage Options for Azure

Azure supports guest connected NetApp storage with the native Azure NetApp Files (ANF) service or with Cloud Volumes ONTAP (CVO).

# Azure NetApp Files (ANF)

Azure netApp Files brings enterprise-grade data management and storage to Azure so you can manage your workloads and applications with ease. Migrate your workloads to the cloud and run them without sacrificing performance.

Azure netApp Files removes obstacles, so you can move all of your file-based applications to the cloud. For the first time, you do not

have to re-architect your applications, and you get persistent storage for your applications without complexity.

Because the service is delivered through the Microsoft Azure Portal, users experience a fully managed service as part of their Microsoft enterprise Agreement. World-class support, managed by Microsoft, gives you complete peace of mind. This single solution enables you to quickly and easily add multiprotocol workloads. you can build and deploy both Windows and Linux file-based applications, even for legacy environments.

#### Azure NetApp Files (ANF) as guest connected storage

# Configure Azure NetApp Files with Azure VMware Solution (AVS)

Azure NetApp Files shares can be mounted from VMs that are created in the Azure VMware Solution SDDC environment. The volumes can also be mounted on the Linux client and mapped on the Windows client because Azure NetApp Files supports SMB and NFS protocols. Azure NetApp Files volumes can be set up in five simple steps.

Azure NetApp Files and Azure VMware Solution must be in the same Azure region.

To create and mount Azure NetApp Files volumes, complete the following steps:

1. Log in to the Azure Portal and access Azure NetApp Files. Verify access to the Azure NetApp Files service and register the Azure NetApp Files Resource Provider by using the *az provider register --namespace Microsoft.NetApp –wait* command. After registration is complete, create a NetApp account.

For detailed steps, see Azure NetApp Files shares. This page will guide you through the step-by-step process.

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complex, file-based applications with no code nge. With support for multiple protocols and rated data protection, storage management is simple, fast, and reliable.								
Create NetApp account								
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2. After the NetApp account is created, set up the capacity pools with the required service level and size.

For more information, see Set up a capacity pool.

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3. Configure the delegated subnet for Azure NetApp Files and specify this subnet while creating the volumes. For detailed steps to create delegated subnet, see Delegate a subnet to Azure NetApp Files.

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4. Add an SMB volume by using the Volumes blade under the Capacity Pools blade. Make sure the Active Directory connector is configured prior to creating the SMB volume.

Azure NetApp Files « NetApp (cloudcontrolproduction.com)	NetApp account	Active Directory connections	Primary DNS * ③
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	Azure NetApp Files		Organizational Unit Path 💿
	Active Directory connections		
	Storage service		
< Page 1 V of 1 >	Capacity pools		Join

5. Click Review + Create to create the SMB volume.

If the application is SQL Server, then enable the SMB continuous availability.

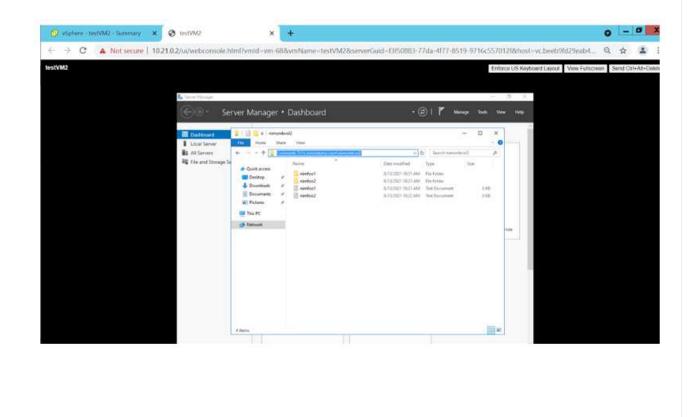
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To learn more about Azure NetApp Files volume performance by size or quota, see Performance considerations for Azure NetApp Files.

6. After the connectivity is in place, the volume can be mounted and used for application data.

To accomplish this, from the Azure portal, click the Volumes blade, and then select the volume to mount and access the mount instructions. Copy the path and use the Map Network Drive option to mount the volume on the VM running on Azure VMware Solution SDDC.



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7. To mount NFS volumes on Linux VMs running on Azure VMware Solution SDDC, use this same process. Use volume reshaping or dynamic service level capability to meet the workload demands.

ilesystem	1K-blocks	Used	Available	Use%	Mounted on
dev	8168112	0	8168112	6%	/dev
npfs	1639548	1488	1638060	1%	/run
dev/sdaS	50824704	7982752	40310496	17%	1
npfs	8197728	0	8197728	6%	/dev/shm
npfs	5120	0	5120	0%	/run/lock
npfs	8197728	0	8197728	6%	/sys/fs/cgroup
dev/loop0	56832	56832	0	100%	/snap/core18/2128
dev/loop2	66688	66688	6	100%	/snap/gtk-common-the
es/1515					
dev/loop1	224256	224256	8	100%	/snap/gnome-3-34-18
/72					
dev/loop3	52224	52224	8	100%	/snap/snap-store/54
dev/loop4	33152	33152	0	100%	/snap/snapd/12704
dev/sda1	523248	4	523244	1%	/boot/efi
npfs	1639544	52	1639492	1%	/run/user/1000
dev/sr0	54738	54738	8	100%	/media/nimoadmin/VM
re Tools					
72.24.3.4:/nimodemonfsv1	104857600	0	104857600	8%	/home/nimoadmin/nim

For more information, see Dynamically change the service level of a volume.

# 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

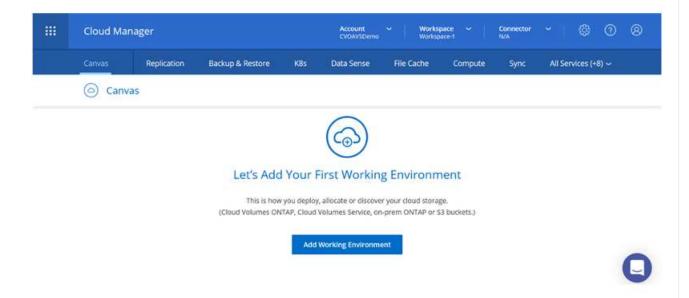
Cloud Volumes ONTAP shares and LUNs can be mounted from VMs that are created in the Azure VMware Solution SDDC environment. The volumes can also be mounted on the Linux client and on Windows client because Cloud Volumes ONTAP supports iSCSI, SMB, and NFS protocols. Cloud Volumes ONTAP volumes can be 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 Azure, either using a site-to-site VPN or ExpressRoute. 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 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.

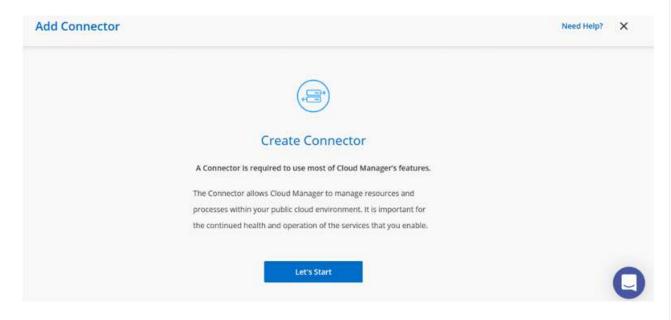
1. Log in to NetApp Cloud Central—the Fabric View screen is displayed. Locate the Cloud Volumes ONTAP tab and select Go to Cloud Manager. After you are logged in, the Canvas screen is displayed.



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

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3. When creating the first Cloud Volumes ONTAP working environment, Cloud Manager prompts you to deploy a Connector.



4. After the connector is created, update the Details and Credentials fields.

Managed Service Ide	SaaS Backup Prod	CMCVOSub	
Credential Name	Azure Subscription	Marketplace Subscription	Edit Credentials
Details		Credentials	
Working Environment Nam	e (Cluster Name)	User Name	
nimavsCVO	an den en de de de la	admin	
		Password	

5. Provide the details of the environment to be created including the environment name and admin credentials. Add resource group tags for the Azure environment as an optional parameter. After you are done, click Continue.

Details	Credentials
Working Environment Name (Cluster Name)	User Name
nimavsCVO	admin
	Password
Add Resource Group Tags     Optional Field	••••••
	Confirm Password
	********

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

Data Sense & Compliance	<b>•</b>
Backup to Cloud	-• ~
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7. Configure the Azure location and connectivity. Select the Azure Region, resource group, VNet, and subnet to be used.

Azure Region		Resource Group
East US 2		Create a new group     Use an existing group
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nimoavspriv-vnet   NimoAVSDemo	*	Security Group
Subnet		Generated security group     O Use existing security group
172.24.2.0/24	•	
		I have verified network connectivity between the Cloud Manager server and the selected Whiet.
	Con	tinue
	-	

Cloud Volumes ONTAP Charging Methods	NetApp Support Site Account (Optional)
earn more about our charging methods	Learn more about NetApp Support Site (NSS) accounts
Pay-As-You-Go by the hour	To register this Cloud Volumes ONTAP to support, you should add NetApp Support Site Account.
Bring your own license	Don't have a NetApp Support Site account?Select go to finish deploying this system.After its created,use the Support Registration option to create an NSS account

9. Select between several preconfigured packages available for the various types of workloads.

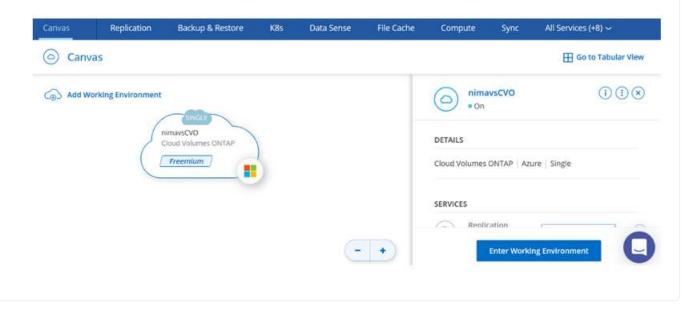
Create a New Working EnvironmentCloud Volumes ONTAP Charging Methods & NSS Account

Select a pre	configured Cloud Volumes ONTAP system that best Preconfigured settings can be n		onfiguration. Change Configuration
·•		\$0	.ę.
POC and small workloads Up to 500GB of storage	Database and application data production workloads	Cost effective DR	Highest performance production workloads

10. Accept the two agreements regarding activating support and allocation of Azure resources. To create the Cloud Volumes ONTAP instance, click Go.

1			
nimavsCVO Ature East US 2			
		out 1 must first conistor	r Claud Volumar CAITAD with Notana Alexa information
			r Cloud Volumes ONTAP with NetApp. More information >
I understand that	t Cloud Manager will alloc	cate the appropriate Azi	ure resources to comply with my above requirements. More information >
	Networking	Storage	

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



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.

Volumes Replications		0	$\bigcirc$	C	⊜	4	Ξ
Create a CIFS server	+ Advance	d					
DNS Primary IP Address	Active Directory Domain to join						
172.24.1.5	nimodemo.com						
DNS Secondary IP Address (Optional)	Credentials authorized to join the domain						
Example: 127.0.0.1	nimoadmin						

 Creating the SMB volume is an easy process. 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.

Details & Protection			Protocol		
Volume Name:	Size (GB);	0	NFS	CIFS	iSCSI
nimavssmbvol1	50				
			Share name:	Permissions:	
Snapshot Policy:			nimavssmbvol1_share	Full Control	
default		•			
③ Default Policy			Users / Groups:		
			Everyone;		

3. After the volume is provisioned, it will be availabe under the Volumes pane. Because a CIFS share is provisioned, give your users or groups permission to the files and folders and verify that those users can access the share and create a file. This step is not required if the volume is replicated from an on-premises environment because the file and folder permissions are all retained as part of SnapMirror replication.

volumes			
Volume 50 GB Alloca	ited 1.74 MB Total Used	(1.74 MB in Disk, 0 KB in Blo	b)
	25 - 251		
erm nimavs	smbvol1		ONLINE
INFO		CAPACITY	
INFO		CAPACITY	
Disk Type	PREMIUM_LRS		1.74 MB
Tiering Policy	Auto	50 GB	Disk Used
		Allocated	
Backup	OFF		O GB Blob Used
			Diab Lizozi

- 4. After the volume is created, use the mount command to connect to the share from the VM running on the Azure VMware Solution SDDC hosts.
- 5. Copy the following path and use the Map Network Drive option to mount the volume on the VM running on Azure VMware Solution SDDC.

Moun o to your mac		er this com	mand					
\\172.24.2.	8\nimavssmb	bvol1_shar	e					
					Col	oy 👘		
					a and a second			
🖓 🧧 🖛   nimavssm	nbvoll share						- 0	>
File Home Share								Ŷ
- 🚽 × 🛧 💆 🕅	242.8\nimavombvol1_s	hate				~ 0	Search nimavssmbvoll_shar	e 9
	Name	0	Date modified	Туре	Size			
Quick access     Desktop				This folder	is empty:			
Downloads					2019 - 211 - C <b>H</b> EL S <b>H</b> ED			
🗿 Documents 👒								

#### Connect the LUN to a host

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

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

Details & Protection		Protocol		
Volume Name:	Size (GB):	NFS	CIFS	iscst
nimavsscsi1	500			What about LUNs? 🕕
Snapshot Policy:		Initiator Group 🚯		
default		Map Existing Init	iator Groups 🢽	Create Initiator Group
Default Policy		Initiator Group		
		avsvmlG		

3. 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 Azure VMware Solution SDDC:

- a. RDP to the VM hosted on Azure VMware Solution SDDC.
- 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.

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

		g on to a target usin arget and then clock		ion, type the	IP address or
Target	172	1.24.2.9			Quick Connect.
Discove	ared targets	i.		-	
					Refresh
Nome				Status	10 C
ddx Co	onnect.	idvanced options, s			Omet
dick Co To con	onnect.	onnect a target, se			Correct Decorvect
dick Co To con then d	pletely disc ick Disconne get properti	onnect a target, se	ect the target and	e	

LUNs on 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.

	Volume	Layout	Type	File System	Status		Capacity	Free Space	% Free	
System Tools	- (C)		Basic			rash Dump, Frimary Partition)		34.99 GB	63 %	
Task Scheduler	SSS_X64FREE_EN+4		Basic		Healthy (Primary Partition)		6.49 GB	0 MB	0%	
Event Vasver     Shared Foldes     Shared Foldes     Local Users and Groups     Orformance     Device Manager     Storage     Windows Server Backup     Disk Management     Services and Applications	- System Reierved	Sample	Basic	NTFS	Healthy Gystern, Active, Pr	imary Partition)	500 M8	169 MB	345	
	40.00 G8	System Reserved 500 ME NTFS Healthy (System, Act	ive Frim	very Partition)	(	ICJ 39.51 GB NTFS Healthy (Boot, Page Fide, C)	rash Dump,	Primary Parti	tion)	

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 E: is mounted Ecomputer Management File Action View Help 💠 🔿 🙇 📆 🖬 🖽 📼 S Computer Management (Local Volume Capacity Free Space % Free ) 39.51 GB 23.95 GB 61 % 499.87 ... 499.73 GB 100 % 9.97 GB 9.91 GB 100 % 5.97 GB 9.91 GB 100 % Layout Type File System Status (C)
 OBdisk (E)
 OBDisk2 (F) Healthy (Boot, Page File, Crash Dump, Primary Partitio Healthy (Primary Partition) Healthy (Primary Partition) 1 System Tools NTES Simple Basic NTFS Simple Basic NTFS Simple Basic NTFS (3) Task Scheduler Event Viewer SSS\_X64FREE\_EN-US\_DV9 (Dr) Simple Basic UDF System Reserved Simple Basic NTFS Shared Folders Healthy (Primary Partition 6.49.GB 0 MB 0% Healthy (System, Active, Primary Partition) 500 MB 169 MB 34% Coar Oest and Unupper
 Coar Oest and Oest an -Disk 1 DBdisk (Ed Basic 499.88 GB 499.87 GE NTFS Online Healthy (Primary Partition) -Disk 2 Bai DROok2 (Fd Basic 9.97 GB Online 9.97 GB NTES by (Prim ary Partition) 💻 | 🔄 📗 😴 | This PC × Computer - 0 View - 🛧 🔜 🖡 This PC V & Search This PC p v Folders (6) ✓ ★ Quick access Desktop Desktop Documents Downloads Downloads B Documents Music Pictures Videos Fictures . 🛫 nimoavsdemosn 🖻 Devices and drives (4) > 🛄 This PC Local Disk (Cr) DBdisk (E) DVD Drive (D:) SSS\_X64FREE\_EN-US\_DV9 > 🥩 Network 23.9 GB free of 39.5 GB 499 GB free of 499 GB 0 bytes free of 6.49 GB DBDisk2 (F;) 9.93 GB free of 9.96 GB Network locations (3) oil\_share invidence nimodemofilvol1 (\\172.24.3.4) (2:) impavsdemosmbv1 (\\172.24.3.5) (\\172.24.2.15) (X:) X (11) 

# Google Cloud VMware Engine Supplemental NFS Datastore with NetApp Cloud Volume Service

Customers can expand storage capacity on Google Cloud VMware Engine using NFS supplemental datastore with NetApp Cloud Volume Service.

# Overview

Authors: Suresh Thoppay, NetApp

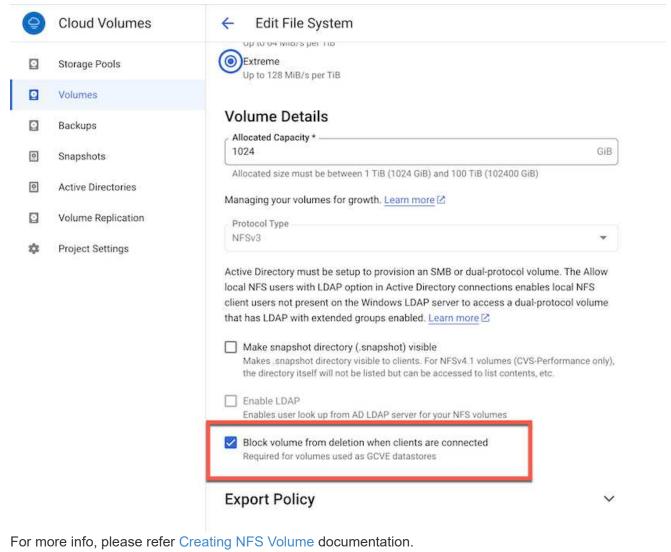
Customers that requires additional storage capacity on their Google Cloud VMware Engine (GCVE) environment can utilize Netapp Cloud Volume Service to mount as supplemental NFS datastore. Storing data on NetApp Cloud Volume Service allows customers to replicate between regions to protect from diaster.



# Deployment steps to mount NFS datastore from NetApp CVS on GCVE

#### Provision CVS-Performance Volume

The NetApp Cloud Volume Service volume can be either provisioned by Using Google Cloud Console Using NetApp BlueXP portal or API To avoid accidental deletion of volume while VM is running, ensure the volume is marked as nondeletable as shown in screenshot below.



#### Ensure Private Connection on GCVE exists for NetApp CVS Tenant VPC.

To mount NFS Datastore, there should be a private connection exists between GCVE and NetApp CVS project.

For more info, please refer How to setup Private Service Access

For instructions on how to mount NFS datastore on GCVE, please refer How to create NFS datastore with NetApp CVS



As vSphere hosts are managed by Google, you don't have access to install NFS vSphere API for Array Integration (VAAI) vSphere Installation Bundle (VIB). If you need support for Virtual Volumes (vVol), please let us know.

If you like to use Jumbo Frames, please refer Maximum supported MTU sizes on GCP

### Savings with NetApp Cloud Volume Service

To learn more about your potential saving with NetApp Cloud Volume Service for your storage demands on GCVE, please check NetApp ROI Calculator

# **Reference Links**

- Google Blog How to use NetApp CVS as datastores for Google Cloud VMware Engine
- NetApp Blog A better way to migrate your storage-rich apps to Google Cloud

# NetApp Storage Options for GCP

GCP supports guest connected NetApp storage with Cloud Volumes ONTAP (CVO) or Cloud Volumes Service (CVS).

# **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

Cloud Volumes ONTAP shares and LUNs can be mounted from VMs that are created in the GCVE private cloud environment. The volumes can also be mounted on the Linux client and on Windows client 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 Google Cloud, either using a site-to-site VPN or Cloud Interconnect. 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 xref:./ehc/Setting up data replication between systems.



Use 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 in to 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.

 Cloud Ma	nager			Account ~	Workspace cloud_heroes	<ul> <li>Connet fixawsc</li> </ul>	tor 👻 prinecto	
Canvas	Replication	Backup & Restore	K8s	Data Sense	File Cache	Compute	Sync	All Services (+8) ~
Canv	as							Go to Canvas View
🛆 Add W	orking Environment							

2. On the Cloud Manager Canvas tab, click Add a Working Environment and then select Google Cloud Platform as the cloud and the type of the system configuration. Then, click Next.

Canvas	Replication	Backup & Restore	KBS	Data Sense	File Cache	Compute	Sync	All Services (			
Add Work	ling Environme	nt				_					×
		Microsoft Acure	Ama	aws on Web Services	Google Cloud Plat	loem	On-Premises				
				Choos	e Type						
		Cloud Volumes ON	ТАР	Cloud Volum	es ONTAP HA	Cloud Vol	() umes Service				
		Single Node			allability		waitability				

3. Provide the details of the environment to be created including the environment name and admin

reate a New Work	ing Environment	Details and Cr	edentials
Previous Step	CV-Performance-Testing Google Cloud Project	HCLMainBillingAccountSubs Marketplace Subscription	Edit Project
	Details		Credentials
	Working Environment Name	(Cluster Name)	User Name
	cvogcveva		admin
	Service Account		Password
	<ol> <li>Notice: A Google Cloud se to use two features: backing</li> </ol>	지 것은 물건 것이 있는 일정 등 것이 같이 많은 것이다.	Confirm Password
		Continue	

 Select or deselect the add-on services for Cloud Volumes ONTAP deployment, including Data Sense & Compliance or Backup to Cloud. Then, click Continue.

HINT: A verification pop-up message will be displayed when deactivating add-on services. Add-on services can be added/removed after CVO deployment, consider to deselect them if not needed from the beginning to avoid costs.

Data Sense & Compliance			Previous Step
Backup to Cloud	~	Data Sense & Compliance	
$\overline{\mathbf{Q}}$	~	Backup to Cloud	
WARNING:By turning off Backup to Cloud, future data recovery will not be possible in case of data corruption or los		WARNING:By turning off Backup to Cloud, future data recovery will not be possible in case of data corruption or loss	

5. Select a location, choose a firewall policy, and select the checkbox to confirm network connectivity to Google Cloud storage.

Previous Step	Location	Connectivity
	GCP Region	VPC
	europe-west3 •	cloud-volumes-vpc •
	GCP Zone	Subnet
	europe-west3-c •	10.0.6.0/24
		Firewall Policy
	I have verified connectivity between the target VPC and Google Cloud storage.	<ul> <li>Generated firewall policy</li> <li>Use existing firewall policy</li> </ul>
reemium o	cense option: Pay-As-You-Go or BYOL for us ption is used. Then, click on Continue.	sing existing license. In this example, arging Methods & NSS Account
reemium o Create a New W	cense option: Pay-As-You-Go or BYOL for us ption is used. Then, click on Continue. forking Environment Cloud Volumes ONTAP Cha	sing existing license. In this example, arging Methods & NSS Account
Treemium o Create a New W	cense option: Pay-As-You-Go or BYOL for us ption is used. Then, click on Continue. forking Environment Cloud Volumes ONTAP Cha	sing existing license. In this example, arging Methods & NSS Account NetApp Support Site Account
Treemium o Create a New W	cense option: Pay-As-You-Go or BYOL for us ption is used. Then, click on Continue. forking Environment Cloud Volumes ONTAP Cha	sing existing license. In this example, arging Methods & NSS Account NetApp Support Site Account
Treemium o Create a New W	cense option: Pay-As-You-Go or BYOL for us ption is used. Then, click on Continue. forking Environment Cloud Volumes ONTAP Cha	sing existing license. In this example, arging Methods & NSS Account NetApp Support Site Account Learn more about NetApp Support Site (NSS) account: NetApp Support Site Account
reemium o Create a New W ↑ Previous Step	cense option: Pay-As-You-Go or BYOL for us ption is used. Then, click on Continue. forking Environment Cloud Volumes ONTAP Cha bud Volumes ONTAP Charging Methods	sing existing license. In this example, arging Methods & NSS Account NetApp Support Site Account Learn more about NetApp Support Site (NSS) account
reemium o Create a New W ↑ Previous Step	cense option: Pay-As-You-Go or BYOL for us ption is used. Then, click on Continue. forking Environment Cloud Volumes ONTAP Cha bud Volumes ONTAP Charging Methods	sing existing license. In this example, arging Methods & NSS Account NetApp Support Site Account Learn more about NetApp Support Site (NSS) account NetApp Support Site Account

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

HINT: Hoover your mouse over the tiles for details or customize CVO components and ONTAP version by clicking on Change Configuration.

Select a pre	econfigured Cloud Volumes ONTAP system that best Preconfigured settings can be n		onfiguration. Change Configuration
	5	\$0	
POC and small workloads Up to 500GB of storage	Database and application data production workloads	Cost effective DR	Highest performance production workloads

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

Create a New Work	ng Environment	Review & Approve		
Previous Step     CVOgCVEVal     GCP europe-we	st3		5	how API request
	TAP instance will be registered with NetApp support of	inder the NS5 Account mchad.		
I understand that	Cloud Manager will allocate the appropriate GCP reso	irces to comply with my above requirements. More info	ormation >	
I understand that     Overview	Cloud Manager will allocate the appropriate GCP reso Networking Storage	irces to comply with my above requirements. More inf	srmation >	
Overview		irces to comply with my above requirements. More info	n2-standard-4	
	Networking Storage			

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

<b>#</b>	Cloud Mar	iager				Account ~ Netapp_POC	Workspace cloud_herbe		Connector		۵	Ð	0	8
	Canvas	Replication	Backup & Restore	KBS	Data Sense	File Cache	Compute	Sync	All Service	es (+7) ~				
	Canvo	as :									E	Go to	Tabular	View
	Add Wo	rking Environment						Worki	ng Environn	nents				
	1	cvogcve01			DatacenterDude	-		0		id Volume 5 GiB: Prav				
		Cloud Volumes ONTA	۵. ۲		Azure NetApp Fi	ез		0		for ONTAP ovisioned (	100.000		y)	
								Ē		re NetApp TiB Provisi		oarity		

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.

HINT: Click on the Menu Icon (°), select Advanced to display more options and select CIFS setup.

Volumes Replications		© ∪ ∪ ⊙ + Ξ
Create a CIFS server	+ Advanced	
DNS Primary IP Address	Active Directory Domain to join	
192.168.0.16	ningcveval.com	
DN5 Secondary IP Address (Optional)	Credentials authorized to join the domain	
Example: 127.0.0.1	administrator	

2. Creating the SMB volume is an easy process. At Canvas, double-click the Cloud Volumes ONTAP working environment to create and manage volumes and click on 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, CIFS/SMB is selected as the protocol.

Volume Name:     Size (GB):     NFS     CIFS     ISCSI       cvogcvesmbvol01     10     Share name:     Permissions:       Snapshot Policy:     •     Cips     Full Control       default     •     Users / Groups:     •	cvogcvesmbvol01     10       Snapshot Policy:     Share name:       default     •
Share name:     Permissions:       Shapshot Policy:     cvogcvesmbvol01_share       default     •       Default Policy     Users / Groups:	Snapshot Policy: cvogcvesmbvol01_share Full Control * default *
Snapshot Policy:     cvogcvesmbvol01_share     Full Control       default     •     •       Default Policy     Users / Groups:	Snapshot Policy: cvogcvesmbvol01_share Full Control • default •
default	default -
Default Policy     Users / Groups:	
	Sector and the sector
	Default Policy     Users / Groups:
Everyone;	Everyone;
Valid users and groups separated by a semicolon	Valid users and groups separated by a semicolon

3. After the volume is provisioned, it will be availabe under the Volumes pane. Because a CIFS share is provisioned, give your users or groups permission to the files and folders and verify that those users can access the share and create a file. This step is not required if the volume is replicated from an on-premises environment because the file and folder permissions are all retained as part of SnapMirror replication.

HINT: Click on the volume menu (°) to display its options.

INFO		CAPACITY	
Disk Type	PD-SSD		■ 1.84 MB
Tiering Policy	None	10 GB Allocated	Disk Used

4. After the volume is created, use the mount command to display the volume connection instructions, then connect to the share from the VMs on Google Cloud VMware Engine.

Volu	mes Repl	ications				
	Nount Volun	ne cvogcvesmb	vol01			
o to yoi	ur machine and e	enter this command				
\\10.	0.6.251\cvogcv	esmbvol01_share		Ē	Сору	
py the nning o	on the Google C	and use the Map Ne loud VMware Engin	e.			rolume on the $lacksquare$
py the nning o pecify the	on the Google C		e.			rolume on the ∖
ppy the nning o pecify the rive:	on the Google C e drive letter for the c	loud VMware Engin	e.			rolume on the ∖
py the nning o pecify the rive:	on the Google C e drive letter for the c	loud VMware Engin onnection and the folder th v gcvesmbvol01_share	e. Nat you want to	onnect to:		rolume on the ∖
ppy the nning o pecify the rive:	e drive letter for the co Y: \\10.0.6.251\cvo	loud VMware Engin onnection and the folder th v gcvesmbvol01_share share	e. Nat you want to	onnect to:		rolume on the V
py the nning o	on the Google C e drive letter for the c Y: \\10.0.6.251\cvoj Example: \\server\ Reconnect at s	loud VMware Engin onnection and the folder th v gcvesmbvol01_share share	e. Nat you want to	onnect to:		rolume on the V
py the nning o pecify the rive:	e drive letter for the co Y: \\10.0.6.251\cvog Example: \\server Reconnect at s Connect using	loud VMware Engin onnection and the folder th consection and the folder th govesmbvol01_share share ign-in	e. Nat you want to	onnect to: Browse	ount the v	rolume on the ∖
py the ining o becify the	e drive letter for the co Y: \\10.0.6.251\cvog Example: \\server Reconnect at s Connect using	loud VMware Engin onnection and the folder th consection and the folder th govesmbvol01_share share ign-in different credentials	e. Nat you want to	onnect to: Browse	ount the v	rolume on the ∖

Once mapped, it can be easily accessed, and the NTFS permissions can be set accordingly. 💣 | 🛃 📗 = | Network - 🗆 X 🗌 👎 🛫 l 📴 📒 🖛 l cvogcvesmbvol01\_share (\\10.0.6.251) (Y:) × 4 Home Share View 0 ÷ ↑ 👳 > This PC ⇒ cvogcvesmbvol01\_share (\\10.0.6.251) (Y:) > ✓ Ŏ Search cvogcvesmbvol01\_sha... , P 7 1 Net 6 Name Date modified Type Size # Quick access foo1 11/9/2021 10:59 AM File folder Desktop foo2 11/9/2021 10:59 AM File folder Downloads 1 Documents A Pictures 1 This PC

To connect the cloud volumes ONTAP LUN to a host, complete the following steps:

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

Accold A form though A form though Constrained A form though A form though		a comp of ri	otection				Protocol			
Snapshot Policy:   default   Default Policy     Mop Existing Initiator Group   Miliator Group   WinlG     Operating System Type   Windows     VMeree Cloud - ritap-fracebras X   © Viphere - windch1 - Summary X   windows     Continue     VMeree Cloud - ritap-fracebras X   © Viphere - windch1 - Summary X   windows     Continue     VMeree Cloud - ritap-fracebras X   © Viphere - windch1 - Summary X   windows     Continue     VMeree Cloud - ritap-fracebras X   © Viphere - windch1 - Summary X   windows   © Continue     VMeree Cloud - ritap-fracebras X   © Viphere - windch1 - Summary X   windows   © Continue     Vision fracebras X   © Viphere - windch1 - Summary X   windows   © Continue     Vision fracebras X   © Viphere - windch1 - Summary X   windows   © Continue     Continue     Vision fracebras X   © Viphere - windch1 - Summary X   windows   © Continue		Volume Name:			Size (GB):	0	NFS	CIFS	iscsi	
Snapshot Policy: default Default Policy Map Existing Initiator Groups Initiator Group WindG Operating System Type Windows Continue VMwee Cloud - ntap-for-dem X @ vSphere - vmcdol1 - Summary X vmcdol1 X methods with a sphere		cvogcvescsilun	101		10				What about LUNs	
Map Existing Initiator Group I		Snapshot Policy:					Initiator Group 🎚			
WiniG         Operating System Type         Windows         Continue         Winese Cloud - intag-faz-demo X       Vsphere - vmcdc01 - Summary X       vmcdc01       x       NetApp Cloud Manager       x       +       Co       -							Map Existing	Initiator Groups 🤅	Create Initiator Gro	up
Operating System Type       Windows       Continue         VMessee Cloud - ntap-far-demox X       Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Summary X         Image: Second Lagority - Second La		Default Policy					Initiator Group			
Windows     Continue         VMware Cloud - ntap-fas-demo X     vsphere - vmcdc01 - Summary X     vmcdc01     x     NetApp Cloud Manager     x     +     Co     -         C     C     A     =     https://vcenter.sdddc-S2-37-127-104.vmwarevmc.com/uv/vebconsole.html/vmid=vm-1005&bomName=vmcdc01     00%     Co         Getting Stated     EC2 Management Con.     New Tab     Co         Coto Server Manager + Dashboard     New Tab     Co							WinlG			
Windows       Continue       Www.see Cloud - ntap-fas-demo X     Voltore vmcdc01 - Summary X     vmcdc01     x     NetApp Cloud Manager     x     +     Co										
VMwsre Cloud - ntap-far-demo X       V vSphere + vincdc01 - Summary X       vincdc01       x       NetApp Cloud Manager       X       +       CO       -         C <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Operating System</td> <td>Туре</td> <td></td> <td></td>							Operating System	Туре		
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3. After the volume is provisioned, select the volume menu (°), 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 Google Cloud VMware Engine:

- a. RDP to the VM hosted on Google Cloud VMware Engine.
- 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.

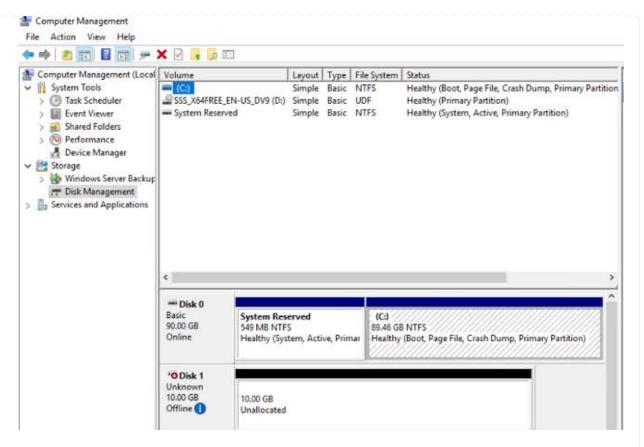


The Windows host must have an iSCSI connection to each node in the cluster. The native DSM selects the best paths to use.

€ 🕞 🔹 Ser	iSCSE Initiato	r Properties			0
Ser Ser		scovery Pavorite Targets Volumes and D	Devices RAD	0.5 Configuration	
Dashboard	Quick Conn To discove DNS name	ect r and log on to a target using a basic conne of the target and then click Quick Connect.	ection, type th	e ≫ address or	
Local Server	Target:	10.0.6.250		Quick Connect	I
AD DS	Discovered targets			Refresh	i
File and Storage Ser	Name		Statu	6	Ĩ.
	dick Conne	201		Carried	
	then dick (	tely disconnect a target, select the target a Xisconnect.		Ownrect	1
	then dick For target select the For configu		ons,	Disconvect Properties - Devotes -	
	then dick For target select the For configu	Nsconnect, properties, including configuration of sesse target and click Properties. uration of devices associated with a target,	ons,	Properter	

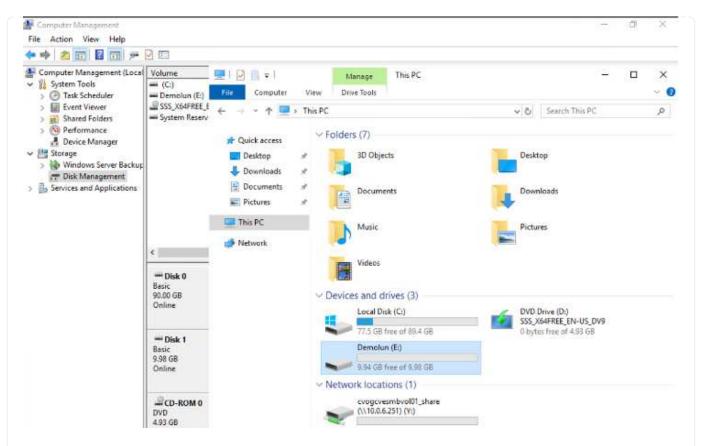
LUNs on storage virtual machine (SVM) appear as disks to the Windows host. Any new disks that are added are not automatically discovered by the host. Trigger a manual rescan to discover the disks by completing the following steps:

- 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:

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



On the Linux clients, ensure the iSCSI daemon is running. Once the LUNs are provisioned, refer to the detailed guidance on iSCSI configuration with Ubuntu as an example here. To verify, run Isblk cmd from the shell.

	nimubulli	:-\$	LSDLK			
NAME	MAJ:MIN	RM	SIZE	RO	TYPE	MOUNTPOINT
loop0	7:0	0	55.4M	1	loop	/snap/core18/2128
Loop1	7:1	Θ	219M	1	loop	/snap/gnome-3-34-1804/72
Loopz	7:2		65.1M	1	loop	/snap/gtk-common-themes/1515
Loop3	7:3	0	51M			/snap/snap-store/547
Loop4	7:4	0	32.3M	1	loop	/snap/snapd/12704
Loop5	7:5	0	32.5M	1	loop	/snap/snapd/13640
loop6	7:6	0	55.5M	1	loop	/snap/core18/2246
Loop7	7:7	0	4K	1	loop	/snap/bare/5
Loop8	7:8	0	65.2M	1	loop	/snap/gtk-common-themes/1519
sda	8:0	0	16G	0	disk	
-sda1	8:1	0	512M	0	part	/boot/efi
-sda2	8:2	0	1K	0	part	
-sda5	8:5	e	15.5G	0	part	1
sdb	8:16	0	16	. 0	disk	

iyaz@ninubu0						
ilesystem	Size	Used	Avail		Mounted on	
idev	1.9G	0	1.96	0%	/dev	
mpfs	394M	1.5M	392M	1%	/run	
dev/sda5	16G	7.6G	6.9G	53%	/	
mpfs	2.0G	0	2.0G	0%	/dev/shm	
mpfs	5.0M	0	5.0M	0%	/run/lock	
mpfs	2.0G	0	2.06	0%	/sys/fs/cgroup	
dev/loop1	219M	219M	6		/snap/gnome-3-34-1804/72	
dev/loop2	66M	66M	8	166%	/snap/gtk-common-themes/1515	
dev/loop3	51M	51M	.0	100%	/snap/snap-store/547	
dev/loop0	56M	56M	0	100%	/snap/core18/2128	
dev/loop4	33M	33M	8	100%	/snap/snapd/12764	
dev/sda1	511M	4.0K	511M	1%	/boot/efi	
mpfs	394M	64K	394M	1%	/run/user/1000	
dev/loop5	33M	33M	0	100%	/snap/snapd/13640	
dev/loop6	56M	56M	6	100%	/snap/core18/2246	
dev/loop7	128K	128K	0	100%	/snap/bare/5	
dev/loop8	66M	66M	θ	100%	/snap/gtk-common-themes/1519	
dev/sdb	976M	2.6M	987M	1%	/mnt	

To mount the Cloud Volumes ONTAP (DIY) file system from VMs within Google Cloud VMware Engine, follow the below steps:

Provision the volume following the below steps

- 1. In the Volumes tab, click Create New Volume.
- 2. On the Create New Volume page, select a volume type:

	cvogcver	nfsvol01					
	INFO		CAPACITY	CAPACITY			
	Disk Type	PD-SSD		■ 6.08 GB			
	Tiering Policy	None	11.05 GB Allocated	Disk Used			
	ne Volumes tab, place Int Command.	e your mouse cursor o	over the volume, select the	e menu icon (º), and then clic			
	Volumes	Replications					
4	O Mount V	olume cvogc	venfsvol01				
G	o to your <mark>Linux m</mark> a	achine and enter t	his mount command				
	mount 10.0.6.2	51:/cvogcvenfsv	ol01 <dest_dir></dest_dir>	Сору			
4. Clicl	k Сору.						
	nect to the designate	d Linux instance.					
				n the appropriate credentials			

\$ sudo mkdir /cvogcvetst

# root@nimubu01:~# sudo mkdir cvogcvetst

8. Mount the Cloud Volumes ONTAP NFS volume to the directory that is created in the previous step.

```
sudo mount 10.0.6.251:/cvogcvenfsvol01 /cvogcvetst
root@nimubu01:~# sudo mount -t nfs 10.0.6.251:/cvogcvenfsvol01 cvogcvetst
nimubu01
                                                                                       Enforce US Keyboard Layout View Fullscreen Send Ctrl+Alt+De
                                       Terminal •
                                                                   Nov 16 12:42
                                                                                               A # 0 .
                                                                 root@nimubu01: -
                                     oot@ninubu01:-# df
ilesysten
                                                                        Use
                                                                        1432
                                                                                       18
                                                                      7832332
                                         edat
                                                                              20113
                                                                 5120
                                                              2011152
                                                                              2011352
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5683
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                                                                                     100% /snap/gtk-co
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                                                                                            ap/snapd/1364
                                                               523248
                                                            515010816
                                                                     42016812
                                                                                             e/nlyaz/cvs1
                                                                                         /snap/snapd/13831
                                                            43264
                                                                       43264
                                                                                     100N
                                                                      8577536
                                                                              4622016
                                                     afsvol01
```

# **Cloud Volumes Service (CVS)**

Cloud Volumes Services (CVS) is a complete portfolio of data services to deliver advanced cloud solutions. Cloud Volumes Services supports multiple file access protocols for major cloud providers (NFS and SMB support).

Other benefits and features include: data protection and restore with Snapshot; special features to replicate, sync and migrate data destinations on-prem or in the cloud; and consistent high performance at the level of a dedicated flash storage system.

Cloud Volumes Service (CVS) as guest connected storage

#### Configure Cloud Volumes Service with VMware Engine

Cloud Volumes Service shares can be mounted from VMs that are created in the VMware Engine environment. The volumes can also be mounted on the Linux client and mapped on the Windows client because Cloud Volumes Service supports SMB and NFS protocols. Cloud Volumes Service volumes can be set up in simple steps.

Cloud Volume Service and Google Cloud VMware Engine private cloud must be in the same region.

To purchase, enable and configure NetApp Cloud Volumes Service for Google Cloud from the Google Cloud Marketplace, follow this detailed guide.

To create and mount NFS volumes, complete the following steps:

1. Access Cloud Volumes from Partner Solutions within the Google cloud console.

÷ -	C 🖬 console.cloud	google o	om/bome/dashboard?	project.»cv-performance-testing		🗞 🕁 😒 Incogn	ito (1) Upda	ti i
=	Google Cloud Platfo	erm i	CV-Performance-Te	sting 👻 🔍 9. Search products and resou		v 10 0	• 1 (	0
ŧ.	Home	>	MMENDATIONS	_			CUSTOM	IZE
*	Pins appear here	×		Compute Engine		Google Cloud Platform status		-
PARTI	NER SOLUTIONS			CPU (N)	•	All services normal		
	Redis Enterprise Apache Kafka on Co				102%	→ Go to Cloud status dashboard		
8	Databricks				85%	-		
٨	DataStax Astra				40%	Billing Estimated charges	\$ USD \$0.00	
\$	Elasticsearch Service		Volumes	12:15 12:30 12:45 1.764	0	For the billing period starting Nov 1, 2021		
0	MongoDB Atlas		Backups Snapshots	Instance/cpu/utilization: 3.39%		View detailed charges		
0	Neo4j Aura Professi		Active Directories	→ Go to Compute Engine				
0	Cloud Volumes	>	Volume Replication			Monitoring	1	

2. In the Cloud Volumes Console, go to the Volumes page and click Create.

	Google Cloud Platform	s cv	Perfe	rmance Testing	۹.		ucts and reso				3.	0	۰	1	8
Ð	Cloud Volumes	Volur	mes	CREA	TE 🖀 DELE	TE									(
	Volumes	Quick r	efere	nce for Cloud Volum	es Private Servic	e Access 🖾 AP	I L2 Shared VPC	support 🖾 Granular permi	ssions 🗠						
	Backups	Ŧ	Filter	Search for volume	rs by name, 10, re	gion, etc.							0	ш	
Ð	Snapshots			ID	Name	Region	Zone	Zone Redundancy	Life Cycle	Billi	ng Label		State	e Detai	is .
	Active Directories Volume Replication		0	DacBaB3d- 03d8-c9db- 2aba-	testnfsds01	europe- west3			available				Avai	lable f	bř s
			0	189c7535445b 330f35e2- b0c6-98b3- ec7a- 8dd4ea7ba00e	gcpive-da4	europe- west3			available				Avai	lable f	Dri
			0	7d0a6f0d- 3e0a-50c3- 5295- 5152040681fc	gcp-ve-ds3	europe- west3			available				Avai	lable f	ors.
		0	0	8cae6850- 0919-4eaf- af42-	gcve-ds-2	europe- west3			available				Avai	lable f	ors

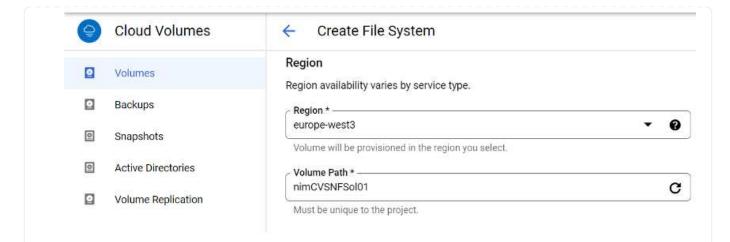
3. On the Create File System page, specify the volume name and billing labels as required for chargeback mechanisms.

Oloud Volumes	← Create File System
2 Volumes	
Backups	Volume Name
Snapshots	nimCVNFSvol01
Active Directories	A human readable name used for display purposes.
Volume Replication	Billing Labels
	Label your volumes for billing reports, queries. Supported with CVS-Performance service type; can be set with CVS service type but not available for billing at this time.
	+ ADD LABEL

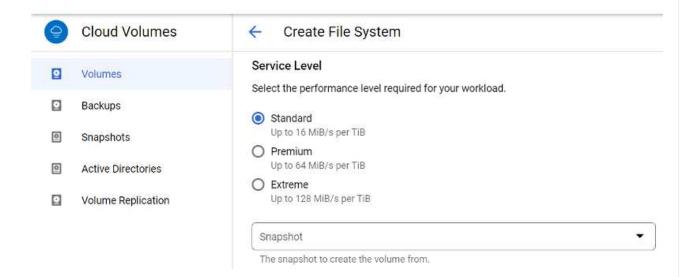
4. Select the appropriate service. For GCVE, choose CVS-Performance and desired service level for improved latency and higher performance based on the application workload requirements.

9	Cloud Volumes	← Create File System
0	Volumes	Service Type
0	Backups	Cloud Volumes Service is offered as two service types: CVS and CVS-Performance. Select the service type that matches your workload needs. Region availability 🖄 varies by
0	Snapshots	service type. Learn more 🖄
0	Active Directories	O CVS Offers volumes created with zonal high availability.
0	Volume Replication	CVS-Performance Offers 3 performance levels and improved latency to address higher performance application requirements.
		Volume Replication
		Secondary Select to create volume as a destination target for volume replication. Applicable only to CVS-performance volumes.

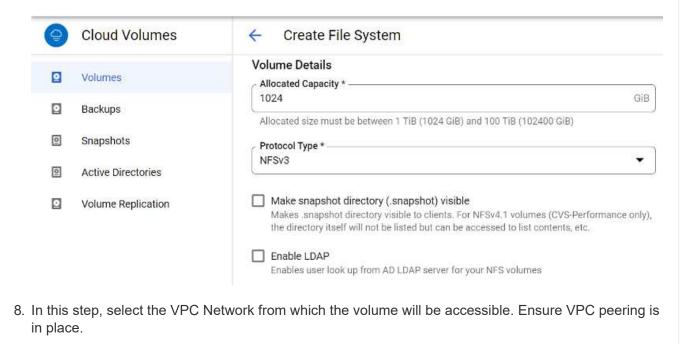
5. Specify the Google Cloud region for the volume and volume path (The volume path must be unique across all of cloud volumes in the project)



6. Select the level of performance for the volume.



7. Specify the size of the volume and the protocol type. In this testing, NFSv3 is used.

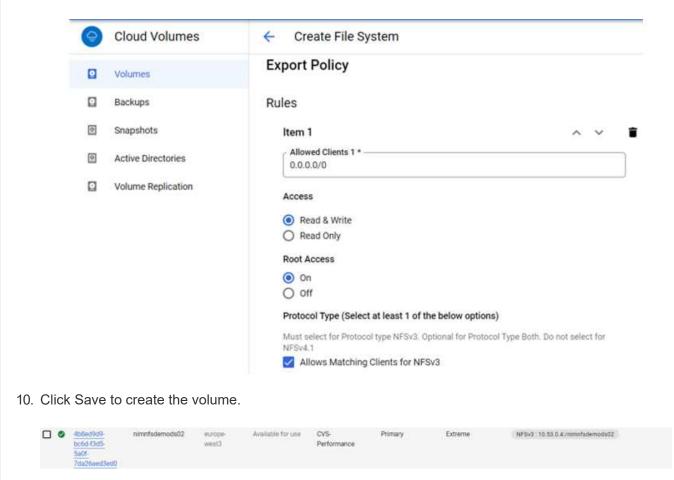


HINT: If VPC peering has not been done, a pop-up button will be displayed to guide you through the peering commands. Open a Cloud Shell session and execute the appropriate commands to peer your VPC with Cloud Volumes Service producer. In case you decide to prepare VPC peering in beforehand, refer to these instructions.

9	Cloud Volumes	← Create File System
	Volumes	Network Details
Ø	Backups	Provide the host project name when deploying in a shared VPC service project.
0	Snapshots	VPC Network Name *
0	Active Directories	Select the VPC Network from which the volume will be accessible. This cannot be changed later.
0	Volume Replication	Use Custom Address Range
		Reserved Address range netapp-addresses

9. Manage the Export policy rules by adding the appropriate rules and Select the checkbox for the corresponding NFS version.

Note: Access to NFS volumes won't be possible unless an export policy is added.



Before preparing to mount the NFS volume, ensure the peering status of private connection is listed as Active. Once status is Active, use the mount command.

To mount an NFS volume, do the following:

- 1. In the Cloud Console, go to Cloud Volumes > Volumes.
- 2. Go to the Volumes page
- 3. Click the NFS volume for which you want to mount NFS exports.
- 4. Scroll to the right, under Show More, click Mount Instructions.

To perform the mounting process from within the guest OS of the VMware VM, follow the below steps:

- 1. Use SSH client and SSH to the virtual machine.
- 2. Install the nfs client on the instance.
  - a. On Red Hat Enterprise Linux or SuSE Linux instance:

sudo yum install -y nfs-utils

b. On an Ubuntu or Debian instance:

sudo apt-get install nfs-common

3. Create a new directory on the instance, such as "/nimCVSNFSol01":

```
sudo mkdir /nimCVSNFSol01
```

Ubuntu-20.04-00		Enforce US Keyboard Layout	View Fullscreen	Send Ctr	+AR+Do
Activities 🖸 Terminal 🔹	Nov 3 06:22				<b>4</b> 6 C
IR Flodelnevel:-5 sudo ekdir /etmcvsNFSplei	floadmin@vm1: -				

4. Mount the volume using the appropriate command. Example command from the lab is below:

```
sudo mount -t nfs -o rw,hard,rsize=65536,wsize=65536,vers=3,tcp
10.53.0.4:/nimCVSNFSol01 /nimCVSNFSol01
```

Filesystem	1K-blocks	Used	Available	Use%	Mounted on
udev	16409952	6.00	16409952	0%	/dev
tnpfs	3288328	1580	3286748	1%	/run
/dev/sdb5	61145932	19231356	38778832	34%	1
tripfs	16441628	6	16441628	8%	/dev/shm
tnpfs	5120	6	\$120	6%	/run/lock
tnpfs	16441628	a	16441628	0%	/sys/fs/cgroup
/dev/loop0	128	128	0	100%	/snap/bare/5
/dev/loop1	56832	56832	6	100%	/snap/core18/2128
/dev/loop2	66688	66688	6	100%	/snap/gtk-common-themes/1515
/dev/loop4	66816	66816	0	100%	/snap/gtk-connon-thenes/1519
/dev/loop3	52224	52224	0	100%	/snap/snap-store/S47
/dev/loop5	224256	224256	0	166%	/snap/gnone-3-34-1804/72
/dev/sdb1	523248	100-12	523244	1%	/boot/efi
tnpfs	3288324	28	3288296	1%	/run/user/1000
10.53.0.4:/gcve-ds-1	107374182400	1136086016	106238096384	2%	/base
/dev/mapper/nfsprdvg1-prod01	419155968	55384972	363778996	14%	/datastore1
/dev/loop8	33280	33280	0	100%	/snap/snapd/13270
/dev/loop6	33280	33280	0	100%	/snap/snapd/13640
/dev/loop7	56832	56832	0	100%	/snap/core18/2246
10.53.0.4:/n1mCV5NFSol01	107374182400	256	107374182144	1%	/nimCVSNFSol01
root@vml:-#					

For SMB volumes, make sure the Active Directory connections is configured prior to creating the SMB volume.

The a Windows Active Directory connection to your existing AD server. This is a prerequisite step before creating volumes with the SMB protocol type. Learn more (2)         The search for Active Directory connections by ID, username, DNS, netBIOS, region, etc.	ctive	Directory cor	nections	+ CREATE	DELETE.						
	eate a	Windows Active D	rectory connection to yo	our existing AD se	rver. This is a prerequisite	step before creating vo	lumes with the SMB pro	tocol type. Learn	more (2		
		and the state of the state			an TANK an application of the	21				•	
	₹ F	Iter Search for A	ctive Directory connection	ons by ID, useman DNS Servers	ne, DNS, netBIOS, region, et NetBIOS Prefix	OU Path	AD Server Name	KDC IP	Region	<b>O</b> Sta	III tus

Once the AD connection is in place, create the volume with the desired service level. The steps are like creating NFS volume except selecting the appropriate protocol.

- 1. In the Cloud Volumes Console, go to the Volumes page and click Create.
- 2. On the Create File System page, specify the volume name and billing labels as required for chargeback mechanisms.



#### Volume Name

Name \* ---

nimCVSMBvol01

A human readable name used for display purposes.

#### **Billing Label**

Label your volumes for billing reports, queries. Supported with CVS-Performance service type; can be set with CVS service type but not available for billing at this time.



3. Select the appropriate service. For GCVE, choose CVS-Performance and desired service level for improved latency and higher performance based on the workload requirements.

## **Create File System**

#### Service Type

←

Cloud Volumes Service is offered as two service types: CVS and CVS-Performance. Select the service type that matches your workload needs. <u>Region availability</u> is varies by service type. Learn more is



Offers volumes created with zonal high availability.



Offers 3 performance levels and improved latency to address higher performance application requirements.

## **Volume Replication**

#### Secondary

Select to create volume as a destination target for volume replication. Applicable only to CVS-performance volumes.

4. Specify the Google Cloud region for the volume and volume path (The volume path must be unique across all of cloud volumes in the project)



#### Region

Region availability varies by service type.

europe-west3	Ŧ	0
Volume will be provisioned in the region you select.		
Volume Path *		

C

nimCVSMBvol01

Must be unique to the project.

5. Select the level of performance for the volume.

0.0	rvice Level	
Sel	lect the performance level required for your workload.	
0	Standard Up to 16 MiB/s per TiB	
0	Premium Up to 64 MIB/s per TIB	
0	Extreme Up to 128 MiB/s per TiB	
s	inapshot 👻	
T	he snapshot to create the volume from.	
Зре	cify the size of the volume and the protocol type. In this testing, SMB is used.	
÷	Create File System	
Vo	lume Details	
A	llocated Capacity *	
( A)	Ilocated Capacity * 024 GiB	
( A)	llocated Capacity *	
	Ilocated Capacity *	
	Ilocated Capacity *	
Al Al SI	Ilocated Capacity * GiB Ilocated size must be between 1 TiB (1024 GiB) and 100 TiB (102400 GiB) rotocol Type * MB Make snapshot directory (.snapshot) visible Makes snapshot directory visible to clients. For NFSv4.1 volumes (CVS-Performance only), the directory itself will not be listed but can be accessed to list contents, etc. Enable SMB Encryption Enable this option only if you require encryption of your SMB data traffic.	
Al Al SI	Ilocated Capacity * 024 GiB Ilocated size must be between 1 TiB (1024 GiB) and 100 TiB (102400 GiB) rotocol Type * MB Make snapshot directory (.snapshot) visible Makes .snapshot directory visible to clients. For NFSv4.1 volumes (CVS-Performance only), the directory itself will not be listed but can be accessed to list contents, etc. Enable SMB Encryption	
Al Al SI	Ilocated Capacity *	

		PC configur e host projec		hen deployi	ng in a shar	ed VPC ser	vice project.	
1.1.1.1.1.1.1.1	C Network	Name * Nes-vpc						•
Sele		°C Network f	rom which	n the volum	e will be acc	essible. Th	is cannot be	changed
	Jse Cust	om Address	Range					
	erved Ad app-addi	dress range esses						
V SI	NOW SN	APSHOT PC	LICY					
SA		CANCEL						
	Save to	create the	volume.					
-						Primary	Standard	SM8 \\nimamb-3830.nimgcveval.com\nimCVSMBw

To mount the SMB volume, do the following:

- 1. In the Cloud Console, go to Cloud Volumes > Volumes.
- 2. Go to the Volumes page
- 3. Click the SMB volume for which you want to map an SMB share.
- 4. Scroll to the right, under Show More, click Mount Instructions.

To perform the mounting process from within the Windows guest OS of the VMware VM, follow the below steps:

- 1. Click the Start button and then click on Computer.
- 2. Click Map Network Drive.
- 3. In the Drive list, click any available drive letter.
- 4. In the folder box, type:

\\nimsmb-3830.nimgcveval.com\nimCVSMBvol01

What n	etwork folder would you	like to map?									
Specify th	e drive letter for the connection	and the folder that you want t	o connect to:								
Drive:	Z:	~									
Folder:	\\10.53.0.4\nimcvsmbvpl0										
	Example: \\server\share										
	Reconnect at sign-in										
	Connect using different credentials										
	Connect to a Web site that y	you can use to store your docu	ments and pictures	15							
To conn	ect every time you log o	n to your computer, se	elect the Reco	nnect at sign-i	n che	ck box.					
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## Region Availability for Supplemental NFS datastores on AWS, Azure, and GCP

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Learn more about the the Global Region support for supplemental NFS datastores on AWS, Azure and Google Cloud Platform (GCP).

## AWS Region Availability

The availability of supplemental NFS datastores on AWS / VMC is defined by Amazon. First, you need to determine if both VMC and FSxN are available in a specified region. Next, you need to determine if the FSxN supplemental NFS datastore is supported in that region.

• Check the availability of VMC here.

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- Amazon's pricing guide offers information on where FSxN (FSx ONTAP) is available. You can find that information here.
- Availability of the FSxN supplemental NFS datastore for VMC is coming soon.

While information is still being released, the following chart identifies the current support for VMC, FSxN and FSxN as a supplemental NFS datastore.

#### Americas

AWS Region	VMC Availability	FSx ONTAP Availability	NFS Datastore Availability
US East (Northern Virginia)	Yes	Yes	Yes
US East (Ohio)	Yes	Yes	Yes
US West (Northern California)	Yes	No	No
US West (Oregon)	Yes	Yes	Yes
GovCloud (US West)	Yes	Yes	Yes
Canada (Central)	Yes	Yes	Yes
South America (Sao Paulo)	Yes	Yes	Yes

Last updated on: June 2, 2022.

#### EMEA

AWS Region	VMC Availability	FSx ONTAP Availability	NFS Datastore Availability
Europe (Ireland)	Yes	Yes	Yes
Europe (London)	Yes	Yes	Yes
Europe (Frankfurt)	Yes	Yes	Yes
Europe (Paris)	Yes	Yes	Yes
Europe (Milan)	Yes	Yes	Yes
Europe (Stockholm)	Yes	Yes	Yes

Last updated on: June 2, 2022.

#### Asia Pacific

AWS Region	VMC Availability	FSx ONTAP Availability	NFS Datastore Availability
Asia Pacific (Sydney)	Yes	Yes	Yes
Asia Pacific (Tokyo)	Yes	Yes	Yes
Asia Pacific (Osaka)	Yes	No	No
Asia Pacific (Singapore)	Yes	Yes	Yes
Asia Pacific (Seoul)	Yes	Yes	Yes
Asia Pacific (Mumbai)	Yes	Yes	Yes
Asia Pacific (Jakarta)	No	No	No
Asia Pacific (Hong Kong)	) Yes	Yes	Yes

#### **Azure Region Availability**

The availability of supplemental NFS datastores on Azure / AVS is defined by Microsoft. First, you need to determine if both AVS and ANF are available in a specific region. Next, you need to determine if the ANF supplemental NFS datastore is supported in that region.

- Check the availability of AVS and ANF here.
- Check the availability of the ANF supplemental NFS datastore here.

#### **GCP Region Availability**

GCP region availability will be released when GCP enters public availability.

# Summary and Conclusion: Why NetApp Hybrid Multicloud with VMware

NetApp Cloud Volumes along with VMware solutions for the major hyperscalers provides great potential for organizations looking to leverage hybrid cloud. The rest of this section provides the use cases that show integrating NetApp Cloud Volumes enables true hybrid Multicloud capabilities.

### Use case #1: Optimizing storage

When performing a sizing exercise using RVtools output, it is always evident that the horsepower (vCPU/vMem) scale is parallel with storage. Many times, organizations find themselves in a situation where the storage space requires drives the size of the cluster well beyond what is needed for horsepower.

By integrating NetApp Cloud Volumes, organizations can realize a vSphere-based cloud solution with a simple migration approach, with no re-platforming, no IP changes, and no architectural changes. Additionally, this optimization enables you to scale the storage footprint while keeping the host count to least amount required in vSphere, but no change to the storage hierarchy, security, or files made available. This allows you to optimize the deployment and reduce the overall TCO by 35–45%. This integration also enables you to scale storage from warm storage to production-level performance in seconds.

## Use case #2: Cloud migration

Organizations are under pressure to migrate applications from on-premises data centers to the Public Cloud for multiple reasons: an upcoming lease expiration; a finance directive to move from capital expenditure (capex) spending to operational expenditures (opex) spending; or simply a top-down mandate to move everything to the cloud.

When speed is critical, only a streamlined migration approach is feasible because re-platforming and refactoring applications to adapt to the cloud's particular laaS platform is slow and expensive, often taking months. By combining NetApp Cloud Volumes with the bandwidth-efficient SnapMirror replication for guest-connected storage (including RDMs in conjunction with application-consistent Snapshot copies and HCX, cloud specific migration (e.g. Azure Migrate), or third-party products for replicating VMs), this transition is even easier than relying on time-consuming I/O filters mechanisms.

## Use case #3: Data center expansion

When a data center reaches capacity limits due to seasonal demand spikes or just steady organic growth, moving to the cloud-hosted VMware along with NetApp Cloud Volumes is an easy solution. Leveraging NetApp Cloud Volumes allows storage creation, replication, and expansion very easily by providing high availability across availability zones and dynamic scaling capabilities. Leveraging NetApp Cloud Volumes helps in minimizing host cluster capacity by overcoming the need for stretch clusters.

## Use case #4: Disaster recovery to the cloud

In a traditional approach, if a disaster occurs, the VMs replicated to the cloud would require conversion to the cloud's own hypervisor platform before they could be restored – not a task to be handled during a crisis.

By using NetApp Cloud Volumes for guest-connected storage using SnapCenter and SnapMirror replication from on-premises along with public cloud virtualization solutions, a better approach for disaster recovery can be devised allowing VM replicas to be recovered on fully consistent VMware SDDC infrastructure along with cloud specific recovery tools (e.g. Azure Site Recovery) or equivalent third-party tools such as Veeam. This approach also enables you to perform disaster recovery drills and recovery from ransomware quickly. This also enables you to scale to full production for testing or during a disaster by adding hosts on-demand.

## Use case #5: Application modernization

After applications are in the public cloud, organizations will want to take advantage of the hundreds of powerful cloud services to modernize and extend them. With the use of NetApp Cloud Volumes, modernization is an easy process because the application data is not locked into vSAN and allows data mobility for a wide range of use cases, including Kubernetes.

## Conclusion

Whether you are targeting an all-cloud or hybrid cloud, NetApp Cloud Volumes provides excellent options to deploy and manage the application workloads along with file services and block protocols while reducing the TCO by making the data requirements seamless to the application layer.

Whatever the use case, choose your favorite cloud/hyperscaler together with NetApp Cloud Volumes for rapid realization of cloud benefits, consistent infrastructure, and operations across on-premises and multiple clouds, bidirectional portability of workloads, and enterprise-grade capacity and performance.

It is the same familiar process and procedures that are used to connect the storage. Remember, it is just the position of the data that changed with new names; the tools and processes all remain the same and NetApp Cloud Volumes helps in optimizing the overall deployment.

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