

Dell Technologies Cloud Validated Designs: Dell EMC Storage with VMware Cloud Foundation

Abstract

This document describes how to configure the Dell Technologies™ Cloud Validated Design consisting of Dell EMC™ storage with VMware® Cloud Foundation.

May 2020

Revisions

Date	Description
February 2019	Initial release
March 2019	SC Series added
April 2019	PowerMax NFS, VxFlex OS, and XtremIO added
July 2019	PowerMax and Dell EMC Unity iSCSI steps added
August 2019	Introducing Fibre Channel storage as principal storage for VMware Cloud Foundation workload domains
December 2019	VCF 3.9 updates
April 2020	PowerStore added
May 2020	Added VMware vSphere Virtual Volumes (vVols) guidance

Acknowledgments

Authors: Nicholas Ringborg: Dell Technologies Cloud Validated Design sections
 Darin Schmitz: Dell Technologies Storage configuration sections

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1 Introduction

Digital Transformation is no longer a buzz word, but rather a direct reflection of the massive changes that are happening across every industry. Organizations are making substantial investments in IT to succeed in this digital landscape that require leveraging data as an asset across all aspects of their business. There has also been substantial movement towards onboarding cloud services to accelerate innovation, expand to new locations, keep up with massive growth, and reduce costs of delivering IT.

As a result, IT departments are under significant pressure today. They are no longer treated as a cost center only responsible for keeping the lights on, but instead IT is playing a significant role in shaping their organization's overall digital strategy. As organizations continue to grow their application ecosystems, this represents a large shift for many IT departments with significant challenges on the way such as aging data centers and legacy infrastructure that make it difficult to support their transformation ambitions.

IT departments are now forced to re-examine what they do and how they do it—prioritizing their business objectives to deliver greater efficiency, predictability, and business agility.

1.1 The need for a hybrid cloud model

The explosion of data and devices in addition to the continued focus on controlling and reducing operating expenses has accelerated the adoption of both public and private cloud computing. Achieving success is having the ability to make data-driven decisions and to act quickly on new ideas to deliver outstanding customer and user experiences. To support this new paradigm, IT is addressing the needs of both traditional three-tier applications as well as new cloud-native applications, each with a different set of priorities.

For existing workloads, IT departments are looking to reduce costs and improve performance and efficiency, while for cloud-native workloads the priorities focus around access to new cloud services such as containers or AI/ML platforms. To address the specific needs of workloads, organizations are moving towards adopting a mix of public and private clouds.

However, operating in multiple clouds comes with another set of challenges including operational silos, different management and operations tools, complex workload migrations, security concerns, and inconsistent SLAs. These problems are byproducts of the lack of consistent infrastructure and operations across clouds, slowing cloud adoption and limiting its effectiveness.

To overcome this complexity, the ideal choice for organizations is to embrace a consistent hybrid cloud strategy for both public and private clouds, allowing for the optimal deployment of workloads. According to research from analyst firm ESG¹, half of organizations formulating hybrid cloud strategies have cited seamless compatibility with their on-premises infrastructure as their most important consideration. In other words, they need a hybrid cloud strategy that eliminates multi-cloud complexity, while providing flexible deployment options for high-value workloads.

¹ IDC Worldwide Quarterly Cloud IT Infrastructure Tracker, Q1 2019, June 2019

1.2 VMware Cloud Foundation

VMware® is a leader in providing both the virtualization and management software that support a software-defined data center (SDDC). The VMware vision of a modern data center starts with a foundation of software-defined infrastructure that is simple to manage, monitor, and operate. The architecture for the SDDC empowers companies to run hybrid clouds, delivering scalability, automation, and agility. It is based on well-established products from VMware, such as vSphere®, vSAN™, and NSX®, providing compute, storage, and networking virtualization—together with the vRealize® Suite bringing additional management, self-service, automation, intelligent operations, life-cycle management, and financial transparency. With VMware Cloud Foundation, IT departments now have a powerful operational hub for their hybrid cloud environments and external storage arrays, delivering a strong foundation to deploy and manage both traditional and cloud-native workloads.

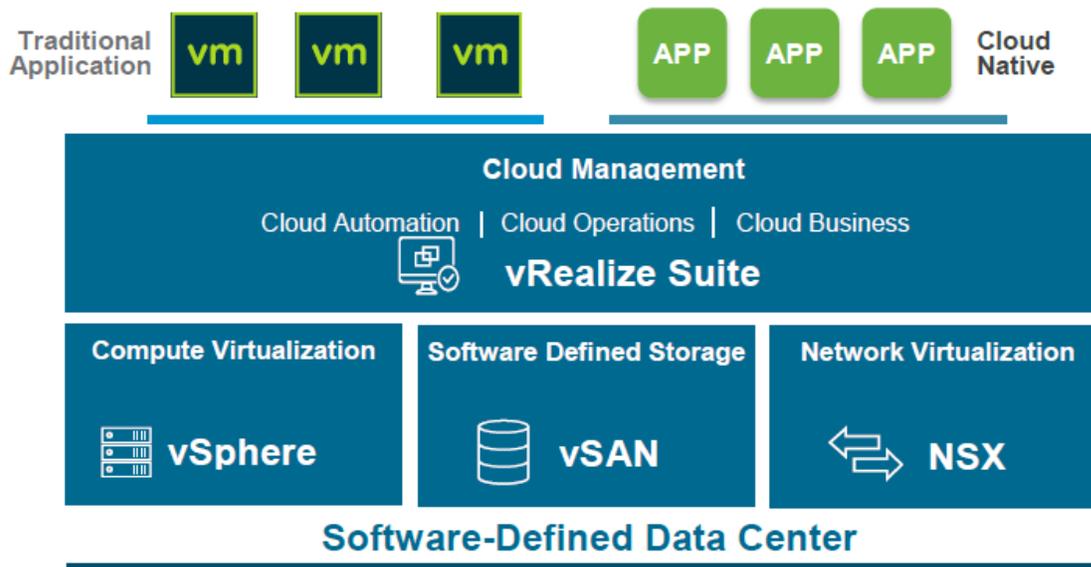


Figure 1 VMware software-defined data center architecture

1.3 Dell Technologies Cloud

The Dell Technologies Cloud is a set of cloud infrastructure solutions that are designed to make hybrid cloud environments simpler to deploy and manage. Combining the power of VMware Cloud Foundation and Dell Technologies™, the number 1 provider of cloud infrastructure², customers now have a consistent experience across public clouds, private clouds, and edge locations. With streamlined operations and lowered total cost of ownership (TCO), IT departments can now let business priorities determine where workloads reside, ensuring they are delivering the reliable infrastructure that best meets their unique business needs.

Using Dell Technologies Cloud, customers can deploy their workloads on-premises or use cloud environments—with VMware Cloud Foundation providing the consistent operational experience across all. The hybrid cloud solution is delivered through unique integration of hardware, software, services, and

² ESG Master Survey Results, Hybrid Cloud Trends, May 2019

consumption options from Dell Technologies and VMware. Customers can consume in the way that aligns best with their workload requirements and business objectives:

- **Dell Technologies Cloud Platform** with Enterprise PKS and VMware Cloud Foundation on VxRail: The only fully integrated HCI system jointly engineered with VMware, delivered as a turnkey option. VxRail supports external storage arrays as supplemental storage only. vSAN Ready Nodes are required for Dell EMC arrays to be used as principal storage for a workload domain.
- **Dell Technologies Cloud Datacenter-as-a-Service** with VMware Cloud on Dell EMC: A fully managed service for data center and edge locations.
- **Dell Technologies Partner Clouds** with support for major cloud providers and over 4,200 additional cloud partners: Available by subscription/lease or usage-based.
- **Dell Technologies Cloud Validated Designs**³ using Dell EMC best-of-breed storage, compute, and networking: Pre-tested infrastructure with deployment guidance.

1.4 Dell Technologies Cloud Validated Designs

Dell Technologies Cloud Validated Designs enable customers to bring cloud to a broader set of workloads that require independent scaling of storage and compute. This new option to consume Dell Technologies Cloud provides deployment guidance for pre-tested Dell EMC storage, compute, and networking infrastructure that has been validated with VMware Cloud Foundation. Using Validated Designs, customers can now support new and legacy workloads that have infrastructure-intensive requirements in the most efficient way possible.

Benefits of Validated Designs include the following:

- Rapid time-to-value with pre-tested infrastructure and deployment guidance
- Excellent performance with independent scaling of storage and compute
- Ability to leverage existing investments for hybrid cloud environments

³ A Dell Technologies Cloud Validated Design does not equal a VMware Validated Design (VVD). A VVD is a software bill of materials (BoM) with related documentation to guide customers building their own software-defined data center (SDDC). Dell Technologies Cloud VD are focused on infrastructure, with related documentation to guide customers building out their own on-premises infrastructure.

2 Dell EMC storage with VMware Cloud Foundation

Currently, Validated Designs are available for Dell EMC PowerMax™, Dell EMC PowerStore™, Dell EMC Unity™ XT, and Dell EMC PowerEdge™ MX—which have been the backbone of most companies’ high-value workloads for the better part of the last three decades. While this white paper is focused on Dell EMC storage with VMware Cloud Foundation, more Validated Designs are coming soon.

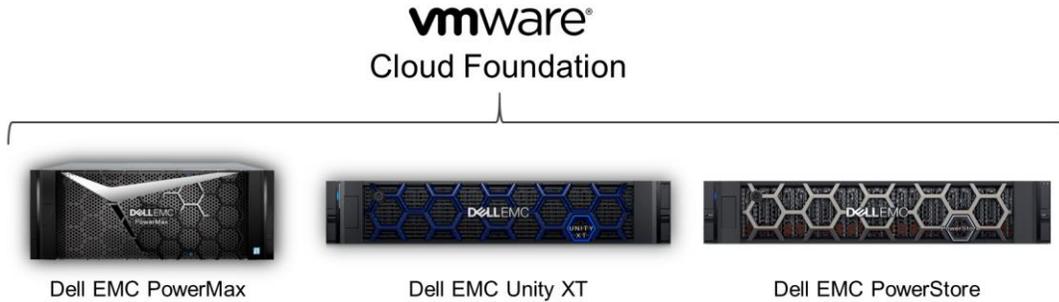


Figure 2 Dell EMC storage integrated with VMware Cloud Foundation

2.1 Customer use cases

Customers can now use Validated Designs to build their own hybrid cloud infrastructure, combining the best of software-defined and traditional three-tier architecture. With more choices, they have deployment flexibility to meet unique external storage-intensive requirements such as the ability to scale storage capacity independent from compute capacity.

Currently, PowerMax, PowerStore, and Dell Unity XT storage systems support Network File System (NFS) and Fibre Channel (FC) as principal storage and iSCSI as supplemental storage.

	Management Domain	Workload Domains: Principal Storage	Workload Domains: Supplemental Storage
vSAN	✓	✓	✓
NFSv3	✗	✓	✓
Fibre Channel (FC)	✗	✓	✓
NFSv4	✗	✗	✓
iSCSI	✗	✗	✓
Virtual Volumes (vVols)	✗	✗	✓

Figure 3 Protocol configuration options

2.1.1 Storage-intensive applications

Dell EMC storage arrays are ideal for applications with demanding throughput and capacity needs. They are powerful additions to VMware Cloud Foundation environments, delivering the flexibility to scale storage independent of compute for greater performance and application flexibility. In addition, customers can also build new levels of storage resiliency with synchronous replication for disaster recovery from on-premises data centers to multiple sites, for example.

2.1.2 Investment protection

For customers with existing Dell EMC storage infrastructure, they can now easily attach existing data capacity to their hybrid cloud environments. This enables them to take advantage of the advanced data services, performance, and capacity that PowerMax, PowerStore, and Dell EMC Unity XT delivers.

2.1.3 Deployment automation

The vRealize Orchestrator (vRO) plug-in for PowerMax and PowerStore allows administrators to take advantage of VMware deployment tools of choice to rapidly stand up new environments with attached external storage. Customers can now run storage operations such as provisioning storage or scheduling snapshots directly from vRO. In addition, they can further automate storage-management activities by establishing workflows through a self-service portal using vRealize Automation (vRA). This allows administrators to simplify the user experience and deliver a pre-defined catalog of items that users can deploy without prior knowledge of specific storage platforms. Examples of self-service items include the following:

- High-performance storage: Predefined storage for workloads that require extremely low latency such as credit card authorizations for retail transactions. Users select preconfigured high-performance NVMe storage capacity that offers high read/write performance that is designed to support Online Transaction Processing (OLTP) transactional workloads.
- Data warehouse storage: Predefined storage for workloads that require large sequential read performance such as business analytics. Users select preconfigured high-capacity storage (such as NL-SAS or SATA drives) that offer great sequential read performance supporting large database queries.

2.2 Principal and supplemental storage for workload domains

Continuing a history of collaboration with VMware, Dell EMC has qualified external storage solutions for VMware Cloud Foundation workload domains. Originally, the ability to use external NFSv3 as principal with FC storage as supplemental storage became available with VMware Cloud Foundation 3.5.1. Subsequently, the use of VMFS on FC storage as principal storage in workload domains is available with VMware Cloud Foundation versions 3.9 and above.

VMware Cloud Foundation supports both VMFS on FC and NFSv3 as principal storage, and iSCSI or NFSv4 as supplemental storage for workload domains using PowerMax, PowerStore, and Dell EMC Unity XT.

2.3 VMware Virtual Volumes

For Dell EMC storage arrays that support VMware vSphere Virtual Volumes™ (vVols), they can be used as supplemental storage to workload domains only. The [VMware HCL](#) for vVols can provide array, protocol, and VASA-provider versions that are required to use vVols with ESXi hosts in a VCF environment. See the respective Dell EMC product administration guides listed in appendix A for configuration instructions.

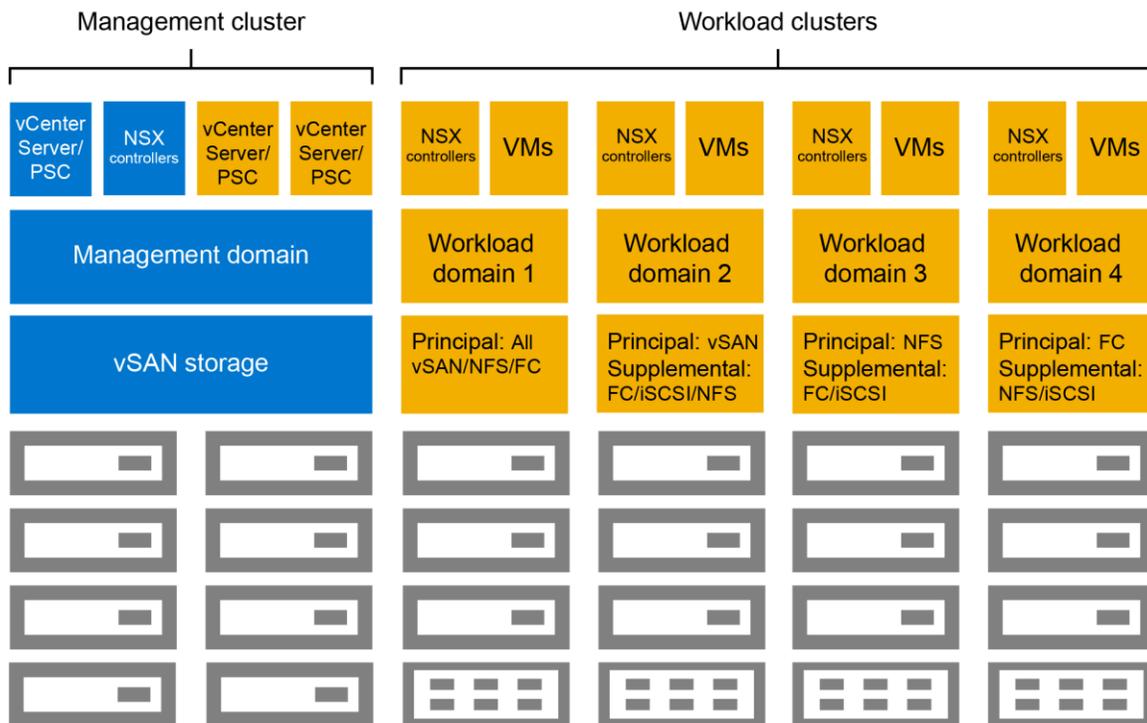


Figure 4 Dell EMC storage deployment options for vSAN ReadyNodes with VMware Cloud Foundation

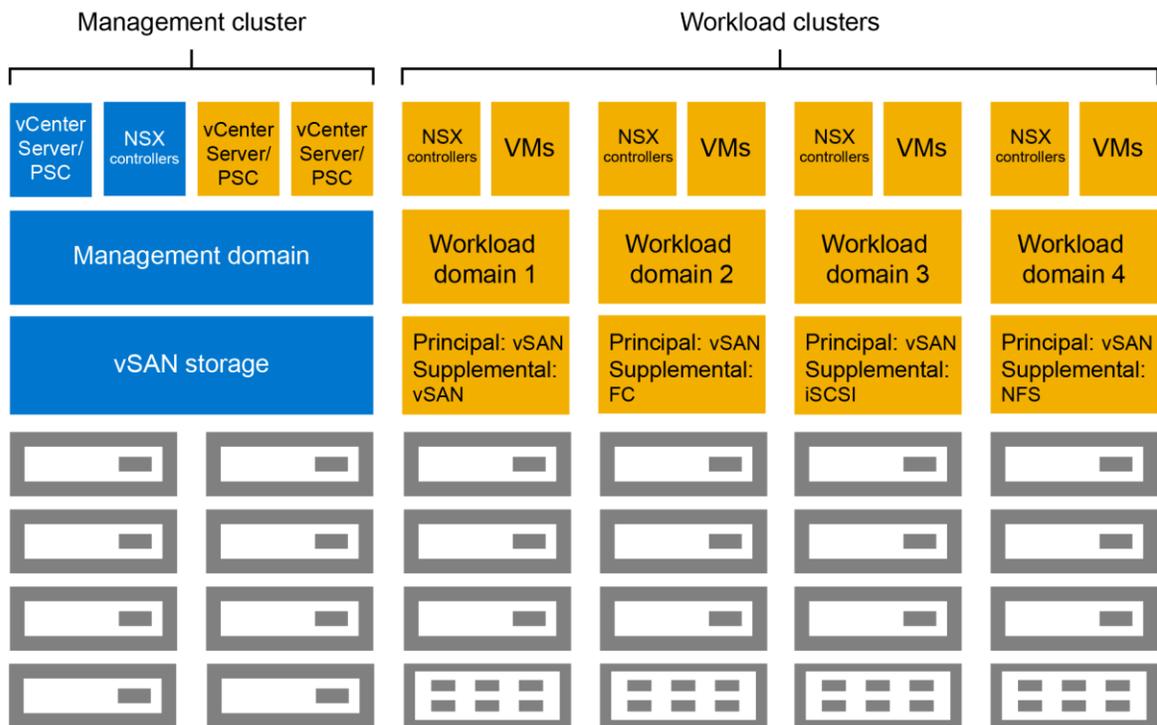


Figure 5 Dell EMC storage deployment options for VxRail with VMware Cloud Foundation

Note: Virtual Volumes (vVols) and NFSv4 can only be used as supplemental storage for workload domains with supported protocols on Dell EMC arrays.

3 Prerequisites

The Dell Technologies Cloud Validated Designs focus on Dell EMC storage arrays using principal or supplemental storage for workload domains.

Before completing the main steps in this guide, complete the following prerequisites:

VMware Cloud Foundation:

- The management domain is deployed by the VMware Cloud Builder virtual machine.
- Additional hosts are commissioned and are ready to be added to a new workload domain.

Dell EMC storage:

- Storage networking is configured to allow connectivity between the Dell EMC arrays and the VMware Cloud Foundation workload hosts.
 - For NFS and iSCSI configurations, it is recommended to dedicate a workload domain VLAN for an IP-based storage network pool.
 - For Fibre Channel configuration, the workload host initiator ports must be zoned with the target ports for the array within the FC switch networks.

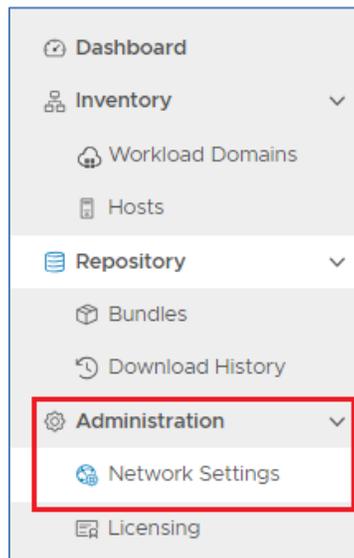
4 Workload domain configuration with NFS

When provisioning an NFS-based workload domain, the principal storage assignment for that workload domain must use either NFSv3 or vSAN storage for the initial cluster creation. Once the workload domain has been created, supplemental storage from other arrays or protocols can be added later. This section details how to configure NFSv3 storage to be used for workload domain creation.

4.1 VMware Cloud Foundation network pool configuration

Before creating the NFS share, a dedicated storage IP networking pool must be created for NFS traffic.

1. From the SDDC Manager dashboard, in the left pane, expand **Administration** and click **Network Settings**.



2. In the upper-right side of the screen, click **Create Network Pool**.



3. Create the network pool.
 - a. Specify a **Network Pool Name**.
 - b. For **Network Type**, select **NFS**.
 - c. Enter the IP storage network information.
 - d. When finished adding IP address ranges, click **Save**.

The screenshot shows the 'Create Network Pool' configuration page in VMware Cloud Foundation. The 'Network Pool Name' is 'msp01-workloadpool'. The 'Network Type' is 'NFS', which is selected with a red box. Below this, there are two main sections: 'NFS Network Information' and 'vMotion Network Information'. The 'NFS Network Information' section is highlighted with a red border and contains the following fields:

Field	Value
VLAN ID	10
MTU	1600
Network	10.10.132.0
Subnet Mask	255.255.0.0
Default Gateway	10.10.132.1

Below the network information, there is a section for 'Included IP Address Ranges'. It contains one range: 10.10.132.50 To 10.10.132.100, with a 'REMOVE' button. There is also an 'ADD' button for adding more ranges.

The 'vMotion Network Information' section is also visible, with fields for VLAN ID (21), MTU (1600), Network (192.168.21.0), Subnet Mask (255.255.255.0), and Default Gateway (192.168.21.1). It also has its own 'Included IP Address Ranges' section with a range of 192.168.21.50 To 192.168.21.100 and an 'ADD' button.

4. Make note of the **Included IP Address Ranges** for later use when assigning host access permissions on the NFS share.

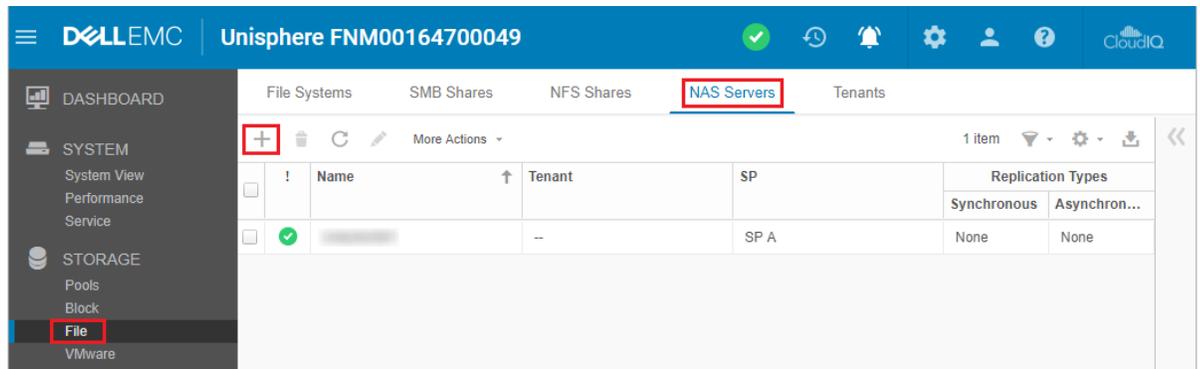
4.2 Dell EMC storage configuration

This section details the steps for each of the various arrays to prepare the NFS mount points for VMware Cloud Foundation.

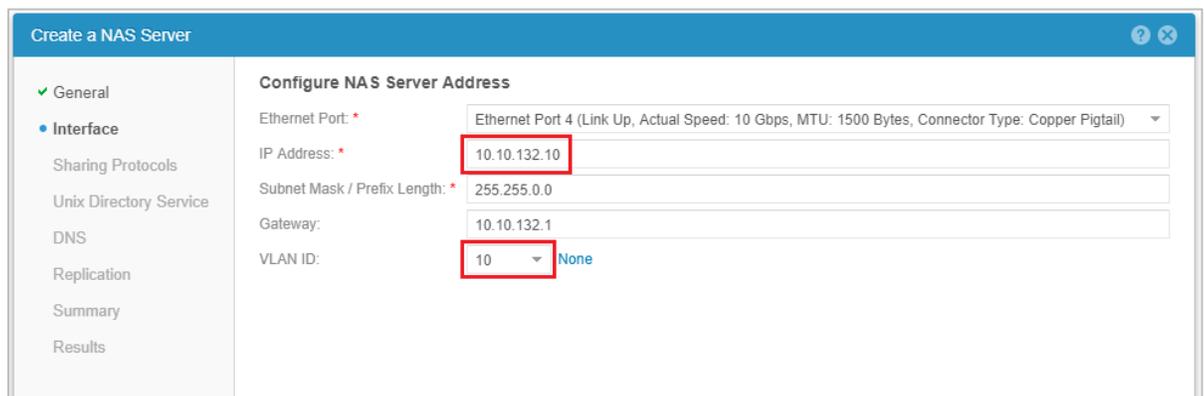
4.2.1 Dell EMC Unity NFS share creation

To create the NFSv3 share on the Dell EMC Unity array, follow these steps:

1. To create the NAS server, from within the Dell EMC Unity Unisphere™ interface, under **Storage** click **File**, click the **NAS Servers** section, and click the **plus (+)** to add a NAS server.



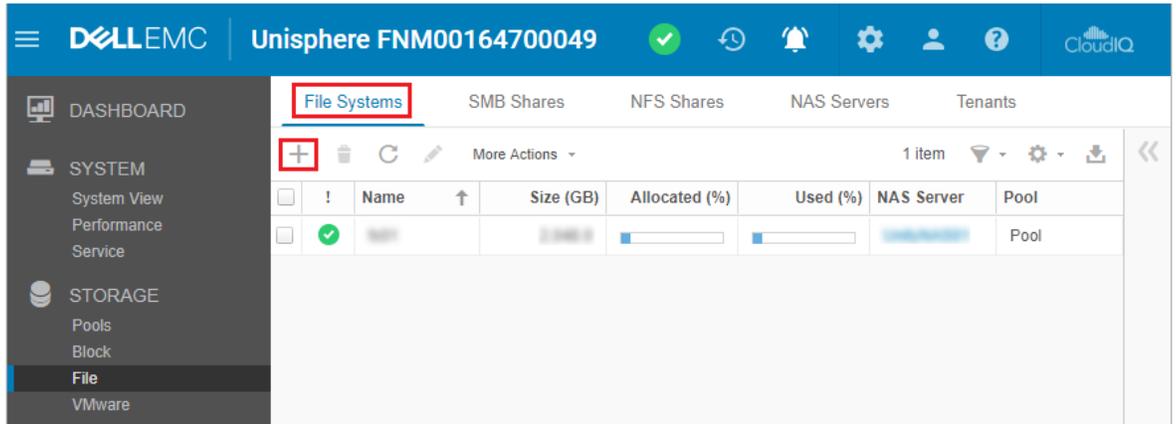
2. Follow the wizard and specify the settings unique to your environment. Any configuration pages that require special attention are covered in the following steps.
3. On the **Interface** page, specify an IP address within the VLAN of the NFS network pool that was created earlier from the SDDC Manager, and click **Next**.



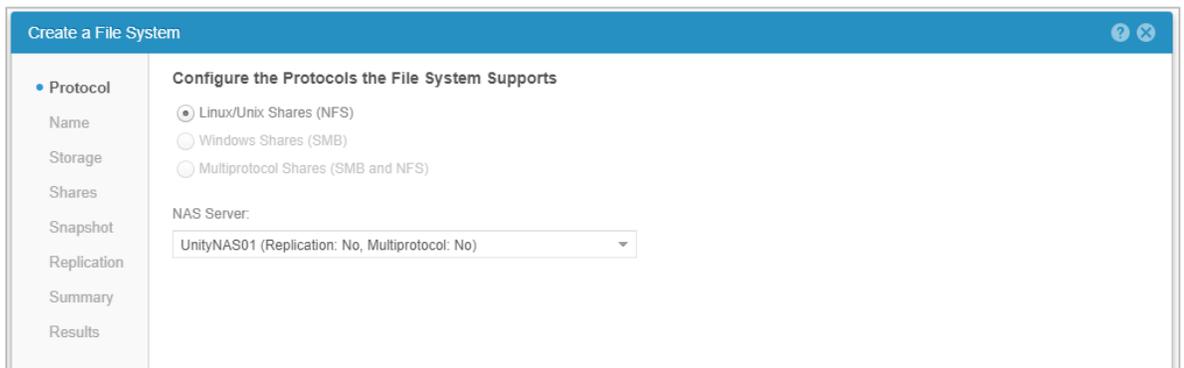
4. On the Sharing Protocols page, select Linux/Unix shares (NFS) and click Next.
5. On the **Summary** page, click **Finish** to create the NAS server.

Next, create the file system for the NFS share.

1. Select the **File Systems** section and click the **plus (+)** to add a new file system.

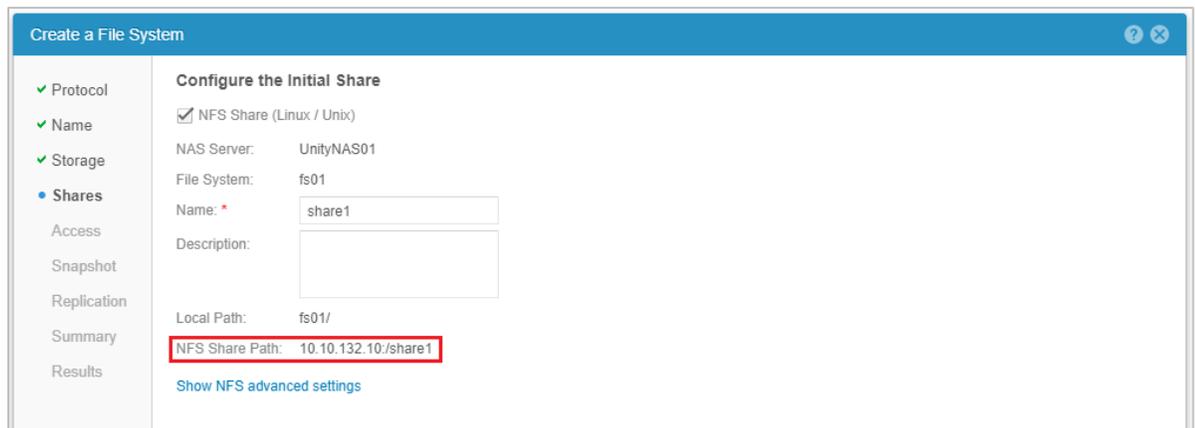


2. On the **Protocol** page, select **Linux/Unix Shares (NFS)**, select the **NAS Server** that was created previously, and click **Next**.

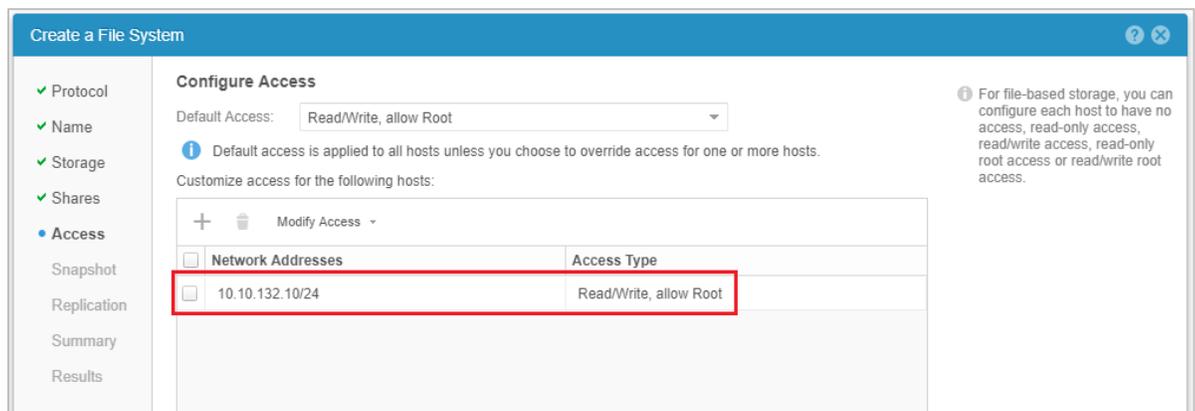


3. Specify the options for the **Name** and click **Next**.
4. On the **Shares** page, check the **NFS Share (Linux/Unix)** box, specify a share name, and click **Next**.

5. Make note of the **NFS Share Path** for use later in configuring the NFS share from within the SDDC Manager.



6. On the **Access** page, set the **Default Access** to **Read/Write, allow Root**, and click the **plus sign (+)** to customize the host access. In the section **Customize access for the following hosts**, add the **Included IP Address Ranges** assigned to the NFS network pool created in section 4.1. Click **Next**.



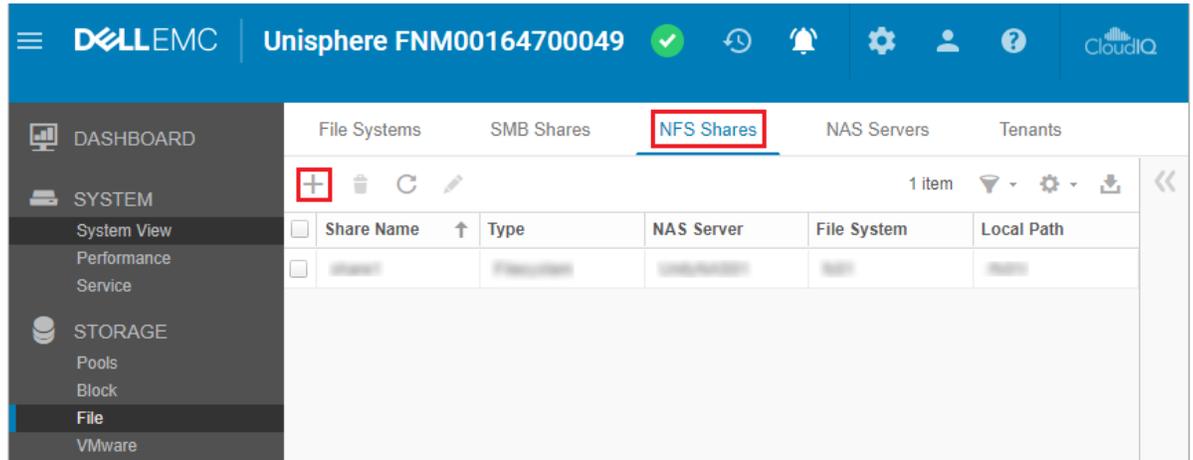
7. Specify the options for the **Snapshot** and **Replication** pages. At the **Summary** page, click **Finish**.

Next, create the NFS share.

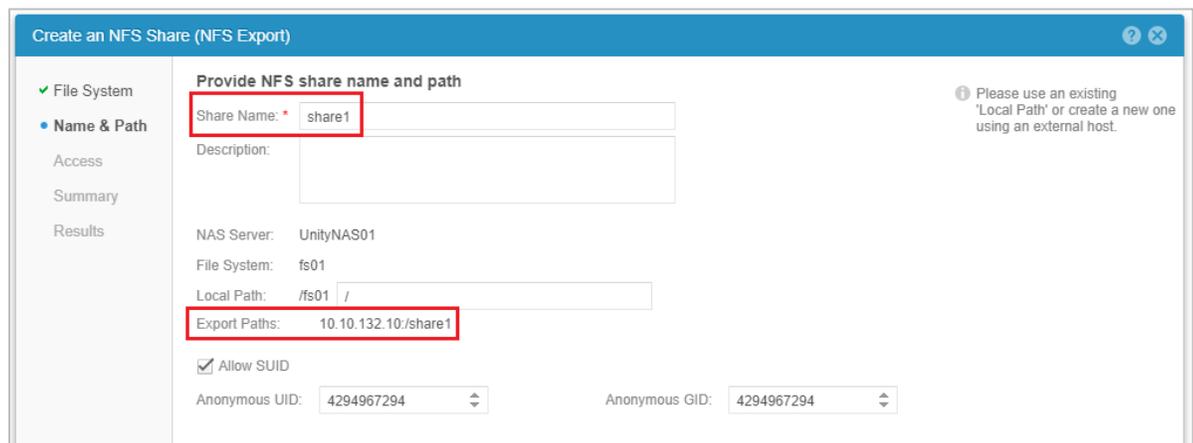
Note: If the NFS share was previously created in section 4.2.1, skip this section and perform the steps in section 4.2.2.

If the NFS share has not yet been created, perform the following steps.

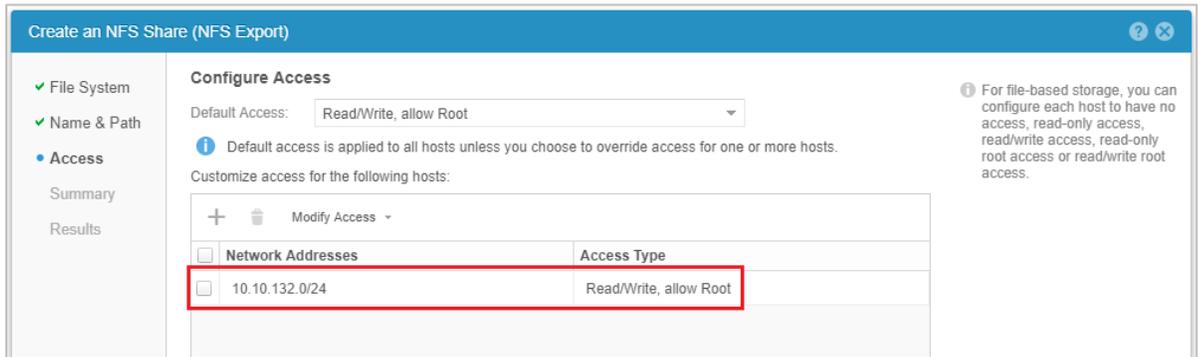
1. Select the **NFS Shares** section and click the **plus (+)** to add a new NFS share.



2. On the **File System** page, select the file system that was created in the previous step and click **Next**.
3. On the **Name & Path** page, specify the **Share Name**. Keep note of the **Export Paths** address for later use later when configuring the NFS share from within the SDDC Manager.



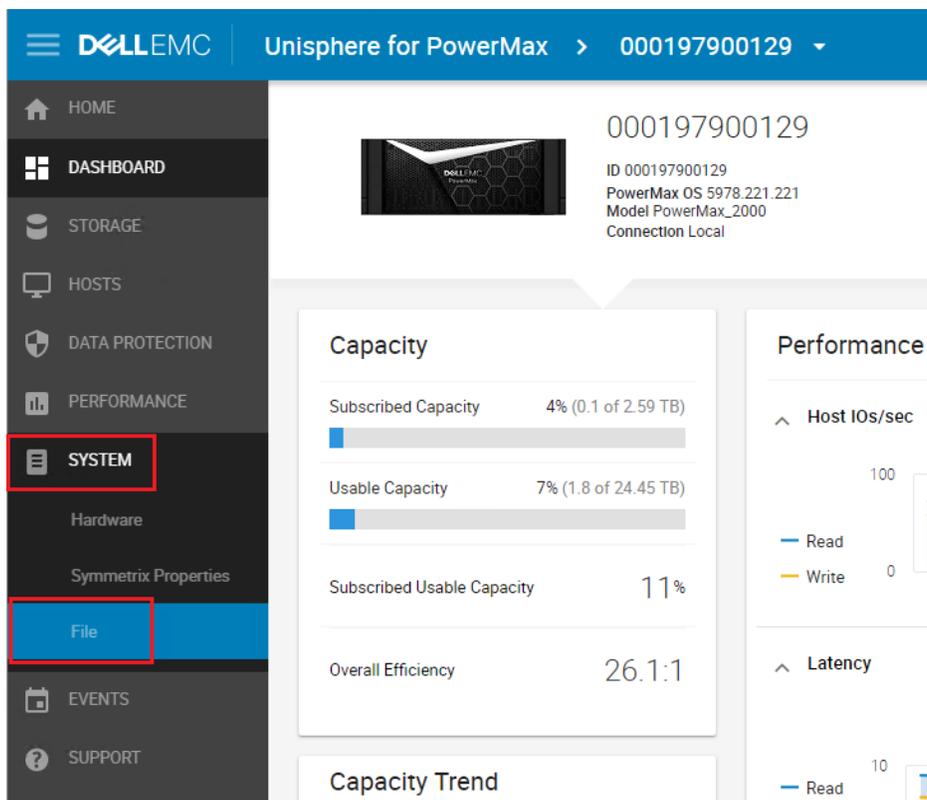
- On the **Access** page, set the **Default Access** to **Read/Write, allow Root** and click the **plus (+)** to customize the host access. In the **Customize access for the following hosts** section, add the **Included IP Address Ranges** assigned to the NFS network pool created in section 4.1.



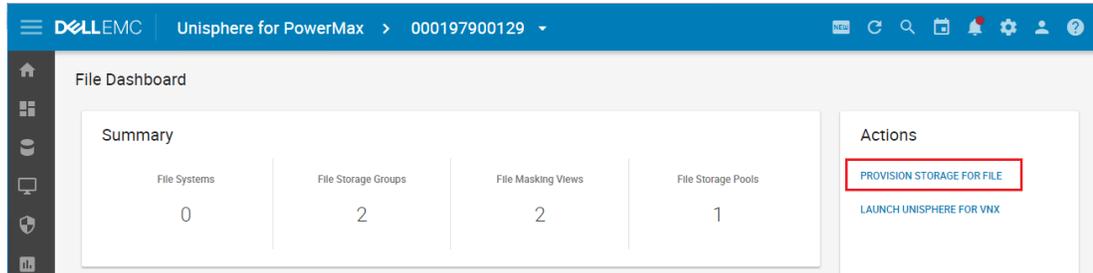
4.2.2 PowerMax NFS share creation

To create the NFS share on the PowerMax array, follow these steps:

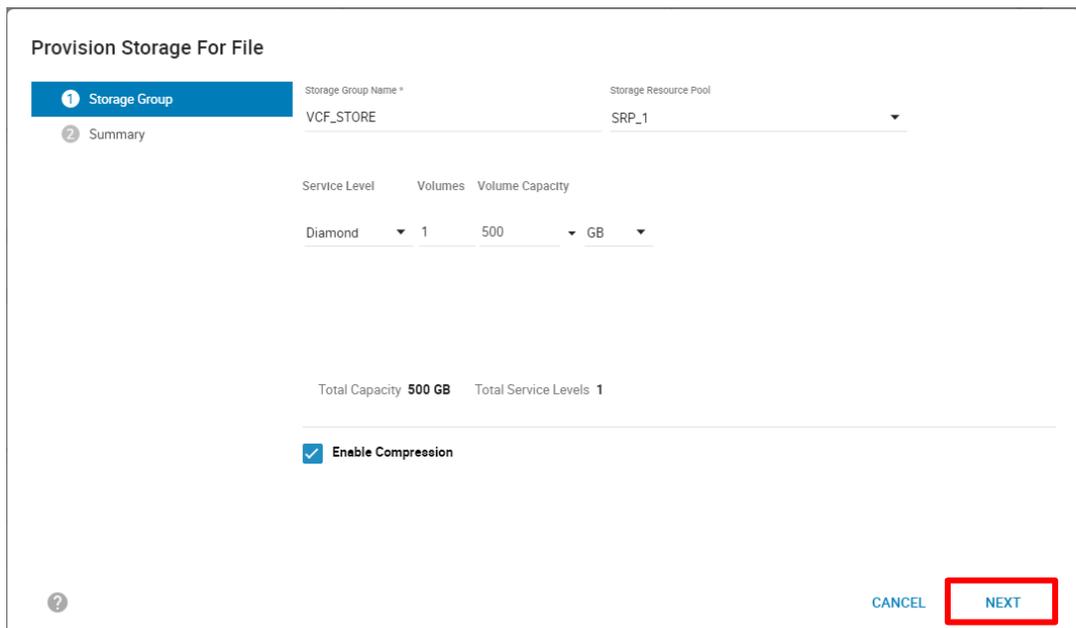
- In the Unisphere interface, click **System > File**.



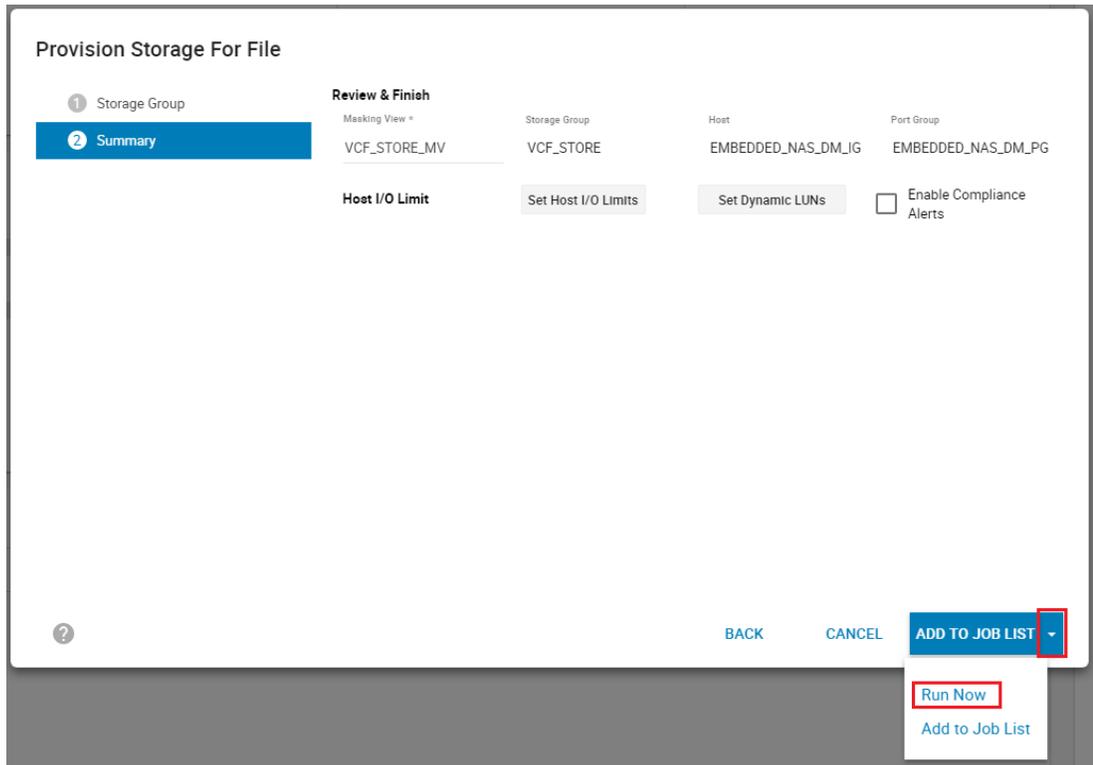
2. In the Actions pane, click Provision Storage for File.



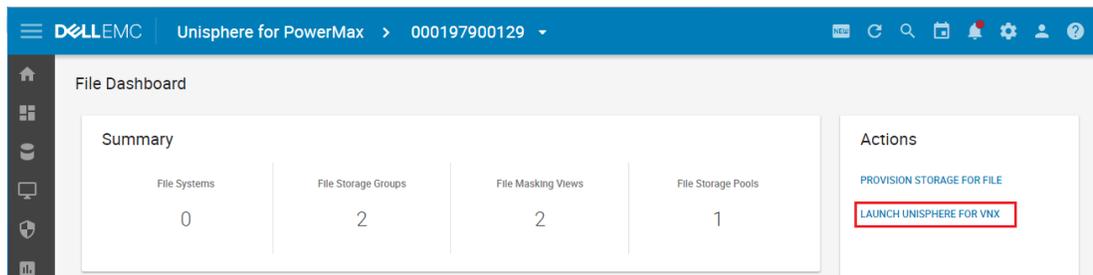
3. When the wizard opens to the **Storage Group** section, specify the **Storage Group Name**, select the **Storage Resource Pool** and the **Service Level**, set **Volumes** to **1**, set the desired **Volume Capacity**, and click **Next**.



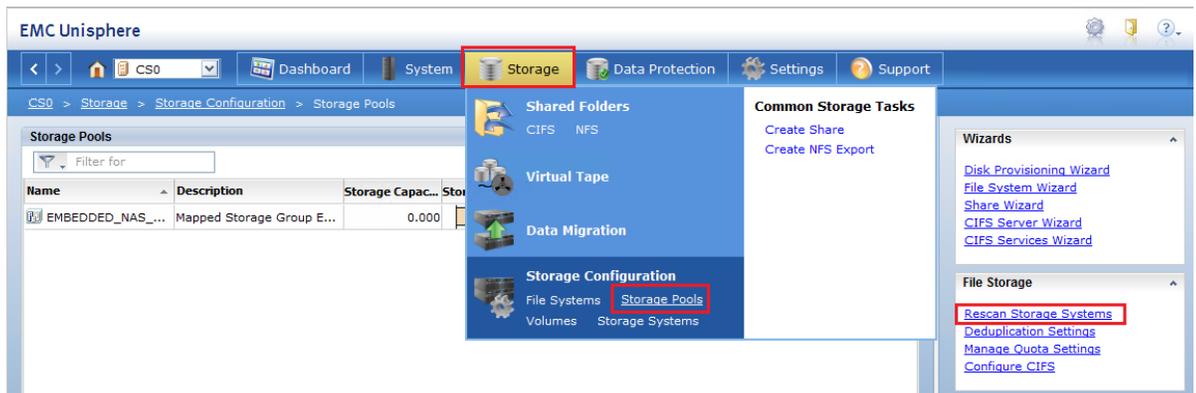
4. On the **Summary** screen, review the settings. Click the **drop-down arrow** next to **Add to Job List** and select **Run Now**.



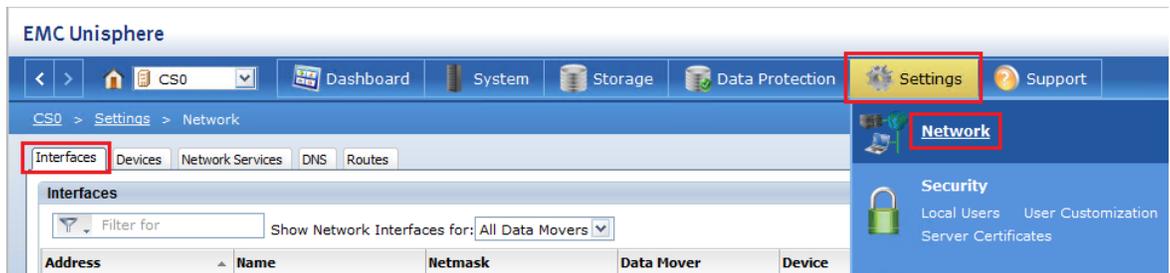
5. Launch Unisphere for VNX.



- When the administrative console opens, click **Storage, Storage Pool**. When the pane opens, click **Rescan Storage Systems**. When the dialog opens, click **OK**.

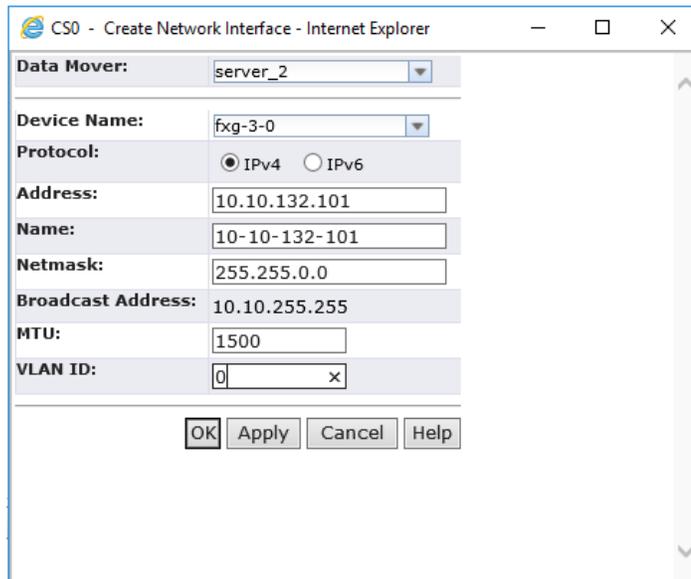


- To create the interface, click **Settings > Network** and click **Interfaces**.

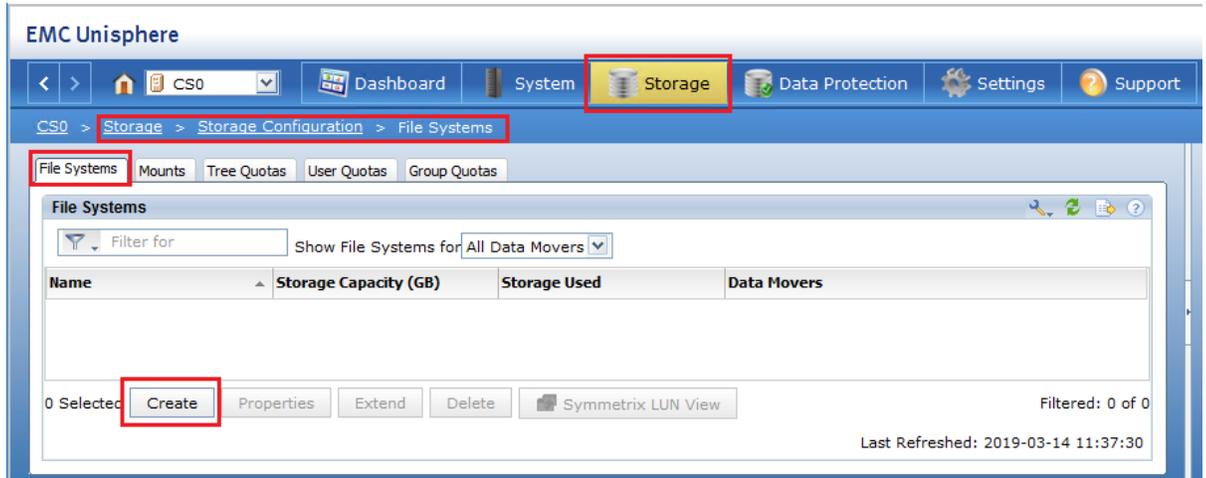


- At the bottom of the pane, click **Create**. Specify the interface settings and click **OK**.

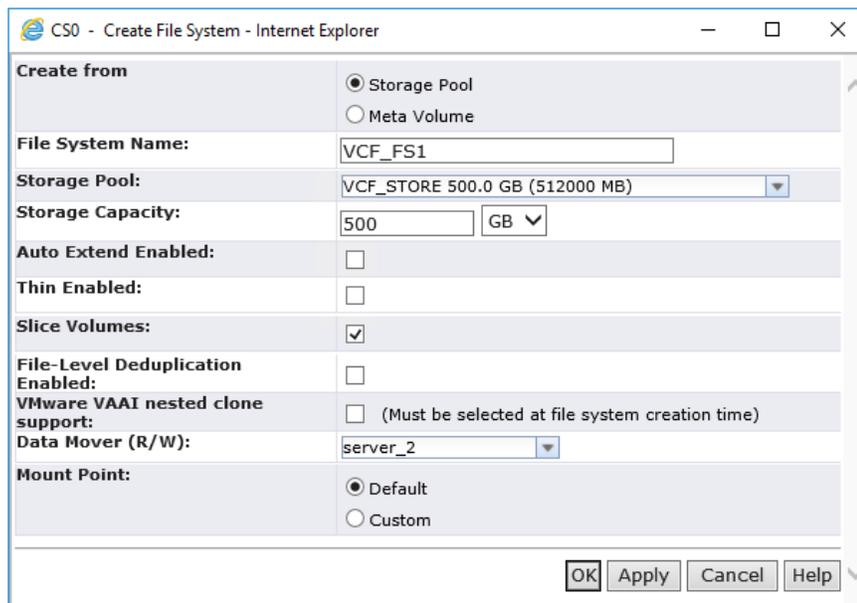
Note this IP address for use in section 4.3.



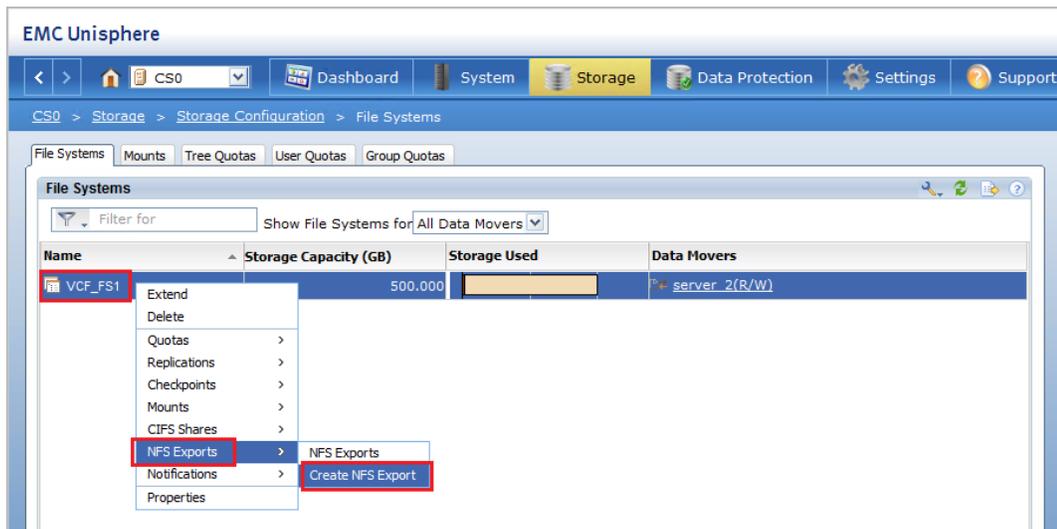
- To create the file system, click **Storage > Storage Configuration > File Systems** and click **Create**.



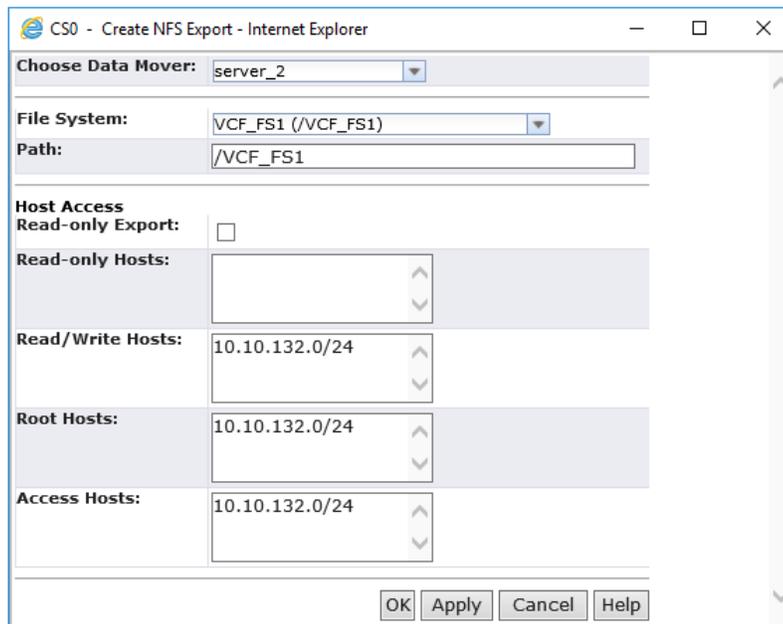
- Specify the desired options for the file system and click **OK**.



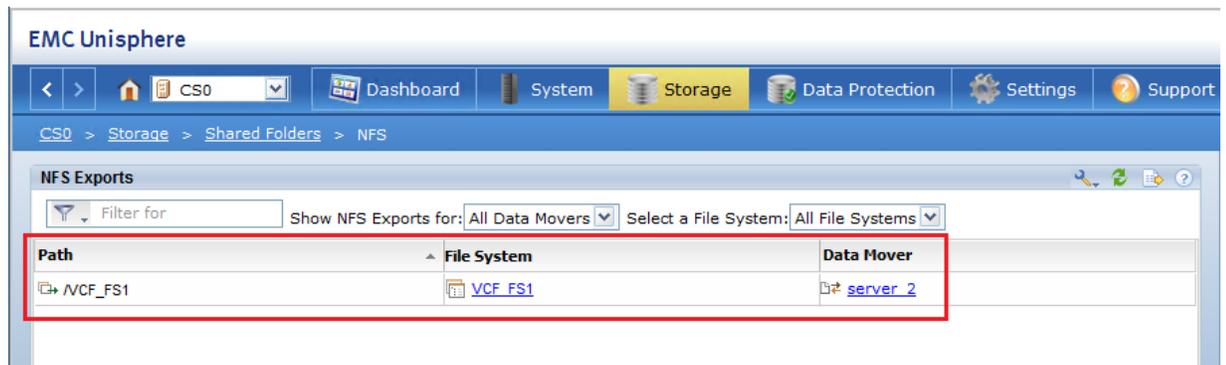
11. To create the NFS export, right-click the file system, click **NFS Exports**, and click **Create NFS Export**.



12. When the **Create NFS Export** configuration screen appears, enter the export and host information and click **OK**.



- Click **Storage > Shared Folders** and click **NFS** to reveal the share information needed for section 4.3.

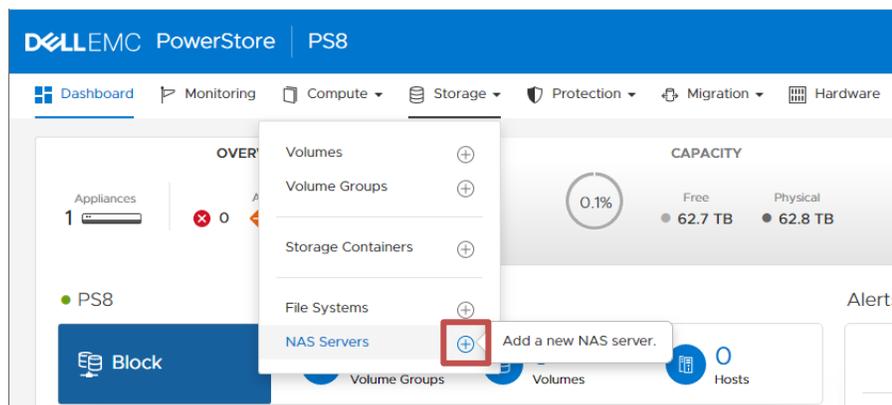


In this example, the NFS share is: **10.10.132.101:VCF_FS1**

4.2.3 PowerStore NFS share creation

To create the NFSv3 share on the PowerStore appliance, follow these steps:

- From within the PowerStore Manager, click **Storage**, and click the **plus sign (+)** next to **NAS Servers**.



- Follow through the wizard to specify the settings unique to your environment. Any configuration pages that require special attention are covered in the following steps.

3. In the **Details** section, specify the name, and IP address for the NAS server. Ensure that the NAS server IP address is within the VLAN of the NFS network pool that was created earlier from the SDDC Manager and click **Next**.

Create NAS Server

Details Sharing Protocol Summary

Give your NAS server a friendly name, configure File Interface and Sharing Protocol

Name
VCF-NAS

Description (Optional)

IP Address
10.10.132.10

Subnet Mask/Prefix Length
255.255.0.0

Gateway
10.10.132.1

VLAN ID
10

CANCEL NEXT

4. In the **Sharing Protocol** section, select **NFSv3**, and click **Next**.

Create NAS Server

Details Sharing Protocol Summary

Select the type of File Sharing Protocol your NAS server will use. Selecting both SMB and NFS will enable Multiprotocol.

Select Sharing Protocol

Windows Server Settings

Unix Directory Services

DNS

Protocol Type

SMB

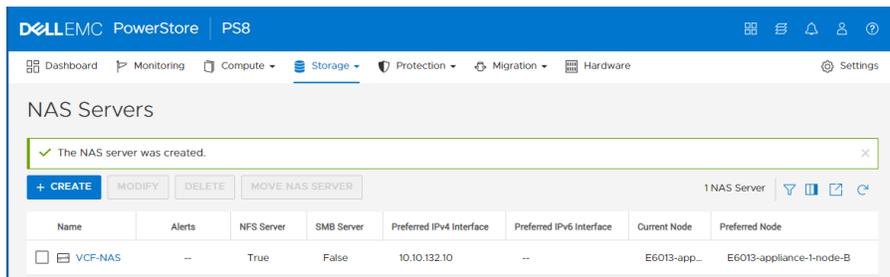
NFSv3

NFSv4

CANCEL BACK NEXT

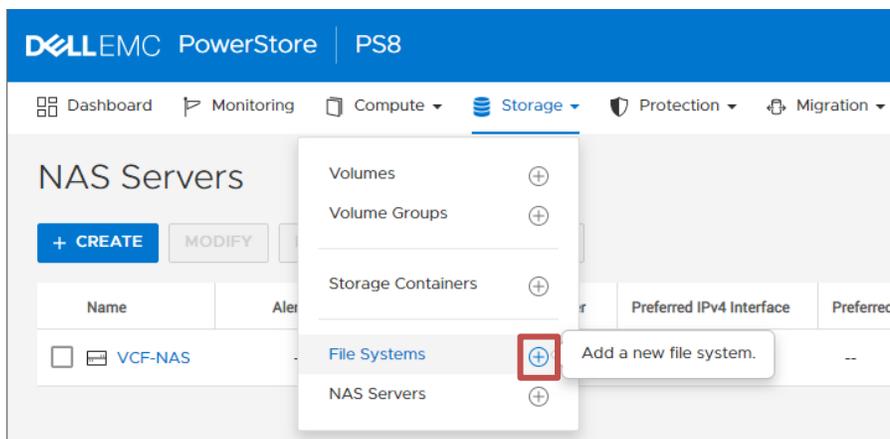
5. (Optional) If using Unix Directory Services, configure the settings, and click **Next**.

6. (Optional) Configure the NAS Server DNS and click **Next**.
7. At the Summary page, review the settings, and click **CREATE NAS SERVER**.

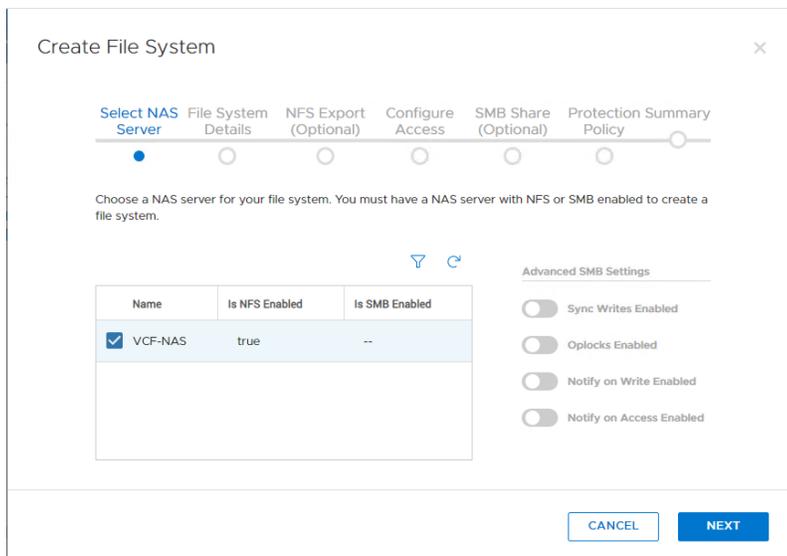


Next, create the file system for the NFS share.

1. To create the file system, click **Storage**, and click the **plus (+)** next to **File Systems**.



2. In the **Select NAS Server** section, select the NAS server that was created previously, and click **Next**.



3. In the **File System Details**, specify a name and size for the file system, and click **Next**.

The screenshot shows the 'Create File System' wizard with the 'File System Details' step selected. The progress bar indicates the following steps: Select NAS Server, File System Details (active), NFS Export (Optional), Configure Access, Protection Policy, and Summary. The 'Provide file system name and size' section contains the following fields:

- Name:** FS01
- Description (Optional):** (Empty text area)
- Size:** 1 TB

At the bottom right, there are three buttons: CANCEL, BACK, and NEXT.

4. On the **NFS Export** page, specify the **Name** for the export. Make note of the **NFS Export Path** for use later in configuring NFS options from within the SDDC Manager.

The screenshot shows the 'Create File System' wizard with the 'NFS Export (Optional)' step selected. The progress bar indicates the following steps: Select NAS Server, File System Details, NFS Export (Optional) (active), Configure Access, Protection Policy, and Summary. The 'Provide NFS Export name' section contains the following fields:

- Name:** share1
- Description (Optional):** (Empty text area)

Below the description field is the 'NFS Export' summary table:

NAS Server	VCF-NAS
Local Path	/FS01
File System Name	FS01
NFS Export Path	10.10.132.10/share1

The 'NFS Export Path' value is highlighted with a red box. At the bottom right, there are three buttons: CANCEL, BACK, and NEXT.

- On the **Configure Access** page, click **ADD HOST** to add the **Included IP Address Ranges** assigned to the NFS network pool created in section 4.1, then assign **Read/Write, allow Root** permissions.

Minimum Security: Sys

Default Access: No Access

Name/Network Address	Access Type
<input type="checkbox"/> 10.10.132.0/24	Read/Write, allow Root

- On the **Protection Policy** page, select the protection policy for the file system then click **Next**.
- At the **Summary** page, review the settings, and click **CREATE FILE SYSTEM**.

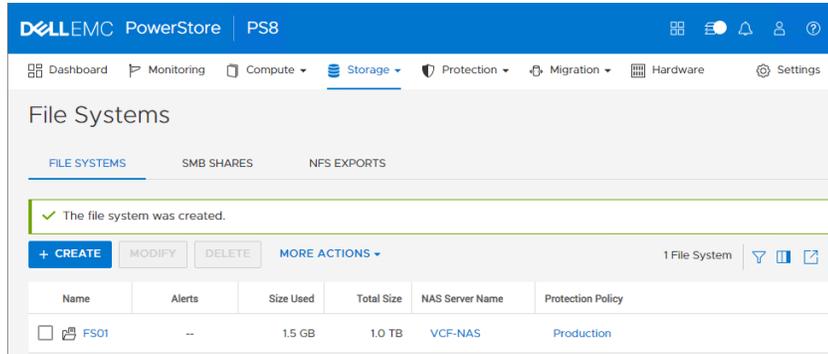
File System Details

NAS Server: VCF-NAS
 Description: NA
 Size: 1.0 TB
 Protection Policy: Production

NFS Export

Name: share1
 Description:
 Local Path: FS01/
 NFS Export Path: 10.10.132.10/share1
 Default Access: No Access
 Minimum Security: No Access
 Configured Host Access: Yes

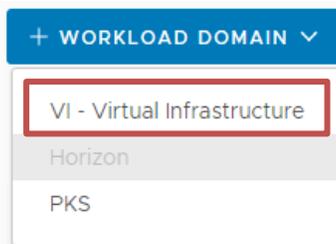
- Once the file system is created, go to section 4.3.



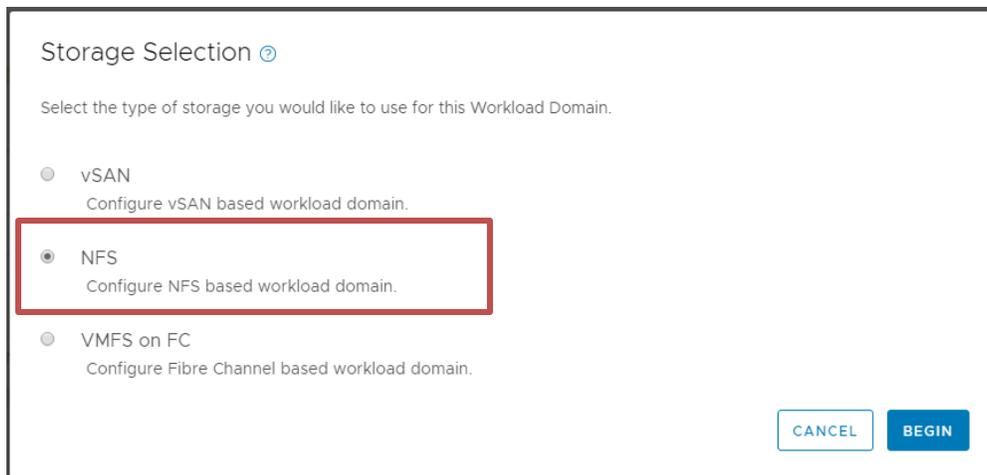
4.3 VMware Cloud Foundation workload domain deployment

This section describes how to deploy the NFS workload domain using the NFS share settings noted previously.

- From the SDDC Manager dashboard, click the **+Workload Domain** button and click **VI - Virtual Infrastructure**.

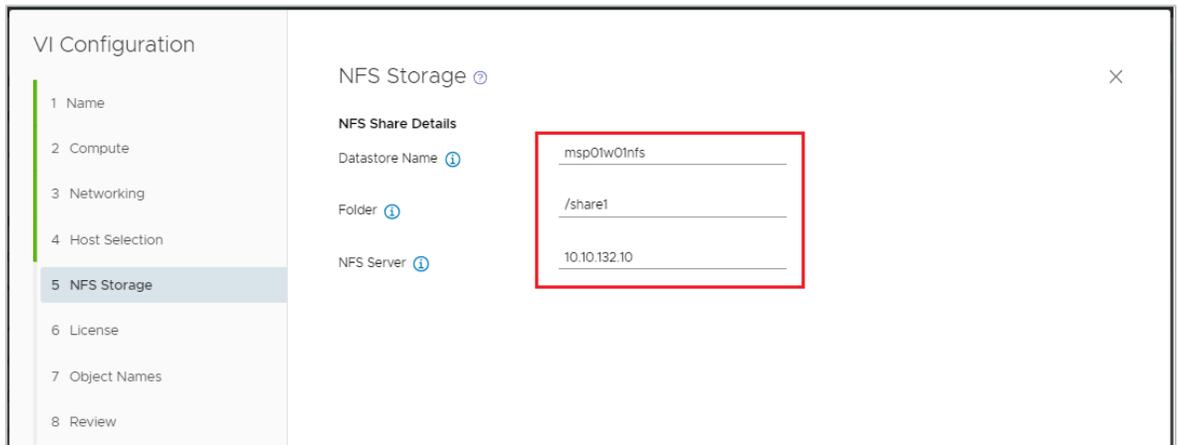


- For **Storage Selection**, select **NFS** and click **Next**.

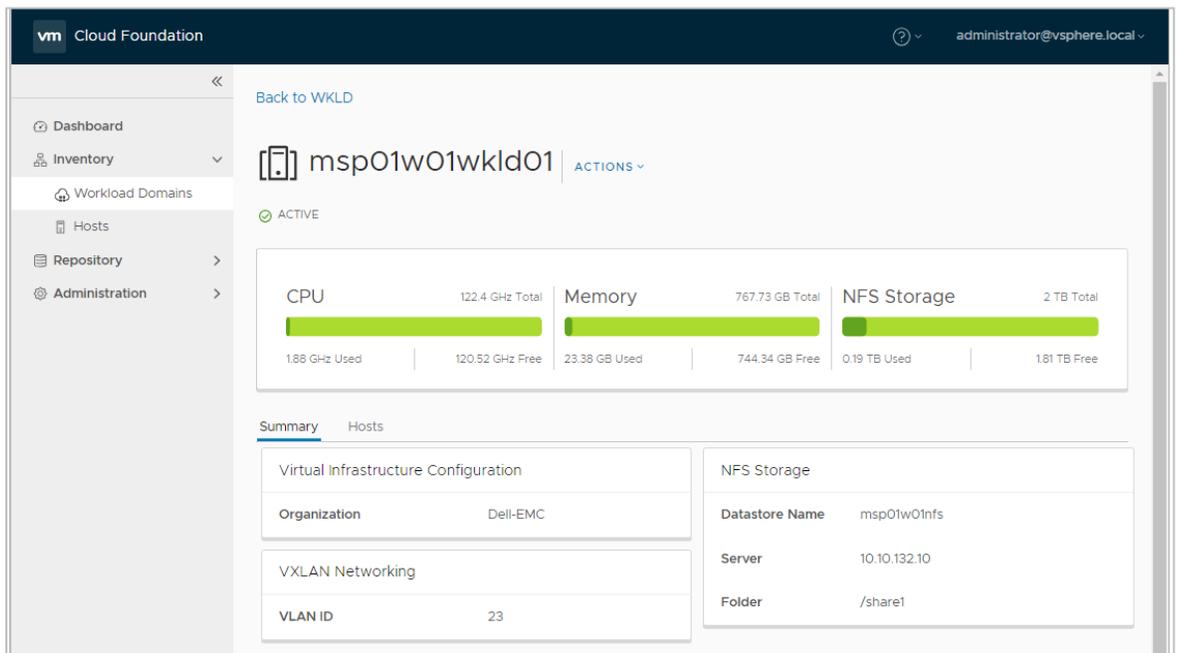


- When the **VI Configuration** wizard begins, enter the environment-specific details into the **Name**, **Compute**, **Networking**, and **Host Selection** pages.

- When the **NFS Storage** page is reached, enter the NFS share **Export Paths** info previously noted in section 4.2.



- Continue with the wizard to specify the **Licenses** and **Object Names**. On the **Review** page, click **Finish** to begin the workload domain deployment.
- When the workload domain has finished deployment, the NFS share information appears in the SDDC Manager interface.



5 Workload domain configuration with Fibre Channel or iSCSI

When presenting external storage to VMware Cloud Foundation vSphere hosts, remember that VMFS datastores on Fibre Channel (FC) can be principal or supplemental, while iSCSI is considered only supplemental storage for a workload domain. On creation, vSAN, NFSv3, or VMFS on FC storage is required for initial workload domain deployment. Afterwards, the iSCSI or NFSv4 datastores can be presented to the workload hosts.

In addition, while vSAN, NFS, or FC storage can be monitored from within the SDDC Manager interface, all supplemental datastores must be managed independently through the workload domain VMware vCenter® instance.

Note: Presenting FC or iSCSI datastores to the management domain is not supported. FC or iSCSI datastores should only be presented to workload domains.

Caution: When upgrading VMware ESXi™ hosts within the VMware Cloud Foundation workload cluster, hosts requiring custom Fibre Channel VIBs may be overwritten, potentially causing an outage. Consult the VMware KB article [How to upgrade ESXi hosts in VMware Cloud Foundation 3.5 with a vendor-specific ISO image \(65047\)](#) for more information.

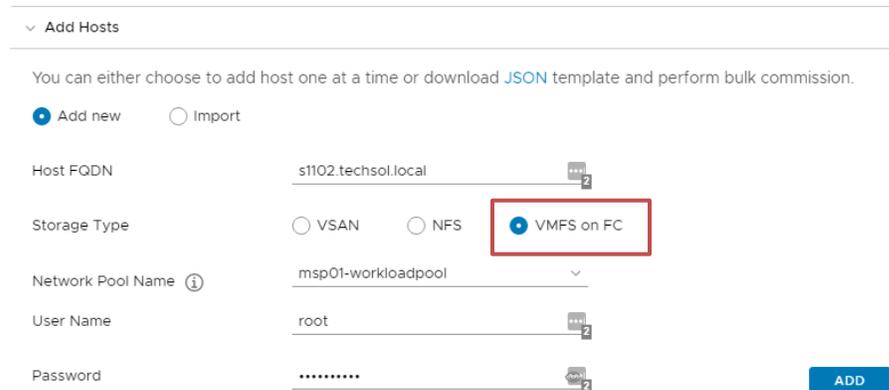
5.1 Using Fibre Channel as principal storage

This section covers the prerequisite steps that are required to use Fibre Channel as principal storage for workload domain hosts.

5.1.1 Commission hosts for VMFS on FC

Before the workload domain can be created using FC as principal storage, the hosts must be commissioned with the **VMFS on FC** storage type.

Host Addition and Validation 



▼ Add Hosts

You can either choose to add host one at a time or download [JSON](#) template and perform bulk commission.

Add new Import

Host FQDN

Storage Type VSAN NFS VMFS on FC

Network Pool Name

User Name

Password

ADD

Figure 6 Selecting the VMFS on FC storage type for host commissioning

5.1.2 Create the VMFS datastore

The wizard for workload domain creation requires a preconfigured VMFS datastore that is visible to all the ESXi hosts used in the workload domain.

To accomplish this task, follow these general steps:

1. Verify that all the workload domain ESXi hosts have been zoned to the storage array.
2. Create a datastore volume and present it to all the workload domain hosts. Section 5.2 includes instructions for each Dell EMC storage array.
3. Log in to the web client of one of the ESXi hosts and create the datastore.
 - a. Rescan the storage adapters for new storage devices.
 - b. Create a new VMFS-6 datastore and note the datastore name for workload domain creation later.
4. Log in to the remaining ESXi hosts web client to verify that the hosts can see the newly created datastore.

5.1.3 Workload domain creation

When creating the workload domain, the **storage** section of the wizard prompts for the VMFS-6 datastore name that was created previously. If the correct datastore name is not provided, the interface produces an error message like Figure 7.

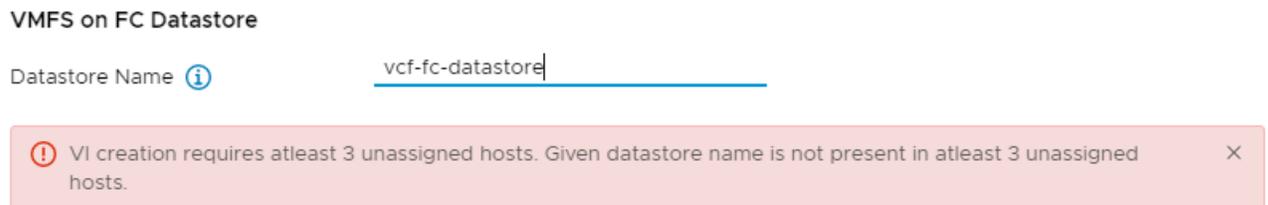


Figure 7 Error message displayed when SDDC manager cannot detect the datastore on the workload domain hosts.

5.2 Dell EMC storage configuration

For each Dell EMC storage product, the steps to provision storage to VMware Cloud Foundation vary from model to model. This section details the high-level steps for each.

5.2.1 Dell EMC Unity

When presenting storage from a Dell EMC Unity array, the array can present either a VMFS on FC datastore or NFSv3 share for the principal workload domain storage, as well as iSCSI datastores for supplemental storage.

Detailed steps for provisioning datastores to vSphere hosts are not covered within this document. For more information, refer to the document [Dell EMC Unity Storage with VMware vSphere](#).

The high-level steps to provision FC or iSCSI storage to the workload cluster are as follows:

1. If using FC, perform the following:
 - a. Create Fibre Channel zones for the workload domain ESXi hosts.
 - b. Perform the following in SDDC Manager:
 - i. Commission the workload domain hosts.
 - ii. Create a new workload domain from the commissioned hosts.
 - > The workload domain storage selection must use either VMFS on FC, NFS, or vSAN.
 - > If using a Dell EMC Unity NFS share for the storage selection, see the steps in section 4.
2. If using iSCSI, perform the following:
 - a. Add an iSCSI Distributed Port Group and assign it the iSCSI VLAN.
 - b. Add a VMkernel adapter to each workload domain host with an IP in the storage network.
 - c. Add a software iSCSI adapter to each workload domain host.
 - d. Add the iSCSI targets for the array to the iSCSI adapter and then rescan.
3. Perform the following in the Dell EMC Unity Unisphere interface:
 - a. Create the hosts for the workload domain ESXi® hosts.
 - b. Create a block LUN specifying the name, capacity, and other options desired for the datastore. Configure the host access to specify the workload domain vSphere hosts.
 - c. Optionally, use the **Create Datastore Wizard** from the VMware storage section to automatically provision a datastore to the vSphere hosts, which bypasses the following manual datastore-creation steps.
4. Create the new datastore using the steps outlined in section 5.3.

5.2.2 PowerMax

When presenting storage from a Dell EMC PowerMax array, the array can present a VMFS on FC datastore or NFSv3 share for the principal workload domain storage, as well as iSCSI datastores for supplemental storage. When presenting storage from PowerMax arrays to a workload domain, the process is completed in the same manner as presenting storage to conventional vSphere clusters.

Detailed steps for provisioning datastores to vSphere hosts are not covered within this document. For more information, refer to the document [Using Dell EMC VMAX and PowerMax in VMware vSphere Environments.](#)

The high-level steps to provision FC or iSCSI storage to the workload cluster are as follows:

1. If using FC, perform the following:
 - a. Create Fibre Channel zones for the workload domain VMware ESXi hosts.
2. Perform the following in SDDC Manager:
 - a. Commission the workload domain hosts.
 - b. Create a new workload domain from the commissioned hosts. The workload domain storage selection must use VMFS on FC, NFS, or vSAN.

3. If using iSCSI, perform the following:
 - a. Add an iSCSI distributed port group and assign it the iSCSI VLAN.
 - b. Add a VMkernel adapter to each workload domain host with an IP in the storage network.
 - c. Add a software iSCSI adapter to each workload domain host.
 - d. Add the iSCSI targets for the array to the iSCSI adapter and then rescan.
4. Perform the following in the Unisphere for PowerMax interface:
 - a. Create the port group for the PowerMax target ports zoned to the ESXi hosts.
 - b. Create the hosts and hosts group for initiators belonging to the workload domain ESXi hosts.
 - c. Create a storage group specifying the name and volume capacity desired for the datastore.
 - d. Create the masking view to present the new volume to the workload domain vSphere cluster.
5. Create the new datastore using the steps outlined in section 5.3.

5.2.3 PowerStore

When presenting storage from a PowerStore T model appliance, it can present either a VMFS on FC datastore or NFSv3 share for the principal workload domain storage, as well as iSCSI datastores for supplemental storage. The PowerStore X model appliance can present storage externally to VCF workload domain hosts as a VMFS on FC datastore for principal workload domain storage, and iSCSI datastores for supplemental storage. It is important to note that PowerStore X model ESXi hosts cannot be used to create, or be used as part of a VCF workload domain cluster.

Detailed steps for provisioning datastores to vSphere hosts are not covered within this document. For more information, see the document [Dell EMC PowerStore Series Virtualization Guide](#).

The high-level steps to provision FC or iSCSI storage to the workload cluster are as follows:

1. If using FC, perform the following:
 - a. Create Fibre Channel zones for the workload domain ESXi hosts.
 - b. Perform the following in SDDC Manager:
 - i. Commission the workload domain hosts.
 - ii. Create a new workload domain from the commissioned hosts.
 - > The workload domain storage selection must use:
 - PowerStore T model – VMFS on FC, NFSv3, or vSAN
 - PowerStore X model – VMFS on FC, or vSAN
 - > If using a PowerStore NFSv3 share, see the steps in section 4.3.
2. If using iSCSI, perform the following:
 - a. Add an iSCSI Distributed Port Group and assign it the iSCSI VLAN.
 - b. Add a VMkernel adapter to each workload domain host with an IP in the storage network.
 - c. Add a software iSCSI adapter to each workload domain host.
 - d. Add the iSCSI targets or Global Storage Discovery IP for the appliance to the iSCSI adapter and then rescan.

3. Perform the following in the PowerStore Manager:
 - a. Create the hosts and host group for the workload domain ESXi hosts.
 - b. Create a volume specifying the name, size, and other options desired for the datastore. Configure the host mappings to specify the workload domain vSphere host group.
 - c. Optionally, use the Virtual Storage Integrator (VSI) vSphere plug-in to automatically provision a datastore to the vSphere hosts, which bypasses the manual datastore-creation steps in section 5.3.
4. Create the new datastore using the steps outlined in section 5.3.

5.2.4 SC Series

When presenting storage from Dell EMC SC Series arrays to a workload domain, the process is completed in the same manner as presenting storage to conventional vSphere clusters. Since FC datastores are added and managed outside of VMware Cloud Foundation, normal SC Series administrative tools can be used.

Detailed steps for provisioning datastores to vSphere hosts are not covered within this document. For more information, see the current *Dell Storage Manager Administrator's Guide* on Dell.com/support.

The high-level steps to provision FC or iSCSI storage to the workload cluster are as follows:

1. If using FC, perform the following:
 - a. Create Fibre Channel zones for the workload domain ESXi hosts.
 - b. Perform the following in SDDC Manager:
 - i. Commission the workload domain hosts.
 - ii. Create a new workload domain from the commissioned hosts.
2. If using iSCSI, perform the following:
 - a. Add an iSCSI Distributed Port Group and assign it the iSCSI VLAN.
 - b. Add a VMkernel adapter to each workload domain host with an IP in the storage network.
 - c. Add a software iSCSI adapter to each workload domain host.
 - d. Add the iSCSI targets for each controller to the iSCSI adapter and then rescan.
3. Perform the following in Dell Storage Manager or Unisphere for SC Series interface:
 - a. Create the Server objects and Server Cluster for the workload domain ESXi hosts.
 - b. Create a volume specifying the name, size, and other options desired for the datastore.
 - i. For the **Server** (Dell Storage Manager Client) or **Server Mapping** (Unisphere for SC Series web interface), select the server cluster created in step a.
 - c. Configure the server mappings to specify the workload domain vSphere cluster.
4. Create the new datastore using the steps outlined in section 5.3.

5.2.5 VxFlex OS

When presenting storage from VxFlex OS nodes to a workload domain for supplemental storage, the process is completed in the same manner as presenting storage to conventional vSphere clusters. Since the datastores are managed outside of VMware Cloud Foundation, VxFlex OS administrative tools should only be used for storage-specific operations.

Note: Since VxFlex is only supported as supplemental storage while employing a two-layer storage-only configuration, an alternative principal storage option must be used for workload domain creation.

Detailed steps for provisioning datastores to vSphere hosts are not covered in this document. For more information, see the current *Dell EMC VxFlex OS Deployment Guide* on Dell.com/support.

The high-level steps to provision storage to the workload cluster are as follows:

1. Perform the following in SDDC Manager:
 - a. Commission the workload domain hosts.
 - b. Create a new workload domain using an alternative principal storage option.
2. From the vCenter web client, create VMkernel Interfaces on each of the workload domain ESXi host vSphere Distributed Switches (vDS) for the SDC storage traffic.
3. Install the SDC on each workload domain ESXi host and connect it to VxFlex OS system.
4. Perform the following in the VxFlex OS UI or CLI:
 - a. Create a new volume specifying the name, size, and other options desired for the datastore.
 - b. Map the new volume to the workload domain hosts.
5. Create the new datastore using the steps outlined in section 5.3.

5.2.6 XtremIO

When presenting storage from XtremIO storage controllers to a workload domain, the process is completed in the same manner as presenting storage to conventional vSphere clusters. Since the datastores are managed outside of VMware Cloud Foundation, XtremIO administrative tools should only be used for storage-specific operations.

Detailed steps for provisioning datastores to vSphere hosts are not covered within this document. For more information, refer to the latest *XtremIO Storage Array User Guide* on Dell.com/support.

The high-level steps to provision storage to the workload cluster are as follows:

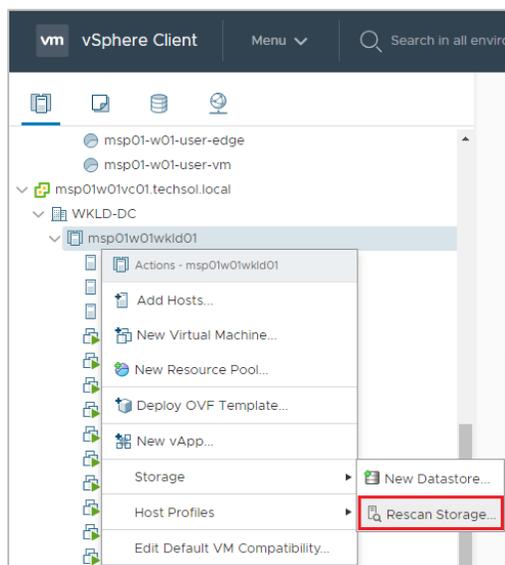
1. Perform the following in SDDC Manager:
 - a. Commission the workload domain hosts.
 - b. Create a new workload domain from the commissioned hosts. The workload domain storage selection must use either VMFS on FC for Fibre Channel arrays, or an alternative principal storage option such as vSAN for iSCSI arrays.

2. Perform the following in the XtremIO Storage Management interface:
 - a. Create the initiator group for initiators belonging to the workload domain ESXi hosts.
 - b. Create a new volume specifying the name, size, and other desired options for the datastore.
 - c. Map the volume to the initiator group for the workload domain ESXi hosts.
3. Create the new datastore using the steps outlined in section 5.3.

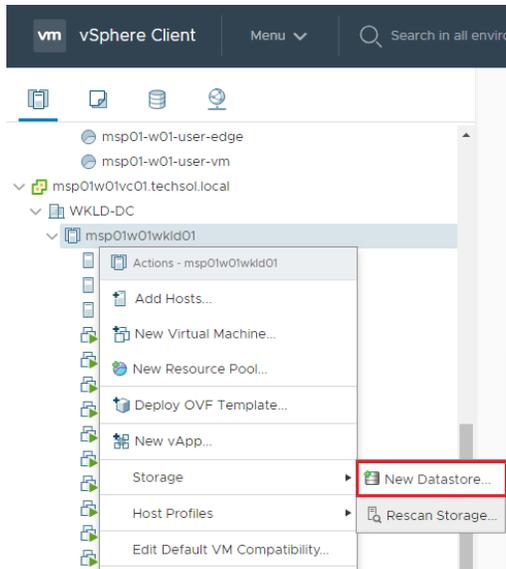
5.3 Datastore creation

Once the storage device is presented to the ESXi cluster, switch to the workload domain's VMware vCenter client to finish provisioning the datastore.

1. To rescan for new storage, right-click the workload vSphere Cluster, click **Storage**, and click **Rescan Storage**.



2. Right-click the vSphere Cluster, click **Storage**, and click **New Datastore**.



3. Complete the New Datastore wizard to create the new datastore for the workload cluster.

A Technical support and resources

[Dell.com/support](https://www.dell.com/support) is focused on meeting customer needs with proven services and support.

[Storage technical documents and videos](#) provide expertise that helps to ensure customer success on Dell EMC storage platforms.

A.1 Related resources

- VMware Cloud Foundation resources
 - [VMware Cloud Foundation documentation](#)
 - [Additional VMware Cloud Foundation documents](#)
- Dell EMC Unity resources
 - [Dell EMC Unity Storage with VMware vSphere](#)
 - [Dell EMC Unity: Best Practices Guide - Best Practices for Performance and Availability](#)
 - [Dell EMC Unity: Virtualization Integration](#)
- PowerMax resources
 - [PowerMax Product Guide](#)
 - [Using Dell EMC VMAX and PowerMax in VMware vSphere Environments](#)
- PowerStore resources
 - [PowerStore Product Documentation](#)
 - [PowerStore Info Hub](#)
- VxFlex OS resources
 - [VxFlex OS Product Documentation](#)
- XtremIO resources
 - [Dell EMC XtremIO Storage Array Host Configuration Guide](#)