Dell EMC Storage with VMware Cloud Foundation

Abstract
This guide shows how to configure Dell EMC™ storage products to work with VMware® Cloud Foundation™.

April 2019
Revisions

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 2019</td>
<td>Initial release</td>
</tr>
<tr>
<td>March 2019</td>
<td>SC Series added</td>
</tr>
<tr>
<td>April 2019</td>
<td>PowerMax NFS, VxFlex OS, and XtremIO added</td>
</tr>
</tbody>
</table>

Acknowledgements

Author: Darin Schmitz

The information in this publication is provided “as is.” Dell Inc. makes no representations or warranties of any kind with respect to the information in this publication, and specifically disclaims implied warranties of merchantability or fitness for a particular purpose.

Use, copying, and distribution of any software described in this publication requires an applicable software license.

© 2019 Dell Inc. or its subsidiaries. All Rights Reserved. Dell, EMC, Dell EMC and other trademarks are trademarks of Dell Inc. or its subsidiaries. Other trademarks may be trademarks of their respective owners. [4/17/2019] [Configuration and Deployment] [H17607.2]
# Table of contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revisions</td>
<td>2</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>2</td>
</tr>
<tr>
<td>Table of contents</td>
<td>3</td>
</tr>
<tr>
<td>1 Introduction</td>
<td>4</td>
</tr>
<tr>
<td>1.1 Prerequisites</td>
<td>4</td>
</tr>
<tr>
<td>2 Workload domain configuration with NFS</td>
<td>6</td>
</tr>
<tr>
<td>2.1 VMware Cloud Foundation network pool configuration</td>
<td>6</td>
</tr>
<tr>
<td>2.2 Dell EMC storage configuration</td>
<td>8</td>
</tr>
<tr>
<td>2.2.1 Dell EMC Unity NFS share configuration</td>
<td>8</td>
</tr>
<tr>
<td>2.2.2 PowerMax NFS share creation</td>
<td>12</td>
</tr>
<tr>
<td>2.3 VMware Cloud Foundation workload domain deployment</td>
<td>18</td>
</tr>
<tr>
<td>3 Workload domain configuration with Fibre Channel</td>
<td>20</td>
</tr>
<tr>
<td>3.1 Dell EMC storage configuration</td>
<td>20</td>
</tr>
<tr>
<td>3.1.1 Dell EMC Unity</td>
<td>20</td>
</tr>
<tr>
<td>3.1.2 PowerMax</td>
<td>21</td>
</tr>
<tr>
<td>3.1.3 SC Series</td>
<td>21</td>
</tr>
<tr>
<td>3.1.4 VxFlex OS</td>
<td>22</td>
</tr>
<tr>
<td>3.1.5 XtremIO</td>
<td>22</td>
</tr>
<tr>
<td>3.2 Datastore creation</td>
<td>23</td>
</tr>
<tr>
<td>A Technical support and resources</td>
<td>24</td>
</tr>
<tr>
<td>A.1 Related resources</td>
<td>24</td>
</tr>
</tbody>
</table>
1. **Introduction**

*VMware® Cloud Foundation™* (VCF) is a software-defined data center (SDDC) management platform that integrates VMware virtualization and management capabilities into a single solution to enable a hybrid cloud. It uses VMware compute, network, and storage virtualization to deliver an integrated software stack for on-premises private cloud deployment, similar to a deployment within VMware Cloud with public cloud partners.

When used on premises, VCF can leverage existing storage investments to enhance their private-cloud capabilities within an environment. This guide walks through the configuration of Dell EMC™ Unity, PowerMax®, VxFlex OS, XtremIO™, and SC Series storage arrays in conjunction with VMware Cloud Foundation.

![Diagram of VMware Cloud Foundation with Dell EMC storage](image)

1. **Prerequisites**

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 VCF workload hosts.
  - For NFS configuration, it is recommended to dedicate a workload domain VLAN for an IP-based storage network pool.

---

1 This configuration guide is also applicable with VMAX™ All Flash 250F and 950F models.
- For Fibre Channel (FC) configuration, the workload host initiator ports must be zoned with the target ports for the array within the FC switch networks. Since FC volumes can only be used as ancillary storage for the workload domain, NFS or VSAN storage must be used for the workload domain creation.
2 Workload domain configuration with NFS

When provisioning a workload domain, the primary storage assignment for that workload domain must use either NFS or VSAN storage for the initial cluster creation. Ancillary storage such as Fibre Channel can be added later. This section details how to configure NFS storage to be used for workload domain creation.

2.1 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-hand pane, expand Administration, and select Network Settings.

2. In the upper right-hand 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**.

4. Make note of the **Included IP Address Ranges** for later use when assigning host access permissions on the NFS share.
2.2 Dell EMC storage configuration
This section details the steps for each of the various arrays to prepare the NFS mount points for VCF.

2.2.1 Dell EMC Unity NFS share configuration
To create the NFS 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 through the wizard and specify the settings unique to your environment. Any configuration pages that require special attention will be called out in the following steps.

3. On the Interface page, specify an IP address within the VLAN of the NFS network pool 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 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.
Make note of the **NFS Share Path** for use later in configuring the NFS share from within the SDDC Manager.

5. 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 2.1. Click **Next**.

6. 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 2.2.1, skip this section and perform the steps in section 2.2.2.

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 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 when configuring the NFS share from within the SDDC Manager.
4. 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 2.1.

---

### 2.2.2 PowerMax NFS share creation

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

1. 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**.

![Provision Storage For File](image)

5. Launch Unisphere for VNX.

![Unisphere for VNX](image)
6. When the administrative console opens, click **Storage, Storage Pool**. When the pane opens, click **Rescan Storage Systems**. When the dialog opens, click **OK**.

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

8. At the bottom of the pane, click **Create**. Specify the Interface settings, and click **OK**. Note this IP address for use in section 2.3.
9. To create the file system, click **Storage > Storage Configuration > File Systems** and click **Create**.

10. Specify the desired options for the file system and click **OK**.
11. To create the NFS export, right-click the file system, select **NFS Exports**, and select **Create NFS Export**.

12. When the **Create NFS Export** configuration screen appears, enter the export and host information and click **OK**.
13. Click **Storage > Shared Folders** and click **NFS** to reveal the share information needed for section 2.3.

   ![EMC Unisphere](image)

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

2.3 **VMware Cloud Foundation workload domain deployment**

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

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

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

   ![Storage Selection](image)
3. When the **VI Configuration** wizard begins, enter the environment-specific details into the **Name**, **Compute**, **Networking**, and **Host Selection** pages.

4. When the **NFS Storage** page is reached, enter the NFS share **Export Paths** info previously noted in section 0.

5. Continue with the wizard to specify **Licenses** and the **Object Names**. On the **Review** page, click **Finish** to begin the workload domain deployment.

6. When the workload domain has finished deployment, the NFS share information will appear in the SDDC Manager interface.
3  **Workload domain configuration with Fibre Channel**

When presenting external storage to VCF vSphere hosts, it is important to remember that Fibre Channel datastores are considered ancillary storage for a workload domain. In other words, on creation, VSAN or NFS storage is required for initial deployment, and then the FC datastores can be presented to the workload hosts.

In addition, while VSAN and NFS storage can be managed from within the SDDC Manager interface, all Fibre Channel datastores must be managed independently from the workload domain VMware vCenter® instance.

**Note:** Fibre Channel datastores should only be presented to workload domains. Presenting FC datastores to the management domain is not supported.

**Caution:** When upgrading VMware ESXi™ hosts within the VCF 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.

### 3.1 Dell EMC storage configuration

For each Dell EMC storage product, the steps to provision storage to VCF vary from model to model. This section details the steps for each.

#### 3.1.1 Dell EMC Unity

When presenting storage from a Dell EMC Unity array, the array can present an NFS share for the workload domain storage as well as FC datastores for ancillary virtual machine 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 storage to the workload cluster are as follows:

1. Create Fibre Channel zones for the workload domain ESXi hosts.
2. Perform the following in SDDC Manager:
   - Commission the workload domain hosts.
   - Create a new workload domain from the commissioned hosts.
     - The workload domain storage selection must use either vSAN or an NFS share.
     - If using a Dell EMC Unity NFS share for the storage selection, refer to steps in section 2.
3. Perform the following in the Dell EMC Unity Unisphere interface:
   - Create the hosts for the workload domain ESXi hosts.
   - 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.
   - (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 3.2.
3.1.2 PowerMax

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. In other words, since FC datastores are managed outside of VCF, normal administrative tools can be used.

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 storage to the workload cluster are as follows:

1. 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 either vSAN or an NFS share.
3. 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.
4. Create the new datastore using the steps outlined in section 3.2.

3.1.3 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. In other words, since FC datastores are managed outside of VCF, 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, refer to the current Dell Storage Manager Administrator’s Guide on Dell.com/support.

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

1. Create Fibre Channel zones for the workload domain 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 either vSAN or an NFS share.
3. Perform the following in the Dell Storage Manager or Unisphere for SC Series interface:
   a. Create a server cluster and add the workload domain ESXi hosts.
   b. Create a new volume specifying the name, capacity, 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.
4. Create the new datastore using the steps outlined in section 3.2.
3.1.4 **VxFlex OS**

When presenting storage from VxFlex OS nodes to a workload domain, the process is completed in the same manner as presenting storage to conventional vSphere clusters. In other words, since the datastores are managed outside of VCF, normal VxFlex OS administrative tools can be used.

Detailed steps for provisioning datastores to vSphere hosts are not covered within this document. For more information, refer to the current *Dell EMC VxFlex OS deployment guide* on [Dell.com/support](http://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 vSAN or an NFS share.

   If the network pool for the workload domain has NFS defined, it will automatically create VMkernel interfaces on each ESXi host which can be used by the Storage Data Client (SDC) to connect the VxFlex OS nodes. If not, a vSphere administrator will have to manually create the necessary VMKernel Interfaces on the vSphere Distributed Switch (vDS) through the vCenter vSphere web client for the workload domain cluster.

2. Install the SDC on each workload domain ESXi host and connect it to VxFlex OS system.

3. Perform the following in the VxFlex OS GUI 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.

4. Create the new datastore using the steps outlined in section 3.2.

3.1.5 **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. In other words, since the datastores are managed outside of VCF, normal XtremIO administrative tools can be used.

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](http://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 vSAN or an NFS share.

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 3.2.

### 3.2 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.
Technical support and resources

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
- Dell EMC Unity resources
  - Dell EMC Unity Storage with VMware vSphere
  - Dell EMC Unity: Virtualization Integration
- PowerMax resources
  - PowerMax Product Guide
  - Using Dell EMC VMAX and PowerMax in VMware vSphere Environments
- VxFlex OS resources
  - VxFlex OS Product Documentation
- XtremIO resources
  - Dell EMC XtremIO Storage Array Host Configuration Guide