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Dell EMC PowerVault ME4 Series and Citrix XenServer

Abstract

This document provides best practices for deploying Citrix XenServer with Dell EMC™ PowerVault™ ME4 Series storage.

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Revisions

Date	Description
March 2020	Initial release

Acknowledgements

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Contents

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1 Introduction

This document provides examples, tips, recommended settings, and other storage guidelines a system administrator can follow while configuring a Citrix® XenServer® environment to connect to Dell EMC™ PowerVault ME4 Series storage. Frequently asked questions regarding various Dell EMC PowerVault ME4 Series storage features are also addressed.

For additional installation and configuration information, Dell EMC recommends reviewing related XenServer and XenCenter documentation, which is publicly available on the Citrix Product Documentation website.

1.1 Scope

This paper covers the steps required to configure a Citrix XenServer environment to use Dell EMC PowerVault ME4 Series storage and includes best practices for iSCSI environments. This document is focused on XenServer 7.6 and its related features.

1.2 Audience

This paper is intended for storage administrators, network administrators, SAN system designers, storage consultants, or anyone tasked with configuring a SAN infrastructure for Dell EMC PowerVault ME4 Series storage when used to support a Citrix XenServer environment.

It is assumed that readers have received formal training or have advanced working knowledge of:

- Installation and configuration of Citrix XenServer
- Configuration and operation of Dell EMC PowerVault ME4 Series storage
- Guest operating systems in use (such as Microsoft® Windows Server® or Linux®)
- Citrix XenServer 7.6 Administrator's Guide

Note: The specific information contained within this document is based on the test environment built for the creation of this document. Actual configuration details may vary in any other environment.

1.3 Document conventions

Table 1 lists the formatting conventions used in this document.

Table 1   Document conventions

Format	Description	Example
Command-line text	User command-line input	iscsiadm –m node --login
Italic command-line text	Placeholder or variable	*new_initiator_iqn*

1.4 Terminology

The following terms are used throughout this document:

> **Note**: Definitions identified with an asterisk (*) are provided by the *Citrix XenServer 7.6 Administrator's Guide*, which is available on the [Citrix Product Documentation](#) website.

Fault domain (FD): A set of hardware components that share a single point of failure. For controller-level redundancy, fault domains are created for Dell EMC PowerVault ME4 Series storage to maintain connectivity in the event of a controller failure. In a dual-switch topology, each switch acts as a fault domain with a separate subnet and VLAN. Failure of any component in an FD will not impact the other FD.

iSCSI offload engine (iSOE): Technology that can free processor cores and memory resources to increase I/O operations per second (IOPS) and reduce processor utilization.

iSCSI Qualified Names (IQNs): Unique iSCSI initiator (host server) or iSCSI target (storage) addresses are referred to as iSCSI Qualified Names (IQNs). IQNs are the identifiers used for iSCSI connectivity between host servers and iSCSI storage platforms.

Link aggregation group (LAG): A group of Ethernet switch ports configured to act as a single high-bandwidth connection to another switch. Unlike a stack, each individual switch must still be administered separately and function independently.

Local area network (LAN): A network carrying traditional IP-based client communications.

Logical unit (LUN): A number identifying a logical device, usually a volume that is presented by an iSCSI or Fibre Channel storage controller.

Multipath I/O (MPIO): A host-based software layer that manages multiple paths for load balancing and redundancy in a storage environment.

Native VLAN and default VLAN: The default VLAN for a packet that is not tagged with a specific VLAN or has a VLAN ID of 0 or 1. When a VLAN is not specifically configured, the switch default VLAN will be utilized as the native VLAN.

Network interface card (NIC): A network interface card or network interface controller is an expansion board inserted into the computer/server so that the computer/server can connect to a network. Most NICs are designed for a particular type of network (typically Ethernet) protocol (typically TCP/IP) and media.

Physical Block Devices (PBDs)*: Physical Block Devices represent the interface between a physical server and an attached Storage Repository (SR). PBDs are connector objects that allow a given SR to be mapped to a XenServer host. PBDs store the device configuration fields that are used to connect to and interact with a given storage target.

Storage area network (SAN): A Fibre Channel, Ethernet, or other specialized network infrastructure specifically designed to carry block-based traffic between one or more servers to one or more storage and storage inter-process communications systems.

Storage Repositories (SRs)*: A Storage Repository is a particular storage target, in which virtual machine (VM) Virtual Disk Images (VDIs) are stored.

Virtual Block Devices (VBDs)*: Virtual Block Devices are connector objects (similar to the PBD described previously) that allows mappings between VDIs and VMs. In addition to providing a mechanism for attaching (also called plugging) a VDI into a VM, VBDs allow for the fine-tuning of parameters regarding Quality of Service (QoS), statistics, and the bootability of a given VDI.

Virtual Disk Images (VDIs)*: A Virtual Disk Image is a storage abstraction which represents a virtual hard disk drive in a VM. VDIs are the fundamental unit of virtualized storage in XenServer. VDIs are persistent, on-disk objects that exist independently of XenServer hosts.

Virtual LAN (VLAN): A method of virtualizing a LAN to make it appear as an isolated physical network. VLANs can reduce the size of and isolate broadcast domains. VLANs still share resources from the same physical switch and do not provide any additional QoS services such as minimum bandwidth, quality of a transmission, or guaranteed delivery.

Virtual machine (VM)*: A virtual machine (VM) is a computer composed entirely of software that can run its own operating system and applications as if it were a physical computer. A VM behaves exactly like a physical computer and contains its own virtual (software-based) CPU, RAM, hard disk, and NIC.

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2 Citrix XenServer and Dell Storage product overview

This section provides an overview of Citrix XenServer and the Dell EMC PowerVault ME4 Series storage technologies presented in this paper.

2.1 Citrix XenServer

Citrix XenServer is a leading server virtualization and hypervisor management platform that enables reductions in total cost of ownership for desktop, cloud, and server virtualization infrastructures. The ability to consolidate and contain workloads on XenServer provides a means for any organization to address the challenges present in today's IT data center by transforming their compute infrastructure.

2.2 Dell EMC PowerVault ME4 Series storage

The ME4 Series includes entry-level storage appliances that provide many features found in more advanced storage solutions. The base models include the Dell EMC PowerVault ME4012, ME4024, and ME4084.

Figure 1: Front and rear view of the Dell EMC PowerVault ME4024 array, configured with 24 SSD drives and dual controllers

The ME4 Series 2U-chassis models include the ME4012 array which supports up to twelve 3.5-inch drives, and the ME4024 array which supports up to twenty-four 2.5-inch drives. The ME4084 array (5U chassis) supports up to eighty-four 2.5-inch and 3.5-inch drives. All three models support additional drive capacity by adding expansion enclosures.

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Key features of the ME4 Series include the following:

- Simple, customer-installable design
- Intuitive web-based GUI and CLI tools for system configuration and management
- All-inclusive feature-licensing model
- Support for all-flash, spinning, and hybrid drive configurations
- Linear and virtual disk group and pool configuration options
- Thin-provisioning with virtual disk groups for storage efficiency, along with storage tiering for intelligent rea time data placement for hot and cold data
- A variety of RAID levels and hot spare configurations, including distributed sparing with the new ADAPT RAID option
- Full support for multipath I/O (MPIO) with up to eight front-end (FE) ports per array (four per controller head)
- Active-active controller configuration that permits asymmetrical logical unit access (ALUA) aware hosts to automatically designate MPIO FE paths as optimal or non-optimal.
- FE transport options including 12Gb SAS, 8Gb/16Gb Fibre Channel (FC), and 1Gb/10Gb iSCSI
- Support for mixed transport environments (FC and iSCSI)
- Up to nine back-end (BE) expansion enclosures can be added to each ME4 Series array with 12Gb SAS to expand drive capacity
- Support for up to 336 drives with up to 4 petabytes (PB) raw capacity in the ME4084 array
- Direct-attached storage (DAS) support for FE ports (SAS, FC, and iSCSI)
- Storage area network (SAN) support for FE ports connected to FC and iSCSI switches (FE SAS supports DAS only)
- Scheduled and on-demand volume snapshots with rollback and refresh options
- Asynchronous replication over FC or iSCSI to another ME4 Series array for DR protection.

Note: Most of these features work seamlessly in the background, regardless of the platform. In most cases, the default settings for these features work well with Citrix Xen Server or at least serve as good configuration starting points. This document highlights additional configuration or tuning steps that may enhance performance, usability, or other factors.

3 XenServer storage overview

XenServer environments utilize shared storage as part of the virtualization platform. Shared storage can be connected through iSCSI, Fibre Channel (FC), SAS or NFS. The information contained in this document is focused on iSCSI block storage connectivity because the Dell EMC PowerVault ME4 Series storage platform is a block storage platform.

Block storage devices in the form of iSCSI or FC LUNs are presented to the XenServer hosts, from which SRs are created. SRs, which are connected to all XenServer hosts participating in the XenServer pool, are the entity on which VDIs reside. VDIs are recognized by VMs as physical disks and are persistent on the SRs.

3.1 Shared iSCSI storage

XenServer using Dell EMC PowerVault ME4 Series storage provides support for shared SRs on iSCSI-attached LUNs. iSCSI LUNs can use the Open-iSCSI software initiator or a supported iSCSI host bus adapter (HBA). Figure 2 and Figure 3 illustrate how both the Open-iSCSI software initiator and iSCSI HBA environments look conceptually.
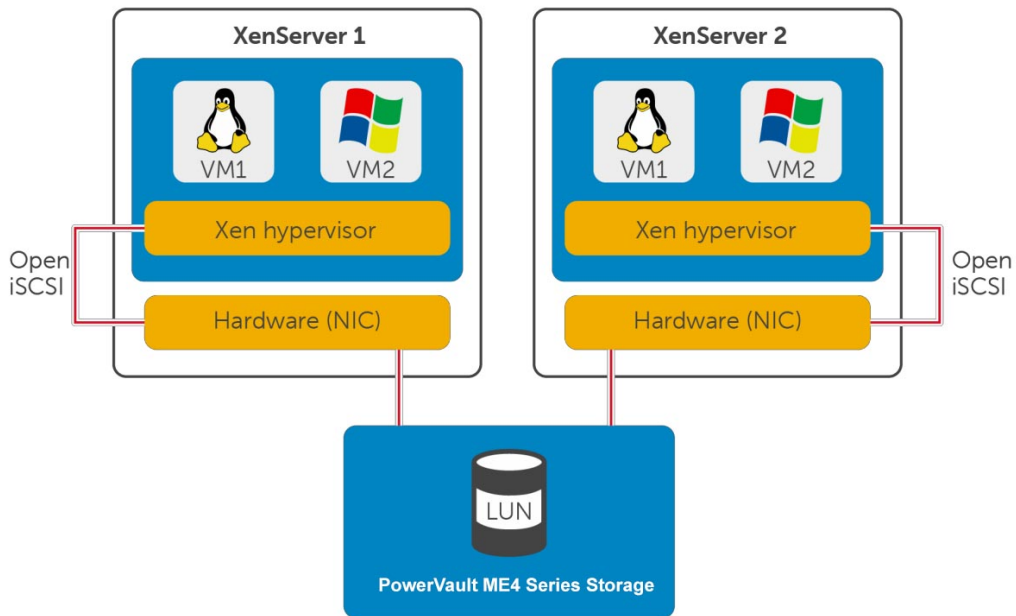
Figure 2: Shared iSCSI storage using the Open-iSCSI software initiator

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3.2 Shared SAS/Fibre Channel storage

XenServer using Dell EMC PowerVault ME4 Series storage provides support for shared SRs on FC-attached/SAS LUNs using FC/SAS HBAs. Figure 3 illustrates how an environment using FC/SAS HBAs looks conceptually.
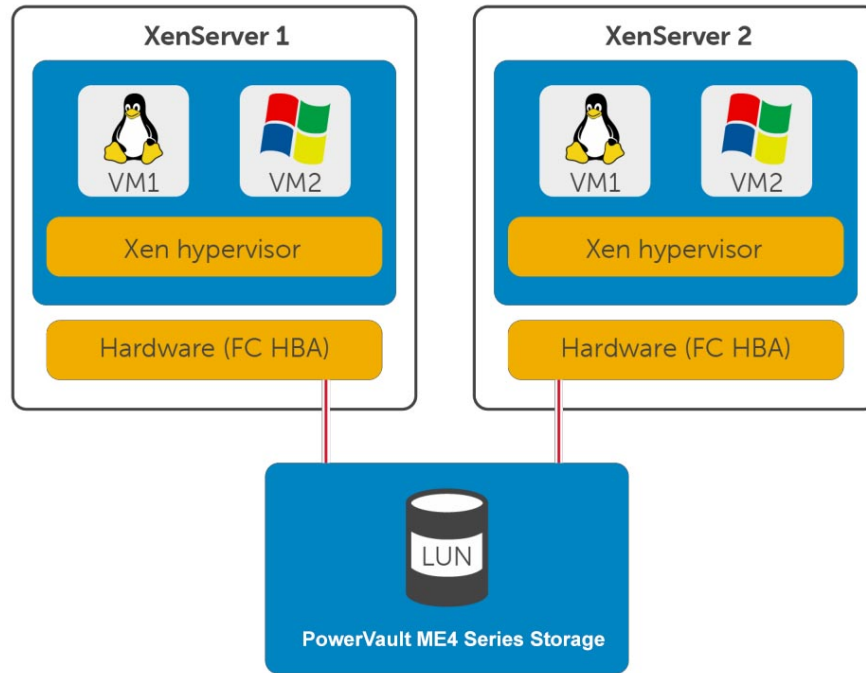
Figure 3: Shared Fibre Channel storage

3.3 SR-to-VM mapping

XenServer is capable of deploying a many-to-one, VM-to-SR (volume) deployment. The best number of VMs per SR largely depends on the workload and IOPS requirement of the VMs being deployed. When multiple VDIs share an SR, they also share the disk queue for that SR on the host. For this reason, care should be taken to prevent bottleneck conditions on the SR. Additionally, replication and DR become a factor when hosting multiple VMs on an SR. This is due to replication and recovery taking place on a per-SR (volume) basis.

3.4 Multipathing

Multipathing allows for failures in storage adapters (Open-iSCSI and HBA), switch ports, SAN switches, and storage I/O ports. Use of multipathing is recommended to increase availability and redundancy for production deployments of XenServer when hosting critical VM workloads.

XenServer supports Active/Active multipathing for iSCSI and FC protocols for I/O data paths. Dynamic multipathing uses a round-robin mode load balancing algorithm resulting in active traffic on all paths during normal operation. Multipathing can be enabled using XenCenter or the command line interface. Enabling multipathing requires a restart of the XenServer host and should be enabled before storage is added to the server. Only use multipathing when there are multiple paths to the storage.

Note: Additional information on multipathing with XenServer hosts can be found in the *Citrix XenServer 7.6 Administrator's Guide*, which is available on the Citrix Product Documentation website.

3.4.1 Enabling multipathing in XenCenter

1. Right-click the server in XenCenter and select **Enter Maintenance Mode**.
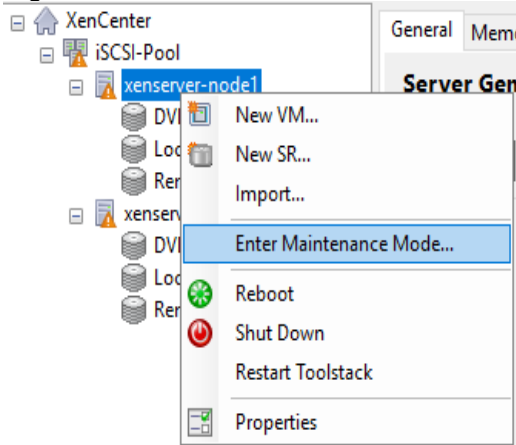
2. Right-click the server and select **Properties**.
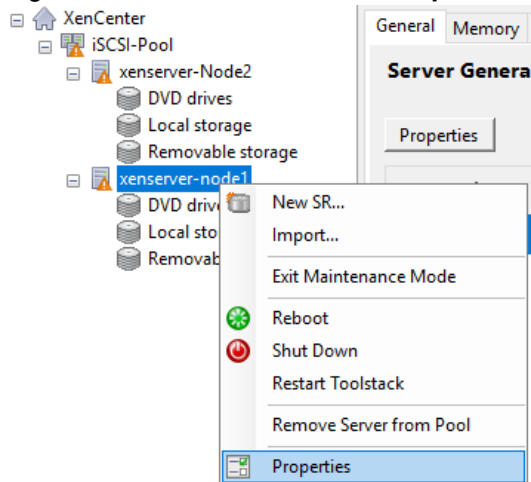
3. In the **Properties** window, select **Multipathing**.
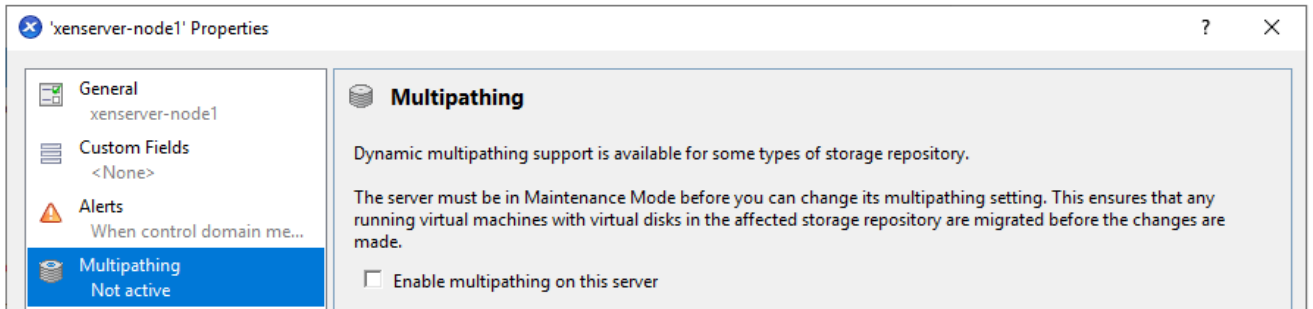
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4. Check the **Enable multipathing on this server** box and click **OK.**
5. Connect to host via SSH.
6. *Open /etc/multipath.conf with your favorite text editor, e.g. vi, and paste the following into the devices section.*

```
device {
        vendor "DellEMC"
        product "ME4"
        path_grouping_policy "group_by_prio"
        path_checker "tur"
        hardware_handler "1 alua"
        prio "alua"
        failback immediate
        path_selector "service-time 0"
}
```

7. To optimize the hosts iSCSI service, edit the /etc/iscsi/iscsid.conf file and set the following values. These values dictate the failover timeout and queue depth. The values shown serve as a starting point and might require adjustment depending on the environment.
    node.session.timeo.replacement_timeout = 30
    node.session.cmds_max = 1024
    node.session.queue_depth = 128

8. The server will need to be restarted for multipathing to take effect.

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4 XenServer storage using Open-iSCSI initiator (software)

XenServer iSCSI storage repositories are supported with Dell EMC PowerVault ME4 Series storage through the use of the Open- iSCSI initiator.

Shared iSCSI SRs using the software-based host initiator are capable of supporting VM agility using XenMotion — VMs can be started on any XenServer host in a resource pool and migrated between them with no noticeable interruption.

iSCSI SRs utilize the entire LUN specified at creation time and may not span more than one LUN. Support for the Challenge-Handshake Authentication Protocol (CHAP) is provided for client authentication, during both the data-path-initialization and the LUN-discovery phases.

> **Note**: Use dedicated network adapters for iSCSI traffic. The default connection can be used, but the best practice is to separate iSCSI and network traffic.

XenServer hosts support a single iSCSI initiator, which is automatically created and configured with a random iSCSI Qualified Name (IQN) during host installation. iSCSI targets commonly provide access control through iSCSI initiator IQN lists, so all iSCSI targets/LUNs to be accessed by a XenServer host must be configured to allow access by the host initiator IQN. Similarly, targets/LUNs to be used as shared iSCSI SRs must be configured to allow access by all host IQNs in the resource pool.

Changing the default XenServer IQN to one that is consistent with a naming schema in the iSCSI environment is recommended. The XenServer host IQN value can be modified using the XenCenter GUI.

To set the host IQN using XenCenter:

Right-click the host, select **Properties,** enter the desired **iSCSI IQN**, and click **OK**.
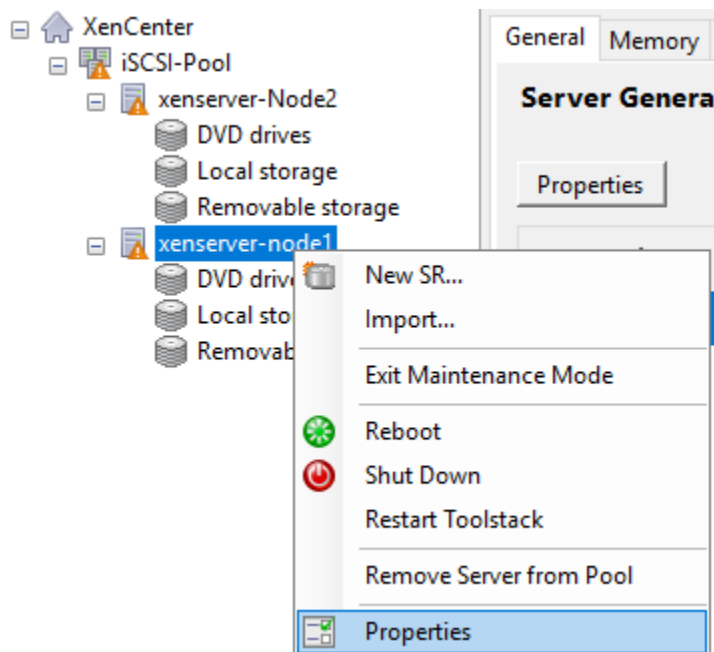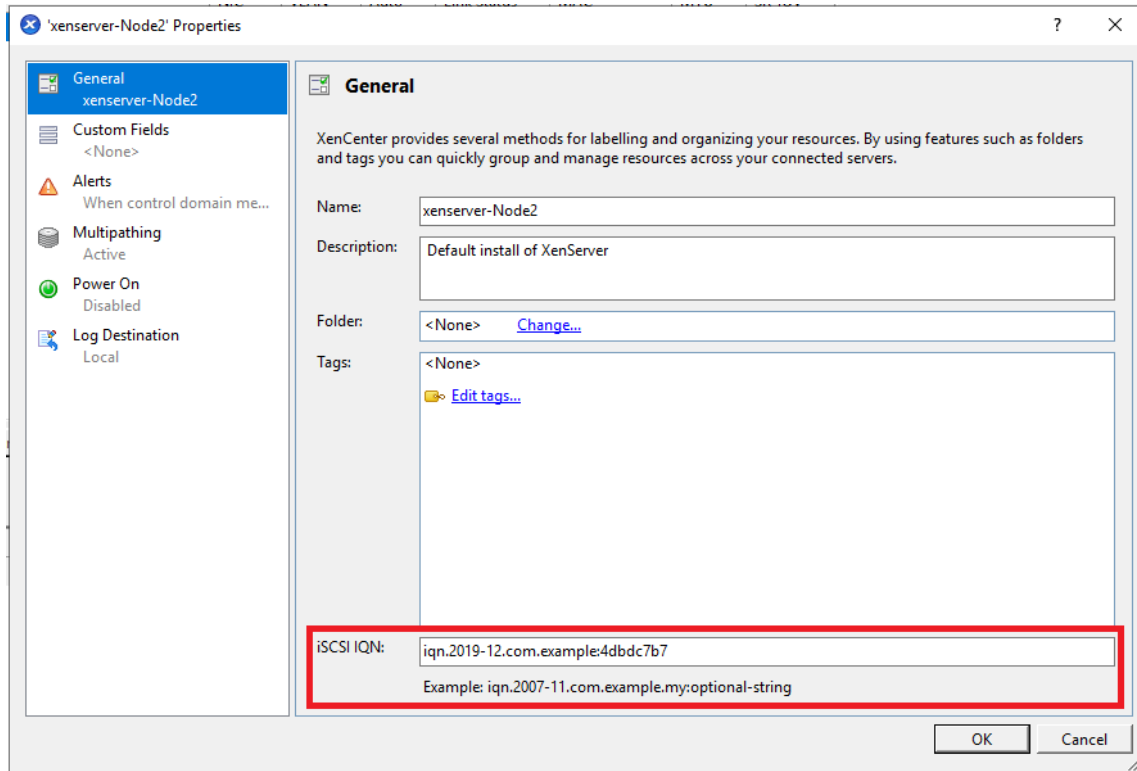
XenCenter: Set host IQN

4.1 Open-iSCSI initiator setup with Dell EMC PowerVault ME4 Series arrays

When planning an iSCSI network, isolate the iSCSI traffic from management traffic through the use of separate switches and subnets. Failure to follow this best practice may result in compromised reliability or performance.

When implementing multipathing with iSCSI storage, be certain none of the redundant iSCSI paths are configured within the same subnet or on the same physical network as the management interface. If this occurs, the iSCSI initiator will not be able to successfully establish a session over any iSCSI path on the management network or subnet.

Multipath with dual subnets: In this configuration, the Front End iSCSI control ports on the Dell EMC PowerVault ME4 Series storage are on two separate subnets. This option uses MPIO for multipathing. This is the recommended option when high availability (HA) is required.

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4.2 Multipath with dual subnets

Using XenServer Open-iSCSI multipathing with dual subnets to properly connect to Dell EMC PowerVault ME4 Series storage requires the following:

- XenServer 7.6 or later
- iSCSI using two unique, dedicated storage NICs and subnets. The two subnets should be different from the XenServer management network to comply with Citrix best practices
- Multipathing enabled on all XenServer hosts in the pool
- iSCSI target IP addresses for the Dell EMC PowerVault ME4 Series storage Front End control ports. For the example included in this document, the iSCSI FE control ports on Dell EMC PowerVault ME4 Series storage are assigned IP addresses 10.10.10.100/24 and 10.10.11.100/24

In this configuration, the Dell EMC PowerVault ME4 Series storage is configured with the iSCSI Front End ports on two separate subnets, different from the management interface. The Dell EMC PowerVault ME4 Series storage is configured with two control ports, one on each subnet. Multipathing is controlled through MPIO.
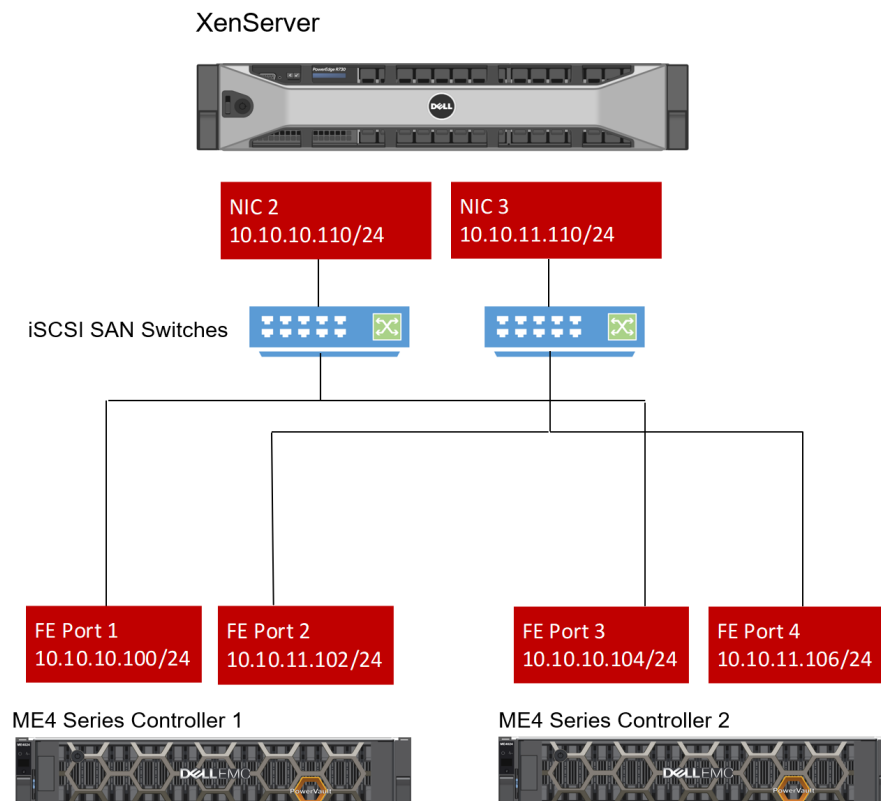
Open-iSCSI: dual subnets and MPIO

4.2.1 XenServer Open-iSCSI initiator configuration
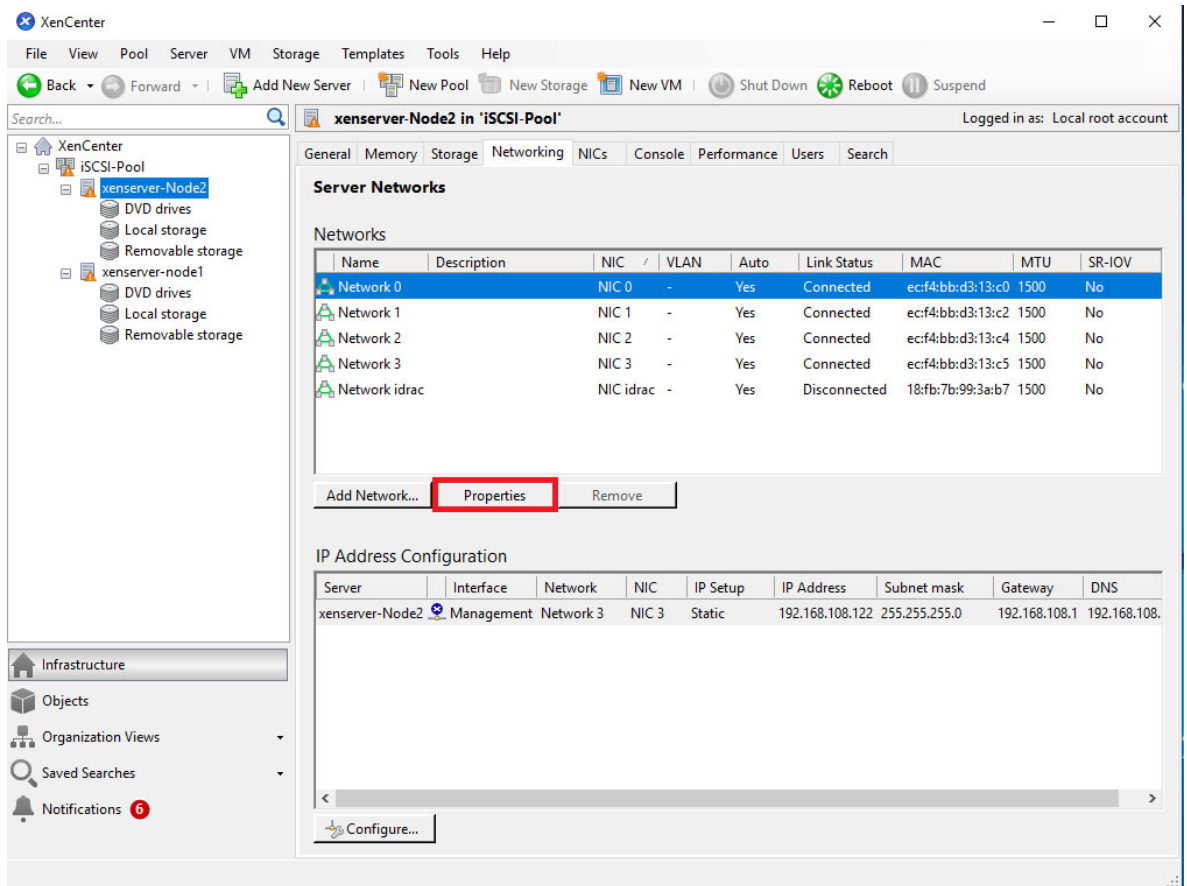
The XenCenter management GUI can be used to configure dedicated NICs for iSCSI storage traffic use. Assigning a NIC for iSCSI use will prevent the use of the NIC for other functions such as host management. However, appropriate network configuration is also required to ensure the NIC is used for the desired traffic. For example, to dedicate a NIC to iSCSI storage traffic, the NIC, storage target, switch, and VLAN (if a VLAN is used) must be configured so the iSCSI storage target is only accessible over the assigned NIC.

Ensure that the dedicated NICs used for iSCSI storage use a separate IP subnet that is not routable from the XenServer management interface. Enforcing this ensures storage traffic will not be directed over the management interface after a host reboot, which would otherwise be possible due to the initialization of the network interfaces.

4.2.2 Assign NIC functions using the XenCenter management GUI

4.2.2.1 Optional steps: implementing Jumbo Frames

1. In the XenCenter management GUI, navigate to the **Infrastructure** view, navigate through the objects, select the desired XenServer host, select the **Networking** tab, select the desired **Network** from the list, and click **Properties**.

2. Select **Network Settings**, input the **MTU** of 8860 (default value is 1500), and deselect the checkbox so this network will not be added to new VMs.
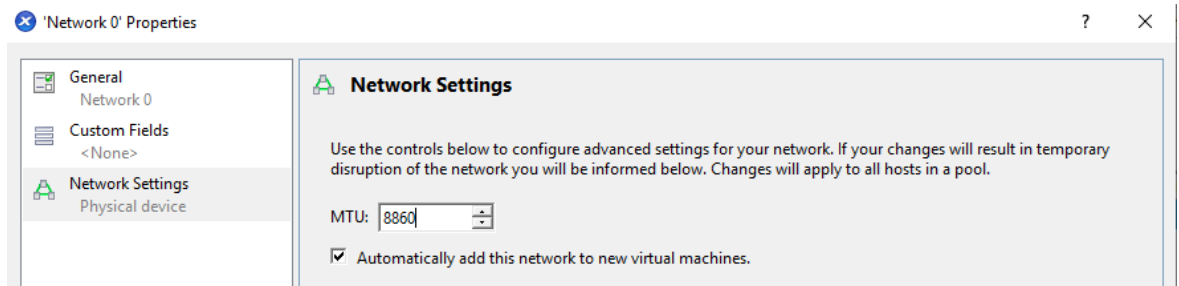
3. Repeat steps 1–2 for each additional network dedicated for iSCSI storage.

4.2.2.2   Optional steps: implementing Jumbo Frames on the Dell EMC PowerVault ME4

1. In the PowerVault Manager navigate to the **Home** tab, click on **Action** and select **System Settings**.
2. In the System Settings, navigate to the **Ports** tab and switch to **Advanced Settings** and check the box for Jumbo frames.

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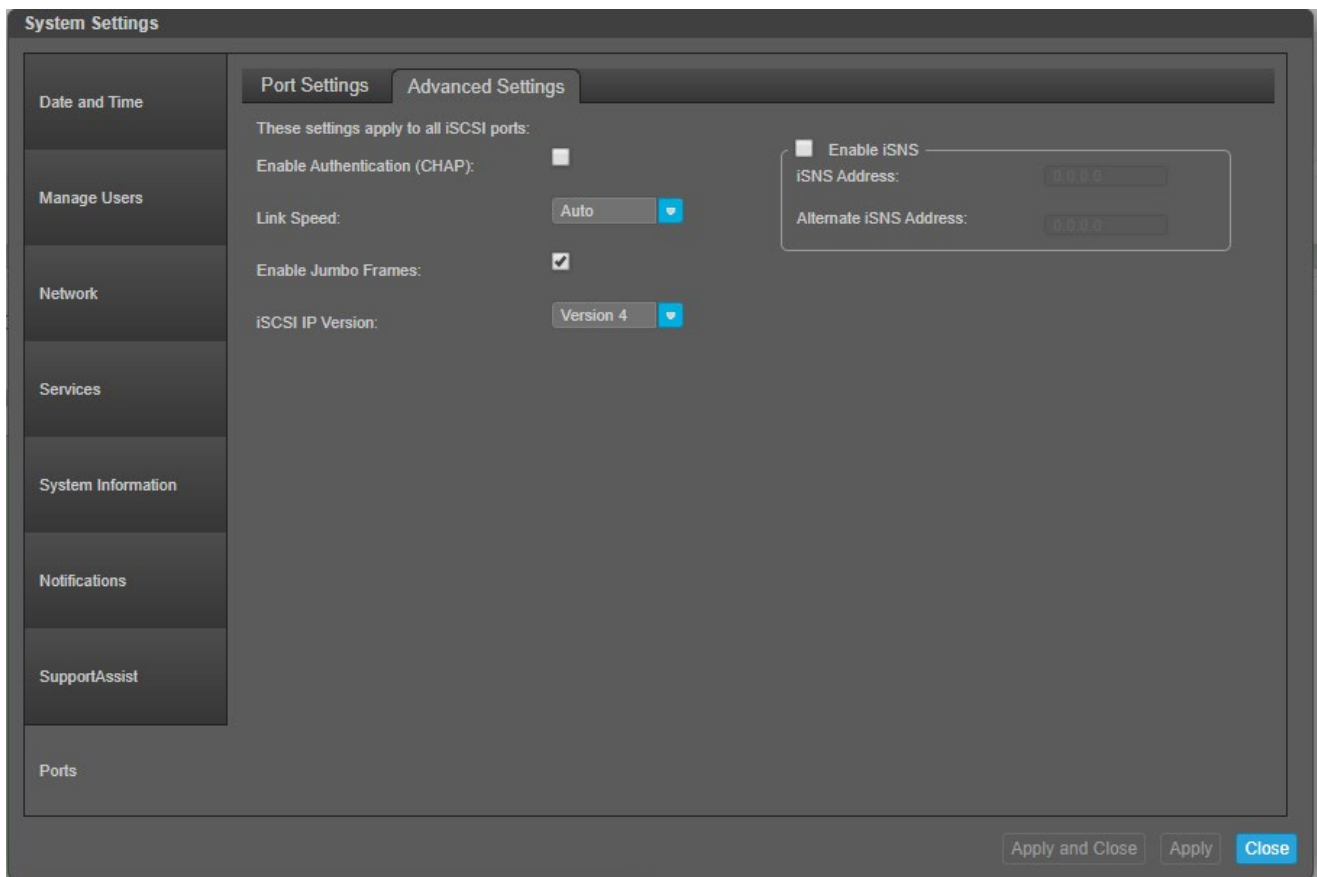
4.2.2.3   Required steps

Note: If Jumbo Frames are to be used, the steps in section 4.2.2.1 & 4.2.2.2 must be completed prior to executing the following steps.

1. In the XenCenter management GUI, navigate to the **Infrastructure** view, navigate through the objects, select the desired XenServer host, select the **Networking** tab, and click **Configure**.
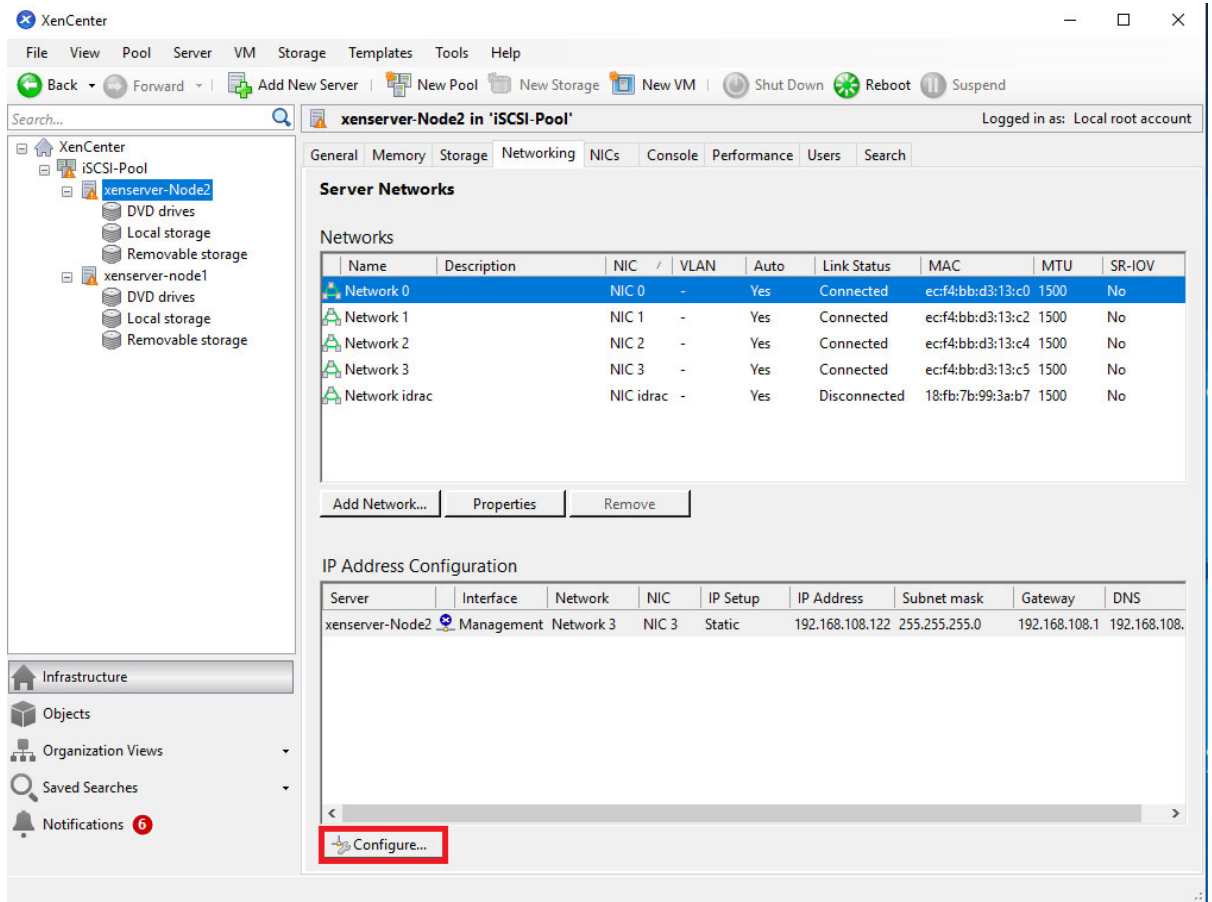
2. Click **Add IP address**, enter the desired name, select the **Network** from the drop-down box, and enter the **IP address settings** for the dedicated iSCSI storage NIC. Click **OK**.
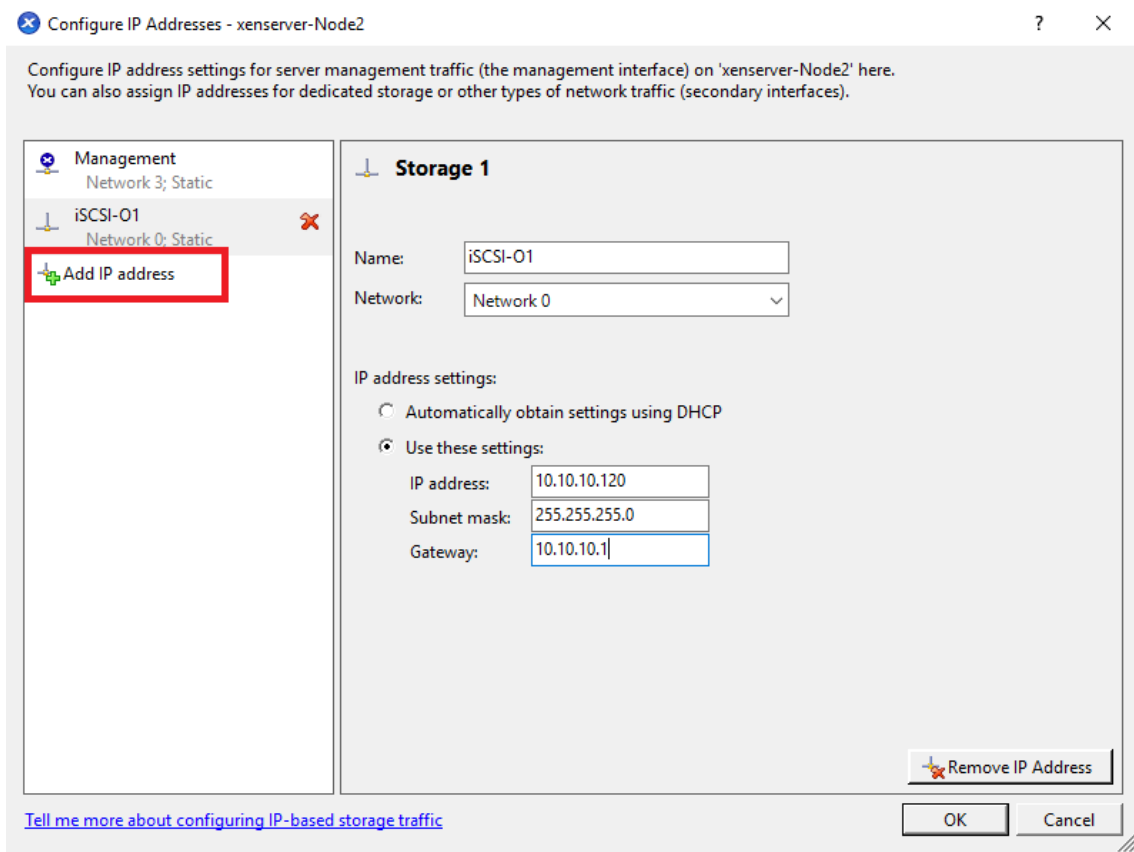
3. Repeat steps 1-2 for each additional NIC dedicated for iSCSI storage.

4.3 Identify Dell EMC PowerVault ME4 Series storage iSCSI targets

To gather Dell EMC PowerVault ME4 Series storage iSCSI target information: Within PowerVault Manager, go to the **Home Tab –** Action - **System Settings**, navigate to **Ports**, and click **Port Settings tab**. This should display the target IPv4 addresses.

System Settings					
	Port Settings	**Advanced Settings**			
Date and Time	iSCSI Param	A0	A1	A2	A3
	IP Address:	10.10.10.100	10.10.11.102	10.10.10.104	10.10.11.106
Manage Users	Netmask:	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
	Gateway:	10.10.10.1	10.10.10.1	10.10.10.1	10.10.10.1
	iSCSI Param	B0	B1	B2	B3
Network	IP Address:	10.10.11.100	10.10.10.102	10.10.11.104	10.10.10.106
	Netmask:	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
Services	Gateway:	10.10.10.1	10.10.10.1	10.10.10.1	10.10.10.1

System Information

Notifications

SupportAssist

Ports

Apply and Close | Apply | Close

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4.4 Configure Host Initiators in PowerVault Manager

Use the following steps to configure the host initiators for access to the Dell EMC PowerVault ME4 Series storage:

4. In XenCenter, select your host on the left-side, switch to the **Storage** tab and click **New SR**.
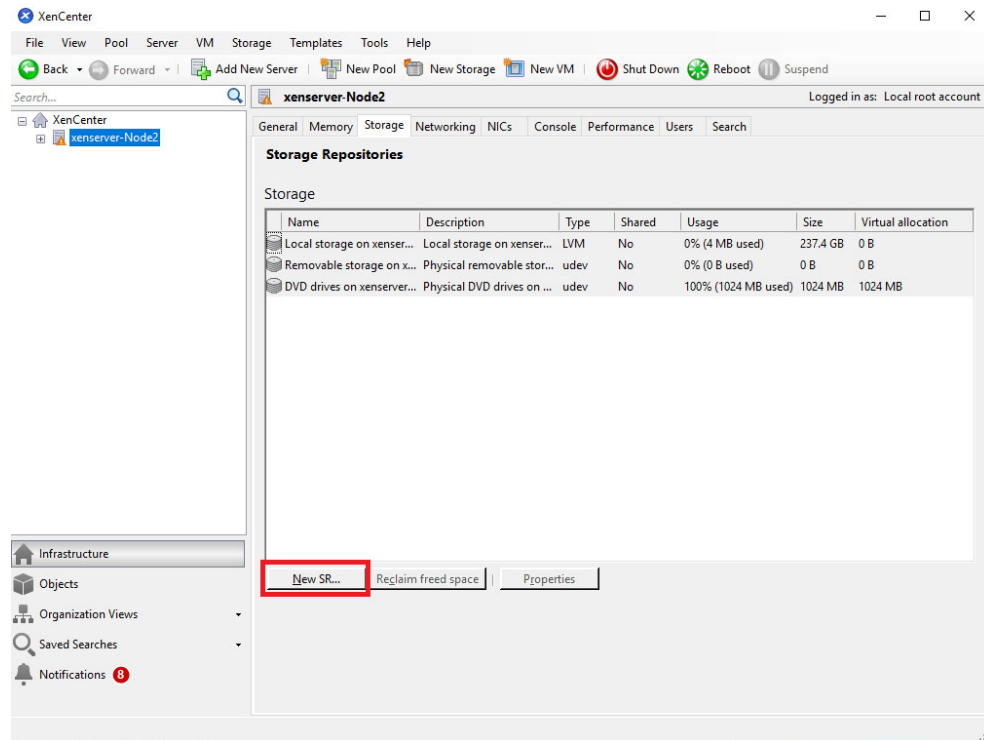
5. Under **Virtual disk storage**, select the **iSCSI** option, and click **Next**.

6. Give the new storage repository a name and click **Next**.

7. Depending on your license, chose between thin or thick provisioning.

8. In the Target hostname/IP address field, enter a Dell EMC PowerVault ME4 Series storage iSCSI IP addresses, and click **Scan Target Host**.

9. In the **Target IQN** drop-down list, select the option with the same *(*IP Address*) as you used for discovery. Leave the menu open.
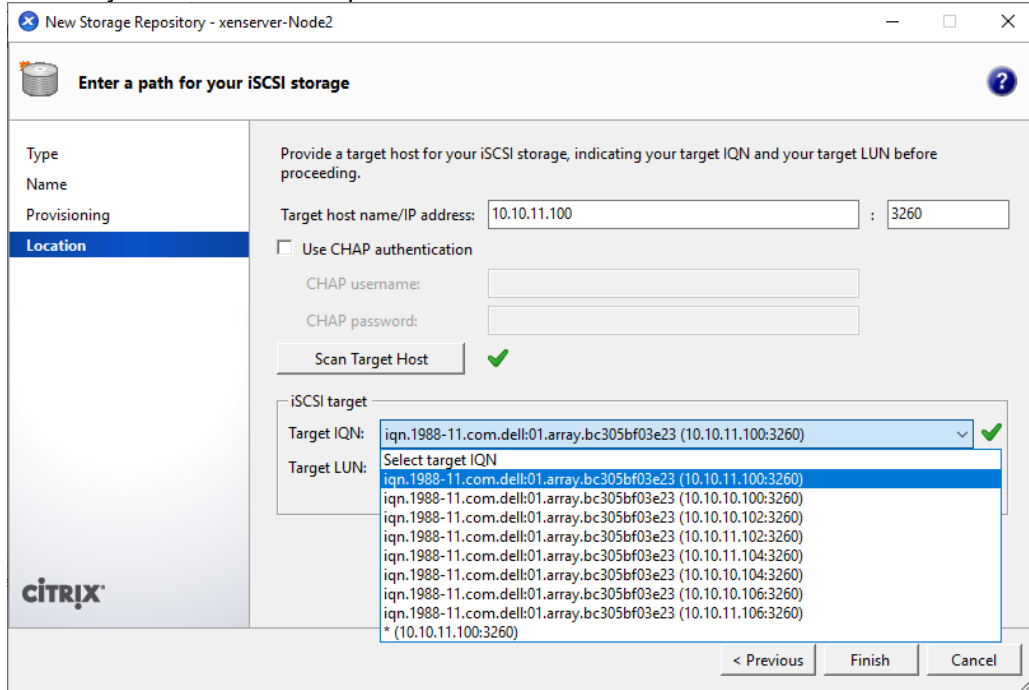

10. Now switch to the **PowerVault Manager** Web interface and navigate to the **Hosts** tab.

11. On the **Home** tab, click **Action** and select **Host Setup**.
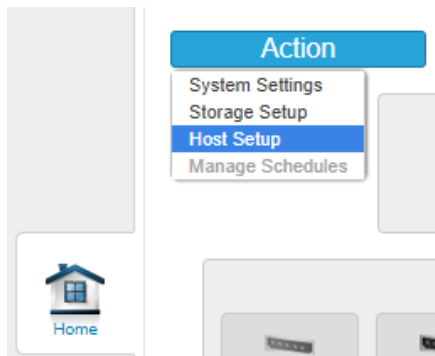
12. In the new window, click **Next**.

13. Enter the **Host Name** and select the IQN belonging to the host. If desired provide each Initiator ID with a NIC for easier identification.
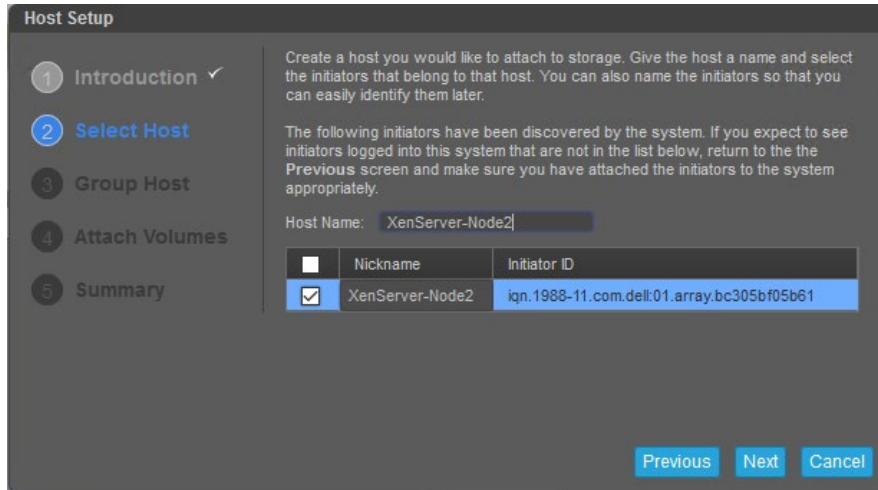
14. Click **Next**
15. If desired, you can **create** a **Host Group** or join the Host to an **existing Host Group**. This is particularly beneficial for larger Clusters. Alternative select "Do not group this Host" and click **Next**.
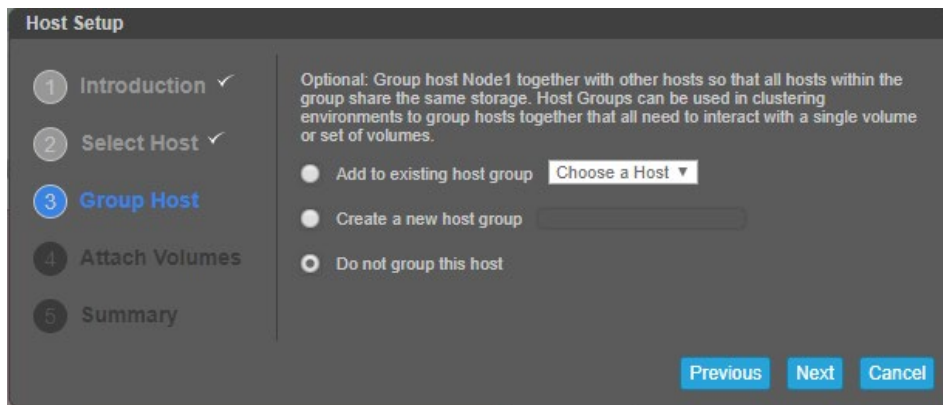
16. Change the **name**, **size** and if desired the **Pool** the volume resides in. If you wish to create **multiple volumes**, simply click **Add Row**.
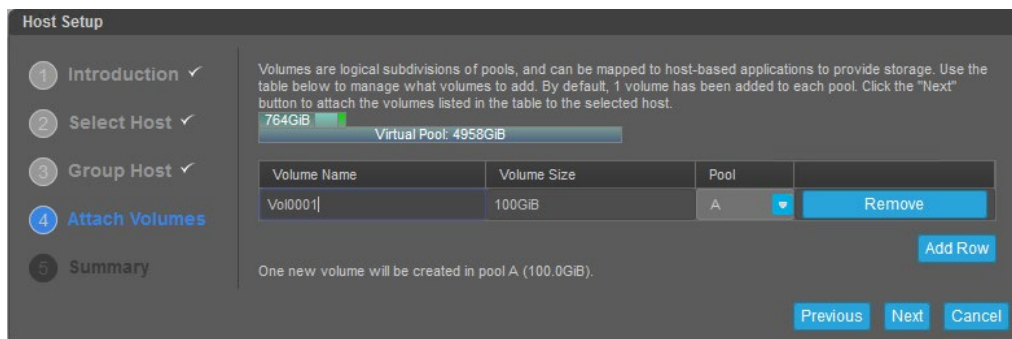
17. Click **Next**, again.

18. Confirm your host configuration by clicking **Configure Host.**

4.5 Creating a Storage Repository (SR) using iSCSI

1. Go back to **Citrix XenCenter**.
2. In the window you left open, click again on **Scan Target**.
3. In the **Target IQN** drop-down list, select the option with the same *(IP Address)* as you used for discovery.

4. In the **Target LUN** drop-down list, select the LUN on which the new SR will reside.
5. Click **Finish**.

6. Confirm that you want to create a new SR:
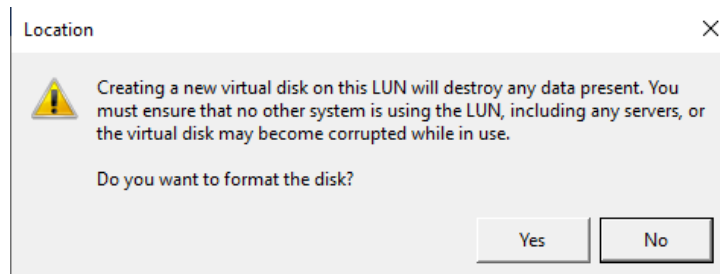
The new SR is now available to the server or pool. Repeat these steps for mapping and adding storage for any additional SRs.

NOTE: For optimal performance, ensure that your VMs have the XenServer Tools installed.

5 XenServer Storage using SAS/Fibre Channel HBA

XenServer Fibre Channel (FC) & SAS Storage Repositories are supported with Dell EMC PowerVault ME4 Series storage through the use of FC or SAS HBAs. A list of supported HBAs can be found in the *Dell EMC PowerVault ME4 Support Matrix*.

Shared SAS or FC SRs using a SAS or FC HBA are capable of supporting VM agility using XenMotion: VMs can be started on any XenServer host in a resource pool and migrated between them with no noticeable interruption.

The following sections detail the steps involved in adding a new SAS or Fibre-Channel-connected volume to a XenServer pool. Be sure Multipathing has been enable a shown in section 3.4.1.

This section assumes all Fibre Channel connections have been properly configured and zoned following deployment guide found in the Dell support Web Page, *Dell EMC PowerVault ME4 Deployment Guide*

5.1 Configure Server Objects in PowerVault Manager

Use the following steps to configure the host initiators for access to the Dell EMC PowerVault ME4 Series storage:
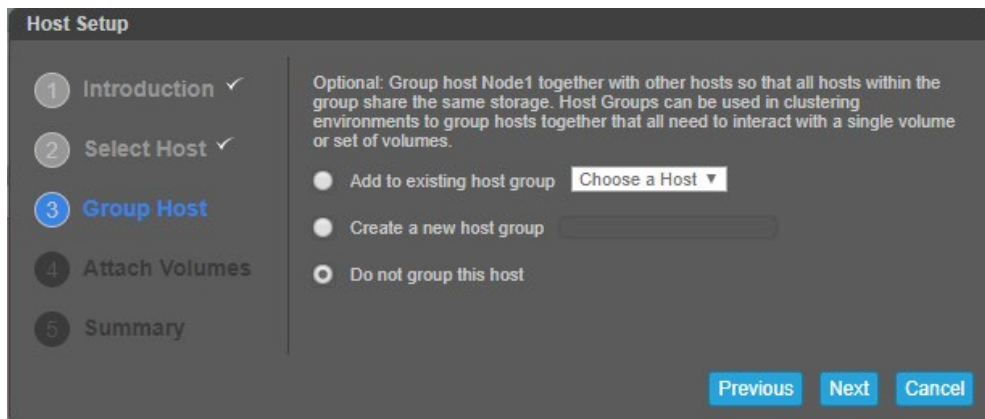
1. In PowerVault Manager, go to the **Home** tab, click **Action** and select **Host Setup**.

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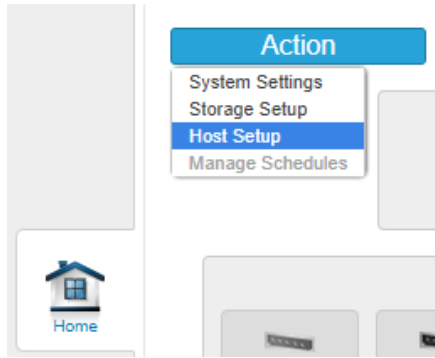
2. In the new window, click **Next**.

3. Enter the **Host Name** and select the WWPNs belonging to the host. If desired provide each Initiator ID with a NIC for easier identification.
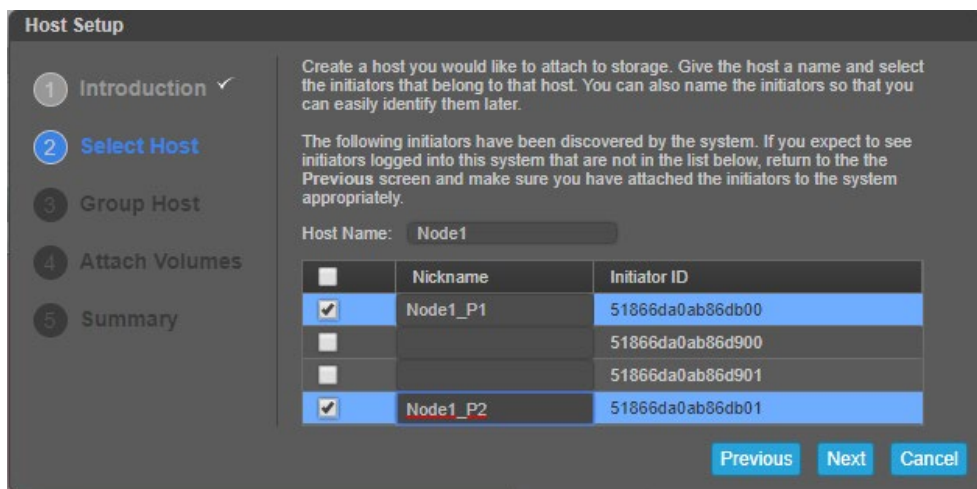
4. Click **Next**

5. If desired, you can **create** a **Host Group** or join the Host to an **existing Host Group**. This is particularly beneficial for larger Clusters. Alternative select "Do not group this Host" and click **Next**.
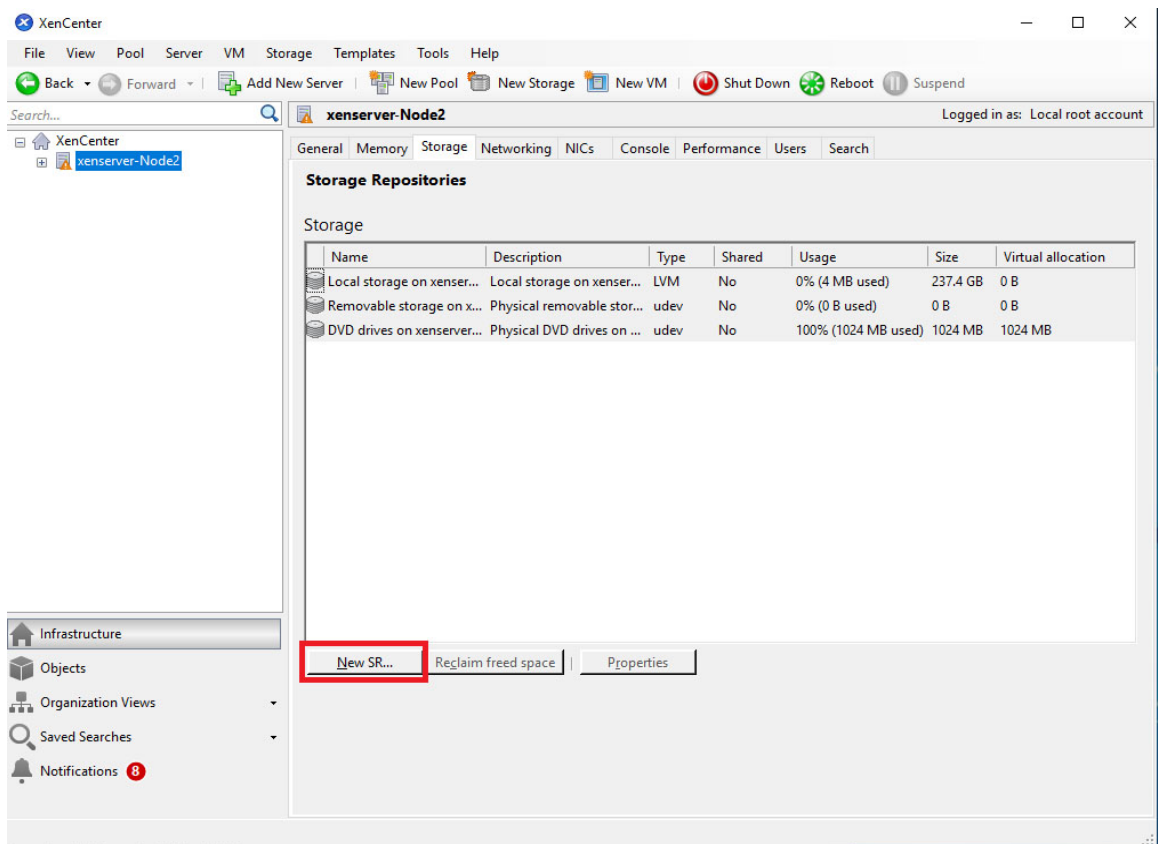

6. Change the **name**, **size** and if desired the **Pool** the volume resides in. If you wish to create **multiple volumes**, simply click **Add Row**.
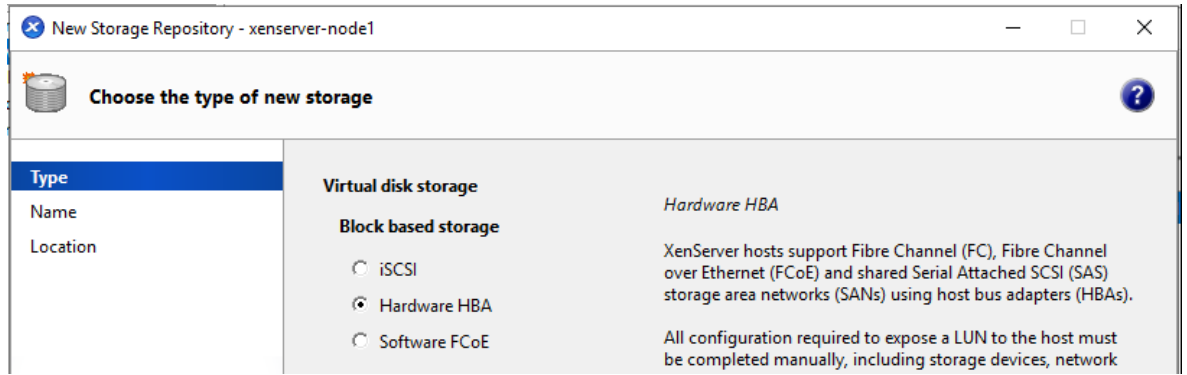
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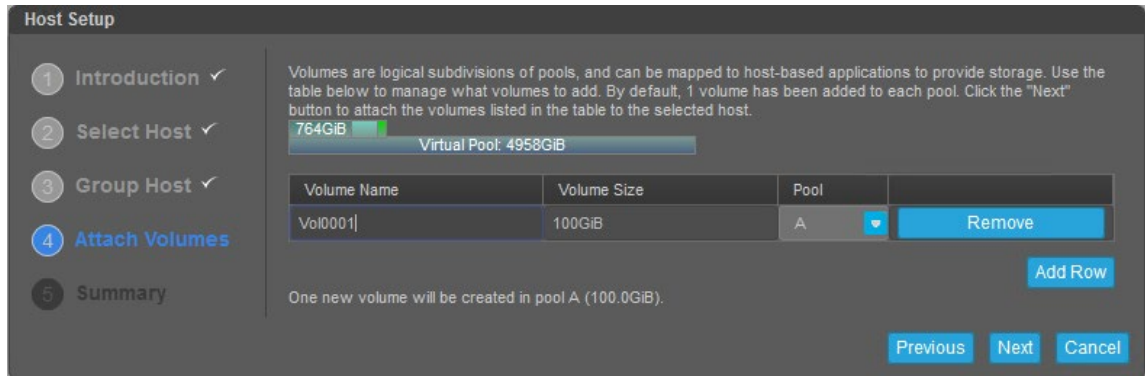
7. Click **Next**, again.
8. Confirm your host configuration by clicking **Configure Host.**

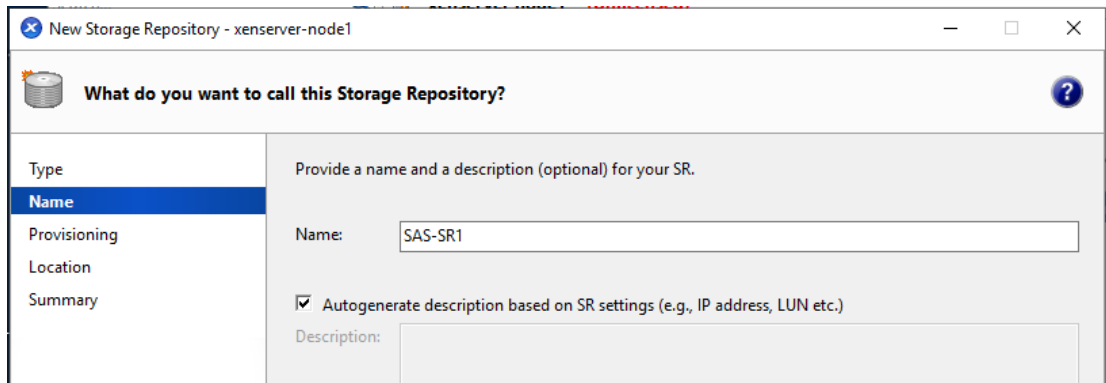## 5.2 Create SR with hardware HBA (SAS and FC)

1. In XenCenter, navigate to the XenServer pool, select the **Storage** tab, and click **New SR**.
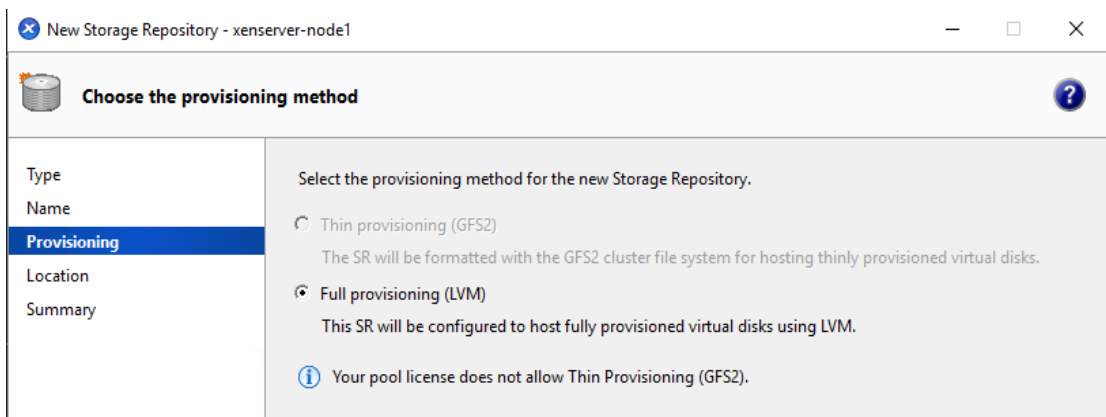

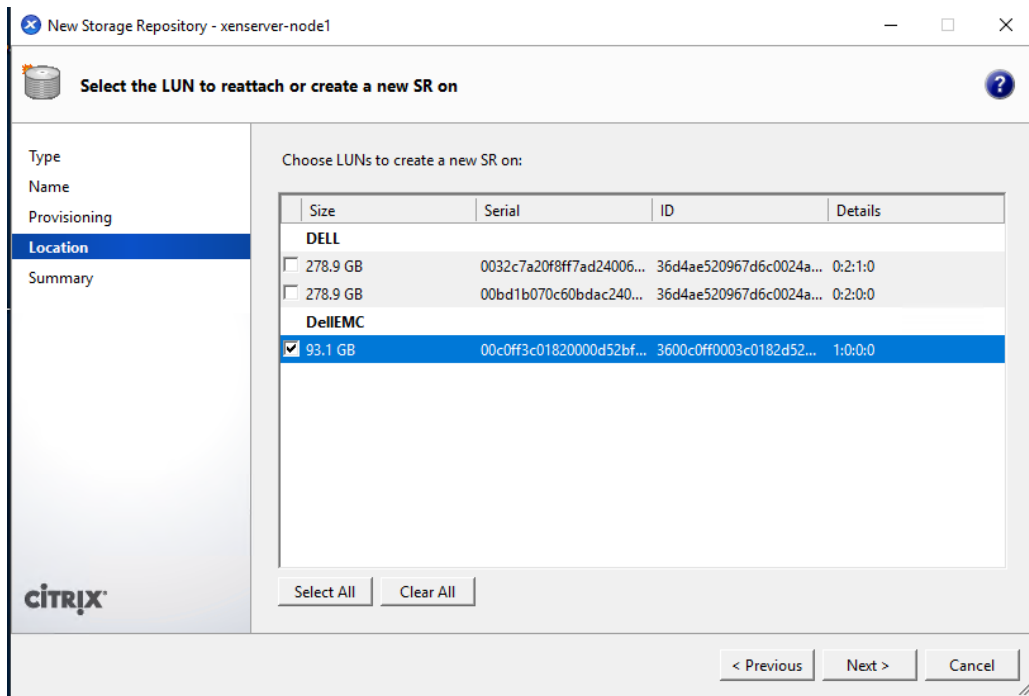2. Under **Virtual disk storage**, select the **Hardware HBA** option, and click **Next**.

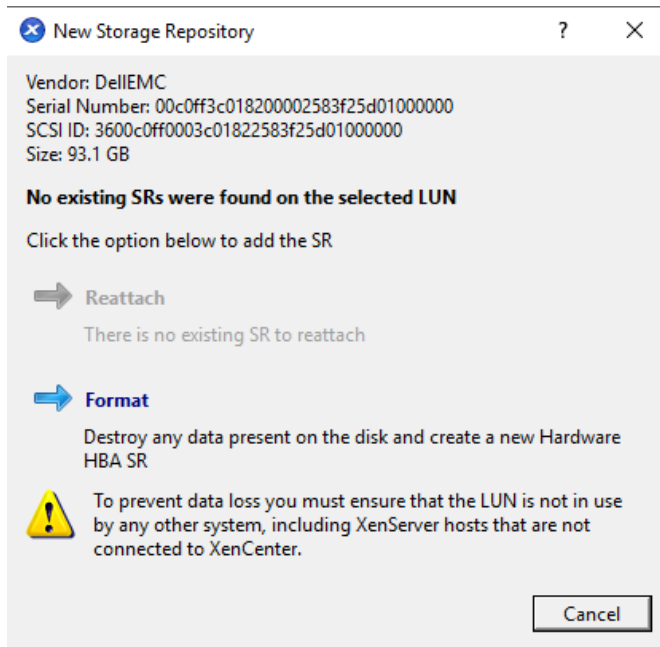3. Give the new storage repository a name and click **Next**.

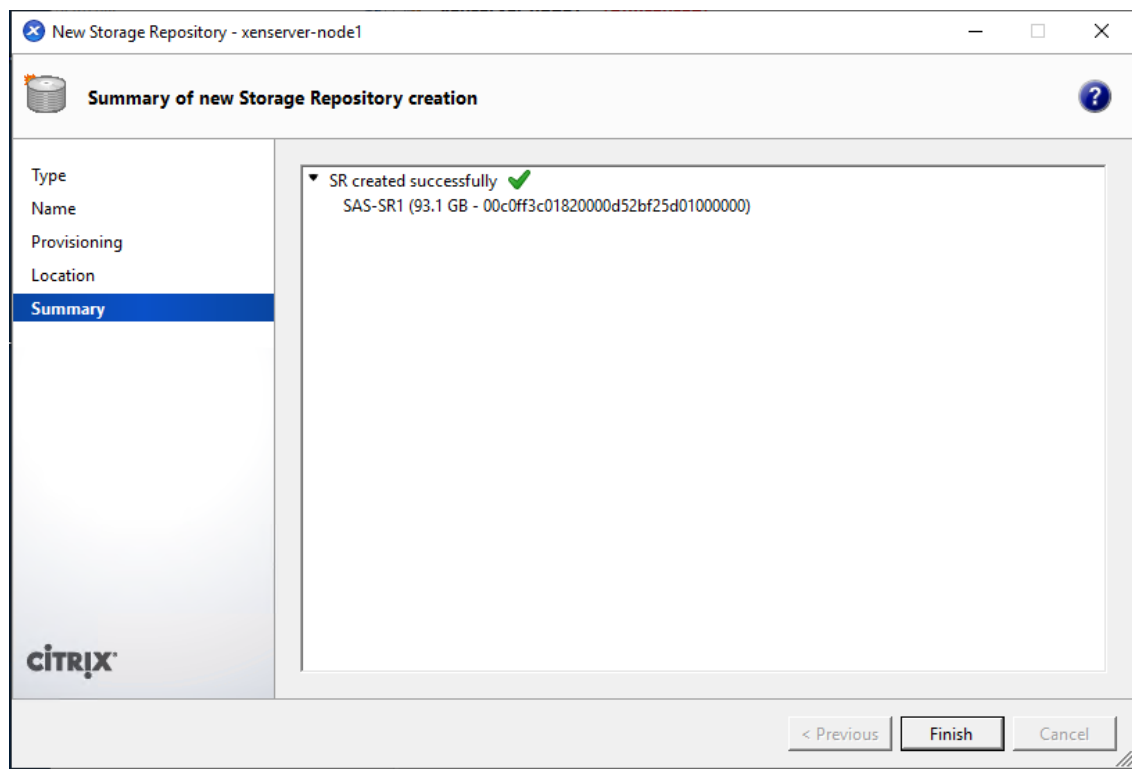4. Depending on your license, chose between thin or thick provisioning and click **Next**.

5. Select the desired LUN and click **Next**.

6. If this is a new SR (has not been created or used before), click **Format** to prepare the SR for use.
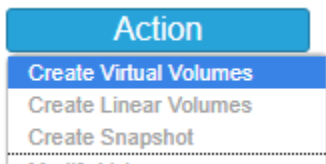
7. Click **Finish** to complete the SR creation process and make the SR available to the server or pool.
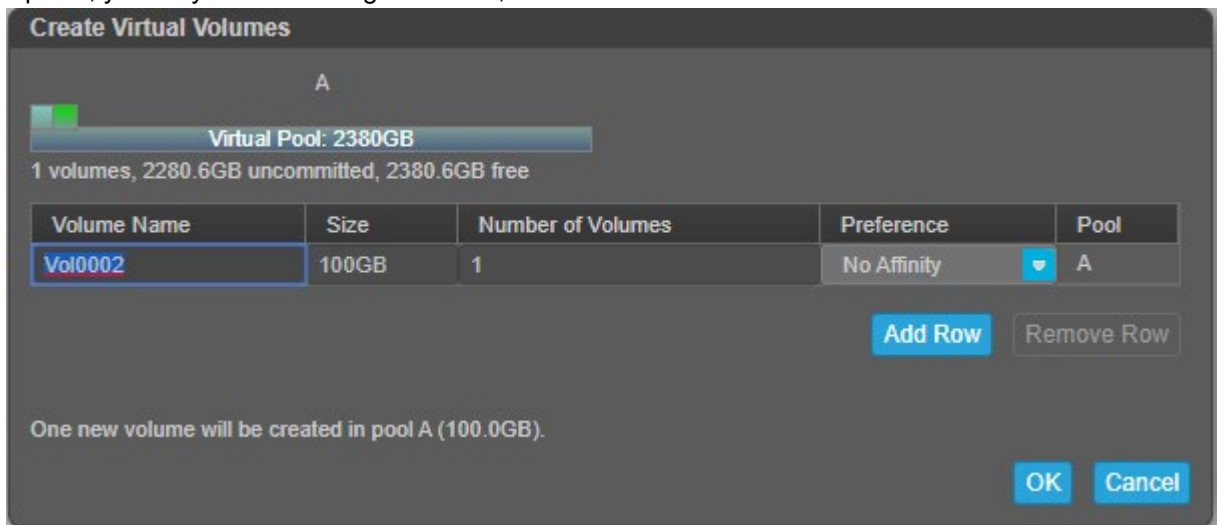
6 Creating & Mapping additional Volumes on Dell EMC PowerVault ME4 via PowerVault Manager

6.1 Creating a Volume:

2. On the Volumes tab, click on "Action" and select "Create virtual Volume":

Action
- **Create Virtual Volumes**
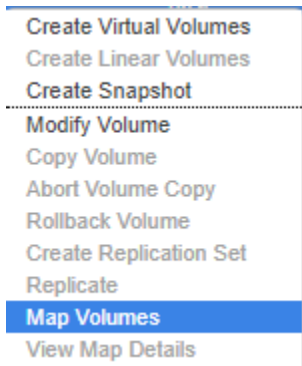- Create Linear Volumes
- Create Snapshot

3. In the new window, give your volume a name and change the size to your needs. If you have multiple pools, you may want to change the Pool, the volume will be created on:

Create Virtual Volumes

A

Virtual Pool: 2380GB
1 volumes, 2280.6GB uncommitted, 2380.6GB free

Volume Name	Size	Number of Volumes	Preference	Pool
Vol0002	100GB	1	No Affinity	A

Add Row   Remove Row

One new volume will be created in pool A (100.0GB).

OK   Cancel

6.2 Mapping the Volume:

2. On the Volumes tab, right-click your Volume and select "Map Volumes":

- Create Virtual Volumes
- Create Linear Volumes
- Create Snapshot
- Modify Volume
- Copy Volume
- Abort Volume Copy
- Rollback Volume
- Create Replication Set
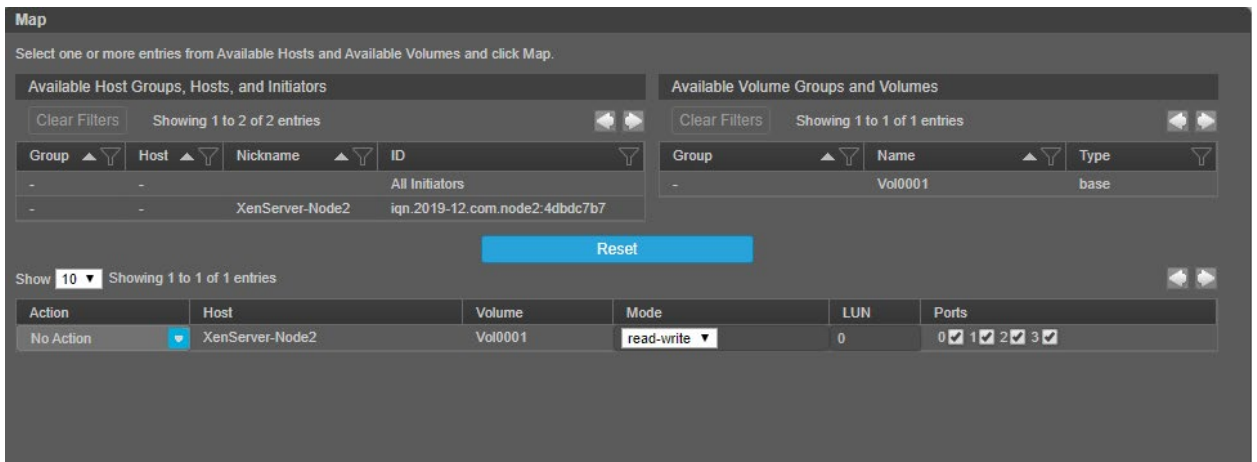- Replicate
- **Map Volumes**
- View Map Details

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3. In the new window, select your Host on the left-side and your Volume on the right-side.
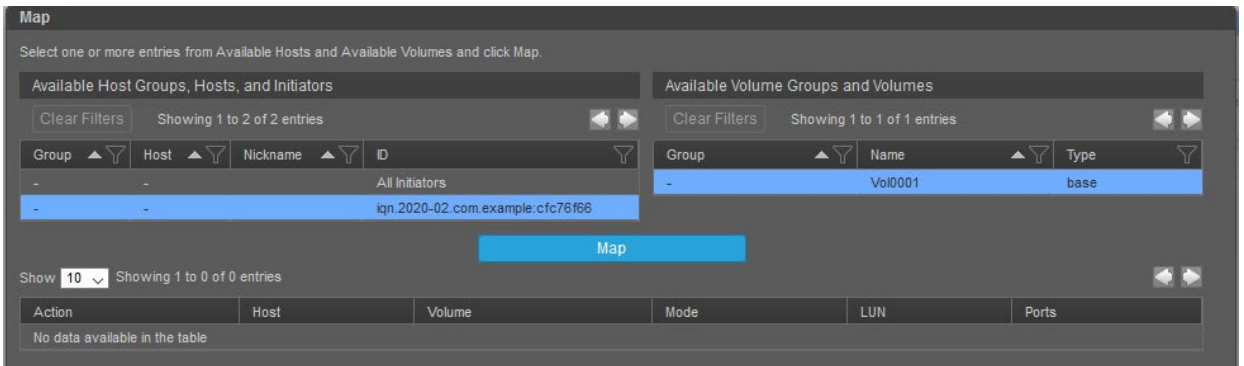
Note: If you want to map multiple Hosts to the same Volumes, you can either use Host-Groups or [SHIFT] / [CTRL] select multiple Hosts and or Volumes.

4. Click the blue "Map" button and proceed to click "OK" to apply the changes.

6.3 Verify multipath status

To view the status of the multipath from the XenCenter GUI, select the new SR from the list of objects and expand the Multipathing dropdown section as shown in Figure 10.
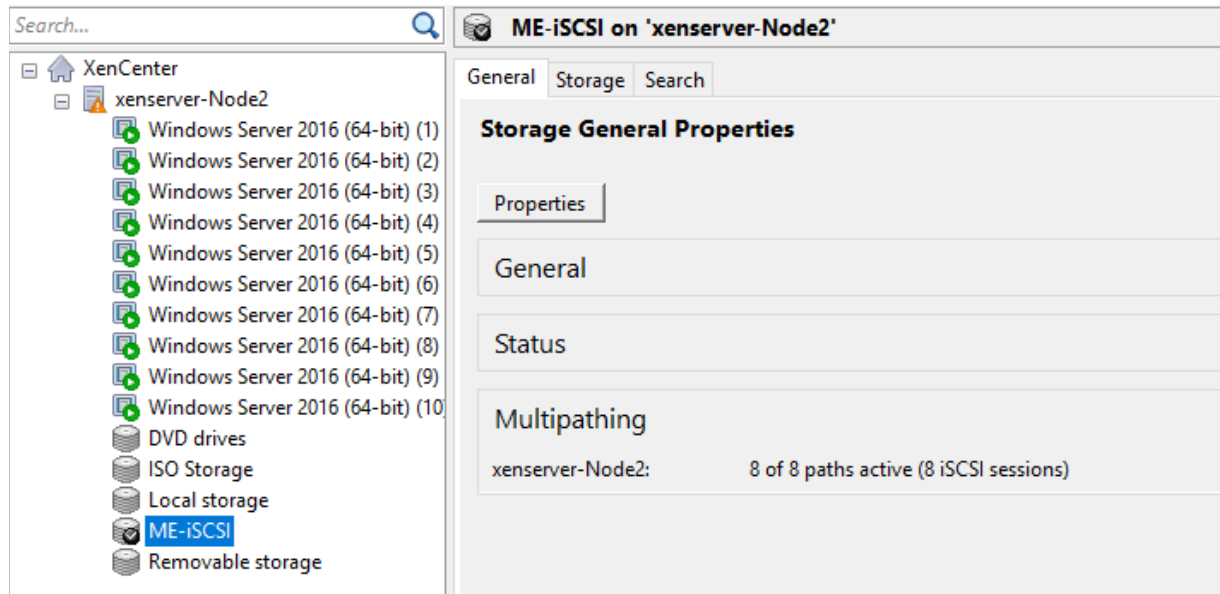

Figure 10   Display multipath status from GUI

Furthermore, you can also verify that multipathing is working, using the CLI command `multipath -ll`:

2. Using an SSH tool, like Putty, to connect to your Host.
3. Execute the command `multipath -ll`, you should receive an output similar to the following:

```
[root@localhost ~]# multipath -ll
3600c0ff00043d0c194764a5e01000000 dm-0 DellEMC ,ME4
size=93G features='0' hwhandler='1 alua' wp=rw
|-+- policy='service-time 0' prio=50 status=active
| |- 101:0:0:0 sde 8:64  active ready running
| |- 103:0:0:0 sdg 8:96  active ready running
| |- 105:0:0:0 sdi 8:128 active ready running
| `- 99:0:0:0  sdc 8:32  active ready running
`-+- policy='service-time 0' prio=10 status=enabled
  |- 100:0:0:0 sdd 8:48  active ready running
  |- 102:0:0:0 sdf 8:80  active ready running
  |- 104:0:0:0 sdh 8:112 active ready running
  `- 106:0:0:0 sdj 8:144 active ready running
[root@localhost ~]#
```

Note: The amount of session you see, depends on the amount of physical connections are present. If you are using a SAS HBA to connect to the ME4, you will only see 2 sessions.

A   Technical support and resources

Dell.com/support is focused on meeting customer needs with proven services and support.

Dell TechCenter is an online technical community where IT professionals have access to numerous resources for Dell EMC software, hardware and services.

Storage Solutions Technical Documents on Dell TechCenter provide expertise that helps to ensure customer success on Dell EMC Storage platforms.

A.1   Related documentation

See the following referenced or recommended Dell and Citrix XenServer publications:

- *Citrix XenServer 7.0 Installation Guide*
- *Citrix XenServer 7.0 Administrator's Guide*
- *Citrix XenServer 7.6 Documentation*
- *Dell EMC PowerVault ME4 Support Page*
- *Dell EMC PowerVault ME4 Support Matrix*
- *Dell EMC PowerVault ME4 Administrator's Guide*

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