



Configuring iSCSI Connectivity with VMware vSphere 6 and Dell PS Series Storage

How to configure and connect a Dell PS Series SAN to a VMware vSphere 6 environment using the software iSCSI initiator

Dell Storage Engineering
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Revisions

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November 2011	Initial release
January 2016	Updates to reflect vSphere 6.0 Web Client

Acknowledgements

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Executive summary

VMware® vSphere® 6 is the flagship VMware product for advanced server virtualization and management. Many advanced features provided by VMware, including the ability to move running virtual machines (VMs) between active servers, high availability (HA) clustering, and advanced load balancing, all require some manner of shared storage accessed by each of the servers. The Dell™ PS Series SAN is a highly virtualized shared storage platform that works with VMware vSphere 6 to provide these advanced features. This document discusses how to configure your VMware ESXi™ 6 environment to communicate with the PS Series SAN.

Audience

The information in this guide is intended for VMware vSphere administrators configuring iSCSI SAN access to a PS Series SAN.

Software and firmware revisions

The following table shows the software and firmware used for the preparation of this document.

Vendor	Model	Software revision
VMware	vSphere 6.x	6.0
Dell	PS Series SAN	8.x



1 Introduction

VMware vSphere 6 offers intelligent and advanced enhancements to the iSCSI software initiator in conjunction with iSCSI SAN connectivity. Many of these new features require advanced configuration in order to work properly.

This paper addresses some of these new features in vSphere and shows administrators how to connect a vSphere 6 environment to a Dell PS Series iSCSI SAN. While these steps are documented in the *VMware iSCSI SAN Configuration Guide* (available on the [VMware website](#)), this document provides a summary of the steps specific to connecting to a PS Series SAN. It covers the steps for utilizing the software iSCSI initiator inside the ESXi host. Users connecting their vSphere environment using iSCSI HBAs, both dependent and independent, should not follow these steps, and should configure their environment as outlined in the *VMware iSCSI SAN Configuration Guide*.



2 Features of the vSphere software iSCSI initiator

VMware vSphere has support for various advances with iSCSI SAN connectivity. This paper covers the features in the iSCSI software initiator as well as how to configure it to connect to the SAN.

Jumbo Frames: With ESXi, Jumbo Frames can be enabled on the iSCSI software initiator. Jumbo Frames support allows for larger packets of data to be transferred between the ESXi hosts and the SAN for increased efficiency and performance.

Note: Jumbo Frames are not required and are optional. Your network infrastructure must be able to fully support them to achieve any benefit.

MPIO: With ESXi, customers can benefit from MultiPath I/O from the ESXi hosts to the SAN. This allows for multiple connections to be concurrently used to allow for greater bandwidth. It also enables ESXi to take full advantage of the scale-out networking in the PS Series SAN.

Third-party MPIO support: VMware has provided an architecture that enables storage vendors to provide new and advanced intelligent integration. Dell has a MPIO plugin that will enhance MPIO with the existing iSCSI software initiator for easier management, better performance, and increased bandwidth.



3 Configuring the vSphere iSCSI software initiator with PS Series storage

Taking advantage of the vSphere iSCSI software initiator features requires advanced configuration by vSphere administrators. vSphere 6 requires the use of the new vSphere Web Client to access the latest features and will be used in this paper. Configuring both a vSphere Standard Switch (vSS) and vSphere Distributed Switch (vDS) will be covered. The correct vSwitch type will depend on your environment.

The rest of this document focuses on the installation and configuration of an iSCSI software initiator connection to a PS Series SAN. Each of these steps can be found in the *VMware iSCSI SAN Configuration Guide*, and where names and IP Addresses are used, they will be different for each environment. This is merely an example of how to configure a new vSphere ESXi 6 environment correctly and connect it to the PS Series SAN.

The following assumptions are made for this example:

- VMware ESXi 6 - the steps are similar for earlier releases
- Current Dell PS Series SAN Firmware
- More than one network interface card (NIC) set aside for iSCSI traffic

Not every environment will require all of the steps detailed in this paper.

The rest of this document assumes the environment is using multiple NICs and attaches to a PS Series SAN utilizing the Native Multipathing Plug-in (NMP) from VMware.



4 Establishing sessions to the SAN

Before continuing, we first must discuss how VMware ESXi establishes its connection to the SAN utilizing the vSphere iSCSI software adapter. VMware uses VMkernel ports as the session initiators, so we must configure each port that we want to use as a path to the storage. This configuration will be a one-to-one (1:1) VMkernel-port-to-NIC relationship. Each session to the SAN will come from one VMkernel port which will go out a single physical NIC. Once these sessions to the SAN are initiated, both the VMware NMP and the Dell PS Series network load balancer will take care of load balancing and spreading the I/O across all available paths.

Each volume on the PS Series array can be utilized by ESXi as either a datastore or a raw device mapping (RDM). To do this, the iSCSI software adapter utilizes the VMkernel ports that were created and establishes a session to the SAN and to that volume to communicate. Administrators have the ability to use additional NICs for failover, but this document focuses on enabling NMP with Round Robin or preparation for third-party multipathing with the Dell PS Series Multipathing Extension Module (MEM). With the improvements to vSphere and MPIO, administrators can take advantage of multiple paths to the SAN for greater bandwidth and performance. This does require some additional configuration which is discussed in detail in this document.

Each VMkernel port is bound to a physical adapter. Depending on the environment, this can create a single session to a volume or up to eight sessions (ESXi maximum number of paths to a volume). Use a one-to-one (1:1) ratio of VMkernel ports to physical network cards. This means if there are two physical NICs, you would establish one VMkernel per physical NIC, associating a separate NIC with each VMkernel port. Looking at the following example, this means you would establish two sessions to a single volume on the SAN. This trend can be expanded depending on the number of NICs in the system.

Note: vSphere MPIO iSCSI traffic cannot be routed. If your environment requires the routing of iSCSI traffic then you must utilize Fixed path.

Standard switch: vSwitch1 (VMkernel iSCSI1)

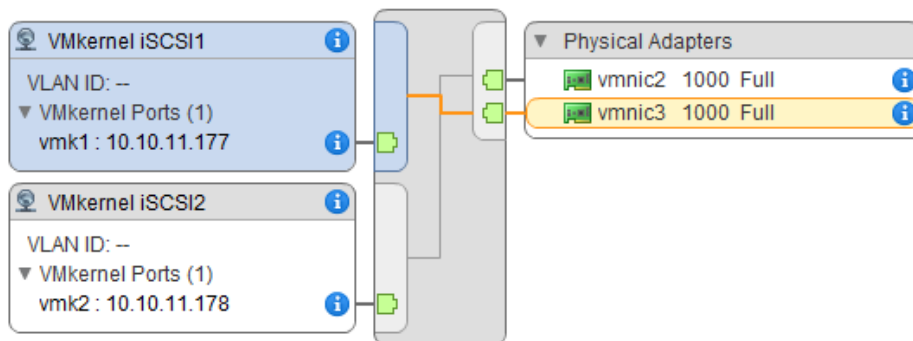


Figure 1 Example of iSCSI sessions using 1:1 VMkernel mapping with two physical NICs for iSCSI traffic on a standard vSwitch



5 Installation overview

Each environment will be different, but the following sections provide example installation steps for configuring a new ESXi host to connect to a PS Series SAN. Throughout these examples, the names and IP addresses assigned will need to be changed to be relevant in your environment. These examples assume a switch with Jumbo Frames support on the physical hardware.

This paper focuses on one-to-one VMkernel mapping with two physical NICs and two VMkernel ports. This would be a typical solution for many environments to utilize all of the bandwidth available to the ESXi host's network interfaces.

There are some suggested configurations depending on the number of NICs that will be used for iSCSI traffic. Every environment will differ depending on the number of hosts, the number of PS Series members, and the number of volumes. In a default configuration, assign one VMkernel port for each physical NIC in the system. So if there are two NICs, assign two VMkernel ports. This is referred to in the VMware iSCSI document as 1:1 port binding.

Keep in mind that it is the VMkernel port that establishes the iSCSI session to the volume and the physical NIC is just the means it utilizes to get there.

Due to how the PS Series SAN automatically load balances volumes across multiple members and iSCSI connections across multiple ports, this configuration will give both redundancy and performance gains when configured properly.

Table 1 Sample configurations

NICs	VMkernel ports
2 physical 1GbE NICs	2 VMkernel ports (1 per physical NIC)
4 physical 1GbE NICs	4 VMkernel ports (1 per physical NIC)
2 physical 10GbE NICs	2 VMkernel ports (1 per physical NIC)

This provides scalability and performance as the SAN environment grows without having to make changes on each ESXi host.

If more iSCSI connections are desired, follow the above sample configurations to obtain the number of VMkernel ports that match the environment and the number of paths you need to the PS Series SAN.

Always keep in mind the entire infrastructure of the virtual datacenter when deciding on network path and volume count. To see the current connection limits of pools and groups for the Dell PS Series SAN, view the release notes at eqsupport.dell.com (login required).

All of these configurations are done at the iSCSI vSwitch level. This means that once the configuration is completed, the ESXi host will create multiple iSCSI connections to the PS Series SAN. Every new volume will have more iSCSI connections as well. Once this is configured, changes are only required if more NICs are being added or if more or less paths to the storage are needed.



6 Part 1: Configure vSwitches

This paper discusses two ways to configure the virtual switches in ESXi: vSphere Standard Switches (vSS) or vSphere Distributed Switches (vDS). Either method is viable for the environment and will depend on the administrator's familiarity with the method along with the VMware license structure in the environment. Administrators should choose one method and apply it to their entire ESXi cluster for ease of configuration and management. The steps are very similar but will be described in detail for each method.

Note: vDS requires the VMware vSphere Enterprise Plus license.

6.1 vSphere Standard Switch configuration

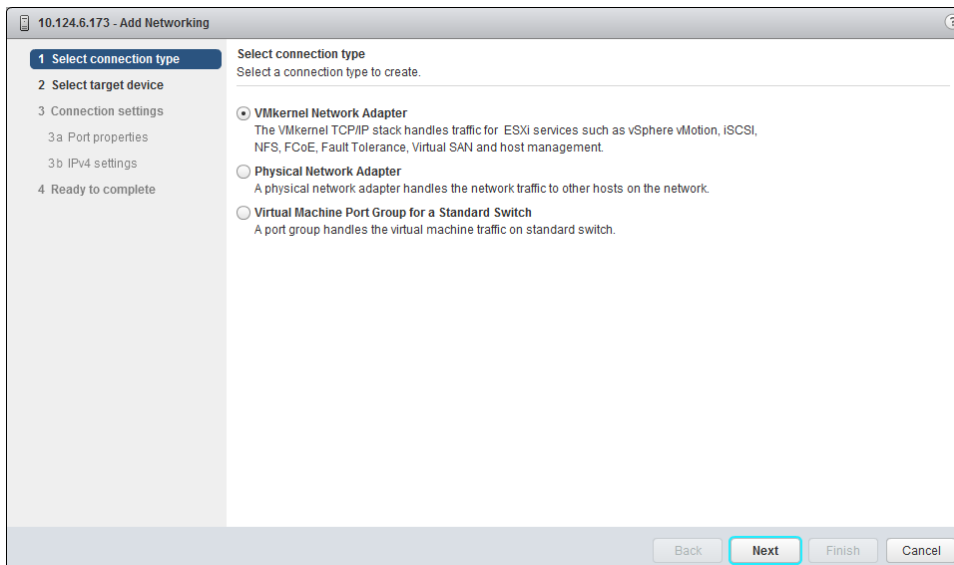
Note: If you are using vDS for iSCSI connectivity, skip these steps and go to the section, vSphere Distributed Switch configuration.

In the following example, an MPIO compatible standard vSwitch with two physical network adapters is created. If adding more than two physical adapters, repeat the relevant steps.

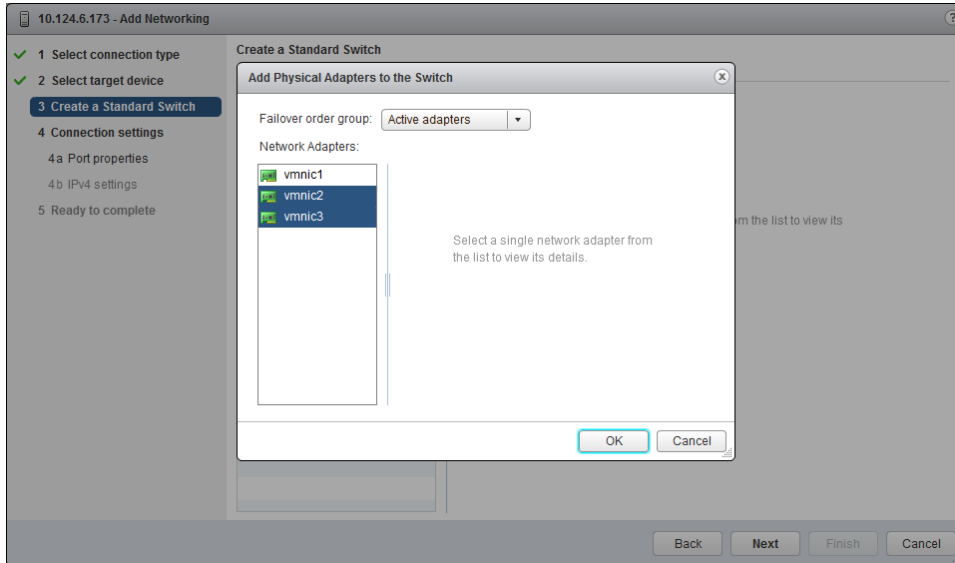
6.1.1 Step 1: Configure standard vSwitch

This step will create a new standard vSwitch designed for use with MPIO iSCSI traffic

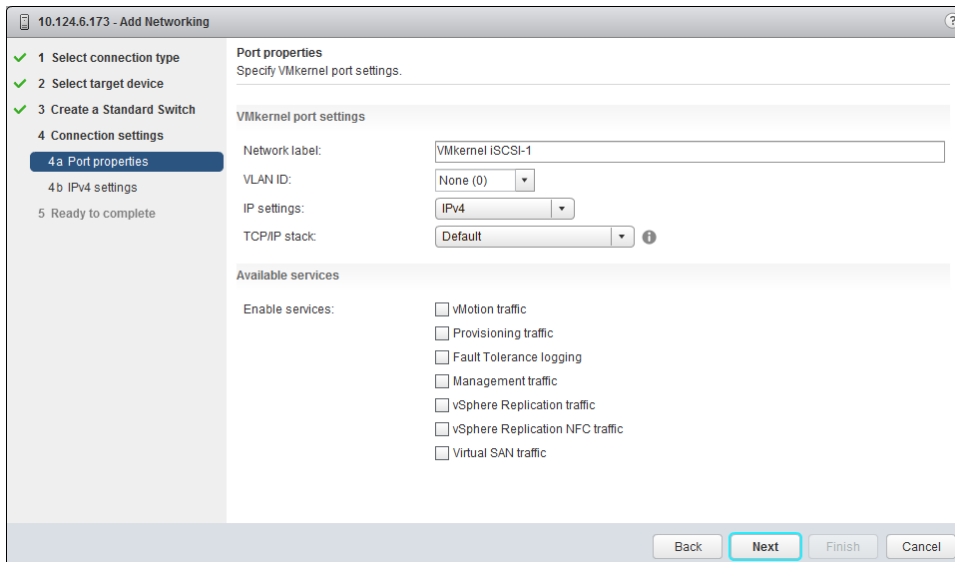
1. From the vSphere Web Client GUI, select the ESXi host to be configured, click the **Actions** drop-down menu, and select **Add Networking**. This brings up the **Add Network Wizard**.
2. Select **VMkernel Network Adapter** and click **Next**.



3. Select the **New Standard Switch** radio box and click **Next**.
4. Click the **Add adapters** icon, the green plus symbol, and select the physical network adapters to add to the vSwitch, making sure to assign the adapters to the Active Adapters. Repeat this step to add additional physical network adapters to the vSwitch.
5. Once all network adapters have been added to the vSwitch, click **Next**.



6. For the **Network Label**, enter **VMkernel iSCSI-1**, and click **Next**.

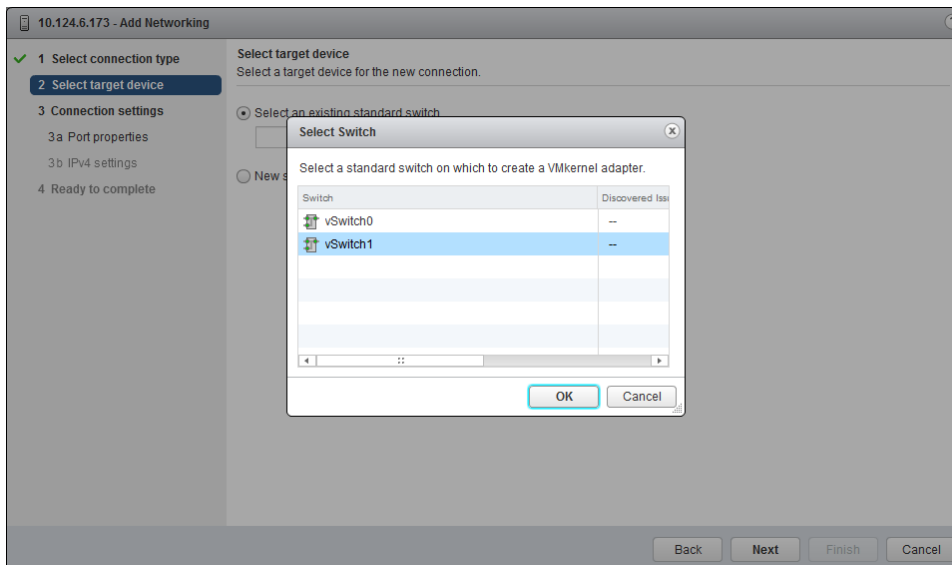


7. Enter in the IP Address and Subnet Mask for the VMkernel iSCSI-1 port. This must be on the same network subnet as the PS Series Group IP Address. Click **Next**.
8. Verify the settings and click **Finish** to complete the vSwitch creation.

6.1.2 Step 2: Add additional iSCSI VMkernel ports

This step assigns additional iSCSI VMkernel ports to the new vSwitch. It also assigns the IP addresses to the iSCSI VMkernel ports. Each additional VMkernel port needs its own IP address, must be on the same subnet as each other, and must be on the same subnet as the PS Series group IP address.

1. Click the **Actions** drop-down menu and select **Add Networking**.
2. Select **VMkernel Network Adapter** and click **Next**.
3. Choose **Select an existing standard switch**, click **Browse**, and select the vSwitch created in the previous step (in this example, **vSwitch1**). Click **OK** and then click **Next**.



4. For the **Network Label**, enter **VMkernel iSCSI-2** and click **Next**.
5. Enter the IP address and subnet mask for the VMkernel iSCSI-1 port. This must be on the same network subnet as the PS Series group IP address. Click **Next**.
6. Verify the settings and click **Finish** to complete the vSwitch creation.

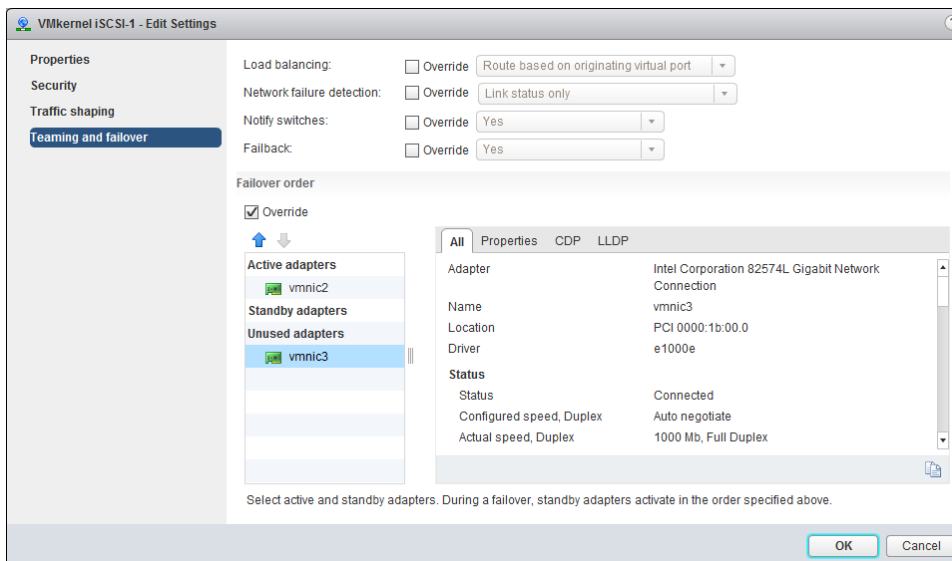
At this point, you have created a standard vSwitch with two VMkernel ports. However, for iSCSI MPIO to function, the VMkernel ports must have only one physical network adapter to route their traffic out. The next step adjusts the failover order to resolve this.

6.1.3 Step 3: Associate VMkernel ports to physical adapters

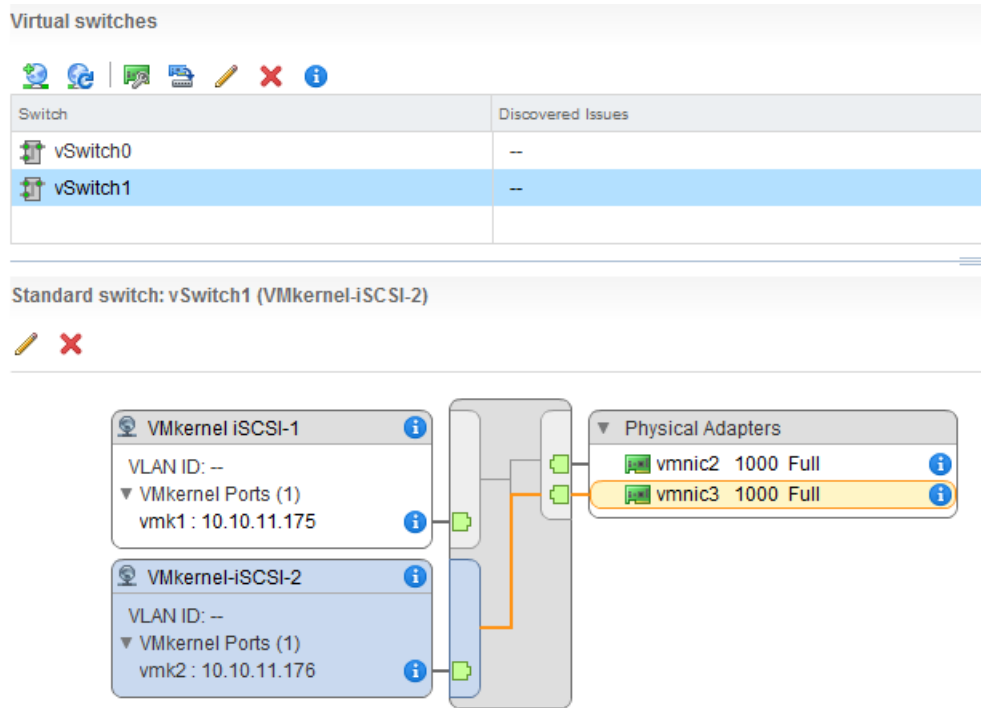
This step creates the individual 1:1 mapping of each VMkernel port to a network adapter. This is required so that MPIO protocols like VMware Round Robin or Dell PS Series MEM can correctly route I/O through the VMkernel port and out from a particular physical network adapter, and therefore correctly load-balance across the available paths.

From the previous step, there are two or more iSCSI VMkernel ports and two or more network adapters. This section assigns each iSCSI VMkernel port one network adapter by modifying the failover order.

1. Select the host, click the **Manage** tab, and then click the **Networking** button.
2. Select the vSwitch created previously (in this example, **vSwitch1**), select the VMkernel port **VMkernel iSCSI-1**, and click the **Edit Setting** icon on the left.
3. Click the **Teaming and failover** link, and then in the **Failover order** pane, check the **Override** checkbox.
4. Select the network adapters that are not going to be assigned to the VMkernel (vmnic3 in this example), and click the down arrow button until it is listed under **Unused adapters**.
5. When this is completed click **OK**.



- Repeat these steps for each iSCSI VMkernel, mapping a different network adapter to each VMkernel port. In the examples shown, VMkernel iSCSI-1 is mapped one-to-one with vmnic2, and VMkernel iSCSI-2 is mapped one-to-one with vmnic3.

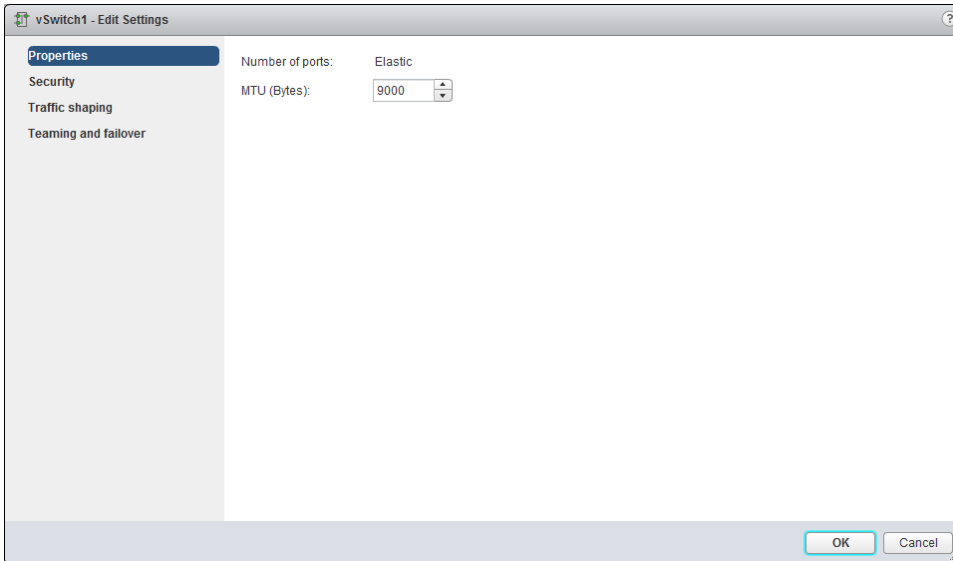


6.1.4 Step 4: Configure Jumbo Frames

In order for Jumbo Frames to work, it must be enabled end-to-end, on both the physical and virtual network infrastructure, or the frame size will fall back to standard frames. PS Series arrays have Jumbo Frames enabled by default. Verify with your network administrator that the network fabric has Jumbo Frames enabled.

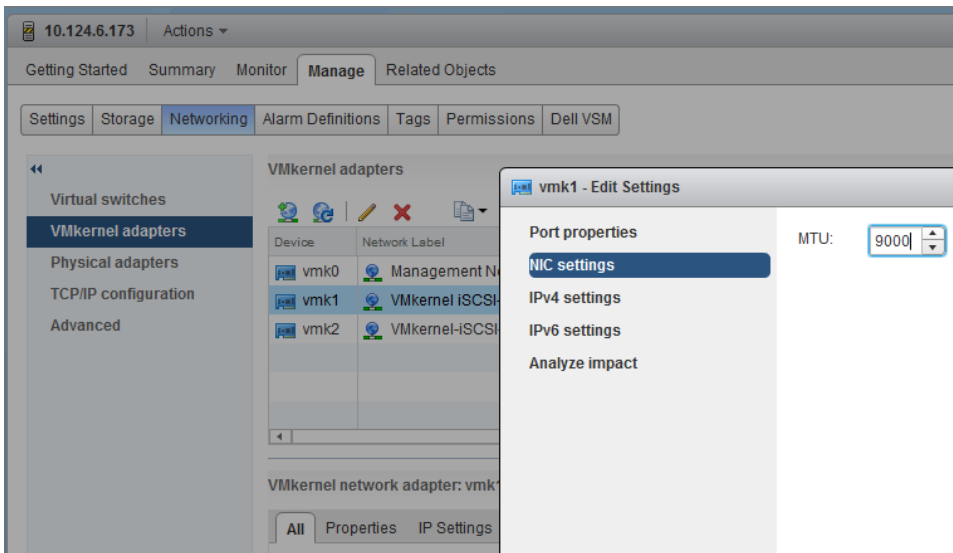
For Jumbo Frames to be enabled for iSCSI traffic on an ESXi host, it must be enabled on both the vSwitch used for iSCSI and all VMkernel ports that will carry iSCSI traffic.

- Select the host, click the **Manage** tab, and then click the **Networking** button.
- Select the previously created vSwitch from the Switch list (in this example **vSwitch1**), then click the **Edit Setting** icon above it.
- In **Edit Setting** under **Properties**, change the **MTU** from the default of **1500** to **9000**, and click **OK**.



For each of the VMkernel ports, Jumbo Frames must also be enabled.

1. Select **VMkernel adapters**, select one of the VMkernel ports from the vSwitch configured for iSCSI (vSwitch1 in this this example), then click the **Edit Setting** icon above it.
2. Under **NIC settings**, change the **MTU** from the default of **1500** to **9000** and click **OK**.



3. Repeat this for each of the VMkernel ports assigned to iSCSI.



6.2 vSphere Distributed Switch configuration

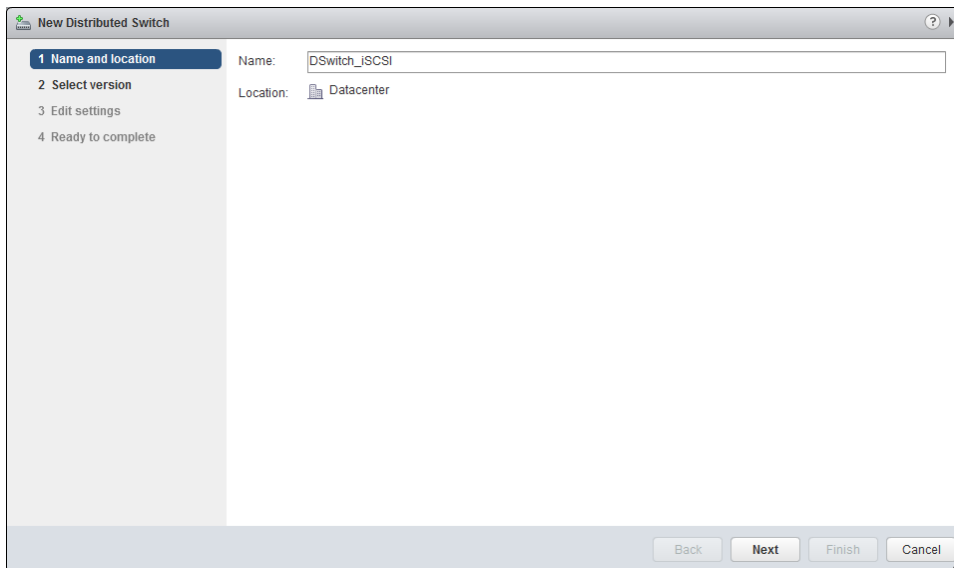
Note: If you are using vSS, skip this section and go to Part 2: Configure VMware iSCSI software initiator.

Some environments utilize vSphere Distributed Switches (vDS) for network connections and management. One of the benefits to a vDS is the ability to create and configure a single network profile and then attach multiple hosts to this configuration.

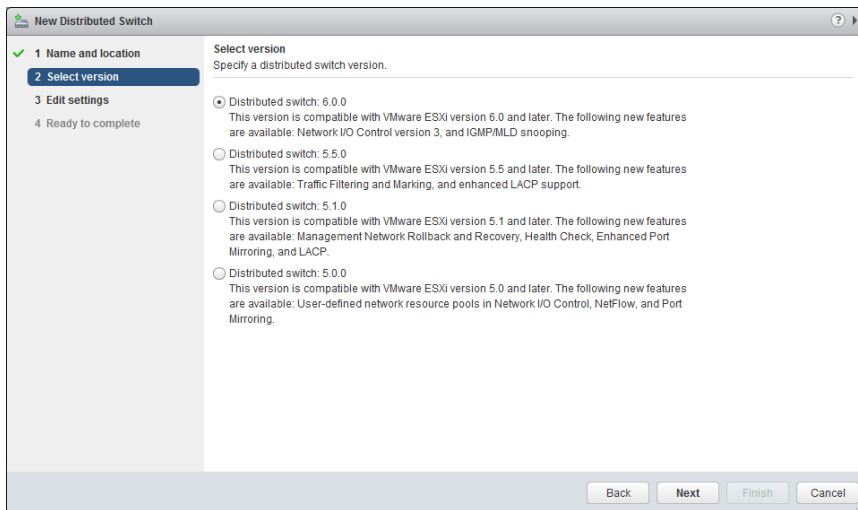
Note: vSphere Distributed Switches require Enterprise Plus licensing.

6.2.1 Step 1: Configure vSphere Distributed Virtual Switch

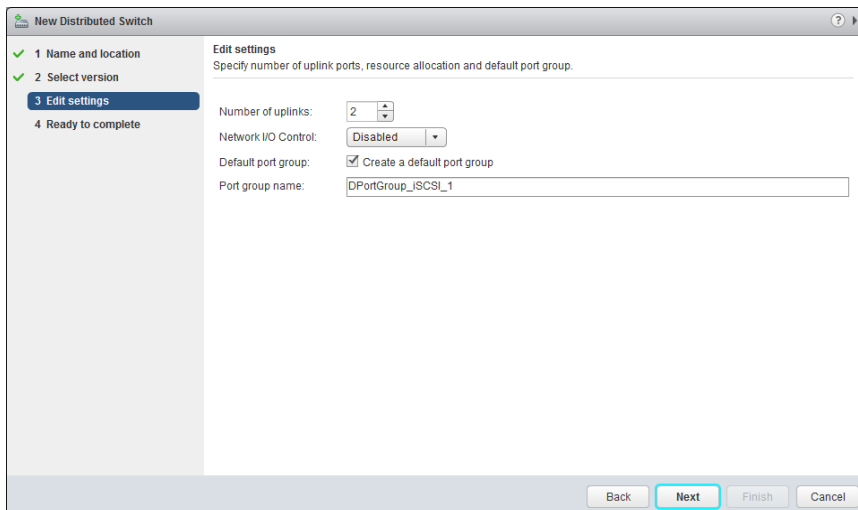
1. In vSphere Web Client, select the data center from the pane on the left. Click the **Related Objects** tab, and then click the **Distributed Switches** button.
2. From the icon toolbar, click the **Create a new distributed switch** icon (it is the first icon).
3. On the **Name and location** page, in the **Name** textbox, enter a name for the new distributed switch (in this example, DSwitch_iSCSI is used). Click **Next** to continue.



4. On the **Select version** page, select the newest version possible. If the environment is a mix of ESXi versions, select the oldest version in the environment that will be connected to this distributed switch. Click **Next** to continue.



5. On the **Edit settings** page there are several values to change:
 - a. Set **Number of uplinks** to the maximum number of physical network adapters to be used for iSCSI (this example uses two).
 - b. Set **Network I/O Control** to **disabled**. Network I/O Control is used when a variety of different kinds of traffic are sharing the same physical infrastructure, and it enables the prioritizing of one type of traffic over another. For iSCSI, it is recommended to use dedicated network adapters and switches.
 - c. Leave the **Create a default port group** checkbox checked, and change the **Port group name** to **DPortGroup_iSCSI_1**. A later step adds the additional port groups and modifies the failover order to permit iSCSI binding.
 - d. Click **Next** to continue.



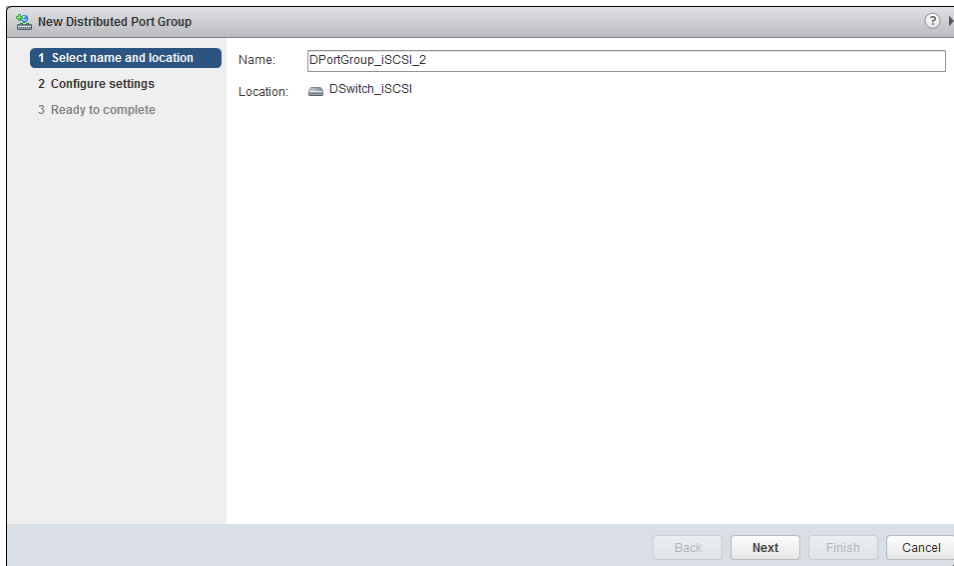
6. On the **Ready to complete** page, review the setting, and click **Finish** to continue.



6.2.2 Step 2: Add additional port groups

The next step creates and configures the additional port groups used to assign the VMkernel ports to. You will need to have one port group for every physical NIC you are using for iSCSI.

1. Returning to the icon toolbar, click the **Create a new distributed port group** icon (it is the second icon).
2. On the **Select name and location** page, change the **Name** to **DPortGroup_iSCSI_2**, and click **Next** to continue.



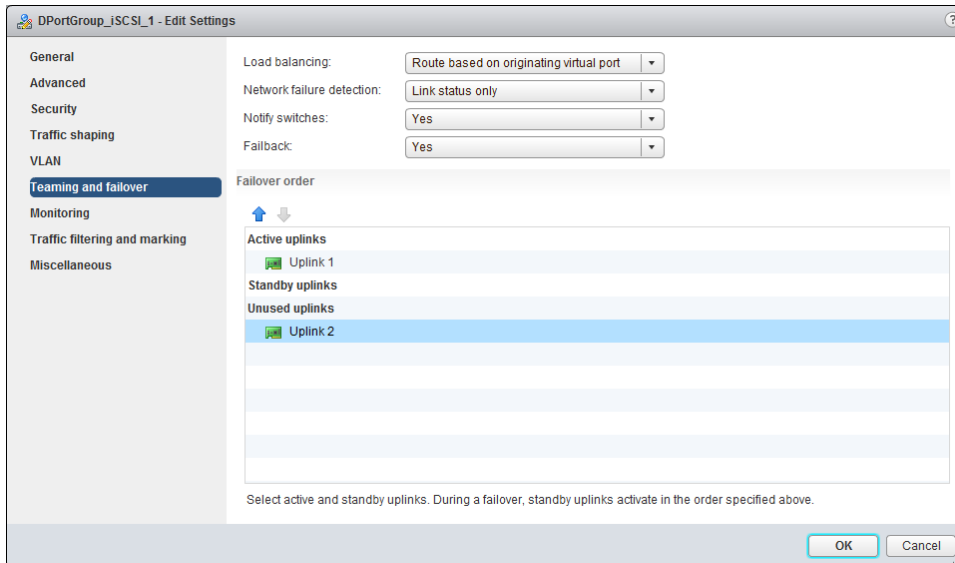
3. On the **Configure settings** page, change nothing and click **Next** to continue.
4. On the **Ready to complete** page, review the settings and click **Finish**.
5. Repeat these steps to add additional port groups as needed for your environment if utilizing more than two NICs for iSCSI.

6.2.3 Step 3: Modify the port group failover order

For iSCSI multipathing there must be only one physical uplink that the VMkernel port is attached to. By default, a VMkernel port is attached to all uplinks in the vDS. This example maps DPortGroup_iSCSI_1 to Uplink 1, and DPortGroup_iSCSI_2 to Uplink 2.

1. Continuing from the data center **Related Objects** tab, select the **Distributed Port Groups** button.
2. Select the first distributed port group (DPortGroup_iSCSI_1 in this example), and click the **Edit distributed port group setting** icon from the toolbar (is it the second icon).
3. From the **Edit Settings** wizard, select the **Teaming and failover** page.
4. In the **Failover order** pane, all the uplinks associated with this distributed port group, DPortGroup_iSCSI_1, are listed under the **Active uplinks** section in which there must only be one active uplink for multipathing iSCSI.

5. Select **Uplink 2** and click the down-arrow button to move it to the **Unused uplinks**. If there are additional uplinks, they must also be moved. Click **OK** to apply the change.



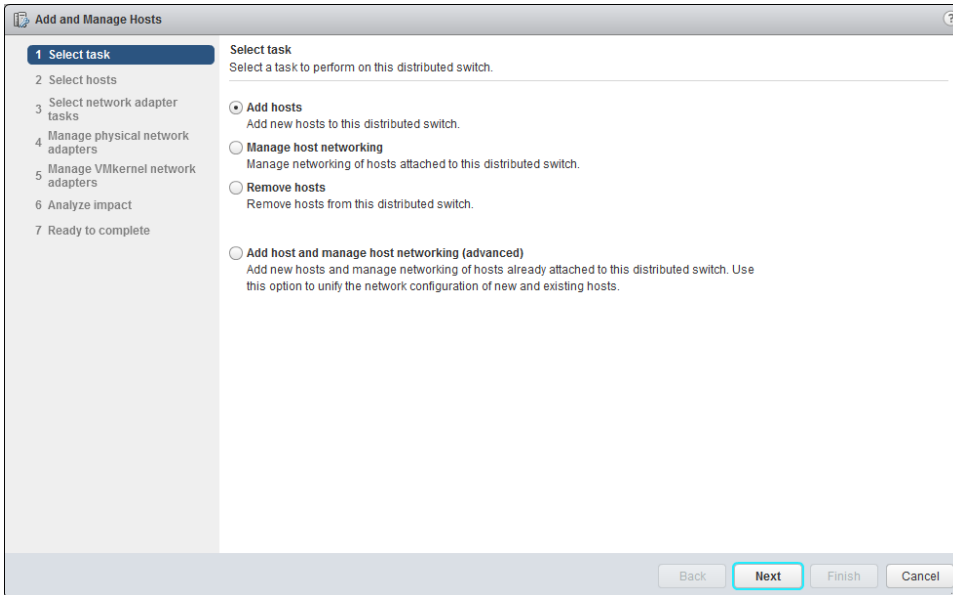
6. Repeat these steps on each of the distributed port groups created for iSCSI until each port group and uplink has a one-to-one mapping.

6.2.4 Step 4: Add the VMkernel adapters to the vDS

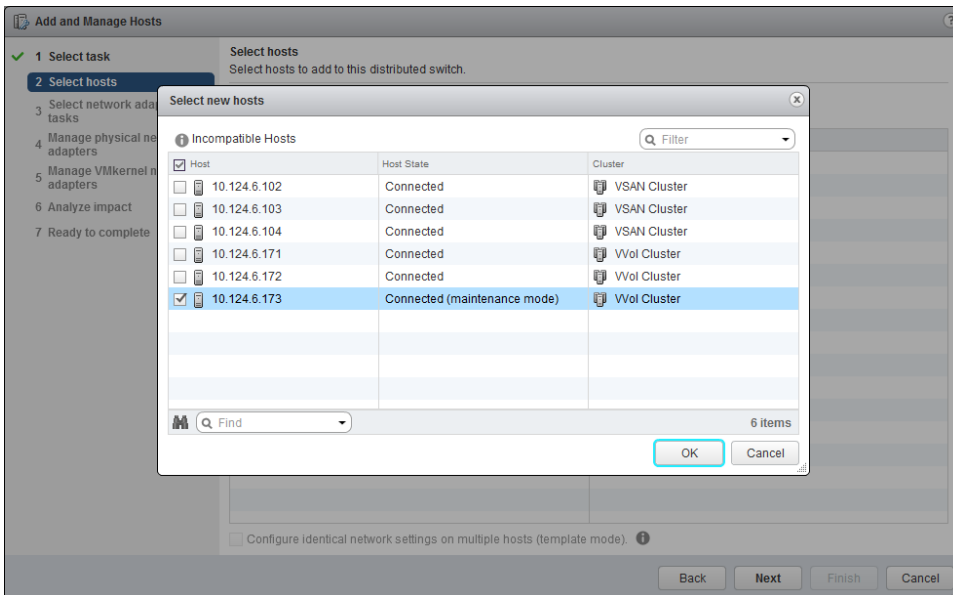
This step adds the vDS to a host and creates VMkernel ports which will be linked 1-to-1 to a particular distributed port group. The step consists of the following phases: selecting a host, selecting which network adapters on that host to use, and adding the VMkernel adapters to the vDS.

1. Return to the **Distributed Switches** button, select the previously created vDS (**DSwitch_iSCSI**), and click the icon, **Add hosts to this distributed switch and migrate physical or virtual network adapters** (the fourth icon on the toolbar).

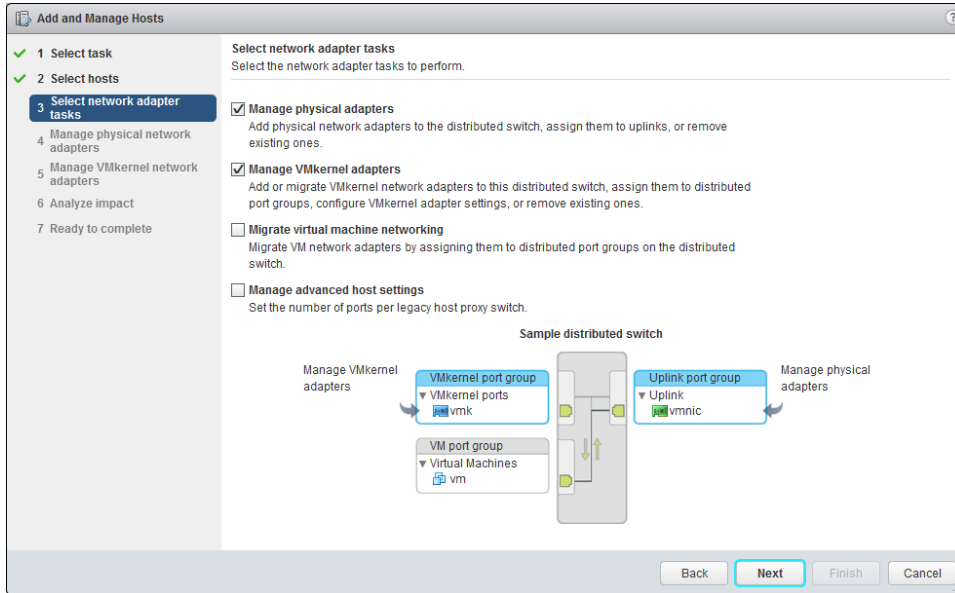
2. On the **Select task** page, select the **Add hosts** radio button and click **Next** to continue.



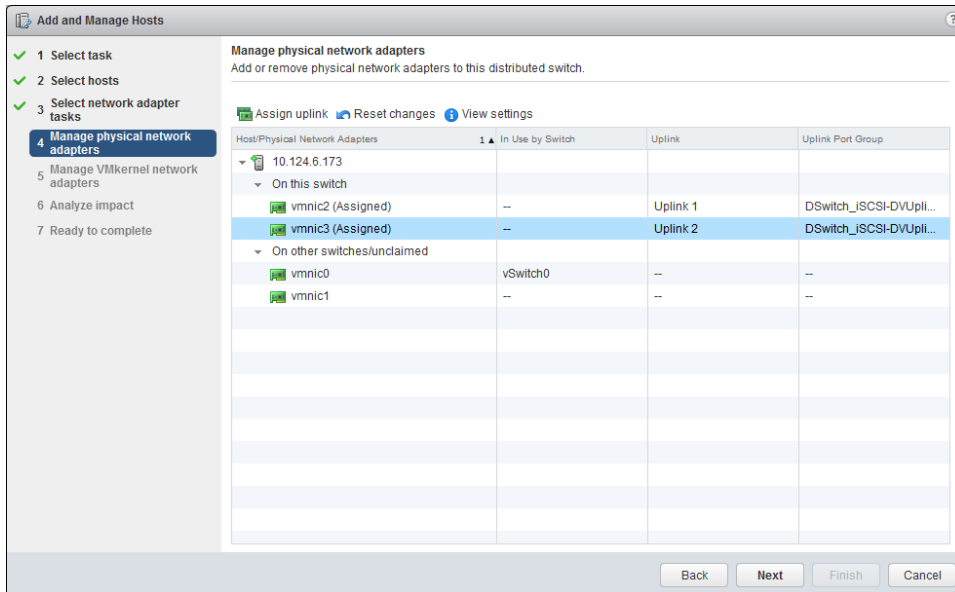
3. On the **Select hosts** page, click the **New hosts** button. From the new dialog box, select at least one ESXi host in the data center, and then click **OK**. Click **Next** to continue.



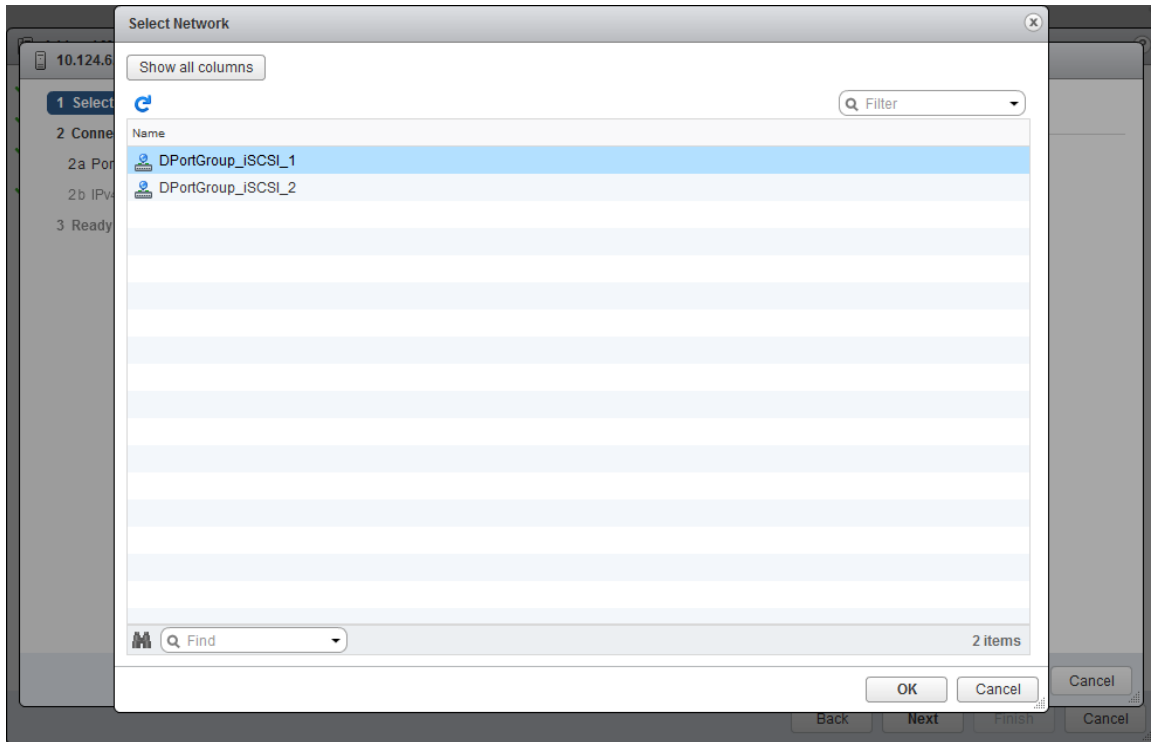
- On the **Select network adapter tasks** page, check the checkboxes for **Manage physical adapters** and **Manage VMkernel adapters**, then click **Next** to continue.



- On the **Manage physical network adapters** page, select one of the network adapters (referred to as vmnic) that are to be used for iSCSI and click the **Assign uplink** button. On the popup dialog box, select the uplinks and click **OK**. In this example **vmnic2** has been assigned to **Uplink 1**, and **vmnic3** will be assigned to **Uplink 2**.



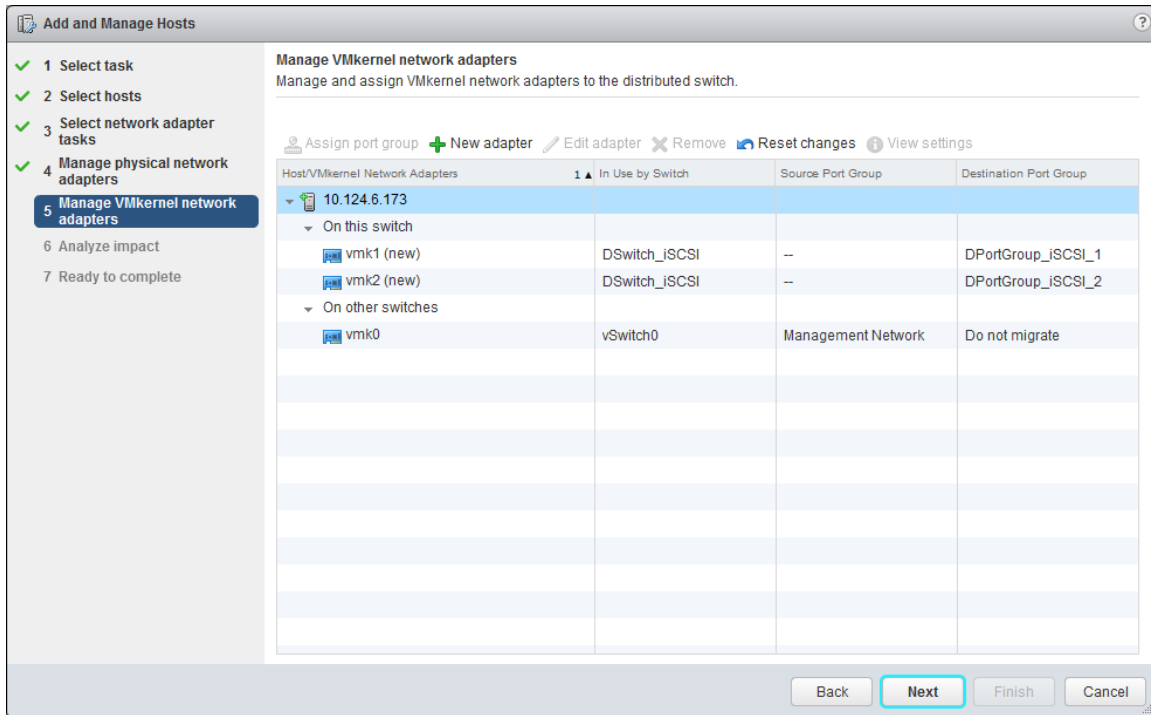
6. Click **Next** to continue.
7. On the **Manage VMkernel network adapters** page, click the **New adapter** button. On the new **Add network** dialog box, click the **Browse** button to select an existing network.
8. On the **Select Network** dialog box, select one of the port groups created for iSCSI to which the new VMkernel will be attached to.



9. Click **OK** to return to the **Add Networking** dialog box.
10. On the **Port properties** page, choose **IPv4** or **IPv6** from the **IP settings** dropdown menu, and click **Next** to continue. No other setting needs to be changed on this page for iSCSI.
11. Enter the IP address to be assigned to the VMkernel port, and click **Next** to continue.
12. On the **Ready to complete** page, review the setting selected, and click **Finish** to continue.

Repeat steps 6 through 10 for each VMkernel adapter to be created. In step 7, make sure to not select a port group that has previously been assigned to a VMkernel port.

- Once all the VMkernel ports have been created and assigned to a port group, click **Next** to continue.



- On the **Analyze impact** page, review the status and resolve any issues that may be outstanding. Click **Next** to continue.
- On the **Ready to complete** page, review the chosen setting and click **Finish**.

6.2.5 Step 5: Configure Jumbo Frames

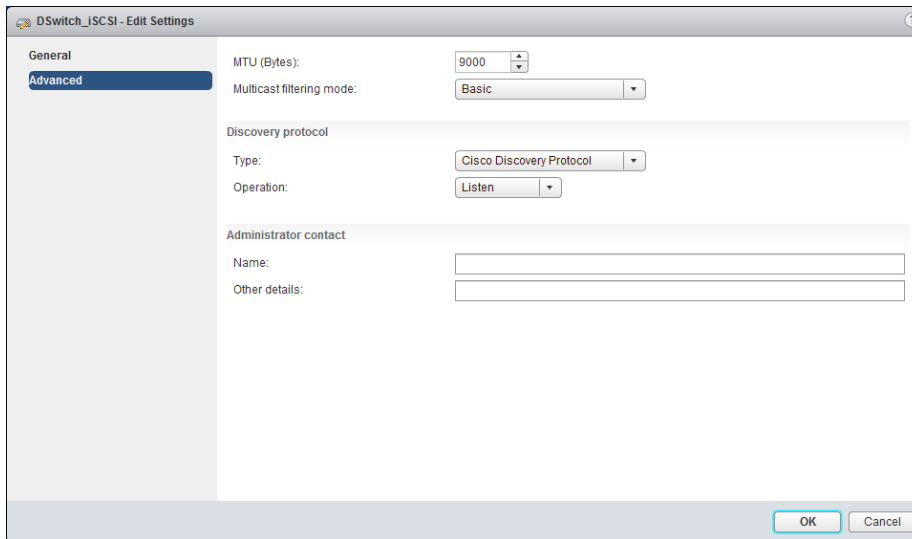
In order for Jumbo Frames to work, it must be enabled end-to-end on both the physical and virtual network infrastructure, or the frame size will fall back to standard frames. PS Series arrays have Jumbo Frames enabled by default. Verify with your network administrator that the network fabric has Jumbo Frames enabled.

For Jumbo Frames to be enabled for iSCSI traffic on an ESXi host, it must be enabled on the distributed vSwitch used for iSCSI and on all VMkernel ports that will carry iSCSI traffic.

To enable Jumbo Frames on the vDS:

- Start from the data center object under the **Networking** inventory view, select the **Related Objects** tab, select the **Distributed Switches** button, and select the **Edit distributed switch setting** icon (the fifth icon on the toolbar).
- On the **Edit Setting** page, select **Advanced**.
- Change the **MTU** setting from the default of **1500** to **9000**.

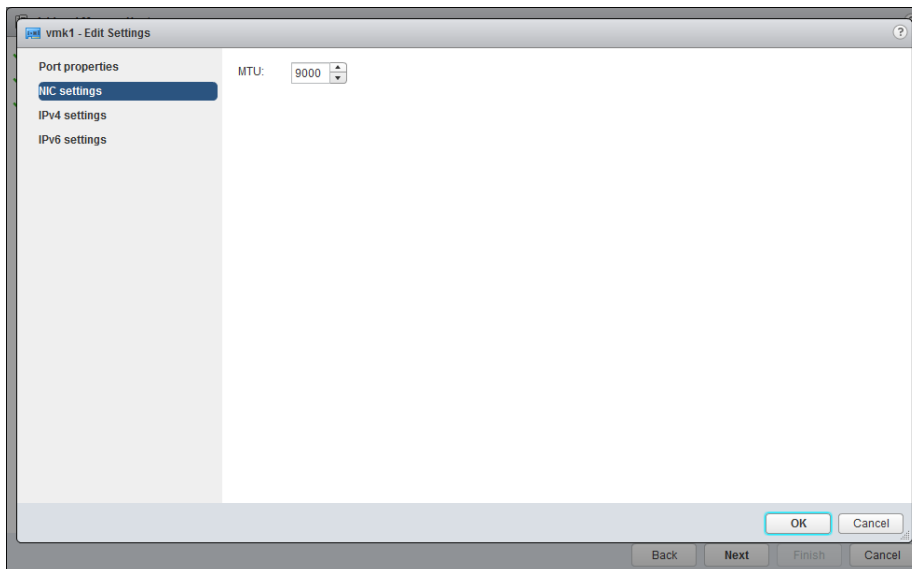




4. Click **OK** to apply.

To enable Jumbo Frames on the VMkernel ports:

1. Select the **Hosts and clusters** inventory view, and select the individual host with the VMkernel ports you wish to enable Jumbo Frames on.
2. Select the **Manage** tab, then the **Networking** button, and click **VMkernel adapters**.
3. Select one of the VMkernel ports assigned to iSCSI, and then click the **Edit setting** icon (the third icon on the toolbar).
4. From the **Edit setting** wizard, select **NIC settings**.
5. Change the **MTU** setting from the default of **1500** to **9000**.



6. Click **OK** to apply.
7. Repeat these steps for each VMkernel assigned to iSCSI.



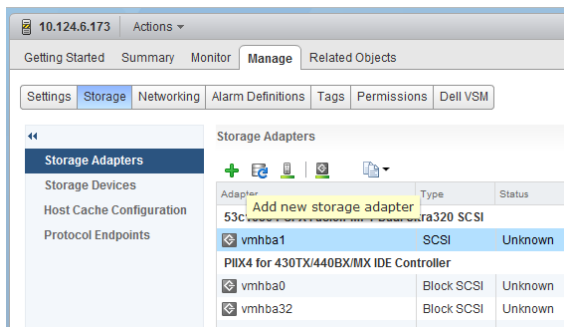
7 Part 2: Configure VMware iSCSI software initiator

Now that the virtual switch (vSS or vDS) is configured and the VMkernel ports are bound to physical NICs in a 1:1 fashion, the next thing to configure is the iSCSI initiator. This section details the enablement and configuration of the VMware iSCSI software initiator. These steps are done on each ESXi host that needs connectivity to the SAN.

7.1.1 Step 1: Enabling the iSCSI software initiator

VMware ESXi does not enable the iSCSI software initiator by default, and it can be enabled using the following steps:

1. From the vCenter Web Client GUI, select the ESXi host, select the **Manage** tab, click the **Storage** button, and then select **Storage Adapters**.
2. Click **Add new storage adapter** (the green plus button), and select **Software iSCSI Adapter**.



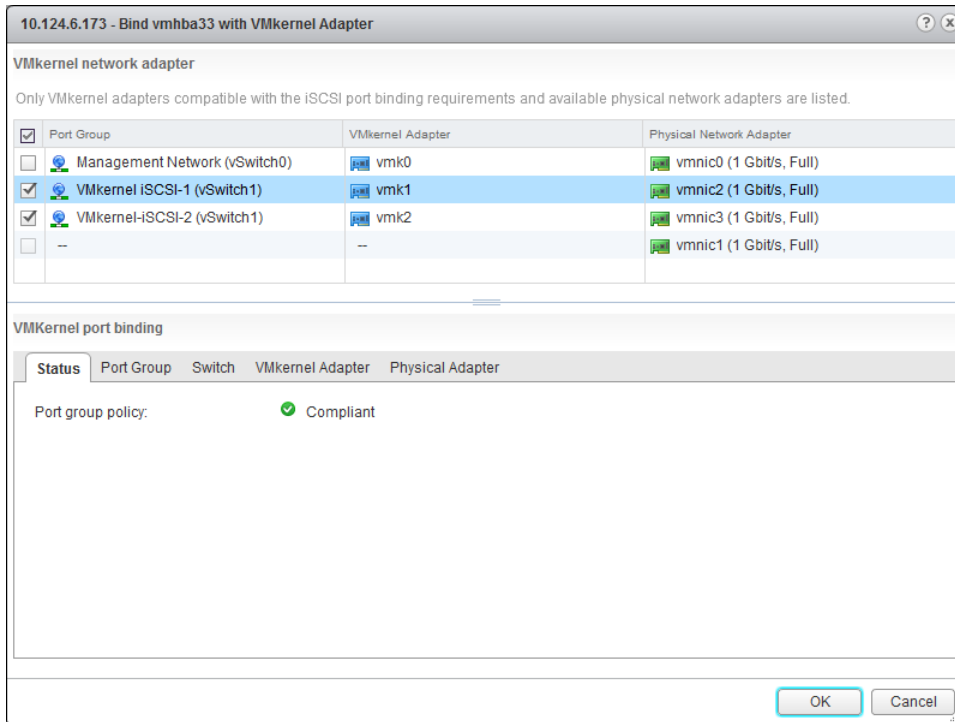
3. Click **OK** on the **Add Software iSCSI Adapter** dialog box.

7.1.2 Step 2: Binding VMkernel Ports to the iSCSI software initiator

The next step is to bind each of the iSCSI VMkernel ports to the iSCSI software adapter. This indicates to the iSCSI software monitor adapter which VMkernel ports to use for connectivity to the SAN.

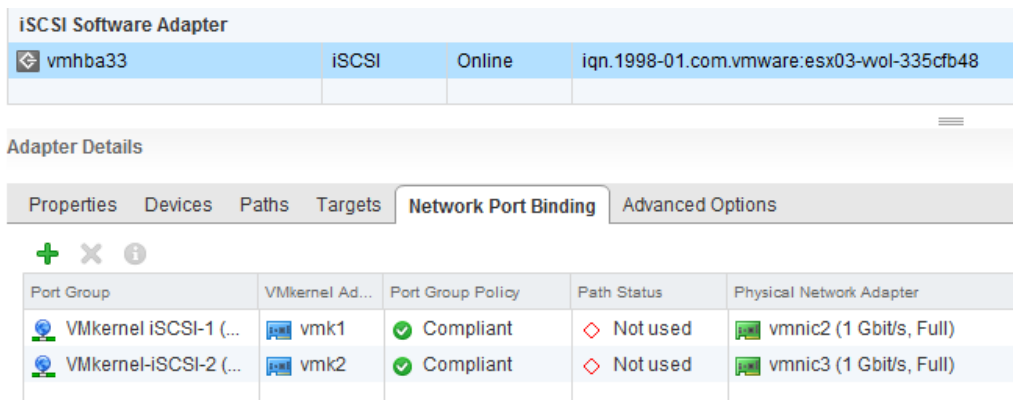
1. Continuing from the previous section, select the newly enabled **iSCSI Software Adapter** from the **Storage Adapters** list. Select the **Network Port Binding** tab, and then click the **Add** button (the green plus icon).

- From the list of VMkernel network adapters, select the ones created for iSCSI (in this example, vmk1 and vmk2) and click **OK**.



Note: After the addition of the VMkernel ports to the iSCSI initiator, the vSphere Web Client may recommend a rescan of the storage adapter. As additional changes are yet to be made, this can be ignored at this time.

- When the VMkernel network adapters are added to the iSCSI software adapter, vSphere will display **Compliant** in the **Port Group Policy** if they are correctly configured. It will also display which physical NIC each one is bound to. Path status will show **Not used** until volumes are attached.



8 Part 3: Connect to Dell PS Series SAN

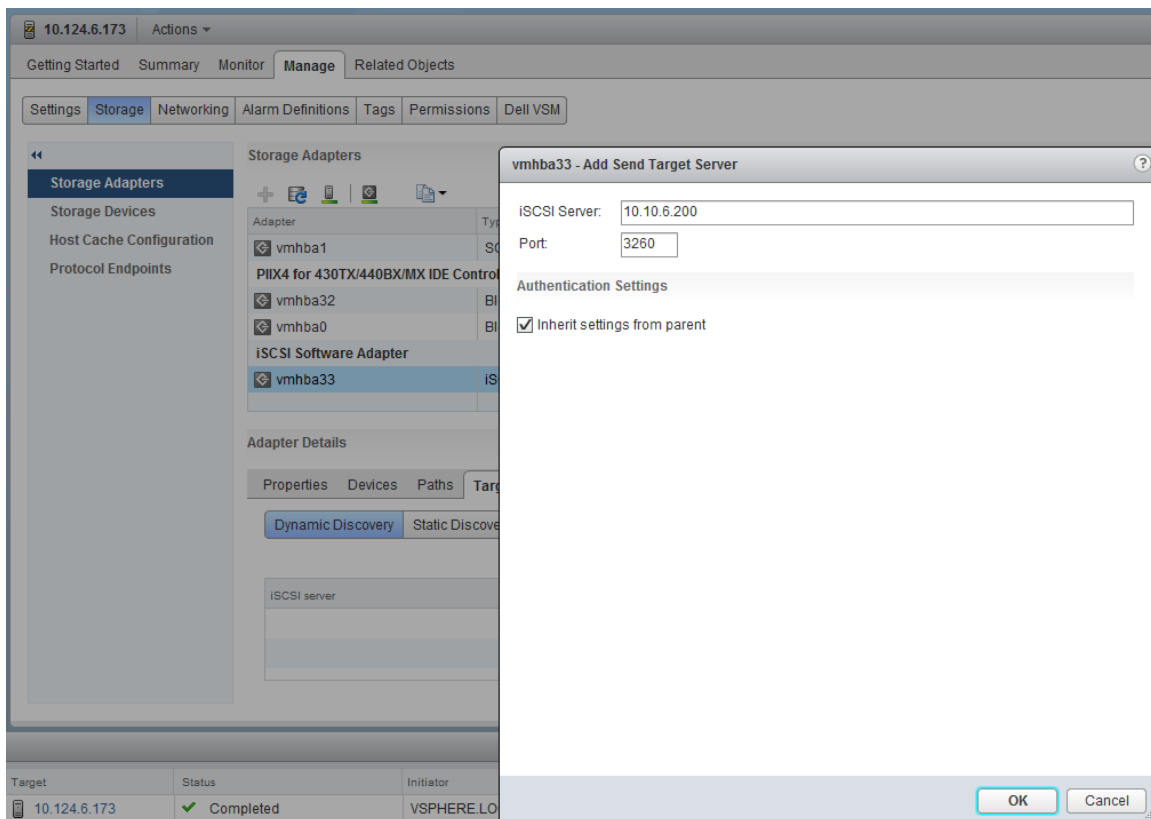
Now that the configuration for the vSphere iSCSI software initiator has been completed, the next stage is to connect to the Dell PS Series SAN and to the volumes it contains.

This example attaches the iSCSI software initiator to the SAN and to a single volume. For more information on complete administration of the Dell PS Series SAN, see the *Dell EqualLogic Group Manager Administrator's Guide* available on eqlsupport.com (login required).

8.1.1 Step 1: Configure dynamic discovery of the PS Series SAN

The first step adds the PS Series group IP address to the dynamic discovery of the ESXi host iSCSI software initiator. This is done to enable rescans to find new volumes that the ESXi host has access rights to.

1. Continuing from the previous steps, select the **Targets** tab from the selected **iSCSI Software Adapter**.
2. Click the **Dynamic Discovery** button, and then click the **Add** button.
3. On the **Add Send Target Server** dialog box, enter the group IP address of the PS Series SAN in the **iSCSI Server** text box, and click **OK**.



4. vSphere will prompt for a rescan of the storage adapter due to the recent configuration changes. If there are no volumes configured on the PS Series array for this ESXi host to access, there is no need to perform this rescan. To perform a rescan, click the **Rescan** button (the forth icon on the toolbar).

8.1.2 Step 2: Create and configure a volume

The next step creates a new volume and assigns it to the ESXi host. There are multiple ways to do this, so refer to the *Group Manager Administrator's Guide* for more information. This can also be done from directly within the vSphere Web Client using the Dell Virtual Storage Manager plugin and completed in only a few clicks. For details, see the document, [Dell Virtual Storage Manager: Installation Considerations and Datastores Manager](#).

This example creates a 500GB volume and assigns it to this ESXi host through an IP-based basic access point. For a more detailed discussion on volume access control, see the document, [Access Control Policies](#), and the firmware *Group Manager Administrator's Guide*.

1. From the Dell PS Series Group Manager web GUI, click the **Volumes** button in the lower left pane, and then click the **Create volume** link in the **Activities** pane.

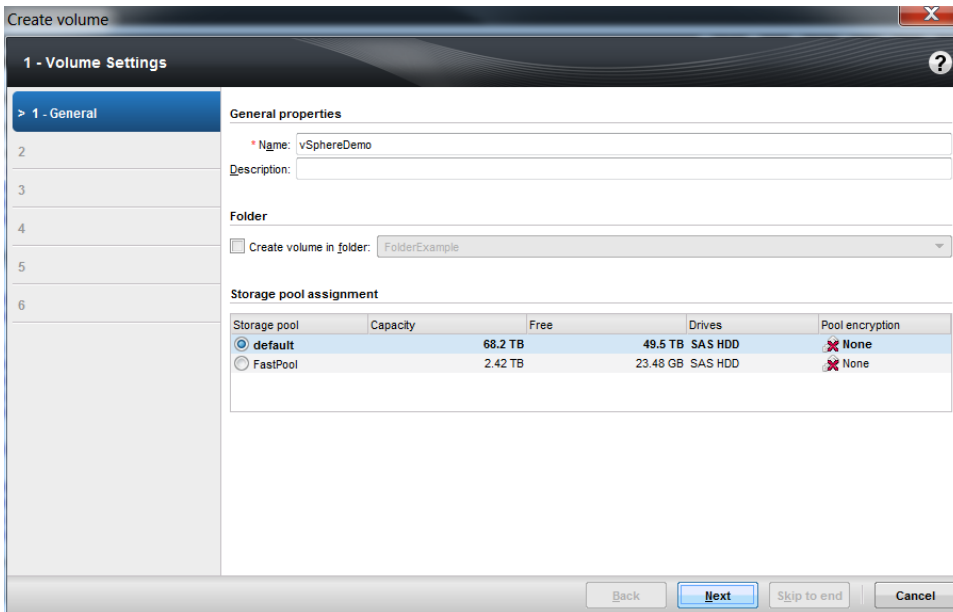
The screenshot displays the Dell EqualLogic Group Manager web GUI. The interface is divided into several sections:

- Left Pane (Navigation):** Shows a tree view with 'Group T1MProd' expanded to 'Volumes', 'Volume Collections', and 'Custom Snapshot Collections'.
- Top Bar:** Features the Dell logo and the text 'EqualLogic Group Manager'.
- Activities Pane:** Contains a 'Volumes' section with links for 'Create volume', 'Create volume folder', 'Manage recovery bin', and 'Manage tags'. Below it is a 'Volume Legac...' section with links for 'Modify settings', 'Modify tags', 'Clone', 'Set offline', 'Set access type', 'Delete volume', 'Convert to template', and 'Move volume'.
- Main Content Area:** Displays a 'Volumes' overview with statistics: 'Total volumes: 11', 'Online volumes: 11', and 'Volumes not shown: 0'. It includes a 'View: Overview' dropdown and a 'Filter by tag' section with 'Settings' and 'Pick tag columns...' options. Below is a table of volumes.

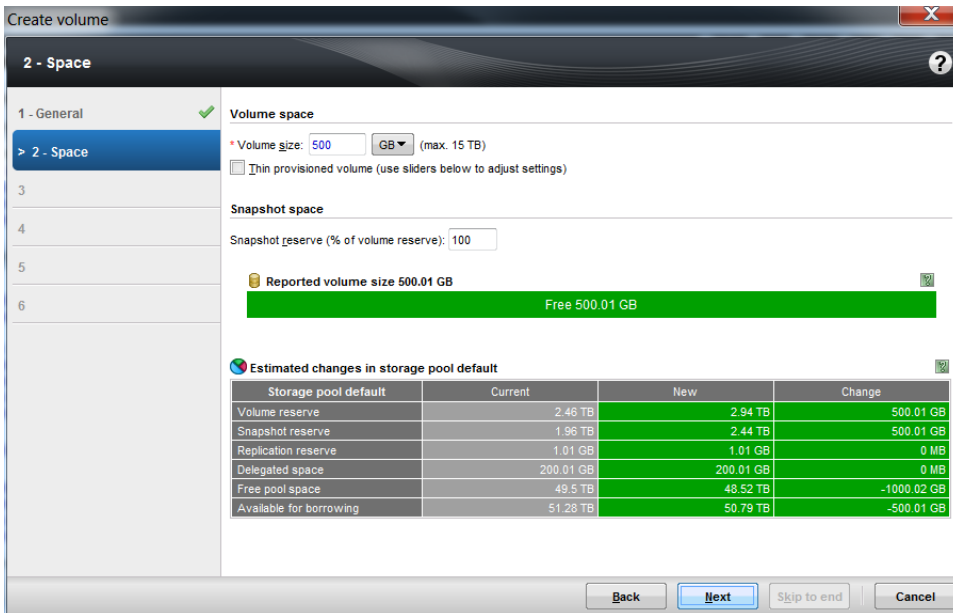
Volume	Status	Storage pool
LegacyVolume	online	default
SpaceBorrow	online	default
VMFS01	online	default
VMFS02	online	default
VMFS03	online	default
VMFS04	online	default
VMFS05	online	default
VMFS06	online	default
VMFS07	online	default
VMFS08	online	default



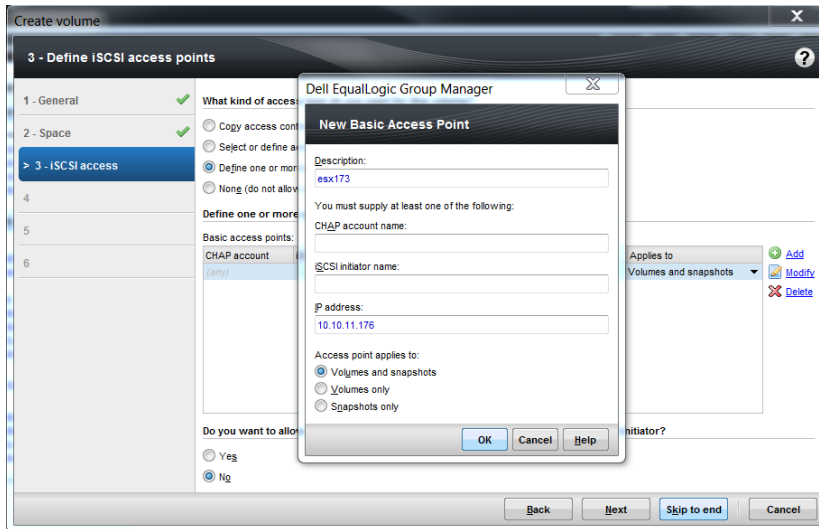
- The first step in the **Create Volume** wizard is provide a volume name and select which pool to place the volume. In this example, a name of **vSphereDemo** has been used, and the volume has been placed in the default pool. Click **Next**.



- Set the volume size (500GB in this example), options for enabling thin provisioning, and snapshot reserve space. Click **Next** to continue.

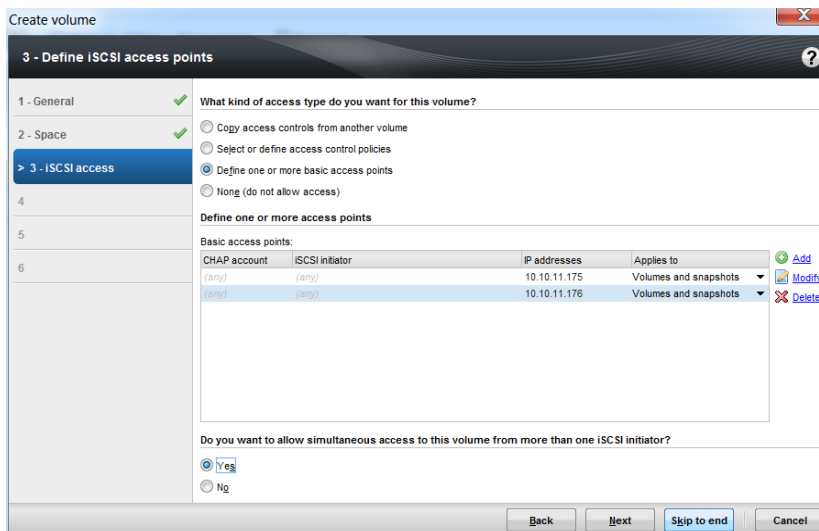


- This example creates a basic access point using IP access controls, and assigns the IPs used in the previously created standard iSCSI vSwitch. Select the **Define one or more basic access points** radio button, and then under **Define one of more basic access points** pane, click **Add**. In the **New Basic Access Point** dialog window, in the **IP address** field, enter the IP address assigned to the first VMkernel port in the previously created iSCSI vSwitch and click **OK**. Repeat this step for each VMkernel port in the host assigned to iSCSI vSwitch.



Note: There are many options for defining access to an iSCSI volume, and this is beyond the scope of the document. Refer to the firmware Group Administrators Guide and the document, [Access Control Policies](#), for additional information.

- Select the **Yes** radio button to **allow simultaneous access to the volume from more than one initiators**. This option is necessary to enable the multiple ESXi hosts in the vSphere cluster to access to this volume at the same time.



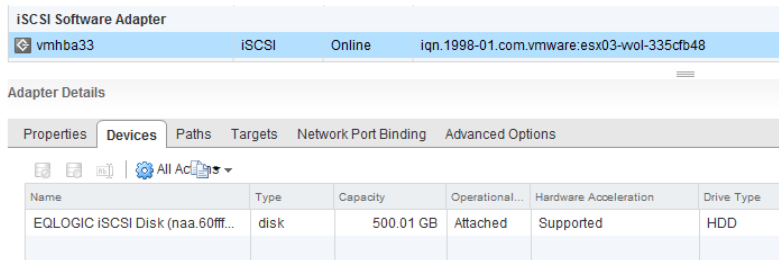
6. Click the **Skip to end** button to skip the optional Tags and Sector size page, and review the content on the **Summary** page.
7. Review the volume creation information on the **Summary** page and click **Finish**.

The volume will now be created on the PS Series array.

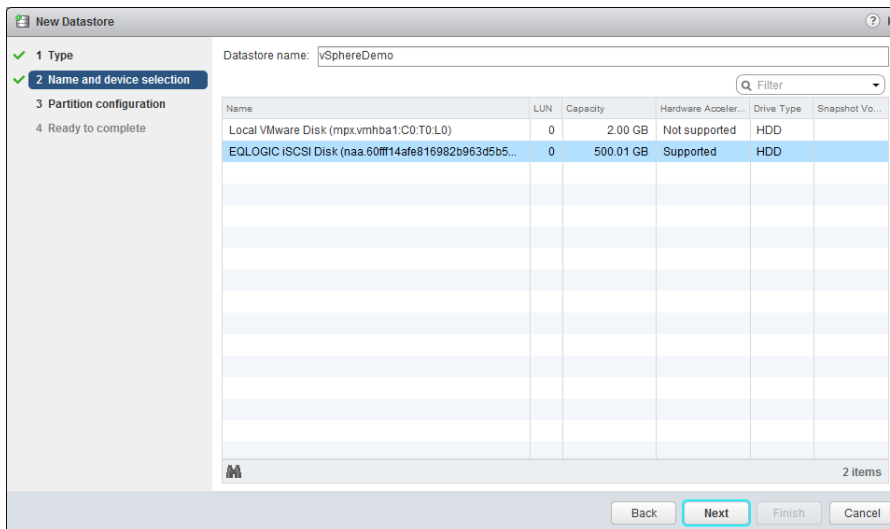
8.1.3 Step 3: Connect to a volume on PS Series SAN

The next step connects to the volume on the SAN and verifies the connection status. Since the iSCSI access and configuration was completed in the last step, the remaining step involves rescanning the storage adapter on the ESXi host and making sure the volume appears correctly.

1. Return to the vSphere Web Client **Hosts and Clusters** inventory view and select the ESXi host.
2. In the **Actions** drop-down menu, click **Storage**, and then click **Rescan Storage**.
3. On the **Rescan Storage** dialog box, leave the boxes checked, and click **OK**.
4. Once the rescan is completed, a new EQLOGIC iSCSI Disk will be listed under the iSCSI Software Adapter **Devices** tab.



5. Click the **Actions** dropdown, select **Storage**, and select **Add Datastore**.
6. For the datastore **Type**, select **VMFS**, and click **Next** to continue.
7. In the **Datastore name** field, enter a name for the datastore. A common best practice is to use the same name as used on the volume on the array. In this case, **vSphereDemo** is used. Select the recently created EQLOGIC iSCSI Disk, and click **Next** to continue.



8. On the **Partition configuration** page, leave the defaults selected, and click **Next** to continue.



9. On the **Ready to complete** page, review the setting and select **Finish**.

The datastore is now available for use by this ESXi host. To enable other ESXi hosts to access this datastore, it will be necessary to update the volume access controls to include those other hosts, and then perform a rescan of the iSCSI storage adapter on that host.

8.1.4 Step 4: Enabling VMware native multipathing with Round Robin

By configuring the iSCSI software initiator in the previous steps, now we can take advantage of the VMware native MPIO by enabling Round Robin. This advanced feature, combined with the fan-out intelligent design of the PS Series group, allows for greater and better bandwidth utilization.

1. From the vSphere Web Client homepage, select **Storage**, and then select the recently added datastore.
2. From that datastores page, select the **Manage** tab, then the **Settings** button, and finally click on **Connectivity and Multipathing**.
3. Select the hosts to which the datastore is mounted to, and then click the **Edit Multipathing** button to the lower right.
4. From the drop-down menu on the **Edit Multipathing Policies**, select **Round Robin**, and click **OK**. This will configure the initiator to utilize all available paths to the volume for reading and writing I/O for this volume.

Note: These steps needs to be completed for all existing and any new volumes that you want the Round Robin policy to apply to, and on each host in the cluster.

Now the multiple paths that exist to the volume show a **Status of Active (I/O)** for all paths.

The screenshot displays the vSphere Web Client interface for a datastore's 'Connectivity and Multipathing' settings. The 'Path Selection Policy' is configured to 'Round Robin (VMware)'. Below, the 'Paths' section shows a table of active paths:

Runtime Name	Status	Target	LUN	Preferred
vmhba33:C1:T0:L0	Active (I/O)	iqn.2001-05.com.equallogic:0-af1f6-826981fe4-326d6dbab5d5...	0	
vmhba33:C0:T0:L0	Active (I/O)	iqn.2001-05.com.equallogic:0-af1f6-826981fe4-326d6dbab5d5...	0	



9 Summary

This paper has demonstrated proper configuration of the VMware iSCSI software initiator and how to connect it to the Dell PS Series SAN. With all of the advanced vSphere features that rely on shared storage, it is important to follow these steps to enable them in the vSphere environment. Always consult the *VMware iSCSI SAN Configuration Guide* for the latest documentation on configuring vSphere environments.



A Additional resources

A.1 Technical support and customer service

Offering online and telephone-based support and service options, Dell support service can answer your questions about PS Series arrays, groups, volumes, array software, and host software. Availability varies by country and product, and some services might not be available in your area.

Visit Dell.com/support or call 800-945-3355 (United States and Canada).

For international support of Dell PS Series products, visit <http://www.dell.com/support/contents/us/en/555/article/Product-Support/Dell-Subsidiaries/equallogic>

Note: If you do not have access to an Internet connection, contact information is printed on your invoice, packing slip, bill, or Dell product catalog.

For PS Series software and documentation, visit eqsupport.dell.com (login required).

A.2 Dell PS Series storage solutions

To learn more about current and upcoming Dell PS Series solutions, visit the [PS Series Dell TechCenter page](#). Here you can find articles, demos, online discussions, technical documentation, and more details about the PS Series product family.

For PS Series technical content, visit the [PS Series Technical Content](#) page on Dell TechCenter.

Dell Storage technical content can be found on the [Storage Applications Engineering](#) page.

A.3 Related documentation

Vendor	Document title
VMware	iSCSI SAN Configuration Guide (available at vmware.com)
VMware	vSphere system administration guides (available at vmware.com)
Dell	<i>Dell EqualLogic Group Manager Administrator's Guide</i> (available on eqsupport.dell.com)
Dell	Configuring and Installing the PS Series Multipathing Extension Module for VMware vSphere and PS Series SANs
Dell	Access Control Policies
Dell	Best Practices for Implementing VMware vSphere in a Dell PS Series Storage Environment

