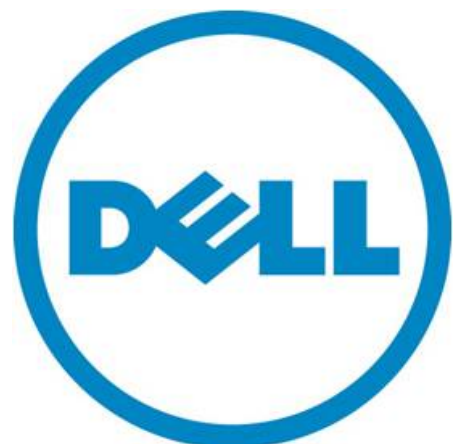


Dell™ PowerVault™ MD32xx Deployment Guide for VMware ESX4.1 Server

A Dell Technical White Paper

PowerVault MD32xx Storage Array

www.dell.com/MD32xx



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March 2011

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Terminology/Glossary

VD == virtual disk

VM == virtual machine

NIC == network interface card

MPIO == Multi-Path I/O

SAS == Serial Attached SCSI

RDM == Raw Device Map

DVS == Distributed Virtual Switch

HA == high availability

DRS == Distributed Resource Scheduler

MRU == Most Recently Used

WWN == World Wide Name

Introduction

The Dell™ PowerVault™ MD32xx storage solution consists of either a standard or high availability configuration. The standard (simplex) configuration has a single controller with four SAS In ports. It can be deployed to support up to 4 hosts non-redundantly. The high availability (duplex) configuration has dual controllers with four SAS In ports per controller for a total of eight SAS In ports. The dual controller option can connect up to 4 fully redundant hosts. This document provides instructions to setup the MD32xx SAS storage solution for use with VMware ESX4.1 Server software.

Generally, you can connect multiple hosts to a single local storage system. The actual number of hosts you connect varies depending on the type of storage device and topology you use.

When multiple hosts connect to the local storage unit, they access storage devices in the unshared mode. The unshared mode does not permit several hosts to access the same VMFS Datastore concurrently. However, a few SAS storage systems offer shared access to multiple hosts.

This type of access permits multiple hosts to access the same VMFS Datastore on a LUN. With the MD32xx this is accomplished with the use of Host Groups which in effect bypass the partition scheme, thus allowing multiple ESX hosts access to the same virtual disk.

Provisioning of storage on servers in a VM environment is a multi-step process starting with definition of the server names for host access. The SAS connection is then established from the storage subsystem. Detection and configuration are then established as a two-way link with the associated ESX server(s), completing the SAS communication subsystem. The final step allocates the detected storage to the virtual machines (VMs), where all or part of the configured storage can be assigned to individual VMs. Connectivity between the storage array and the host server is provided by a Dell 6.0-Gbps SAS Host Bus Adapter (SAS 6 Gb HBA).

Implementing ESX4.1 on the MD32xx Storage Array

This whitepaper addresses some of the new features in vSphere4 as well as showing examples of how to connect a vSphere4 environment to a Dell PowerVault SAS array. Configuration steps for connecting to a PowerVault SAS array are also covered in depth.

New Features in vSphere4

MPIO - With ESX4.1 and vSphere4, customers can benefit from Multi-Path I/O from the ESX4.1 server and the SAS array. This allows for multiple connections to be concurrently used to allow for greater bandwidth. This is especially important for the PowerVault SAS as each PowerVault member has multiple connections and now ESX4.1 can take full advantage of these connections.

Third Party MPIO Support - With ESX4.1 and vSphere4, VMware has provided an architecture that enables storage vendors to provide new and advanced intelligent integration. Drivers for multi-path frameworks such as Microsoft Multi-Path IO (MPIO) and Linux Device Mapper (DM) are installed on host systems that access the storage array and provide I/O path failover.

Supported Hardware and Software

Hardware Requirements

Refer to the following VMware website for a complete up-to-date list of prerequisites for installing VMware ESX server.

http://www.vmware.com/pdf/vsphere4/r41/vsp_41_esx_server_config.pdf

Supported Operating Systems for MD32xx Array

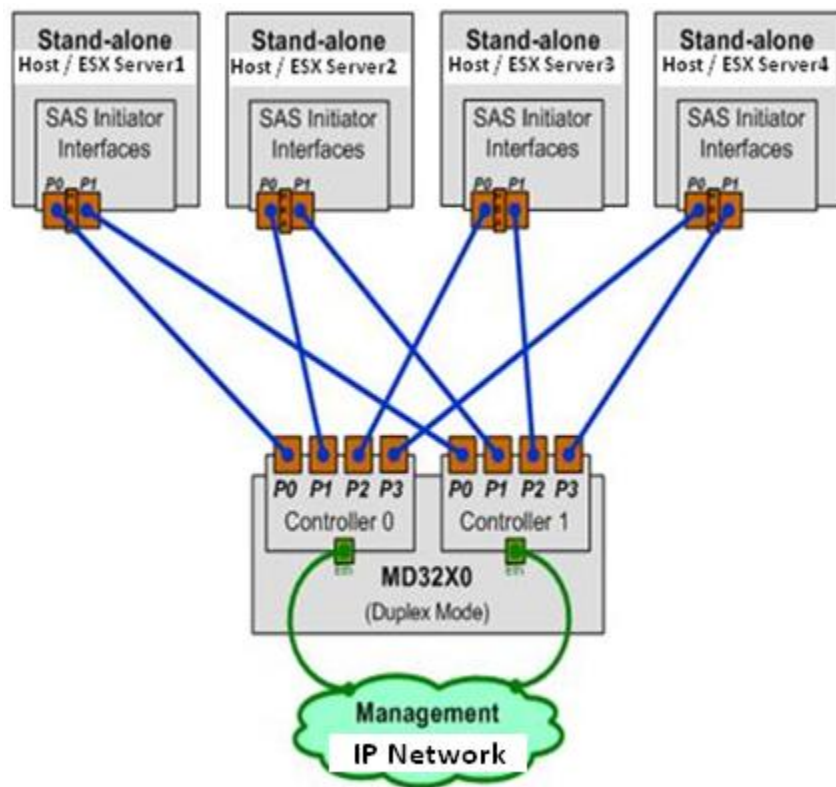
ESX4.1 is the only supported VMware OS for MD32xx.

Architectural Setup

The NIC ports serving SAS traffic on the ESX servers are teamed in order to re-route traffic in the event of an adapter failure.

SAS direct attached storage does not require a storage network to communicate with your host. All you need is a cable connected to the storage unit and a Dell HBA in your host. You will have a SAS HBA and a path (cable) to each controller, as shown in Figure 1.

Figure 1. Connections Between PowerVault Storage Solution and Hosts



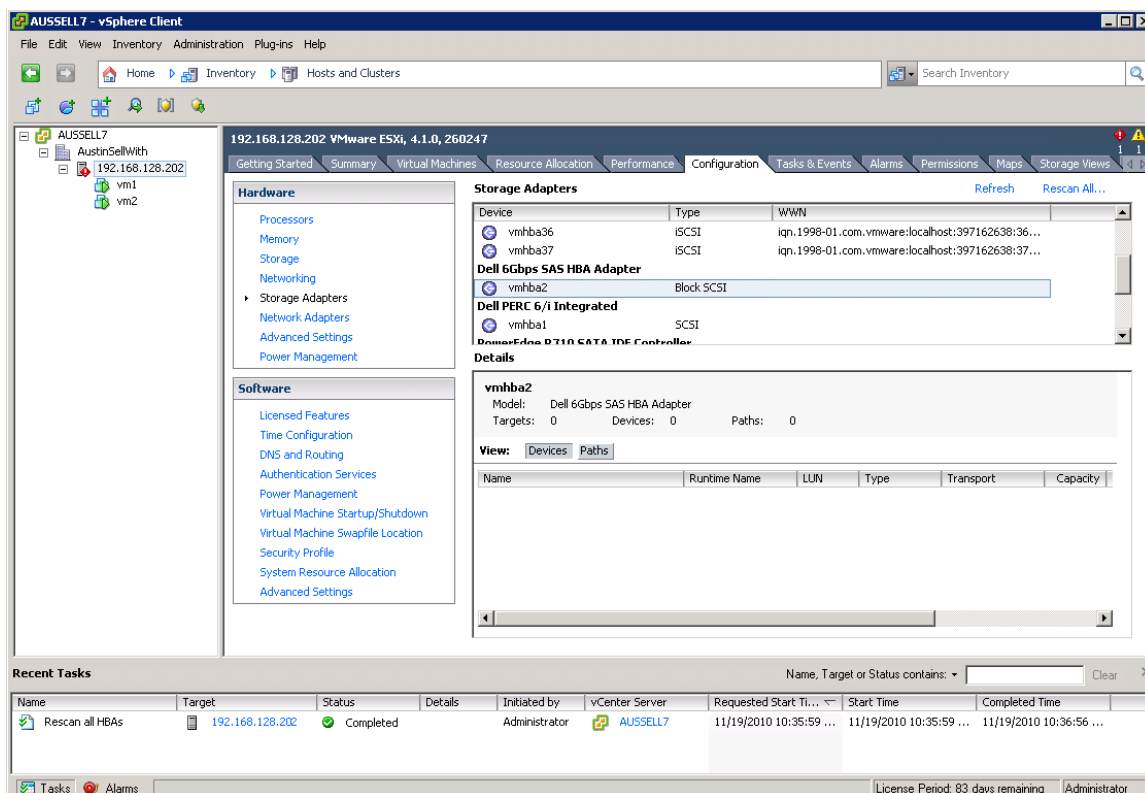
Connections to a MD32xx SAS Array

Prerequisites

- The SAS HBA(s) are already installed in the ESX server
- The cables have been connected to the array
- Both the server and the array are powered on.

To verify that the SAS 6Gb HBA is correctly installed, login to vCenter and select the ESX host. From the Configuration tab select **Storage Adapters**. You should see the Block SCSI HBA listed. Under **Details** you will see the Dell 6Gb SAS HBA adapter. Scroll down if necessary; there will be no devices or paths listed until after you have configured the MD32xx array.

Figure 2. Viewing the Dell 6Gb SAS HBA in vCenter



PowerVault MD32xx Storage Setup and Configuration

Step 1: Manually Define Hosts

First, create virtual disks on MD32xx using steps described in:

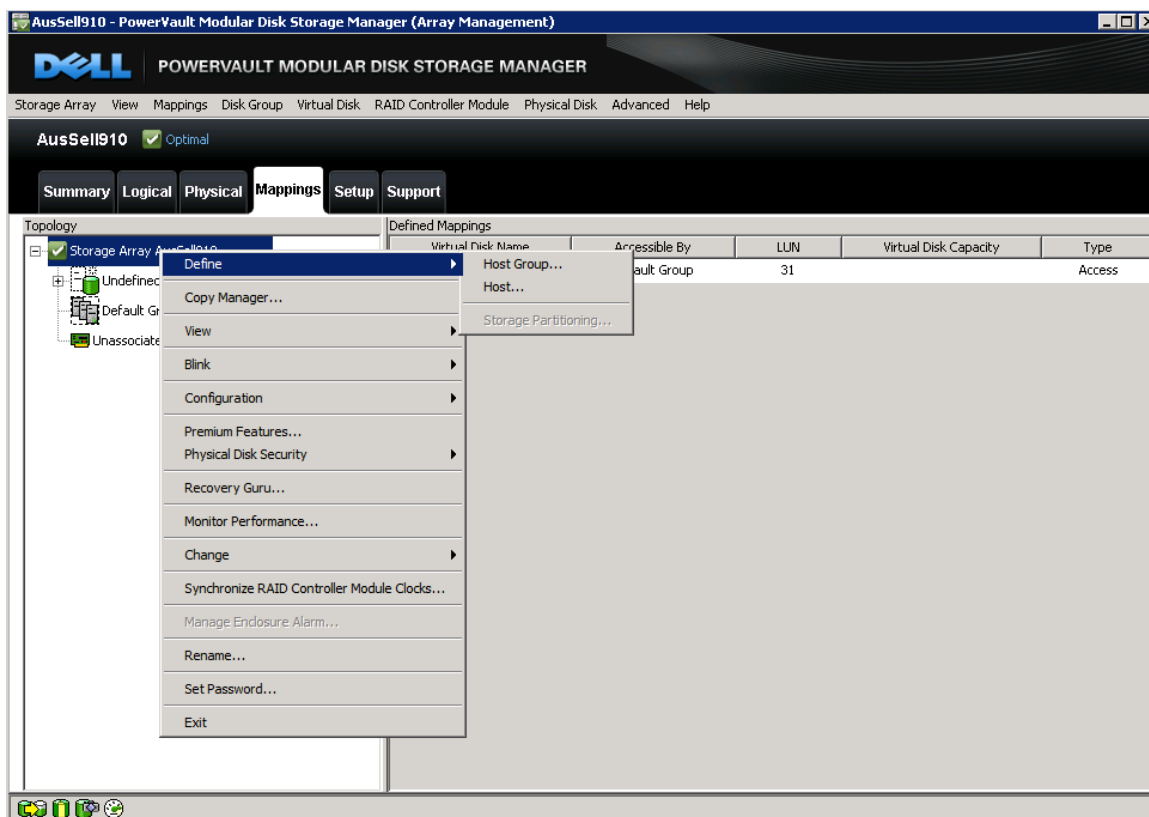
[HTTP://SUPPORT.DELL.COM/SUPPORT/EDOCS/SYSTEMS/MD3200/MULTLANG/GSG/DAO_BCC/GSG.PDF](http://support.dell.com/support/edocs/systems/md3200/multlang/gsg/dao_bcc/gsg.pdf)

After opening the Modular Disk Storage Manager and selecting the MD32xx storage array to be configured, select the **Mappings** tab.

From the **Mappings** tab, manually define hosts by highlighting the Storage Array Name and right clicking, then select **Define -> Host**.

NOTE: in the examples to follow the storage array is an MD32xx with virtual disks already configured using the **Configure Storage Array** selection under the **Setup** tab. The new ESX host being added is named "VMware_host1".

Figure 3. Define a New Host

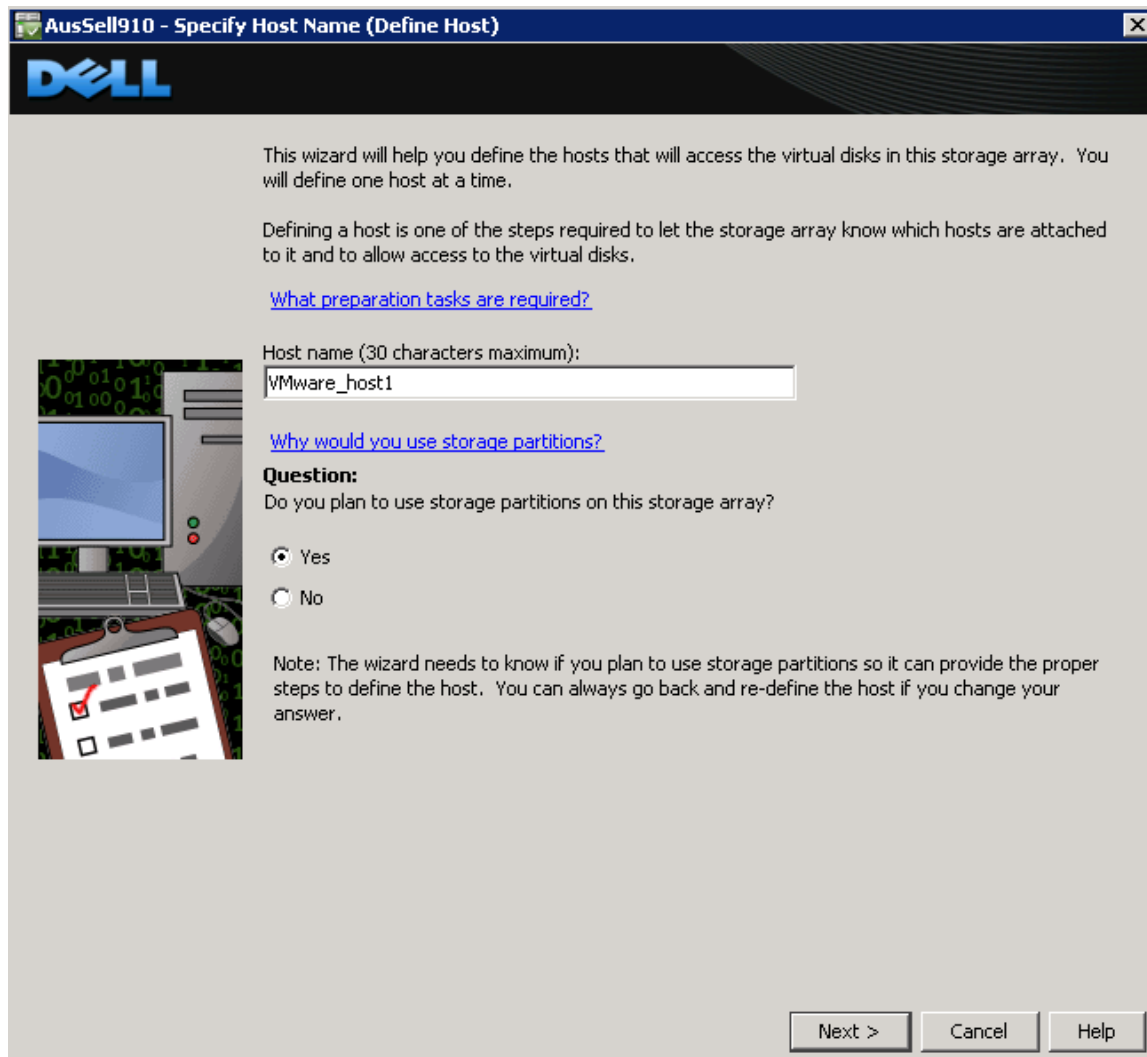


Step 2: Name the Host

Select a name that matches the naming convention used for the environment that you are configuring, such as `VMware_host1`.

Leave partitions enabled and select **Next**.

Figure 4. Naming the Host

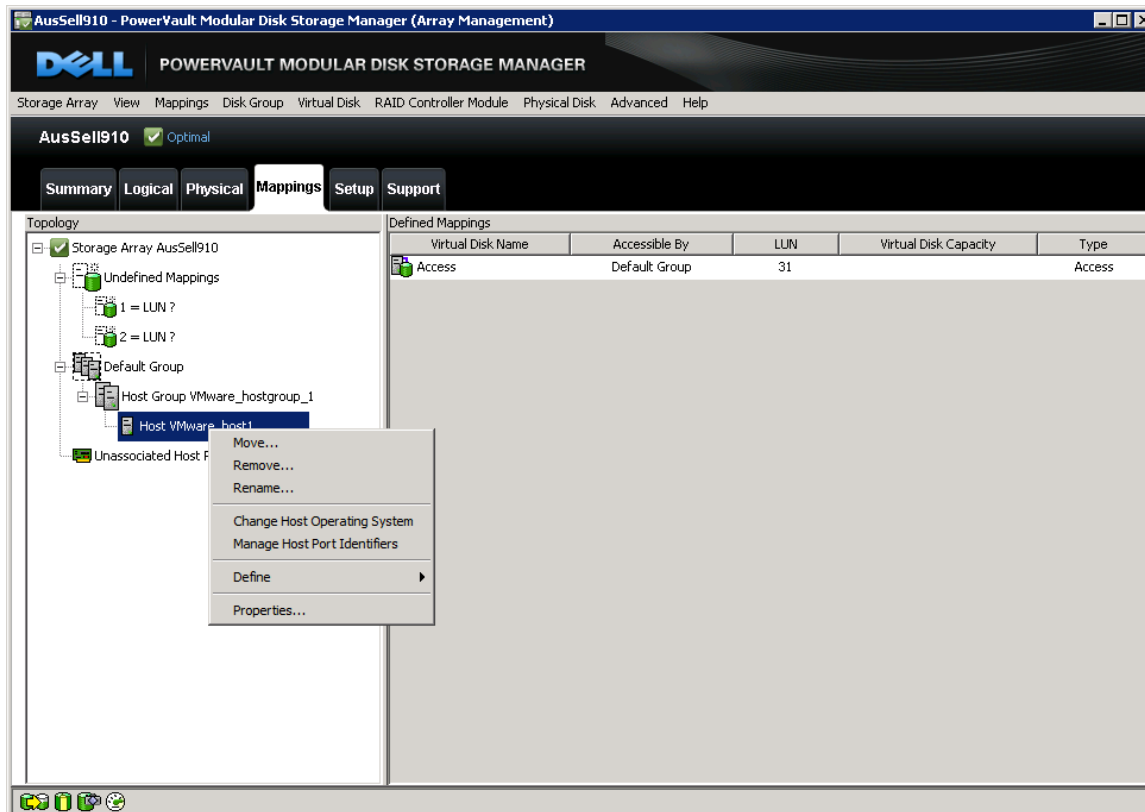


Step 3: Add a Host Port Identifier

To add host port identifiers highlight the host that you just defined in the topology tree.

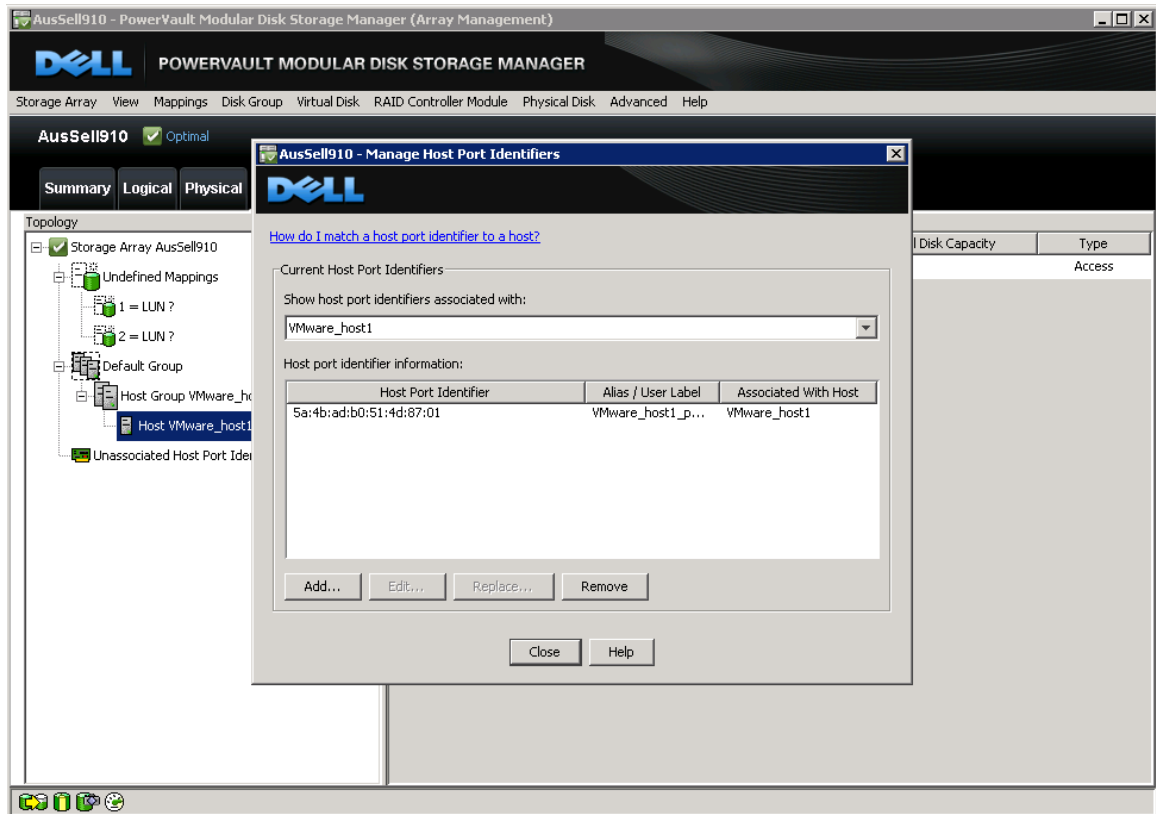
Next, right-click and select **Manage Host Port Identifiers**.

Figure 5. Selecting the New Host



In the Manage Host Port Identifiers window select **Add**.

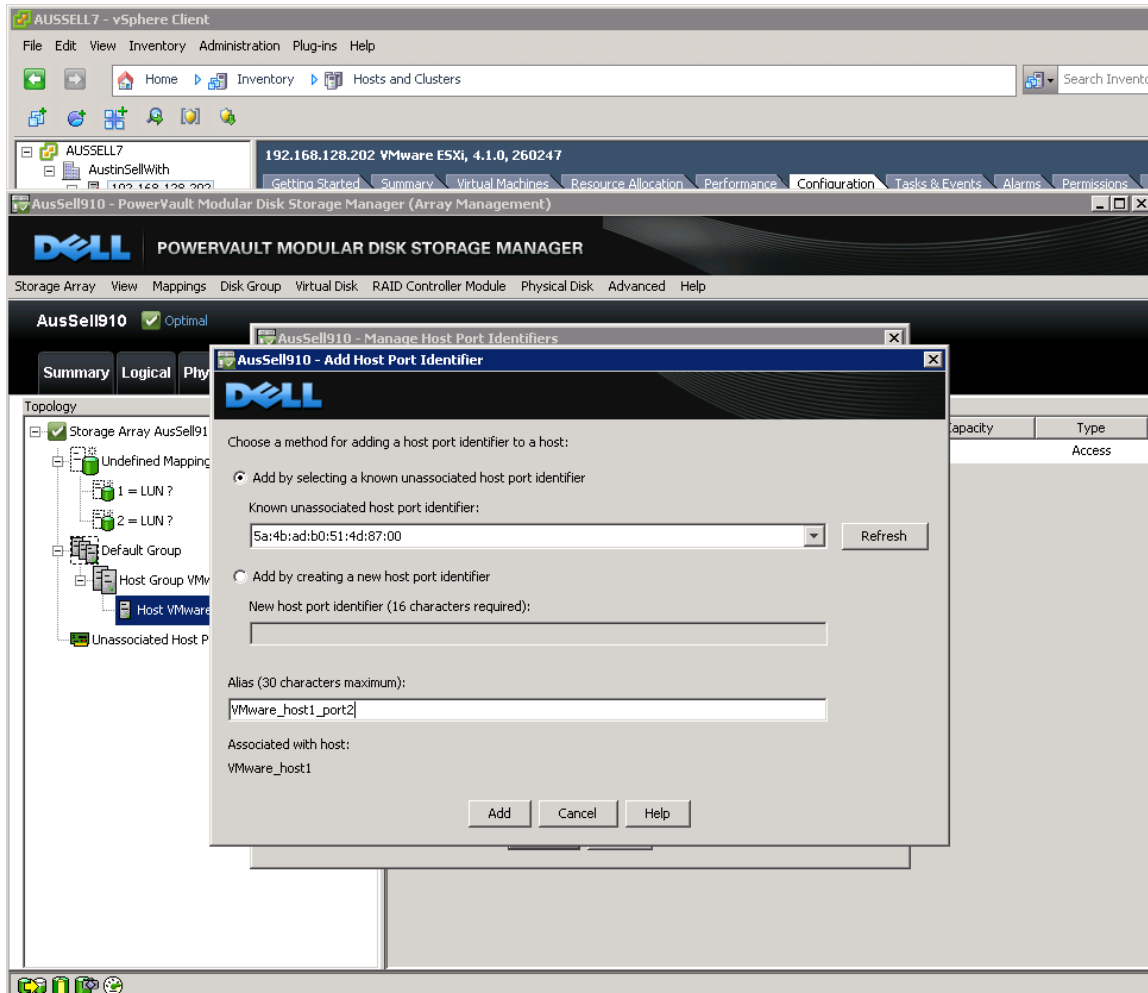
Figure 6. Adding a Host Port Identifier



Step 4: Enter an Alias for the Host Port Identifier

An alias is used in the topology tree to identify the port. Use the pull down to select the new Host Port Identifier. Enter an alias and then select Add.

Figure 7. Creating an Alias for a Host Port Identifier



Step 5: Select Host Port Identifiers for Each Port

Each port on the Dell 6Gb SAS HBA has a unique WWN that is used for the SAS connection. In this example because we are using both controllers there will be two Identifiers, one for each port on the HBA

Using the pull down select the second host port identifier.

Figure 8. Selecting Host Port Identifiers for Each Port

AusSell910 - Specify Host Port Identifiers (Define Host)

DELL

The host communicates with the storage array through its host bus adapters (HBAs) or its iSCSI initiators where each physical port has a unique host port identifier. In this step, select or create an identifier, give it an alias or user label, then add it to the list to be associated with host VMware_Host1.

[How do I match a host port identifier to a host?](#)

Choose a method for adding a host port identifier to a host:

☒ Add by selecting a known unassociated host port identifier

Known unassociated host port identifier:

- Select Identifier -

- Select Identifier -

☐ 5a:4b:ad:b0:51:4d:87:00

☒ 5a:4b:ad:b0:51:4d:87:01

Refresh

Alias (30 characters maximum):

Add Remove

Host port identifiers to be associated with the host:

Host Port Identifier	Alias / User Label

< Back Next > Cancel Help

Step 6: Enter a Host Port Alias

Add a unique alias for this second host port such as the one below, then select **Add**.

Figure 9. Entering a Host Port Alias

AusSell910 - Specify Host Port Identifiers (Define Host)

DELL

The host communicates with the storage array through its host bus adapters (HBAs) or its iSCSI initiators where each physical port has a unique host port identifier. In this step, select or create an identifier, give it an alias or user label, then add it to the list to be associated with host VMware_host1.

[How do I match a host port identifier to a host?](#)

Choose a method for adding a host port identifier to a host:

☒ Add by selecting a known unassociated host port identifier

Known unassociated host port identifier:

5a:4b:ad:b0:51:4d:87:01 Refresh

☐ Add by creating a new host port identifier

New host port identifier (16 characters required):

Alias (30 characters maximum):

VMware_host1_port1

Add ▼ Remove ▲

Host port identifiers to be associated with the host:

Host Port Identifier	Alias / User Label

< Back Next > Cancel Help

The host port screen will be similar to the one below. Select **Next** to continue.

Figure 10. Host Port Identifier

AusSell910 - Specify Host Port Identifiers (Define Host)

DELL

The host communicates with the storage array through its host bus adapters (HBAs) or its iSCSI initiators where each physical port has a unique host port identifier. In this step, select or create an identifier, give it an alias or user label, then add it to the list to be associated with host VMware_host1.

[How do I match a host port identifier to a host?](#)

Choose a method for adding a host port identifier to a host:

☒ Add by selecting a known unassociated host port identifier

Known unassociated host port identifier:

5a:4b:ad:b0:51:4d:87:01 Refresh

☐ Add by creating a new host port identifier

New host port identifier (16 characters required):

Alias (30 characters maximum):

Add Remove

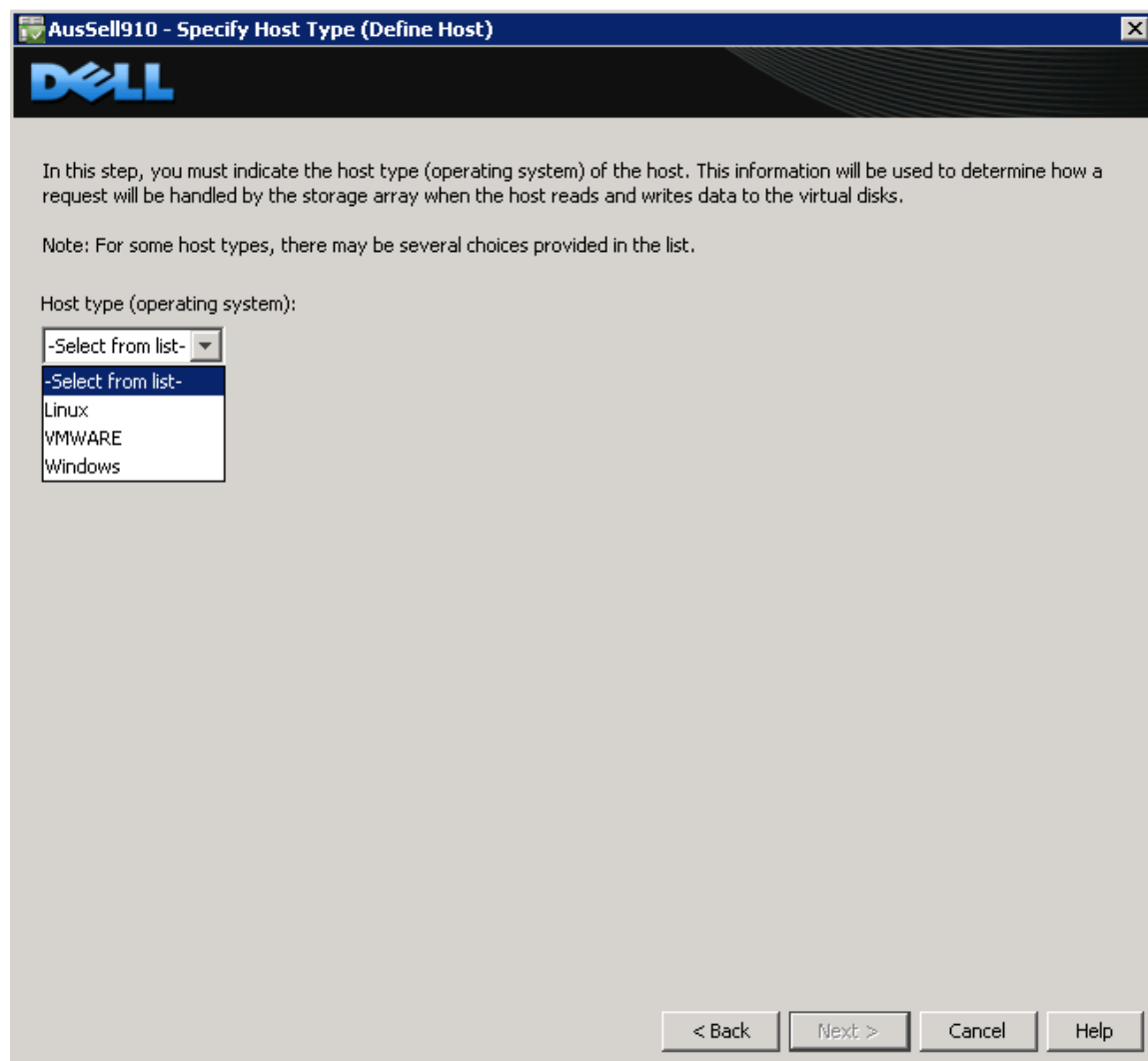
Host port identifiers to be associated with the host:

Host Port Identifier	Alias / User Label
5a:4b:ad:b0:51:4d:87:01	VMware_host1_port1

< Back Next > Cancel Help

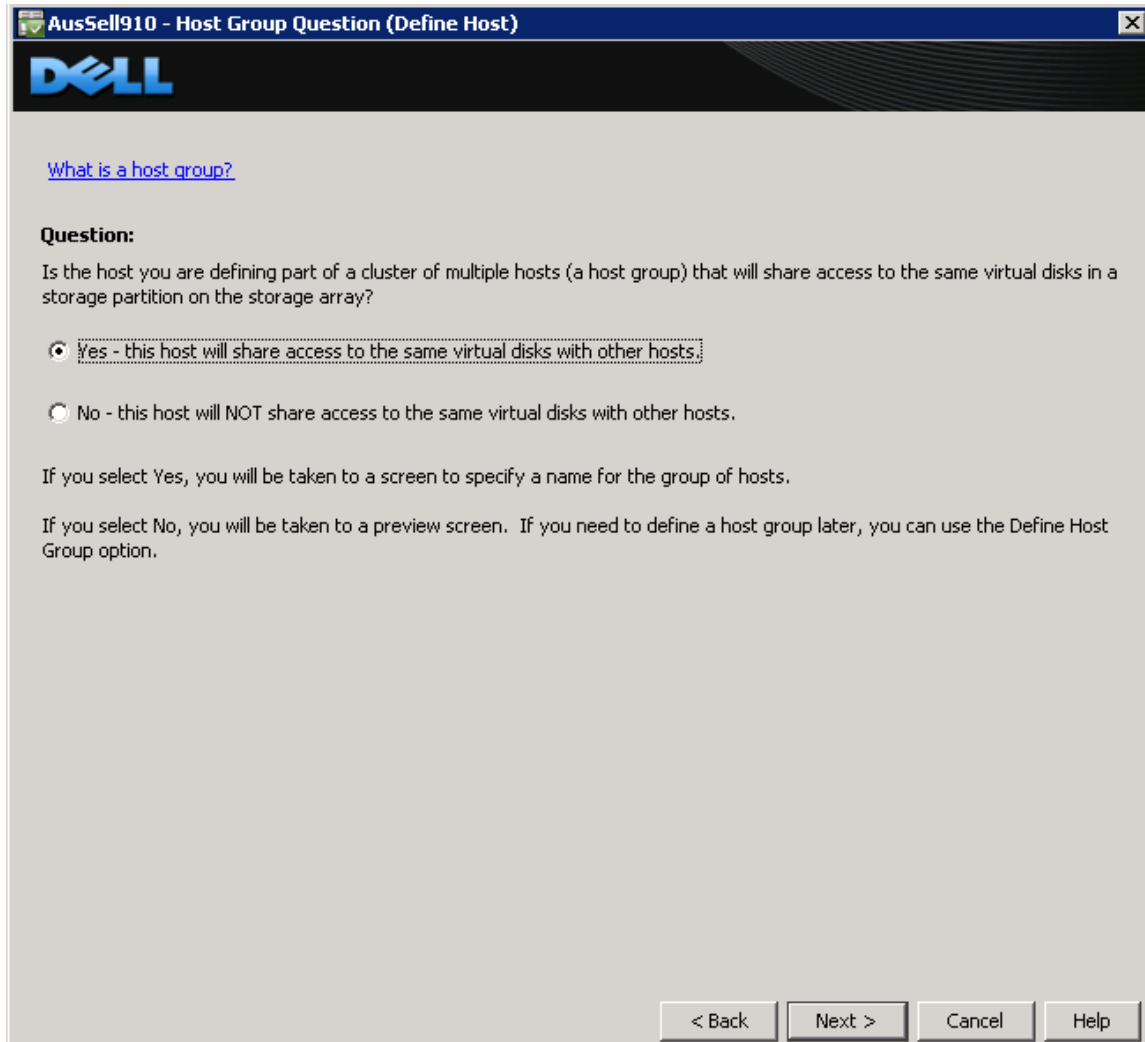
Step 7: Select *VMware* as the Host Type

Figure 11. Selecting the Host Type



If you intend to use advanced VMware features such as VMotion then this host will share access with other ESX servers and you will have to create a Host Group. We will create a host group for this example. .

Figure 12. Creating a Host Group



AusSell910 - Host Group Question (Define Host)

DELL

[What is a host group?](#)

Question:

Is the host you are defining part of a cluster of multiple hosts (a host group) that will share access to the same virtual disks in a storage partition on the storage array?

☒ Yes - this host will share access to the same virtual disks with other hosts.

☐ No - this host will NOT share access to the same virtual disks with other hosts.

If you select Yes, you will be taken to a screen to specify a name for the group of hosts.

If you select No, you will be taken to a preview screen. If you need to define a host group later, you can use the Define Host Group option.

< Back Next > Cancel Help

Step 8: Enter a Host Group Name

Enter a host group name that is appropriate for your environment.

Figure 13. Naming the Host Group

AusSell910 - Specify Host Group (Define Host)

DELL

[What is a host group?](#)

Because you specified on the previous screen that the host you are defining will share access to virtual disks with one or more other hosts, you must indicate the name of the host group that this host will be associated with.

You can either (1) manually enter a new host group name or (2) select an existing host group. If you select an existing one, you will be shown the hosts currently associated with it.

☒ Enter name (30 characters maximum)

VMware_Group1

☐ Select existing host group

-Select from list-

Associated hosts in host group:

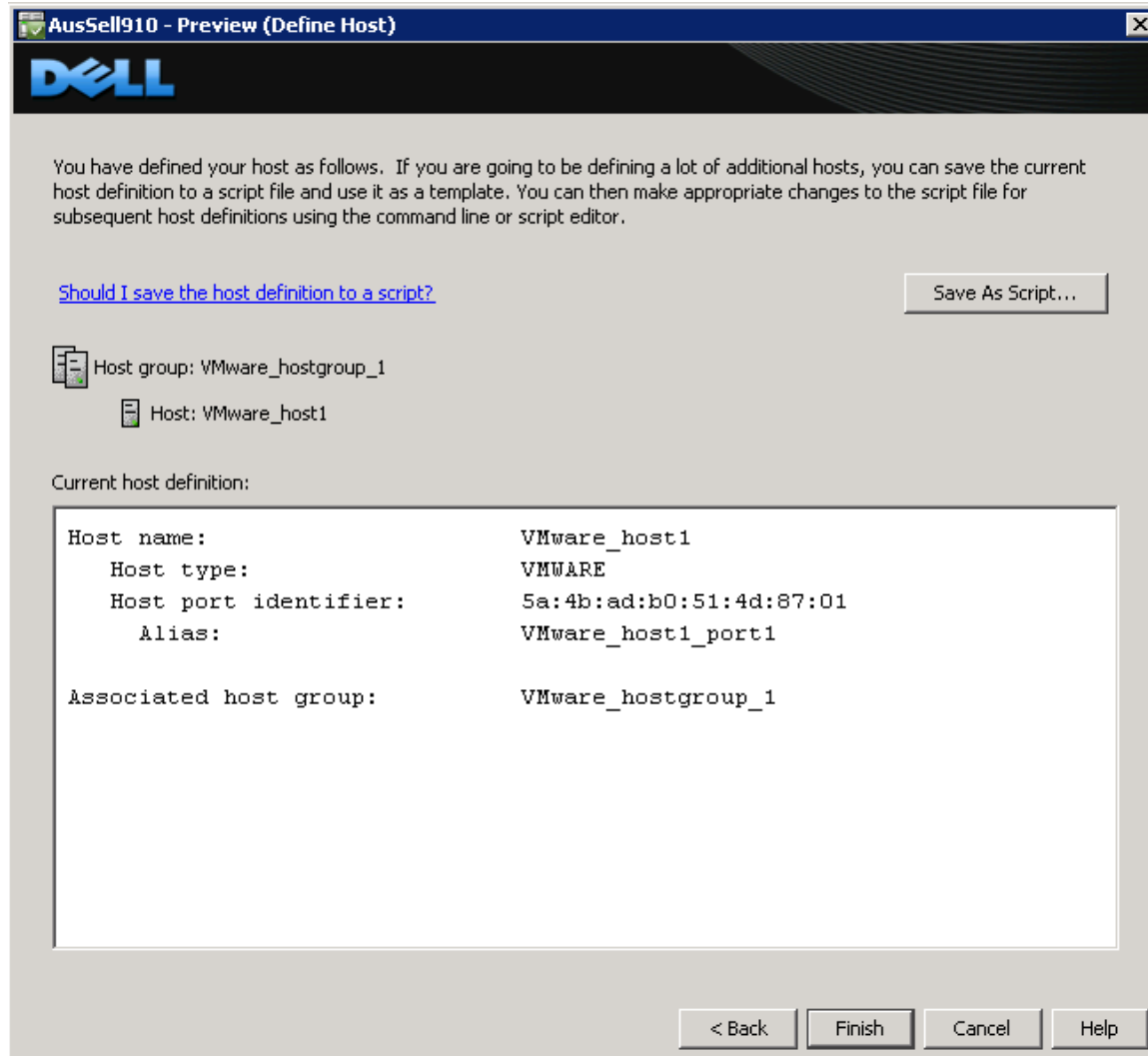
Name	Host Type
------	-----------

< Back Next > Cancel Help

Step 9: Preview the Host Definition

If all of the information is correct for your environment select **Finish**.

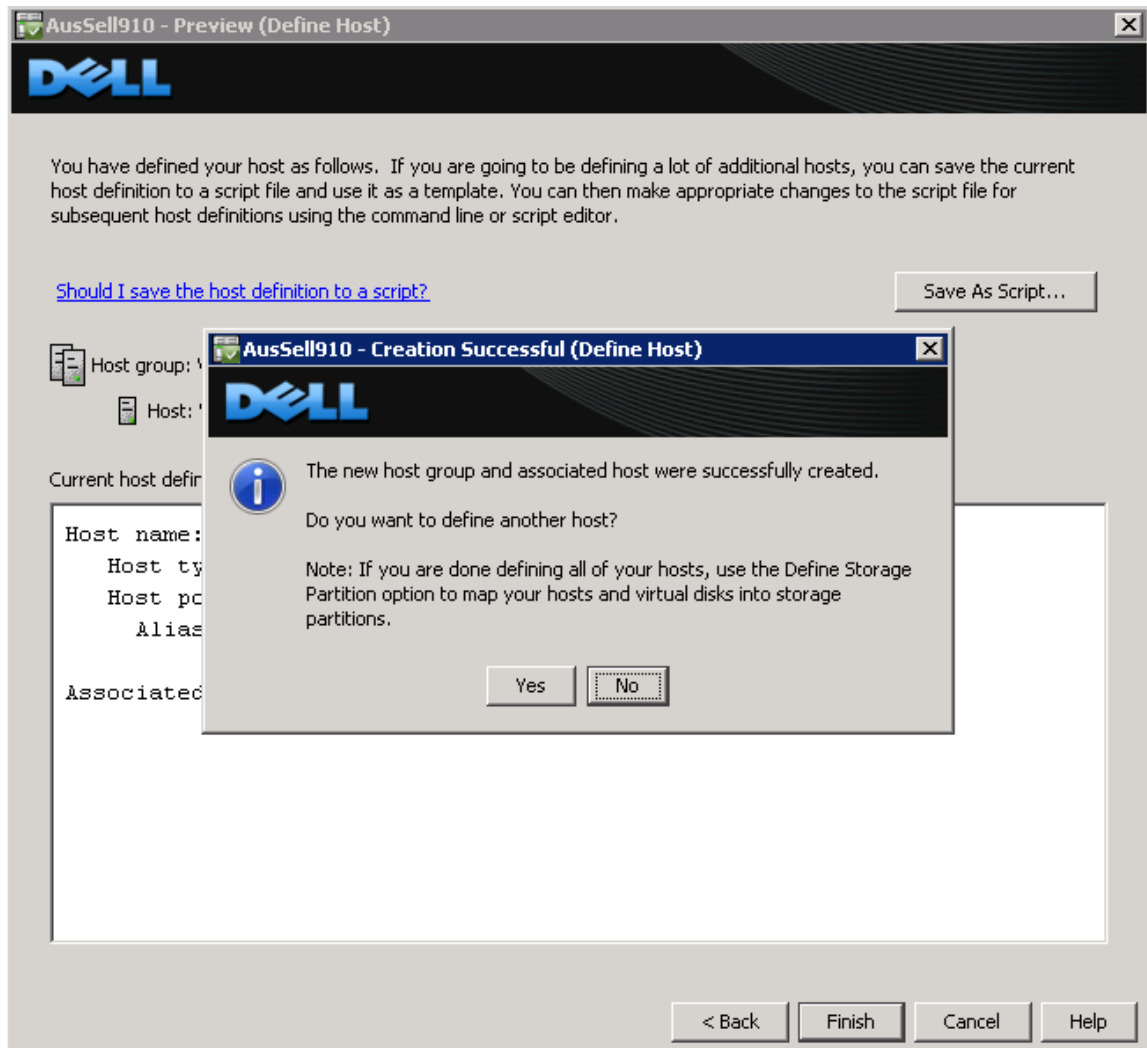
Figure 14. Preview (Define Host) Screen



Step 10: Complete the Topology

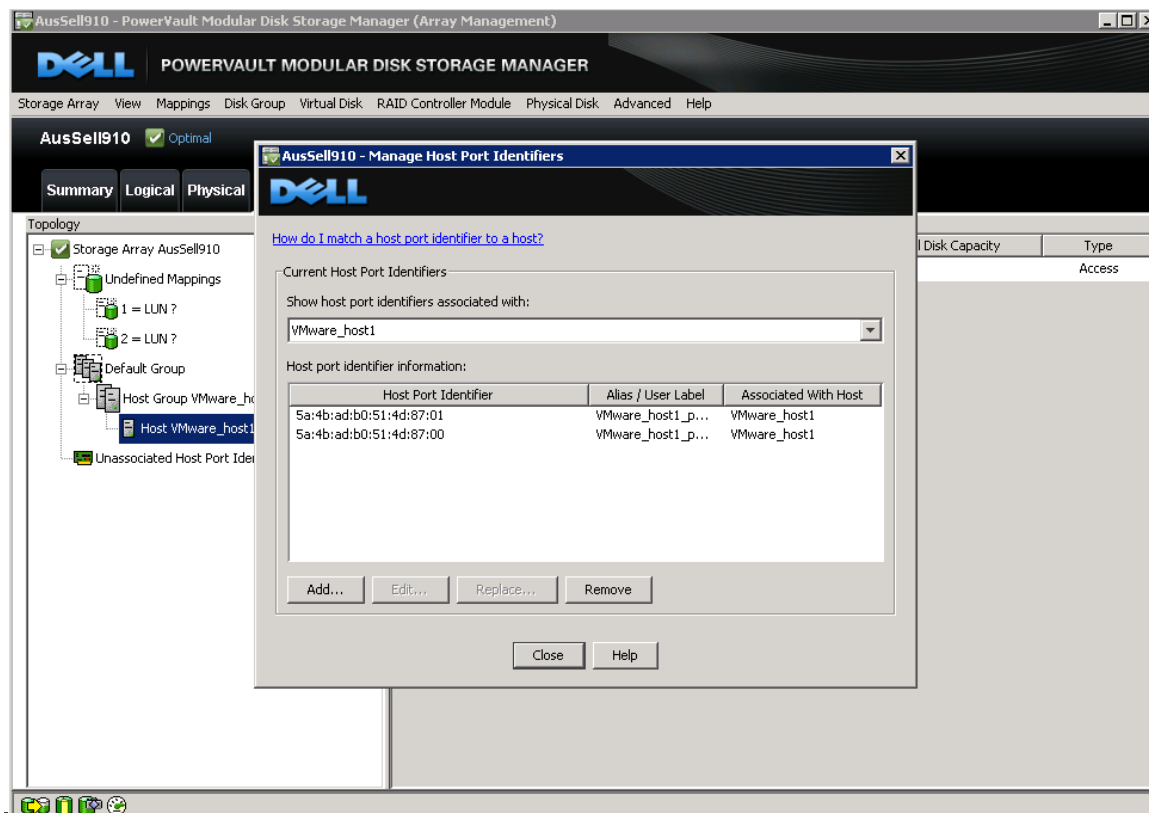
Select **No** at this time. You can add additional Hosts after you have finished configuring the current host.

Figure 15. Topology Creation Successful



The topology is now defined with both Host Port Identifiers.

Figure 16. Topology Defined

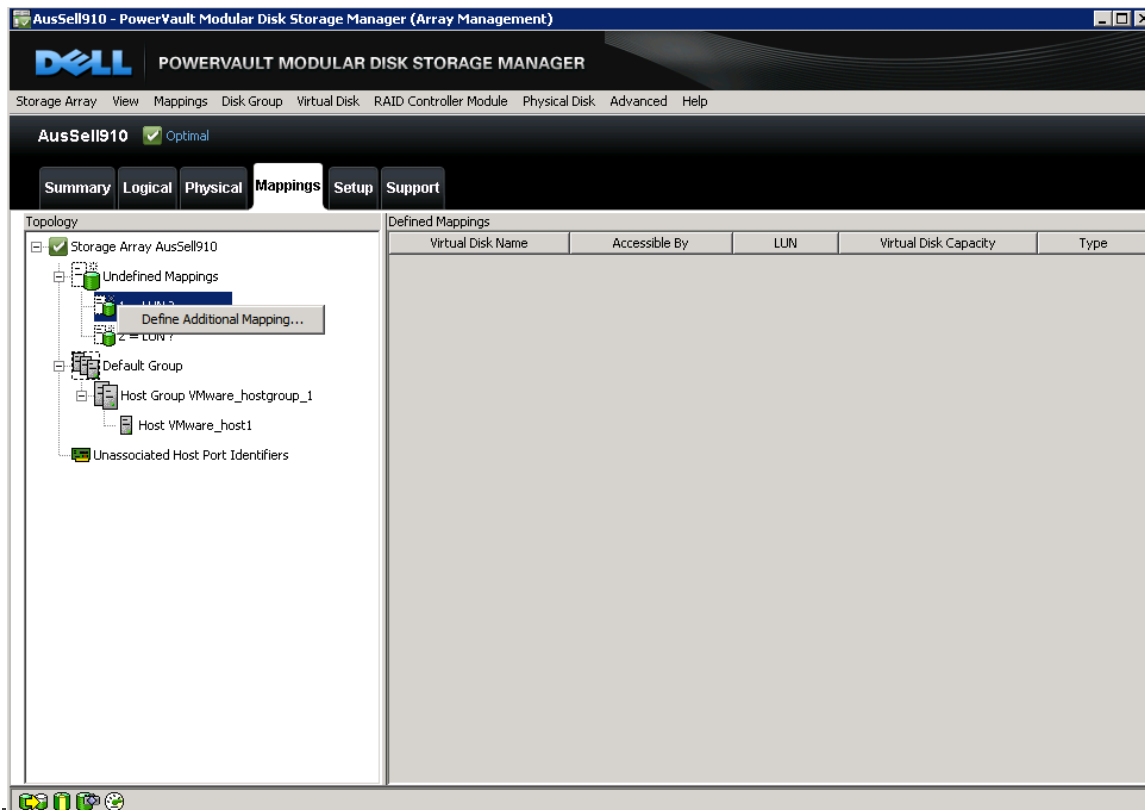


Step 11: Define Mappings for LUNs

NOTE: In this example the Disk Groups and Virtual Disks have already been created using the wizard under the Setup Tab.

In the topology tree, expand the **Undefined Mappings**, highlight one of the **Virtual Disks**, then right-click and select **Define Additional Mappings**.

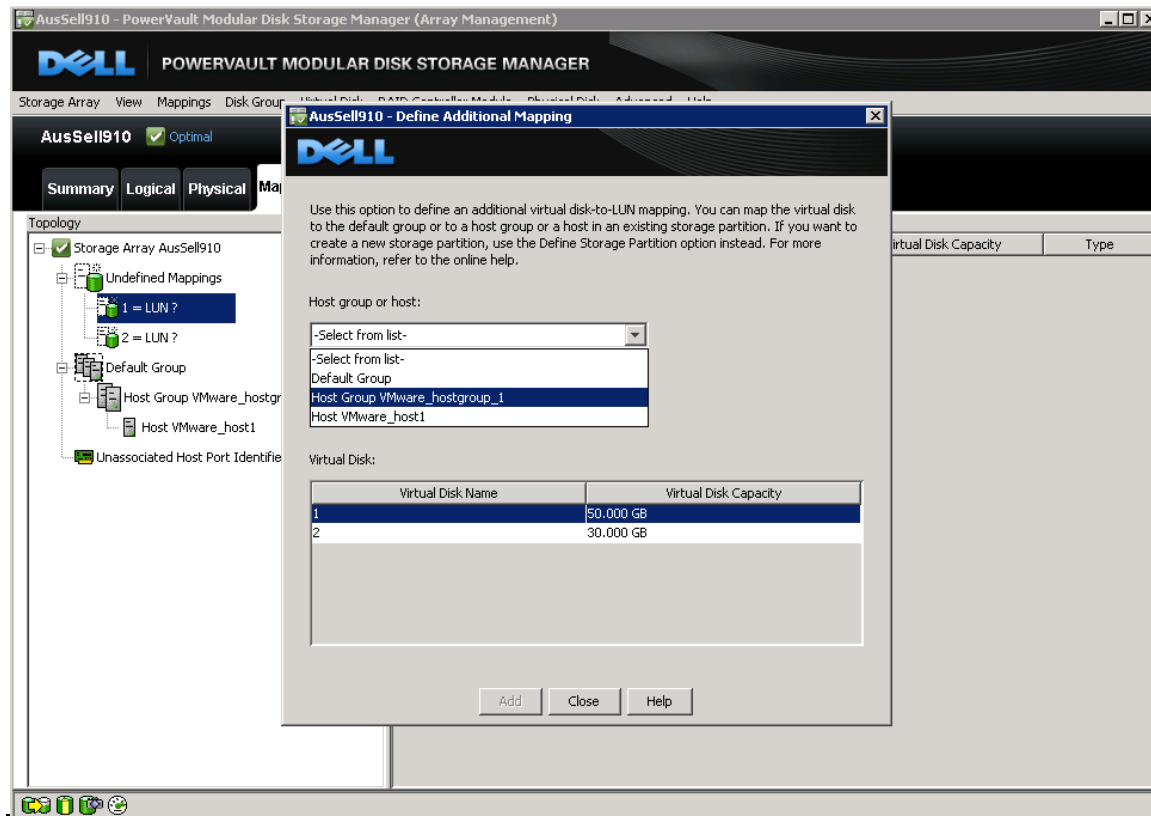
Figure 17. Selecting a Virtual Disk for Mapping



Next, Install SLES11 with the installation media provided by Novell.

Remember that the virtual disk is assigned to the host group and not the host. For this example we selected the host group that was defined in the previous steps.

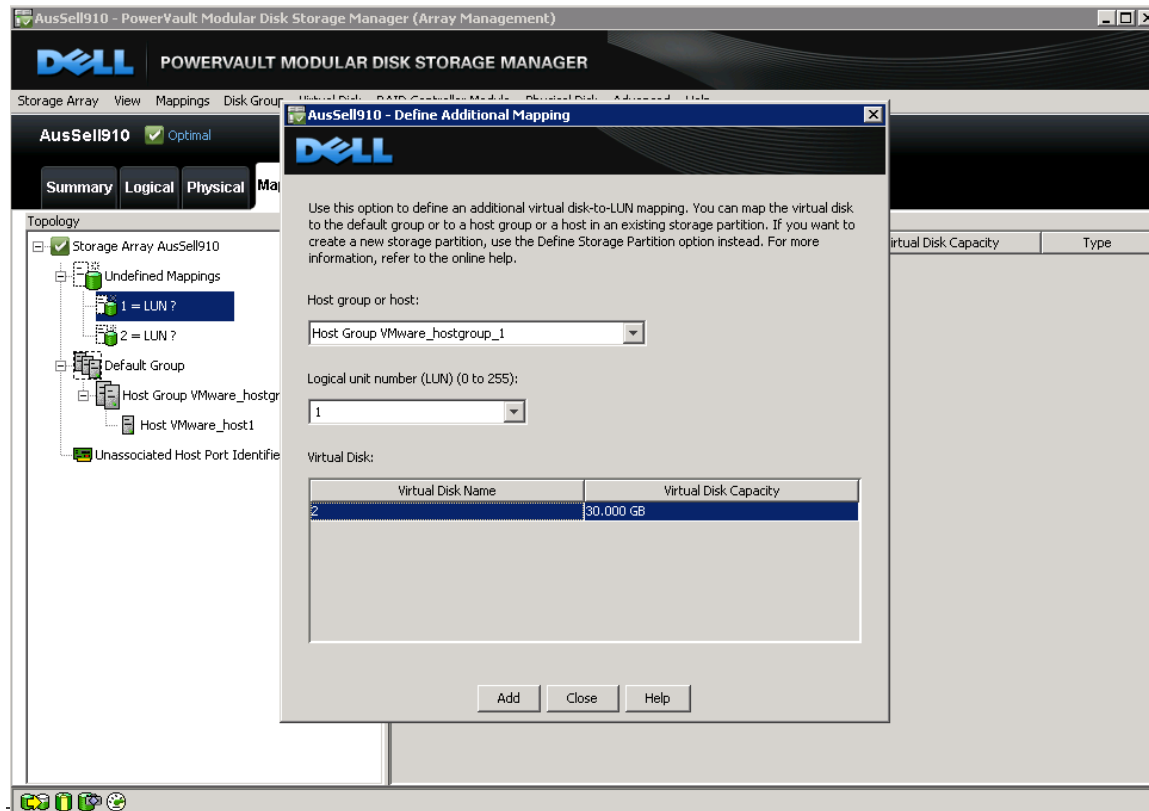
Figure 18. Selecting the Host Group



Step 12: Assign the Other Virtual Disks

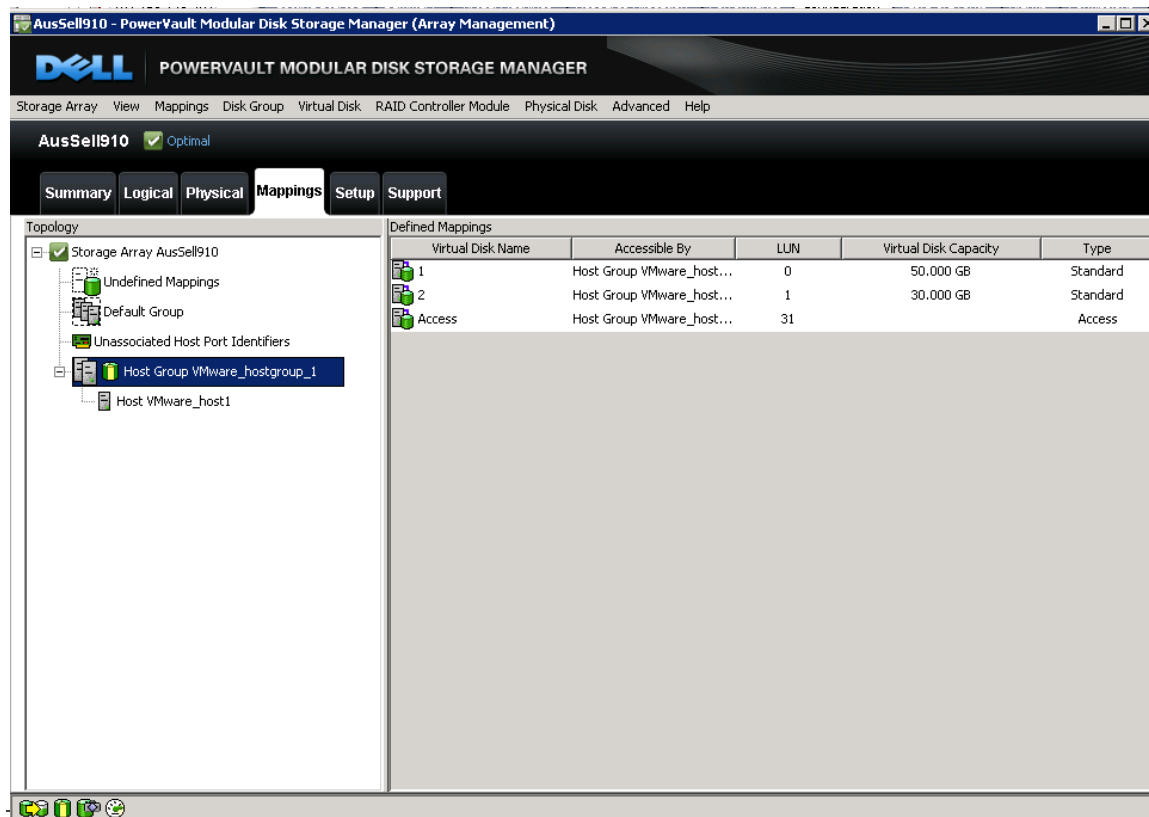
Again, make sure to assign all the virtual disks to the host group, not the host.

Figure 19. Assigning Additional Virtual Disks



After the virtual disks are all assigned, notice that the host group and its associated hosts are no longer under the default group in the topology. This completes the configuration of the storage topology.

Figure 20. Completed Topology with Assigned Virtual Disks



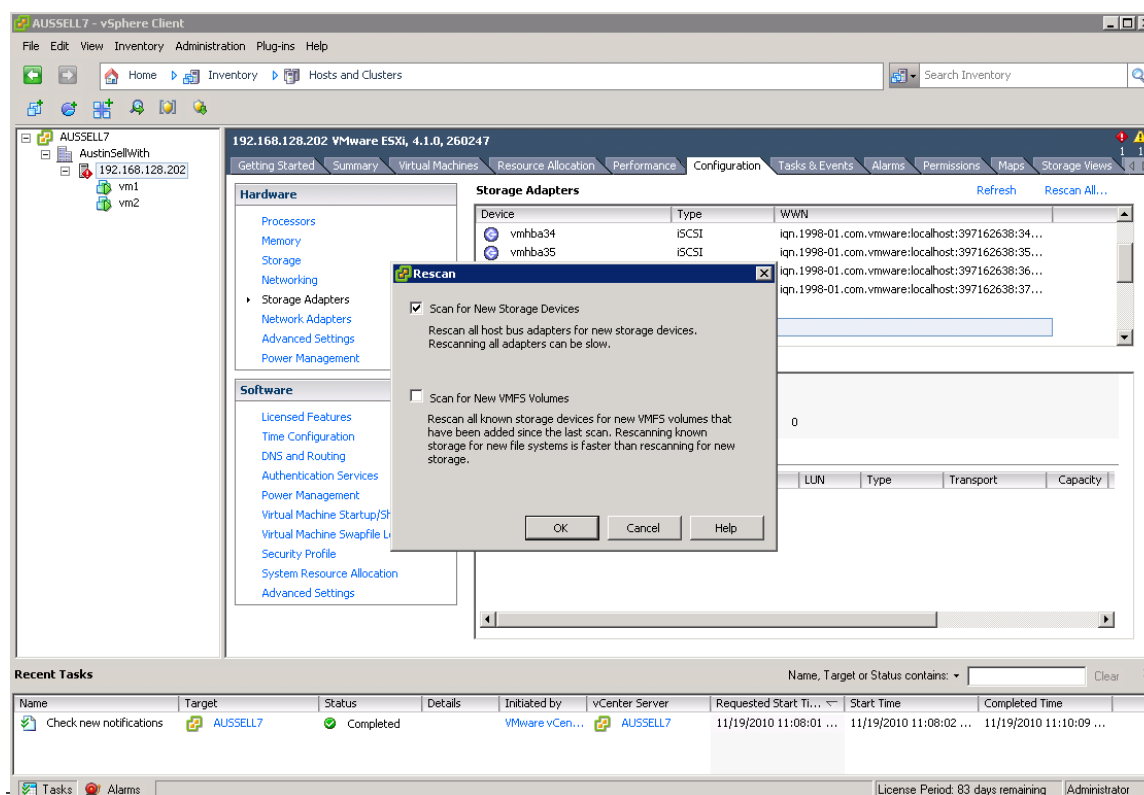
Connecting the Newly-Configured Storage

Step1: Rescan for MD3200 LUNs

Connect to the ESX Server/vCenter using VI Client. In the VSperehere4 GUI, go to the Configuration tab and select Storage Adapters.

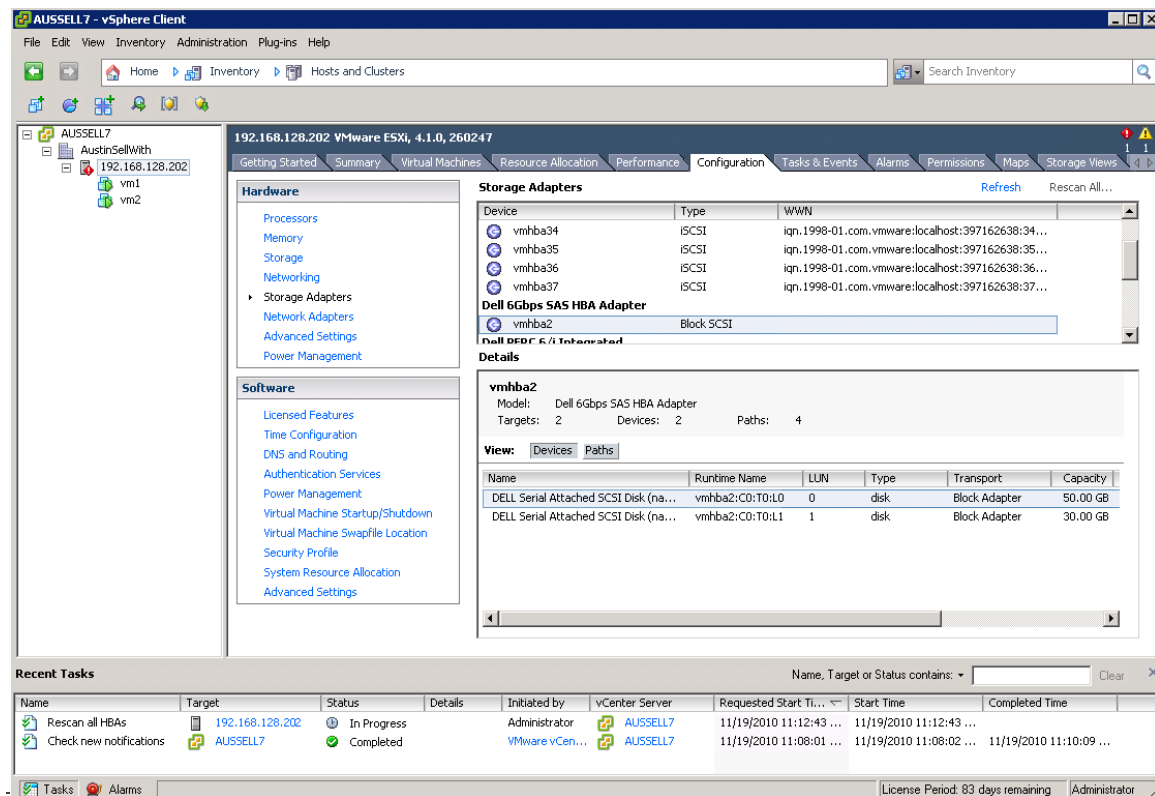
Next, select the Block SCSI adapter (Dell 6Gb SAS HBA) and click Scan for New Storage Devices. (Do not scan for New VMFS Volumes at this time)

Figure 21. Rescanning for the MD3200 LUNS



After the scan completes the newly created LUNs will be visible from the ESX server.

Figure 22. Viewing the New Devices



Step 2: Verify the Available Paths.

To view the paths, select the Path Tab. Depending on how many LUNs have been configured, verify there is at least one active and one standby path to each LUN.

In this setup example, because we have both ports assigned, we can verify that there are two active and two standby paths.

Figure 23. Viewing Available Paths

The screenshot shows the vSphere Client interface for a host named AUSSELL7. The left sidebar displays the inventory tree with the host selected. The main pane shows the configuration of the host's hardware and software. The 'Storage Adapters' section is expanded, showing a list of storage adapters. The 'Dell 6Gbps SAS HBA Adapter' is selected, and the 'Paths' tab is active, displaying a table of available paths.

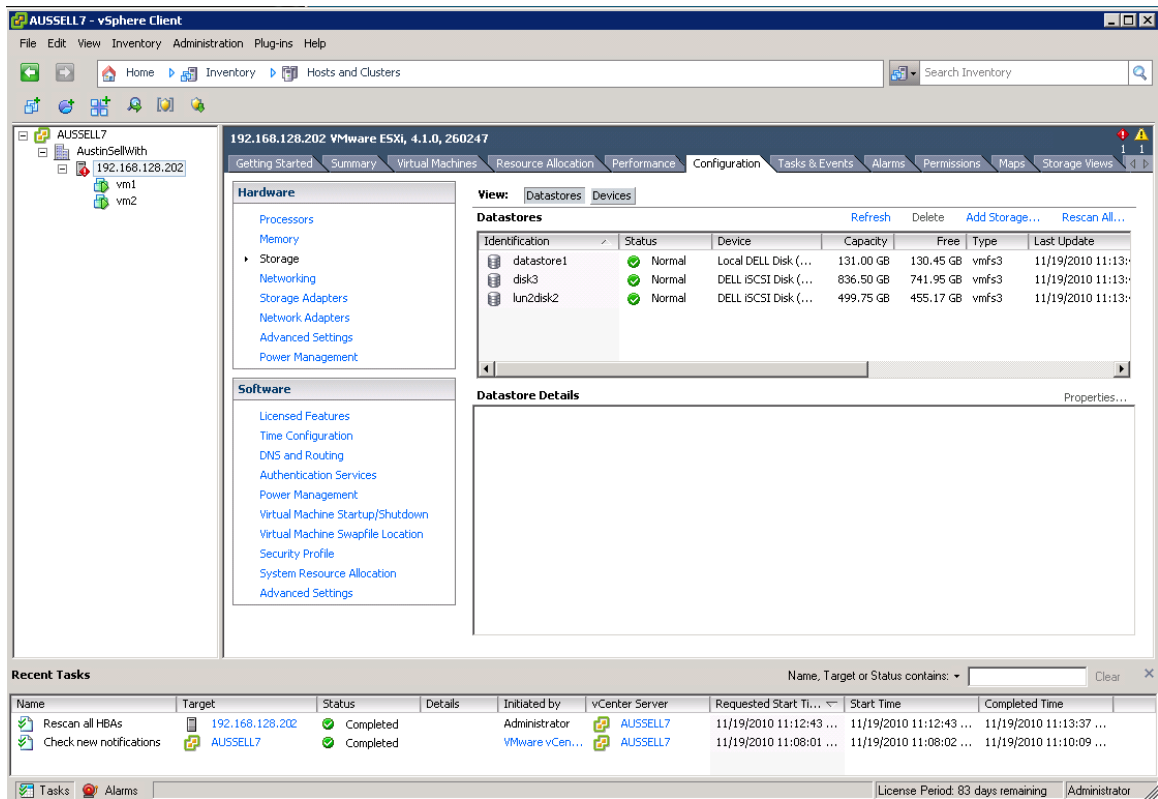
Runtime Name	Target	LUN	Status
vmhba2:C0:T1:L0		0	Stand by
vmhba2:C0:T1:L1		1	Active (I/O)
vmhba2:C0:T0:L0		0	Active (I/O)
vmhba2:C0:T0:L1		1	Stand by

The 'Recent Tasks' section at the bottom shows a list of tasks, including 'Rescan all HBAs' and 'Check new notifications', both of which are completed.

Step 3: Create a Datastore from the MD32xx LUNS

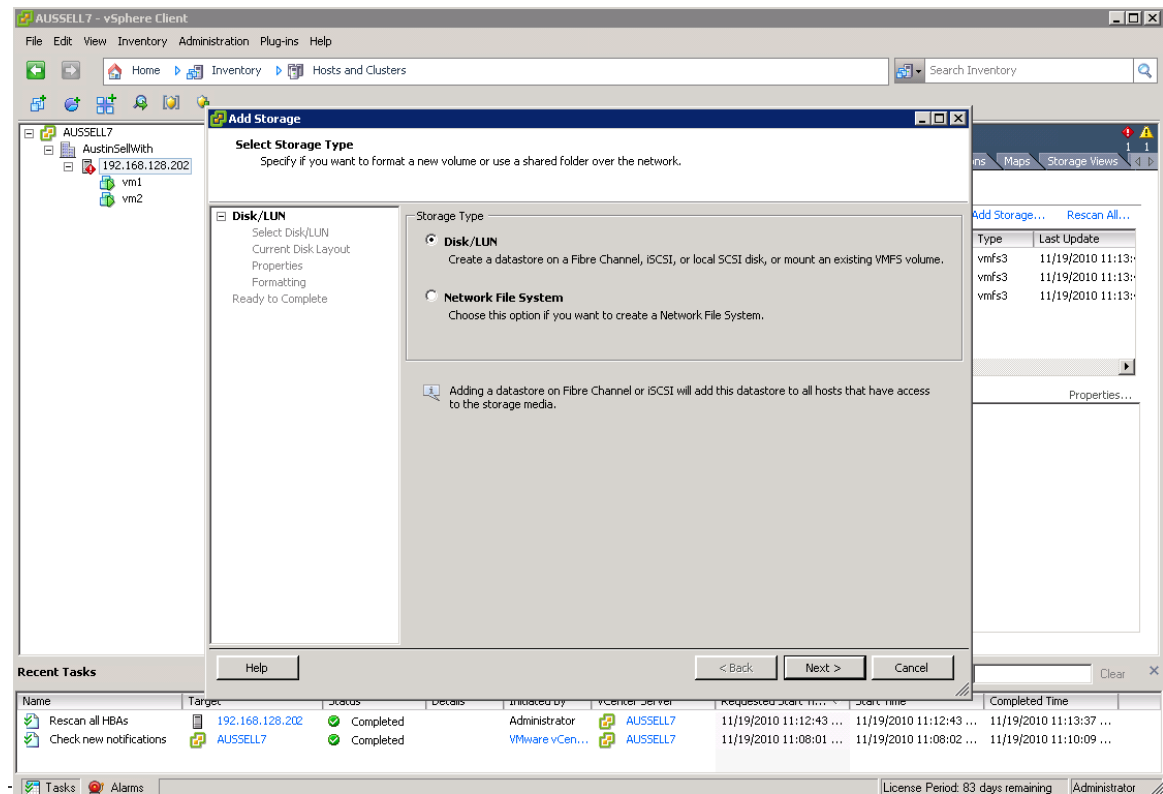
This is the same procedure as creating a Datastore with any local disk. Begin by selecting **Storage** under **Hardware** and then select **Add Storage**.

Figure 24. Creating a Datastore



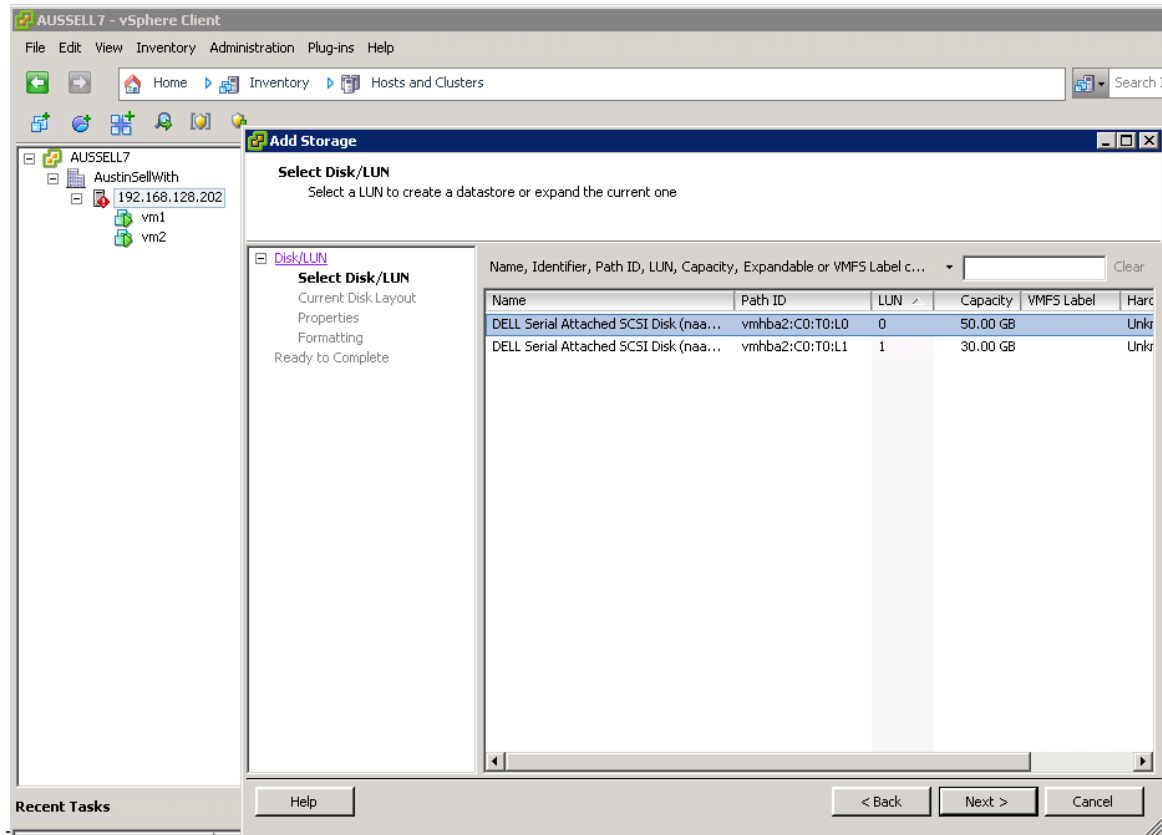
Because SAS is considered a local SCSI disk, the storage type is Disk/LUN.

Figure 25. Selecting Disk/LUN as the Storage Type



Step 4: Select One of the LUNS to Create a Datastore

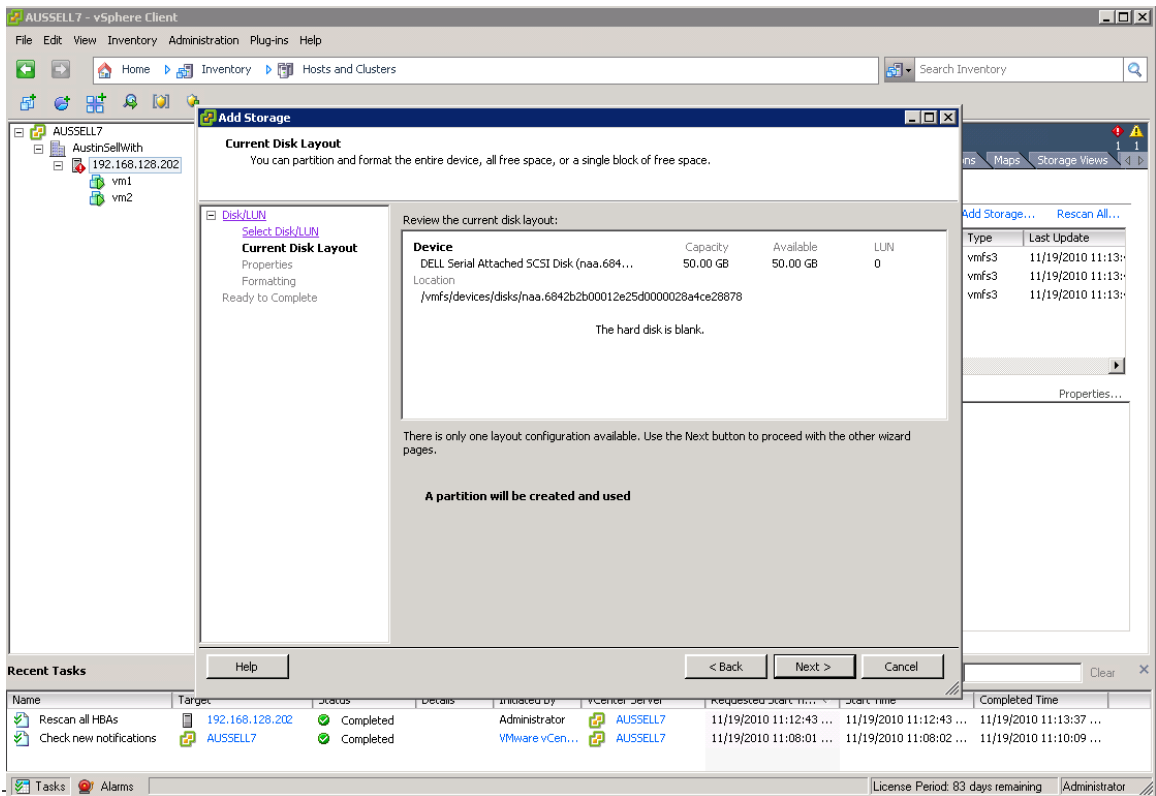
Figure 26. Selecting a LUN



Step 5: Select *Next* to Create a VMFS Partition

This screen displays the information about the disk layout.

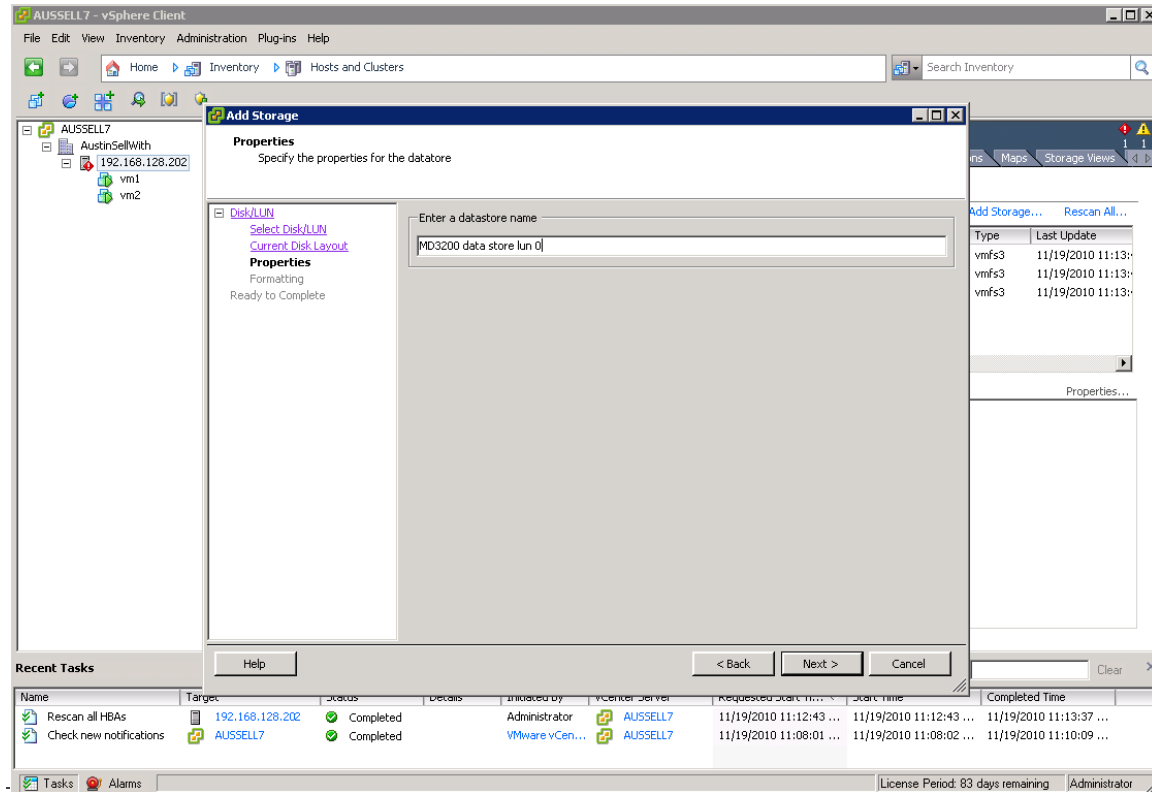
Figure 27. Creating a VMFS Partition



Step 6: Enter a Datastore Name

After entering the Datastore name, select **Next**.

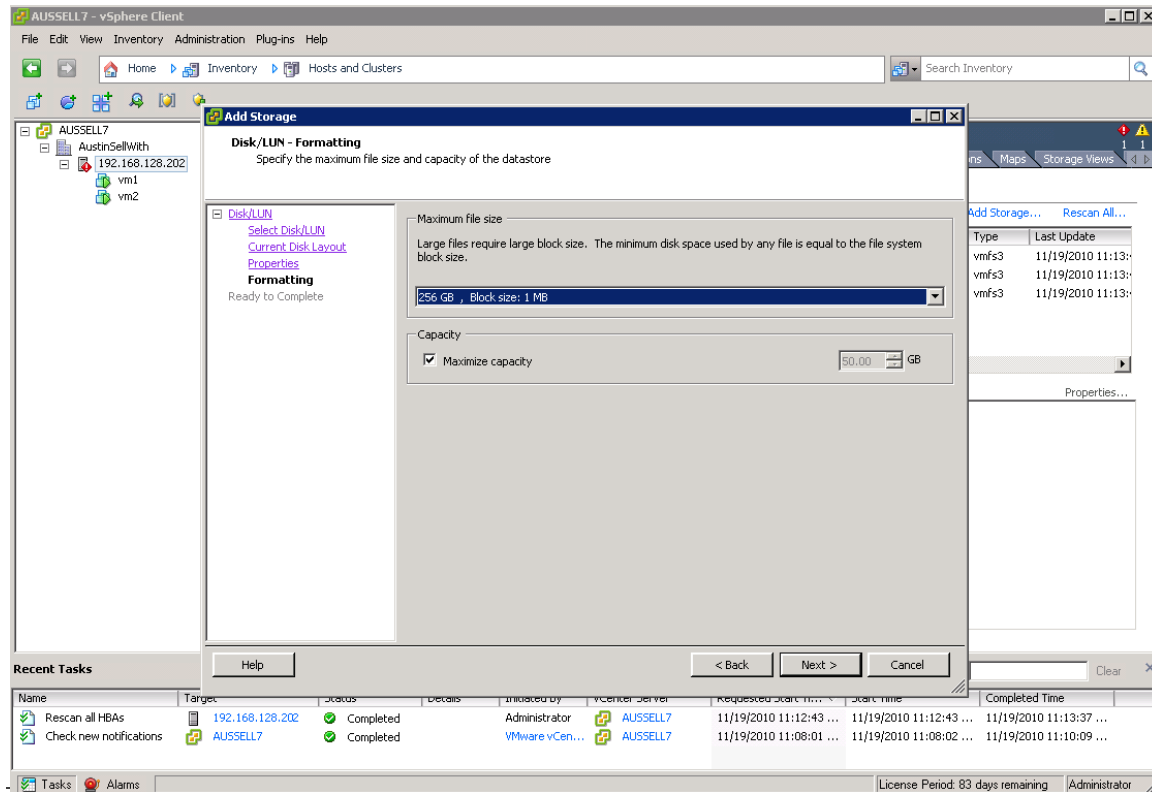
Figure 28. Entering a Datastore Name



Step 7: Set the Maximum File Size

For this example we used the maximum capacity. Select **Next** when finished.

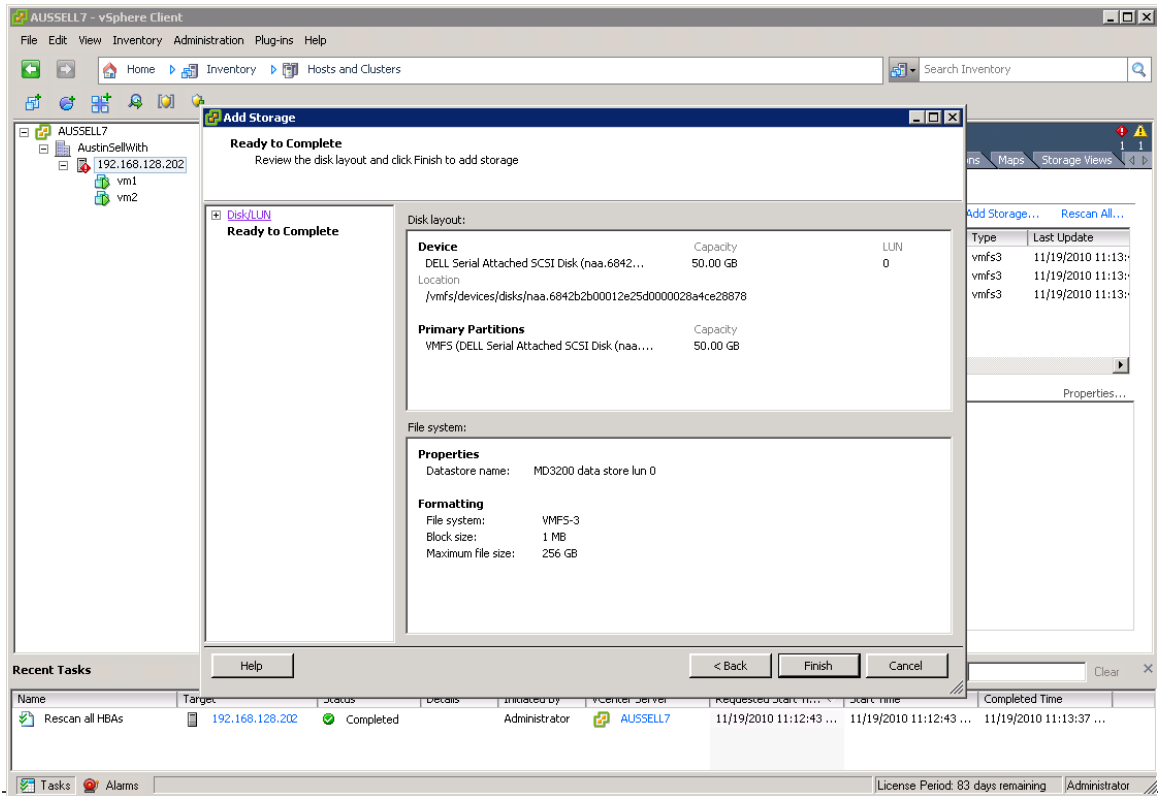
Figure 29. Setting the Maximum File Size



Step 8: Review the Disk Layout

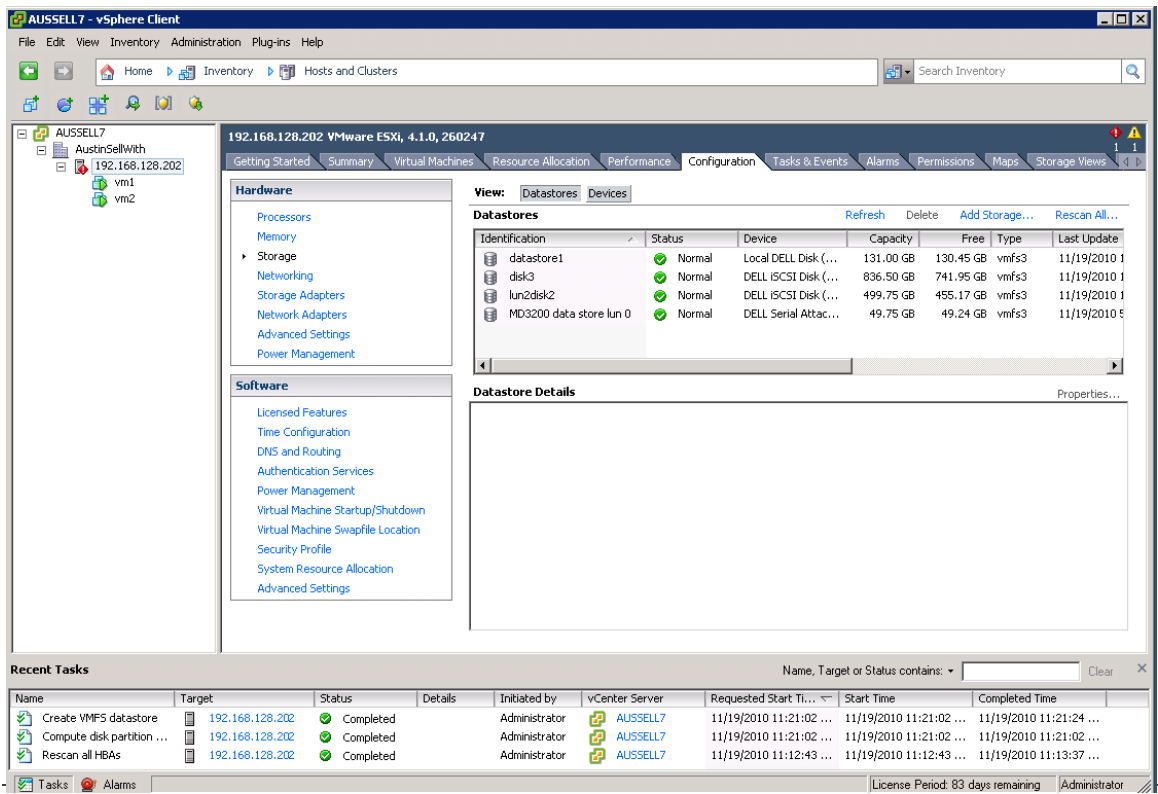
After verifying the layout, click **Finish** to add the storage.

Figure 30. Adding the Storage



The new storage is completed and ready to use with virtual machines.

Figure 30 Configuration Completed



Clustering with ESX4.1 / - Creating DRS Clusters

Refer to the following VMware website for a complete up-to-date list of the prerequisites for clustering with ESX4.1 server.

http://www.vmware.com/pdf/vsphere4/r40/vsp_40_mscs.pdf

Contact Information

Dell Support information:

HTTP://SUPPORT.DELL.COM/SUPPORT/TOPICS/GLOBAL.ASPX/SUPPORT/PRODUCT_SUPPORT/PRODUCT_SUPPORT_CENTRAL?C=US&CS=55&L=EN&S=BIZReferences

VMware vSphere 4.1 Documentation:

http://www.vmware.com/support/pubs/vs_pages/vsp_pubs_esxi41_e_vc41.html

Dell/VMware alliance home page:

<http://www.dell.com/vmware>