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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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.


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

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

**Figure 10. Host Port Identifier**

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:
    - `Ba:4b:ad:b0:51:4d:87:01`
    - [Refresh]

- **Add by creating a new host port identifier**
  - New host port identifier (16 characters required):
    - [Add]
    - [Remove]

**Alias (30 characters maximum):**

- [Add]
- [Remove]

**Host port identifiers to be associated with the host:**

<table>
<thead>
<tr>
<th>Host Port Identifier</th>
<th>Alias / User Label</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>5e:4b:ad:b0:51:4d:37:01</code></td>
<td><code>VMware_host1_port1</code></td>
</tr>
</tbody>
</table>
Step 7: Select VMware as the Host Type

Figure 11. Selecting the Host Type

In this step, you must indicate the host type (operating system) of the host. This information will be used to determine how a request will be handled by the storage array when the host reads and writes data to the virtual disks.

Note: For some host types, there may be several choices provided in the list.

Host type (operating system):
- Select from list:
  - Linux
  - VMware
  - Windows
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

What is a host group?

Questions:
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.
Step 8: Enter a Host Group Name
Enter a host group name that is appropriate for your environment.

Figure 13. Naming the 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 the 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_Group

- Select existing host group
  - Select from list
Step 9: Preview the Host Definition
If all of the information is correct for your environment select Finish.

Figure 14.  Preview (Define Host) Screen

You have defined your host as follows.  If you are going to be defining a lot of additional hosts, you can save the current host definition to a script file and use it as a template.  You can then make appropriate changes to the script file for subsequent host definitions using the command line or script editor.

Should I save the host definition to a script?  

**Host group:** VMware_hostgroup_1

**Host:** VMware_host1

**Current host definition:**

<table>
<thead>
<tr>
<th>Host name:</th>
<th>VMware_host1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host type:</td>
<td>VMWARE</td>
</tr>
<tr>
<td>Host port identifier:</td>
<td>5a:4b:ad:b0:51:4d:07:01</td>
</tr>
<tr>
<td>Alias:</td>
<td>VMware_host1_port1</td>
</tr>
</tbody>
</table>

**Associated host group:** VMware_hostgroup_1
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

Step 1: Rescan for MD3200 LUNs
Connect to the ESX Server/vCenter using VI Client. In the VSphere4 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
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.


Contact Information

Dell Support information:


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