Dell™ PowerVault™ MD3000 Storage Arrays With Microsoft® Windows Server® Failover Clusters

Hardware Installation and Troubleshooting Guide

Notes, Notices, and Cautions

NOTE: A NOTE indicates important information that helps you make better use of your computer.

NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

CAUTION: A CAUTION indicates a potential for property damage, personal injury, or death.

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Contents

1 Introduction 7

Overview **7**

Additional Information **7**

Cluster Solution With Dell PowerVault MD3000 Storage Array **8**

Cluster Hardware Requirements **8**

Cluster Storage **9**

Cluster Storage Management Software 10

Supported Dell Cluster Configurations **12**

Other Documents You May Need **15**

2 Cabling Your Cluster Hardware 17

Cabling the Mouse, Keyboard, and Monitor **17**

Cabling the Power Supplies **17**

Cabling Your Public and Private Networks **20**

Cabling Your Public Network 21

Cabling Your Private Network 21

Using Dual-Port Network Adapters for Your Private Network 22

NIC Teaming 22

Cabling the Storage Systems **23**

Cabling the Cluster in a Non-Redundant Configuration 23

Cabling the Cluster in Redundant Configuration With Single SAS 5/E HBAs. 25

Cabling the Cluster in Redundant Configuration With Dual SAS 5/E HBAs 27

3 Preparing Your Systems for Clustering 29

Cluster Configuration Overview **29**

Installing the Operating System **31**

Additional Information 33

Installing the SAS 5/E HBAs **34**

Installing the SAS 5/E HBA Drivers 34

Installing and Configuring the Storage Management Software. **34**

Adding Storage Arrays to the Failover Cluster 36

Installing and Configuring the Shared Storage System. **36**

Setting Up Your Storage Array 36

Configuring Host Access 37

Creating a Host Group 38

Creating Disk Groups and Virtual Disks. 38

Creating Host-to-Virtual Disk Mappings 39

Loading RAID Controller Module NVSRAM for Non-Redundant Configuration 40

Troubleshooting Tools **41**
Windows Operating System and Dynamic Volumes. 42
Configuring the RAID Level for the Shared Storage Subsystem. 42
Assigning Drive Letters and Mount Points 42
Naming and Formatting Drives on the Shared Storage System 43
Using Advanced (Premium) PowerVault Modular Disk Storage Manager Features 45
Installing and Configuring a Failover Cluster **48**
A Troubleshooting 49
B Cluster Data Form 57
Index 59

1

Introduction

This guide addresses the configuration of your Dell™ PowerVault™ MD3000 storage array for use with Microsoft® Windows Server® failover cluster nodes. It provides information and specific configuration tasks that enable you to deploy the shared storage for your cluster.

The guide is intended for experienced IT professionals who configure the cluster solution and for trained service technicians who perform upgrade and maintenance procedures. This document also addresses readers who are new to clustering.

Overview

A Dell failover cluster combines specific hardware and software components to provide enhanced availability for applications and services that run on the cluster. A failover cluster is designed to reduce the possibility of any single point of failure within the system that can cause the clustered applications or services to become unavailable.

NOTE: It is recommended that you use redundant components like server and storage power supplies, connections between the nodes and the storage array(s), and connections to client systems or other servers in a multi-tier enterprise application architecture in your cluster.

Additional Information

- For more information on deploying your cluster with Windows Server 2003 operating systems, see the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* on the Dell Support website at **support.dell.com**.
- For more information on deploying your cluster with Windows Server 2008 operating systems, see the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* on the Dell Support website at **support.dell.com**.

- For a list of recommended operating systems, hardware components, and driver or firmware versions for your failover cluster, see the *Dell Cluster Configuration Support Matrices* on the Dell High Availability Clustering website at **www.dell.com/ha**.

Cluster Solution With Dell PowerVault MD3000 Storage Array

The cluster solution implements a two-node clustering technology based on the Microsoft Cluster Server software (MSCS) incorporated within the Windows Server 2003 and Windows Server 2008 operating systems. This cluster solution provides the following features:

- 3 Gbps Serial Attached SCSI (SAS) technology
- High availability of system services and resources to network clients
- Redundant paths to the shared storage
- Failure recovery for applications and services
- Flexible maintenance capabilities—allowing you to repair, maintain, or upgrade a cluster node without taking the entire cluster offline

Cluster Hardware Requirements

Your cluster requires the following hardware components:

- Servers (nodes)
- Storage and storage management software

Table 1-1 describes the hardware requirements for your cluster nodes.

Table 1-1. Cluster Node Requirements

Component	Minimum Requirement
Processor	At least one processor for each cluster node.
RAM	At least 256 MB RAM installed on each cluster node for Windows Server 2003 Enterprise Edition. At least 512 MB RAM installed on each cluster node for Windows Server 2003 Enterprise x64 Edition and Windows Server 2008 x64 Edition.

Table 1-1. Cluster Node Requirements *(continued)*

Component	Minimum Requirement
Cluster Nodes	A minimum of two identical Dell™ PowerEdge™ servers are required. The maximum number of nodes supported in both the Windows Server 2003 and the Windows Server 2008 operating system is two.
Host Bus Adapter (HBA)	One or two SAS 5/E HBAs for each cluster node.
Network Interface Cards (NICs)	At least two NICs: one NIC for the public network and another NIC for the private network. **NOTE:** It is recommended that the NICs on each public network are identical and that the NICs on each private network are identical.
Internal Disk Controller	One controller connected to internal disks for each node. Use any supported Redundant Array of Independent Disk (RAID) controller or disk controller. Two physical disks are required for mirroring (RAID 1) and at least three are required for disk striping with parity (RAID 5). **NOTE:** It is strongly recommended that you use hardware-based RAID or software-based disk-fault tolerance for the internal drives.

Cluster Storage

Table 1-2 provides the configuration requirements for the shared storage system.

Table 1-2. Cluster Storage Requirements

Hardware Components	Minimum Requirement
Supported storage systems	One PowerVault MD3000 RAID enclosure. Up to two PowerVault MD1000 expansion enclosures.
Power and cooling requirements	Two integrated hot-pluggable power supply/cooling fan modules.

Table 1-2. Cluster Storage Requirements *(continued)*

Hardware Components	Minimum Requirement
Physical disks	At least two physical disks in the PowerVault MD3000 RAID enclosure.
Cables	Two 1-m, 2-m, or 4-m SAS cables for the non-redundant configuration.
	Four 1-m, 2-m, or 4-m SAS cables for the redundant configuration.
	Two 1-m, 2-m, or 4-m SAS cables for each additional PowerVault MD1000 expansion enclosure.

NOTE: You can configure RAID 0 or independent disks, however such a configuration is not recommended for a high-availability system as it does not offer data redundancy if a disk failure occurs.

NOTE: The PowerVault MD3000 Storage Array with the Dell Failover Cluster does not support sharing a PowerVault MD3000 RAID enclosure with other clustered or stand-alone servers.

Cluster Storage Management Software

The following sections describe various cluster storage management software that you can install and configure on your cluster.

Dell PowerVault Modular Disk Storage Manager Client

The Modular Disk Storage Manager Client runs on the management station to centrally manage the PowerVault MD3000 RAID enclosure. You can use PowerVault Modular Disk Storage Manager to perform tasks such as creating or managing RAID arrays, binding virtual disks, and downloading firmware.

Dell PowerVault Modular Disk Storage Manager Agent

The Modular Disk Storage Manager Agent resides on each cluster node and collects server-based topology data that can be managed by the Modular Disk Storage Manager Client.

Multi-Path Software

Multi-path software (also referred to as the failover driver) is a software resident on each cluster node that provides management of the redundant data path between the server and the RAID enclosure. For the multi-path software to correctly manage a redundant path, the configuration must provide for redundant HBAs and cabling.

The multi-path software identifies the existence of multiple paths to a virtual disk and establishes a preferred path to that disk. If any component in the preferred path fails, the multi-path software automatically re-routes I/O requests to the alternate path so that the storage array continues to operate without interruption.

In a redundant cluster configuration, the **Automatic Failback** feature is disabled by default. Therefore, when a failed component is repaired or replaced, the virtual disk(s) do not automatically transfer to the preferred controller. You can manually initiate a failback using the Modular Disk Storage Manager Client or Command Line Interface (CLI).

Advanced Features

Advanced features for the PowerVault MD3000 RAID enclosure include:

- Snapshot Virtual Disk—Captures point-in-time images of a virtual disk for backup, testing, or data processing without affecting the contents of the source virtual disk.
- Virtual Disk Copy—Generates a full copy of data from the source virtual disk to the target virtual disk in a storage array. You can use Virtual Disk Copy to back up data, copy data from disk groups that use smaller-capacity physical disks to disk groups using greater capacity physical disks, or restore snapshot virtual disk data to the source virtual disk.

  NOTE: For instructions on deploying the correct Virtual Disk options in the cluster environment, see "Using Advanced (Premium) PowerVault Modular Disk Storage Manager Features" on page 45.

NOTE: For more information about Modular Disk Storage Manager, Snapshot Virtual Disk, and Virtual Disk Copy, see ""Installing and Configuring the Shared Storage System" on page 36" and your Modular Disk Storage Manager documentation.

Supported Dell Cluster Configurations

Figure 1-1 to Figure 1-3 illustrate the various supported configurations for your cluster with PowerVault MD3000 and MD1000 RAID enclosures.

Figure 1-1. Non-Redundant Cluster Configuration

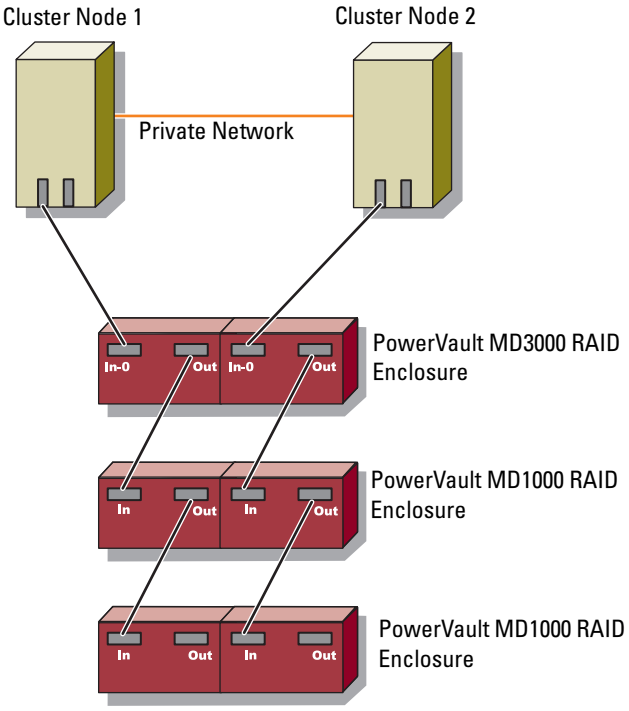


Figure 1-2. Redundant Cluster Configuration With Single SAS 5/E

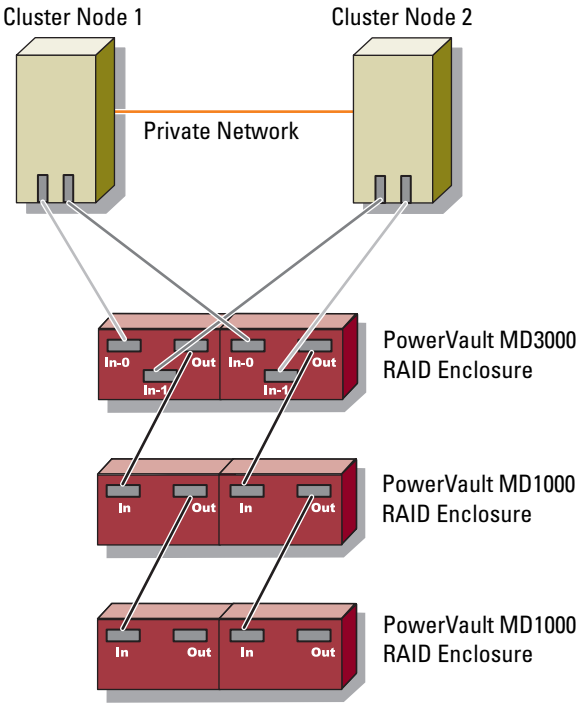
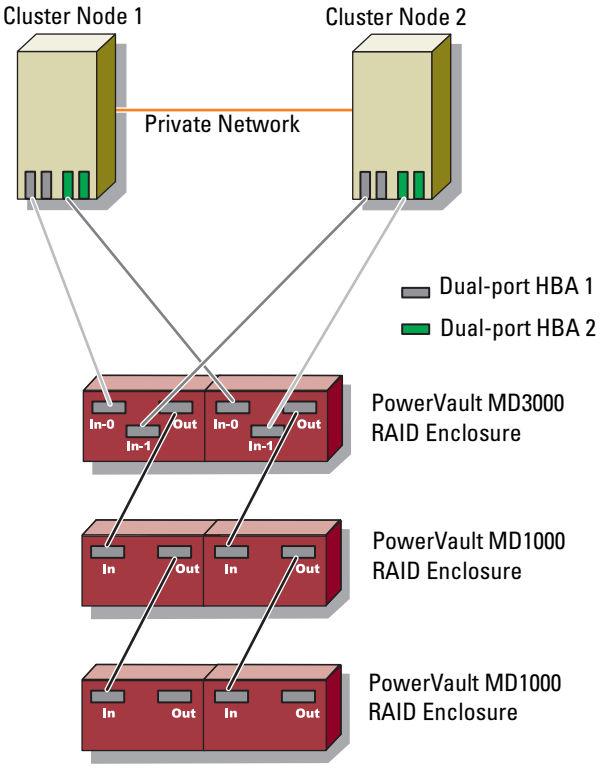


Figure 1-3. Redundant Cluster Configuration With Dual SAS 5/E



Other Documents You May Need

CAUTION: For important safety and regulatory information, see the safety information that shipped with your system. Warranty information may be included within this document or as a separate document.

NOTICE: Always read the updates included—included as release notes or readme files—first, because they often supersede information in other documents.

NOTE: All documentation, unless indicated otherwise, is available on the Dell Support website at **support.dell.com**.

- The *Rack Installation Guide* included with your rack solution describes how to install your system into a rack.
- The *Getting Started Guide* included with you Dell system provides an overview of initially setting up your system.
- The *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* and the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* provides more information on deploying your cluster with the specific variant of the Windows Server operating system.
- The *Dell Cluster Configuration Support Matrices* on the Dell High Availability Clustering website at **www.dell.com/ha** provides a list of recommended operating systems, hardware components, and driver or firmware versions for your failover cluster.
- The *Setting Up Your System* document provides an overview of initially setting up your system.
- The *Users Guide* for your PowerEdge or PowerVault system describes system features and technical specifications, SAS drivers, the system setup program (if applicable), software support, and the system configuration utility.
- The *Installation and Troubleshooting Guide* for your PowerEdge or PowerVault system describes how to troubleshoot the system and install or replace system components.
- The SAS 5/E documentation includes information on the SAS host bus adapter (HBA).

- The PowerVault Modular Disk Storage Manager documentation provides instructions for using the array management software to configure RAID systems.
- Operating system documentation describes how to install (if necessary), configure, and use the operating system software.
- The Dell PowerVault tape library documentation provides information for installing, troubleshooting, and upgrading the tape library.
- The PowerEdge or PowerVault User Guide describes system features, technical specifications, the System Setup program (if applicable), software support and the system configuration utility.
- The *PowerVault Modular Disk Storage Manager CLI Guide* provides information about using the command line interface (CLI).
- The *Dell PowerVault MD3000 Resource* media provides documentation for configuration and management tools, as well as the full documentation set included here.
- The *Dell PowerVault Modular Disk Storage Manager User's Guide* provides instructions for using the array management software to configure RAID systems.
- The *Dell PowerVault Modular Disk Systems Support Matrix* provides information on supported software and hardware for PowerVault Modular Disk systems.
- The *System Administrator's Guide* provides system operation and management operation.
- The *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide*
- Documentation for any components you purchased separately provides information to configure and install these options.
- Release notes or readme files may be included to provide last-minute updates to the system documentation or advanced technical reference material intended for experienced users or technicians.

2

Cabling Your Cluster Hardware

The following sections help you connect the power, network and storage cables to your cluster. After you have connected the hardware components, the subsequent sections in this document provide instructions to configure your cluster.

Cabling the Mouse, Keyboard, and Monitor

When installing a cluster configuration in a rack, you must include a switch box to connect the mouse, keyboard, and monitor to the nodes. For instructions on cabling each node's connections to the switch box, see the documentation included with your rack.

Cabling the Power Supplies

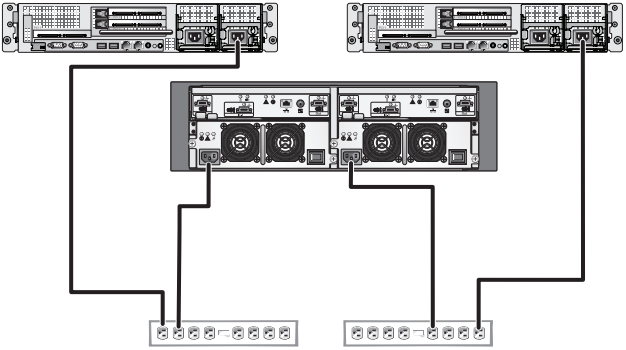
To ensure that the specific power requirements are met, see the documentation for each component in your cluster solution.

It is recommended to follow the guidelines below to protect your cluster solution from power-related failures:

- For nodes with multiple power supplies, plug each power supply into a separate AC circuit.
- Use uninterruptible power supplies (UPS).
- For some environments, consider having backup generators and power from separate electrical substations.

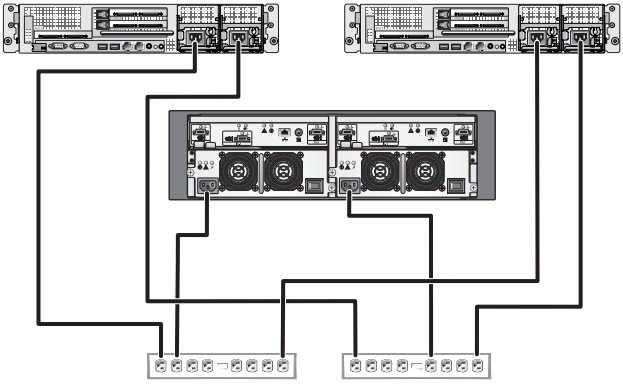
Figure 2-1 and Figure 2-2 illustrate recommended methods of power cabling for a cluster solution consisting of two Dell™ PowerEdge™ systems and one storage system. To ensure redundancy, the primary power supplies of all the components are grouped onto one or two circuits and the redundant power supplies are grouped onto a different circuit.

Figure 2-1. Power Cabling Example With One Power Supply in the PowerEdge Systems



NOTE: This illustration is intended only to demonstrate the power distribution of the components.

Figure 2-2. Power Cabling Example With Two Power Supplies in the PowerEdge Systems



primary power supplies on one AC power strip (or on one AC PDU [not shown])

redundant power supplies on one AC power strip (or on one AC PDU [not shown])

NOTE: This illustration is intended only to demonstrate the power distribution of the components.

Cabling Your Public and Private Networks

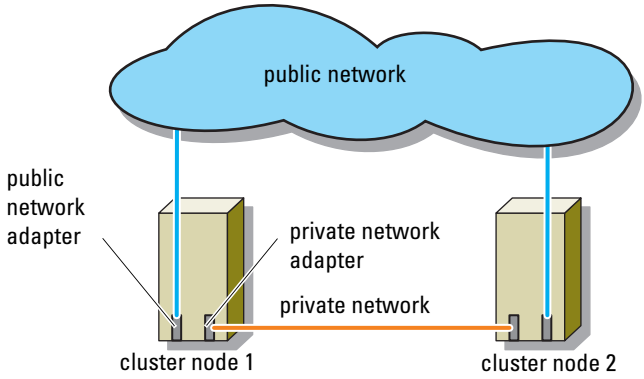
The network adapters in the cluster nodes provide at least two network connections for each node. The network connections are described in Table 2-1.

Table 2-1. Network Connections

Network Connection	Description
Public Network	All connections to the client LAN.
	At least one public network must be configured for mixed mode (public mode and private mode) for private network failover.
Private Network	A dedicated connection for sharing cluster health and status information between the cluster nodes.
	Network adapters connected to the LAN can also provide redundancy at the communications level in case the cluster interconnect fails.
	For more information on private network redundancy, see your Microsoft® Cluster Services (MSCS) documentation

Figure 2-3 shows an example of network adapter cabling in which dedicated network adapters in each node are connected to the public network and the remaining network adapters are connected to each other (for the private network).

Figure 2-3. Example of Network Cabling Connection



Cabling Your Public Network

Any network adapter supported by a system running Transmission Control Protocol/Internet Protocol (TCP/IP) may be used to connect to the public network segments. You can install additional network adapters to support additional public network segments or to provide redundancy in the event of a faulty primary network adapter or switch port.

Cabling Your Private Network

The private network connection to the cluster nodes is provided by a second or subsequent network adapter that is installed in each node. This network is used for intra-cluster communications.

Table 2-2 lists the required hardware components and connection method for two possible private network configurations.

Table 2-2. Private Network Hardware Components and Connections

Method	Hardware Components	Connection
Network switch	Fast Ethernet or Gigabit Ethernet network adapters and switches	Connect standard two-node Ethernet cables from the network adapters in both cluster nodes to a Fast Ethernet or Gigabit Ethernet switch.
Point-to-Point (two-node cluster only)	Fast Ethernet network adapters	Connect a crossover Ethernet cable between the Gigabit Ethernet network adapters in both cluster nodes.
Point-to-Point	Copper Gigabit Ethernet network adapters	Connect a standard Ethernet cable between the Gigabit Ethernet network adapters in both cluster nodes.

Using Dual-Port Network Adapters for Your Private Network

You can configure your cluster to use the public network as a failover for private network communications. However, if dual-port network adapters are used, do not use two ports simultaneously to support both the public and private networks.

NIC Teaming

Network Interface Card (NIC) teaming combines two or more NICs to provide load balancing and/or fault tolerance. Your cluster supports NIC teaming only in a public network. NIC teaming is not supported in a private network.

Use the same brand of NICs in a team. Do not mix brands of teaming drivers.

Cabling the Storage Systems

This section provides information for connecting your cluster to a storage system.

You can either use a SAS connection for in-band storage management or use an Ethernet connection for out-of-band storage management. For out-of-band storage management, cable the Ethernet ports on the storage array to the public network.

NOTE: It is recommended that you configure your Dell PowerVault™ MD3000 to use both in-band and out-of-band management paths. Establishing all management connections to a RAID enclosure provides additional paths in the case of a management connection failure.

NOTE: For more details on the storage hardware description, see the *Dell PowerVault MD3000 RAID Enclosure Hardware Owner's Manual*

Cabling the Cluster in a Non-Redundant Configuration

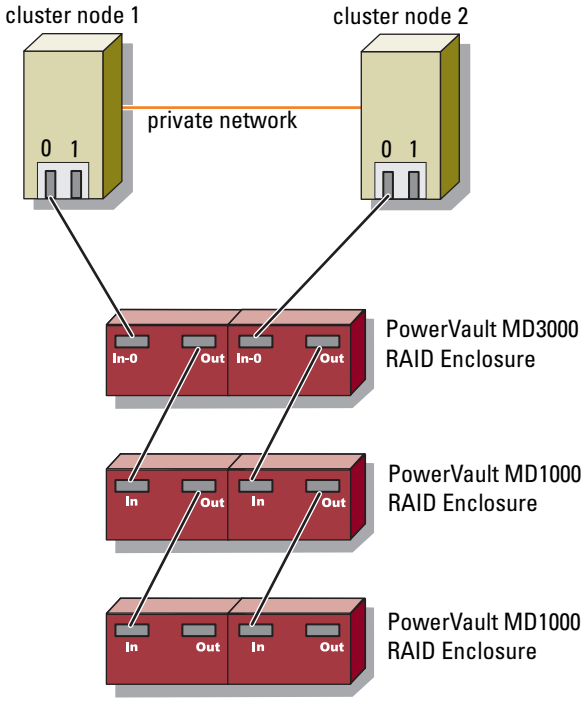
Each cluster node attaches to the storage system using one SAS cable. In this configuration, there is only one storage path from the cluster node to the storage system. If any component such as the HBA, cable, or storage controller fails in the storage path, the cluster may failover. If the cluster failover occurs, MSCS moves the cluster group to the stand-by cluster node and accesses the data.

NOTE: Dell does not support upgrades from a non-redundant cluster configuration to a redundant configuration.

To cable the cluster:

1. Install a SAS cable from the cluster node 1 HBA port 0 to the RAID controller module 0 port In-0.
2. Install a SAS cable from the cluster node 2 HBA port 0 to the RAID controller module 1 port In-0.

Figure 2-4. Non-Redundant Cluster Configuration



NOTE: A multi-path driver that is used in similar configurations is required for this configuration.

NOTE: Only RAID controller modules with one host-to-controller SAS connection are supported in the configuration illustrated in Figure 2-4.

Cabling the Cluster in Redundant Configuration With Single SAS 5/E HBAs

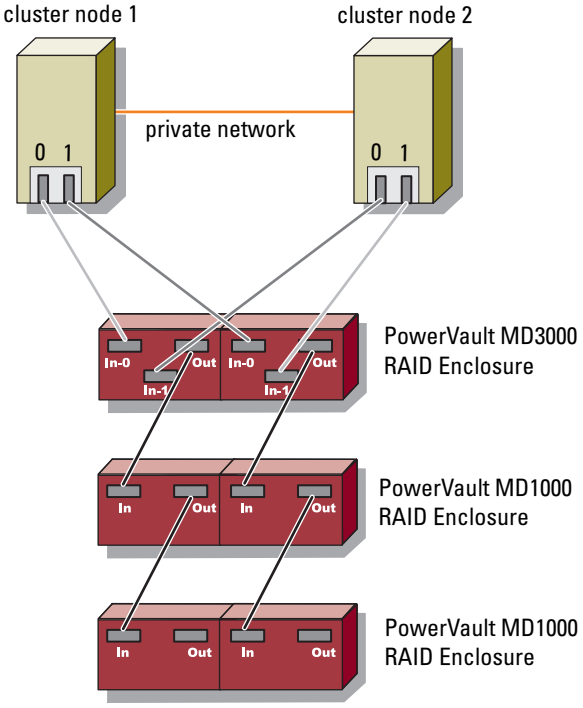
Each cluster node attaches to the storage system using one SAS 5/E HBA and two SAS cables. In this configuration, there are redundant storage paths from the cluster node to the storage system. If a component fails in the storage path such as the port, the cable, or the storage controller, the multi-path software automatically reroutes the I/O requests to the alternate path so that the storage array continues to operate without interruption.

To cable the cluster:

1. Connect cluster node 1 to the storage system.
   a. Install a SAS cable from the cluster node 1 HBA port 0 to the RAID controller module 0 port In-0.
   b. Install a SAS cable from the cluster node 1 HBA port 1 to the RAID controller module 1 port In-0.
2. Connect cluster node 2 to the storage system.
   a. Install a SAS cable from the cluster node 2 HBA port 0 to the RAID controller module 0 port In-0.
   b. Install a SAS cable from the cluster node 2 HBA port 1 to the RAID controller module 1 port In-0.

NOTE: If the HBA on the active node fails, MSCS moves the cluster group to the standby node and accesses the data through the standby node.

Figure 2-5. Redundant Cluster Configuration With Single SAS 5/E HBA



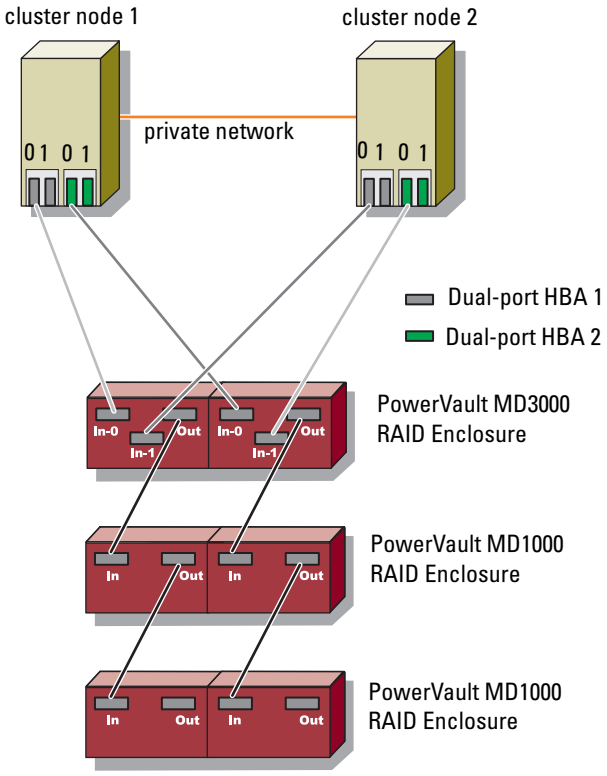
Cabling the Cluster in Redundant Configuration With Dual SAS 5/E HBAs

Each cluster node attaches to the storage system using two SAS 5/E HBAs and two SAS cables. In this configuration, there are redundant storage paths from the cluster node to the storage system. If a component fails in the storage path such as the HBA, the cable, or the storage controller, the multi-path software automatically reroutes the I/O requests to the alternate path so that the storage array continues to operate without interruption.

To cable the cluster:

1. Connect cluster node 1 to the storage system.
   a. Install a SAS cable from the cluster node 1 HBA 1 port 0 to the RAID controller module 0 port In-0.
   b. Install a SAS cable from the cluster node 1 HBA 2 port 0 to the RAID controller module 1 port In-0.
2. Connect cluster node 2 to the storage system.
   a. Install a SAS cable from the cluster node 2 HBA 1 port 0 to the RAID controller module 0 port In-1.
   b. Install a SAS cable from the cluster node 2 HBA 2 port 0 to the RAID controller module 1 port In-1.

Figure 2-6. Redundant Cluster Configuration With Dual HBAs



3

Preparing Your Systems for Clustering

CAUTION: Only trained service technicians are authorized to remove and access any of the components inside the system. For important safety and regulatory information, see the safety information that shipped with your system.

Cluster Configuration Overview

1. Ensure that your site can handle the cluster's power requirements.

   Contact your sales representative for information about your region's power requirements.

2. Install the servers, the shared storage array(s), and the interconnect switches (for example: in an equipment rack), and ensure that all these components are powered on.

   NOTE: For more information on step 3 to step 7 and step 10 to step 12, see "Preparing your systems for clustering" section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide located* on the Dell Support website at support.dell.com.

3. Deploy the operating system (including any relevant service pack and hotfixes), network adapter drivers, and storage adapter drivers (including Multipath I/O drivers(MPIO)) on each of the servers that will become cluster nodes. Depending on the deployment method that is used, it may be necessary to provide a network connection to successfully complete this step.

   NOTE: You can record the Cluster configuration and Zoning configuration (if relevant) to the Cluster Data Form and Zoning Configuration Form, respectively to help in planning and deployment of your cluster. For more information, see "Cluster Data Form" on page 57.

4 Establish the physical network topology and the TCP/IP settings for the network adapters on each server node to provide access to the cluster public and private networks.

5 Configure each server node as a member server in the same Windows® Active Directory Domain.

NOTE: You can configure the cluster nodes as Domain Controllers. For more information, see "Selecting a Domain Model" section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com**.

6 Establish the physical storage topology and any required storage network settings to provide connectivity between the storage array and the servers that will be configured as cluster nodes. Configure the storage system(s) as described in your storage system documentation.

7 Use storage array management tools to create at least one logical unit number (LUN). The LUN is used as a cluster quorum disk for the failover cluster with Windows Server® 2003 and as a witness disk for the failover cluster with Windows Server 2008. Ensure that this LUN is presented to the servers that will be configured as cluster nodes.

NOTE: It is highly recommended that you configure the LUN on a single node, for security reasons, as mentioned in step 8 when you are setting up the cluster. Later, you can configure the LUN as mentioned in step 9 so that other cluster nodes can access it.

8 Select one of the systems and form a new failover cluster by configuring the cluster name, cluster management IP, and quorum resource.

NOTE: For Dell Failover Clusters with Windows Server 2003, run the **Cluster Validation Wizard** to ensure that your system is ready to form the cluster.

9 Join the remaining node(s) to the failover cluster.

10 Configure roles for cluster networks. Take any network interfaces that are used for iSCSI storage (or for other purposes outside of the cluster) out of the control of the cluster.

11 Test the failover capabilities of your new cluster.

NOTE: For Dell Failover Clusters with Windows Server 2008, you can also use the **Cluster Validation Wizard**.

12 Configure highly-available applications and services on your failover cluster. Depending on your configuration, this may also require providing additional LUNs to the cluster or creating new cluster resource groups. Test the failover capabilities of the new resources.

13 Configure client systems to access the highly available applications and services that are hosted on your failover cluster.

Installing the Operating System

Ensure that the Windows Server operating system installed on each cluster node in your failover cluster has the same release, edition, service pack, and processor architecture.

For example, all nodes in your cluster may be configured with Windows Server 2003 R2, Enterprise x64 Edition. If the operating system varies among nodes, it is not possible to configure a failover cluster successfully. It is recommended to establish server roles prior to configuring a failover cluster, depending on the operating system configured on your cluster.

For a list of Dell PowerEdge Servers, iSCSI HBAs and network switches, and the recommended list of operating system variants, specific driver and firmware revisions, see the *Dell Cluster Configuration Support Matrices* on the Dell High Availability Clustering website at **www.dell.com/ha**.

NOTE: For more information on deploying your cluster with the Windows Server 2003 operating systems, see the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* on the Dell Support website at **support.dell.com**.

To establish communication between the cluster nodes and the shared PowerVault MD3000 storage array and to make the shared disks in the storage array available to the cluster:

1 Ensure that your cluster meets the requirements as described in "Before You Begin" on page 31.

2 Reserve static IP addresses for the following cluster resources and components:

- SAS connections
- Public network

- Private network
- Cluster virtual servers

NOTE: You must use these IP addresses when you install the Microsoft Windows operating system and Microsoft Cluster Services (MSCS)/Failover Cluster Service.

NOTE: For more information, see **Assigning Static IP Addresses to Your Cluster Resources and Components** section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com**.

3 Configure the internal disks in your cluster nodes.

NOTE: For more information, see the "Configuring the Internal Drives in Your Cluster Nodes" section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com**.

4 Install and configure the Windows operating system on both the cluster nodes. Each cluster node must have its own licensed copy of the Windows operating system and Certificate of Authenticity (COA) attached.

NOTE: For more information, see the "Installing and Configuring the Windows Operating System" section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com**.

5 Install and configure the storage management software.

NOTE: For more information, see the documentation included with your Dell PowerVault Modular Disk Storage Manager software or available at the Dell Support website located at **support.dell.com**.

6 Configure the shared storage system(s).

NOTE: For more information, see the "Installing and Configuring the Shared Storage System" section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com**.

7 Configure the MSCS/Failover Cluster software.

NOTE: For more information, see the "Installing and Configuring a Failover Cluster" section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com**.

8 Verify cluster functionality. Ensure that:

- The cluster components are communicating with each other.
- MSCS is started.

NOTE: For more information, see the "Verifying Cluster Functionality" section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com.**

9 Verify cluster resource availability. Use Cluster Administrator/Failover Cluster Manager to check the running state of each resource group.

NOTE: For more information, see the "Verifying Cluster Resource Availability" section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com**.

Additional Information

- For a list of Dell PowerEdge Servers, iSCSI HBAs, network switches, recommended list of operating system variants, and specific driver and firmware revisions, see the *Dell Cluster Configuration Support Matrices* on the Dell High Availability Clustering website at **www.dell.com/ha**.
- For a general overview of cluster configuration tasks and more detailed information about deploying your cluster see the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com**.

Installing the SAS 5/E HBAs

For systems with dual SAS 5/E HBAs, Dell recommends installing the cards on separate Peripheral Component Interconnect (PCI) buses. Placing the cards on separate buses improves availability and performance.

For more information about your system's PCI bus configuration, see the *Dell Cluster Configuration Support Matrices* on the Dell High Availability Clustering website at **www.dell.com/ha**.

Installing the SAS 5/E HBA Drivers

1. Close all other programs before installing any new software.
2. Insert the *Dell PowerVault MD3000 Resource Media*, and navigate to the main menu.
3. Click the **Install the SAS 5/E Adapter Driver** bar on the main menu. The **Installation Wizard** appears.
4. Follow the instructions on each screen.
5. After you click **Install**, the Status screen shows the progress of the installation. When the installation is complete, click **Finish** to return to the main menu.

NOTE: To install the software, you must have administrative privileges. If you do not have administrative privileges, a message appears and you are not able to install the software.

Installing and Configuring the Storage Management Software

To install and configure the PowerVault MD3000 RAID enclosure in your cluster:

1. Ensure that the PowerVault MD3000 RAID enclosure has the latest firmware and Non-Volatile Static Random Access Memory (NVSRAM). For more information, see your PowerVault MD3000 RAID enclosure document and the"Loading RAID Controller Module NVSRAM for Non-Redundant Configuration" on page 40.

2 Install the host software (multi-path software and the PowerVault Modular Disk Storage Manager Agent) on each cluster node, and the PowerVault Modular Disk Storage Manager Client software on the management station.

   For more information, see your PowerVault Modular Disk Storage Manager documentation.

3 Set the correct failback mode on each cluster node. You must merge the **PowerVault MD3000 Stand Alone to Cluster.reg** file located in the **\utility** directory of the *Dell PowerVault MD3000 Resource* media into the registry of each node.

NOTE: If you uninstall and reinstall the multi-path I/O software or PowerVault Modular Disk Storage Manager, you must merge the **PowerVault MD3000 Stand Alone to Cluster.reg** file into the registry again.

NOTE: If you are reconfiguring a cluster node into a standalone host, you must merge the **PowerVault MD3000 Cluster to Stand Alone.reg** file located in the **\utility** directory of the *Dell PowerVault MD3000 Resource* media into the host registry.

These registry files enable correct failback operation on the host.

NOTE: The cluster node can be used as a management station.

You can manage a storage array in two ways:

- Out-of-band management
- In-band management

For out-of-band management, data is separate from commands and events. Data travels through the host-to-controller SAS interface cables, while commands and events travel through the Ethernet cables.

When you use out-of-band management, you must set the network configuration for each RAID controller module including its IP address, subnet mask, and gateway. If you are using a DHCP server, you can enable automatic network configuration, but if you are not using a DHCP server, you must enter the network configuration manually.

For in-band management, commands, events, and data travel through the host-to-controller SAS interface cables. Unlike out-of-band management, commands and events are mixed with data.

NOTE: It is recommended to use both in-band and out-of-band management.

Adding Storage Arrays to the Failover Cluster

To add a storage array to the PowerVault Modular Disk Storage Manager, click the **New** link in the **Array Selector** area. A window is displayed that allows you to choose the automatic or manual process to add a new storage array.

You can add the Storage Arrays using either **Automatic Discovery** or **Manual Discovery**.

Installing and Configuring the Shared Storage System

This section provides information for installing and configuring the shared storage systems.

Setting Up Your Storage Array

The **Perform Initial Setup Tasks** link located on the **Summary** tab provides links to the basic steps you should follow when initially setting up a storage array in PowerVault Modular Disk Storage Manager.

Initial setup tasks include:

1. **Blinking the Storage Array** — Find the physical location of the storage array on your network. The storage array can then be identified with a label.
2. **Renaming the Storage Array** — Provide a unique and memorable name to help you easily identify the storage array.
3. **Setting a Storage Array Password** — Prevent unapproved manipulation of the storage array, such as deletion of a virtual disk.
4. **Setting up Alert Notifications** — Enable e-mail and SNMP alerts to notify administrators about storage array conditions that require attention.
    a. **Configure Sender E-mail Settings** — Provide the SMTP, e-mail address, and contact information PowerVault Modular Disk Storage Manager uses to send e-mail alerts.
    b. **Add or Edit E-mail Addresses** — Provide information about accounts that should receive e-mail-based alerts.
    c. **Set Up SNMP Alerts** — Provide information about hosts that should receive SNMP-based alerts.

5 **Configuring Host Access and Create a Host Group** — Set up one or more hosts to access the storage array. For more information, see "Configuring Host Access" on page 37 and "Creating a Host Group" on page 38

6 **Configuring and Manage Virtual Disks** — For more information, see "Creating Disk Groups and Virtual Disks" on page 38.

7 **View and Enable Premium Features (Optional)** — If you have purchased premium features, including Snapshot Virtual Disks and virtual disk copies, check the premium features that are currently available and enable them if they are turned off. For more information, see "Using Advanced (Premium) PowerVault Modular Disk Storage Manager Features" on page 45.

8 **Changing Network Configuration (Optional)** — Change your network configuration by changing RAID controller network settings or obtain the network configuration from a DHCP server.

When you are working with a non-redundant configuration, you need to load the appropriate NVSRAM. For more information, see "Loading RAID Controller Module NVSRAM for Non-Redundant Configuration" on page 40.

Configuring Host Access

Configuring host access allows you to either permit or deny access to a storage array for specific hosts.

Host access configuration is the first step in setting up your storage array. You must complete this task during initial setup and anytime you connect a new host. When you permit host access, that host can then be mapped to a virtual disk on the storage array.

1 On the **Summary** tab, the **Hosts & Mappings** area indicates how many hosts are configured to access the array.

2 Click the **Configured Hosts** link in this area to see the names of these hosts.

NOTE: Ensure that the PowerVault Modular Disk Storage Manager Agent service is started on your cluster nodes.

To begin configuring host access, click the **Configure** tab and then click the **Configure Host Access** link. PowerVault Modular Disk Storage Manager scans the array and displays a list of the hosts it finds that have not yet been configured for access to the array. To see hosts that have already been configured, click the **View Hosts that currently have access to the storage array** link.

To automatically configure a host for access to the storage array:

1. Click the **Configure** tab and then click the **Configure Host Access** link.
2. Select both the cluster nodes individually, or by clicking the **Select All** check box beneath the list.
3. Set the Host Type for all the HBA ports on each cluster node by clicking the **View Details** button (next to the list).
   - For a **Non-Redundant Configuration**, select **Windows MSCS Cluster – Single Path**.
   - For a **Redundant Configuration** with Dual SAS 5/E HBAs, select **Windows 2000/Server 2003/Server 2008 Clustered.**
4. Click **OK** to configure access to the array for the hosts you selected.

Creating a Host Group

After you have created the hosts, follow this procedure to create a host group:

1. Click the **Modify** tab and then click the **Modify Host Topology** link.
2. Click the **Create Host Group** link on the **Modify Host Topology** window. The **Create Host Group** window appears.
3. Type a name for the new host group in the text box.
4. In the **Select Hosts to Add** list, click the names of the first cluster node, then click the **Add** button located to the right of the list. The host moves to the **Hosts in Group List**.
5. Repeat step 4 to add the second cluster node to the host group.
6. To create the host group, click **OK**.

Creating Disk Groups and Virtual Disks

A minimum of one virtual disk is required for an active/passive configuration; at least two virtual disks are required for an active/active configuration. In some cases, the virtual disks may have been bound when the system was shipped. It is still important, however, to install the management software and to verify that the desired virtual disk configuration exists.

NOTE: Before you can create virtual disks, you must first organize the physical disks into disk groups and configure host access. You can then create virtual disks within a disk group.

To create a virtual disk, use one of the following methods:

- Automatic Configuration
- Manual Configuration

It is recommended that you create at least one virtual disk for each application. If multiple NTFS volumes are created on a single virtual disk using Windows Disk Management, the volumes failover together, rather individually from node-to-node.

You can manage your virtual disks remotely using PowerVault Modular Disk Storage Manager.

NOTE: It is recommended that you use a RAID level other than RAID 0 (which is commonly called striping). RAID 0 configurations provide very high performance, but do not provide the level of availability required for the quorum resource. See the documentation for your storage system for more information about setting up RAID levels for the system.

Disk groups are created in the non-configured capacity of a storage array, and virtual disks are created in the free capacity of a disk group. The hosts attached to the storage array read and write data to the virtual disks.

For more information on how to create Disk Groups and Virtual Disks, see your PowerVault Modular Disk Storage Manager documentation.

Creating Host-to-Virtual Disk Mappings

To create host-to-virtual disk mappings to assign virtual disks to the host groups containing cluster node, follow the steps:

1. Click the **Configure** tab.
2. Click the **Create Host-to-Virtual Disk Mappings** link.
3. The **PowerVault Modular Disk Storage Manager** displays a series of pages.
4. Select the **Host Group** containing the cluster nodes and virtual disks to be mapped.
5. Verify the mapping by clicking the **Host-to-Virtual Disk Mappings** link on the **Summary** tab to ensure that the configuration was created correctly.

Loading RAID Controller Module NVSRAM for Non-Redundant Configuration

To ensure that the non-redundant configuration is functioning properly, load the appropriate NVSRAM file to the PowerVault MD3000 storage enclosure. The NVSRAM file is located at the **\utility\NVSRAM** directory on the *PowerVault MD3000 Resource* Media, with a prefix of Non-redundant-MSCS. To load the NVSRAM file to the PowerVault MD3000 RAID enclosure, from the storage management station, open the PowerVault Modular Disk Storage Manager Client:

1. Click the **Support** tab, then click **Download Firmware**.
2. In the **Download Firmware** window, click **Download RAID Controller Module NVSRAM**. The current controller firmware and NVSRAM versions in use are displayed.
3. Click **Select File** to browse to the file you want to download. By default, only firmware images compatible with the current storage array configuration are listed.
4. Select the appropriate file in the **File Selection** window and click **OK**. If the file you selected is not valid or is incompatible with the current storage array configuration, an error message is displayed. Click **OK** to close the message and select another file.
5. Click **Transfer...**. A **Confirm Download** dialog box is displayed showing the RAID controller and NVSRAM firmware you selected.
6. To complete the download, click **Yes**.

Troubleshooting Tools

The Dell PowerVault Modular Disk Storage Manager establishes communication with each managed array and determines the current array status. When a problem occurs on a storage array, the Modular Disk Storage Manager provides several ways to troubleshoot the problem:

- Recovery Guru—The SAS Device Miswire Recovery Guru diagnoses critical events on the storage array and recommends step-by-step recovery procedures for problem resolution. To access the Recovery Guru using the PowerVault Modular Disk Storage Manager, click **Support→ Recover from Failure**. You can access the Recovery Guru from the **Status** area of the **Summary** page.

  NOTE: You can generate the SAS Device Miswire Recovery Guru condition by connecting the host port of one controller to the unused expansion port on the second controller in a PowerVault MD3000 RAID enclosure.

- Storage Array Profile — The Storage Array Profile provides an overview of your storage array configuration, including firmware versions and the current status of all devices on the storage array. To access the Storage Array Profile, click **Support→ View storage array profile**. You can view the profile by clicking the Storage array profile link in the **Hardware Components** area of the **Summary** tab.

- Status Icons — Status icons identify the six possible health status conditions of the storage array. For every non-optimal status icon, use the Recovery Guru to detect and troubleshoot the problem. The six possible health status conditions are described below:

  – Optimal—Every component in the managed array is in the desired working condition.

  – Needs Attention—A problem exists with the managed array that requires intervention to correct it.

  – Fixing—A Needs Attention condition has been corrected and the managed array is currently changing to an **Optimal** status.

  – Unresponsive—The storage management station cannot communicate with the array, one controller, or both controllers in the storage array. Wait at least five minutes for the storage array to return to an **Optimal** status following a recovery procedure.

- Contacting Device—The PowerVault Modular Disk Storage Manager is establishing contact with the array.
- Needs Upgrade—The storage array is running a level of firmware that is no longer supported by the PowerVault Modular Disk Storage Manager.
- Support Information Bundle—The **Gather Support Information** link on the **Support** tab saves all storage array data, such as profile and event log information, to a file that you can send if you seek technical assistance for problem resolution.

Windows Operating System and Dynamic Volumes

For more information on various Windows Server storage options that can be used with your failover cluster, see the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support website at **support.dell.com**.

Configuring the RAID Level for the Shared Storage Subsystem

You must configure the virtual disks in your shared storage subsystem into disk groups or virtual disks using the Dell PowerVault Modular Disk Storage Manager software. All virtual disks, especially if they are used for the quorum resource, should be bound and incorporate the appropriate RAID level to ensure high availability. For more information on the quorum resource, see "Quorum Resource".

NOTE: It is recommended that you use a RAID level other than RAID 0 (which is commonly called striping). RAID 0 configurations provide very high performance, but do not provide the level of availability required for the quorum resource. For more information about setting up RAID levels for the system, see the documentation for your storage system.

Assigning Drive Letters and Mount Points

A mount point is a drive attached to an empty folder on an NTFS volume. A mount point functions the same as a normal drive but is assigned a label or name instead of a drive letter. Using mount points, a cluster can support more shared disks than the number of available drive letters.

The cluster installation procedure does not automatically add the mount point into the disks managed by the cluster. To add the mount point to the cluster, create a physical disk resource in the cluster resource group for each mount point. Ensure that the new physical disk resource is in the same cluster resource group and is dependent on the root disk (i.e., the disk from which the mount point is attached).

NOTE: Mount points are supported in MSCS on the Windows Server 2003 and Windows Server 2008 operating systems only. When mounting a drive to an NTFS volume, do not create mount points from the quorum resource or between the clustered disks and the local disks. Mount points must be in the same cluster resource group and must be dependent on the root disk.

Naming and Formatting Drives on the Shared Storage System

Each virtual disk being created in the PowerVault Modular Disk Storage Manager becomes a physical disk in Windows Disk Management. For each physical disk, perform the following:

- Write the disk signature
- Create the partition
- Assign the drive letter
- Format the partition with NTFS

NOTICE: The drive letters are manually assigned from the second node, the shared disks are simultaneously accessible from both nodes. To ensure file system integrity and prevent possible data loss before you install the MSCS software, prevent any I/O activity to the shared drives by performing the following procedure on one node at a time and ensuring that the other node is shutdown.

The number of drive letters required by individual servers in a cluster may vary. It is recommended that the shared drives be named in reverse alphabetical order beginning with the letter *z*. To assign drive letters and format drives on the shared storage system, perform the following steps:

1. Turn off node 2 and open **Disk Management** on node 1.
2. Allow Windows to enter a signature on all new physical or logical drives.

   NOTE: Do not upgrade or convert your disks to dynamic disks.
3. Locate the icon for the first unnamed, unformatted drive on the shared storage system.

4 Right-click the icon and select **Create** from the submenu. If the unformatted drives are not visible, verify the following:

- The latest version of the SAS 5/E adapter driver is installed.
- The storage system is properly cabled to the servers.

5 In the dialog box, create a partition the size of the entire drive (the default) and then click **OK**.

NOTE: A virtual disk that is mapped or assigned from the storage system to a cluster node(s) is represented as a physical disk within the Windows operating system on each node. MSCS allows only one node to access a given physical disk resource at a time. Therefore, if a disk is partitioned and contains multiple NTFS volumes, concurrent access to different volumes is only possible from the cluster node controlling the physical disk resource. If two NTFS volumes need to be controlled by different nodes, these volumes must reside on separate disks.

6 Click **Yes** to confirm the partition.

7 With the mouse pointer on the same icon, right-click and select **Change Drive Letter and Path** from the submenu.

8 Assign a drive letter to an NTFS volume or create a mount point.

To assign a drive letter to an NTFS volume:

a Click **Edit** and select the letter you want to assign to the drive (for example, z).

b Click **OK**.

c Go to step 9.

To create a mount point:

a Click **Add**.

b Click **Mount** in the following empty NTFS folder.

c Type the path to an empty folder on an NTFS volume, or click **Browse** to locate it.

d Click **OK**.

e Go to step 9.

9 Click **Yes** to confirm the changes.

10 Right-click the drive icon again and select **Format** from the submenu.

11 Under **Volume Label**, enter a descriptive name for the new volume; for example, Disk_Z or Email_Data.

12 In the dialog box, change the file system to **NTFS**, select **Quick Format**, and click the **Start** button.

NOTE: The NTFS file system format is required for shared-disk resources under MSCS.

13 Click **OK** at the warning.

14 Click **OK** to acknowledge that the format is complete.

15 Click **Close** to close the dialog box.

16 Repeat step 3 through step 15 for each remaining drive.

17 Close **Disk Management**.

18 Turn off node 1.

19 Turn on node 2.

20 On node 2, open **Disk Management**.

21 Ensure that the drive letters for node 2 are correct and re-assign the drive letters, if necessary. To re-assign the drive the drive letters, repeat step 7 through step 9.

22 Set the client system's public network segment(s) to **All communications**.

This setting provides a redundant path for the cluster-to-cluster communication in the event the private network fails.

Using Advanced (Premium) PowerVault Modular Disk Storage Manager Features

PowerVault Modular Disk Storage Manager includes the following advanced features:

- Snapshot Virtual Disk
- Virtual Disk Copy

To install and enable these premium features, you must purchase a feature key file for each feature and then specify the storage array that hosts them. For instructions about this process, see the *Premium Feature Activation* card that shipped along with your Dell PowerVault MD3000 storage array.

These premium features increase the high availability for your cluster solution. It is essential that you follow the instructions below to ensure proper cluster operations.

Snapshot Virtual Disk

Snapshot Virtual Disk captures point-in-time images of a virtual disk for backup, testing, or data processing without affecting the contents of the source virtual disk. You can use either Simple Path or Advanced Path to create a snapshot for your cluster disk. The Snapshot Virtual Disk can be mapped to the primary node (the node owning the source disk) or the secondary node (the node not owning the source disk) for backup, testing, or data processing.

NOTICE: Avoid mapping the Snapshot Virtual Disk to more than one node in the cluster at any point of time. The Snapshot Virtual Disk is not managed by MSCS, so mapping the Snapshot Virtual Disk to the host group or both nodes in the cluster may allow both nodes to access data concurrently and thus cause data corruption.

To map the Snapshot Virtual Disk to the primary node:

1. Use Host-to-Virtual Disk Mapping in the PowerVault Modular Disk Storage Manager. This ensures that a different disk signature is assigned properly to the Snapshot Virtual Disk.
2. Use Windows Disk Management to re-scan for the Snapshot Virtual Disk, assign the drive letter, and start accessing the drive.

   NOTE: The disks may be re-scanned several times for the Snapshot Virtual Disk to be detected by Windows Disk Management. If the Snapshot Virtual Disk is not detected, wait for a few minutes and re-scan the disks. Repeat the process until the Snapshot Virtual Disk is detected; do not reboot the server.

If you need to map the Snapshot Virtual Disk to the secondary node (the node not owning the source disk), you must map the Snapshot Virtual Disk to the primary node first, to ensure that the snapshot is assigned a new disk signature. Then, use the PowerVault Modular Disk Storage Manager to unmap the Snapshot Virtual Disk from the primary node, map it to the secondary node, and start accessing it.

NOTICE: Attempts to map the Snapshot Virtual Disk to the secondary node, prior to obtaining the signature from the primary node, may cause the operating system to misidentify the Snapshot Virtual Disk as an existing system volume and that may result in data loss or inaccessible Snapshot Virtual Disk.

NOTE: For a cluster configuration with multiple Snapshot Virtual Disks, each virtual disk must be mapped to the node owning the associated source disk first. The primary node for a Snapshot Virtual Disk may not be the primary node for another Snapshot Virtual Disk.

Virtual Disk Copy

Virtual Disk Copy generates a full copy of data from the source virtual disk to the target virtual disk in a storage array. You can use Virtual Disk Copy to back up data, copy data from disk groups that use smaller-capacity physical disks to disk groups using greater-capacity physical disks, or restore Snapshot Virtual Disk data to the source virtual disk.

To create a Virtual Disk Copy of an MSCS cluster shared disk:

1. Create a Snapshot Virtual Disk using the cluster shared disk as a source disk.
2. Do not map that Snapshot Virtual Disk to any cluster node. Then, use the newly created Snapshot Virtual Disk as the source disk for the Virtual Disk Copy.

   NOTE: When you attempt to create a Virtual Disk Copy of an MSCS cluster shared disk directly, the operation fails and displays the following error: `The operation cannot complete because the selected virtual disk is not a source virtual disk candidate`.

If the cluster shared disk fails and you need to restore it from the target virtual disk, use Cluster Administrator to change the status of the cluster group containing the failed disk to offline, and then use one of the following methods:

1. Use Virtual Disk Copy to transfer the data from the target virtual disk to the cluster shared disk.
2. Unassign the cluster shared disk from the host group and then map the target virtual disk to the host group.

Installing and Configuring a Failover Cluster

You can configure the operating system services on your failover cluster, after you have established the private and public networks and have assigned the shared disks from the storage array to the cluster nodes.

The procedures for configuring the failover cluster are different, depending on the Windows Server operating system you use.

For more information on deploying your cluster with Windows Server 2003 operating systems, see the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* on the Dell Support website at **support.dell.com**.

For more information on deploying your cluster with Windows Server 2008 operating systems, see the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* on the Dell Support website at **support.dell.com**.

A

Troubleshooting

This appendix provides troubleshooting information for your cluster configurations.

Table A-1 describes general cluster problems you may encounter and the probable causes and solutions for each problem.

Table A-1. General Cluster Troubleshooting

Problem	Probable Cause	Corrective Action
The nodes cannot access the storage system, or the cluster software is not functioning with the storage system.	The storage system is not cabled properly to the nodes or the cabling between the storage components is incorrect.	Ensure that the cables are connected properly from the node to the storage system. For more information, see "Cabling Your Cluster Hardware" on page 17.
	One of the cables is faulty.	Replace the faulty cable.
	Host Group or Host-to-Virtual Disk Mappings is not created correctly.	Verify the following: • Host Group is created and the cluster nodes are added to the Host Group. • Host-to-Virtual Disk Mapping is created and the virtual disks are assigned to the Host Group containing the cluster nodes.

Table A-1. General Cluster Troubleshooting *(continued)*

Problem	Probable Cause	Corrective Action
One of the nodes takes a long time to join the cluster. OR One of the nodes fail to join the cluster.	The node-to-node network has failed due to a cabling or hardware failure. Long delays in node-to-node communications may be normal.	Check the network cabling. Ensure that the node-to-node interconnection and the public network are connected to the correct NICs. Verify that the nodes can communicate with each other by running the ping command from each node to the other node. Try both the host name and IP address when using the ping command.
	One or more nodes may have the Internet Connection Firewall enabled, blocking Remote Procedure Call (RPC) communications between the nodes.	Configure the Internet Connection Firewall to allow communications that are required by the Microsoft® Cluster Service (MSCS) and the clustered applications or services. For more information, see Microsoft Knowledge Base article **KB**883398 at the Microsoft Support website at **support.microsoft.com**.

Table A-1. General Cluster Troubleshooting *(continued)*

Problem	Probable Cause	Corrective Action
Attempts to connect to a cluster using Cluster Administrator fail.	The Cluster Service has not been started. A cluster has not been formed on the system. The system has just been booted and services are still starting.	Verify that MSCS is running and that a cluster has been formed. Use the Event Viewer and look for the following events logged by the Cluster Service: `Microsoft Cluster Service successfully formed a cluster on this node`. OR `Microsoft Cluster Service successfully joined the cluster`. If these events do not appear in Event Viewer and for instructions on setting up the cluster on your system and starting the MSCS, see the *Microsoft Cluster Service Administrator's Guide*.
	The cluster network name is not responding on the network because the Internet Connection Firewall is enabled on one or more nodes.	Configure the Internet Connection Firewall to allow communications that are required by MSCS and the clustered applications or services. For more information, see Microsoft Knowledge Base article **KB883398** at the Microsoft Support website at **support.microsoft.com**.

Table A-1. General Cluster Troubleshooting *(continued)*

Problem	Probable Cause	Corrective Action
You are prompted to configure one network instead of two during MSCS installation.	The TCP/IP configuration is incorrect.	The node-to-node network and public network must be assigned static IP addresses on different subnets. For information about assigning the network IPs, see the "Assigning Static IP Addresses to Your Cluster Resources and Components" section of the *Dell Failover Clusters with Microsoft Windows Server 2003 Installation and Troubleshooting Guide* or the *Dell Failover Clusters with Microsoft Windows Server 2008 Installation and Troubleshooting Guide* located on the Dell Support site at **support.dell.com**.
	The private (point-to-point) network is disconnected.	Ensure that all systems are turned on so that the NICs in the private network are available.
Using Microsoft Windows NT® 4.0 to remotely administer a Windows Server® 2003 cluster generates error messages.	Some resources in Windows Server 2003 are not supported in Windows NT 4.0.	It is recommended that you use Microsoft Windows® XP Professional or Windows Server 2003 for remote administration of a cluster running Windows Server 2003.

Table A-1. General Cluster Troubleshooting *(continued)*

Problem	Probable Cause	Corrective Action
Unable to add a node to the cluster.	The new node cannot access the shared disks. The shared disks are enumerated by the operating system differently on the cluster nodes.	Ensure that the new cluster node can enumerate the cluster disks using Windows Disk Administration. If the disks do not appear in Disk Administration, check the following: • Check all cable connections • Check all zone configurations • Check the Access Control settings on the attached storage systems • Use the **Advanced** option with the **Minimum** option.
	One or more nodes may have the Internet Connection Firewall enabled, blocking RPC communications between the nodes	Configure the Internet Connection Firewall to allow communications that are required by the MSCS and the clustered applications or services. For more information see the Microsoft Knowledge Base article **KB883398** at the Microsoft Support website at **support.microsoft.com**.
The disks on the shared cluster storage appear unreadable or uninitialized in Windows Disk Administration.	This situation is normal if you stopped the Cluster Service. If you are running Windows Server 2003, this situation is normal if the cluster node does not own the cluster disk.	No action required.

Table A-1. General Cluster Troubleshooting *(continued)*

Problem	Probable Cause	Corrective Action
MSCS does not operate correctly on a cluster running Windows Server 2003 and the Internet Firewall enabled.	The Windows Internet Connection Firewall is enabled, which may conflict with MSCS.	Perform the following steps: **1** On the Windows desktop, right-click **My Computer** and click **Manage**. **2** In the **Computer Management** window, double-click **Services**. **3** In the **Services** window, double-click **Cluster Services**. **4** In the **Cluster Services** window, click the **Recovery** tab. **5** Click the **First Failure** drop-down arrow and select **Restart the Service**. **6** Click the **Second Failure** drop-down arrow and select **Restart the Service**. **7** Click **OK**. For information on how to configure your cluster with the Windows Internet Connection Firewall enabled, see Microsoft Base (KB) articles **258469** and **883398** at the Microsoft Support website at **support.microsoft.com** and the Microsoft Windows Server 2003 Technet website at **www.microsoft.com/technet**.

Table A-1. General Cluster Troubleshooting *(continued)*

Problem	Probable Cause	Corrective Action
Public network clients cannot access the applications or services that are provided by the cluster.	One or more nodes may have the Internet Connection Firewall enabled, blocking RPC communications between the nodes.	Configure the Internet Connection Firewall to allow communications that are required by the MSCS and the clustered applications or services. See Microsoft Knowledge Base article KB883398 at the Microsoft Support website at **support.microsoft.com** for more information.
Virtual Disks fail over continuously between the two storage controllers when a storage path fails.	The failback mode for the cluster node(s) is not set properly.	Set the correct failback mode on each cluster node. You must merge the **PowerVault MD3000 Stand Alone to Cluster.reg** file located in the **\utility** directory of the *Dell PowerVault MD3000 Resource* media into the registry of each node.
Virtual Disk Copy operation fails.	The Virtual Disk Copy operation uses the cluster disk as the source disk.	To perform a Virtual Disk Copy operation on the cluster share disk, create a snapshot of the disk, and then perform a Virtual Disk Copy of the snapshot virtual disk.

Table A-1. General Cluster Troubleshooting *(continued)*

Problem	Probable Cause	Corrective Action
Unable to assign the drive letter to the snapshot virtual disk. Unable to access the snapshot virtual disk. System Error Log displays a warning with event 59 from **partmgr** stating that the snapshot virtual disk is a redundant path of a cluster disk.	The snapshot virtual disk has been erroneously mapped to the node that does not own the source disk.	Unmap the snapshot virtual disk from the node not owning the source disk, then assign it to the node that owns the source disk. For more information, see "Using Advanced (Premium) PowerVault Modular Disk Storage Manager Features" on page 45.
In a non-redundant configuration, the Recovery Guru in the Modular Disk Storage Manager Client reports virtual disks not on the preferred controller, and the enclosure status Light Emitting Diode (LED) is blinking amber.	The NVSRAM for the non-redundant configuration has not been loaded.	Load the correct NVSRAM for the non-redundant configuration.

B

Cluster Data Form

You can attach the following form in a convenient location near each cluster node or rack to record information about the cluster. Use the form when you call for technical support.

Table B-1. Cluster Data Form

Cluster Information	Cluster Solution
Cluster name and IP address	
Server type	
Installer	
Date installed	
Applications	
Location	
Notes	

Table B-2. Node Data Form

Node Name	Service Tag Number	Public IP Address	Private IP Address

Table B-3. Additional Networks Data Form

Additional Networks

Table B-4. Dell PowerVault MD3000 Data Form

Dell™ PowerVault™ MD3000 Name	Service Tag	IP Address	Number of Disks, Virtual Disk Information

Index

B

Blinking, 36

C

Certificate of Authenticity, 32

Cluster Nodes, 9

Cluster.reg, 35

Contacting Device Status Icon, 42

F

Fixing Status Icon, 41

H

hot-pluggable, 9

I

In-band management, 35

in-band storage management, 23

M

Microsoft Cluster Server software, 8

mount point, 42

Multi-path software, 11

N

Needs Attention, 41

Needs Attention Status Icon, 41

Needs Upgrade Status Icon, 42

NTFS, 39, 45

NVSRAM, 34, 37

O

Optimal Status Icon, 41

Out-of-band management, 35

out-of-band storage management, 23

P

PERC RAID Adapter
installing, 34

PowerVault 22*x*S storage system
clustering, 43

Processor, 8

R

RAM, 8

Recovery Guru, 41

S

Snapshot Virtual Disk, 11

static IP addresses, 31

Status Icons, 41

Storage Array Profile, 41

Support Information Bundle
Status Icon, 42

U

Unresponsive, 41

Unresponsive Status Icon, 41

V

Virtual Disk Copy, 11