

Dell™ PowerVault™ NAS Systems SCSI Cluster Installation and Troubleshooting Guide

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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.

Abbreviations and Acronyms

For a complete list of abbreviations and acronyms, see "Abbreviations and Acronyms."

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Getting Started

Dell™ PowerVault™ NAS Systems SCSI Cluster Installation and Troubleshooting Guide

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This guide provides information for installing, configuring, and troubleshooting a Dell™ PowerVault™ network attached storage (NAS) system's hardware and software components in a cluster configuration and provides information about the configuration listed in [Table 1-1](#).

Table 1-1. PowerVault NAS System SCSI Cluster Configuration

Systems	RAID Controllers	Storage Systems	Operating System
Two PowerVault NAS systems	PERC 3/DC PERC 4/DC	Up to four PowerVault 21 xS or 22 xS storage systems	Microsoft® Windows® Storage Server 2003, Enterprise Edition

The information in this guide includes:

- Basic SCSI cluster installation procedures, which include:
 - Preparing NAS and storage systems for clustering
 - Cabling the cluster configuration
 - Installation procedures for installing the Microsoft® Windows® Storage Server 2003, Enterprise Edition operating systems in your cluster configuration
 - Configuring the cluster peripherals, including PERC cards and network adapters
- Installation procedures for installing a SCSI cluster configuration in your corporate network
- Cluster upgrading and maintenance procedures
- Information about the Microsoft Cluster Service (MSCS), the clustering software built into the operating systems

 **NOTE:** Hereafter, Microsoft Cluster Service is also known as MSCS.

- Troubleshooting procedures
- Data sheets for recording critical cluster configuration information

See the *Dell PowerVault NAS Systems SCSI Cluster Platform Guide* for information about supported configurations.

 **NOTE:** Dell and Microsoft support only the specific configurations described in the *Platform Guide*.

Intended Audience

This guide addresses two audience levels:

- Users and system installers who will perform general setup, cabling, and configuration of the PowerVault NAS Cluster components
- Trained service technicians who will perform more extensive installations, such as firmware upgrades and installation of required expansion cards

Obtaining More Information

See "[Obtaining Technical Assistance](#)" and "[Overview of NAS Clusters](#)" for a general description of PowerVault NAS SCSI clusters and clustering technology.

See "[Using MSCS](#)" for an overview of the clustering software built into the Windows Storage Server 2003, Enterprise Edition operating system.

Obtaining Technical Assistance

Dell Enterprise Training and Certification is available; see www.dell.com/training for more information. This service may not be offered in all locations.

Overview of NAS Clusters

The PowerVault NAS SCSI cluster implements clustering technology on PowerVault NAS systems based on the Windows Storage Server 2003, Enterprise Edition operating system. PowerVault NAS clusters provide the following benefits in meeting the needs of mission-critical network application programs:

- **High availability** — Clustering technology built into Microsoft Cluster Service (MSCS) ensures that system services and resources are available to network clients if a cluster node fails for any reason.
- **Redundant storage** — Application data can be stored on a maximum of four PowerVault storage systems.
- **Cluster share failure recovery** — Cluster shares run on *virtual servers*, which can be *failed over* to another cluster node if a node fails for any reason.
- **Zero impact on network resources** — Cluster nodes can be repaired, serviced, upgraded, or replaced without taking the entire cluster offline.

PowerVault NAS systems provide an easy-to-install solution for ensuring high-availability of your network storage resources for Windows and UNIX® clients. Novell® NetWare® and Apple resources are also supported. However, if a system running NetWare or Apple resources fails for any reason, you must manually restart their dependent resources. This procedure does not corrupt the share data.

A NAS cluster provides a failover solution for the NAS systems, thereby ensuring a higher availability of network resources than a nonclustered NAS system. The NAS cluster consists of the following components:

- **PowerVault NAS systems** — Two homogeneous (identical) PowerVault NAS systems with the Windows Storage Server 2003, Enterprise Edition operating system installed on each system
- **Cluster interconnect cable** — An Ethernet crossover cable (cluster interconnect) connected to a network adapter in

both systems

- **Storage systems** — One to four PowerVault 21 xS or 22 xS storage systems

Each cluster node is configured with software and network resources that enable it to interact with the other node to provide a mutual redundancy of operation and application program processing. Because the systems interact in this way, they appear as a single system to the network clients.

As an integrated system, the PowerVault NAS Cluster is designed to dynamically handle most hardware failures and prevent downtime. In the event that one of the cluster nodes fails for any reason, the processing workload of the failed node switches over (or *fails over*) to the remaining node in the cluster. This failover capability enables the cluster system to keep network resources and application programs up and running on the network while the failed node is taken offline, repaired, and brought back online. The failover process is transparent and network clients experience only a momentary delay in accessing their resources. After the failed node is repaired, the network resources can be transferred back to the original node, if desired.

 **NOTE:** When a cluster node running the Windows Storage Server 2003, Enterprise Edition operating system fails, the NFS files shares running on the failed node are moved to the remaining node in the cluster and restarted. When a cluster node with Novell NetWare shares or Apple shares fails, the file shares running on the failed node are converted to file directories and moved to the remaining node in the cluster. To access the data in the failed-over directories, you must manually reconfigure the file directories to file shares.

The availability of network services is critical to applications in a client/server environment. Clustering reduces the amount of downtime caused by unexpected failures, providing maximum uptime of mission critical applications—also known as *high availability*—that surpasses the capabilities of a stand-alone system. Using MSCS, clustering ensures that applications on a failed cluster node continue on the remaining node(s) by migrating and managing the required resource to another node in the cluster. Clusters that reduce the amount of system downtime are known as *high availability clusters*.

Configuring Active and Passive Cluster Nodes

Cluster configurations may include both active and passive cluster nodes. Active nodes are nodes that support the cluster workload by processing application requests and providing client services. Passive nodes are backup nodes that support the active nodes in the event of a hardware or software failure, thereby ensuring that client applications and services are highly available.

 **NOTE:** Passive nodes must be configured with the appropriate processing power and storage capacity to support the resources that are running on the active nodes.

NAS SCSI cluster solutions running Windows are limited to active/active and active/passive configurations because this solution supports two nodes.

An active/active configuration is a cluster with virtual servers running separate applications or services on each node. When an application is running on node 1, the remaining cluster node does not have to wait for node 1 to fail. The remaining cluster node can run its own cluster-aware applications (or another instance of the same application) while providing failover capabilities for the resources on node 1.

An active/passive configuration is a cluster where the *active* cluster node is processing requests for a clustered application while the *passive* cluster node simply waits for the active node to fail.

Active/passive configurations are more costly in terms of price and performance because one cluster node remains idle all of the time. This configuration is appropriate for business-critical systems since the application can use all the resources of a standby cluster node in case one active cluster node fails.

Cluster Node Limitations

The Windows Powered operating system installed on your cluster nodes is dedicated to file server operations. Because your PowerVault NAS Cluster is a dedicated file server, the cluster nodes cannot be used in the following capacities:

- Primary Domain Controller (PDC)



NOTE: If another domain controller is not available on the network, you can configure a NAS cluster node as a domain controller for the NAS cluster. However, client systems outside of the NAS cluster cannot be included as members of the NAS cluster domain.

- Windows Internet Naming Service (WINS) server
- Dynamic Host Configuration Protocol (DHCP) server
- Domain Name System (DNS) server
- Microsoft Exchange Server
- Microsoft Structured Query Language (SQL) server
- Network Information Service (NIS) server

NAS Cluster Features

The PowerVault NAS cluster solution provides a high level of availability that is not available in nonclustered PowerVault NAS systems. Because of the differences between clustered and nonclustered systems, compare the features in the clustered PowerVault NAS systems to ensure that they meet your specific needs.

[Table 1-2](#) provides a comparison of the features in both clustered and nonclustered PowerVault NAS systems.

Table 1-2. NAS Cluster Features

Features	Clustered PowerVault NAS Systems	Nonclustered PowerVault NAS Systems
Failover capability	Yes	No
Server Message Block (SMB)	Yes	Yes
SMB share failover	Yes	No
Dell OpenManage™ Array Manager management	Yes	Yes
Monitor and keyboard required	Yes	No
Failover SCSI storage	Yes	No
Snapshot functionality	Yes	Yes
Optional Directory Quotas	Yes	Yes
Network File System (NFS) shares failover	Yes	No
Failover internal SCSI storage	No	No
Novell NetWare share failover	No	No
Apple shares failover	No	No
Simplified disk and volume management	No	Yes
Online volume expansion	Yes	Yes

NAS Cluster Components

The following subsections describe the components that are common to the PowerVault NAS cluster, as well as the components that are specific to each cluster system.

[Table 1-3](#) lists the common components that are used in a PowerVault NAS cluster.

Table 1-3. Cluster Components

Component	Description
NAS systems	Two identical PowerVault 770N or 775N NAS systems in a homogeneous pair with the Windows Storage Server 2003, Enterprise Edition operating system installed in each system. NOTE: Dell or Microsoft can support only the specific configurations described in the <i>Dell PowerVault NAS SCSI Cluster Platform Guide</i> .
Shared storage system	Up to four PowerVault 21xS storage systems with dual SCSI expander management modules (SEMMs) or up to four PowerVault 22xS with dual enclosure management modules (EMMs).
Network adapters	Supported network adapters for the public LAN.

PowerVault NAS-Specific Network Components

[Table 1-4](#) describes the required components for each PowerVault NAS system.

Table 1-4. PowerVault NAS-Specific Network Components

Hardware Component	Description
Hot-spare drive support	Support for 1-inch SCSI hot-pluggable spare drives.
RAID controller(s)	One of the following PERC RAID controller(s) installed in each PowerVault NAS system for the cluster's shared storage: <ul style="list-style-type: none"> • PERC 3/DC • PERC 4/DC
RAID support	Support for RAID 1, 5, and 1+0 levels. RAID 1+0 is supported in a single enclosure or spanning two enclosures with hot-spare drives. RAID 0 and independent drive configurations can be installed in a PowerVault NAS cluster. Because they do not offer data redundancy if a disk fails, they are not recommended for a high-availability system. NOTE: Dell and Microsoft support only the specific configuration described in the <i>Dell PowerVault NAS SCSI Cluster Platform Guide</i> .
Shared storage system(s)	Up to four PowerVault 21xS storage systems with dual SEMMs or up to four PowerVault 22xS with dual EMMs.
Network adapters	Two or more network adapters installed in each PowerVault NAS system for the node-to-node cluster interconnect. If two network adapters are not installed in the PowerVault 770N NAS system, you must install an additional network adapter for the private network. PowerVault 775N NAS systems are preconfigured with two onboard network adapters, which meets the minimum requirements. NOTE: The network adapters must be identical on both systems. NOTE: Dell and Microsoft support only the specific configuration described in the <i>Dell PowerVault NAS SCSI</i>

Crossover cable	One Ethernet crossover cable for the node-to-node cluster interconnect (private network).
Keyboard and monitor	A keyboard and monitor are required for troubleshooting the cluster nodes.

RAID Controllers

[Table 1-5](#) lists the Dell PowerEdge™ Expandable RAID controllers (PERC) that are used to connect the PowerVault 770N and 775N systems to external PowerVault storage systems. See the PERC documentation included with your system for a complete list of features.

 **NOTE:** [Table 1-5](#) lists the RAID controllers that are connected to the external storage system(s). Your NAS system also contains an internal RAID controller that is used to manage the system's internal hard drives.

Table 1-5. RAID Controller Features

Feature	PERC 3/DC	PERC 4/DC
SCSI channels	2	2
SCSI data transfer rate	Up to 160 MB/s per channel	Up to 320 MB/s per channel
Maximum number of drives per channel	14	14
RAID levels	RAID 0, 1, 1+0, 5, and 5+0	RAID 0, 1, 1+0, 5, and 5+0
Number of supported logical drives and arrays	Up to 14 logical drives and 32 arrays per controller	Up to 14 logical drives and 32 arrays per controller
Cache	128 MB	128 MB
NOTE: RAID 0 and independent drives are possible but are not recommended for a high-availability system because they do not offer data redundancy if a disk failure occurs.		

PowerVault NAS System Specific Network Components

[Figure 1-1](#) shows a sample configuration of the PowerVault 770N SCSI cluster components and cabling. [Figure 1-2](#) shows a similar sample configuration for the PowerVault 775N SCSI cluster.

See the *Platform Guide* for system-specific configuration information.

Figure 1-1. PowerVault 770N Cluster Solution

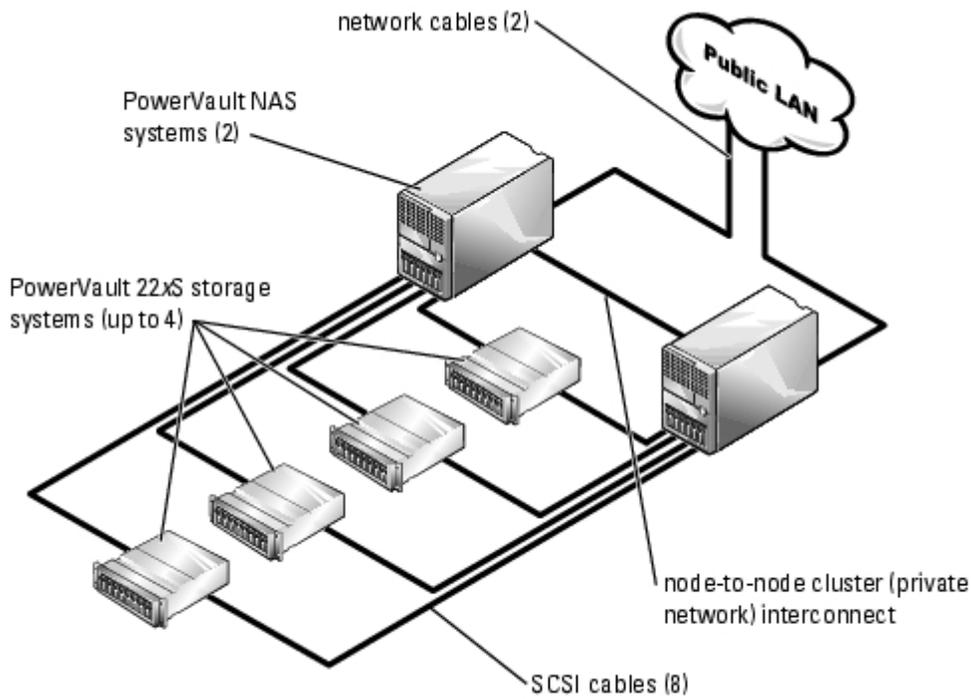
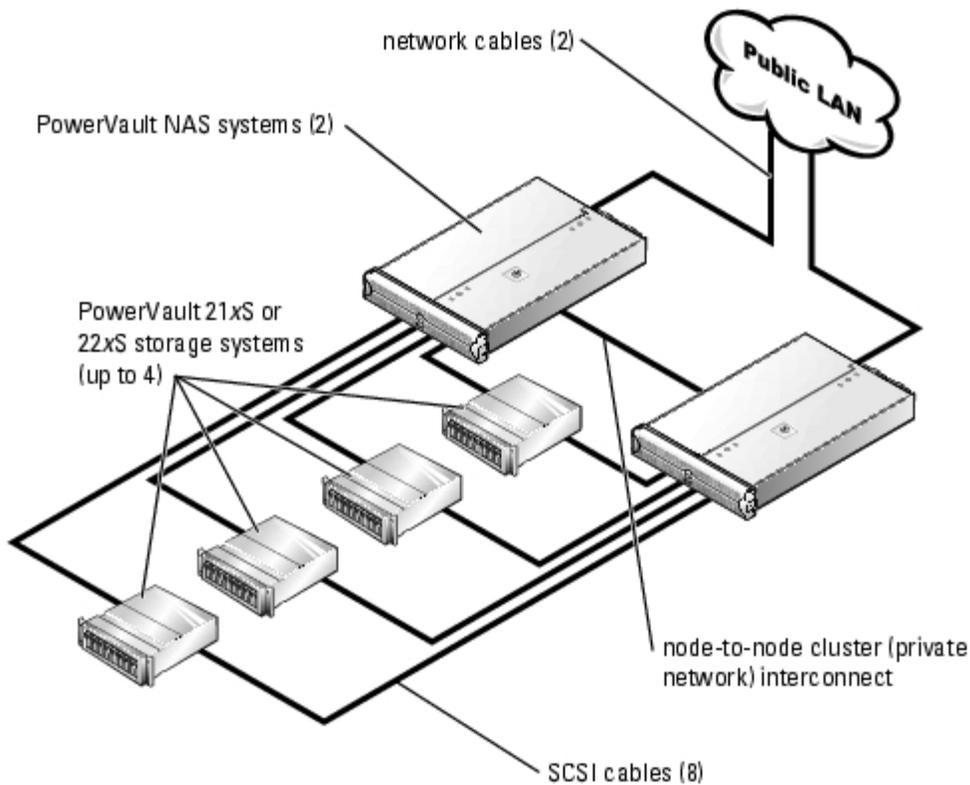


Figure 1-2. PowerVault 775N Cluster Solution



Minimum System Requirements

If you are installing a new PowerVault NAS SCSI cluster or upgrading an existing system to a PowerVault NAS SCSI cluster, review the previous subsections to ensure that your hardware components meet the minimum system requirements listed in the following section.

PowerVault NAS Cluster Minimum System Requirements

PowerVault NAS SCSI cluster configurations require the following hardware and software components:

- Cluster nodes
- Cluster storage
- Cluster interconnects (private network)
- Client network connections (public network)
- Operating system and storage management software

Cluster Nodes

[Table 1-6](#) lists the hardware requirements for the cluster nodes.

Table 1-6. Cluster Node Requirements

Component	Minimum Requirement
Cluster nodes	Two homogeneous (identical) PowerVault 770N or 775N NAS systems that support clusters in homogeneous pairs.
Processors	One or two processors on both cluster nodes. NOTE: Both cluster nodes must be configured with the same number of processors.
RAM	At least 512 MB of RAM installed on each cluster node.
RAID controllers	One of the following PERC RAID controllers installed in each system for the cluster's shared storage: <ul style="list-style-type: none">• PERC 3/DC• PERC 4/DC Up to two PERCs per cluster node may be used for the cluster's shared storage. Two disk drives are required for mirroring (RAID 1) and at least three disk drives are required for disk striping with parity (RAID 5).
Network adapters	Two or more network adapters installed in each PowerVault NAS system for the node-to-node cluster interconnect. If two network adapters are not installed in the PowerVault 770N NAS system, you must install an additional network adapter for the private network. PowerVault 775N NAS systems are preconfigured with two onboard network adapters, which meets the minimum requirements. NOTE: The network adapters must be identical on both systems. NOTE: Dell and Microsoft support only the specific configuration described in the <i>Dell PowerVault NAS SCSI Cluster Platform Guide</i> .
Private network cables	If you are using Fast Ethernet network adapters for the private network, connect a <i>crossover</i> Ethernet cable between the network adapters in both cluster nodes. If you are using Gigabit Ethernet network adapters for the private network, connect a <i>standard</i> Ethernet cable between the network adapters in both cluster nodes.

Cluster Storage

[Table 1-7](#) provides the minimum requirements for the shared storage system(s).

Table 1-7. Cluster Shared Storage System Requirements

Hardware Component	Minimum Requirement
Shared storage system(s)	<p>Up to four PowerVault 21xS or 22xS enclosures (for the shared disk resource) with the following configuration:</p> <ul style="list-style-type: none"> • Two SEMMs for each PowerVault 21xS • Two EMMs for each PowerVault 22xS • Redundant power supplies connected to separate power sources • At least two SCSI hard drives in each PowerVault 21xS or 22xS enclosure to support hardware-based RAID functionality <p>Currently, MSCS supports only the Windows NT File System (NTFS) format for the shared storage system.</p> <ul style="list-style-type: none"> • Two volumes are the minimum requirement for an active/active cluster configuration (where the active nodes process requests and provide failover for each other) <p>See "Configuring Active and Passive Cluster Nodes" for more information on active/active and active/passive cluster configurations.</p> <ul style="list-style-type: none"> • Two 1-, 4-, 8-, or 20-m SCSI cables for each PowerVault 21xS or 22xS storage system in the cluster

Cluster Interconnects (Private Network)

[Table 1-8](#) provides the minimum requirements for the cluster interconnects (private network).

Table 1-8. Cluster Interconnects (Private Network) Requirements

Hardware Component	Minimum Requirement
Network adapters	<p>Any network adapter supported by the system for each cluster node. The network adapters for the private network must be identical and supported by the system.</p> <p>NOTE: Dual-port Fast Ethernet network adapters are not recommended for simultaneous cluster connections to the public and private networks. When you configure the network adapter in MSCS Setup to All Communications, the public network can provide redundancy for node-to-node traffic in the case of a failure in the private network segment.</p>
Ethernet switch (optional)	<p>One Ethernet switch for the private network (cluster interconnect).</p>
Ethernet cables	<p>One standard or crossover Ethernet cable.</p> <ul style="list-style-type: none"> • Standard Ethernet cable (not included with the Dell Cluster kit) connects two copper Gigabit Ethernet (1000 BASE-T) network adapters. • Crossover Ethernet cable connects two fast 100 Mb/s Ethernet network adapters.
Ethernet switch cabling (optional)	<p>Additional Ethernet cables (not included) may be used to attached to an Ethernet switch for the public network (client connections) and private network (cluster interconnect).</p>

Client Network Connections (Public Network)

The cluster connections to the public network (for client access of cluster resources) require one or more identical network adapters supported by the system for each cluster node. Configure this network in a mixed mode (**All Communications**) to communicate the cluster heartbeat to the cluster nodes if the private network fails for any reason.

Other Documents You May Need



The *System Information Guide* provides important safety and regulatory information. Warranty information may be included within this document or as a separate document.

- The *Platform Guide* provides information about the platforms that support the NAS SCSI cluster configuration.
- The *Rack Installation Guide* and *Rack Installation Instructions* document that was included with your rack solution describes how to install your system into a rack.
- The *Getting Started Guide* provides an overview of initially setting up your system.
- The *User's Guide* for your PowerVault system describes system features and technical specifications, SCSI drivers, the System Setup program (if applicable), software support, and the system configuration utility.
- The *Installation and Troubleshooting Guide* for your PowerVault system describes how to troubleshoot the system and install or replace system components.
- The *Dell PowerVault 77xN NAS Systems Administrator's Guide* provides system configuration, operation, and management information.
- The *Dell PowerVault 200S, 201S, 210S, and 211S Storage Systems Installation and Service Guide* describes how to install and troubleshoot the PowerVault 200S, 201S, 210S, and 211S storage systems and install or replace system components.
- The *Dell PowerVault 220S and 221S System Installation and Troubleshooting Guide* describes how to install and troubleshoot the PowerVault 220S and 221S storage systems and install or replace system components.
- The PERC documentation includes information on the SCSI RAID controller.
- The Dell OpenManage™ Array Manager documentation provides instructions for using the array management software to configure RAID systems.
- Documentation for any components you purchased separately provides information to configure and install these options.
- Updates are sometimes included with the system to describe changes to the system, software, and/or documentation.



NOTE: Always read the updates first because they often supersede information in other documents.

- 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.

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Preparing Your Systems for Clustering

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-

Before You Begin

1. Ensure that your site can handle the power requirements of the cluster equipment.

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



CAUTION: Only trained service technicians are authorized to remove and access any of the components inside the system. See your *System Information Guide* for complete information about safety precautions, working inside the computer, and protecting against electrostatic discharge.

2. Ensure that the following components are installed in each PowerVault NAS system in the cluster:

- Network adapters
- PERC cards
- SCSI hard drives
- Any additional peripheral components
- HBA drivers

You can download the latest drivers from the Dell Support website at support.dell.com.



NOTE: Both NAS systems and the hardware components in each system must be identical.

3. Ensure that the following components are installed in each Dell™ PowerVault™ 21 xS or 22 xS system in the cluster:

- Two SEMMs (PowerVault 21 xS only) or two EMMs (PowerVault 22 xS only)
- A split-bus module
- SCSI hard drives

See "[Installing and Configuring the Shared Storage System](#)" for more information.

4. Cable the system hardware for clustering.

See "[Cabling Your Cluster Hardware](#)" for more information.

5. Configure the storage system(s) as described in your storage system documentation.
 6. Configure the PERC cards as described in your PERC card documentation.
 7. Configure RAID for the internal SCSI hard drives, configure the hard drives using the controller's BIOS utility or Dell OpenManage™ Array Manager.
-

Installation Overview

This section provides installation overview procedures for configuring your cluster running the Microsoft® Windows® Storage Server 2003 operating system.

1. Ensure that your cluster meets the requirements as described in "[Before You Begin](#)."
2. Select a domain model that is appropriate for your corporate network and operating system.

See "[Selecting a Domain Model](#)" for more information.

3. Reserve static IP addresses for your cluster resources and components.

The resources and components include:

- Public network
- Private network
- Cluster virtual servers

See "[Assigning Static IP Addresses to Your Cluster Resources and Components](#)" for more information.

4. Install or update the PERC drivers.

The PERC drivers allow your cluster nodes to communicate with the shared storage systems.

See "[Updating the PERC Card Driver](#)" for more information.

5. Configure the hard drives on the shared storage system(s).

See "[Configuring and Managing Virtual Disks](#)" for more information.

6. Configure the MSCS software.

The MSCS software is the clustering component of the Windows operating system that provides the failover capabilities for the cluster.

See "[Installing and Configuring MSCS](#)" for more information.

7. Verify cluster functionality. Ensure that:

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

See "[Verifying Cluster Functionality](#)" for more information.

8. Verify cluster resource availability.

Use Cluster Administrator to check the running state of each resource group.

See "[Verifying Cluster Resource Availability](#)" for more information.

The following sections provide detailed information for each step in the "[Installation Overview](#)" that is specific to your Windows operating system.



NOTE: Dell strongly recommends that you use the "[PowerVault SCSI Cluster Solution Data Sheet](#)" during the installation of your cluster to ensure that all installation steps are completed. The data sheets are located in "[Cluster Data Sheet](#)."

Selecting a Domain Model

On a cluster running the Windows Storage Server 2003, Enterprise Edition operating system, both cluster nodes must belong to a common domain or directory model. The following membership configurations are supported:

- Both cluster nodes are member systems in a Windows 2000 Active Directory domain.
- Both cluster nodes are member systems in a Windows Storage Server 2003 Active Directory domain.
- One node is a domain controller and the other node is a member of the domain, without other member systems or clients in the domain.

If a cluster node cannot contact a domain controller, the node will not be able to authenticate client requests.

Configuring Windows Networking

You must configure the public and private networks in each node before you install MSCS. The following sections introduce you to some principles and procedures necessary to the networking prerequisites.

Assigning Static IP Addresses to Your Cluster Resources and Components

A static IP address is an Internet address that a network administrator assigns exclusively to a system or a resource. The address assignment remains in effect until it is changed by the network administrator.

The IP address assignments for the public LAN segments will depend on the configuration of your environment. If the IP assignments are set up correctly, all of the network adapter resources will respond to ping commands and appear online

before and after you install MSCS. If the IP assignments are not set up correctly, the cluster nodes may not be able to communicate with the domain. See "[Troubleshooting](#)" for more information.

PowerVault NAS SCSI cluster configurations running the Windows operating system require static IP addresses assigned to hardware and software applications in your cluster, as listed in [Table 2-1](#).

Table 2-1. Applications and Hardware Requiring IP Address Assignments

Application/Hardware	Description
Cluster IP address	The cluster IP address is used for cluster management and must correspond to the cluster name. Because each server has at least two network adapters, the minimum number of static IP addresses required for a cluster configuration is five (one for each network adapter and one for the cluster). Additional static IP addresses are required when MSCS is configured with application programs that require IP addresses.
Cluster-aware applications running on the cluster	For example, these applications may include a network file system (NFS) share, server message block (SMB) file share, or a general purpose file share.
Cluster node network adapters	<p>The network adapters are used to connect to the public and private networks.</p> <p>For cluster operation, two network adapters are required: one network adapter for the public network (LAN/WAN) and another network adapter for the private network (sharing heartbeat information between the cluster nodes).</p> <p>See "Cabling Your Cluster Hardware" for more information about cluster interconnect options.</p> <p>NOTE: To ensure cluster operations during a DHCP server failure, Dell recommends using static IP addresses for your cluster.</p>

Configuring IP Addresses for the Private Network (Cluster Interconnect)

Having two network adapters connected to separate networks on the cluster provides a contingency solution for cluster communication failure. If the private network (cluster interconnect) fails, MSCS can default cluster node communications through the public network, thereby ensuring that failover capabilities are possible in the event of a cluster node failure.

The network adapters installed in each cluster node on the private network (cluster interconnect) must reside on different IP subnets. Having a separate IP subnet or a different network ID than the LAN subnet(s) used for client connectivity ensures that both the public and private network communications do not interfere with each other.

If you are connecting the cluster node network adapters together using an Ethernet cable, Dell recommends using the static IP address assignments in [Table 2-2](#) for the network adapters that are connected to the private network.

Table 2-2. Sample Static IP Address Assignments for the Private Network

Cluster Node	IP Address	Subnet
Node 1	10.0.0.1	255.255.255.0
Node 2	10.0.0.2	255.255.255.0

If you are connecting multiple network adapters together for the private network using a network switch, ensure that each network adapter connected to a private network is assigned a unique IP address. For example, you can continue the IP address scheme in [Table 2-2](#) by using 10.0.0.3 and 10.0.0.4 for additional cluster nodes and the network adapters for the private network that are connected to the same switch.

 **NOTE:** The IP address assignments for the public LAN segment(s) depend on the configuration of your environment.

If the IP assignments are set up correctly, all of the network adapter resources will respond to ping commands and will appear online after you install MSCS. If the IP address resources are not set up correctly, the cluster nodes may not be able

to communicate with the domain and the Cluster Configuration Wizard may not allow you to configure all of your networks.

See "[Troubleshooting](#)" for more information on troubleshooting problems.

 **NOTE:** Additional fault tolerance for the LAN segments can be achieved by using network adapters that support adapter teaming or by having multiple LAN segments. Do not use fault tolerant network adapters for the cluster interconnect, as these network adapters require a dedicated link between the cluster nodes.

Creating Separate Subnets for the Public and Private Networks

The network adapters for the public and private networks that are installed in the same cluster node must reside on separate IP subnetworks. Therefore, the private network used to exchange heartbeat information between the cluster nodes must have a separate IP subnet or a different network ID than the public network, which is used for client connections.

Setting the Network Interface Binding Order

1. Click the **Start** button, select **Control Panel**, and double-click **Network Connections**.
2. Click the **Advanced** menu, and then click **Advanced Settings**.

The **Advanced Settings** window appears.

3. In the **Adapters and Bindings** tab, ensure that the **Private** and **Public** connections are at the top of the list.

To change the connection order:

- a. Click **Public** or **Private**.
- b. Click the up-arrow or down-arrow to move the connection to the top or bottom of the **Connections** box.
- c. Click **OK**.
- d. Close the **Network Connections** window.

Using Dual-Port Network Adapters for the Private Network

Using a dual-port network adapter, you can configure your cluster to use the public network as a failover for private network communications. However, to ensure high-availability and redundancy in your NAS cluster, configure the public and private networks on two separate network adapters. For example, you can configure an internal network adapter port for the private network and a PCI network adapter port for the public network.

 **NOTE:** Configuring the public and private network on a dual-port network adapter is not supported.

Verifying Cluster Network Communications

To ensure proper cluster operations, the cluster nodes must be able to communicate with each other through the private network (cluster interconnect). This communication involves the exchange of heartbeat messages, whereby the two cluster nodes inquire about each other's status, or "health," and acknowledge each inquiry.

To verify network communications between the cluster nodes:

1. Open a command prompt on each cluster node.

2. At the prompt, type:

```
ipconfig /all
```

3. Press <Enter>.

All known IP addresses for each local server appear on the screen.

4. Issue the **ping** command from each remote system.

Ensure that each local server responds to the **ping** command.

Installing a PERC RAID Controller

You can install a PERC controller in your PowerVault NAS systems to manage your external storage systems. When you install a RAID controller in your system, install the controller in the correct PCI slot. Some PCI slots on your system are connected to different PCI buses with varying I/O configurations (for example, 32-bit, 32-MHz vs. 64-bit, 32-MHz) that might affect the data transfer rate from your RAID controller to your shared storage system. Install the RAID controller in the recommended PCI slot.

See the *Platform Guide* for more information about your system's PCI bus configuration.

See "[RAID Controllers](#)" for a list of supported RAID controllers.

Updating the PERC Card Driver

See the Dell Support website at support.dell.com to download the latest Windows driver for the PERC card.

To update the default driver to the latest PERC driver:

1. Click the **Start** button, select **Programs**, select **Administrative Tools**, and click **Computer Management**.
2. Select **System Tools**, select **Device Manager**, and click the **plus (+)** sign to expand **SCSI and RAID controllers**. One or more PERC cards are listed.
3. Right-click the PERC card, select **Properties**, select the **Driver** tab, and then click **Update Driver** to start the Windows Device Driver wizard.
4. Click **Next** to proceed to the **Install Hardware Device Drivers** dialog box.
5. Select **Display a list of known drivers for this device...** and then click **Next**.
6. Click **Have Disk**, insert the diskette or the *Dell OpenManage Server Assistant* CD that contains Dell's updated driver, specify the location of the driver (A: > or D: >), and then click **OK**.
7. Select the appropriate RAID controller (PERC card) and click **Next**.
8. Click **Next** to begin the installation.
9. When the installation is complete, click **Finish** to exit the wizard.
10. Click **Close** to exit the **Properties** window.
11. Click **Yes** to restart the system.

12. Repeat this procedure for cluster node 2.

Installing and Configuring the Shared Storage System

Clustering PowerVault Storage Systems

If you are upgrading an existing PowerVault 21 xS or 22xS storage system to meet the cluster requirements for the shared storage system, you may need to install additional hard drives and/or one of the following management modules in the shared storage system:

- SCSI SEMM (PowerVault 21 xS only)
- EMM (PowerVault 22xS only)

The size and number of drives you add depends on the RAID level you want to use, the number of hard drives installed in your system, and the number of application programs you want to run in your cluster environment.

See the *Dell PowerVault 200S, 201S, 210S, and 211S Storage Systems Installation and Service Guide* or the *Dell PowerVault 220S and 221S System Installation and Troubleshooting Guide* for information about installing the hard drives in the PowerVault 22xS storage system.



NOTE: In cluster mode, the last slot (SCSI ID 15) in the PowerVault 22xS is not used; SCSI ID 15 is used for the primary EMM.

Configuring the PowerVault 21 xS Storage System for Cluster Mode

To ensure that both NAS systems recognize all the drives in the storage system, you must enable forced-joined mode on the SEMMs installed in each storage system that you will share between the two storage systems for clustering. This mode prevents the storage system from operating in a dual-bus split backplane configuration (2 x 4 or 2 x 6) when two cables are attached.

The SEMMs are identified by a label adjacent to the SCSI connector. Two identical SEMMs installed in each storage system are required for cluster operation. You cannot use one SEMM.

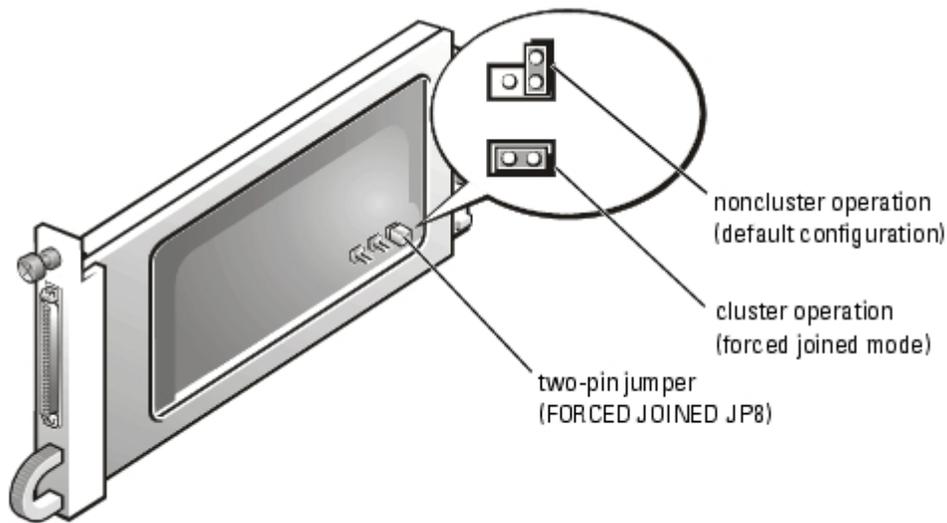
See the *Dell PowerVault 200S, 201S, 210S, and 211S Storage Systems Installation and Service Guide* for more information on installing and configuring the SEMMs.

To configure the SEMMs for forced join mode:

1. Locate the two-pin jumper labeled "FORCED JOINED JP8" on the SEMM, as shown in [Figure 2-1](#).

The SEMM is shipped with a jumper plug that is connected to only one jumper pin.

Figure 2-1. SEMM Configuration



NOTE: Only the FORCED JOINED JP8 jumper contains a jumper plug. The Dell-installed default for jumpers JP1, JP2, JP6, and JP7 is a noncluster operation (default configuration), as shown in [Figure 2-1](#).

2. Move the jumper plug to connect the two pins of the FORCED JOINED JP8 jumper.
3. Repeat [step 1](#) and [step 2](#) for the second SEMM.
4. Install the two SEMMs in the PowerVault 21xS storage system.

Configuring the PowerVault 22xS Storage System for Cluster Mode

To ensure that both systems recognize all the drives in the storage system, you must set the split-bus configuration switch to cluster mode on the PowerVault 22xS storage system before turning on the storage system.

To configure the storage system in cluster mode:

1. Set the bus configuration switch (see [Figure 2-2](#)) on the split-bus module to cluster mode (down position). The cluster LED indicator (see [Figure 2-3](#)) indicates that the storage system is in cluster mode.

[Figure 2-3](#) illustrates the front panel indicators on the storage system's front panel. See the *Dell PowerVault 220S and 221S System's User's Guide* for more information.

See "[Split-Bus Module](#)" for more information about the split-bus module.

2. Install the split-bus module in the PowerVault 22xS storage system.
3. Install the two EMMs in the PowerVault 22xS storage system.

See "[Enclosure Management Module \(EMM\)](#)" for basic information about EMMs; see the *Dell PowerVault 220S and 221S Installation and Troubleshooting Guide* for information about installing EMMs.

Figure 2-2. Back-Panel Module Features and Indicators

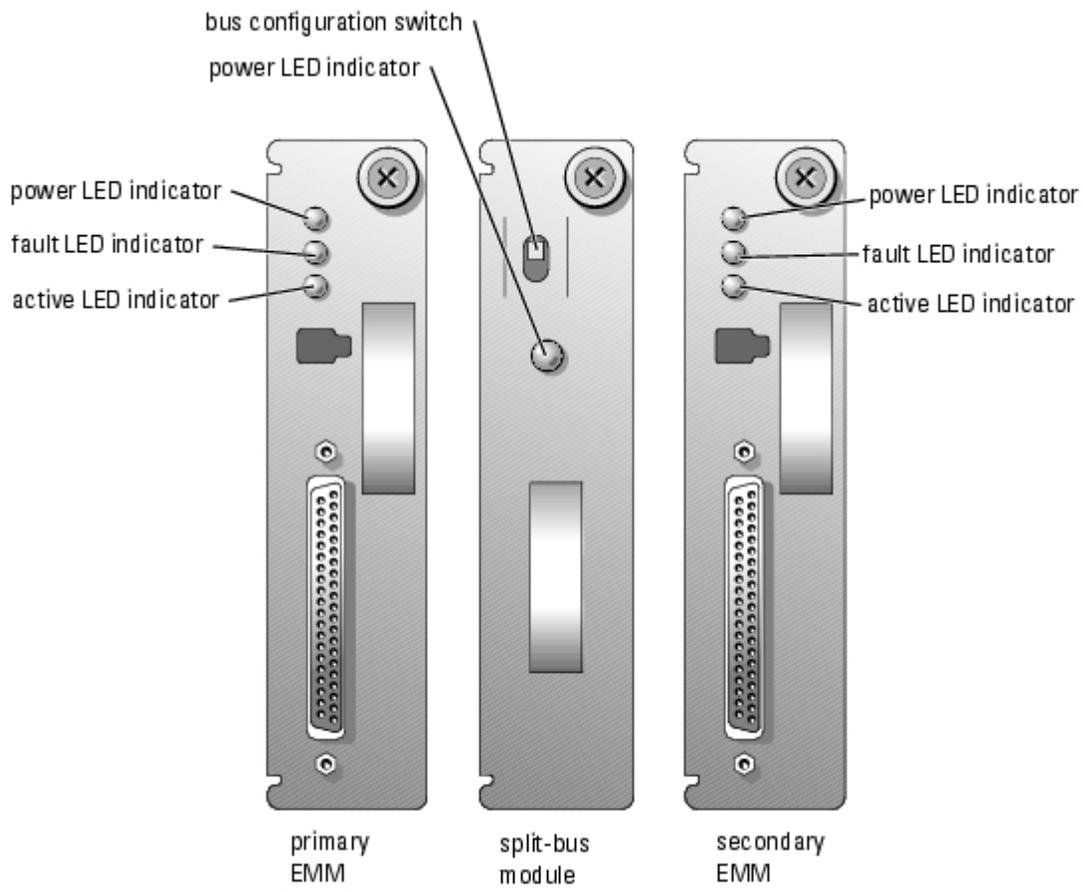
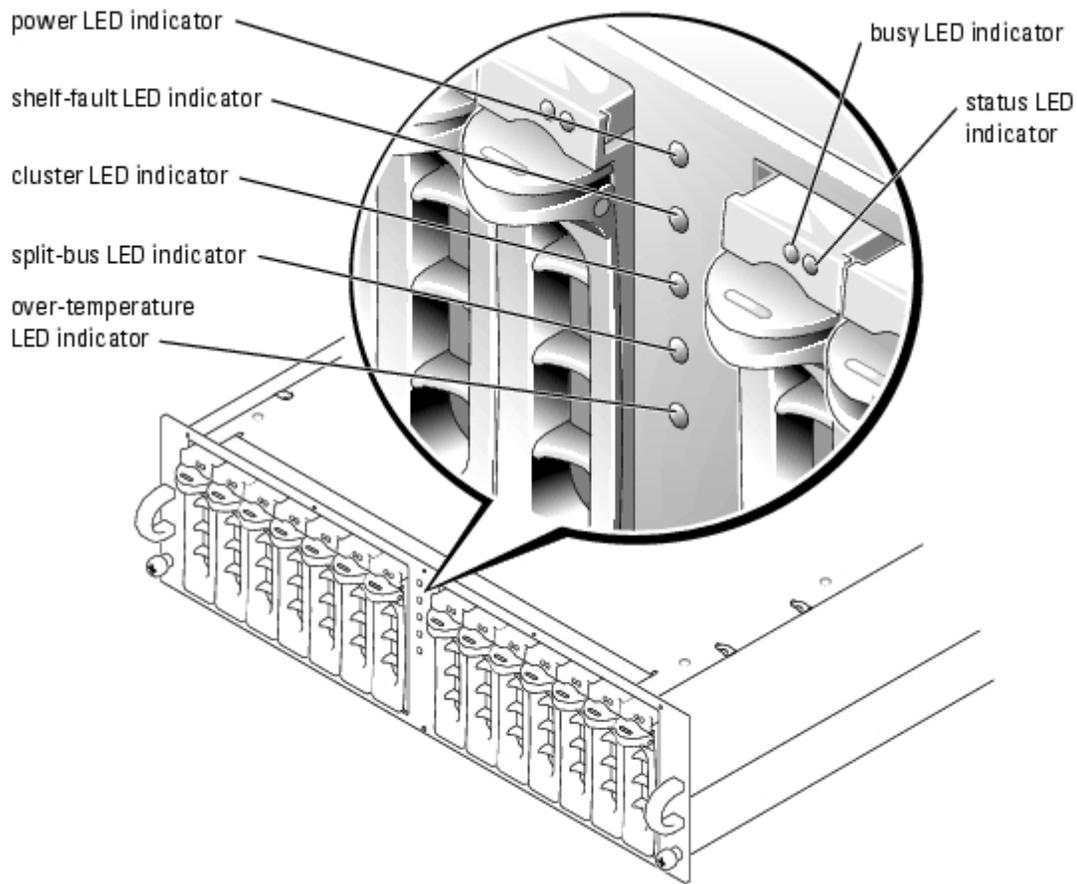


Figure 2-3. Front Panel Features and Indicators



Split-Bus Module

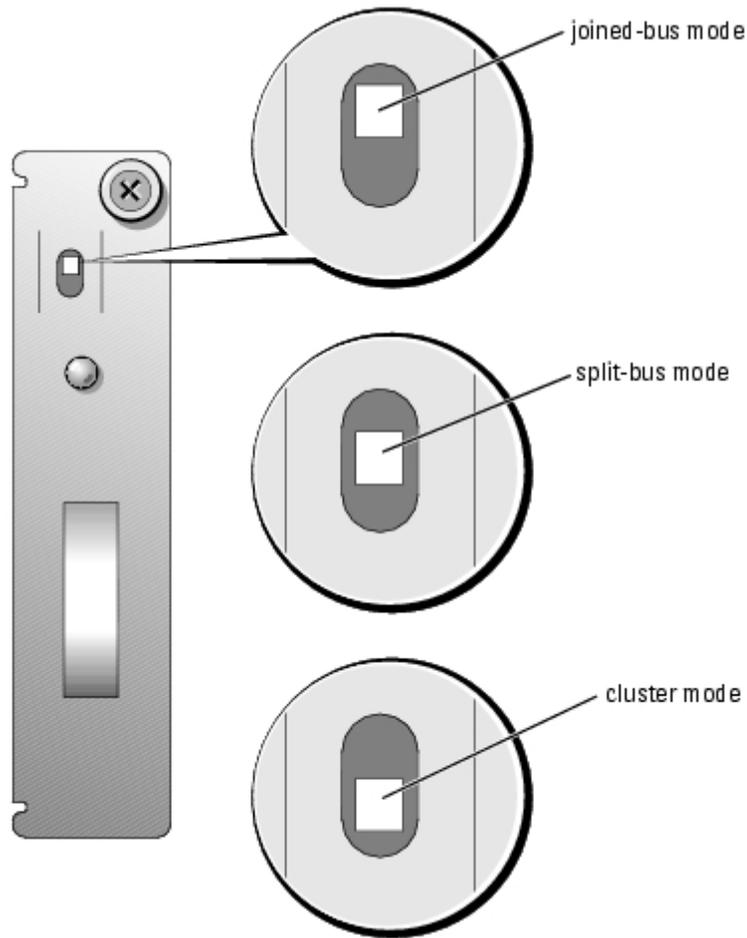
Your system supports three SCSI bus modes controlled by the split-bus module:

- Joined-bus mode
- Split-bus mode
- Cluster mode

These modes are controlled by the position of the bus configuration switch when the system is turned on.

[Figure 2-4](#) illustrates the switch position for each mode.

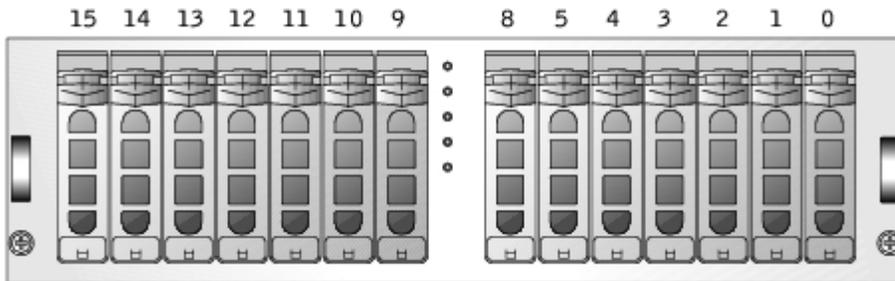
Figure 2-4. Bus Configuration Switch Modes



The only difference between cluster mode and joined-bus mode is the SCSI ID occupied by the enclosure services processor. When cluster mode is detected, the processor SCSI ID changes from 6 to 15, allowing a second initiator to occupy SCSI ID 6. As a result, SCSI ID 15 is disabled, leaving 13 available hard drives in cluster mode. As a result, you must remove the SCSI ID 15 hard drive from the enclosure when using the enclosure in cluster mode.

[Figure 2-5](#) illustrates the SCSI IDs and their associated hard drives for the PowerVault 22xS storage system.

Figure 2-5. PowerVault 22xS SCSI ID Numbers and Associated Drives



See your *Dell PowerVault 220S and 221S Systems Installation and Troubleshooting Guide* for more information about SCSI ID assignments and cluster mode operation.

[Table 2-3](#) provides a description of the split-bus module modes and functions.

Table 2-3. Split-bus Module Modes and Functions

Mode	Position of Bus Configuration Switch	Function
Joined-bus mode	Up	LVD termination on the split-bus module is disabled, electrically joining the two SCSI buses to form one contiguous bus. In this mode, neither the split-bus nor the cluster LED indicators on the front of the enclosure are illuminated.
Split-bus mode	Center	LVD termination on the split-bus module is enabled and the two buses are electrically isolated, resulting in two seven-drive SCSI buses. The split-bus LED indicator on the front of the enclosure is illuminated while the system is in split-bus mode.
Cluster mode	Down	LVD termination is disabled and the buses are electrically joined. The cluster LED on the front of the enclosure is illuminated while the system is in cluster mode.

 **NOTE:** To change the SCSI bus mode, you must change the position of the bus configuration switch *before* turning on the storage system. Using the bus configuration switch while the system is on does not affect system operation. If you change the bus configuration switch while the system is running, the change will not take effect until you perform the following sequence: shut down the nodes, reboot the storage system, and then power up the nodes.

The split-bus module has only one LED indicator (see [Figure 2-2](#) for location), which is illuminated when the module is receiving power.

Enclosure Management Module (EMM)

The EMM serves two primary functions in your storage system:

- SCSI bus expansion — Acts as a buffer for the SCSI bus, electrically dividing the bus into two independent segments while logically allowing all SCSI bus traffic to pass through it transparently. The buffer improves the quality of the SCSI signals and allows longer cable length connections.
- Management functions — Includes SES and SAF-TE reporting to the host initiator, control of all enclosure LED indicators, and monitoring of all enclosure environmental elements such as temperature sensors, cooling modules, and power supplies.

A system with redundant enclosure management features two EMMs that are designated as primary and secondary and can be configured in either a cluster, joined-bus, or split-bus mode. A nonredundant configuration consists of one EMM and one SCSI terminator card, and can be configured in a joined-bus mode only. In a redundant system, only one EMM per SCSI bus is active at one time, so only one EMM per SCSI bus can respond to SCSI commands from an initiator.

If a secondary EMM receives a message that the primary EMM has failed in joined-bus and cluster modes, the fault LED indicator on the primary EMM is illuminated and the condition is reported back to the host initiator. The secondary EMM then becomes active and holds the failed primary in a state of reset until it is replaced. If the primary EMM detects that the secondary has failed, the secondary's fault LED indicator is illuminated and the failed status is reported back to the host initiator.

 **NOTE:** In split-bus mode, each EMM controls half of the enclosure. If one EMM fails in split-bus mode, the second EMM reports the failure, but does not assume control of the entire SCSI bus.

The primary EMM is always plugged into the slot on the left (viewed from the back of the system). In a redundant joined-bus configuration, the primary EMM assumes control of all the enclosure functionality. In addition, the primary EMM is the only module that reports the status of the system to the host initiator through SES and SAF-TE protocols. Because the secondary EMM must assume the responsibilities of the primary in the event that the primary fails, both the primary and secondary EMMs are continuously monitoring the status of the system's components.

Preparing the PERC Card for Clustering

The warning message shown in [Figure 2-6](#) appears on your screen when you attempt to modify the configuration of the shared storage system on your cluster by using the PERC BIOS configuration utility.

Figure 2-6. Important System Warning

```
!!!STOP!!!  
  
This operation may change the configuration of disks and  
can cause loss of data! Ensure:  
  
1. Peer server is powered up for its controller NVRAM to be  
updated. Otherwise, disk configuration should be read from  
disk and saved to controller's NVRAM.  
  
2. The second server must not be configuring the disks.  
  
3. There is no I/O activity against shared drives.  
  
Press Any Key To Continue
```

The warning message appears on the screen immediately after activating the PERC BIOS configuration utility by pressing <Ctrl><m> during the system's POST and when you attempt to perform a data-destructive operation in the Dell™ PowerEdge™ RAID Console utility. Examples of data-destructive operations include clearing the configuration of the logical drives or changing the RAID level of your shared hard drives.

This warning message alerts you to the possibility of data loss if certain precautions are not taken to protect the integrity of the data on your cluster.

➡ **NOTICE:** To prevent data loss, your cluster must meet the conditions in the following bulleted list before you attempt any data-destructive operation on your shared hard drives.

- Ensure that the peer system is turned on during the operation so that the PERC card's NVRAM can be updated with the new configuration information. Alternately, if the peer system is down, you must save the disk configuration to the shared storage system. When you restart the system later, update the peer system's NVRAM from the disk configuration saved to the shared storage system.
- Ensure that the peer cluster node is not currently configuring the shared storage system.
- Ensure that I/O activity does not occur on the shared storage system during the operation.
- Ensure that your PERC firmware is the latest version. See your PERC documentation for information on downloading the latest firmware.

Enabling the Cluster Mode Using the PERC Card

Each PERC card that is used to connect to a shared storage enclosure must have *cluster mode* enabled using the PERC card's BIOS configuration utility. Enabling cluster mode implements the additional functionality required for the controller to operate in a cluster environment.

See [Table 2-3](#) for more information on split-bus module modes.

➡ **NOTICE:** If you replace your PERC card, ensure that you enable the cluster mode on the replacement PERC card and set the SCSI ID to the appropriate value (6 or 7) before you connect the SCSI cables to the shared storage.

See the appropriate PERC card documentation for more information about enabling cluster mode and the SCSI host adapter.

Setting the SCSI Host Adapter IDs

After you enable cluster mode on the PERC card, you have the option to change the SCSI ID for both of the adapter's channels. For each shared SCSI bus (a connection from a channel on one system's PERC card to the shared storage enclosure to a channel on the second system's PERC card), you must have unique SCSI IDs for each controller. The default SCSI ID for the PERC is ID 7. Thus, the SCSI ID for one of the system's PERC cards must be configured to ID 6.

For cluster configurations with two PERC cards in each node connected to shared storage enclosures, set both controllers in one system to SCSI ID 6; that is, one node's pair of PERC cards utilizes SCSI ID 7 (default) and the other node's pair of PERC cards is changed to utilize SCSI ID 6.

See the PERC documentation for more information about setting the SCSI host adapter ID number.

 **NOTICE:** If you replace a PERC card, you must set the appropriate SCSI ID before you connect the SCSI cables to the shared storage.

Configuring and Managing Virtual Disks

The hard drives in the shared storage system must be configured for clustering. Before you configure the virtual disks, configure the RAID levels that you will be using in your cluster. See the PERC documentation and the Array Manager documentation for instructions about setting up a RAID array.

All virtual disks, especially if they are used for the quorum resource, should incorporate the appropriate RAID level to ensure high availability. See "[Creating the Quorum Resource](#)" for more information on the quorum resource.

 **NOTE:** Dell recommends 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 necessary redundancy that is required for the quorum resource. See the documentation for your storage system for more information about setting up RAID levels for the system.

In a cluster configuration, if multiple NTFS partitions are created on a single virtual disk, these partitions will fail over together. If you plan to run cluster-aware applications on each cluster node, you must create at least two separate virtual disks to ensure that the applications can fail over independently.

Obtaining More Information

See "[Naming and Formatting Drives on the Shared Storage System](#)" for information on how to assign drives letters to the shared hard drives in a cluster installation.

See the appropriate operating system documentation and the PERC documentation for instructions on partitioning and formatting the shared storage system's hard drives.

Windows Storage Server 2003, Enterprise Edition Dynamic Disks and Volumes

The Windows operating system does not support dynamic disks or volumes as shared cluster storage. If the shared cluster storage is configured as a dynamic disk, the Cluster Configuration wizard will not be able to discover the disks, which prevents the cluster and network clients from accessing the disks.

Naming and Formatting Drives on the Shared Storage System

After the virtual disks are created, write the disk signature, assign drive letters to the virtual disks, and then format the drives as NTFS drives. Format the drives and assign drive letters from only one cluster node.

 **NOTICE:** Accessing the hard drives from multiple cluster nodes may corrupt the file system.

Assigning Drive Letters

 **NOTICE:** If the disk 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 shut down.

Before installing MSCS, ensure that both nodes have the same view of the shared storage systems. Because each node has access to hard drives that are in a common storage array, each node must have identical drive letters assigned to each hard drive. Up to 22 logical drive letters (E through Z) can be used for the shared storage systems.

 **NOTE:** Drive letters A through D are reserved for the local system.

The number of drive letters required by individual servers in a cluster may vary. Dell recommends 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:

1. With node 2 shut down, open **Disk Management** on node 1.
2. Allow Windows to enter a signature on all new physical or logical drives.

 **NOTE:** Do not create dynamic disks on your hard drives.

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 PERC driver is installed.
- The storage system is properly cabled to the servers.
- The split-bus module on the PowerVault 22xS is set to cluster mode.

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

 **NOTE:** The MSCS software allows only one node to access a logical drive at a time. If a logical drive is partitioned into multiple disks, only one node is able to access all the partitions for that logical drive. If each node must access a separate disk, two or more logical drives must be present in the storage system.

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.
- 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. Shut down 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.

To modify the drive letters on node 2, repeat [step 7](#) through [step 9](#).

Installing a PowerVault 770N NAS Cluster Minimum Configuration

[Table 2-4](#) provides the hardware requirements for a PowerVault 770N NAS cluster minimum configuration.

[Figure 2-7](#) shows a minimum system configuration for a PowerVault 770N NAS Cluster.

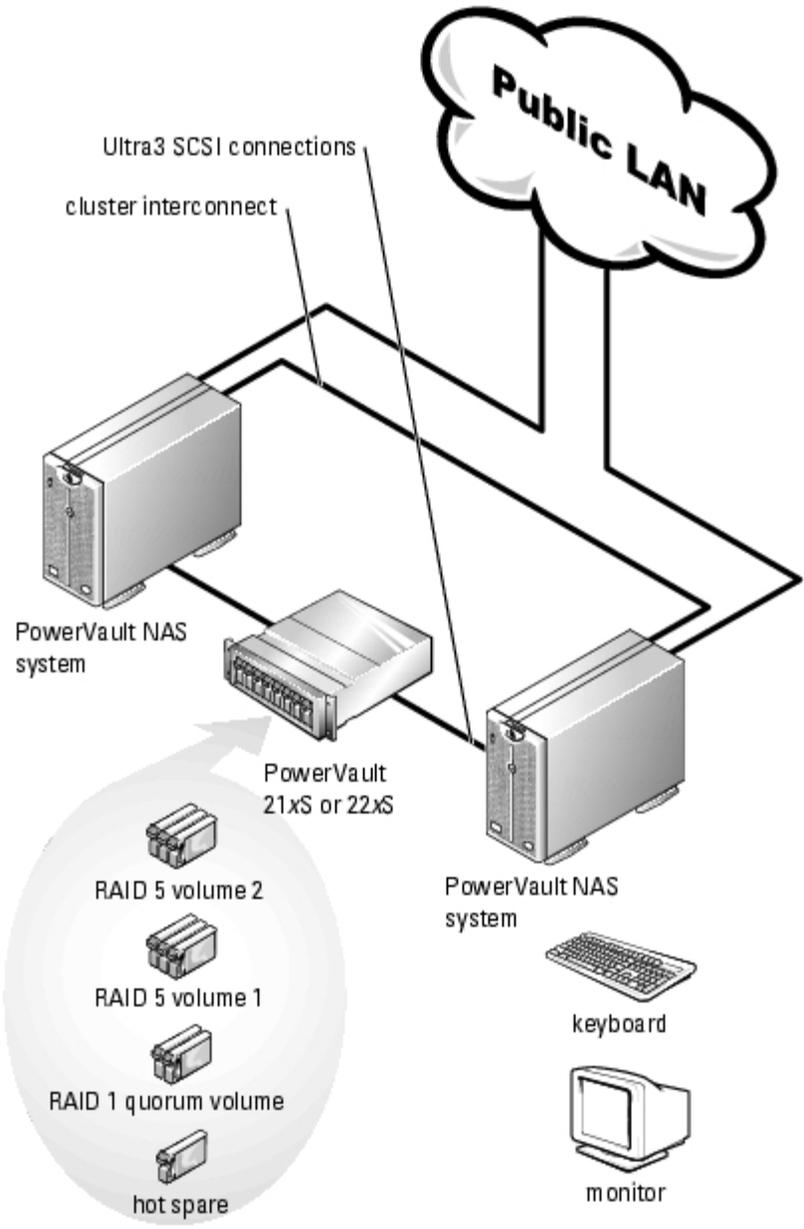
See "[Minimum System Requirements](#)" for more information.

Table 2-4. PowerVault 770N NAS Cluster Minimum Configuration Hardware Requirements

Component	Hardware Requirement
PowerVault 770N	Two homogeneous (identical) PowerVault 770N NAS systems running the Windows Storage Server

NAS systems	2003, Enterprise Edition operating system
Operating system	Windows Storage Server 2003, Enterprise Edition
RAID controller	One supported PERC installed in both systems
Shared storage systems	One PowerVault 21xS or 22xS storage system with at least nine hard drives reserved for the cluster
Private network cabling	One <i>crossover</i> cable (not included) attached to a Fast Ethernet network adapter in both systems OR One <i>standard</i> cable (not included) attached to a Gigabit Ethernet network adapter in both systems
Public network cabling	One standard cable attached to a network adapter in both systems for the public network
Network adapter	An additional network adapter installed in each NAS system for the private network

Figure 2-7. Minimum System Configuration of a PowerVault 770N NAS Cluster



Installing a PowerVault 775N NAS Cluster Minimum Configuration

The following cluster components are required for a minimum system cluster configuration using the PowerVault 775N NAS Cluster:

[Table 2-5](#) provides the hardware requirements for a PowerVault 775N NAS cluster minimum configuration.

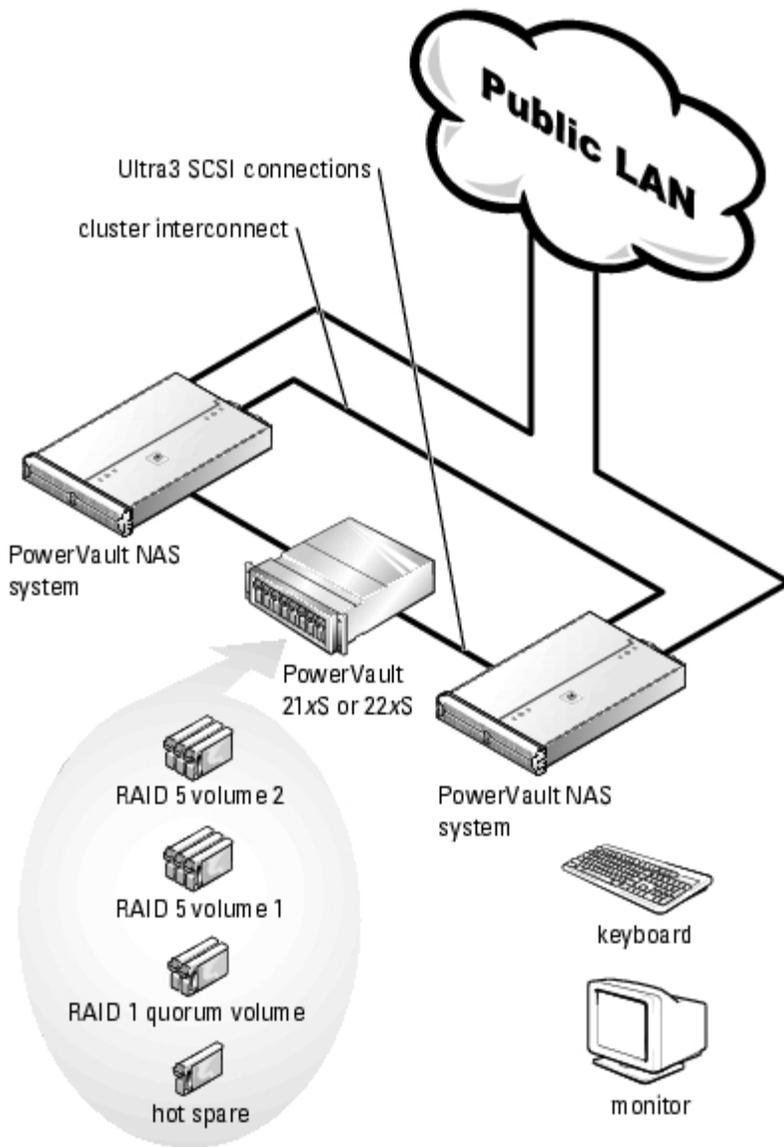
[Figure 2-8](#) shows a minimum system configuration for a PowerVault 775N NAS Cluster.

See "[Minimum System Requirements](#)" for more information.

Table 2-5. PowerVault 775N NAS Cluster Minimum Configuration Hardware Requirements

Cluster Component	Hardware Requirement
PowerVault 775N NAS systems	Two homogeneous (identical) PowerVault 775N NAS systems that support clusters
Operating system	Windows Storage Server 2003, Enterprise Edition
RAID controllers	One supported PERC installed in both systems for the external storage system(s)
Shared storage systems	One PowerVault 21xS or 22xS storage system with at least nine hard drives reserved for the cluster
Private network cabling	One Ethernet cable attached to a network adapter in both systems for the private network
Public network cabling	One Ethernet cable attached to a network adapter in both systems for the public network

Figure 2-8. Minimum System Configuration of a PowerVault 775N NAS Cluster



Configuring the Shared Disks

This section provides the steps for performing the following procedures:

- Creating the quorum resource
- Configuring the shared disk for the quorum disk
- Configuring the shared disks for the data disks
- Configuring the hot spare

Creating the Quorum Resource

When you install Windows Storage Server 2003, Enterprise Edition in your cluster, the software installation wizard automatically selects the quorum resource (or *quorum disk*), which you can modify later using Cluster Administrator. Additionally, you can assign a specific hard drive for the quorum resource. To prevent quorum resource corruption, Dell and Microsoft recommend that you do not place data on the resource.

The quorum resource is typically a hard drive in the shared storage system that serves the following purposes in a PowerVault NAS Cluster configuration:

- Acts as an arbiter between the cluster nodes to ensure that the specific data necessary for system recovery is maintained consistently across the cluster nodes
- Logs the recovery data sent by the cluster node

Only one cluster node can control the quorum resource at one time. This node continues to run if the two nodes are unable to communicate with each other. If the two nodes are unable to communicate through the private network, MSCS automatically shuts down the node that does not contain the quorum resource.

When one of the cluster nodes fails for any reason, changes to the cluster configuration database are logged to the quorum resource, ensuring that the healthy node gaining control of the quorum resource has access to an up-to-date version of the cluster configuration database.

Creating a Partition for the Quorum Resource

Dell recommends creating a separate partition—approximately 1 GB in size—for the quorum resource.

When you create the partition for the quorum resource:

- Format the partition with NTFS.
- Use the partition exclusively for your quorum logs.
- Do not store any application data or user data on the quorum resource partition.
- To properly identify the quorum resource, Dell recommends that you assign the drive letter "Q" to the quorum resource partition.

Dell does not recommend using the remainder of the virtual disk for other cluster resources. If you do use the space for cluster resources, be aware that when you create two volumes (partitions) on a single virtual disk, they will both fail over together if a server fails.

Preventing Quorum Resource Failure

Because the quorum resource plays a crucial role in cluster operation, losing a quorum resource causes the entire cluster to fail. To prevent cluster failure, configure the quorum resource on a RAID volume in the shared storage system.

 **NOTICE:** Dell recommends that you use a RAID level other than RAID 0, which is commonly called striping. RAID 0 configurations provide very high performance, but they do not provide the level of redundancy that is required for the quorum resource.

Configuring the Shared Disk for the Quorum Resource

1. Open Dell OpenManage Array Manager.
2. Locate two hard drives of the same size in the external storage system(s).
3. Create a RAID 1 virtual disk.

See your Array Manager documentation for information on installing a virtual disk.

 **NOTE:** After you create the virtual disk and the virtual disk is initialized by the PERC 3 controller, you must reboot the system.

4. Write a signature on the new disk.
5. Using the new disk, create a volume, assign a drive letter, and format the disk in NTFS.

See your Array Manager documentation for information about configuring the shared disk.

Configuring the Shared Disks for the Data Disk(s)

1. Open Array Manager.
2. Locate three or more hard drives of the same size in the external storage system(s).
3. Create a RAID 5 virtual disk using at least three hard drives.

See your Array Manager documentation for information on installing a virtual disk.

 **NOTE:** After you create the virtual disk and the virtual disk is initialized by the PERC 3 controller, you must reboot the system.

4. Write a signature on the new disk.
5. Using the new disk, create a volume, assign a drive letter, and format the disk in NTFS.

To configure the shared disks for the data disks on data volume 2, repeat the steps for configuring the shared disks for other data volumes.

Configuring the Hot Spare

The hot spare is a failover hard drive for any of the internal hard drives in the external storage system. If one of the hard drives in the storage system fails, the responsibilities of the failed disk will automatically fail over to the hot spare.

1. Open Dell OpenManage Array Manager.
2. Assign a global hot spare disk.

See your Array Manager documentation for more information.

Configuring Cluster Networks Running Windows Storage Server 2003, Enterprise Edition

When you install and configure a cluster running Windows Storage Server 2003, Enterprise Edition, the software installation wizard automatically assigns and configures the public and private networks for your cluster. You can rename a network, allow or disallow the cluster to use a particular network, or modify the network role using Cluster Administrator. Dell recommends that you configure at least one network for the cluster interconnect (private network) and one network for all communications. Additionally, Dell recommends that you use a Gigabit Ethernet network adapter for the private network.

Installing and Configuring MSCS

MSCS is an integrated service in the Windows Storage Server 2003, Enterprise Edition operating system. MSCS performs the basic cluster functionality, which includes membership, communication, and failover management. When MSCS is installed properly, the service starts on each node and responds automatically if one of the nodes fails or goes offline. To provide application failover for the cluster, the MSCS software must be installed on both cluster nodes.

See "[Using MSCS](#)" for more information.

 **NOTE:** For systems with split backplane modules installed, the cluster installation tries to use the logical drives on the secondary backplane as cluster disks. Because these drives are not accessible to all nodes in the cluster, ensure that they are removed from the cluster after the installation is complete.

 **NOTE:** In Windows Storage Server 2003, Enterprise Edition, mapping a network drive to the same drive letter as a cluster disk resource renders the cluster disk inaccessible from Windows Explorer on the host. Ensure that mapped network drives and cluster disks are never assigned the same drive letter.

Verifying Cluster Readiness

To ensure that your server and storage systems are ready for MSCS installation, ensure that these systems are functioning correctly and verify the following:

- All cluster servers are able to log on to the same domain.
- The shared disks are partitioned and formatted, and the same drive letters that reference logical drives on the shared storage system are used on each node.
- For each attached PowerVault 22xS storage system, the split-bus module is set to cluster mode before power-up.
- Cluster mode is enabled on all PERC cards connected to shared storage.
- The controller's SCSI IDs (6 or 7) on each node are different.
- All peer PERC cards are connected to the same PowerVault system through the same channel number.
- All IP addresses and network names for each system node are communicating with each other and the rest of the network. The private IP addresses should not be accessible from the LAN.

Configuring Microsoft Windows Storage Server 2003, Enterprise Edition Cluster Service (MSCS)

The cluster setup files are automatically installed on the system disk.

To create a new cluster:

1. From either node, click the **Start** button, select **Programs** → **Administrative Tools**, and then double-click **Cluster Administrator**.
2. From the **File** menu, select **Open Connection**.
3. In the **Action** box of the **Open Connection to Cluster**, select **Create new cluster**.

The New Server Cluster Wizard appears.

4. Click **Next** to continue.

5. Follow the procedures in the wizard, and then click **Finish**.
6. Add the second node to the cluster.
 - a. Turn on the remaining node.
 - b. Click the **Start** button, select **Programs**→ **Administrative Tools**, and double-click **Cluster Administrator**.
 - c. From the **File** menu, select **Open Connection**.
 - d. In the **Action** box of the **Open Connection to Cluster**, select **Add nodes to cluster**.
 - e. In the **Cluster or server name** box, type the name of the cluster or click **Browse** to select an available cluster from the list, and then click **OK**.

The **Add Nodes Wizard** window appears.

If the Add Nodes Wizard *does not* generate a cluster feasibility error, go to [step f](#).

If the Add Nodes Wizard generates a cluster feasibility error, go to "[Adding Cluster Nodes Using the Advanced Configuration Option](#)."

- f. Click **Next** to continue.
- g. Follow the procedures in the wizard, and then click **Finish**.

Adding Cluster Nodes Using the Advanced Configuration Option

If you are adding additional nodes to the cluster using the Add Nodes Wizard and the nodes are not configured with identical internal storage devices, the wizard may generate one or more errors while checking cluster feasibility in the **Analyzing Configuration** menu. If this situation occurs, select **Advanced Configuration Option** in the Add Nodes Wizard to add the nodes to the cluster.

To add the nodes using the **Advanced Configuration Option**:

1. From the **File** menu in Cluster Administrator, select **Open Connection**.
2. In the **Action** box of the **Open Connection to Cluster**, select **Add nodes to cluster**, and click **OK**.

The **Add Nodes Wizard** window appears.

3. Click **Next**.
4. In the **Select Computers** menu, click **Browse**.
5. In the **Enter the object names to select (examples)**, type the names of one to seven systems to add to the cluster, with each system name separated by a semicolon.
6. Click **Check Names**.

The Add Nodes Wizard verifies and underlines each valid system name.

7. Click **OK**.
8. In the **Select Computers** menu, click **Add**.
9. In the **Advanced Configuration Options** window, click **Advanced (minimum) configuration**, and then click **OK**.

10. In the **Add Nodes** window, click **Next**.
11. In the **Analyzing Configuration** menu, Cluster Administrator analyzes the cluster configuration.

If Cluster Administrator discovers a problem with the cluster configuration, a warning icon appears in **Checking cluster feasibility**. Click the plus (+) sign to review any warnings, if needed.

12. Click **Next** to continue.
13. In the **Password** field of the **Cluster Service Account** menu, type the password for the account used to run MSCS, and click **Next**.

The **Proposed Cluster Configuration** menu appears with a summary with the configuration settings for your cluster.

14. Click **Next** to continue.

The new systems (hosts) are added to the cluster. When completed, **Tasks completed** appears in the **Adding Nodes to the Cluster** menu.

 **NOTE:** This process may take several minutes to complete.

15. Click **Next** to continue.
16. In the **Completing the Add Nodes Wizard**, click **Finish**.

Verifying Cluster Functionality

To verify cluster functionality, monitor the cluster network communications to ensure that your cluster components are communicating properly with each other. Also, verify that MSCS is running on the cluster nodes.

Verifying MSCS Operation

After you install MSCS, verify that the service is operating properly.

1. Click the **Start** button and select **Programs** → **Administrative Tools**, and then select **Services**.
2. In the **Services** window, verify the following:
 - In the **Name** column, **Cluster Service** appears.
 - In the **Status** column, Cluster Service is set to **Started**.
 - In the **Startup Type** column, Cluster Service is set to **Automatic**.

Verifying Cluster Resource Availability

In the context of clustering, a resource is a basic unit of failover management. Application programs are made up of resources that are grouped together for recovery purposes. All recovery groups, and therefore the resources that comprise the recovery groups, must be online (or in a ready state) for the cluster to function properly.

To verify that the cluster resources are online:

1. Start Cluster Administrator on the monitoring node.
 2. Click the **Start** button and select **Programs**→ **Administrative Tools (Common)**→ **Cluster Administrator**.
 3. Open a connection to the cluster and observe the running state of each resource group. If a group has failed, one or more of its resources might be offline.
-

Configuring and Managing the Cluster Using Cluster Administrator

Cluster Administrator is Microsoft's tool for configuring and managing a cluster. The following procedures describe how to run Cluster Administrator locally on a cluster node and how to install the tool on a remote console.

Launching Cluster Administrator on a Cluster Node

1. Click the **Start** button and select **Programs**.
2. Select **Administrative Tools**.
3. Select **Cluster Administrator**.

Troubleshooting Failed Resources

Troubleshooting the failed resources is beyond the scope of this document, but examining the properties of each resource and ensuring that the specified parameters are correct are the first two steps in this process. In general, if a resource is offline, it can be brought online by right-clicking the resource and selecting **Bring Online** from the drop-down menu.

Obtaining More Information

See the Windows Storage Server 2003, Enterprise Edition documentation and online help for information about troubleshooting resource failures.

See Microsoft's online help for configuring MSCS.

See "[Using MSCS](#)" for more information about MSCS.

Managing Directory Quotas (Optional)

Directory Quota is an optional tool in the PowerVault NAS Manager that allows you to manage and control disk space allocation on the server appliance. Using Directory Quota, you can add, delete, monitor and change space limits for specific directories on your cluster nodes. The Administrator can configure the settings for Directory Quota in the PowerVault NAS Manager, which are available and enforced in a failover scenario.

 **NOTE:** Directory Quota monitors disk space for specific directories and does not monitor disk space for each individual user. To enable quotas for each user, you must use Disk Quota.

In a cluster configuration, each cluster node can manage and configure Directory Quota for the volume(s) owned by the node.

For example, if a cluster has two volumes and each node owns one of the volumes, a typical scenario in an active/active configuration (where virtual servers are running on each node) would be:

- Node 1 owns Volume G.
- Node 2 owns Volume H.

In this configuration, the administrator must use the PowerVault NAS Manager connect to node 1 to configure the Directory Quota settings for Volume G, and then connect to node 2 to configure the Directory Quota settings for Volume H.

See the *Dell PowerVault NAS Systems—Installing Storage Manager for Server Appliances* document located on the Dell Support website at support.dell.com for information on installing Directory Quota in your PowerVault NAS Manager.

Using Shadow Copies of Shared Folders

A shadow copy is a point-in-time copy of a shared file or folder. If you change a file on the active file system after making a shadow copy, the shadow copy contains the old version of the file. If an active file gets corrupted or deleted, you can restore the old version by copying the file from the latest shadow copy or restoring a directory or file.

-  **NOTICE:** Shadow copies are temporary backups of your data that typically reside on the same volume as your data. If the volume becomes damaged and you lose your data, the shadow copy is also lost. Do not use shadow copies to replace scheduled or regular backups. Table 2-4 provides a summary of shadow copies.

See the *Dell PowerVault 77xN NAS Systems Administrator's Guide* for more information on shadow copies.

You can create shadow copies of shared folders that are located on shared resources, such as a file server. When creating shadow copies of shared folders on a NAS SCSI cluster running the Windows Storage Server 2003, Enterprise Edition operating system, note the information listed in [Table 2-6](#).

See the Microsoft Support website at www.microsoft.com for more information on shadow copies for shared folders.

Table 2-6. Creating Shadow Copies

Cluster Type/Task	Description	Action
Single quorum device cluster	Two-node cluster with both nodes connected to a storage system with a physical disk resource.	Create and manage shadow copies on the physical disk resource. NOTE: The Volume Shadow Copy Service Task resource type can be used to manage shadow copies in a NAS cluster, but requires a dependency on the physical disk resource.
Scheduled tasks that generate volume shadow copies.	Creates a shadow copy of an entire volume.	Run the scheduled task on the same node that owns the volume. NOTE: The cluster resource that manages the scheduled task must be able to fail over with the physical disk resource that manages the storage volume.

Shadow Copy Considerations

When using shadow copies, note the following:

- To avoid disabling and re-enabling shadow copies, enable shadow copies after you create your NAS SCSI cluster.
- Enable shadow copies in a NAS SCSI cluster when user access is minimal—for example, during nonbusiness hours. When you enable shadow copy volumes, the shadow copy volumes and all dependent resources go offline for a brief period of time, which may impact client system access to user resources.

Managing Shadow Copies

You must use the Dell PowerVault NAS Manager to manage your shadow copies. Using Cluster Administrator or **cluster.exe** to manage shadow copies in a cluster is not supported.

See the *Dell PowerVault 77xN NAS Systems Administrator Guide* for more information on managing shadow copies using NAS Manager.

Enabling Shadow Copies on a Cluster Node

When you enable shadow copies on a cluster node (for example, by using the Configure Shadow Copy user interface through the Computer Management Microsoft Management Console [MMC]), the operating system automatically generates and configures a Volume Shadow Copy Service Task resource and a scheduled task for creating the shadow copy. You are not required to use Cluster Administrator or **cluster.exe** to create the resource. Additionally, the Configure Shadow Copy user interface automatically configures the required resource dependencies.

[Table 2-7](#) provides the default properties of the scheduled task and Volume Shadow Copy Service Task resource.

Table 2-7. Default Properties for the Scheduled Task and Volume Shadow Copy Service Task Resource

Scheduled Task Property	Volume Shadow Copy Service Task Resource (cluster.exe Property)	Default Setting
Name of task	Name of resource (taskname)	ShadowCopyVolume{ <i>VolumeGUID</i> }
Run	Command to run/Command parameters (ApplicationName/ApplicationParams)	%systemroot%\system32\vssadmin.exe Create Shadow /AutoRetry=5/For=\\[drive_letter]\ Volume{ VolumeGUID}\
Creator	n/a	Cluster service
Start in	Start in	%systemroot%\system32\
Run as	n/a	Local System
Schedule	Schedule (TriggerArray)	The default settings used by Shadow Copies of Shared Folders

Installing the Cluster Management Software

The cluster management software assists you in configuring and administering your cluster. Microsoft provides Cluster Administrator as a built-in tool for cluster management.

Cluster Administrator is Microsoft's built-in tool for configuring and administering a cluster. The following procedures describe how to run Cluster Administrator locally on a cluster node and how to install it on a remote console.

Running Cluster Administrator on a Cluster Node

To launch the cluster administrator from the **Start** menu, perform the following steps:

1. Click the **Start** button and select **Programs**.
2. Select **Administrative Tools**.

3. Select **Cluster Administrator**.

Creating a System State Backup

A system state backup of your proven cluster configuration can help speed your recovery efforts in the event that you need to replace a cluster node. Therefore, you should create a system state backup after you have completed installing, configuring, and testing your PowerVault NAS Cluster and after you make any changes to the configuration.

[Back to Contents Page](#)

Cabling Your Cluster Hardware

Dell™ PowerVault™ NAS Systems SCSI Cluster Installation and Troubleshooting Guide

- [Cabling the NAS SCSI Cluster Solution](#)
- [Cabling Your Public and Private Networks](#)
- [Cabling the Mouse, Keyboard, and Monitor](#)
- [Power Cabling the NAS SCSI Cluster Solution](#)

Dell™ PowerVault™ NAS SCSI cluster configurations require cabling for the storage systems, cluster interconnects, client network connections, and power connections.

Cabling the NAS SCSI Cluster Solution

The cluster systems and components are interconnected to provide four independent functions as listed in [Table 3-1](#), each of which is described in more detail throughout this section.

Table 3-1. Cluster Cabling Components

Components	Description	Connection
Shared storage system	Connects the host-based, RAID controller(s) to the disk enclosure(s).	Connect a Dell SCSI cable from the PERC controllers in the PowerVault NAS systems to each PowerVault 21xS or 22xS storage system that is cabled to the cluster.
Cluster interconnect (private network)	Connects the NAS systems to each other to exchange information and status.	For point-to-point Fast Ethernet, connect a <i>crossover</i> Ethernet cable between the Fast Ethernet network adapters in both cluster nodes. For point-to-point Gigabit Ethernet, connect a <i>standard</i> Ethernet cable between the Gigabit Ethernet network adapters in both cluster nodes.
Network connection for public traffic (public network)	Provides a connection between each cluster node and the client network. See the <i>Platform Guide</i> for a list of supported network adapters for your configuration.	Connect an Ethernet cable from the client network to the public network adapter connector on the back of the system.
Power connection	Provides a connection between the power source and the power supplies in your system.	Connect the power strips or power distribution units (PDUs) to separate AC circuits. When you are finished, connect each power supply in your PowerVault systems to the separate power strips or PDUs.

Cabling One PowerVault 21xS or 22xS Shared Storage System to a NAS SCSI Cluster

- ✎ **NOTE:** See "[Configuring the PowerVault 22xS Storage System for Cluster Mode](#)" for more information about configuring the storage systems.
- ✎ **NOTE:** Ensure that you securely tighten the retaining screws on all SCSI connectors to ensure a reliable connection.
- ➡ **NOTICE:** Do not turn on the systems or the storage system(s) until the split-bus module on the back of the PowerVault system has been set to cluster mode and all cabling is complete.

When performing the following procedures, reference the appropriate figures according to the type of NAS systems that are installed in your cluster.

1. Locate two SCSI cables containing a 68-pin connector (for the PowerVault storage systems) and an ultra high density connector interface (UHDCI) connector (for the PERC controllers).
2. Ensure that the SCSI cables are long enough to connect your PowerVault storage systems to your PowerVault NAS systems.
3. Locate connectors A and B on the back panel of your PowerVault storage system.

[Figure 3-1](#) shows the back panel of the PowerVault 21xS storage system, and [Figure 3-1](#) shows the back panel of the PowerVault 22xS storage system.

Figure 3-1. PowerVault 21xS Back Panel

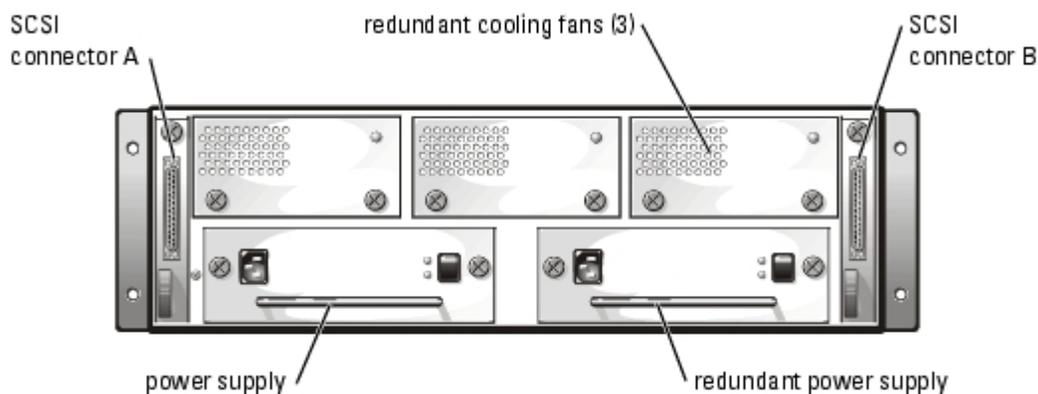
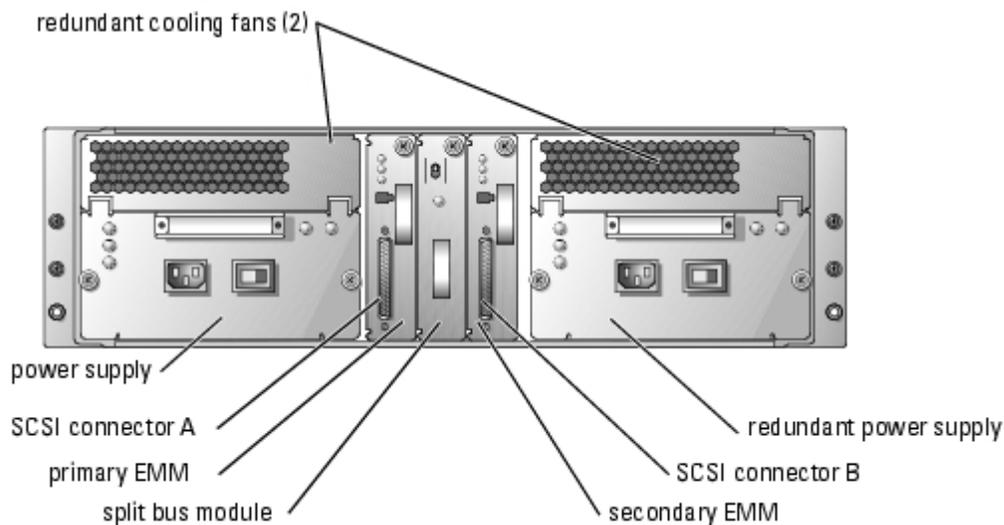


Figure 3-2. PowerVault 22xS Back Panel



4. On the first SCSI cable, connect the 68-pin connector to SCSI connector A on the back of your PowerVault storage system.
5. Tighten the retaining screws on the SCSI connector.
6. On the second SCSI cable, connect the 68-pin connector to SCSI connector B on the back of your PowerVault storage system.
7. Tighten the retaining screws on the SCSI connector.

8. Ensure that the PERC card is installed in the same PCI slot in both PowerVault NAS systems.
9. On the first SCSI cable, connect the VHDCI connector to the PERC channel 1 connector on cluster node 1.

See [Figure 3-3](#) and [Figure 3-4](#) for PowerVault 770N NAS cluster configurations.

See [Figure 3-5](#) and [Figure 3-6](#) for PowerVault 775N NAS cluster configurations.

Figure 3-3. Cabling a Clustered PowerVault 770N NAS System to One PowerVault 21xS Storage System.

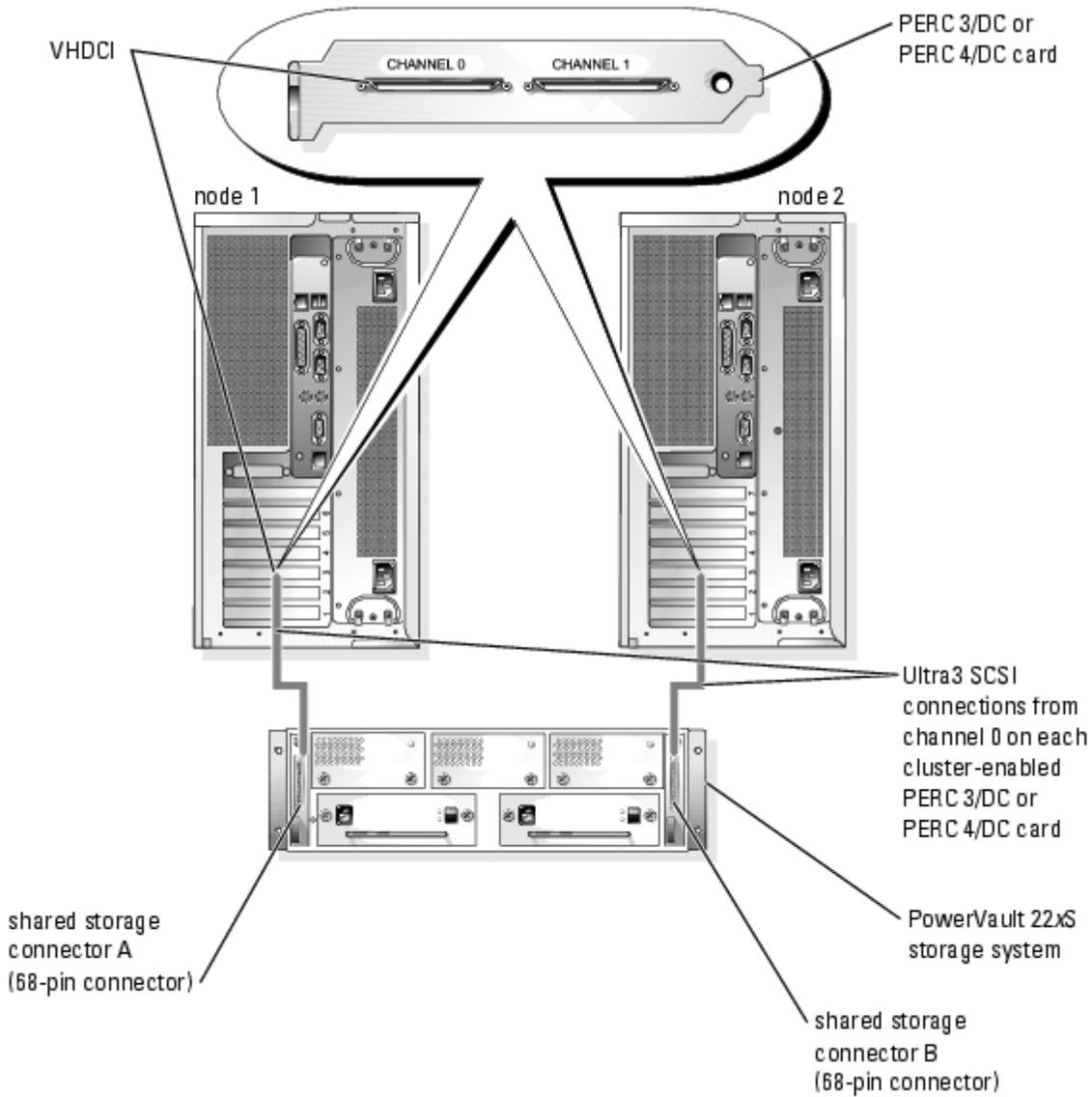


Figure 3-4. Cabling a Clustered PowerVault 770N NAS System to One PowerVault 22xS Storage System

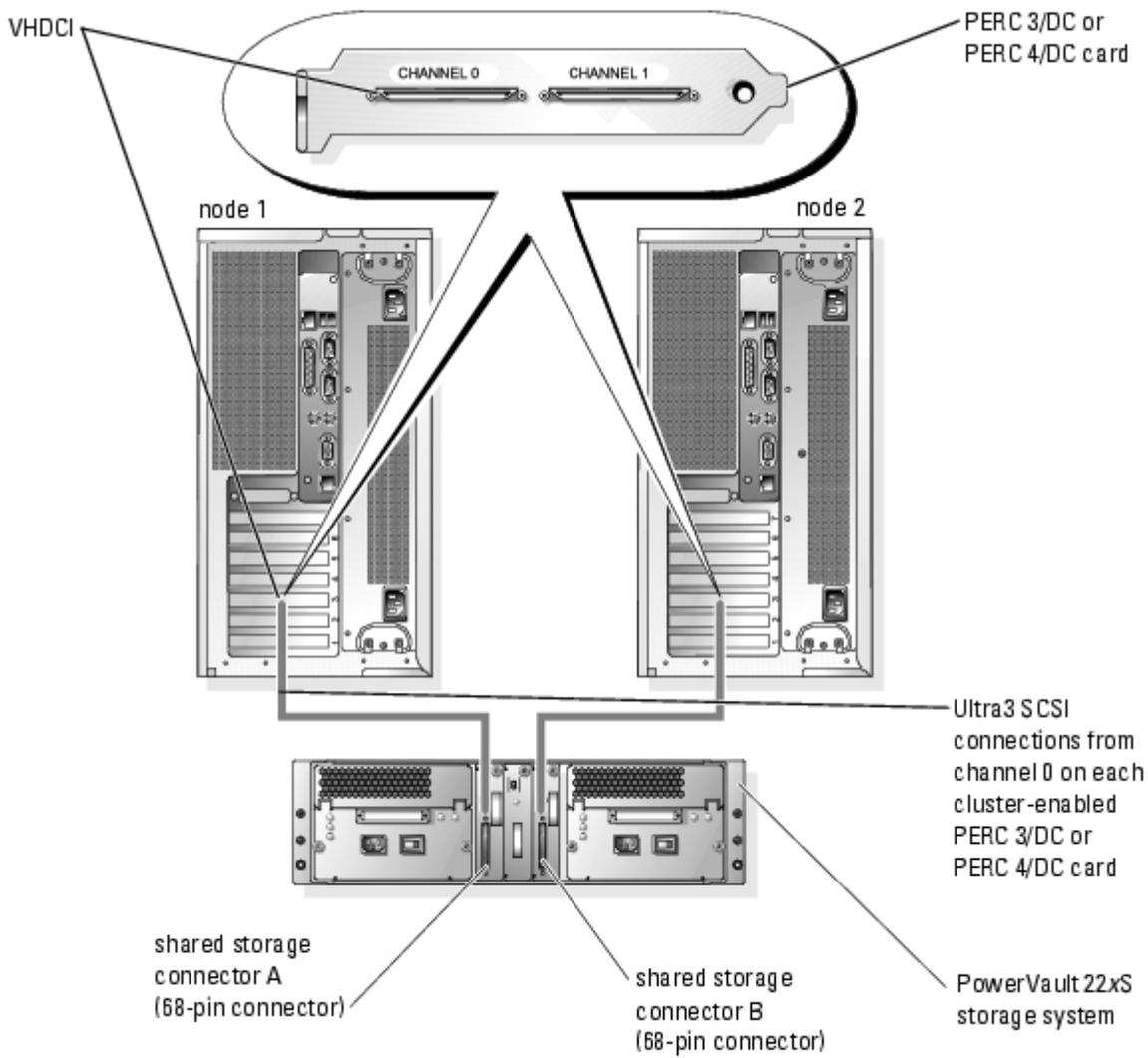


Figure 3-5. Cabling a Clustered PowerVault 775N NAS System to One PowerVault 21xS Storage System

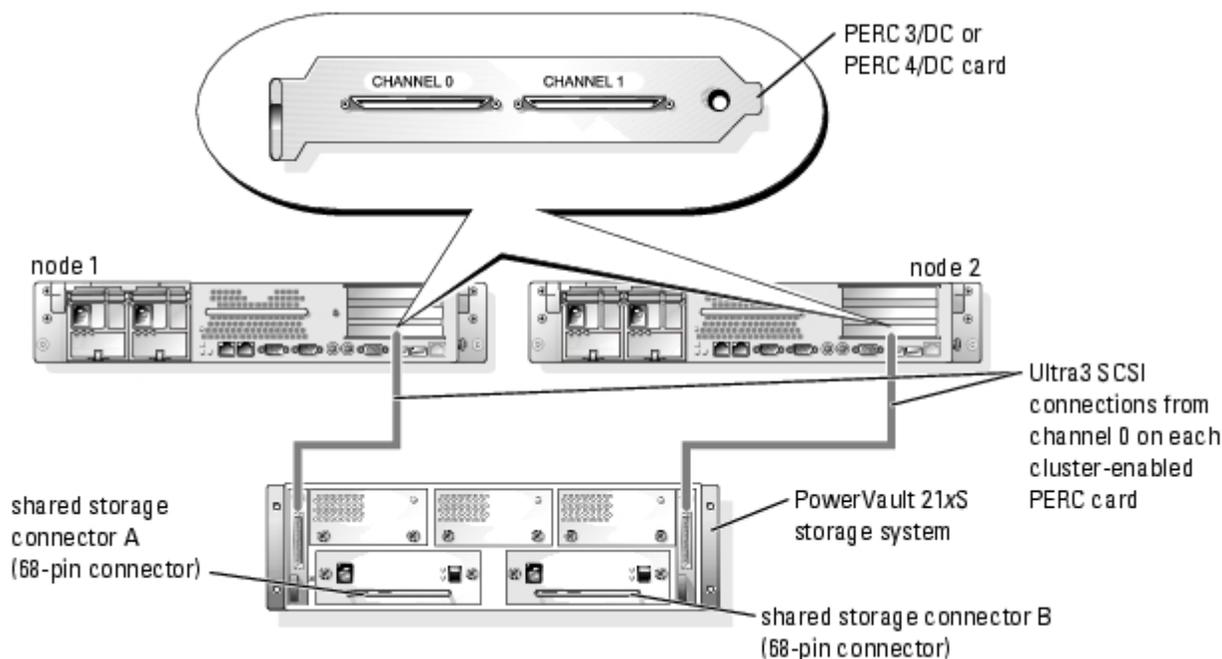
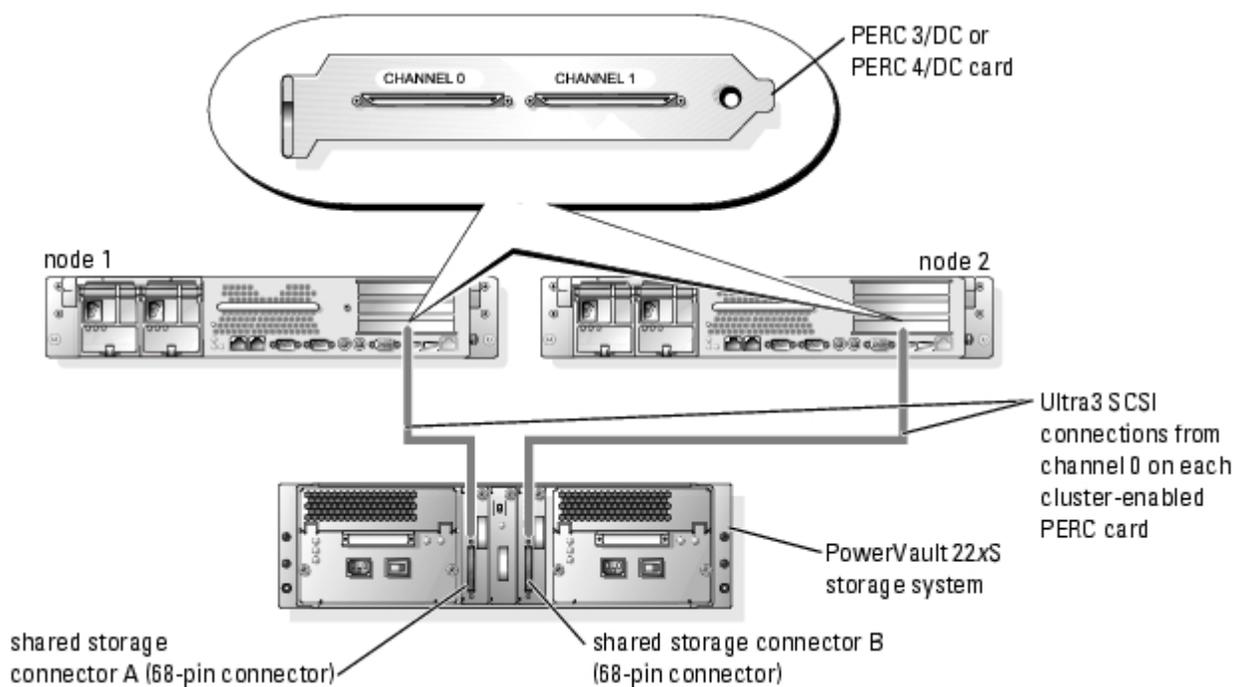


Figure 3-6. Cabling a Clustered PowerVault 775N NAS System to One PowerVault 22xS Storage System



10. Tighten and secure the retaining screws on the SCSI connectors.
11. On the second cable, connect the UHDCI connector to the PERC channel 1 connector on cluster node 2.
12. Tighten and secure the retaining screws on the SCSI connectors.

NOTE: If the PowerVault 22xS storage system is disconnected from the cluster, it must be reconnected to the same channel on the same PERC card for proper operation.

Cabling Two PowerVault 21xS or 22xS Storage Systems to a NAS SCSI Cluster

Connecting the cluster to two PowerVault storage systems is similar to connecting the cluster to a single PowerVault storage system. Connect PERC card channel 0 in each node to the back of the first storage system. Repeat the process for channel 1 on the PERC card in each node using a second PowerVault storage system.

With dual storage systems connected to a single PERC card, mirroring disk drives from one storage system to another is supported through RAID 1 and 1+0. To protect the cluster applications and your data if an entire storage system fails, Dell strongly recommends using RAID 1 (mirroring) or 1+0 (mirroring and striping).

NOTE: If you have dual cluster-enabled PERC cards (four channels) and only two shared storage systems, you may want to connect one storage system to each controller. If the cable connections are removed, you must reconnect the cables as they were previously connected. To ensure that the cables are reconnected correctly, Dell recommends that you tag or color-code the cables.

[Figure 3-7](#) shows two PowerVault 21xS storage systems cabled to a PERC on a PowerVault 770N NAS cluster.

[Figure 3-8](#) shows two PowerVault 22xS storage systems cabled to a PERC on a PowerVault 770N NAS cluster.

[Figure 3-9](#) shows two PowerVault 21xS storage systems cabled to a PERC on a PowerVault 775N NAS cluster.

[Figure 3-10](#) shows two PowerVault 22xS storage systems cabled to a PERC on a PowerVault 770N NAS cluster.

Figure 3-7. Cabling Two PowerVault 21xS Storage Systems to a PowerVault 770N NAS SCSI Cluster

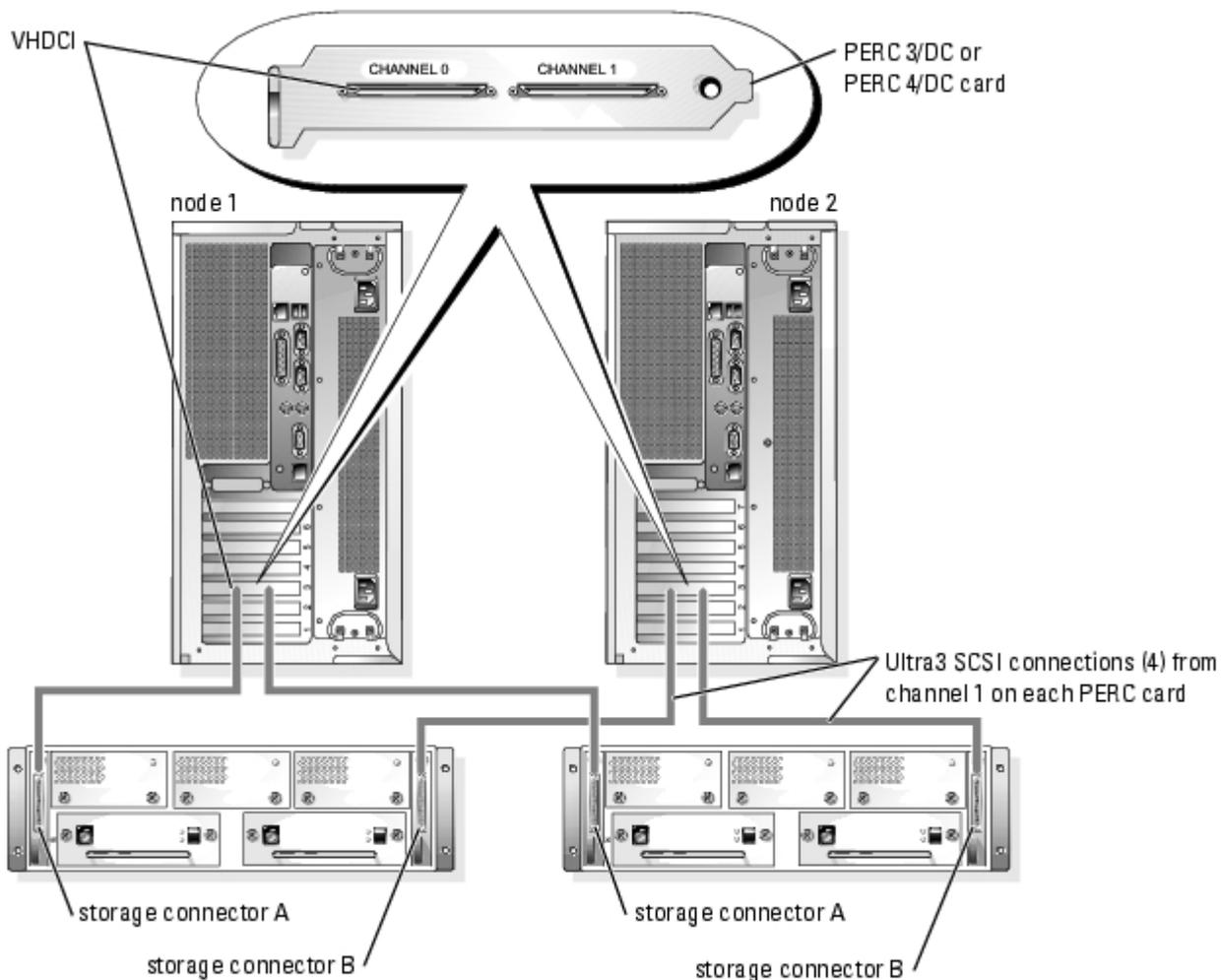
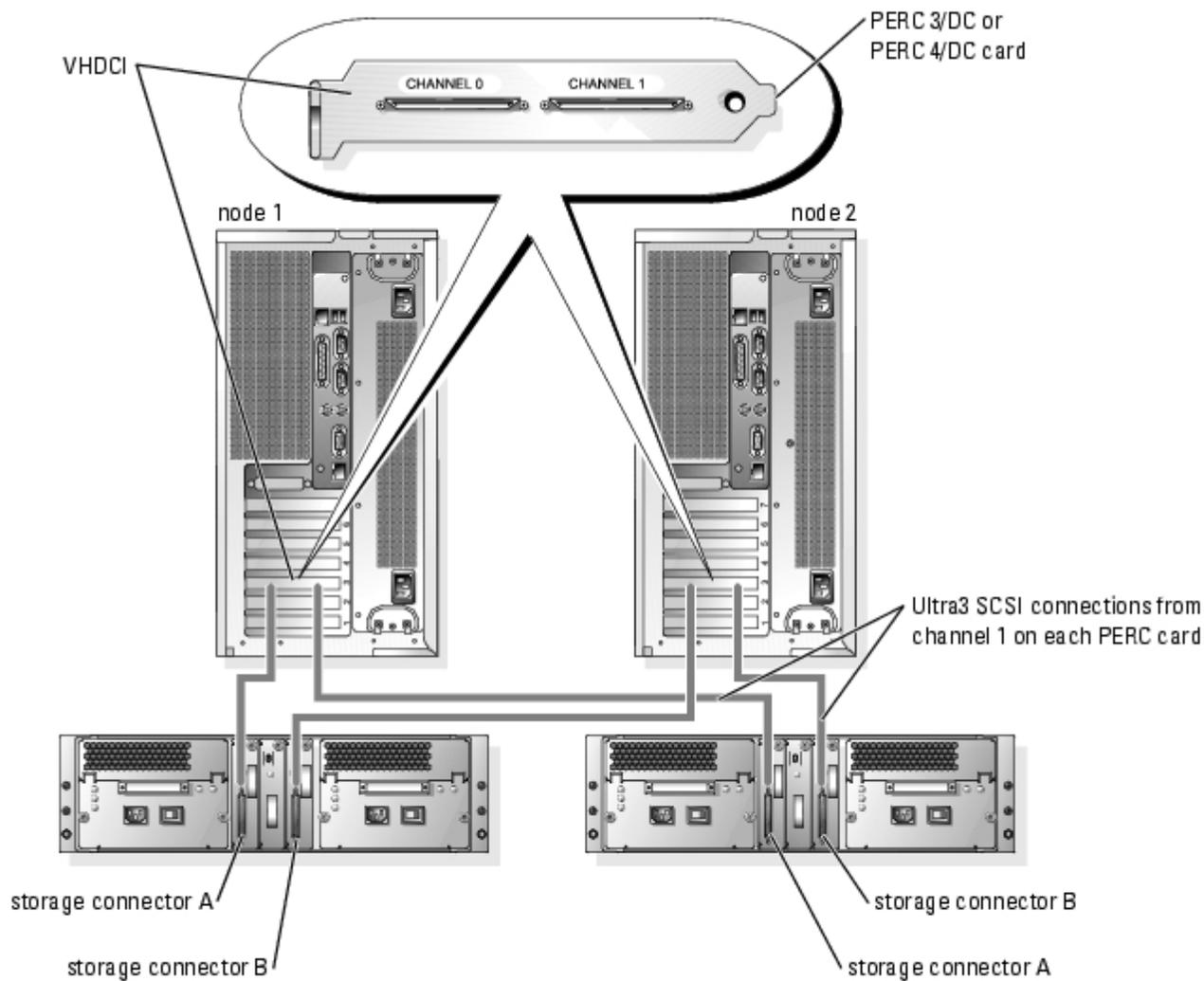


Figure 3-8. Cabling Two PowerVault 22xS Storage Systems to a PowerVault 770N NAS SCSI Cluster



CAUTION: The arrangement of the cluster components in this illustration is intended only to demonstrate the power distribution of the components. Do not stack components as in the configuration shown.

Figure 3-9. Cabling Two PowerVault 21 xS Storage Systems to a PowerVault 775N NAS SCSI Cluster

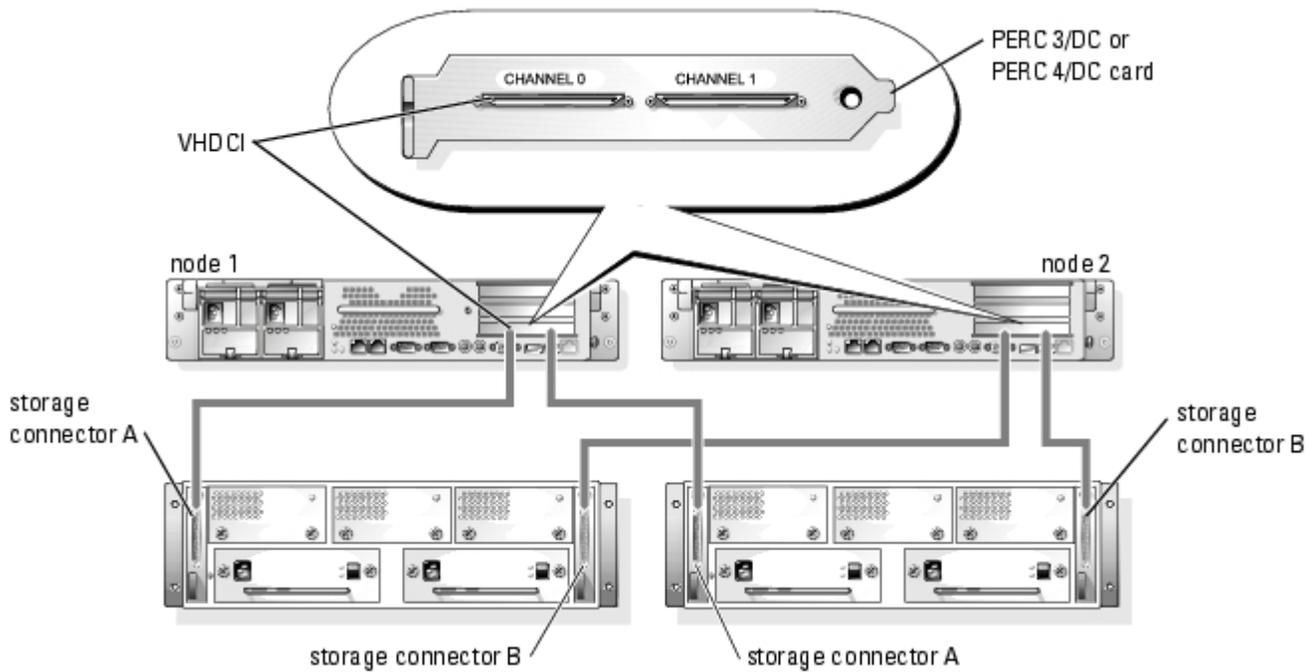
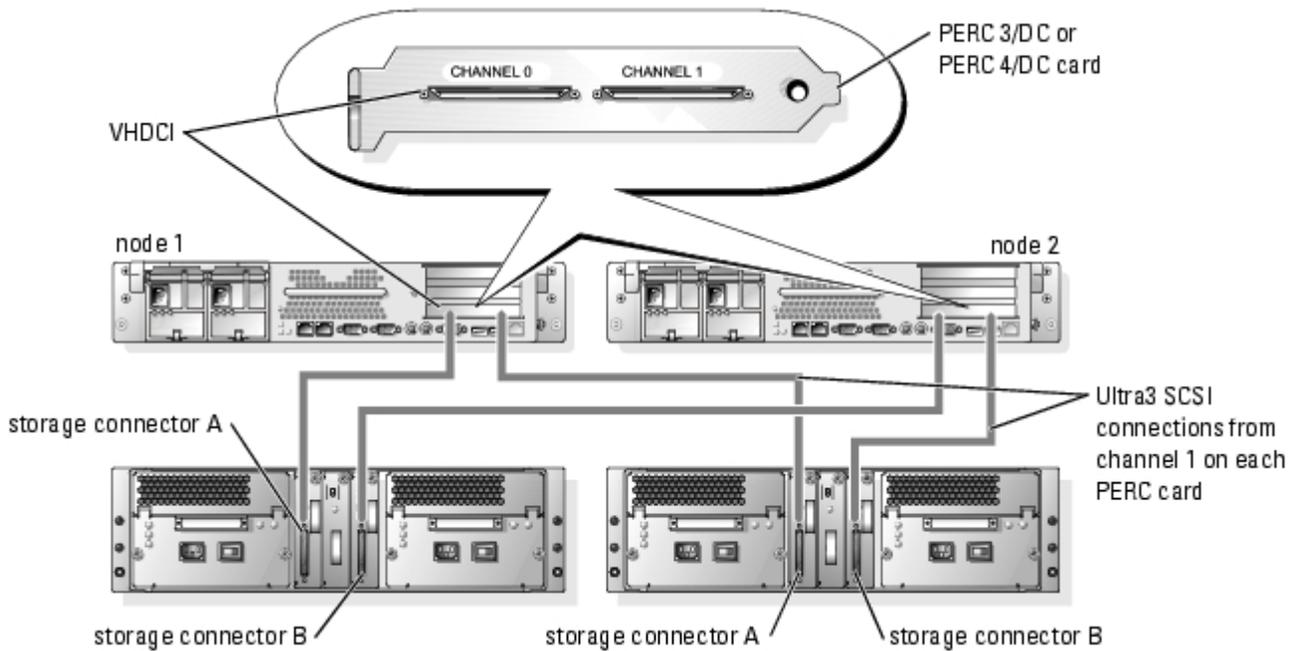


Figure 3-10. Cabling Two PowerVault 22xS Storage Systems to a PowerVault 775N NAS SCSI Cluster



Cabling Three or Four PowerVault 22xS Storage Systems to a NAS SCSI Cluster

To connect the cluster to three or four PowerVault 22xS storage systems, repeat the process described in the preceding section for a second controller.

NOTICE: If you have dual storage systems that are attached to a second controller, Dell supports disk mirroring between channels on the second controller. However, Dell does not support mirroring disks on one cluster-enabled PERC card to disks on another cluster-enabled PERC card.

Cabling Your Public and Private Networks

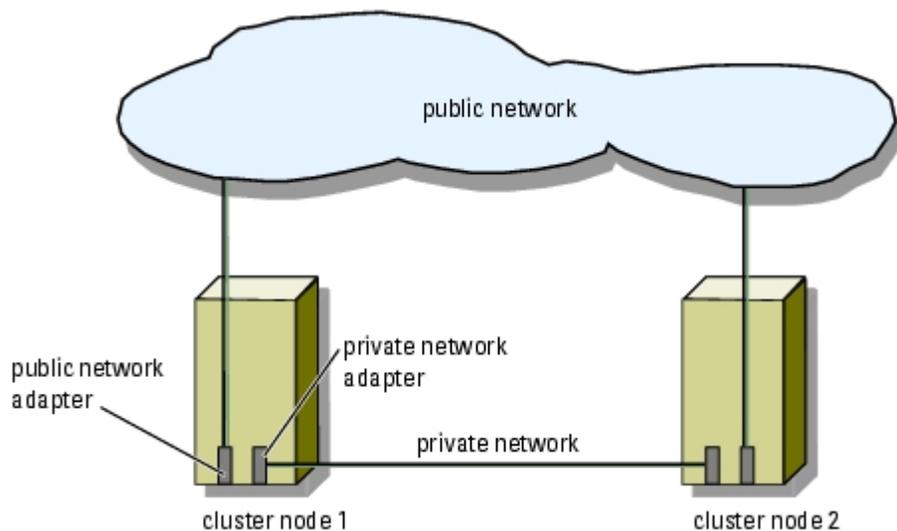
The network adapters in the cluster nodes provide at least two network connections for each node. These connections are described in [Table 3-2](#).

Table 3-2. Network Connections

Network Connection	Description
Public network	All connections to the client LAN. At least one public network must be configured for Mixed mode for private network failover.
Private network	A dedicated connection for sharing cluster health and status information between the cluster nodes. For point-to-point Fast Ethernet, connect a <i>crossover</i> Ethernet cable between the Fast Ethernet network adapters in both cluster nodes. For point-to-point Gigabit Ethernet, connect a <i>standard</i> Ethernet cable between the Gigabit Ethernet network adapters in both cluster nodes. NOTE: Network adapters connected to the LAN can also provide redundancy at the communications level in case the cluster interconnect fails. See your MSCS documentation for more information on private network redundancy.

[Figure 3-11](#) 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 3-11. Example of Network Cabling Connection



Cabling Your Public Network

The public network connection (client network) to the cluster nodes is provided by a network adapter that is installed in each node. Any network adapter supported by the system running TCP/IP may be used to connect to the public network segments. Additional network adapters may be installed to support additional separate public network segments or to provide redundancy for the public network.



NOTE: Ensure that the network adapters in both cluster nodes are identical.

Installing redundant network adapters provides your cluster with a failover connection to the public network. If the primary network adapter or a switch port fails, your cluster will be able to access the public network through the secondary network adapter until the faulty network adapter or switch port is repaired.

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, the two ports should not be used simultaneously to support both the public and private networks.

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 intracluster communications. [Table 3-3](#) lists the required hardware components and connection method for three possible private network configurations.

Table 3-3. Private Network Hardware Components and Connections

Method	Hardware Components	Connection
Network switch	Fast Ethernet or Gigabit Ethernet network adapters and switches	Connect <i>standard</i> Ethernet cables from the network adapters in both cluster nodes to a Fast Ethernet or Gigabit Ethernet switch.
Point-to-Point Fast Ethernet	Fast Ethernet network adapters	Connect a <i>crossover</i> Ethernet cable between the Fast Ethernet network adapters in both cluster nodes.
Point-to-Point Gigabit Ethernet	Copper Gigabit Ethernet network adapters	Connect a <i>standard</i> Ethernet cable between the Gigabit Ethernet network adapters in both cluster nodes.

Cabling the Mouse, Keyboard, and Monitor

If you are installing a NAS SCSI cluster configuration in a Dell rack, your cluster will require a switch box to enable the mouse, keyboard, and monitor for your cluster nodes.

See your rack installation documentation included with your rack for instructions on cabling each cluster node's KVM to the mouse/keyboard/monitor switch box in the rack.

Power Cabling the NAS SCSI Cluster Solution

Observe the following cautions when connecting the power cables to the NAS SCSI cluster solution.

 **CAUTION:** Although each component of the NAS SCSI cluster meets leakage current safety requirements, the total leakage current may exceed the maximum that is permitted when the components are used together. To meet safety requirements in the Americas (that is, the United States, Canada, and Latin America), you must use a Type B plug and socket connection for the cluster power to enable the appropriate level of ground protection. In Europe, you must use one or two power distribution units (PDUs) or two Type B plug-and- socket connections wired and installed by a qualified electrician in accordance with the local wiring regulations.

 **CAUTION:** Do not attempt to cable the NAS SCSI cluster to electrical power without first planning the distribution of the cluster's electrical load across available circuits. For operation in the Americas, the NAS SCSI cluster requires two AC circuits with a minimum capacity of 20 amperes (A) each to handle the electrical load of the system. Do not allow the electrical load of the system to exceed 16 A on either

circuit.



CAUTION: For operation in Europe, the NAS SCSI cluster requires two circuits rated in excess of the combined load of the attached systems. Refer to the ratings marked on the back of each cluster component when determining the total system's electrical load.

See your system and storage system documentation for more information about the specific power requirements for your cluster system's components.

Dell recommends the following guidelines to protect your cluster system from power-related failures:

- For cluster nodes with multiple power supplies, plug each power supply into a separate AC circuit.
- Use uninterruptible power supplies (UPS).

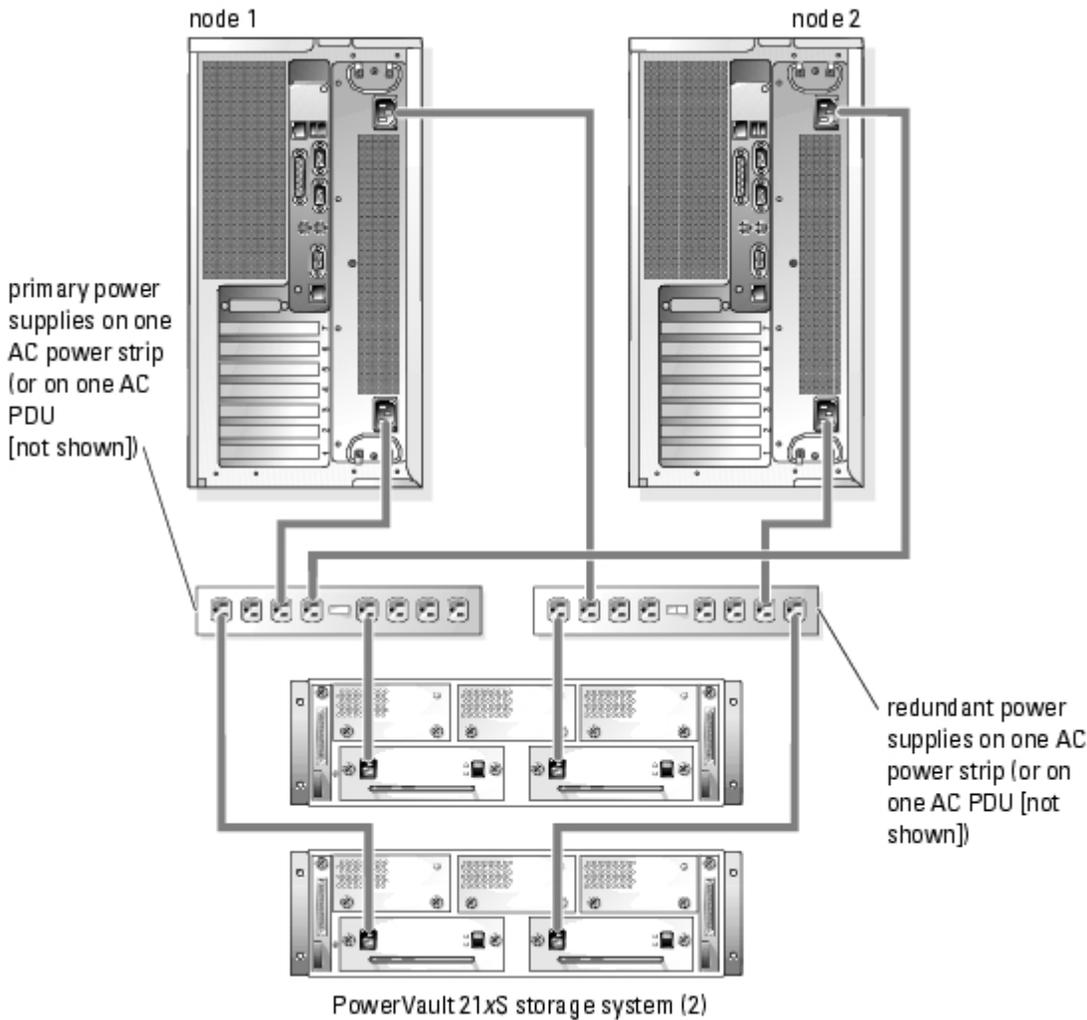
For some environments, you may consider having backup generators and power from separate electrical substations.

Each cluster component must have power supplied by two or three separate AC circuits—one circuit to each component power supply. Therefore, the primary power supplies of all the NAS SCSI cluster components are grouped onto one or two circuits and the redundant power supplies are grouped onto a different circuit.

[Figure 3-12](#) and [Figure 3-13](#) illustrate the proper power cabling for the PowerVault 770N NAS systems with two PowerVault 21 xS and 22 xS storage systems, respectively.

[Figure 3-14](#) and [Figure 3-15](#) illustrate the proper power cabling for the PowerVault 775N NAS systems with two PowerVault 21 xS and 22 xS storage systems, respectively.

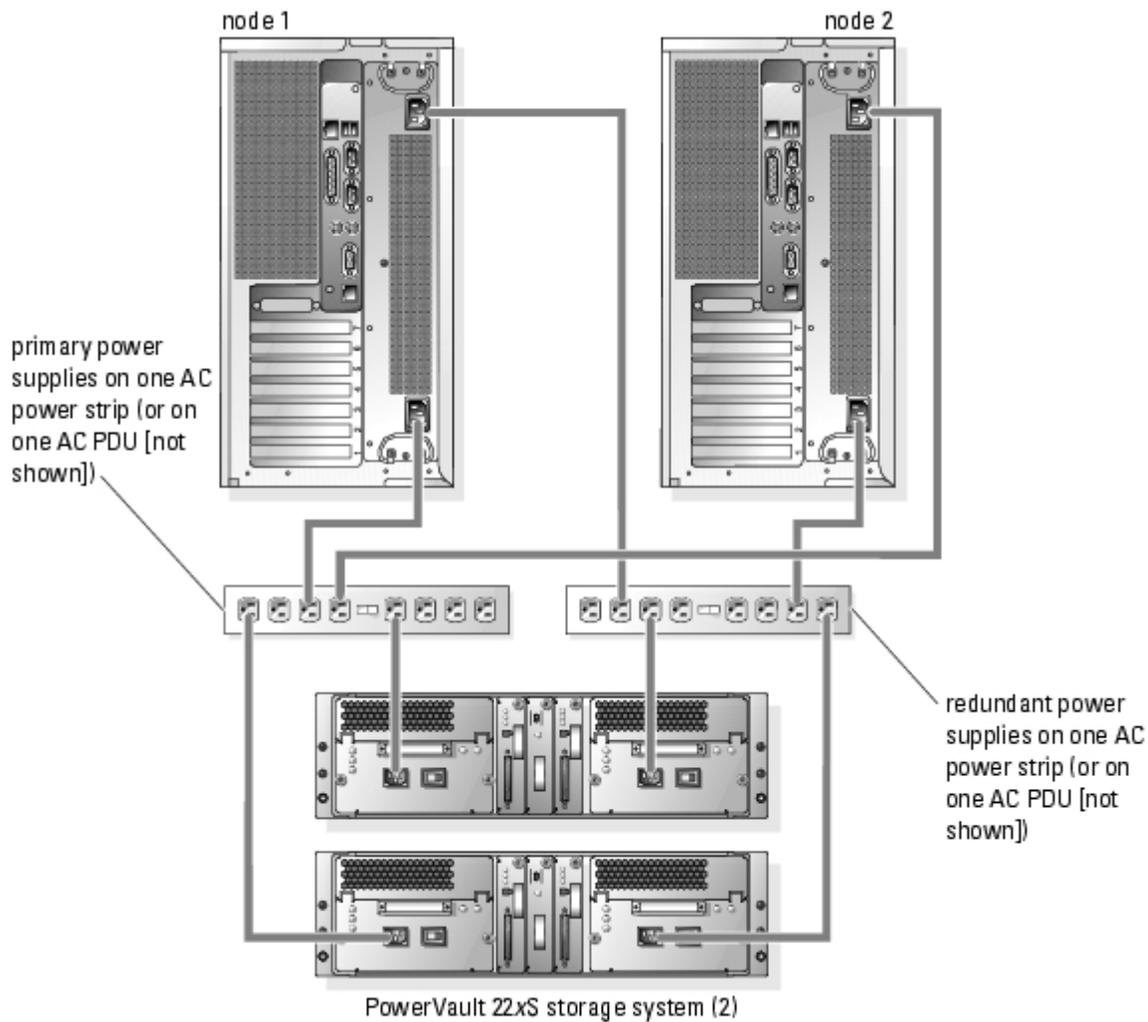
Figure 3-12. Power Cabling for PowerVault 770N NAS Systems and PowerVault 21 xS Storage Systems



CAUTION: The arrangement of the cluster components in this illustration is intended only to demonstrate the power distribution of the components. Do not stack components as in the configuration shown.

NOTE: For high-availability, Dell recommends that you use redundant power supplies as shown in [Figure 3-12](#).

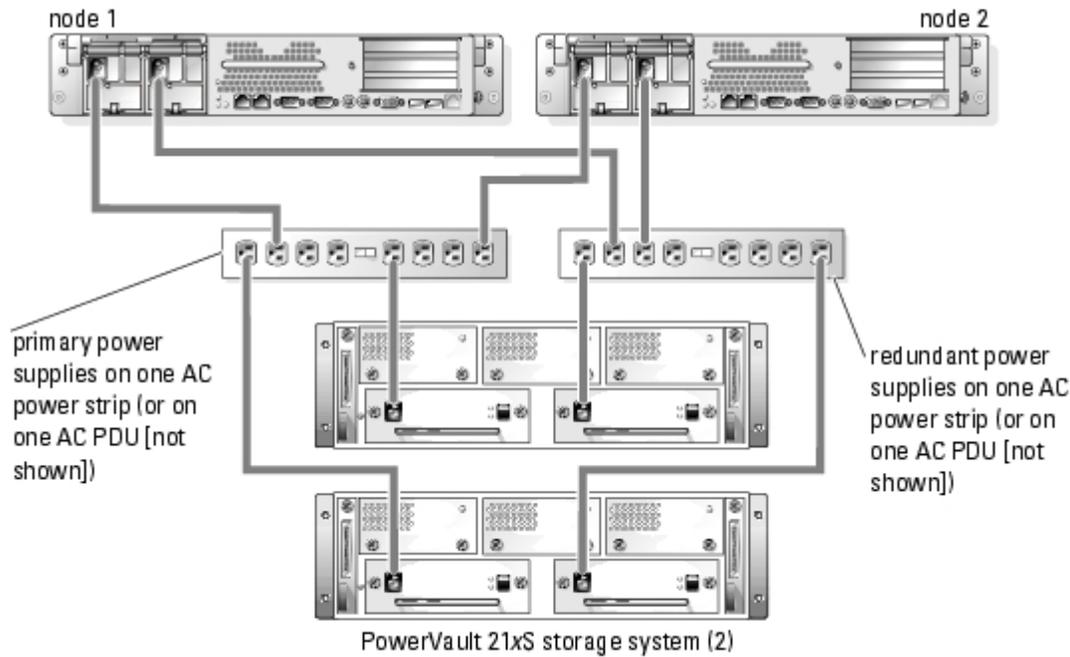
Figure 3-13. Power Cabling for PowerVault 770N NAS Systems and PowerVault 22xS Storage Systems



CAUTION: The arrangement of the cluster components in this illustration is intended only to demonstrate the power distribution of the components. Do not stack components as in the configuration shown.

NOTE: For high-availability, Dell recommends that you use redundant power supplies as shown in [Figure 3-13](#).

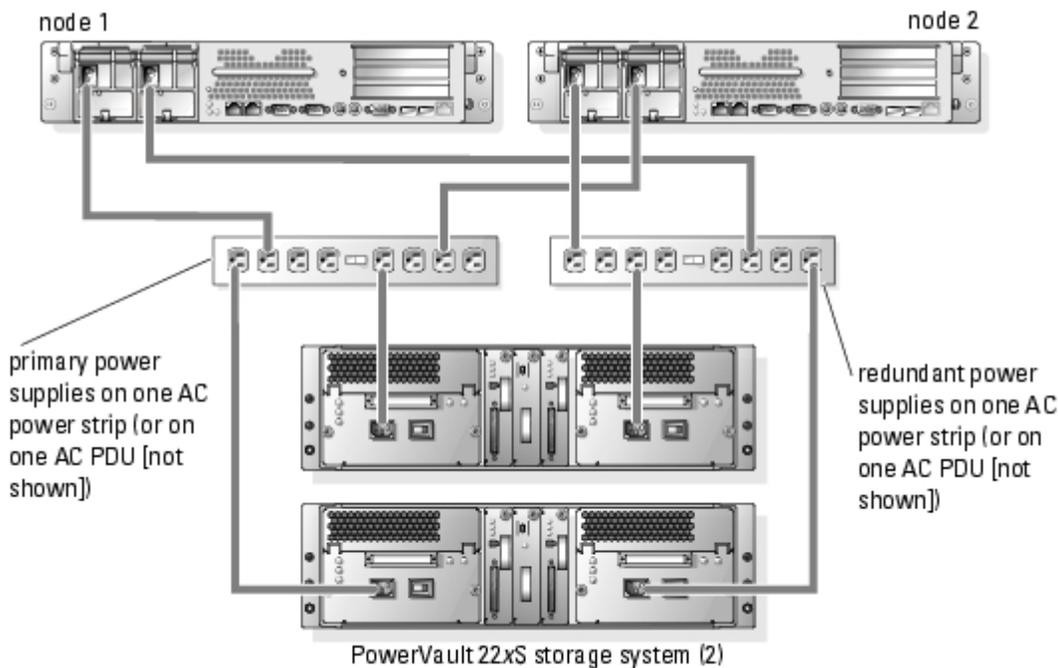
Figure 3-14. Power Cabling for PowerVault 775N NAS Systems and PowerVault 21 xS Storage Systems



CAUTION: The arrangement of the cluster components in this illustration is intended only to demonstrate the power distribution of the components. Do not stack components as in the configuration shown.

NOTE: For high-availability, Dell recommends that you use redundant power supplies as shown in [Figure 3-14](#).

Figure 3-15. Power Cabling for PowerVault 775N NAS Systems and PowerVault 22xS Storage Systems



CAUTION: The arrangement of the cluster components in this illustration is intended only to demonstrate the power distribution of the components. Do not stack components as in the configuration shown.

NOTE: For high-availability, Dell recommends that you use redundant power supplies as shown in [Figure 3-15](#).

Maintaining Your Cluster

Dell™ PowerVault™ NAS Systems SCSI Cluster Installation and Troubleshooting Guide

- [Adding a Network Adapter to a Cluster Node](#)
 - [Changing the IP Address of a Cluster Node on the Same IP Subnet](#)
 - [Removing a Node Using Cluster Administrator](#)
 - [Running chkdsk /f on a Quorum Disk](#)
 - [Recovering From a Corrupt Quorum Disk](#)
 - [Replacing a Cluster-Enabled Dell PERC Card](#)
 - [Replacing a Cluster Node](#)
 - [Reinstalling an Existing Cluster Node](#)
 - [Changing the Cluster Service Account Password in Windows Storage Server 2003, Enterprise Edition](#)
 - [Reformatting a Cluster Disk](#)
 - [Adding New Physical Drives to an Existing Shared Storage System](#)
 - [Rebuilding a Shared Array Using Dell OpenManage Array Manager](#)
 - [Upgrading the PowerVault 22xS EMM Firmware Using Array Manager](#)
-

Adding a Network Adapter to a Cluster Node

This procedure assumes that Microsoft® Windows® Storage Server 2003, Enterprise Edition, the current Windows Service Pack, and MSCS are installed on both cluster nodes.

 **NOTE:** The IP addresses used in the following sections are examples only and are not representative of actual addresses to use. The IP addresses are 192.168.1.101 for the network adapter in the first node and 192.168.1.102 for the network adapter in the second node. The subnet mask for both nodes is 255.255.255.0.

 **NOTE:** Both cluster nodes must be configured with identical hardware components. As a result, you must add a network adapter to both cluster nodes.

1. Move all cluster resources from the cluster node you are upgrading to another node in the cluster.

See the MSCS documentation for information about moving cluster resources to a specific node.

2. Shut down the cluster node you are upgrading and install the additional network adapter in that system.

See the system *Installation and Troubleshooting Guide* for instructions about installing expansion cards in your system.

3. Boot to the Windows operating system.

Windows Plug and Play detects the new network adapter and installs the appropriate drivers.

 **NOTE:** If Plug and Play *does not* detect the new network adapter, the adapter is not supported.

- a. Update the network adapter drivers (if required).

You can download the latest network adapter drivers from the Dell Support website at **support.dell.com**.

- b. After the drivers are installed, click the **Start** button, select **Control Panel**, and then double-click **Network Connections**.
- c. In the **Connections** box, locate the new network adapter that you installed in the system.
- d. Right-click the new network adapter, and then select **Properties**.

- e. Assign a unique static IP address, subnet mask, and gateway.
4. Ensure that the network ID portion of the new network adapters IP address is different from the other adapter.

For example, if the first network adapter in the node had an address of 192.168.1.101 with a subnet mask of 255.255.255.0, you might enter the following IP address and subnet mask for the second network adapter:

IP address: 192.168.2.102

Subnet mask: 255.255.255.0

5. Click **OK** and exit network adapter properties.
6. On the Windows desktop, click the **Start** button and select **Programs**→ **Administrative Tools**→ **Cluster Administrator**.
7. Click the **Network** tab.
8. Verify that a new resource called "New Cluster Network" appears in the window.

To rename the new resource, right click the resource and enter a new name.

9. Move all cluster resources to another cluster node.
10. Repeat [step 2](#) through [step 9](#) on each cluster node.

 **NOTE:** Ensure that you assign the new network adapter with the same IP address as the second network adapter on the first node (for example, 192.168.2.101) as you did with the second node.

If the installation and IP address assignments have been performed correctly, all of the new network adapter resources appear online and respond successfully to **ping** commands.

Changing the IP Address of a Cluster Node on the Same IP Subnet

 **NOTE:** If you are migrating your cluster nodes to a different subnet, take all cluster resources offline and then migrate all nodes together to the new subnet.

1. Open Cluster Administrator.
2. Stop **Cluster Service** on the cluster node.

The Cluster Administrator utility running on the second cluster node indicates that the first node is down by displaying a red icon in the **Cluster Service** window.

3. Reassign the IP address.
4. If you are running DNS, verify that the DNS entries are correct (if required).
5. Restart MSCS on the cluster node.

The cluster nodes re-establish their connection and Cluster Administrator changes the node icon back to blue to show that the node is back online.

Removing a Node Using Cluster Administrator

1. Take all resource groups offline or move them to another cluster node.
2. Click the **Start** button, select **Programs**→ **Administrative Tools**, and then double-click **Cluster Administrator**.
3. In Cluster Administrator, right-click the icon of the node you want to uninstall and then select **Stop Cluster Service**.
4. In Cluster Administrator, right-click the icon of the node you want to uninstall and then select **Evict Node**.

If you cannot evict the node and the node is the last node in the cluster:

 **NOTICE:** To avoid problems with reconfiguring your cluster, you must perform the following procedure if you are removing the last node in the cluster.

- a. Open a command prompt.
- b. Type the following:

```
cluster node <node_name> /force
```

where *<node_name>* is the cluster node you are evicting from the cluster.

5. Close Cluster Administrator.

Running chkdsk /f on a Quorum Disk

 **NOTICE:** You cannot run the **chkdsk** command with the /f (fix) option on a device that has an open file handle active. Because MSCS maintains an open handle on the quorum resource, you cannot run **chkdsk /f** on the hard drive that contains the quorum resource.

To run **chkdsk /f** on a quorum resource's hard drive:

1. Move the quorum resource temporarily to another drive:
 - a. Right-click the cluster name and select **Properties**.
 - b. Click the **Quorum** tab.
 - c. Select another disk as the quorum disk and press <Enter>.
2. Run **chkdsk /f** on the drive that previously stored the quorum resource.
3. Move the quorum disk back to the original drive.

Recovering From a Corrupt Quorum Disk

The quorum disk maintains the configuration data necessary for cluster recovery when a cluster node fails. If the quorum disk resource is unable to come online, the cluster will not start and all of the shared drives will be unavailable. If this situation occurs, and you need to run **chkdsk** on the quorum disk, you can start the cluster manually from the command line.

To start the cluster manually from a command prompt:

1. Open a command prompt window.
2. Select the cluster folder directory by typing the following:

```
cd \windows\cluster
```

3. Start the cluster in manual mode (on one node only) with no quorum logging by typing the following:

```
Clussvc -debug -noquorumlogging
```

Cluster Service starts.

4. Run **chkdsk /f** on the disk designated as the quorum resource.

To run the **chkdsk /f** utility:

- a. Open a second command prompt window.
- b. Type:

```
chkdsk /f
```

5. After the **chkdsk** utility completes, stop MSCS by pressing <Ctrl><c>.
6. Restart **Cluster Service**.

To restart **Cluster Service** from the **Services** console:

- a. Click the **Start** button and select **Programs**→ **Administrative Tools**→ **Services**.
- b. In the **Services** window, right-click **Cluster Service**.
- c. In the drop-down menu, click the **Start** button.

To restart **Cluster Service** from the command prompt:

- a. Open the second command prompt window that you opened in [step 4a](#).
- b. Type the following:

```
Net Start Clussvc
```

Cluster Service restarts.

See the Microsoft Knowledge Base article KB258078 located at the Microsoft Support website at www.microsoft.com for more information on recovering from a corrupt quorum disk.

Replacing a Cluster-Enabled Dell PERC Card

1. Connect a keyboard, monitor, and mouse to your system.
2. Turn off the failed node.

3. Disconnect the failed PERC card's cable from the shared storage system.

 **NOTICE:** If you replace your PERC card, ensure that you enable cluster mode on the replacement PERC card before you connect the SCSI cables to the shared storage system. See "[Enabling the Cluster Mode Using the PERC Card](#)" for more information.

4. Replace the failed PERC card in the system without reconnecting the cable.

5. Power on the system with the replaced PERC card and run the BIOS configuration utility.

 **NOTICE:** If you replace a PERC card that will be connected to shared storage system, you must set the appropriate SCSI ID before you connect the SCSI cables to the shared storage system. See "[Setting the SCSI Host Adapter IDs](#)" for more info.

6. Change the SCSI ID so that it differs from the SCSI ID on the peer cluster node's PERC card.

 **NOTE:** See your PERC documentation for more information about changing SCSI ID. Also, see the cluster configuration tables (if you completed the information in the tables) in the *Dell PowerVault NAS SCSI Cluster Platform Guide*.

7. Shut down the system.

8. Reconnect the system to the shared storage system.

9. Restart the system and restore the RAID configuration using configuration information stored on the disks. See the PERC documentation for more information about this procedure.

Replacing a Cluster Node

This section provides an overview for removing and installing a *new node* in the cluster.

1. If possible, backup the system state on the cluster node you are replacing. Include the following data in your backup:
 - Registry
 - COM+ class registration database
 - System boot files
 - Users and groups information
 - Share configuration data

See the *System Administrator's Guide* for more information on creating a system state backup.

2. Start Cluster Administrator on the remaining node and perform the following procedures:
 - a. Move all cluster resources from the node you are replacing to the remaining node in the cluster.

See the MSCS documentation for information about moving cluster resources to a specific node.

- b. Right-click on the node you are evicting and select **Stop Cluster Service**.
- c. Evict the node you are replacing from the cluster.

- d. Close Cluster Administrator.
3. Shut down the cluster node you are replacing and disconnect the network, power, and SCSI cables.
4. Ensure that the following hardware and software components are installed in the replacement node:
 - PERC card
 - Network adapter drivers
 - Windows Storage Server 2003, Enterprise Edition operating system
5. On the remaining node, identify the SCSI ID on the system's PERC card.

See your PERC card documentation for information about identifying the SCSI ID.

6. Connect the network and power cables to the replacement node.

 **NOTE:** If you are connecting the system's PERC card to a shared storage system, do not connect the SCSI cable(s) in this step.

7. Turn on the replacement node.
8. If you installed the PERC card from the failed node to the replacement node, run the BIOS configuration utility (if required), and then go to [step 10](#).
9. On the replacement node, change the SCSI ID so that it differs with the SCSI ID on the remaining node in [step 5](#).

See your PERC documentation for more information on changing the SCSI ID. Also, see the cluster configuration tables (if you completed the information in the tables) in the *Dell PowerVault NAS SCSI Cluster Platform Guide*.

10. On the replacement node, restore the system state (if possible).

See the *System Administrator's Guide* for more information.

11. Shut down the replacement node.
12. On the replacement node, connect the SCSI cable(s) to the system's PERC card(s).

See "[Enabling the Cluster Mode Using the PERC Card](#)" and "[Setting the SCSI Host Adapter IDs](#)" in "[Preparing Your Systems for Clustering](#)" for more information.

13. Turn on the replacement node and restore the RAID configuration using the configuration information stored on the disks.

See the PERC documentation for more information.

If you installed a new PERC card, the following error message appears:

```
Configuration of NVRAM and drives mismatch (Normal mismatch) Run View/Add Configuration option of
Config Utility Press <Ctrl><H> for WebBIOS
Press A Key to Run Configuration Utility
Or <Alt><F10> to Continue
```

Perform the following steps:

- a. Press any key to enter the RAID controller's BIOS configuration utility, and select **Configure**→ **View/Add Configuration**→ **View Disk Configuration**.

- b. Verify that the configuration that is being displayed includes the existing configuration on the disks.
- c. Press <Esc>, select **Yes** to save the disk configuration, and exit the configuration utility.
- d. Configure the SCSI ID so that it differs with the SCSI ID on the remaining node.

See your PERC documentation for more information on verifying and changing the SCSI ID. Also, see the cluster configuration tables (if you completed the information in the tables) in the *Dell PowerVault NAS SCSI Cluster Platform Guide*.

See "[Enabling the Cluster Mode Using the PERC Card](#)" and "[Setting the SCSI Host Adapter IDs](#)" in "[Preparing Your Systems for Clustering](#)" for more information.

- e. Restart the system and allow Windows to start normally.
14. Add the new node to the network domain.
 15. Start Cluster Administrator on the remaining node and perform the following procedures:
 - a. Join the new node to the cluster.
 - b. Move the necessary resources to the replacement node.
 - c. Open the Windows Event Viewer and check for any errors.
 16. Download and install the latest software updates on the replacement node (if required) from the Dell Support website located at **support.dell.com**.
-

Reinstalling an Existing Cluster Node

This section provides an overview for removing and reinstalling an *existing* node to the cluster.

 **NOTE:** Perform the following procedures to service the nodes in your cluster.

1. If possible, backup the system state on the cluster node you are removing from the cluster. Include the following data in your backup:
 - Registry
 - COM+ class registration database
 - System boot files
 - Users and groups information
 - Share configuration data

See the *System Administrator's Guide* for more information on creating a system state backup.

2. Start Cluster Administrator on the remaining node and perform the following procedures:
 - a. Move all cluster resources from node you are evicting from the cluster to the remaining node in the cluster.

See the MSCS documentation for information about moving cluster resources to a specific node.

- b. Right-click on the node you are evicting and select **Stop Cluster Service**.

- c. Evict the remaining node from the cluster.
 - d. Close Cluster Administrator.
3. Shut down the evicted node and disconnect the power, network, and SCSI cables.
 4. Perform any servicing or repairs to your evicted node as needed.
 5. Reconnect the power and network cables to the evicted node.

 **NOTICE:** Do not connect the SCSI cables from the storage system to the evicted node in this step.

6. Turn on the evicted node.

The following message may appear:

```
Configuration of NVRAM and drives mismatch (Normal mismatch) Run View/Add Configuration option of
Config Utility Press <Ctrl><H> for WebBIOS
Press A Key to Run Configuration Utility
Or <Alt><F10> to Continue
```

If the message *does not* appear, go to [step 7](#).

If the message appears, run the BIOS configuration utility and then go to [step 7](#).

7. Restore the system state on the evicted node (if required).
8. Turn off the evicted node.
9. Connect the SCSI cable(s) to the system's PERC card(s).
10. Turn on the evicted node.
11. Restore the RAID configuration using the configuration information stored on the disk (if required).

If you replaced PERC card, the following error message appears:

```
Configuration of NVRAM and drives mismatch (Normal mismatch) Run View/Add Configuration option of
Config Utility Press <Ctrl><H> for WebBIOS
Press A Key to Run Configuration Utility
Or <Alt><F10> to Continue
```

Perform the following steps:

- a. Press any key to enter the RAID controller's BIOS configuration utility, and select **Configure**→ **View/Add Configuration**→ **View Disk Configuration**.
- b. Verify that the configuration that displays includes the existing configuration on the disks.
- c. Press <Esc>, select **Yes** to save the disk configuration, and exit the configuration utility.
- d. Restart the system and allow Windows to start normally.
- e. Configure the SCSI ID so that it differs with the SCSI ID on the remaining node.

See your PERC documentation for more information on verifying and changing the SCSI ID. Also, see the cluster configuration tables (if you completed the information in the tables) in the *Dell PowerVault NAS SCSI Cluster Platform Guide*.

12. Rejoin the node to the domain.
13. Start Cluster Administrator on the remaining node and perform the following steps:
 - a. Join the node to the cluster.
 - b. Move the necessary resources to the evicted node.

If the evicted node was your active node, you must manually failover the resources to the node.

14. Open the Windows Event Viewer and check for any errors.
-

Changing the Cluster Service Account Password in Windows Storage Server 2003, Enterprise Edition

To change the Cluster Service (MSCS) account password for all nodes in a cluster running Windows Storage Server 2003, Enterprise Edition, open a command prompt and type the following syntax:

```
Cluster /cluster:[cluster_name] /changePASS
```

where `cluster_name` is the name of your cluster.

For help with changing the cluster password, type the following:

```
cluster /changePASS /help
```

Reformatting a Cluster Disk



NOTE: Ensure that all client systems are disconnected from the cluster disk before you perform this procedure.

1. Click the **Start** button and select **Programs**→ **Administrative Tools**→ **Cluster Administrator**.
2. In the **Cluster Administrator** left window pane, expand the **Groups** directory.
3. In the **Groups** directory, right-click a cluster resource group that contains the disk to be reformatted, and select **Take Offline**.
4. In the Cluster Administrator right window pane, right-click the physical disk you are reformatting and select **Bring Online**.
5. In the **Cluster Administer** right window pane, right-click the physical disk you are reformatting and select **Properties**.

The **Properties** window appears.

6. Click the **Advanced** tab.
7. In the **Advanced** tab menu in the "**Looks Alive**" **poll interval** box, select **Specify value**.
8. In the **Specify value** field, type:

where 6000000 equals 6000000 milliseconds (or 100 minutes).

9. Click **Apply**.
10. On the Windows desktop, right-click **My Computer** and select **Manage**.

The **Computer Management** window appears.

11. In the **Computer Management** left window pane, click **Disk Management**.

The physical disk information appears in the right window pane.

12. Right-click the disk you want to reformat and select **Format**.

Disk Management reformats the disk.

13. In the **File** menu, select **Exit**.
 14. In the "**Looks Alive**" **poll interval** box, select **Use value from resource type** and click **OK**.
 15. In the Cluster Administrator left window pane, right-click the cluster group that contains the reformatted disk and select **Bring Online**.
 16. In the **File** menu, select **Exit**.
-

Adding New Physical Drives to an Existing Shared Storage System

The Dell™ PowerVault™ NAS SCSI cluster solution consists of two systems that share an external SCSI storage system. Each system contains a PERC card with cluster-enabled firmware. The following procedure describes adding additional storage to an existing shared storage system in the cluster configuration.

To add new physical drives to an existing shared storage system in the cluster:

1. Stop all I/O activity.
2. Ensure that both nodes are online.
3. Install the new physical hard drives into the storage system.

 **CAUTION:** See your storage system's *Installation and Troubleshooting Guide*, which provides safety instructions for installing components into the storage system.

4. Restart node 1 and press <Ctrl><m> during the system POST to launch the PERC BIOS Configuration utility.
5. Configure the virtual disks.

 **NOTE:** See the PERC documentation for more information.

6. Restart node 1.
7. After system restarts, use Disk Manager to write the disk signature, create a new partition, assign drive letters, and format the partition with NTFS.

8. Restart node 1.
 9. On node 1, use Cluster Administrator to add a new group (for example Disk Group *n*).
 10. Select possible owners, but do not bring the group online yet.
 11. Add a new resource (for example, Disk *z*).
 12. Select **Physical Disk** for the type of resource, and assign it to the new group you just created.
 13. Select possible owners, and select the drive letter that you assigned to the new array.
 14. Bring the new group that you just added online.
 15. Reboot node 2, and ensure that node 2 is completely online before you continue.
 16. To verify that the new resource group is online and the drive is accessible using the cluster name, connect to **\\clustername\n\$**, where *n* is the drive letter you assigned to the newly- added disk, and use Cluster Administrator to verify that you can move the new disk group to the other cluster node.
-

Rebuilding a Shared Array Using Dell OpenManage Array Manager

If the cluster node is rebooted or power to the node is lost while a PERC card is rebuilding a shared array, the controller terminates the rebuild operation and identifies the hard drive as failed. This condition also occurs if the rebuild is performed from the PERC BIOS Configuration utility and the user exits the utility before the rebuild completes. This condition occurs with all versions of the PERC firmware on both standard and cluster-enabled controllers.

If the second node in the clustered configuration is turned on, it restarts the operation.

If the rebuild operation fails to complete due to a system restart, the rebuild must be reinitiated using the PERC BIOS configuration utility.

 **NOTICE:** Do not restart any of the cluster nodes while a rebuild operation is in progress. Restarting a node while performing a rebuild could cause system data loss or data corruption.

See your Dell OpenManage™ Array Manager documentation for more information on the rebuild operation.

Upgrading the PowerVault 22xS EMM Firmware Using Array Manager

 **NOTE:** Before upgrading the EMM firmware, suspend all I/O activity and shut down the second node. Otherwise, the EMM firmware attached to that node may not be updated.

To download the PowerVault 22xS EMM firmware onto a cluster node:

1. Download the latest EMM firmware from the Dell Support website (located at support.dell.com) to your hard drive or to a diskette.
2. Shut down node B.
3. Stop all I/O activity on node A.
4. Launch the Array Manager Console from node A by clicking the **Start** button and selecting **Programs**→ **Dell OpenManage Applications**→ **Array Manager**→ **Array Manager console**.

5. In the **Arrays** directory, select **PERC Subsystem 1** → **<your_PERC_card> x (Cluster)** → **(Channel 0)** or **(Channel 1)**.

where x indicates the number associated with the controller on the system. Select the channel (0 or 1) to which the enclosure is attached.

6. If you downloaded the EMM firmware to a diskette, ensure that the diskette is inserted.
7. Right-click the enclosure icon for the desired channel, and select **Download Firmware**.

You can also click the channel number and select **Download Firmware** from the **Task Menu**.

8. From the **Firmware Download** dialog box, click **Browse** and navigate to the EMM firmware that you downloaded to your hard drive or diskette.
9. Verify that the selected file is correct.
10. Click **Download Firmware** to begin the download process.

 **NOTE:** This process takes several minutes to complete.

11. When the message `Firmware Downloaded Successfully` appears, click **OK**.
12. Repeat [step 3](#) through for each channel that has an enclosure attached.
13. To verify the firmware upgrade for each channel, right-click the channel number, select **Properties**, and view the version information.
14. Start up node B and resume I/O activity.

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Using MSCS

Dell™ PowerVault™ NAS Systems SCSI Cluster Installation and Troubleshooting Guide

- [Cluster Objects](#)
- [Cluster Networks](#)
- [Network Interfaces](#)
- [Cluster Nodes](#)
- [Groups](#)
- [Cluster Resources](#)
- [File Share Resources](#)
- [Failover and Failback](#)

This section provides information about Microsoft® Cluster Service (MSCS). This section is intended to be an overview of MSCS and provides information about the following:

- Cluster objects
- Cluster networks
- Network interfaces
- Cluster nodes
- Groups
- Cluster resources
- File share resources
- Failover and failback

For information about specific MSCS procedures, see the MSCS online help.



NOTE: In this guide and in other cluster documentation, the quorum resource is also referred to as the quorum disk.

Cluster Objects

Cluster objects are the physical and logical units managed by MSCS. Each object is associated with the following:

- One or more properties, or attributes, that define the object and its behavior within the cluster.
 - A set of cluster control codes used to manipulate the object's properties.
 - A set of object management functions used to manage the object through MSCS.
-

Cluster Networks

A network performs one of the following roles in a cluster:

- A network that carries internal cluster communication
- A public network that provides client systems with access to cluster application services
- A public-and-private network that carries both internal cluster communication and connects client systems to cluster application services
- Neither a public nor private network that carries traffic unrelated to cluster operation

Preventing Network Failure

MSCS uses all available private and public-and-private networks for internal communication. Configure multiple networks as private or public-and-private to protect the cluster from a single network failure. If there is only one such network available and it fails, the cluster nodes stop communicating with each other. When two nodes are unable to communicate, they are partitioned and MSCS automatically shuts down on one node. While this shutdown guarantees the consistency of application data and the cluster configuration, it can make cluster resources unavailable.

For example, if each node has only one network adapter, and the network cable on one of the nodes fails, each node, (because it is unable to communicate with the other), attempts to take control of the quorum disk. There is no guarantee that the node with a functioning network connection will gain control of the quorum disk. If the node with the failed network cable gains control, the entire cluster is unavailable to network clients. To avoid this problem, ensure that all nodes have at least two networks and are configured to use both networks for the private network (internal communications).

Node-to-Node Communication

MSCS does not use public only networks for internal communication. For example, a cluster has Network A configured as private and Network B configured as public. If Network A fails, MSCS does not use Network B because it is public; the nodes stop communicating and one node terminates its Cluster Service.

Network Interfaces

The Microsoft® Windows® operating system keeps track of all network adapters in a server cluster. This tracking system allows you to view the state of all cluster network interfaces from a cluster management application, such as Cluster Administrator.

Cluster Nodes

A cluster node is a system in a server cluster that has a working installation of the Windows operating system and MSCS.

Cluster nodes have the following characteristics:

- Every node is attached to one or more cluster storage devices. Each cluster storage device attaches to one or more disks. The disks store all of the cluster's configuration and resource data. Each disk can be owned by only one node at any point in time, but ownership can be transferred between nodes. The result is that each node has access to all cluster configuration data.
- Every node communicates with the other nodes in the cluster through one or more network adapters that attach nodes to networks.
- Every node in the cluster is aware of another system joining or leaving the cluster.
- Every node in the cluster is aware of the resources that are running on all nodes in the cluster.

- All nodes in the cluster are grouped under a common cluster name, which is used when accessing and managing the cluster.

[Table 5-1](#) defines various states of a node that can occur in cluster operation.

Table 5-1. Node States and Definitions

State	Definition
Down	The node is not actively participating in cluster operations.
Joining	The node is in the process of becoming an active participant in the cluster operations.
Paused	The node is actively participating in cluster operations but cannot take ownership of resource groups and cannot bring resources online.
Up	The node is actively participating in all cluster operations, including hosting cluster groups.
Unknown	The state cannot be determined.

When MSCS is installed for the first time on a node, the administrator must choose whether that node forms its own cluster or joins an existing cluster. When MSCS is started on a node, that node searches for other active nodes on networks enabled for internal cluster communications.

Forming a New Cluster

If a cluster cannot be joined, the node attempts to form the cluster by gaining control of the quorum disk. If the node gains control of the quorum disk, the node forms the cluster and uses the recovery logs in the quorum disk to update its cluster database. MSCS maintains a consistent, updated copy of the cluster database on all active nodes.

Joining an Existing Cluster

A node can join an existing cluster if it can communicate with another cluster node. If a cluster exists and the joining node finds an active node, it attempts to join that node's cluster. If it succeeds, MSCS then validates the node's name and verifies version compatibility. If the validation process succeeds, the node joins the cluster. The node is updated with the latest copy of the cluster database.

Groups

A group is a collection of cluster resources with the following characteristics:

- All of the resources in the group are moved to the alternate node when one resource in a group fails and it is necessary to move the resource to an alternate node.
- A group is always owned by one node at any point in time, and a resource is always a member of a single group. Therefore, all of a group's resources reside on the same node.

Groups enable resources to be combined into larger logical units. Typically a group is made up of related or dependent resources, such as applications and their associated peripherals and data. However, groups can also be established with resources that are unrelated and nondependent to balance the load or for administrative convenience.

Every group maintains a prioritized list of the nodes that can and should act as its host. The preferred nodes list is generated by MSCS. Cluster Service produces a list of preferred nodes for a group from the list of possible owners that is maintained by

the group's resources and can be modified by an Administrator.

To maximize the processing power of a cluster, establish at least as many groups as there are nodes in the cluster.

Cluster Resources

A cluster resource is any physical or logical component that has the following characteristics:

- Can be brought online and taken offline
- Can be managed in a server cluster
- Can be hosted (owned) by only one node at a time

To manage resources, MSCS communicates to a resource DLL through a Resource Monitor. When MSCS makes a request of a resource, the Resource Monitor calls the appropriate entry-point function in the resource DLL to check and control the resource's state.

Dependent Resources

A dependent resource requires another resource to operate. For example, a network name must be associated with an IP address. Because of this requirement, a network name resource is dependent on an IP address resource. A resource can specify one or more resources on which it is dependent. A resource can also specify a list of nodes on which it is able to run. Preferred nodes and dependencies are important considerations when administrators organize resources into groups.

Dependent resources are taken offline before the resources upon which they depend are taken offline, likewise, they are brought online after the resources on which they depend are brought online.

Setting Resource Properties

Using the resource Properties dialog box, you can perform the following tasks:

- View or change the resource name
- View or change the resource description and possible owners
- Assign a separate memory space for the resource
- View the resource type, group ownership, and resource state
- View which node currently owns the resource
- View pre-existing dependencies and modify resource dependencies
- Specify whether to restart a resource and the settings used to restart the resource (if required)
- Check the online state of the resource by configuring the **Looks Alive** and **Is Alive** polling intervals in MSCS
- Specify the time requirement for resolving a resource in a pending state (**Online Pending** or **Offline Pending**) before MSCS places the resource in **Offline** or **Failed** status
- Set specific resource parameters

The **General**, **Dependencies**, and **Advanced** tabs are the same for every resource. Some resource types support additional

tabs.

Properties of a cluster object should not be updated on multiple nodes simultaneously. See the MSCS online documentation for more information.

Resource Dependencies

Groups function properly only if resource dependencies are configured correctly. MSCS uses the dependencies list when bringing resources online and offline. For example, if a group in which a physical disk and a file share are located is brought online, the physical disk containing the file share must be brought online before the file share.

[Table 5-2](#) shows resources and their dependencies. The resources in the right column must be configured before you create the resource.

Table 5-2. Cluster Resources and Required Dependencies

Resource	Required Dependencies
File share	Network name (only if configured as a distributed file system [DFS] root)
IP address	None
Network name	IP address that corresponds to the network name
Physical disk	None

Setting Advanced Resource Properties

You can configure the advanced resource properties using the **Advanced** tab in the resource **Properties** dialog box. Use the **Advanced** tab to have MSCS perform the following tasks:

- Restart a resource or allow the resource to fail.
 - To restart the resource, select **Affect the group** (if applicable).
 - To fail over the resource group to another cluster node when the resource fails, select **Affect the group** and then enter the appropriate values in **Threshold** and **Period**. If you do not select **Affect the group**, the resource group will not fail over to the healthy cluster node.

The **Threshold** value determines the number of attempts by MSCS to restart the resource before the resource fails over to a healthy cluster node.

The **Period** value assigns a time requirement for the **Threshold** value to restart the resource.

- Adjust the time parameters for **Looks Alive** (general check of the resource) or **Is Alive (detailed check of the resource)** to determine if the resource is in the online state.
- Select the default number for the resource type.

To apply default number, select **Use resource type value**.

- Specify the time parameter for a resource in a pending state (**Online Pending** or **Offline Pending**) to resolve its status before moving the resource to **Offline** or **Failed** status.

Resource Parameters

The **Parameters** tab in the **Properties** dialog box is available for most resources. [Table 5-3](#) lists each resource and its configurable parameters.

Table 5-3. Resources and Configurable Parameters

Resource	Configurable Parameters
File share	Share permissions and number of simultaneous users Share name (clients will detect the name in their browse or explore lists) Share comment Shared file path
IP address	IP address Subnet mask Network parameters for the IP address resource (specify the correct cluster network)
Network name	System name
Physical disk	Drive for the physical disk resource (the drive cannot be changed after the resource is created)

Quorum Disk (Quorum Resource)

The quorum resource is a common resource in the cluster that is accessible by all of the cluster nodes. Normally a physical disk on the shared storage, the quorum resource maintains data integrity, cluster unity, and cluster operations—such as forming or joining a cluster—by performing the following tasks:

- **Enables a single node to gain and defend its physical control of the quorum resource** — When the cluster is formed or when the cluster nodes fail to communicate, the quorum resource guarantees that only one set of active, communicating nodes is allowed to form a cluster.
- **Maintains cluster unity** — The quorum resource allows cluster nodes that can communicate with the node containing the quorum resource to remain in the cluster. If a cluster node fails for any reason and the cluster node containing the quorum resource is unable to communicate with the remaining nodes in the cluster, MSCS automatically shuts down the node that does not control the quorum resource.
- **Stores the most current version of the cluster configuration database and state data** — If a cluster node fails, the configuration database helps the cluster recover a failed resource or recreate the cluster in its current configuration.

The only type of resource supported by MSCS that can act as a quorum resource is the physical disk resource. However, developers can create their own quorum disk types for any resources that meet the arbitration and storage requirements.

Using the Quorum Disk for Cluster Integrity

The quorum disk is also used to ensure cluster integrity by performing the following functions:

- Maintaining the cluster node database
- Ensuring cluster unity

When a node joins or forms a cluster, MSCS must update the node's private copy of the cluster database. When a node joins

an existing cluster, MSCS can retrieve the data from the other active nodes. However, when a node forms a cluster, no other node is available. MSCS uses the quorum disk's recovery logs to update the node's cluster database, thereby maintaining the correct version of the cluster database and ensuring that the cluster is intact.

For example, if node 1 fails, node 2 continues to operate, writing changes to the cluster database. Before you can restart node 1, node 2 fails. When node 1 becomes active, it updates its private copy of the cluster database with the changes made by node 2 using the quorum disk's recovery logs to perform the update.

To ensure cluster unity, the operating system uses the quorum disk to ensure that only one set of active, communicating nodes is allowed to operate as a cluster. A node can form a cluster only if it can gain control of the quorum disk. A node can join a cluster or remain in an existing cluster only if it can communicate with the node that controls the quorum disk.

For example, if the private network (cluster interconnect) between cluster nodes 1 and 2 fails, each node assumes that the other node has failed, causing both nodes to continue operating as the cluster. If both nodes were allowed to operate as the cluster, the result would be two separate clusters using the same cluster name and competing for the same resources. To solve this problem, MSCS uses the node that owns the quorum disk to maintain cluster unity and solve this problem. In this scenario, the node that gains control of the quorum disk is allowed to form a cluster, and the other fails over its resources and becomes inactive.

Resource Failure

A failed resource is not operational on the current host node. At periodic intervals, MSCS checks to see if the resource appears operational by periodically invoking the Resource Monitor. The Resource Monitor uses the resource DLL for each resource to detect if the resource is functioning properly. The resource DLL communicates the results back through the Resource Monitor to MSCS.

Adjusting the Poll Intervals

You can specify how frequently MSCS checks for failed resources by setting the **Looks Alive (general resource check)** and **Is Alive (detailed resource check)** poll intervals. MSCS requests a more thorough check of the resource's state at each **Is Alive** interval than it does at each **Looks Alive** interval; therefore, the **Is Alive** poll interval is typically longer than the **Looks Alive** poll interval.

 **NOTE:** Do not adjust the **Looks Alive** and **Is Alive** settings unless instructed by technical support.

Adjusting the Threshold and Period Values

If the resource DLL reports that the resource is not operational, MSCS attempts to restart the resource. You can specify the number of times MSCS can attempt to restart a resource in a given time interval. If MSCS exceeds the maximum number of restart attempts (**Threshold** value) within the specified time period (**Period** value), and the resource is still not operational, MSCS considers the resource to be failed.

 **NOTE:** See "[Setting Advanced Resource Properties](#)" to configure the **Looks alive**, **Is alive**, **Threshold**, and **Period** values for a particular resource.

 **NOTE:** Do not adjust the **Threshold** and **Period** values settings unless instructed by technical support.

Configuring Failover

You can configure a resource to fail over an entire group to another node when a resource in that group fails for any reason. If the failed resource is configured to cause the group that contains the resource to fail over to another node, Cluster Service will attempt a failover. If the number of failover attempts exceeds the group's threshold and the resource is still in a failed state, MSCS will attempt to restart the resource. The restart attempt will be made after a period of time specified by the resource's **Retry Period On Failure** property, a property common to all resources.

When you configure the **Retry Period On Failure** properly, consider the following guidelines:

- Select a unit value of minutes, rather than milliseconds (the default value is milliseconds).
- Select a value that is greater or equal to the value of the resource's restart period property. This rule is enforced by MSCS.

 **NOTE:** Do not adjust the **Retry Period On Failure** settings unless instructed by technical support.

Resource Dependencies

A dependent resource requires—or depends on—another resource to operate. For example, if a Generic Application resource requires access to clustered physical storage, it would depend on a physical disk resource.

The following terms describe resources in a dependency relationship:

- **Dependent resource** — A resource that depends on other resources (the dependencies).
- **Dependency** — A resource on which another resource depends.
- **Dependency tree** — A series of dependency relationships such that resource A depends on resource B, resource B depends on resource C, and so on.

Resources in a dependency tree obey the following rules:

- A dependent resource and all of its dependencies must be in the same group.
- MSCS takes a dependent resource offline before any of its dependencies are taken offline, and brings a dependent resource online after all its dependencies are online, as determined by the dependency hierarchy.

Creating a New Resource

Before you add a resource to your NAS SCSI cluster, you must verify that the following elements exist in your cluster:

- The type of resource is either one of the basic types provided with MSCS or a custom resource type provided by the application vendor, Microsoft, or a third party vendor.
- A group that contains the resource already exists within your cluster.
- All dependent resources have been created.
- A separate Resource Monitor—recommended for any resource that has caused problems in the past.

To create a new resource:

1. Click the **Start** button and select **Programs**→ **Administrative Tools**→ **Cluster Administrator**.

The **Cluster Administrator** window appears.

2. In the console tree (usually the left pane), double-click the **Groups** folder.
3. In the details pane (usually the right pane), click the group to which you want the resource to belong.
4. On the **File** menu, point to **New**, and then click **Resource**.

5. In the New Resource wizard, type the appropriate information in **Name** and **Description**, and click the appropriate information in **Resource type** and **Group**.
6. Click **Next**.
7. Add or remove possible owners of the resource, and then click **Next**.

The **New Resource** window appears with **Available resources** and **Resource dependencies** selections.

8. To *add* dependencies, under **Available resources**, click a resource, and then click **Add**.
9. To *remove* dependencies, under **Resource dependencies**, click a resource, and then click **Remove**.
10. Repeat [step 7](#) for any other resource dependencies, and then click **Finish**.
11. Set the resource properties.

For more information on setting resource properties, see the MSCS online help.

Deleting a Resource

1. Click the **Start** button and select **Programs**→**Administrative Tools**→**Cluster Administrator**.

The **Cluster Administrator** window appears.

2. In the console tree (usually the left pane), click the **Resources** folder.
3. In the details pane (usually the right pane), click the resource you want to remove.
4. In the **File** menu, click **Delete**.

When you delete a resource, Cluster Administrator also deletes all the resources that have a dependency on the deleted resource.

File Share Resources

Creating a Cluster-Managed File Share

1. Launch **Windows Explorer**.
2. On a shared volume, create a new folder for the file share.

 **NOTE:** Do not create a share for this folder.

3. Right-click the folder and select **Properties**.
4. In the **Properties** window, click the **Security** tab.
5. In the **Group or users names** box, verify that the **Cluster Service** account has **Full Control** rights to this folder for the NTFS file system.
6. Close **Windows Explorer**.

7. Click the **Start** button and select **Programs**→ **Administrative**→ **Tools**→ **Cluster Administrator**.
8. In the Cluster Administrator left window pane, ensure that a physical disk resource exists in the cluster.
9. In the Cluster Administrator left or right window pane, right-click and select **New**→ **Resource**.
10. In the **New Resource** window, perform the following steps:
 - a. In the **Name** field, type a name for the new share.
 - b. In the **Description** field, type a description of the new share (if required).
 - c. In the **Resource type** drop-down menu, select **File Share**.
 - d. In the **Group** drop-down menu, select the appropriate virtual server for your file share.
11. Click **Next**.

The **Possible Owners** window appears.

12. Select the appropriate cluster node(s) in the **Available nodes** box on which this resource can be brought online.
13. Click the **Add** button to move the cluster node(s) to the **Possible owners** menu.
14. Click **Next**.

The **Dependencies** window appears.

15. In the **Available resources** menu, select the appropriate resource dependencies which must be brought online first by the Cluster Service.
16. Click the **Add** button to move the resources to the **Resource dependencies** menu.
17. Click **Next**.

The **File Share Parameters** window appears.

18. Perform the following steps:
 - a. In the **Share name** field, type the name of the file share.
 - b. In the **Path** field, type the path to the file share.
 - c. In the **Comment** field, enter any additional information about the file share (if required).
 - d. Click **Permissions** and apply the appropriate group or user names and permissions for the file share (if required), and then click **OK**.
 - e. Click **Advanced** and select the appropriate file share properties (if required), and then click **OK**.

See "[File Share Resource Types](#)" for more information.

19. Click **Finish**.

The Cluster Administrator window appears.

20. In the right window pane, right-click the share and select **Bring Online**.

Deleting a File Share

1. Click the **Start** button and select **Programs**→ **Administrative**→ **Tools**→ **Cluster Administrator**.
2. In the **Cluster Administrator** window console tree, click the **Resources** folder.
3. In the right window pane, right-click the file share you want to remove and select **Delete**.

 **NOTE:** When you delete a resource, Cluster Administrator automatically deletes all the resources that have a dependency on the deleted resource.

DFS File Shares

You can use the **File Share** resource type selection in Cluster Administrator to create a resource that manages a stand-alone DFS root; however, fault-tolerant DFS roots cannot be managed by this resource. The DFS root **File Share** resource has required dependencies on a network name and an IP address. The network name can be either the cluster name or any other network name for a virtual server.

A cluster-managed DFS root is different from an Active Directory (or domain-based) DFS root. If the data set does not change very often, using and replicating a domain-based DFS root can be a better selection than a cluster-managed DFS root for providing high availability. If the data set changes frequently, replication is not recommended, and a cluster-managed DFS root is the better solution.

[Table 5-4](#) provides a summary for choosing the appropriate DFS root management scheme.

See the *Dell PowerVault 77xN NAS Systems Administrator's Guide* for more information.

Table 5-4. Selecting the Appropriate DFS Root Management Scheme

Data Set Activity	DFS Root Management
Data changes often	Domain-based
Data does not change very often	Cluster-managed

 **NOTE:** Microsoft Windows Storage Server 2003, Enterprise Edition supports multiple stand-alone DFS roots. The DFS roots can exist in multiple resource groups and each group can be hosted on a different node in the cluster.

File Share Resource Types

If you want to use a PowerVault NAS SCSI cluster as a high-availability file server, you will need to select the type of file share for your resource. Three ways to use this resource type are available:

- **Basic file share** — Publishes a single file folder to the network under a single name.
- **Share subdirectories** — Publishes several network names—one for each file folder and all of its immediate subfolders. This method is an efficient way to create large numbers of related file shares on a single file server.

For example, you can create a file share for each user with files on the cluster node.

- **DFS root** — Creates a resource that manages a stand-alone DFS root. Fault tolerant DFS roots cannot be managed by this resource. A DFS root file share resource has required dependencies on a network name and an IP address. The network name can be either the cluster name or any other network name for a virtual server.

Enabling Cluster NFS File Share Capabilities

After you add a node to the cluster, enable the NFS file sharing capabilities by performing the following steps.

 **NOTE:** Perform this procedure on one cluster node after you configure the cluster.

1. Open a command prompt.
2. At the prompt, type:

```
c:\dell\util\cluster
```

3. In the **cluster** directory, run the **NFSShareEnable.bat** file.
-

Failover and Failback

This section provides information about the failover and failback capabilities of MSCS.

Failover

When an individual NAS cluster resource fails on a cluster node, MSCS detects the resource failure and tries to restart the resource on the cluster node. If the restart attempt reaches a preset threshold, MSCS brings the running resource offline, moves the dependent resources to another cluster node, and restarts all resources and related dependencies on the other cluster node(s). This process of automatically moving resources from a failed cluster node to other healthy cluster node(s) is called *failover*.

To fail over and fail back running NAS cluster resources, the resources are placed together in a group so that MSCS can move the cluster resources as a combined unit. This process ensures that the failover and/or failback procedures transfers all of the user resources as transparently as possible.

After failover, the Cluster Administrator can reset the following recovery policies:

- NAS cluster resource dependencies
- NAS cluster resource(s) restart on the same cluster node
- Workload rebalancing (or failback) when a failed cluster node is repaired and brought back online

Failover Process

MSCS attempts to fail over a group when any of the following conditions occur:

- The node currently hosting the group becomes inactive for any reason.
- One of the resources within the group fails, and it is configured to affect the group.
- Failover is forced by the System Administrator.

When a failover occurs, MSCS attempts to perform the following procedures:

- The group's resources are taken offline.

The resources in the group are taken offline by MSCS in the order determined by the group's dependency hierarchy: dependent resources first, followed by the resources on which they depend.

For example, if an application depends on a Physical Disk resource, MSCS takes the application offline first, allowing the application to write changes to the disk before the disk is taken offline.

- The resource is taken offline.

Cluster Service takes a resource offline by invoking, through the Resource Monitor, the resource DLL that manages the resource. If the resource does not shut down within a specified time limit, MSCS forces the resource to shut down.

- The group is transferred to the next preferred host node.

When all of the resources are offline, MSCS attempts to transfer the group to the node that is listed next on the group's list of preferred host nodes.

For example, if cluster node 1 fails, MSCS moves the resources to the next cluster node number, which is cluster node 2.

- The group's resources are brought back online.

If MSCS successfully moves the group to another node, it tries to bring all of the group's resources online. Failover is complete when all of the group's resources are online on the new node.

MSCS continues to try and fail over a group until it succeeds or until the number of attempts occurs within a predetermined time span. A group's failover policy specifies the maximum number of failover attempts that can occur in an interval of time. MSCS will discontinue the failover process when it exceeds the number of attempts in the group's failover policy.

Modifying the Failover Policy

Because a group's failover policy provides a framework for the failover process, ensure that your failover policy is appropriate for your particular needs. When you modify your failover policy, consider the following guidelines:

- Define the method in which MSCS detects and responds to individual resource failures in a group.
- Establish dependency relationships between the cluster resources to control the order in which MSCS takes resources offline.
- Specify **Time-out**, failover **Threshold**, and failover **Period** for your cluster resources
 - **Time-out** controls how long MSCS waits for the resource to shut down.
 - **Threshold** and **Period** control how many times MSCS attempts to fail over a resource in a particular period of time.
- Specify a **Possible owner list** for your cluster resources. The **Possible owner list** for a resource controls which cluster nodes are allowed to host the resource.

Failback

When the System Administrator repairs and restarts the failed cluster node, the opposite process occurs. After the original

cluster node has been restarted and rejoins the cluster, MSCS will bring the running application and its resources offline, move them from the failover cluster node to the original cluster node, and then restart the application. This process of returning the resources back to their original cluster node is called failback.

You can configure failback to occur immediately at any given time, or not at all. However, ensure that you configure the failback time during your offpeak hours to minimize the effect on users, as they may experience a delay in service until the resources come back online.

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Troubleshooting

Dell™ PowerVault™ NAS Systems SCSI Cluster Installation and Troubleshooting Guide

This appendix provides troubleshooting information for Dell™ PowerVault™ NAS SCSI 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
<p>The RAID drives in the Dell™ PowerVault™ storage system are not accessible by one of the cluster nodes, or the shared storage system is not functioning properly with the cluster software.</p> <p>A disk resource will not move over to another node or will not come online.</p>	<p>The SCSI cables are loose or defective, or the cables exceed the maximum allowable length.</p> <p>The PERC cards connected to a single storage system are not configured consistently.</p> <p>The storage system is not running in cluster mode.</p> <p>If the cluster has multiple storage systems, the cabling between the PERC card and the storage systems is wrong.</p> <p>Enclosure management modules (EMMs) are not installed.</p> <p>The PERC drivers are not installed in your Microsoft® Windows® operating system.</p>	<p>Check the cable connections or replace the cable with a working cable. For more information on the length of SCSI cables, see "Cabling Your Cluster Hardware."</p> <p>Ensure that the RAID configuration is identical for each channel between the PERC cards connected to a shared storage system. Ensure that cluster mode is enabled on both PERC cards and that their SCSI IDs are different on each node.</p> <p>Configure the storage system for cluster mode. For more information, see "Preparing Your Systems for Clustering."</p> <p>Ensure that the cables attached to each channel of the PERC card in each server node are connected to the correct storage system and that the channels on an optional second PERC card in each server node are connected to the correct system.</p> <p>Attach or replace the SCSI cable between the cluster node and the shared storage system.</p> <p>Install EMMs.</p> <p>Install the drivers. See the appropriate PERC documentation for more information.</p>
<p>The option to change the SCSI IDs is not visible in the PERC BIOS.</p>	<p>Cluster mode is not enabled.</p>	<p>Enabling cluster mode will permit you to change the SCSI IDs.</p>
<p>One or more of the SCSI controllers are not detected by the system.</p> <p>PERC cards hang during boot.</p>	<p>The controllers for the shared storage system have the same SCSI ID as their peer adapters in the other system (that is, the same SCSI ID as the controllers connected to the other side of the shared storage system).</p>	<p>Change one of the controller SCSI IDs so that the ID numbers do not conflict. Set the controller in the primary node to SCSI ID 7 (default), and set the controller in the secondary node to SCSI ID 6. See the appropriate PERC documentation for more information about setting SCSI host adapter IDs.</p>
<p>Dell OpenManage™ Array Manager and the PERC BIOS utility only report 13 drives in cluster mode.</p>	<p>Normal</p>	<p>The SCSI ID limitations are imposed by SCSI protocol. As a result of this limitation, the last slot in the storage system cannot be utilized in cluster mode.</p>
<p>One of the nodes takes a long</p>	<p>The node-to-node network has failed</p>	<p>Check the network cabling. Ensure that the node-</p>

time to join the cluster.	<p>due to a cabling or hardware failure.</p> <p>Long delays in node-to-node communications may be normal.</p>	<p>to-node interconnection and the public network are connected to the correct network adapters.</p> <p>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.</p>
You are prompted to configure one network instead of two during MSCS installation.	<p>The TCP/IP configuration is incorrect.</p> <p>The private (point-to-point) network is disconnected.</p>	<p>The node-to-node network and public network must be assigned static IP addresses on different subnets. See "Assigning Static IP Addresses to Your Cluster Resources and Components" for information about assigning the network IPs.</p> <p>Ensure that both systems are powered on so that both network adapters in the private network are available.</p>
Client systems are dropping off of the network while the cluster is failing over.	<p>With MSCS, the service provided by the recovery group becomes temporarily unavailable to clients during failover. Clients may lose their connection if their attempts to reconnect to the cluster are too infrequent or if they end too abruptly.</p>	<p>The time that the service is temporarily unavailable varies depending on the application. Contact the application program vendor for more information.</p>
Only one network segment appears during Cluster Service installation.	<p>Public and private networks segments are not unique.</p>	<p>Place all installed network adapters in a cluster node on separate IP networks.</p> <p>Ensure that the same network segments that were used for each network adapter are identical on the second cluster node.</p>
Attempts to connect to a cluster using Cluster Administrator fail.	<p>The Cluster Service (MSCS) has not been started.</p> <p>A cluster has not been formed on the system.</p> <p>The system has just been booted and services are still starting.</p>	<p>Verify that the Cluster Service is running and that a cluster has been formed. Use the Event Viewer and look for the following events logged by the Cluster Service:</p> <p>Microsoft Cluster Service successfully formed a cluster on this node.</p> <p>or</p> <p>Microsoft Cluster Service successfully joined the cluster.</p> <p>If these events do not appear in Event Viewer, see the <i>Microsoft Cluster Service Administrator's Guide</i> for instructions on setting up the cluster on your system and starting the Cluster Service.</p>
Using Microsoft Windows NT® 4.0 to remotely administer a Windows Storage Server 2003, Enterprise Edition cluster generates error messages.	<p>Normal. Some resources in Windows Storage Server 2003, Enterprise Edition are not supported in Windows NT 4.0.</p>	<p>Dell strongly recommends that you use Windows XP Professional or Windows Storage Server 2003, Enterprise Edition for remote administration of a cluster running Windows Storage Server 2003, Enterprise Edition.</p>
MSCS does not show any available shared disks during installation.	<p>The PERC drivers are not installed in the operating system.</p> <p>Disks are configured as dynamic disks.</p>	<p>Install the drivers. See the PERC documentation for more information.</p> <p>Change disks to "basic" before cluster installation. See "Maintaining Your Cluster" for more information on configuring dynamic disks as basic disks.</p>
One of the nodes can access one of the shared hard drives, but the second node cannot.	<p>If MSCS is installed, this situation is normal.</p>	<p>If MSCS is installed, only the node that owns the disk resource will be able to access the disk. The other node will show the disk resource as offline in Windows Disk Management.</p>

The **Create NFS Share** option does not exist.

The Enable NFS Share utility is not installed on one of the cluster nodes.

Run the Enable NFS File Share utility. See "[Enabling Cluster NFS File Share Capabilities](#)" for more information.

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Cluster Data Sheet

Dell™ PowerVault™ NAS Systems SCSI Cluster Installation and Troubleshooting Guide

[PowerVault SCSI Cluster Solution Data Sheet](#)

The cluster data sheets on the following pages are provided for the system installer to record pertinent information about Dell™ PowerVault™ SCSI cluster configurations.

Make a copy of the appropriate data sheet to use for the installation or upgrade, complete the requested information on the sheet, and have the completed sheet available if you need to call Dell for technical assistance. If you have more than one cluster, complete a copy of the sheet for each cluster.

PowerVault SCSI Cluster Solution Data Sheet

You can attach the following form to the back of each cluster node or rack. The system installer may want to use the form to record important information about the hardware on each cluster component. Have a copy of the form available any time you call Dell for technical support.

Cluster Type	PowerVault SCSI Cluster Solution
Cluster name	
Domain name	
Cluster IP address	
Cluster subnet mask (same as public network)	
Cluster Service account	
Cluster Service password	
Installer	
Date installed	
Applications	
Location	
Notes	

Node (Server Name)	Server Type	Cluster Name	Service Tag Number
Node 1			
Node 2			

Network Settings	TCP/IP Address	Subnet Mask	Private or Public?
Node 1, network adapter 1			
Node 1, network adapter 2			

Additional Node 1 network adapter(s)			
Node 2, network adapter 1			
Node 2, network adapter 2			
Additional Node 2 network adapter(s)			

System	Storage 1	Storage 2	Storage 3	Storage 4	SCSI ID
Node 1, PERC					
Node 2, PERC					
Node 1, PERC					
Node 2, PERC					

PowerVault Storage System	Description of Installed Items (Drive letters, RAID types, applications/data)
Storage 1	
Storage 2	
Storage 3	
Storage 4	

Component	Storage 1	Storage 2	Storage 3	Storage 4
Service Tag				

PCI Slot Number	Adapter Installed (PERC, network adapter, and so on)	Use (public network, private network, shared storage, internal drives)	PCI Slot Description
PCI slot 1			
PCI slot 2			
PCI slot 3			
PCI slot 4			
PCI slot 5			
PCI slot 6			
PCI slot 7			

PCI slot 8			
PCI slot 9			
PCI slot 10			
PCI slot 11			

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Abbreviations and Acronyms

Dell™ PowerVault™ NAS Systems SCSI Cluster Installation and Troubleshooting Guide

A

ampere(s)

API

Application Programming Interface

AC

alternating current

ACM

advanced cooling module

BBS

Bulletin Board Service

BDC

backup domain controller

BIOS

basic input/output system

bps

bits per second

BTU

British thermal unit

C

Celsius

CIFS

Common Internet File System

cm

centimeter(s)

DC

direct current

DFS

distributed file system

DHCP

dynamic host configuration protocol

DLL

dynamic link library

DNS

domain naming system

ESD

electrostatic discharge

EMM

enclosure management module

ERP

enterprise resource planning

F

Fahrenheit

FC

Fibre Channel

FCAL

Fibre Channel arbitrated loop

ft

feet

FTP

file transfer protocol

g

gram(s)

GB

gigabyte

Gb

gigabit

Gb/s

gigabits per second

GUI

graphical user interface

HBA

host bus adapter

HSSDC

high-speed serial data connector

HVD

high-voltage differential

Hz

hertz

ID

identification

IIS

Internet Information Server

I/O

input/output

IP

Internet Protocol

K

kilo- (1024)

lb

pound(s)

LAN

local area network

LED

light-emitting diode

LS

loop resiliency circuit/SCSI enclosure services

LVD

low-voltage differential

m

meter

MB

megabyte(s)

MB/sec

megabyte(s) per second

MHz

megahertz

MMC

Microsoft® Management Console

MSCS

Microsoft Cluster Service

MSDTC

Microsoft Distributed Transaction Coordinator

NAS

network attached storage

NIS

Network Information Service

NFS

network file system

NTFS

NT File System

NVRAM

nonvolatile read-only memory

PAE

physical address extension

PCB

printed circuit board

PDC

primary domain controller

PDU

power distribution unit

PERC

PowerEdge™ Expandable RAID Controller

PERC 3/DC

PowerEdge Expandable RAID controller 3/dual channel

PERC 4/DC

PowerEdge Expandable RAID controller 4/dual channel

PCI

Peripheral Component Interconnect

POST

power-on self-test

RAID

redundant array of independent disks

RAM

random access memory

rpm

revolutions per minute

SAF-TE

SCSI accessed fault-tolerant enclosures

SCSI

small computer system interface

sec

second(s)

SEMM

SCSI expander management modules

SES

SCSI enclosure services

SMB

Server Message Block

SMP

symmetric multiprocessing

SNMP

Simple Network Management Protocol

SQL

Simple Query Language

TCP/IP

Transmission Control Protocol/Internet Protocol

UHDCI

ultra high-density connector interface

UPS

uninterruptible power supply

V

volt(s)

VHDCI

very high-density connector interface

WINS

Windows Internet Naming Service

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