Dell™ PowerEdge™ Cluster FE400 Systems Platform Guide

Notes, Notices, and Cautions

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

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

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

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This document provides information for installing and connecting peripheral hardware, storage, and storage area network (SAN) components for your Dell™ PowerEdge™ Cluster FE400 solution. The configuration information in this document is specific to the Microsoft® Windows® 2000 Advanced Server and Windows Server 2003, Enterprise Edition operating systems.

This document covers the following topics:

- Configuration information for installing peripheral hardware components, such as HBAs, NICs, and PCI adapter cards into Cluster FE400 configurations
- Configuration rules and guidelines for direct-attached or SAN-attached configurations
- Best practices

NOTE: Configurations not listed in this document may not be certified or supported by Dell or Microsoft.

NOTE: In this guide and in other cluster documentation, the Microsoft Cluster Service (for Windows 2000 Advanced Server or Windows Server 2003, Enterprise Edition) is also referred to as MSCS.

Supported Cluster Configurations

This section provides information about supported cluster configurations for your PowerEdge cluster configuration.

The Cluster FE400 solution supports the following configurations:

- Two-node clusters running the Microsoft® Windows® 2000 Advanced Server operating system.
- Clusters with up to eight nodes running the Windows Server 2003, Enterprise Edition operating system.

Table 1-1 provides a list of supported cluster configurations for the Cluster FE400 systems running Windows 2000 Advanced Server or Windows Server 2003, Enterprise Edition.

NOTE: Each cluster node must be of the same system model and have two or more processors.

Table 1-1. Supported Cluster Configurations

PowerEdge Cluster	Supported PowerEdge Systems	Supported Storage Systems	Supported Cluster Interconnect (for the Private Network)
FE400	1550, 1650, 1750, 1800, 1850, 2500, 2550, 2600, 2650, 2800, 2850, 4400, 4600, 6400, 6450, 6600, 6650, and 8450	Dell | EMC CX600 Dell | EMC CX400 Dell | EMC CX200	Any NIC supported by the system. **NOTE:** All nodes in the same cluster must use homogeneous (identical) NICs for the cluster interconnect.

Obtaining More Information

See the *Dell PowerEdge Cluster FE400 Installation and Troubleshooting Guide* for a detailed list of related documentation.

High-Availability Cluster Configurations

This section provides information about the supported operating systems, HBAs, and HBA drivers for your cluster configuration.

NOTICE: All cluster nodes in a Cluster FE400 solution must run the same operating system. Mixing Windows 2000 Advanced Server and Windows Server 2003, Enterprise Edition in the same cluster is not supported except during a rolling upgrade.

NOTICE: HBAs installed in clusters using redundant paths must be identical. Cluster configurations are tested and certified using identical HBAs installed in all of the cluster nodes. Using dissimilar HBAs in your cluster nodes is not supported.

Service Pack Support

Windows 2000 Advanced Server

Microsoft Windows 2000 Service Pack 4 or later is required for Cluster FE400 systems that use Windows 2000 Advanced Server.

You can download the latest service pack from the Microsoft Support website at **support.microsoft.com**.

Windows Server 2003, Enterprise Edition

At the time this document was printed, a service pack was not available for Windows Server 2003, Enterprise Edition. However, hotfix KB818877 and the most recent hotfix for storport.sys are required.

See Knowledge Base article KB818877 on the Microsoft Support website at **support.microsoft.com** for more information. At the time this document was printed, KB838894 was the most recent hotfix for storport.sys. You can also go to the Dell Support website at **support.dell.com** for the most recent information on this issue.

HBA Support for PowerEdge Cluster FE400 Configurations

Table 1-2 lists the systems and the HBAs that are supported for Cluster FE400 configurations running Windows 2000 Advanced Server or Windows Server 2003, Enterprise Edition.

See "Installing Peripheral Components in Your Cluster Node PCI Slots" for PCI slot recommendations.

Table 1-2. Supported HBAs for Cluster FE400 Configurations

PowerEdge System	Emulex LP982 or LP9802 (PCI-X) HBA	QLogic QLA2340 (PCI-X) HBA	Emulex LP1050-EX (PCIe Express [PCIe]) HBA
1550	X	X	
1650	X	X	
1750	X	X	
1800	X	X	X
1850	X*	X*	X**
2500	X	X	
2550		X	
2600/2650	X	X	
2800	X	X	X
2850	X*	X*	X**
4400	X	X	
4600	X	X	
6400/6450	X	X	
6600/6650	X	X	
8450	X	X	

* The PowerEdge system must have a PCI-X riser installed in order to use this HBA.
** The PowerEdge system must have a PCIe riser installed in order to use this HBA.

Fibre Channel Switches

- Dual (redundant) fabric configurations are required.
- A maximum of 16 switches may be used in a SAN.
- A minimum of two and a maximum of eight Inter-Switch Links (ISLs) may exist between any two directly communicating switches. A single ISL is permitted only when connecting to a remote switch in an EMC® MirrorView™ configuration.
- A maximum of three hops (the number of ISLs each data frame must traverse) may exist between a host and a storage system.

Rules and Guidelines

When configuring your cluster, all cluster nodes must contain identical versions of the following:

- Operating systems and service packs
- Hardware, drivers, firmware, or BIOS for the NICs, HBAs, and any other peripheral hardware components
- Systems management software, such as Dell OpenManage™ systems management software and EMC Navisphere® storage management software

Maximum Distance Between Cluster Nodes

The maximum cable length allowed from an HBA to a switch, an HBA directly connected to a storage system, or a switch to a storage system is 300 meters using multimode fiber at 2 Gb/sec. The total distance between an HBA and a storage system may be increased through the use of switch ISLs.

The maximum cable length for Fast Ethernet and copper Gigabit Ethernet is 100 meters, and for optical Gigabit Ethernet, it is 550 meters. This distance may be extended using switches and VLAN technology. The maximum latency for a round-trip network packet between nodes is 500 milliseconds.

Obtaining More Information

See the *Dell PowerEdge Cluster FE400 Installation and Troubleshooting Guide* for installation instructions for hardware configurations running Windows 2000 Advanced Server or Windows Server 2003, Enterprise Edition.

Installing Peripheral Components in Your Cluster Node PCI Slots

This section provides configuration information. Table 1-3 provides information about PCI slot configurations. Table 1-4 provides information about PCI slot assignments.

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

Table 1-3. PCI Slot Configurations for PowerEdge Cluster Nodes

PowerEdge System	Riser Board Option	Slot	Slot Type	Slot Speed
1550	N/A	1-2	PCI	64 bit, 66 MHz
1650	Any	1	PCI	64 bit, 66 MHz or 32 bit, 33 MHz
		2	PCI	64 bit, 66 MHz
1750	Any	1	PCI-X or PCI	64 bit, 133 MHz PCI-X or 64 bit, 33 MHz PCI
		2	PCI-X	64 bit, 133 MHz
1800	N/A	1	PCI	64 bit, 66 MHz
		2	PCIe	2.5 GHz PCIe x4-lane width
		3	PCIe	2.5 GHz PCIe x8-lane width
		4	PCI	32 bit, 33 MHz
		5-6	PCI-X	64 bit, 100 MHz
1850	Standard	1	PCI-X	64 bit, 133 MHz
		2	PCI-X	64 bit, 100 MHz
	PCI-X with ROMB	1	PCI-X	64 bit, 133 MHz
		2	PCI-X	64 bit, 100 MHz
	PCIe with ROMB	1	PCIe	2.5 GHz PCIe x4-lane width
		2	PCIe	2.5 GHz PCIe x8-lane width

Table 1-3. PCI Slot Configurations for PowerEdge Cluster Nodes *(continued)*

PowerEdge System	Riser Board Option	Slot	Slot Type	Slot Speed
2500		1-2	PCI	64 bit, 66 MHz
		3-5	PCI	64 bit, 33 MHz
		6-7	PCI	32 bit, 33 MHz
2550		1-3	PCI	64 bit, 33 MHz
2600		1	PCI	32 bit, 33 MHz
		2-5	PCI-X	64 bit, 100 MHz
		6-7	PXI-X	64 bit, 133 MHz
2650		1	PCI-X	64 bit, 100 MHz
		2-3	PXI-X	64 bit, 133 MHz **NOTE:** Slot 1 must be empty for Slot 2 to attain an operating speed of 133 MHz.
2800		1	PCI	32 bit, 33 MHz
		2-5	PCI-X	64 bit, 133 MHz
		6	PCIe	2.5 GHz PCIe x4-lane width
		7	PCIe	2.5 GHz PCIe x8-lane width
2850	PCI-X	1-3	PCI-X	64 bit, 133 MHz **NOTE:** If Slot 1 is populated, Slots 2 and 3 operate at 100 MHz.
	PCIe	1	PCIe	2.5 GHz PCIe x4-lane width
		2	PCIe	2.5 GHz PCIe x8-lane width
		3	PCI-X	64 bit, 100 MHz
4400	N/A	1-2	PCI	64 bit, 66 MHz
		3-6	PCI	64 bit, 33 MHz
		7	PCI	32 bit, 33 MHz
4600	N/A	1	PCI	32 bit, 33 MHz
		2-3	PCI-X	64 bit, 100 MHz

Table 1-3. PCI Slot Configurations for PowerEdge Cluster Nodes *(continued)*

PowerEdge System	Riser Board Option	Slot	Slot Type	Slot Speed
		4-5	PCI-X	64 bit, 100 MHz
		6-7	PCI-X	64 bit, 100 MHz
6400	N/A	1	PCI	32 bit, 33 MHz
		2-5	PCI	64 bit, 33 MHz
		6-7	PCI	64 bit, 66 MHz
6450	N/A	1	PCI	32 bit, 33 MHz
		2-5	PCI	64 bit, 33 MHz
		6-7	PCI	64 bit, 66 MHz
6600	N/A	1	PCI	32 bit, 33 MHz
		2-3	PCI-X	64 bit, 100 MHz
		4-5	PCI-X	64 bit, 100 MHz
		6-7	PCI-X	64 bit, 100 MHz
		8-9	PCI-X	64 bit, 100 MHz
		10-11	PCI-X	64 bit, 100 MHz
6650	N/A	1	PCI	32 bit, 33 MHz
		2-3	PCI-X	64 bit, 100 MHz
		4-5	PCI-X	64 bit, 100 MHz
		6	PCI-X	64 bit, 100 MHz
		7	PCI-X	64 bit, 100 MHz
		8	PCI-X	64 bit, 100 MHz
8450	N/A	1-2	PCI	64 bit, 33 MHz
		3-6	PCI	64 bit, 33 MHz
		7-8	PCI	64 bit, 66 MHz
		9-10	PCI	64 bit, 66 MHz

Table 1-4. PCI Slot Assignments for PowerEdge Cluster Nodes

PowerEdge System	Riser Board Option	HBA	PCI Slot Assignment
1550	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI slots.

Table 1-4. PCI Slot Assignments for PowerEdge Cluster Nodes *(continued)*

PowerEdge System	Riser Board Option	HBA	PCI Slot Assignment
1650	Any	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI slots.
1750	Any	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI or PCI-X slots.
1800	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in PCI/PCI-X slots 1, 5, or 6.
		Emulex LP1050-EX	Install the HBAs in PCIe slots 2 and 3.
1850	Standard	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in PCI-X slots 1 and 2.
	PCI-X with ROMB	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in PCI-X slots 1 and 2.
	PCIe with ROMB	Emulex LP1050-EX	Install the HBAs in PCIe slots 1 and 2.
2500	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in PCI slots 1, 2, 3, 4, or 5.
2550	N/A	QLogic QLA2340	Install the HBAs in any available PCI slots.
2600	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in PCI-X slots 2, 3, 4, or 5.
2650	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI or PCI-X slots.
2800	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in PCI-X slots 2, 3, 4, or 5.
		Emulex LP1050-EX	Install the HBAs in PCIe slots 6 and 7.
2850	PCI-X	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI-X slots.

Table 1-4. PCI Slot Assignments for PowerEdge Cluster Nodes *(continued)*

PowerEdge System	Riser Board Option	HBA	PCI Slot Assignment
	PCIe	Emulex LP1050-EX	Install the HBAs in PCIe slots 1 and 2.
4400	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI slots.
4600	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI or PCI-X slots.
6400	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI slots.
6450	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI slots.
6600	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI or PCI-X slots.
6650	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI or PCI-X slots.
8450	N/A	Emulex LP982 Emulex LP9802 QLogic QLA2340	Install the HBAs in any available PCI slots.

NOTE: Whenever possible, it is recommended that the HBAs be placed on separate buses to balance the load on the system. These buses are identified as separate rows in Table 1-3.

Attaching Your Cluster to a Shared Storage System Through Direct-Attach Configuration

This section provides the rules and guidelines for attaching your cluster nodes to the shared storage system using a direct connection (without Fibre Channel switches).

In a direct-attach configuration, both cluster nodes are connected directly to the storage system.

Rules and Guidelines

The rules and guidelines described in Table 1-5 apply to direct-attached clusters.

Table 1-5. Direct-Attached Clusters Rules and Guidelines

Rule/Guideline	Description
Primary storage	Each Windows 2000 Advanced Server and Windows Server 2003, Enterprise Edition cluster can support up to 22 unique drive letters for shared logical drives. Windows Server 2003 can support additional physical drives through mount points.
	Only one storage system can be directly attached to the cluster.
Fibre Channel HBAs supported	See Table 1-2 to determine which HBAs are supported on your PowerEdge server.
Emulex driver version	SCSI port driver 5-2.22a8 or later (Windows 2000), Storport miniport driver 5-1.02a3 or later (Windows 2003).
Emulex firmware version	1.90a4 or later
QLogic driver version	SCSI miniport driver 9.00.12 or later (Windows 2000), Storport miniport driver 9.00.17 or later (Windows Server 2003).
QLogic BIOS version	1.42 or later
Operating system	Each direct-attached cluster must run Windows 2000 Advanced Server or Windows Server 2003, Enterprise Edition.
Windows 2000 Advanced Server service pack	Windows 2000 Advanced Server configurations require Service Pack 4 or later.
Windows Server 2003, Enterprise Edition service pack	Windows Server 2003 configurations require KB818877 and the latest StorPort hotfix (KB838894 at the time of print); or Service Pack 1 if available.
Dell | EMC CX600 core software	2.07.600 or later; however, Access Logix™ Option 01.02.5 or later must be installed and enabled if two clusters or a mix of clustered and non-clustered hosts are direct-attached to the CX700.
Dell | EMC CX400 core software	2.07.400 or later.
Dell | EMC CX200 core software	2.07.200 or later.
Additional software application programs	EMC Navisphere Agent 6.7 or later.
	EMC Navisphere Manager 6.7 or later.
	EMC PowerPath® 3.0.6 or later.
	EMC AdmSnap version 2.4.0 or later.
	EMC SnapView™ Option version 01.01.5 or later
	Emulex Configuration Utility for Windows 2000 version 1.41a13 or later.
	Emulex LPUtilNT for Windows Server 2003 version 1.7a12 or later.
	QLogic SANsurfer SANblade Manager version 2.0.29 or later.

Attaching Your Cluster Shared Storage System to a SAN

This section provides the rules and guidelines for attaching your PowerEdge cluster nodes to the shared storage systems through a Dell | EMC SAN using redundant Fibre Channel switch fabrics.

Rules and Guidelines

The rules and guidelines described in Table 1-6 apply to SAN-attached clusters.

Table 1-6. SAN-Attached Clusters Rules and Guidelines

Rule/Guideline	Description
Primary storage	Each Windows 2000 Advanced Server and Windows Server 2003, Enterprise Edition cluster can support up to 22 unique drive letters for shared logical drives. Windows Server 2003 can support additional physical drives through mount points.
	Up to four Dell | EMC Fibre Channel disk arrays are supported per cluster in a SAN environment.
Secondary storage	Up to two PowerVault™ 132T, 136T, or 160T libraries.
	Any system attached to the SAN can share these devices.
Fibre Channel switch configuration	Redundant switch fabrics required.
Fibre Channel switch zoning	Single-initiator zoning.
Fibre Channel switches supported	Dell | EMC DS-16B2 (Brocade SilkWorm 3800), Brocade SilkWorm 3200, Brocade SilkWorm 3250, Brocade SilkWorm 3850, or Dell | EMC DS-24M2 (McData Sphereon 4500).
Fibre Channel switch firmware	Version 3.1.2a or later for Brocade Silkworm 3200 /3800.
	Version 4.2.0b or later for Brocade Silkworm 3250 /3850.
	Version 6.01.00 or later for McData Sphereon 4500.
Fibre Channel HBAs supported	See Table 1-2 to determine which HBAs are supported on your PowerEdge server.
Emulex driver version	SCSI port driver 5-2.22a8 or later (Windows 2000), Storport miniport driver 5-1.02a3 or later (Windows 2003).
Emulex firmware version	1.90a4 or later
QLogic driver version	SCSI miniport driver 9.00.12 or later (Windows 2000), Storport miniport driver 9.00.17 or later (Windows Server 2003).
QLogic BIOS version	1.42 or later
Operating system	Each cluster attached to the SAN must run Windows 2000 Advanced Server or Windows Server 2003, Enterprise Edition.

Table 1-6. SAN-Attached Clusters Rules and Guidelines *(continued)*

Rule/Guideline	Description
Windows 2000 Advanced Server service pack	Windows 2000 Advanced Server configurations require Service Pack 4 or later.
Windows Server 2003, Enterprise Edition service pack	Windows Server 2003 configurations require KB818877 and the latest StorPort hotfix (KB838894 at the time of print); or Service Pack 1 if available.
Dell | EMC CX600 core software	2.07.600 (with Access Logix Option 01.02.5 or later installed and Access Control enabled) or later.
Dell | EMC CX400 core software	2.07.400 (with Access Logix Option 01.02.5 or later installed and Access Control enabled) or later.
Dell | EMC CX200 core software	2.07.200 (with Access Logix Option 01.02.5 or later installed and Access Control enabled) or later.
Additional software application programs	EMC Navisphere Agent 6.7 or later.
	EMC Navisphere Manager 6.7 or later.
	EMC PowerPath 3.0.6 or later.
	EMC MirrorView Option version 01.01.5 or later (not supported on the Dell | EMC CX200).
	EMC MirrorView/Asynchronous Option version 01.01.5 or later (not supported on the Dell | EMC CX200).
	EMC AdmSnap version 2.4.0 or later.
	EMC SnapView Option version 01.01.5 or later.
	Emulex Configuration Utility for Windows 2000 version 1.41a13 or later.
	LPUtilNT for Windows Server 2003 version 1.7a12 or later.
	QLogic SANsurfer SANblade Manager for Windows 2000 version 2.0.29 or later.

Obtaining More Information

See the *Dell PowerEdge Cluster FE400 Installation and Troubleshooting Guide* for more information about SAN-attached clusters. You can also see the Dell Support website at **support.dell.com**.

Best Practices

This section provides best practices for troubleshooting issues that may occur in your cluster.

- **Incorrect TimeOutValue setting in the Registry.**

  When you run the Cluster Configuration wizard on a cluster solution running Windows Server 2003, the wizard modifies the following registry value:

HKLM\System\CurrentControlSet\Services\Disk\TimeOutValue

The disk **TimeOutValue** setting is the timeout value set by Windows for storage system I/O operations. The Dell | EMC Fibre Channel storage environment requires 60 seconds for I/O operations. When you run the Cluster Configuration wizard, the wizard sets the **TimeOutValue** setting to 20 seconds, which may not be sufficient for complex I/O operations. Consequently, storage system I/O operations may continually time out.

Microsoft has confirmed a problem with the wizard and has implemented hotfix KB818877 to resolve this issue. See Microsoft Knowledge Base article KB818877 on the Microsoft Support website at **support.microsoft.com** for more information.

To resolve this issue, read the Knowledge Base article for instructions about how to obtain the required Quick Fix Executable (QFE) file from Microsoft. Download and apply the QFE as soon as possible.

If you *have not* configured your cluster, apply the QFE (or Service Pack 1 when available) to all of the cluster nodes.

If you have configured your cluster, perform one of the following procedures and then reboot each cluster node, one at a time:

– Manually change the registry **TimeOutValue** setting to `60` on each cluster node.

– Download the Cluster Disk Timeout Fix utility from the Dell Support website at **support.dell.com** and run the utility on your cluster.

  When prompted, type the name of your cluster in the **Cluster name** field and select **Dell | EMC** in the **Storage system type** field. The utility locates the cluster nodes associated with the cluster name and sets the **TimeOutValue** setting on each node to the correct setting.

- **Using a Tape Backup Library in a SAN**

  Cluster FE400 solutions-based on Windows 2000 Advanced Server- that are configured with Emulex HBAs can be connected to one or more tape backup libraries that can be shared with other clusters and systems in a SAN. To avoid disrupting I/O activities from other network systems to the tape drive and to ensure cluster failover operations, disable the target reset to the tape device.

  To disable the target reset:

  a Click the **Start** button, select **Run**, and type the following:

  ```
  c:\Program Files\HBAnyware\elxcfg.exe --emc
  ```

  The **Emulex Configuration Tool** window appears.

  b In the **Available Adapters** box, select the first HBA in the list.

  c In the **Adapter Controls** box, select **Disable Target Reset for Tape Devices**.

  d In the **File** menu, select **Apply**.

e In the **Available Adapters** box, select the second HBA in the list.

f Repeat step c and step d.

g Reboot the cluster node.

h Repeat step a through step g on each additional node.

- **The cluster disks are not initialized in Disk Management.**

  On clusters running Windows Server 2003, Disk Management may display the cluster disks as `not initialized`. This issue may occur if the cluster disks are owned by other nodes in the same cluster.

  This behavior is normal and does not affect cluster operations. See Microsoft Knowledge Base article KB818878 on the Microsoft Support website at **support.microsoft.com** for more information.