



SAN Compatibility Guide For ESX Server 2.x

Last Updated: October 1, 2008

What's New

Changes since the last edition of this guide include:

- Added support for 3PAR T-Class. See ["3PAR,"](#) on page 19, ["3PAR,"](#) on page 39, ["3PAR,"](#) on page 56, ["3PAR,"](#) on page 73, ["3PAR,"](#) on page 88.

Introduction

VMware ESX Server has been tested and deployed in a variety of SAN environments. However, in practice, because every customer's device combination, topology, and configuration are unique, VMware recommends that VMware professional services be engaged to install and configure the initial ESX Server installation in your SAN environment.

The support matrix below describes in detail the combinations of HBAs and storage devices currently tested by VMware and its storage partners.

NOTE The use of an external enclosure, or JBOD connected to a supported SAS/SCSI controller in a supported server is supported, as long as there is no disk sharing among multiple servers or SAS/SCSI cards.

This support guide is a live document that will be updated frequently. Before deploying ESX Server, please check the latest version of this document online at:

http://www.vmware.com/pdf/esx_SAN_guide.pdf

If you are having a technical issue with 3rd party HW/SW and it is not found on this list, please refer to our 3rd Party HW/SW support policy at <http://www.vmware.com/support/policies/ThirdParty.html>.

The following sections are included in this guide:

- ["Third-Party Software"](#) on page 2
- ["ESX Server 2.5.5"](#) on page 3
- ["ESX Server 2.5.4"](#) on page 25
- ["ESX Server 2.5.3"](#) on page 45

- [“ESX Server 2.5.2”](#) on page 61
- [“ESX Server 2.5.1”](#) on page 78
- [“ESX Server 2.5”](#) on page 93
- [“ESX Server 2.1.2”](#) on page 104
- [“ESX Server 2.1.1”](#) on page 105
- [“ESX Server 2.1”](#) on page 112
- [“ESX Server 2.0.1”](#) on page 119
- [“ESX Server 2.0”](#) on page 125
- [“ESX Server 1.5.2”](#) on page 130

Third-Party Software

Most SAN array vendors provide software that can be used to clone or snapshot SAN LUNs at the array level. VMware works closely with our storage partners as they certify that these applications function as expected in an ESX Server System environment. The following links indicate which storage vendors have completed certification of their cloning and snapshotting software and support it in conjunction with ESX Server System. Please contact the storage vendor for any support, configuration, or best practices information that you need that is not found through the links below.

Table 1.

| | |
|--|---|
| EMC SRDF (PowerLink account is required to access this link.) | http://powerlink.emc.com/km/live1/en_US/Offering_Technical/Technical_Documentation/300-003-507_a01_elcmt_0.pdf |
| EMC SnapView and MirrorView | http://www.emc.com/interoperability/matrices/EMCSupportMatrix.pdf |
| HP Business Copy | http://h18006.www1.hp.com/products/quickspecs/11617_div/11617_div.html |
| HP Continuous Access | http://h18006.www1.hp.com/products/quickspecs/11616_na/11616_na.html |
| IBM RVM | http://www-1.ibm.com/servers/storage/disk/ds4000/pdf/interop-matrix.pdf |
| NetApp Snapshot | http://www.netapp.com/tech_library/ftp/3393.pdf |

ESX Server 2.5.5

This section lists the supported SAN devices for ESX Server version 2.5.5. VMware and our partners are actively working together to qualify certification for additional devices as quickly as possible. Please check back periodically for updates and newly certified HBAs and storage devices currently tested by VMware and its storage partners. The latest version of this guide is available on the VMware Web site at <http://www.vmware.com/support/resources/>.

Storage Vendor Qualifications and Support

ESX Server 2.5.5 is supported by the following major storage vendors:

- [“Bull”](#) on page 5
- [“Dell”](#) on page 6
- [“EMC”](#) on page 7
- [“Fujitsu”](#) on page 8
- [“Fujitsu Siemens”](#) on page 9
- [“HP”](#) on page 11
- [“Hitachi, Ltd”](#) on page 13
- [“Hitachi Data Systems \(HDS\)”](#) on page 14
- [“IBM”](#) on page 15
- [“NetApp”](#) on page 17
- [“NEC”](#) on page 18
- [“Nihon Unisys Ltd,”](#) on page 18
- [“Pillar Data Systems”](#) on page 19
- [“3PAR”](#) on page 19
- [“Sun”](#) on page 19
- [“Xiotech”](#) on page 20

Server Clustering

Storage arrays are tested in clustered and non-clustered environments. Clustering refers to the use of Microsoft Cluster Services (Windows 2003 Release 2, Service Pack 1 and Service Pack 2) in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

The following options are supported with MSCS and ESX Server 2.5.x:

Table 2.

| ESX Version | Windows OS | FC HBA Speed | Supported FC drivers |
|-----------------------------------|-----------------------|--------------|---|
| Prior to ESX Server 2.5.4 patch 2 | 2000 SP4 | 2G | Default 2G |
| | 2003 RTM | 2G | |
| ESX Server 2.5.4 patch 2 or later | 2000 SP4 | 2G | Default 2G |
| | 2003 RTM | 2G | Qlogic: qla2200_7xx/qla2300_7xx 7.04.00 |
| | 2003 SP1 ¹ | 2G | Emulex: lpfcdd_2xx 2.01g |
| | 2003 R2 ¹ | 2G | |
| ESX 2.5.5 | 2000 SP4 | 2G&4G | Default unified 2G&4G Qlogic: qla2200_707/qla2300_707 7.07.04 Emulex: lpfcdd_732 7.3.2_vmw4 |

¹ Requires Microsoft hotfix KB <http://support.microsoft.com/kb/911030>.

ESX Server 2.5.5 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2003 Release 2, Service Pack 1 and Service Pack 2:

Table 3.

| Configuration | Description | Restrictions |
|--|---|--|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only. |
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only ■ If using SAN path failover, this configuration is fully supported only if the virtual machines share raw disks, not virtual disks. If virtual machines share virtual disks, the cluster will fail over before the SAN path fails over. |
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | <ul style="list-style-type: none"> ■ Two-node cluster only. |

ESX Server 2.5.5 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Storage Arrays

VMware ESX Server 2.5.5 supports a variety of storage arrays in various configurations. The tables below state the VMware supported storage arrays and the supported configurations for each vendor.

Note: All storage products listed in this compatibility guide are supported. For further details about array firmware, storage product configurations, and best practices, please contact the storage vendor.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switch. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Boot from SAN — In this configuration, the ESX Server machine boots from a LUN stored on the SAN rather than in the server itself.

Table 4. Bull

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Microsoft Clustering support | Boot from SAN |
|--|---------|--------------------|--------------------------------|---|------------------------------|---------------|
| StoreWay | FDA1500 | X | X | X | | X |
| | FDA2500 | X | X | X | | X |
| | FDA2800 | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |

Table 5. Dell

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|-------------------------|--------------------|--------------------------------|---|--------------------|---------------|
| Power Vault 650F | X | | | | |
| AX100 | X | X | X | X ¹ | |
| AX150 | X | X | X | X ¹ | |
| CX200 | X | X | X | X ¹ | X |
| CX300 | X | X | X | X ³ | X |
| CX400 | X | X | X | X ³ | X |
| CX500 | X | X | X | X ³ | X |
| CX600 | X | X | X | X ³ | X |
| CX700 | X | X | X | X ³ | X |
| CX3-20 ⁶ | X | X | X | X ^{2, 5} | X |
| CX3-20c ^{4, 6} | X | X | X | X ^{2, 5} | X |
| CX3-40 ⁶ | X | X | X | X ^{2, 5} | X |
| CX3-40c ⁶ | X | X | X | X ^{2, 5} | X |
| CX3-80 ⁶ | X | X | X | X ^{2, 5} | X |

See **NOTE** on page 1 for JBOD support information.

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX2.5.4 releases prior to patch 2. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX2.5.4 patch 2 or later.

⁴ Supported on Fibre Channel only, not iSCSI.

⁵ Only supported with 2G HBA driver.

⁶ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

Table 6. EMC

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|-----------------|----------------------|-----------------------|--------------------------------------|---|-----------------------|---------------------|
| EMC CLARiiON | AX100 | X | X | X | X ¹ | |
| | AX150 ⁵ | X | X | X | X ¹ | |
| | CX200 | X | X | X | X ^{6, 7} | X |
| | CX300 | X | X | X | X ^{6, 7} | X |
| | CX400 | X | X | X | X ^{6, 7} | X |
| | CX500 | X | X | X | X ^{6, 7} | X |
| | CX600 | X | X | X | X ^{6, 7} | X |
| | CX700 | X | X | X | X ^{6, 7} | X |
| | CX3-10c ⁵ | X | X | X | X ^{6, 7} | X |
| | CX3-20 ⁵ | X | X | X | X ^{6, 7} | X |
| | CX3-20c ⁵ | X | X | X | X ^{6, 7} | X |
| | CX3-20f ⁵ | X | X | X | X ^{6, 7} | X |
| | CX3-40 ⁵ | X | X | X | X ^{6, 7} | X |
| | CX3-40c ⁵ | X | X | X | X ^{6, 7} | X |
| | CX3-40f ⁵ | X | X | X | X ^{6, 7} | X |
| | CX3-80 ⁵ | X | X | X | X ^{6, 7} | X |

See **NOTE** on page 1 for JBOD support information.

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX2.5.4 releases prior to patch 2. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX2.5.4 patch 2 or later.

⁴ Only supported with 2G HBA driver.

⁵ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

⁶ MSCS Supported with 2Gb and 4Gb HBAs using Qlogic 7.07.04.1vmw and Emulex 7.3.2_vmw4 drivers.

⁷ Supports Windows Server 2003 SP1 - Enterprise Edition, Windows Server 2003 SP2 - Enterprise Edition, Windows Server 2003 R2 - Enterprise Edition.

Table 6. EMC (Continued)

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---------------|-------------|--------------------|--------------------------------|---|--------------------|---------------|
| EMC Symmetrix | 8000 Series | X | X | X | X ³ | X |
| | DMX/DMX2 | X | X | X | X ^{6, 7} | X |
| | DMX3 | X | X | X | X ^{6, 7} | X |

See **NOTE** on page 1 for JBOD support information.

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX2.5.4 releases prior to patch 2. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX2.5.4 patch 2 or later.

⁴ Only supported with 2G HBA driver.

⁵ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

⁶ MSCS Supported with 2Gb and 4Gb HBAs using Qlogic 7.07.04.1vmw and Emulex 7.3.2_vmw4 drivers.

⁷ Supports Windows Server 2003 SP1 - Enterprise Edition, Windows Server 2003 SP2 - Enterprise Edition, Windows Server 2003 R2 - Enterprise Edition.

Table 7. Fujitsu

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---------------------------|-----------|--------------------|--------------------------------|---|--------------------|---------------|
| ETERNUS 3000 ¹ | | X | X | X | | X |
| ETERNUS 4000 | Model 80 | X | X | X | | X |
| | Model 100 | X | X | X | | X |
| | Model 300 | X | X | X | | X |
| | Model 500 | X | X | X | | X |
| ETERNUS 6000 | | X | X | X | | X |

See **NOTE** on page 1 for JBOD support information.

¹ Contact your Fujitsu representative for the required setting to enable support for the ETERNUS 3000.

Table 7. Fujitsu

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|------------|-----------------------|--------------------------------------|--|-----------------------|---------------------|
| ETERNUS 8000 | Model 700 | X | X | X | | X |
| | Model 900 | X | X | X | | X |
| | Model 1100 | X | X | X | | X |
| | Model 2100 | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |
| ¹ Contact your Fujitsu representative for the required setting to enable support for the ETERNUS 3000. | | | | | | |

Table 8. Fujitsu Siemens

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|----------------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| FibreCAT | CX3-10c ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-20 ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-20c ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-20f ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-40 ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-40c ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-40f ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-80 ⁵ | X | X | X | X ^{2,4} | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |
| ¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1. | | | | | | |
| ² This applies to Windows 2003 RTM only, but not Windows 2003 SP1. | | | | | | |
| ³ One gigabyte only. | | | | | | |
| ⁴ Only supported with 2G HBA driver. | | | | | | |
| ⁵ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later. | | | | | | |

Table 8. Fujitsu Siemens (Continued)

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|-----------------------|-------|-------------------------------|---|--|-------------------------------|--------------------------|
| FSC Storage Models | S60 | X ³ | | | | |
| | S80 | X | X | X | | |
| | AX100 | X | X | X | X ¹ | |
| | CX200 | X | X | X | X ¹ | X |
| | CX300 | X | X | X | X ¹ | X |
| | CX400 | X | X | X | X ¹ | X |
| | CX500 | X | X | X | X ¹ | X |
| | CX600 | X | X | X | X ¹ | X |
| | CX700 | X | X | X | X ¹ | X |

See **NOTE** on page 1 for JBOD support information.

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ One gigabyte only.

⁴ Only supported with 2G HBA driver.

⁵ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

Table 9. HP

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|--|-----------------------|--------------------------------------|---|-----------------------|------------------|
| HP Modular Systems Array (MSA) | 1000 ⁵ | X | X | X | X ² | X |
| | 1500 ⁵ | X | X | X | X ² | X |
| HP Enterprise Virtual Array (EVA) ⁴ | 3000 | X | X | X | X ² | X |
| | 4000 ⁶ | X | X | X | X ^{8, 9} | X |
| | 4100 ⁶ | X | X | X | X ^{8, 9} | X |
| | 4400 ⁶ | X | X | X | | |
| | 4400 with Embedded Switch ⁶ | X | X | X | | |
| | 5000 | X | X | X | X ² | X |
| | 6000 ⁶ | X | X | X | X ^{8, 9} | X |
| | 6100 ⁶ | X | X | X | X ^{8, 9} | X |
| | 8000 ⁶ | X | X | X | X ^{8, 9} | X |
| | 8100 ⁶ | X | X | X | X ^{8, 9} | X |

See **NOTE** on page 1 for JBOD support information.

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products..

¹ Limited to internal storage configurations only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ This applies to Windows 2003 RTM only, but not to Windows 2003 SP1.

⁴ Contact HP for array firmware versions and matching host mode settings.

⁵ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500).

⁶ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

⁷ Only supported with 2G HBA driver.

⁸ MSCS Supported with 2Gb and 4Gb HBAs using Qlogic 7.07.04.1vmw and Emulex 7.3.2_vmw4 drivers.

⁹ Supports Windows Server 2003 SP1 - Enterprise Edition, Windows Server 2003 SP2 - Enterprise Edition , Windows Server 2003 R2 - Enterprise Edition.

Table 9. HP

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|-----------------|----------------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| HP StorageWorks | XP48 | X | X | X | X ³ | X |
| | XP128 | X | X | X | X ³ | X |
| | XP512 | X | X | X | X ³ | X |
| | XP1024 | X | X | X | X ³ | X |
| | XP10000 ¹ | X | X | X | X ³ | X |
| | XP12000 ¹ | X | X | X | X ³ | X |

See **NOTE** on page 1 for JBOD support information.

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products..

¹ Limited to internal storage configurations only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ This applies to Windows 2003 RTM only, but not to Windows 2003 SP1.

⁴ Contact HP for array firmware versions and matching host mode settings.

⁵ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500).

⁶ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

⁷ Only supported with 2G HBA driver.

⁸ MSCS Supported with 2Gb and 4Gb HBAs using Qlogic 7.07.04.1vmw and Emulex 7.3.2_vmw4 drivers.

⁹ Supports Windows Server 2003 SP1 - Enterprise Edition, Windows Server 2003 SP2 - Enterprise Edition , Windows Server 2003 R2 - Enterprise Edition.

Table 10. Hitachi, Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|--------------------|--------------------------------|---|--------------------|---------------|
| BR 50 | X | X | X | X | X |
| BR 150 | X | X | X | X | X |
| SANRISE USP 100 ¹ | X | X | X | | X |
| SANRISE USP 600 ¹ | X | X | X | | X |
| SANRISE USP 1100 ¹ | X | X | X | | X |
| SANRISE NSC ¹ | X | X | X | | X |
| SANRISE H12000 ¹ | X | X | X | | X |
| SANRISE H10000 ¹ | X | X | X | | X |
| SANRISE 9980V | X | X | X | | X |
| SANRISE 9970V | X | X | X | | X |
| SANRISE H1024 | X | X | X | | X |
| SANRISE H128 | X | X | X | | X |
| SANRISE 2000 | X | X | X | | X |
| SANRISE 9500V series | X | X | X | | X |
| SANRISE 9585V | X | X | X | | X |
| SANRISE 9570V | X | X | X | | X |
| SANRISE 9530V | X | X | X | | X |
| SANRISE AMS200 | X | X | X | X | X |
| SANRISE AMS500 | X | X | X | X | X |
| SANRISE AMS1000 | X | X | X | X | X |
| SANRISE WMS100 | X | X | X | X | X |
| See NOTE on page 1 for JBOD support information. | | | | | |
| ¹ Limited to internal storage configurations only. | | | | | |

Table 11. Hitachi Data Systems (HDS)

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|--------------------|--------------------------------|---|--------------------|---------------|
| 9500 V Series | X | X | X | | X |
| Lightning 9910 | X | X | X | | X |
| Lightning 9960 | X | X | X | | X |
| Lightning 9970V | X | X | X | | X |
| Lightning 9980V | X | X | X | | X |
| TagmaStore AMS200 | X | X | X | X | X |
| TagmaStore AMS500 | X | X | X | X | X |
| TagmaStore AMS1000 | X | X | X | X | X |
| TagmaStore NSC55 ¹ | X | X | X | | X |
| TagmaStore USP 100 ¹ | X | X | X | | X |
| TagmaStore USP 1100 ¹ | X | X | X | | X |
| TagmaStore USP 600 ¹ | X | X | X | | X |
| TagmaStore WMS 100 | X | X | X | X | X |
| Thunder 9520V | X | X | X | | X |
| Thunder 9530V | X | X | X | | X |
| Thunder 9570V | X | X | X | | X |
| Thunder 9585V | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | |
| ¹ Limited to internal storage configurations only. | | | | | |

Table 12. IBM

| | | Basic connectivity | Multipathing with HBA failover⁴ | Multipathing with storage port failover⁴ | Clustering support | Boot from SAN |
|---------------|--------------------------|-------------------------------|---|--|-------------------------------|------------------------------|
| IBM DS Series | FASTT 200 | X | X | X | X ² | X |
| | FASTT 500 | X | X | X | X ² | X |
| | 3400 | X | X | X | | X |
| | 4100 | X | X | X | X | X |
| | 4200 ⁵ | X | X | X | X ^{7, 8} | X |
| | 4300 | X | X | X | X ⁶ | X |
| | 4400 | X | X | X | X ² | X |
| | 4500 | X | X | X | X ² | X |
| | 4700 ⁵ | X | X | X | X ^{7, 8} | X |
| | 4800 | X | X | X | X ^{7, 8} | X |
| | 6000 | X | X | X | | X |
| | 8000 Series ¹ | X | X | X | | X |

See **NOTE** on page 1 for JBOD support information.

¹ QLogic HBA support only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, IBM supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between IBM filers and does not affect the behavior of the filers as seen by the servers.

⁴ In addition to the multipathing options detailed in the matrix above, IBM offers filer clustering. This configuration is certified to work as well with the exception of:
Linux Guest operating systems are only supported if using the vmxlsiologic SCSI emulation driver. For configuration details of changes to guest operating system support, check What's New in ESX Server at: www.vmware.com/support/esx25/doc/releasenotes_esx25.html.

⁵ Requires ESX2.5.3 Upgrade Patch 3 or higher.

⁶ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX Server 2.5.4 releases prior to patch 2. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX Server 2.5.4 patch 2 or later.

⁷ MSCS Supported with 2Gb and 4Gb HBAs using Qlogic 7.07.04.1vmw and Emulex 7.3.2_vmw4 drivers.

⁸ Supports Windows Server 2003 SP1 - Enterprise Edition, Windows Server 2003 SP2 - Enterprise Edition, Windows Server 2003 R2 - Enterprise Edition.

Table 12. IBM

| | | | | | | |
|------------------|----------------------|---|---|---|----------------|---|
| IBM System | N3700 ³ | X | X | X | X ² | X |
| Storage N Series | N5200 ³ | X | X | X | X ² | X |
| | N5500 ³ | X | X | X | X ² | X |
| | ESS 800 ¹ | X | X | X | | X |

See **NOTE** on page 1 for JBOD support information.

¹ QLogic HBA support only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, IBM supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between IBM filers and does not affect the behavior of the filers as seen by the servers.

⁴ In addition to the multipathing options detailed in the matrix above, IBM offers filer clustering. This configuration is certified to work as well with the exception of:
Linux Guest operating systems are only supported if using the vmxsisilogic SCSI emulation driver. For configuration details of changes to guest operating system support, check What's New in ESX Server at: www.vmware.com/support/esx25/doc/releasenotes_esx25.html.

⁵ Requires ESX2.5.3 Upgrade Patch 3 or higher.

⁶ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX Server 2.5.4 releases prior to patch 2. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX Server 2.5.4 patch 2 or later.

⁷ MSCS Supported with 2Gb and 4Gb HBAs using Qlogic 7.07.04.1vmw and Emulex 7.3.2_vmw4 drivers.

⁸ Supports Windows Server 2003 SP1 - Enterprise Edition, Windows Server 2003 SP2 - Enterprise Edition, Windows Server 2003 R2 - Enterprise Edition.

Table 13. NetApp

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-------------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| NetApp Fibre Channel SAN Attached Storage System ¹ | FAS200 Series | X | X | X | X ⁴ | X |
| | F800 Series | X | X | X | X ⁴ | X |
| | FAS900 Series | X | X | X | X ⁴ | X |
| | FAS3000 Series | X | X | X | X ⁴ | X |
| | FAS6000 Series | X | X | X | | X |

See **NOTE** on page 1 for JBOD support information.

¹ These configurations are also supported with the NetApp NearStore R200 back end.

² VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, NetApp supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between NetApp Storage Systems and does not affect the behavior of the storage systems as seen by the servers.

³ In addition to the multipathing options detailed in the matrix above, NetApp offers storage system clustering. This configuration is certified to work as well with the exception of:

Linux Guest operating systems are only supported if using the vmxlsiologic SCSI emulation driver. For configuration details of changes to guest operating system support, check What's New in ESX Server at: www.vmware.com/support/esx25/doc/releasesnotes_esx25.html.

⁴ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 14. NEC

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| iStorage | S400 | X | X | X | | X |
| | S500 | X | X | X | | X |
| | S1400 | X | X | X | | X |
| | S1500 | X | X | X | | X |
| | S2400 | X | X | X | | X |
| | S2500 | X | X | X | | X |
| | S2800 | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |

Table 15. Nihon Unisys Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-----------------------|--------------------------------------|---|-----------------------|------------------|
| SANARENA 1830 | X | X | X | X | X |
| SANARENA 1870 | X | X | X | X | X |
| SANARENA 1890 | X | X | X | X | X |
| SANARENA 1895 | X | X | X | X | X |
| SANARENA 18AS | X | X | X | X | X |
| SANARENA 5200 ¹ | X | X | X | | X |
| SANARENA 5800 ¹ | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | |
| ¹ Limited to internal storage configurations only. | | | | | |

Table 16. Pillar Data Systems

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|-----|-----------------------|--------------------------------------|---|-----------------------|------------------|
| Axiom | 300 | X | X | X | | X |
| Axiom | 500 | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |

Table 17. 3PAR

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| InServ Storage Servers | S200 | X | X | X | | X |
| | S400 | X | X | X | | X |
| | S800 | X | X | X | | X |
| T-Class | | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |

Table 18. Sun

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-----------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| StorageTek FlexLine | FLX 380 | X | X | X ² | | X |
| | FLX 280 | X | X | X | | X |
| | FLX240 | X | X | X | | X |
| | FLX 210 | X | X | X | | X |
| | BC84/D178 | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |
| ¹ Limited to internal storage configurations only. | | | | | | |
| ² Multiple Pathing with storage port failover Supported only on ESX Server 2.5.4 Upgrade Patch 2 | | | | | | |

Table 18. Sun

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|------------|-------------------|--------------------|--------------------------------|---|--------------------|---------------|
| StorageTek | 3510 | X | X | X | | X |
| | 3511 | X | X | X | | X |
| | 6540 | X | X | X ² | | X |
| | 6920 ¹ | X | X | X | | X |
| | 9910 | X | X | X | | X |
| | 9960 | X | X | X | | X |
| | 9970 | X | X | X | | X |
| | 9980 | X | X | X | | X |
| | 9985 ¹ | X | X | X | | X |
| | 9990 ¹ | X | X | X | | X |

See [NOTE](#) on page 1 for JBOD support information.

¹ Limited to internal storage configurations only.

² Multiple Pathing with storage port failover Supported only on ESX Server 2.5.4 Upgrade Patch 2

Table 19. Xiotech

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--------------|--------------------|--------------------|--------------------------------|---|--------------------|---------------|
| Magnitude 3D | Magnitude 3D 1000e | X | X | X | | X |
| | Magnitude 3D 1000s | X | X | X | | X |
| | Magnitude 3D 3000e | X | X | X | | X |
| | Magnitude 3D 3000s | X | X | X | | X |

See [NOTE](#) on page 1 for JBOD support information.

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2.5.5 drivers are based on the Emulex provided lpfcdd_732 7.3.2_vmw4 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

VMware ESX Server 2.5.4 Upgrade Patch 4 enabled support for 4GB Emulex Fibre Channel HBA.

- LP1150
- LP11002
- LPe1105
- LPe1150
- LPe11000
- LPe11002

Table 20.

| | |
|-------------------------------------|--|
| LP8000, 8000DC | If your HBA has a Dragonfly chip version 2.00 or greater, use firmware version 3.90a7. If your HBA has a Dragonfly chip below version 2.00, use firmware version 3.30a7. |
| LP9000 | Minimum firmware revision 3.90a1 |
| LP9002L, LP9002L-E, LP9002C, 9002DC | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.90a1 |
| LP9802DC | Minimum firmware revision 1.00a2 |
| LP10000, 10000DC, LP10000E | Minimum firmware revision 1.91a5 |
| LP101 | |
| LP952L | Minimum firmware revision 3.91a3 |
| LP982, 9802 | Minimum firmware revision 1.91a5 |
| LP1050, 1050DC, 1050-F2 | Minimum firmware revision 1.91a5 |
| LP1050EX | |
| LP7000E | Minimum firmware revision 3.21a0 |

VMware supports the following HP OEM versions of the Emulex adapters:

Table 21. Hewlett Packard OEM Emulex Adapters

| | |
|-------------------|----------------------------------|
| Emulex LPE1105-HP | |
| FC2143 | |
| FC2243 | |
| FC2142SR | |
| FC2242SR | |
| FCA2404DC | Minimum firmware revision 1.00a2 |

Table 21. Hewlett Packard OEM Emulex Adapters

| | |
|--|----------------------------------|
| FCA2684, FCA2684DC | Minimum firmware revision 1.80a2 |
| A7298A, FCA2408, AB232A, FCA2384, FCA2404 | Minimum firmware revision 1.00a4 |
| A7387A, A7388A, AB466A, AB467A A7560A | Minimum firmware revision 1.80a3 |

VMware supports the following Sun OEM versions of the Emulex adapters:

Table 22. Sun OEM Emulex Adapters

| | |
|----------------|----------------------------------|
| SG-XPCI1FC-EM2 | Minimum firmware revision 1.70a3 |
| SG-XPCI2FC-EM2 | Minimum firmware revision 1.70a3 |

QLogic Fibre Channel Adapters

The default ESX Server 2.5.5 driver is based on the QLogic-provided qla2300_707 7.07.04 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

VMware ESX Server 2.5.4 Upgrade Patch 4 enabled support for 4GB QLogic Fibre Channel HBA.

- QLA2460
- QLA2462
- QLE2460
- QLE2462
- QMH2462

The HBA that controls the boot LUN must be a QLogic HBA; currently the QLA-23xx series is supported.

- QLA-2200
- QLA-2300
- QLA-2310/2312 (Blade servers)
- QLA-2340/2342
- QLE-2360/2362

VMware supports the following Dell OEM versions of the QLogic adapters:

- Dell QLogic 2342M (for Dell PowerEdge 1855 blade servers)

- Dell QLogic 2362M (for Dell PowerEdge 6850)

VMware supports the following HP OEM versions of the QLogic adapters:

- HP FC1142SR
- HP FC1143
- HP FC1242SR
- HP FC1243
- HP FCA2210
- HP FCA2214
- HP FCA2214DC
- HP QLogic QMH2462

VMware supports the following Sun OEM versions of the QLogic adapters:

Table 23. Supported Sun OEM Versions of QLogic Adapters

| QLogic Adapter | Sun OEM Version |
|---|-----------------------------------|
| QLA2342 | Sun SG-XPCI2FC-QF2 ¹ |
| QLA2342 | StorageTek HBAQ032 |
| QLA2342R | Sun SG-XPCI2FC-QF2-Z ¹ |
| ¹ This OEM version of the QLogic adapter does not support boot-from-SAN. | |

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 24.

| QLogic Adapter | IBM OEM Version |
|----------------|----------------------------------|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |
| 48P7061 | IBM HS20 Fibre Channel Expansion |

Table 24.

| QLogic Adapter | IBM OEM Version |
|----------------|---|
| 13N2203 | IBM HS20 Fibre Channel Expansion |
| 26K4841 | IBM Bladecenter SFF Fibre Channel Expansion |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 25.

| | ESX Server 2.5.5 |
|---|--------------------------------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 192 + n*32 where n=#physical extents |

¹ When you use an Emulex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs.

² ESX Server 2.5.4 supports a maximum of 160 virtual targets. In some situations (For example, when every virtual target is on a different VMFS volume), that maximum may decrease to 128 virtual targets.

³ In ESX Server 2.5.4, VMFS-2 can span up to 32 partitions on multiple disks, each of which can support 2TB of space.

ESX Server 2.5.4

This section lists the supported SAN devices for ESX Server version 2.5.4. VMware and our partners are actively working together to qualify certification for additional devices as quickly as possible. Please check back periodically for updates and newly certified HBAs and storage devices currently tested by VMware and its storage partners. The latest version of this guide is available on the VMware Web site at <http://www.vmware.com/support/resources/>.

Storage Vendor Qualifications and Support

ESX Server 2.5.4 is supported by the following major storage vendors:

- “Bull” on page 27
- “Dell” on page 28
- “EMC” on page 29
- “Fujitsu” on page 30
- “Fujitsu Siemens” on page 31
- “HP” on page 32
- “Hitachi, Ltd” on page 34
- “Hitachi Data Systems (HDS)” on page 35
- “IBM” on page 36
- “NetApp” on page 37
- “NEC” on page 38
- “Nihon Unisys Ltd,” on page 38
- “Pillar Data Systems” on page 39
- “3PAR” on page 39
- “Sun” on page 39
- “Xiotech” on page 40

Server Clustering

Storage arrays are tested in clustered and non-clustered environments. Clustering refers to the use of Microsoft Cluster Services (Windows 2003 and 2000) in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

The following options are supported with MSCS and ESX Server 2.5.x:

Table 26.

| ESX Version | Windows OS | FC HBA Speed | Supported FC drivers |
|-----------------------------------|-----------------------|--------------|--|
| Prior to ESX Server 2.5.4 patch 2 | 2000 SP4 | 2G | Default 2G |
| | 2003 RTM | 2G | |
| ESX Server 2.5.4 patch 2 or later | 2000 SP4 | 2G | Default 2G |
| | 2003 RTM | 2G | Qlogic: qla2200_7xx/qla2300_7xx 7.04.00 |
| | 2003 SP1 ¹ | 2G | Emulex: lpfcdd_2xx 2.01g |
| | 2003 R2 ¹ | 2G | |
| ESX 2.5.5 | 2000 SP4 | 2G&4G | Default unified 2G&4G |
| | | | Qlogic: qla2200_707/qla2300_707 7.07.04 Emulex: lpfcdd_732 7.3.2_vmw4 |

¹ Requires Microsoft hotfix KB <http://support.microsoft.com/kb/911030>.

ESX Server 2.5.4 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2000 and 2003:

Table 27.

| Configuration | Description | Restrictions |
|--|---|--|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only. |
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only ■ If using SAN path failover, this configuration is fully supported only if the virtual machines share raw disks, not virtual disks. If virtual machines share virtual disks, the cluster will fail over before the SAN path fails over. |
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | <ul style="list-style-type: none"> ■ Two-node cluster only. |

ESX Server 2.5.4 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Storage Arrays

VMware ESX Server 2.5.4 supports a variety of storage arrays in various configurations. The tables below state the VMware supported storage arrays and the supported configurations for each vendor.

Note: All storage products listed in this compatibility guide are supported. For further details about array firmware, storage product configurations, and best practices, please contact the storage vendor.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switch. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Boot from SAN — In this configuration, the ESX Server machine boots from a LUN stored on the SAN rather than in the server itself.

Table 28. Bull

| | | Basic connectivity Multipathing with HBA failover Multipathing with storage port failover Microsoft Clustering support Boot from SAN | | | |
|--|---------|--|---|---|---|
| StoreWay | FDA1500 | X | X | X | X |
| | FDA2500 | X | X | X | X |
| | FDA2800 | X | X | X | X |
| See NOTE on page 1 for JBOD support information. | | | | | |

Table 29. Dell

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|-------------------------|--------------------|--------------------------------|---|--------------------|---------------|
| Power Vault 650F | X | | | | |
| AX100 | X | X | X | X ¹ | |
| AX150 | X | X | X | X ¹ | |
| CX200 | X | X | X | X ¹ | X |
| CX300 | X | X | X | X ³ | X |
| CX400 | X | X | X | X ³ | X |
| CX500 | X | X | X | X ³ | X |
| CX600 | X | X | X | X ³ | X |
| CX700 | X | X | X | X ³ | X |
| CX3-20 ⁶ | X | X | X | X ^{2, 5} | X |
| CX3-20c ^{4, 6} | X | X | X | X ^{2, 5} | X |
| CX3-40 ⁶ | X | X | X | X ^{2, 5} | X |
| CX3-40c ⁶ | X | X | X | X ^{2, 5} | X |
| CX3-80 ⁶ | X | X | X | X ^{2, 5} | X |

See **NOTE** on page 1 for JBOD support information.

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX2.5.4 releases prior to patch 2. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX2.5.4 patch 2 or later.

⁴ Supported on Fibre Channel only, not iSCSI.

⁵ Only supported with 2G HBA driver.

⁶ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

Table 30. EMC

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|------------------|----------------------|-----------------------|--------------------------------------|---|-----------------------|---------------------|
| EMC CLARiiON | AX100 | X | X | X | X ¹ | |
| | AX150 ⁵ | X | X | X | X ¹ | |
| | CX200 | X | X | X | X ¹ | X |
| | CX300 | X | X | X | X ³ | X |
| | CX400 | X | X | X | X ³ | X |
| | CX500 | X | X | X | X ³ | X |
| | CX600 | X | X | X | X ³ | X |
| | CX700 | X | X | X | X ³ | X |
| | CX3-10c ⁵ | X | X | X | X ^{2, 4} | X |
| | CX3-20 ⁵ | X | X | X | X ^{2, 4} | X |
| | CX3-20c ⁵ | X | X | X | X ^{2, 4} | X |
| | CX3-20f ⁵ | X | X | X | X ^{2, 4} | X |
| | CX3-40 ⁵ | X | X | X | X ^{2, 4} | X |
| | CX3-40c ⁵ | X | X | X | X ^{2, 4} | X |
| | CX3-40f ⁵ | X | X | X | X ^{2, 4} | X |
| | CX3-80 ⁵ | X | X | X | X ^{2, 4} | X |
| EMC Symmetrix | 8000 Series | X | X | X | X ³ | X |
| | DMX/ DMX2 | X | X | X | X ³ | X |
| | DMX3 | X | X | X | X ¹ | X |

See **NOTE** on page 1 for JBOD support information.

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX2.5.4 releases prior to patch 2. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX2.5.4 patch 2 or later.

⁴ Only supported with 2G HBA driver.

⁵ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

Table 31. Fujitsu

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|------------|-----------------------|--------------------------------------|---|-----------------------|---------------------|
| ETERNUS 3000 ¹ | | X | X | X | | X |
| ETERNUS 4000 | Model 80 | X | X | X | | X |
| | Model 100 | X | X | X | | X |
| | Model 300 | X | X | X | | X |
| | Model 500 | X | X | X | | X |
| ETERNUS 6000 | | X | X | X | | X |
| ETERNUS 8000 | Model 700 | X | X | X | | X |
| | Model 900 | X | X | X | | X |
| | Model 1100 | X | X | X | | X |
| | Model 2100 | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |
| ¹ Contact your Fujitsu representative for the required setting to enable support for the ETERNUS 3000. | | | | | | |

Table 32. Fujitsu Siemens

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|-----------------------|----------------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| FibreCAT | CX3-10c ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-20 ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-20c ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-20f ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-40 ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-40c ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-40f ⁵ | X | X | X | X ^{2,4} | X |
| | CX3-80 ⁵ | X | X | X | X ^{2,4} | X |
| FSC Storage Models | S60 | X ³ | | | | |
| | S80 | X | X | X | | |
| | AX100 | X | X | X | X ¹ | |
| | CX200 | X | X | X | X ¹ | X |
| | CX300 | X | X | X | X ¹ | X |
| | CX400 | X | X | X | X ¹ | X |
| | CX500 | X | X | X | X ¹ | X |
| | CX600 | X | X | X | X ¹ | X |
| | CX700 | X | X | X | X ¹ | X |

See **NOTE** on page 1 for JBOD support information.

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ One gigabyte only.

⁴ Only supported with 2G HBA driver.

⁵ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

Table 33. HP

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|--|-----------------------|--------------------------------------|---|-----------------------|------------------|
| HP Modular Systems Array (MSA) | 1000 ⁵ | X | X | X | X ² | X |
| | 1500 ⁵ | X | X | X | X ² | X |
| HP Enterprise Virtual Array (EVA) ⁴ | 3000 | X | X | X | X ² | X |
| | 4000 ⁶ | X | X | X | X ^{3, 7} | X |
| | 4100 ⁶ | X | X | X | X ^{3, 7} | X |
| | 4400 ⁶ | X | X | X | | |
| | 4400 with Embedded Switch ⁶ | X | X | X | | |
| | 5000 | X | X | X | X ² | X |
| | 6000 ⁶ | X | X | X | X ^{3, 7} | X |
| | 6100 ⁶ | X | X | X | X ^{3, 7} | X |
| | 8000 ⁶ | X | X | X | X ^{3, 7} | X |
| | 8100 ⁶ | X | X | X | X ^{3, 7} | X |

See **NOTE** on page 1 for JBOD support information.

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products..

¹ Limited to internal storage configurations only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ This applies to Windows 2003 RTM only, but not to Windows 2003 SP1.

⁴ Contact HP for array firmware versions and matching host mode settings.

⁵ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500).

⁶ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

⁷ Only supported with 2G HBA driver.

Table 33. HP

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|-----------------|----------------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| HP StorageWorks | XP48 | X | X | X | X ³ | X |
| | XP128 | X | X | X | X ³ | X |
| | XP512 | X | X | X | X ³ | X |
| | XP1024 | X | X | X | X ³ | X |
| | XP10000 ¹ | X | X | X | X ³ | X |
| | XP12000 ¹ | X | X | X | X ³ | X |

See **NOTE** on page 1 for JBOD support information.

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products..

¹ Limited to internal storage configurations only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ This applies to Windows 2003 RTM only, but not to Windows 2003 SP1.

⁴ Contact HP for array firmware versions and matching host mode settings.

⁵ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500).

⁶ Supported with 4Gb HBAs with ESX Server 2.5.4 Upgrade Patch 4 or later.

⁷ Only supported with 2G HBA driver.

Table 34. Hitachi, Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|--------------------|--------------------------------|---|--------------------|---------------|
| BR 50 | X | X | X | X | X |
| BR 150 | X | X | X | X | X |
| SANRISE USP 100 ¹ | X | X | X | | X |
| SANRISE USP 600 ¹ | X | X | X | | X |
| SANRISE USP 1100 ¹ | X | X | X | | X |
| SANRISE NSC ¹ | X | X | X | | X |
| SANRISE H12000 ¹ | X | X | X | | X |
| SANRISE H10000 ¹ | X | X | X | | X |
| SANRISE 9980V | X | X | X | | X |
| SANRISE 9970V | X | X | X | | X |
| SANRISE H1024 | X | X | X | | X |
| SANRISE H128 | X | X | X | | X |
| SANRISE 2000 | X | X | X | | X |
| SANRISE 9500V series | X | X | X | | X |
| SANRISE 9585V | X | X | X | | X |
| SANRISE 9570V | X | X | X | | X |
| SANRISE 9530V | X | X | X | | X |
| SANRISE AMS200 | X | X | X | X | X |
| SANRISE AMS500 | X | X | X | X | X |
| SANRISE AMS1000 | X | X | X | X | X |
| SANRISE WMS100 | X | X | X | X | X |
| See NOTE on page 1 for JBOD support information. | | | | | |
| ¹ Limited to internal storage configurations only. | | | | | |

Table 35. Hitachi Data Systems (HDS)

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|--------------------|--------------------------------|---|--------------------|---------------|
| 9500 V Series | X | X | X | | X |
| Lightning 9910 | X | X | X | | X |
| Lightning 9960 | X | X | X | | X |
| Lightning 9970V | X | X | X | | X |
| Lightning 9980V | X | X | X | | X |
| TagmaStore AMS200 | X | X | X | X | X |
| TagmaStore AMS500 | X | X | X | X | X |
| TagmaStore AMS1000 | X | X | X | X | X |
| TagmaStore NSC55 ¹ | X | X | X | | X |
| TagmaStore USP 100 ¹ | X | X | X | | X |
| TagmaStore USP 1100 ¹ | X | X | X | | X |
| TagmaStore USP 600 ¹ | X | X | X | | X |
| TagmaStore WMS 100 | X | X | X | X | X |
| Thunder 9520V | X | X | X | | X |
| Thunder 9530V | X | X | X | | X |
| Thunder 9570V | X | X | X | | X |
| Thunder 9585V | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | |
| ¹ Limited to internal storage configurations only. | | | | | |

Table 36. IBM

| | | Basic connectivity | Multipathing with HBA failover ⁴ | Multipathing with storage port failover ⁴ | Clustering support | Boot from SAN |
|-----------------------------|--------------------------|--------------------|---|--|--------------------|---------------|
| IBM DS Series | FAST 200 | X | X | X | X ² | X |
| | FAST 500 | X | X | X | X ² | X |
| | 3400 | X | X | X | | X |
| | 4100 | X | X | X | X | X |
| | 4200 ⁵ | X | X | X | | X |
| | 4300 | X | X | X | X ⁶ | X |
| | 4400 | X | X | X | X ² | X |
| | 4500 | X | X | X | X ² | X |
| | 4700 ⁵ | X | X | X | | X |
| | 4800 | X | X | X | X ² | X |
| | 6000 | X | X | X | | X |
| | 8000 Series ¹ | X | X | X | | X |
| IBM System Storage N Series | N3700 ³ | X | X | X | X ² | X |
| | N5200 ³ | X | X | X | X ² | X |
| | N5500 ³ | X | X | X | X ² | X |
| | ESS 800 ¹ | X | X | X | | X |

See **NOTE** on page 1 for JBOD support information.

¹ QLogic HBA support only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, IBM supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between IBM filers and does not affect the behavior of the filers as seen by the servers.

⁴ In addition to the multipathing options detailed in the matrix above, IBM offers filer clustering. This configuration is certified to work as well with the exception of:
Linux Guest operating systems are only supported if using the vmxsililogic SCSI emulation driver. For configuration details of changes to guest operating system support, check What's New in ESX Server at: www.vmware.com/support/esx25/doc/releasenotes_esx25.html.

⁵ Requires ESX2.5.3 Upgrade Patch 3 or higher.

⁶ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX Server 2.5.4 releases prior to patch 2. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX Server 2.5.4 patch 2 or later.

Table 37. NetApp

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-------------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| NetApp Fibre Channel SAN Attached Storage System ¹ | FAS200 Series | X | X | X | X ⁴ | X |
| | F800 Series | X | X | X | X ⁴ | X |
| | FAS900 Series | X | X | X | X ⁴ | X |
| | FAS3000 Series | X | X | X | X ⁴ | X |
| | FAS6000 Series | X | X | X | | X |

See **NOTE** on page 1 for JBOD support information.

¹ These configurations are also supported with the NetApp NearStore R200 back end.

² VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, NetApp supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between NetApp Storage Systems and does not affect the behavior of the storage systems as seen by the servers.

³ In addition to the multipathing options detailed in the matrix above, NetApp offers storage system clustering. This configuration is certified to work as well with the exception of:

Linux Guest operating systems are only supported if using the vmxlsiologic SCSI emulation driver. For configuration details of changes to guest operating system support, check What's New in ESX Server at: www.vmware.com/support/esx25/doc/releasesnotes_esx25.html.

⁴ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 38. NEC

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| iStorage | S400 | X | X | X | | X |
| | S500 | X | X | X | | X |
| | S1400 | X | X | X | | X |
| | S1500 | X | X | X | | X |
| | S2400 | X | X | X | | X |
| | S2500 | X | X | X | | X |
| | S2800 | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |

Table 39. Nihon Unisys Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-----------------------|--------------------------------------|---|-----------------------|------------------|
| SANARENA 1830 | X | X | X | X | X |
| SANARENA 1870 | X | X | X | X | X |
| SANARENA 1890 | X | X | X | X | X |
| SANARENA 1895 | X | X | X | X | X |
| SANARENA 18AS | X | X | X | X | X |
| SANARENA 5200 ¹ | X | X | X | | X |
| SANARENA 5800 ¹ | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | |
| ¹ Limited to internal storage configurations only. | | | | | |

Table 40. Pillar Data Systems

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|-----|-----------------------|--------------------------------------|---|-----------------------|------------------|
| Axiom | 300 | X | X | X | | X |
| Axiom | 500 | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |

Table 41. 3PAR

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| InServ Storage Servers | S200 | X | X | X | | X |
| | S400 | X | X | X | | X |
| | S800 | X | X | X | | X |
| T-Class | | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |

Table 42. Sun

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-----------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| StorageTek FlexLine | FLX 380 | X | X | X ² | | X |
| | FLX 280 | X | X | X | | X |
| | FLX240 | X | X | X | | X |
| | FLX 210 | X | X | X | | X |
| | BC84/D178 | X | X | X | | X |
| See NOTE on page 1 for JBOD support information. | | | | | | |
| ¹ Limited to internal storage configurations only. | | | | | | |
| ² Multiple Pathing with storage port failover Supported only on ESX Server 2.5.4 Upgrade Patch 2 | | | | | | |

Table 42. Sun

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|------------|-------------------|--------------------|--------------------------------|---|--------------------|---------------|
| StorageTek | 3510 | X | X | X | | X |
| | 3511 | X | X | X | | X |
| | 6540 | X | X | X ² | | X |
| | 6920 ¹ | X | X | X | | X |
| | 9910 | X | X | X | | X |
| | 9960 | X | X | X | | X |
| | 9970 | X | X | X | | X |
| | 9980 | X | X | X | | X |
| | 9985 ¹ | X | X | X | | X |
| | 9990 ¹ | X | X | X | | X |

See [NOTE](#) on page 1 for JBOD support information.

¹ Limited to internal storage configurations only.

² Multiple Pathing with storage port failover Supported only on ESX Server 2.5.4 Upgrade Patch 2

Table 43. Xiotech

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--------------------|--------------------|--------------------|--------------------------------|---|--------------------|---------------|
| Magnitude 3D 1000e | Magnitude 3D 1000e | X | X | X | | X |
| | Magnitude 3D 1000s | X | X | X | | X |
| | Magnitude 3D 3000e | X | X | X | | X |
| | Magnitude 3D 3000s | X | X | X | | X |

See [NOTE](#) on page 1 for JBOD support information.

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2.5.4 drivers are based on the Emulex-provided lpfcdd-2xx 2.01g driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

VMware ESX Server 2.5.4 Upgrade Patch 4 enabled support for 4GB Emulex Fibre Channel HBA.

- LP1150
- LP11002
- LPe1105
- LPe1150
- LPe11000
- LPe11002

Table 44.

| | |
|-------------------------------------|--|
| LP8000, 8000DC | If your HBA has a Dragonfly chip version 2.00 or greater, use firmware version 3.90a7. If your HBA has a Dragonfly chip below version 2.00, use firmware version 3.30a7. |
| LP9000 | Minimum firmware revision 3.90a1 |
| LP9002L, LP9002L-E, LP9002C, 9002DC | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.90a1 |
| LP9802DC | Minimum firmware revision 1.00a2 |
| LP10000, 10000DC, LP10000E | Minimum firmware revision 1.91a5 |
| LP101 | |
| LP952L | Minimum firmware revision 3.91a3 |
| LP982, 9802 | Minimum firmware revision 1.91a5 |
| LP1050, 1050DC, 1050-F2 | Minimum firmware revision 1.91a5 |
| LP1050EX | |
| LP7000E | Minimum firmware revision 3.21a0 |

VMware supports the following HP OEM versions of the Emulex adapters:

Table 45. Hewlett Packard OEM Emulex Adapters

| | |
|-------------------|----------------------------------|
| Emulex LPE1105-HP | |
| FC2143 | |
| FC2243 | |
| FC2142SR | |
| FC2242SR | |
| FCA2404DC | Minimum firmware revision 1.00a2 |

Table 45. Hewlett Packard OEM Emulex Adapters

| | |
|--|----------------------------------|
| FCA2684, FCA2684DC | Minimum firmware revision 1.80a2 |
| A7298A, FCA2408, AB232A, FCA2384, FCA2404 | Minimum firmware revision 1.00a4 |
| A7387A, A7388A, AB466A, AB467A | Minimum firmware revision 1.80a3 |
| A7560A | |

VMware supports the following Sun OEM versions of the Emulex adapters:

Table 46. Sun OEM Emulex Adapters

| | |
|----------------|----------------------------------|
| SG-XPCI1FC-EM2 | Minimum firmware revision 1.70a3 |
| SG-XPCI2FC-EM2 | Minimum firmware revision 1.70a3 |

QLogic Fibre Channel Adapters

The default ESX Server 2.5.4 driver is based on the QLogic-provided qla2x00 v 7.0.4 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

VMware ESX Server 2.5.4 Upgrade Patch 4 enabled support for 4GB QLogic Fibre Channel HBA.

- QLA2460
- QLA2462
- QLE2460
- QLE2462
- QMH2462

The HBA that controls the boot LUN must be a QLogic HBA; currently the QLA-23xx series is supported.

- QLA-2200
- QLA-2300
- QLA-2310/2312 (Blade servers)
- QLA-2340/2342
- QLE-2360/2362

VMware supports the following Dell OEM versions of the QLogic adapters:

- Dell QLogic 2342M (for Dell PowerEdge 1855 blade servers)

- Dell QLogic 2362M (for Dell PowerEdge 6850)

VMware supports the following HP OEM versions of the QLogic adapters:

- HP FC1142SR
- HP FC1143
- HP FC1242SR
- HP FC1243
- HP FCA2210
- HP FCA2214
- HP FCA2214DC
- HP QLogic QMH2462

VMware supports the following Sun OEM versions of the QLogic adapters:

Table 47. Supported Sun OEM Versions of QLogic Adapters

| QLogic Adapter | Sun OEM Version |
|---|-----------------------------------|
| QLA2342 | Sun SG-XPCI2FC-QF2 ¹ |
| QLA2342 | StorageTek HBAQ032 |
| QLA2342R | Sun SG-XPCI2FC-QF2-Z ¹ |
| ¹ This OEM version of the QLogic adapter does not support boot-from-SAN. | |

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 48.

| QLogic Adapter | IBM OEM Version |
|----------------|----------------------------------|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |
| 48P7061 | IBM HS20 Fibre Channel Expansion |

Table 48.

| QLogic Adapter | IBM OEM Version |
|----------------|---|
| 13N2203 | IBM HS20 Fibre Channel Expansion |
| 26K4841 | IBM Bladecenter SFF Fibre Channel Expansion |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 49.

| | ESX Server 2.5.4 |
|---|--------------------------------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 192 + n*32 where n=#physical extents |

¹ When you use an Emulex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs.

² ESX Server 2.5.4 supports a maximum of 160 virtual targets. In some situations (For example, when every virtual target is on a different VMFS volume), that maximum may decrease to 128 virtual targets.

³ In ESX Server 2.5.4, VMFS-2 can span up to 32 partitions on multiple disks, each of which can support 2TB of space.

ESX Server 2.5.3

This section lists the supported SAN devices for ESX Server version 2.5.3. VMware and our partners are actively working together to qualify certification for additional devices as quickly as possible. Please check back periodically for updates and newly certified HBAs and storage devices currently tested by VMware and its storage partners. The latest version of this guide is available on the VMware Web site at <http://www.vmware.com/support/resources/>.

Storage Vendor Qualifications and Support

ESX Server 2.5.3 is supported by the following major storage vendors:

- “Bull” on page 47
- “Dell” on page 47
- “EMC” on page 49
- “Fujitsu” on page 50
- “Fujitsu Siemens” on page 50
- “HP” on page 51
- “Hitachi, Ltd” on page 52
- “Hitachi Data Systems (HDS)” on page 53
- “IBM” on page 54
- “NetApp” on page 55
- “NEC” on page 55
- “Nihon Unisys Ltd,” on page 56
- “Pillar Data Systems” on page 56
- “3PAR” on page 56
- “Sun” on page 57
- “StorageTek” on page 57
- “Xitech” on page 58

Server Clustering

Storage arrays are tested in clustered and non-clustered environments. Clustering refers to the use of Microsoft Cluster Services (Windows 2003 and 2000) in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

ESX Server 2.5.3 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2000 and 2003:

Table 50.

| Configuration | Description | Restrictions |
|--|---|--|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | ■ Two-node clusters only. |
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | ■ Two-node clusters only ■ If using SAN path failover, this configuration is fully supported only if the virtual machines share raw disks, not virtual disks. If virtual machines share virtual disks, the cluster will fail over before the SAN path fails over. |
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | ■ Two-node cluster only. |

ESX Server 2.5.3 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Storage Arrays

VMware ESX Server 2.5.3 supports a variety of storage arrays in various configurations. The tables below state the VMware supported storage arrays and the supported configurations for each vendor.

Note: All storage products listed in this compatibility guide are supported. For further details about array firmware, storage product configurations, and best practices, please contact the storage vendor.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switch. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Boot from SAN — In this configuration, the ESX Server machine boots from a LUN stored on the SAN rather than in the server itself.

Table 51. Bull

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Microsoft Clustering support | Boot from SAN |
|----------|---------|--------------------|--------------------------------|---|------------------------------|---------------|
| StoreWay | FDA1500 | X | X | X | | X |
| | FDA2500 | X | X | X | | X |
| | FDA2800 | X | X | X | | X |

Table 52. Dell

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|------------------|--------------------|--------------------------------|---|--------------------|---------------|
| Power Vault 650F | X | | | | |
| AX100 | X | X | X | X ¹ | |
| AX150 | X | X | X | X ¹ | |
| CX200 | X | X | X | X ¹ | X |
| CX300 | X | X | X | X ³ | X |
| CX400 | X | X | X | X ³ | X |
| CX500 | X | X | X | X ³ | X |
| CX600 | X | X | X | X ³ | X |
| CX700 | X | X | X | X ³ | X |

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX2.5.3 releases prior to patch 4. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX2.5.3 patch 4 or later.

⁴ Supported on Fibre Channel only, not iSCSI.

Table 52. Dell

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---------------------|---------------------------|---------------------------------------|--|---------------------------|----------------------|
| CX3-20 ⁴ | X | X | X | X ² | X |
| CX3-20c | X | X | X | X ² | X |
| CX3-40 | X | X | X | X ² | X |
| CX3-40c | X | X | X | X ² | X |
| CX3-80 | X | X | X | X ² | X |

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX2.5.3 releases prior to patch 4. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX2.5.3 patch 4 or later.

⁴ Supported on Fibre Channel only, not iSCSI.

Table 53. EMC

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|------------------|----------------|-----------------------|--------------------------------------|---|-----------------------|---------------------|
| EMC CLARiiON | AX100 | X | X | X | X ¹ | |
| | AX150 | X | X | X | X ¹ | |
| | CX200 | X | X | X | X ¹ | X |
| | CX300 | X | X | X | X ³ | X |
| | CX400 | X | X | X | X ³ | X |
| | CX500 | X | X | X | X ³ | X |
| | CX600 | X | X | X | X ³ | X |
| | CX700 | X | X | X | X ³ | X |
| | CX3-10c | X | X | X | X ² | X |
| | CX3-20 | X | X | X | X ² | X |
| | CX3-20c | X | X | X | X ² | X |
| | CX3-20f | X | X | X | X ² | X |
| | CX3-40 | X | X | X | X ² | X |
| | CX3-40c | X | X | X | X ² | X |
| | CX3-40f | X | X | X | X ² | X |
| | CX3-80 | X | X | X | X ² | X |
| EMC Symmetrix | 8000 Series | X | X | X | X ³ | X |
| | DMX/ DMX2 | X | X | X | X ³ | X |
| | DMX3 | X | X | X | X ¹ | X |

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

² This applies to Windows 2003 RTM only, but not Windows 2003 SP1.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX2.5.3 releases prior to patch 4. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX2.5.3 patch 4 or later.

Table 54. Fujitsu

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---------------------------|------------|--------------------|--------------------------------|---|--------------------|---------------|
| ETERNUS 3000 ¹ | | X | X | X | | X |
| ETERNUS 4000 | Model 80 | X | X | X | | X |
| | Model 100 | X | X | X | | X |
| | Model 300 | X | X | X | | X |
| | Model 500 | X | X | X | | X |
| ETERNUS 6000 | | X | X | X | | X |
| ETERNUS 8000 | Model 700 | X | X | X | | X |
| | Model 900 | X | X | X | | X |
| | Model 1100 | X | X | X | | X |
| | Model 2100 | X | X | X | | X |

¹ Contact your Fujitsu representative for the required setting to enable support for the ETERNUS 3000.

Table 55. Fujitsu Siemens

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--------------------|-------|--------------------|--------------------------------|---|--------------------|---------------|
| FSC Storage Models | S60 | X 1Gb only | | | | |
| | S80 | X | X | X | | |
| | AX100 | X | X | X | X ¹ | |
| | CX200 | X | X | X | X ¹ | X |
| | CX300 | X | X | X | X ¹ | X |
| | CX400 | X | X | X | X ¹ | X |
| | CX500 | X | X | X | X ¹ | X |
| | CX600 | X | X | X | X ¹ | X |
| | CX700 | X | X | X | X ¹ | X |

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 56. HP

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|----------------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| HP Modular Systems Array (MSA) | 1000 ⁵ | X | X | X | X ² | X |
| | 1500 ⁵ | X | X | X | X ² | X |
| HP Enterprise Virtual Array (EVA) ⁴ | 3000 | X | X | X | X ² | X |
| | 4000 | X | X | X | X ³ | X |
| | 4100 | X | X | X | X ³ | X |
| | 5000 | X | X | X | X ² | X |
| | 6000 | X | X | X | X ³ | X |
| | 6100 | X | X | X | X ³ | X |
| | 8000 | X | X | X | X ³ | X |
| | 8100 | X | X | X | X ³ | X |
| HP StorageWorks | XP48 | X | X | X | X ³ | X |
| | XP128 | X | X | X | X ³ | X |
| | XP512 | X | X | X | X ³ | X |
| | XP1024 | X | X | X | X ³ | X |
| | XP10000 ¹ | X | X | X | X ³ | X |
| | XP12000 ¹ | X | X | X | X ³ | X |

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products..

¹ Limited to internal storage configurations only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ This applies to Windows 2003 RTM only, but not to Windows 2003 SP1.

⁴ Contact HP for array firmware versions and matching host mode settings.

⁵ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500).

Table 57. Hitachi, Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-----------------------|--------------------------------------|--|-----------------------|------------------|
| BR 50 | X | X | X | X ² | X |
| BR 150 | X | X | X | X ² | X |
| SANRISE USP 100 ¹ | X | X | X | | X |
| SANRISE USP 600 ¹ | X | X | X | | X |
| SANRISE USP 1100 ¹ | X | X | X | | X |
| SANRISE NSC ¹ | X | X | X | | X |
| SANRISE H12000 ¹ | X | X | X | | X |
| SANRISE H10000 ¹ | X | X | X | | X |
| SANRISE 9980V | X | X | X | | X |
| SANRISE 9970V | X | X | X | | X |
| SANRISE H1024 | X | X | X | | X |
| SANRISE H128 | X | X | X | | X |
| SANRISE 2000 | X | X | X | | X |
| SANRISE 9500V series | X | X | X | | X |
| SANRISE 9585V | X | X | X | | X |
| SANRISE 9570V | X | X | X | | X |
| SANRISE 9530V | X | X | X | | X |
| SANRISE AMS200 | X | X | X | X ² | X |
| SANRISE AMS500 | X | X | X | X ² | X |
| SANRISE AMS1000 | X | X | X | X ² | X |
| SANRISE WMS100 | X | X | X | X ² | X |
| ¹ Limited to internal storage configurations only. | | | | | |
| ² Requires ESX 2.5.3 Upgrade Patch 3 or higher | | | | | |

Table 58. Hitachi Data Systems (HDS)

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-----------------------|--------------------------------------|---|-----------------------|------------------|
| 9500 V Series | X | X | X | | X |
| Lightning 9910 | X | X | X | | X |
| Lightning 9960 | X | X | X | | X |
| Lightning 9970V | X | X | X | | X |
| Lightning 9980V | X | X | X | | X |
| TagmaStore AMS200 | X | X | X | X ² | X |
| TagmaStore AMS500 | X | X | X | X ² | X |
| TagmaStore AMS1000 | X | X | X | X ² | X |
| TagmaStore NSC55 ¹ | X | X | X | | X |
| TagmaStore USP 100 ¹ | X | X | X | | X |
| TagmaStore USP 1100 ¹ | X | X | X | | X |
| TagmaStore USP 600 ¹ | X | X | X | | X |
| TagmaStore WMS 100 | X | X | X | X ² | X |
| Thunder 9520V | X | X | X | | X |
| Thunder 9530V | X | X | X | | X |
| Thunder 9570V | X | X | X | | X |
| Thunder 9585V | X | X | X | | X |
| ¹ Limited to internal storage configurations only. | | | | | |
| ² Requires ESX 2.5.3 Upgrade Patch 3 or higher | | | | | |

Table 59. IBM

| | | Basic connectivity | Multipathing with HBA failover ⁴ | Multipathing with storage port failover ⁴ | Clusterin g support | Boot from SAN |
|--------------------------------------|--------------------------|-----------------------|---|--|------------------------|---------------------|
| IBM DS Series | FAStT 200 | X | X | X | X ² | X |
| | FAStT 500 | X | X | X | X ² | X |
| | 4100 | X | X | X | X | X |
| | 4200 ⁵ | X | X | X | | X |
| | 4300 | X | X | X | X ⁶ | X |
| | 4400 | X | X | X | X ² | X |
| | 4500 | X | X | X | X ² | X |
| | 4700 ⁵ | X | X | X | | X |
| | 4800 | X | X | X | X ² | X |
| | 6000 | X | X | X | | X |
| | 8000 Series ¹ | X | X | X | | X |
| IBM System Storage N Series | N3700 ³ | X | X | X | X ² | X |
| | N5200 ³ | X | X | X | X ² | X |
| | N5500 ³ | X | X | X | X ² | X |
| | ESS 800 ¹ | X | X | X | | X |

¹ QLogic HBA support only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, IBM supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between IBM filers and does not affect the behavior of the filers as seen by the servers.

⁴ In addition to the multipathing options detailed in the matrix above, IBM offers filer clustering. This configuration is certified to work as well with the exception of:
Linux Guest operating systems are only supported if using the vmxlsilogic SCSI emulation driver. For configuration details of changes to guest operating system support, check What's New in ESX Server at: www.vmware.com/support/esx25/doc/releasenotes_esx25.html.

⁵ Requires ESX2.5.3 Upgrade Patch 3 dated 7/27/06.

⁶ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1 for ESX Server 2.5.3 releases prior to patch 4. Windows 2003 SP1 with Microsoft Hotfix (see <http://support.microsoft.com/kb/910048>) is supported only with ESX Server 2.5.3 patch 4 or later.

Table 60. NetApp

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|----------------|--------------------|--------------------------------|---|--------------------|---------------|
| NetApp Fibre Channel SAN Attached Storage System ¹ | FAS200 Series | X | X | X | X ⁴ | X |
| | F800 Series | X | X | X | X ⁴ | X |
| | FAS900 Series | X | X | X | X ⁴ | X |
| | FAS3000 Series | X | X | X | X ⁴ | X |
| | FAS6000 Series | X | X | X | X ⁵ | X |

¹ These configurations are also supported with the NetApp NearStore R200 back end.

² VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, NetApp supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between NetApp Storage Systems and does not affect the behavior of the storage systems as seen by the servers.

³ In addition to the multipathing options detailed in the matrix above, NetApp offers storage system clustering. This configuration is certified to work as well with the exception of:

Linux Guest operating systems are only supported if using the vmxlsilogic SCSI emulation driver. For configuration details of changes to guest operating system support, check What's New in ESX Server at: www.vmware.com/support/esx25/doc/releasesnotes_esx25.html.

⁴ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

⁵ This applies only to Windows 2003 in a Cluster Across Box configuration.

Table 61. NEC

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|----------|-------|--------------------|--------------------------------|---|--------------------|---------------|
| iStorage | S400 | X | X | X | | X |
| | S500 | X | X | X | | X |
| | S1400 | X | X | X | | X |
| | S1500 | X | X | X | | X |
| | S2400 | X | X | X | | X |
| | S2500 | X | X | X | | X |
| | S2800 | X | X | X | | X |

Table 62. Nihon Unisys Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|--------------------|--------------------------------|---|--------------------|---------------|
| SANARENA 1830 | X | X | X | X ² | X |
| SANARENA 1870 | X | X | X | X ² | X |
| SANARENA 1890 | X | X | X | X ² | X |
| SANARENA 1895 | X | X | X | X ² | X |
| SANARENA 18AS | X | X | X | X ² | X |
| SANARENA 5200 ¹ | X | X | X | | X |
| SANARENA 5800 ¹ | X | X | X | | X |
| ¹ Limited to internal storage configurations only. | | | | | |
| ² Requires ESX 2.5.3 Upgrade Patch 3 or higher | | | | | |

Table 63. Pillar Data Systems

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|-------|-----|--------------------|--------------------------------|---|--------------------|---------------|
| Axiom | 300 | X | X | X | | X |
| Axiom | 500 | X | X | X | | X |

Table 64. 3PAR

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|------------------------|------|--------------------|--------------------------------|---|--------------------|---------------|
| InServ Storage Servers | S200 | X | X | X | | X |
| | S400 | X | X | X | | X |
| | S800 | X | X | X | | X |
| T-Class | | X | X | X | | X |

Table 65. Sun

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-------------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| StorEdge | 6920 ¹ | X | X | X | | X |
| | 9910 | X | X | X | | X |
| | 9960 | X | X | X | | X |
| | 9970 | X | X | X | | X |
| | 9980 | X | X | X | | X |
| | 9985 ¹ | X | X | X | | X |
| | 9990 ¹ | X | X | X | | X |
| ¹ Limited to internal storage configurations only. | | | | | | |

Table 66. StorageTek

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|---------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| FlexLine 200/300 Series | FLX 380 | X | X | X ¹ | | X |
| | FLX 280 | X | X | X | | X |
| | FLX240 | X | X | X | | X |
| | FLX 210 | X | X | X | | X |
| | BC84/ D178 | X | X | X | | X |
| StorageTek | 3510 | X | X | X | | X |
| | 3511 | X | X | X | | X |
| ¹ Supported only on ESX Server 2.5.3 Upgrade Patch 2. | | | | | | |

Table 67. Xiotech

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---------------|--------------------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| Magnitud e | Magnitude 3D 1000e | X | X | X | | X |
| | Magnitude 3D 1000s | X | X | X | | X |
| | Magnitude 3D 3000e | X | X | X | | X |
| | Magnitude 3D 3000s | X | X | X | | X |

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2.5.3 drivers are based on the Emulex-provided lpfcdd-2xx 2.01g driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Table 68.

| | |
|-------------------------------------|--|
| LP8000, 8000DC | If your HBA has a Dragonfly chip version 2.00 or greater, use firmware version 3.90a7. If your HBA has a Dragonfly chip below version 2.00, use firmware version 3.30a7. |
| LP9000 | Minimum firmware revision 3.90a1 |
| LP9002L, LP9002L-E, LP9002C, 9002DC | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.90a1 |
| LP9802DC | Minimum firmware revision 1.00a2 |
| LP10000, 10000DC, LP10000E | Minimum firmware revision 1.91a5 |
| LP101 | |
| LP952L | Minimum firmware revision 3.91a3 |
| LP982, 9802 | Minimum firmware revision 1.91a5 |
| LP1050, 1050DC, 1050-F2 | Minimum firmware revision 1.91a5 |
| LP1050EX | |
| LP7000E | Minimum firmware revision 3.21a0 |

VMware supports the following HP OEM versions of the Emulex adapters:

Table 69.

| | |
|--|----------------------------------|
| FCA2404DC | Minimum firmware revision 1.00a2 |
| FCA2684, FCA2684DC | Minimum firmware revision 1.80a2 |
| A7298A, FCA2408, AB232A, FCA2384, FCA2404 | Minimum firmware revision 1.00a4 |
| A7387A, A7388A, AB466A, AB467A A7560A | Minimum firmware revision 1.80a3 |

QLogic Fibre Channel Adapters

The default ESX Server 2.5.3 driver is based on the QLogic-provided qla2x00 v 7.0.4 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Note: The HBA that controls the boot LUN must be a QLogic HBA; currently only the QLA-23xx series is supported.

- QLA-2200
- QLA-2300
- QLA-2310/2312 (Blade servers)
- QLA-2340/2342
- QLE-2360/2362

VMware supports the following Dell OEM versions of the QLogic adapters:

- Dell QLogic 2342M (for Dell PowerEdge 1855 blade servers)
- Dell QLogic 2362M (for Dell PowerEdge 6850)

VMware supports the following HP OEM versions of the QLogic adapters:

- HP FCA2210
- HP FCA2214
- HP FCA2214DC

VMware supports the following Sun OEM versions of the QLogic adapters:

Table 70. Supported Sun OEM Versions of QLogic Adapters

| QLogic Adapter | Sun OEM Version |
|---|-----------------------------------|
| QLA2342 | Sun SG-XPCI2FC-QF2 ¹ |
| QLA2342 | StorageTek HBAQ032 |
| QLA2342R | Sun SG-XPCI2FC-QF2-Z ¹ |
| ¹ This OEM version of the QLogic adapter does not support boot-from-SAN. | |

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 71.

| QLogic Adapter | IBM OEM Version |
|----------------|---|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |
| 48P7061 | IBM HS20 Fibre Channel Expansion |
| 13N2203 | IBM HS20 Fibre Channel Expansion |
| 26K4841 | IBM Bladecenter SFF Fibre Channel Expansion |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 72.

| ESX Server 2.5.2 | |
|---|--------------------------------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 192 + n*32 where n=#physical extents |
| ¹ When you use an Emulex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs. ² ESX Server 2.5.3 supports a maximum of 160 virtual targets. In some situations (For example, when every virtual target is on a different VMFS volume), that maximum may decrease to 128 virtual targets. ³ In ESX Server 2.5.3, VMFS-2 can span up to 32 partitions on multiple disks, each of which can support 2TB of space. | |

ESX Server 2.5.2

This section lists the supported SAN devices for ESX Server version 2.5.2. VMware and our partners are actively working together to qualify certification for additional devices as quickly as possible. Please check back periodically for updates and newly certified HBAs and storage devices currently tested by VMware and its storage partners. The latest version of this guide is available on the VMware Web site at <http://www.vmware.com/support/resources/>.

Storage Vendor Qualifications and Support

ESX Server 2.5.2 is supported by the following major storage vendors:

- **“Bull”** on page 64

- [“Dell”](#) on page 64
- [“EMC”](#) on page 65
- [“Fujitsu”](#) on page 65
- [“Fujitsu Siemens”](#) on page 65
- [“HP”](#) on page 66
- [“Hitachi, Ltd”](#) on page 67
- [“Hitachi Data Systems \(HDS\)”](#) on page 69
- [“IBM”](#) on page 70
- [“NEC”](#) on page 72
- [“NetApp”](#) on page 72 Table 61.
- [“Nihon Unisys Ltd,”](#) on page 73
- [“Pillar Data Systems”](#) on page 73
- [“3PAR”](#) on page 73
- [“Sun”](#) on page 74
- [“StorageTek”](#) on page 74
- [“Xitech”](#) on page 75

Server Clustering

Storage arrays are tested in clustered and non-clustered environments. Clustering refers to the use of Microsoft Cluster Services (Windows 2003 and 2000) in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

ESX Server 2.5.2 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2000 and 2003:

Table 73.

| Configuration | Description | Restrictions |
|---|---|---|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only. |

Table 73.

| Configuration | Description | Restrictions |
|--|---|--|
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only ■ If using SAN path failover, this configuration is fully supported only if the virtual machines share raw disks, not virtual disks. If virtual machines share virtual disks, the cluster will fail over before the SAN path fails over. |
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | <ul style="list-style-type: none"> ■ Two-node cluster only. |

ESX Server 2.5.2 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Storage Arrays

VMware ESX Server 2.5.2 supports a variety of storage arrays in various configurations. The tables below state the VMware supported storage arrays and the supported configurations for each vendor.

Note: All storage products listed in this compatibility guide are supported. For further details about array firmware, storage product configurations, and best practices, please contact the storage vendor.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switch. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Boot from SAN — In this configuration, the ESX Server machine boots from a LUN stored on the SAN rather than in the server itself.

Table 74. Bull

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Microsoft Clustering support |
|----------|---------|--------------------|--------------------------------|---|------------------------------|
| | | Boot from SAN | | | |
| StoreWay | FDA1500 | X | X | X | X |
| | FDA2500 | X | X | X | X |
| | FDA2800 | X | X | X | X |

Table 75. Dell

| | Dell Storage Models | | | | | | | | |
|---|---------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | Power Vault 650F | AX100 | AX150 | CX200 | CX300 | CX400 | CX500 | CX600 | CX700 |
| Basic connectivity | X | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X | X | X | X | X |
| Clustering support | | X ¹ | X ¹ | X ¹ | X ¹ | X ¹ | X ¹ | X ¹ | X ¹ |
| Boot from SAN | | | | X | X | X | X | X | X |

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 76. EMC

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---------------|-------------|--------------------|--------------------------------|---|--------------------|---------------|
| EMC CLARiiON | AX100 | X | X | X | X | |
| | AX150 | X | X | X | X | |
| | CX200 | X | X | X | X | X |
| | CX300 | X | X | X | X | X |
| | CX400 | X | X | X | X | X |
| | CX500 | X | X | X | X | X |
| | CX600 | X | X | X | X | X |
| | CX700 | X | X | X | X | X |
| EMC Symmetrix | 8000 Series | X | X | X | X | X |
| | DMX/DMX2 | X | X | X | X | X |
| | DMX3 | X | X | X | X | X |

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 77. Fujitsu

| | ETERNUS 3000 | ETERNUS 6000 |
|---|--------------|--------------|
| Basic connectivity | X | X |
| Multipathing with HBA failover | X | X |
| Multipathing with storage port failover | X | X |
| Clustering support | | |
| Boot from SAN | X | X |

¹ Contact your Fujitsu representative for the required setting to enable support for the ETERNUS 3000.

Table 78. Fujitsu Siemens

| | |
|--|---------------------------|
| | FSC Storage Models |
|--|---------------------------|

Table 78. Fujitsu Siemens

| | S60 | S8 0 | AX10 0 | CX20 0 | CX30 0 | CX40 0 | CX50 0 | CX60 0 | CX70 0 |
|---|-------------|-----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Basic connectivity | X | X | X | X | X | X | X | X | X |
| | 1Gb only | | | | | | | | |
| Multipathing with HBA failover | | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X | X | X | X | X |
| Clustering support | | | X ¹ | X ¹ | X ¹ | X ¹ | X ¹ | X ¹ | X ¹ |
| Boot from SAN | | | | X | X | X | X | X | X |

¹ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 79. HP

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--------------------|-------------------|-------------------------------|---|--|-------------------------------|------------------------------|
| HP Modular Systems | 1000 ⁵ | X | X | X | X ² | X |
| Array (MSA) | 1500 ⁵ | X | X | X | X ² | X |

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products..

¹ Limited to internal storage configurations only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ This applies to Windows 2003 RTM only, but not to Windows 2003 SP1.

⁴ Contact HP for array firmware versions and matching host mode settings.

⁵ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500).

Table 79. HP (Continued)

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--|----------------------|-----------------------|--------------------------------------|---|-----------------------|---------------------|
| HP Enterprise Virtual Array (EVA) ⁴ | 3000 | X | X | X | X ² | X |
| | 4000 | X | X | X | X ³ | X |
| | 4100 | X | X | X | X ³ | X |
| | 5000 | X | X | X | X ² | X |
| | 6000 | X | X | X | X ³ | X |
| | 6100 | X | X | X | X ³ | X |
| | 8000 | X | X | X | X ³ | X |
| | 8100 | X | X | X | X ³ | X |
| HP StorageWorks | XP48 | X | X | X | X ³ | X |
| | XP128 | X | X | X | X ³ | X |
| | XP512 | X | X | X | X ³ | X |
| | XP1024 | X | X | X | X ³ | X |
| | XP10000 ¹ | X | X | X | X ³ | X |
| | XP12000 ¹ | X | X | X | X ³ | X |

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products..

¹ Limited to internal storage configurations only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ This applies to Windows 2003 RTM only, but not to Windows 2003 SP1.

⁴ Contact HP for array firmware versions and matching host mode settings.

⁵ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500).

Table 80. Hitachi, Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--------|-----------------------|--------------------------------------|---|-----------------------|------------------|
| BR 50 | X | X | X | | X |
| BR 150 | X | X | X | | X |

¹ Limited to internal storage configurations only.

Table 80. Hitachi, Ltd (Continued)

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-----------------------|--------------------------------------|--|-----------------------|------------------|
| SANRISE USP 100 ¹ | X | X | X | | X |
| SANRISE USP 600 ¹ | X | X | X | | X |
| SANRISE USP 1100 ¹ | X | X | X | | X |
| SANRISE NSC ¹ | X | X | X | | X |
| SANRISE H12000 ¹ | X | X | X | | X |
| SANRISE H10000 ¹ | X | X | X | | X |
| SANRISE 9980V | X | X | X | | X |
| SANRISE 9970V | X | X | X | | X |
| SANRISE H1024 | X | X | X | | X |
| SANRISE H128 | X | X | X | | X |
| SANRISE 2000 | X | X | X | | X |
| SANRISE 9500V series | X | X | X | | X |
| SANRISE 9585V | X | X | X | | X |
| SANRISE 9570V | X | X | X | | X |
| SANRISE 9530V | X | X | X | | X |
| SANRISE AMS200 | X | X | X | | X |
| SANRISE AMS500 | X | X | X | | X |
| SANRISE AMS1000 | X | X | X | | X |
| SANRISE WMS100 | X | X | X | | X |
| ¹ Limited to internal storage configurations only. | | | | | |

Table 81. Hitachi Data Systems (HDS)

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|-----------------------|--------------------------------------|--|-----------------------|------------------|
| 9500 V Series | X | X | X | | X |
| Lightning 9910 | X | X | X | | X |
| Lightning 9960 | X | X | X | | X |
| Lightning 9970V | X | X | X | | X |
| Lightning 9980V | X | X | X | | X |
| TagmaStore AMS200 | X | X | X | | X |
| TagmaStore AMS500 | X | X | X | | X |
| TagmaStore AMS1000 | X | X | X | | X |
| TagmaStore NSC55 ¹ | X | X | X | | X |
| TagmaStore USP 100 ¹ | X | X | X | | X |
| TagmaStore USP 1100 ¹ | X | X | X | | X |
| TagmaStore USP 600 ¹ | X | X | X | | X |
| TagmaStore WMS 100 | X | X | X | | X |
| Thunder 9520V | X | X | X | | X |
| Thunder 9530V | X | X | X | | X |
| Thunder 9570V | X | X | X | | X |
| Thunder 9585V | X | X | X | | X |
| ¹ Limited to internal storage configurations only. | | | | | |

Table 82. IBM

| IBM DS Series | | Basic connectivity | Multipathing with HBA failover ⁴ | Multipathing with storage port failover ⁴ | Clustering support | Boot from SAN |
|-----------------------------|--------------------------|--------------------|---|--|--------------------|---------------|
| | FAStT 200 | X | X | X | X ² | X |
| | FAStT 500 | X | X | X | X ² | X |
| | 4100 | X | X | X | X | X |
| | 4300 | X | X | X | X ² | X |
| | 4400 | X | X | X | X ² | X |
| | 4500 | X | X | X | X ² | X |
| | 4800 | X | X | X | X ² | X |
| | 6000 | X | X | X | | X |
| | 8000 Series ¹ | X | X | X | | X |
| IBM System Storage N Series | N3700 ³ | X | X | X | X ² | X |
| | N5200 ³ | X | X | X | X ² | X |
| | N5500 ³ | X | X | X | X ² | X |
| | ESS 800 ¹ | X | X | X | | X |

¹ QLogic HBA support only.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

³ VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, IBM supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between IBM filers and does not affect the behavior of the filers as seen by the servers.

⁴ In addition to the multipathing options detailed in the matrix above, IBM offers filer clustering. This configuration is certified to work as well with the exception of:
Linux Guest operating systems are only supported if using the vmxlsilogic SCSI emulation driver. For configuration details of changes to guest operating system support, check What's New in ESX Server at: www.vmware.com/support/esx25/doc/releasenotes_esx25.html.

Table 83. Fujitsu

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|----------|------|--------------------|--------------------------------|---|--------------------|---------------|
| | | | | | | |
| ETERN US | 6000 | X | X | X | | |

Table 84. NEC

| iStorage | | | | | | | |
|---|------|------|-------|-------|-------|-------|-------|
| | S400 | S500 | S1400 | S1500 | S2400 | S2500 | S2800 |
| Basic connectivity | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X |
| Clustering support | | | | | | | |
| Boot from SAN | X | X | X | X | X | X | X |

Table 85. NetApp

| NetApp Fibre Channel SAN Attached Storage System ¹ | | | | |
|---|----------------|----------------|----------------|----------------|
| | FAS200 Series | F800 Series | FAS900 Series | FAS3000 Series |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |
| Clustering support | X ⁴ | X ⁴ | X ⁴ | X ⁴ |
| Boot from SAN | X | X | X | X |

¹ These configurations are also supported with the NetApp NearStore R200 back end.

² VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, NetApp supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between NetApp storage systems and does not affect the behavior of the storage systems as seen by the servers.

³ In addition to the multipathing options detailed in the matrix above, NetApp offers storage system clustering. This configuration is certified to work as well with the exception of:
Linux Guest operating systems are only supported if using the vmxlogic SCSi emulation driver. For configuration details of changes to guest operating system support, check What's New in ESX Server at: www.vmware.com/support/esx25/doc/releasenotes_esx25.html.

⁴ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 86. Nihon Unisys Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|---|--------------------|--------------------------------|---|--------------------|---------------|
| SANARENA 1830 | X | X | X | | X |
| SANARENA 1870 | X | X | X | | X |
| SANARENA 1890 | X | X | X | | X |
| SANARENA 1895 | X | X | X | | X |
| SANARENA 18AS | X | X | X | | X |
| SANARENA 5200 ¹ | X | X | X | | X |
| SANARENA 5800 ¹ | X | X | X | | X |
| ¹ Limited to internal storage configurations only. | | | | | |

Table 87. Pillar Data Systems

| Axiom | | |
|---|-----|-----|
| | 300 | 500 |
| Basic connectivity | X | X |
| Multipathing with HBA failover | X | X |
| Multipathing with storage port failover | X | X |
| Clustering support | | |
| Boot from SAN | X | X |

Table 88. 3PAR

| | InServ Storage Servers | | | T-Class |
|---|------------------------|------|------|---------|
| | S200 | S400 | S800 | |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |

Table 88. 3PAR

| | InServ Storage Servers | | | T-Class |
|--------------------|------------------------|------|------|---------|
| | S200 | S400 | S800 | |
| Clustering support | | | | |
| Boot from SAN | X | X | X | X |

Table 89. Sun

| | StorEdge | | | | | | StorageTek | | |
|---|-------------------|------|------|------|------|-------------------|-------------------|------|------|
| | 6920 ¹ | 9910 | 9960 | 9970 | 9980 | 9985 ¹ | 9990 ¹ | 3510 | 3511 |
| Basic connectivity | X | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X | X |
| Clustering support | | | | | | | | | |
| Boot from SAN | X | X | X | X | X | X | X | X | X |

¹ Limited to internal storage configurations only.

Table 90. StorageTek

| FlexLine 200/300 Series | | | | | |
|---|---------|---------|--------|---------|-----------|
| | FLX 380 | FLX 280 | FLX240 | FLX 210 | BC84/D178 |
| Basic connectivity | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X |
| Clustering support | | | | | |
| Boot from SAN | X | X | X | X | X |

Table 91. Xiotech

| Magnitude | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| | Magnitude 3D 1000e | Magnitude 3D 1000s | Magnitude 3D 3000e | Magnitude 3D 3000s |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |
| Clustering support | | | | |
| Boot from SAN | X | X | X | X |

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2.5.2 drivers are based on the Emulex-provided lpfcdd-2xx 2.01g driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Table 92.

| | |
|-------------------------------------|--|
| LP8000, 8000DC | If your HBA has a Dragonfly chip version 2.00 or greater, use firmware version 3.90a7. If your HBA has a Dragonfly chip below version 2.00, use firmware version 3.30a7. |
| LP9000 | Minimum firmware revision 3.90a1 |
| LP9002L, LP9002L-E, LP9002C, 9002DC | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.90a1 |
| LP9802DC | Minimum firmware revision 1.91a5 |
| LP10000, 10000DC, LP10000E | Minimum firmware revision 1.91a5 |
| LP101 | |
| LP952L | Minimum firmware revision 3.91a3 |
| LP982, 9802 | Minimum firmware revision 1.00a4 |
| LP1050, 1050DC, 1050-F2 | Minimum firmware revision 1.91a5 |
| LP1050EX | |
| LP7000E | Minimum firmware revision 3.21a0 |

VMware supports the following HP OEM versions of the Emulex adapters:

Table 93.

| | |
|--|----------------------------------|
| FCA2404DC | Minimum firmware revision 1.00a2 |
| FCA2684, FCA2684DC | Minimum firmware revision 1.80a2 |
| A7298A, FCA2408, AB232A, FCA2384, FCA2404 | Minimum firmware revision 1.00a4 |
| A7387A, A7388A, AB466A, AB467A A7560A | Minimum firmware revision 1.80a3 |

QLogic Fibre Channel Adapters

The default ESX Server 2.5.2 driver is based on the QLogic-provided qla2x00 v 7.0.4 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Note: The HBA that controls the boot LUN must be a QLogic HBA; currently only the QLA-23xx series is supported.

- QLA-2200
- QLA-2300
- QLA-2310/2312 (Blade servers)
- QLA-2340/2342
- QLE-2360/2362

VMware supports the following Dell OEM versions of the QLogic adapters:

- Dell QLogic 2342M (for Dell PowerEdge 1855 blade servers)
- Dell QLogic 2362M (for Dell PowerEdge 6850)

VMware supports the following HP OEM versions of the QLogic adapters:

- HP FCA2210
- HP FCA2214
- HP FCA2214DC

VMware supports the following Sun OEM versions of the QLogic adapters:

Table 94. Supported Sun OEM Versions of QLogic Adapters

| QLogic Adapter | Sun OEM Version |
|---|-----------------------------------|
| QLA2342 | Sun SG-XPCI2FC-QF2 ¹ |
| QLA2342 | StorageTek HBAQ032 |
| QLA2342R | Sun SG-XPCI2FC-QF2-Z ¹ |
| ¹ This OEM version of the QLogic adapter does not support boot-from-SAN. | |

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 95.

| QLogic Adapter | IBM OEM Version |
|----------------|---|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |
| 48P7061 | IBM HS20 Fibre Channel Expansion |
| 13N2203 | IBM HS20 Fibre Channel Expansion |
| 26K4841 | IBM Bladecenter SFF Fibre Channel Expansion |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 96.

| | ESX Server 2.5.2 |
|--|------------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |

Table 96.

| ESX Server 2.5.2 | |
|---|--------------------------------------|
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 192 + n*32 where n=#physical extents |

¹ When you use an Emulex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs.

² ESX Server 2.5.2 supports a maximum of 160 virtual targets. In some situations (For example, when every virtual target is on a different VMFS volume), that maximum may decrease to 128 virtual targets.

³ In ESX Server 2.5.2, VMFS-2 can span up to 32 partitions on multiple disks, each of which can support 2TB of space.

ESX Server 2.5.1

The following section lists the supported SAN devices for ESX Server version 2.5.1. VMware and our partners are actively working together to qualify certification for additional devices as quickly as possible. Please check back periodically for updates and newly certified HBAs and storage devices currently tested by VMware and its storage partners. The latest version of this guide is available on the VMware Web site at <http://www.vmware.com/support/resources/>.

Storage Vendor Qualifications and Support

ESX Server 2.5.1 is supported by the following major storage vendors:

- [“Dell”](#) on page 80
- [“EMC”](#) on page 81
- [“Fujitsu”](#) on page 81
- [“Fujitsu Siemens”](#) on page 82
- [“HP”](#) on page 83
- [“Hitachi, Ltd”](#) on page 84
- [“Hitachi Data Systems \(HDS\)”](#) on page 85

- [“IBM”](#) on page 86
- [“”](#) on page 86
- [“NetApp”](#) on page 87
- [“NEC”](#) on page 87
- [“Nihon Unisys Ltd,”](#) on page 88
- [“3PAR”](#) on page 88
- [“Sun”](#) on page 88
- [“StorageTek”](#) on page 89
- [“Xiotech”](#) on page 89

Server Clustering

Storage arrays are tested in clustered and non-clustered environments. Clustering refers to the use of Microsoft Cluster Services (Windows 2003 and 2000) in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

ESX Server 2.5.1 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2000 and 2003:

Table 97.

| Configuration | Description | Restrictions |
|--|---|--|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only. |
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only ■ If using SAN path failover, this configuration is fully supported only if the virtual machines share raw disks, not virtual disks. If virtual machines share virtual disks, the cluster will fail over before the SAN path fails over. |

Table 97.

| Configuration | Description | Restrictions |
|--|---|--------------------------|
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | ■ Two-node cluster only. |

ESX Server 2.5.1 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Storage Arrays

VMware ESX Server 2.5.1 supports a variety of storage arrays in various configurations. The tables below state the VMware supported storage arrays and the supported configurations for each vendor.

Note: All storage products listed in this compatibility guide are supported. For further details about array firmware, storage product configurations, and best practices, please contact the storage vendor.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switch. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Boot from SAN — In this configuration, the ESX Server machine boots from a LUN stored on the SAN rather than in the server itself.

Table 98. Dell

| | Dell Storage Models | | | | | | | |
|--------------------------------|---------------------|-------|-------|-------|-------|-------|-------|-------|
| | Power Vault 650F | AX100 | CX200 | CX300 | CX400 | CX500 | CX600 | CX700 |
| Basic connectivity | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | | X | X | X | X | X | X | X |

Table 98. Dell

| | | | | | | | |
|---|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Multipathing with storage port failover | X | X | X | X | X | X | X |
| Clustering support | X ¹ | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} |
| Boot from SAN | | X | X | X | X | X | X |

¹ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 99. EMC

| | EMC CLARiiON | | | | | | | EMC Symmetrix | | |
|---|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | AX100 | CX200 | CX300 | CX400 | CX500 | CX600 | CX700 | 8000 Series | DMX/DMX2 | DMX3 |
| Basic connectivity | X | X | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X | X | X |
| Clustering support | X ¹ | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} |
| Boot from SAN | | X | X | X | X | X | X | X | X | X |

¹ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 100. Fujitsu

| | ETERNUS 3000 ¹ | ETERNUS 6000 |
|--------------------|---------------------------|--------------|
| Basic connectivity | X | X |

Table 100. Fujitsu

| | ETERNUS | ETERNUS |
|---|-------------------|---------|
| | 3000 ¹ | 6000 |
| Multipathing with HBA failover | X | X |
| Multipathing with storage port failover | X | X |
| Clustering support | | |
| Boot from SAN | X | X |

¹ Contact your Fujitsu representative for the required setting to enable support for the ETERNUS 3000.

Table 101. Fujitsu Siemens

| | FSC Storage Models | | | | | | | | |
|---|--------------------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | S60 | S80 | AX10 0 | CX20 0 | CX30 0 | CX40 0 | CX50 0 | CX60 0 | CX70 0 |
| Basic connectivity | X | X | X | X | X | X | X | X | X |
| | 1Gb only | | | | | | | | |
| Multipathing with HBA failover | | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X | X | X | X | X |
| Clustering support | | X ¹ | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} |
| Boot from SAN | | | X | X | X | X | X | X | X |

¹ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 102. HP

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clusterin g support | Boot from SAN |
|--|----------------------|-----------------------|--------------------------------------|---|------------------------|---------------------|
| HP Modular Systems Array (MSA) | 1000 ⁶ | X | X | X | X ^{2, 3} | X |
| | 1500 ⁶ | X | X | X | X ^{2, 3} | X |
| HP Enterprise Virtual Array (EVA) ⁵ | 3000 | X | X | X | X ^{2, 3} | X |
| | 4000 | X | X | X | X ^{2, 4} | X |
| | 5000 | X | X | X | X ^{2, 3} | X |
| | 6000 | X | X | X | X ^{2, 4} | X |
| | 8000 | X | X | X | X ^{2, 4} | X |
| HP StorageWorks | XP48 | X | X | X | X ^{2, 4} | X |
| | XP128 | X | X | X | X ^{2, 4} | X |
| | XP512 | X | X | X | X ^{2, 4} | X |
| | XP1024 | X | X | X | X ^{2, 4} | X |
| | XP10000 ¹ | X | X | X | X ^{2, 4} | X |
| | XP12000 ¹ | X | X | X | X ^{2, 4} | X |

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products..

¹ Limited to internal storage configurations only.

² If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

⁴ This applies to Windows 2003 RTM only, but not to Windows 2003 SP1.

⁵ Contact HP for array firmware versions and matching host mode settings.

⁶ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500).

Table 103. Hitachi, Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Boot from SAN |
|-------------------------------|--------------------|--------------------------------|---|---------------|
| BR 50 | X | X | X | X |
| BR 150 | X | X | X | X |
| SANRISE USP 100 ¹ | X | X | X | X |
| SANRISE USP 600 ¹ | X | X | X | X |
| SANRISE USP 1100 ¹ | X | X | X | X |
| SANRISE NSC ¹ | X | X | X | X |
| SANRISE H12000 ¹ | X | X | X | X |
| SANRISE H10000 ¹ | X | X | X | X |
| SANRISE 9980V | X | X | X | X |
| SANRISE 9970V | X | X | X | X |
| SANRISE H1024 | X | X | X | X |
| SANRISE H128 | X | X | X | X |
| SANRISE 2000 | X | X | X | X |
| SANRISE 9500V series | X | X | X | X |
| SANRISE 9585V | X | X | X | X |
| SANRISE 9570V | X | X | X | X |
| SANRISE 9530V | X | X | X | X |
| SANRISE AMS200 | X | X | X | X |
| SANRISE AMS500 | X | X | X | X |
| SANRISE AMS1000 | X | X | X | X |
| SANRISE WMS100 | X | X | X | X |

¹ Limited to internal storage configurations only.

For Hitachi storage array microcode levels and specific guest operating system, HBA, and switched fabric configurations that Hitachi supports, please contact your Hitachi support representative.

Table 104. Hitachi Data Systems (HDS)

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Boot from SAN |
|----------------------------------|--------------------|--------------------------------|---|---------------|
| TagmaStore USP 100 ¹ | X | X | X | X |
| TagmaStore USP 600 ¹ | X | X | X | X |
| TagmaStore USP 1100 ¹ | X | X | X | X |
| TagmaStore NSC55 ¹ | X | X | X | X |
| TagmaStore WMS100 | X | X | X | X |
| TagmaStore AMS200 | X | X | X | X |
| TagmaStore AMS500 | X | X | X | X |
| TagmaStore AMS1000 | X | X | X | X |
| Lightning 9970V | X | X | X | X |
| Lightning 9980V | X | X | X | X |
| Lightning 9960 | X | X | X | X |
| Lightning 9910 | X | X | X | X |
| 9500V Series | X | X | X | X |
| Thunder 9585V | X | X | X | X |
| Thunder 9570V | X | X | X | X |
| Thunder 9530V | X | X | X | X |
| Thunder 9520V | X | X | X | X |

¹ Limited to internal storage configurations only.

For HDS storage array microcode levels and specific guest operating system, HBA, and switched fabric configurations that HDS supports, please contact your HDS support representative.

Table 105. IBM

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clusterin g support | Boot from SAN |
|---------------------|-----------------------------|-----------------------|--------------------------------------|---|------------------------|---------------------|
| IBM DS Series | FASTT 200 | X | X | X | X ^{2,3} | X |
| | FASTT 500 | X | X | X | X ^{2,3} | X |
| | 4300 | X | X | X | X ^{2,3} | X |
| | 4400 | X | X | X | X ^{2,3} | X |
| | 4500 | X | X | X | X ^{2,3} | X |
| | 4800 | X | X | | | X |
| | | | single fabric only | | | |
| | 6000 | X | X | X | | X |
| | 8000 Series ¹ | X | X | X | | X |
| | ESS 800 ¹ | X | X | X | | X |

¹ QLogic HBA support only.

² If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 106. Fujitsu

| ETERNUS | |
|---|---|
| 6000 | |
| Basic connectivity | X |
| Multipathing with HBA failover | X |
| Multipathing with storage port failover | X |
| Clustering support | |
| Boot from SAN | |

Table 107. NetApp

| NetApp Fibre Channel SAN Attached Storage System ¹ | | | | |
|---|-------------------|-------------------|-------------------|-------------------|
| | FAS200 Series | F800 Series | FAS900 Series | FAS3000 Series |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |
| Clustering support | X ^{4, 5} | X ^{4, 5} | X ^{4, 5} | X ^{4, 5} |
| Boot from SAN | X | X | X | X |

¹ These configurations are also supported with the NetApp NearStore R200 back end.

² VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, NetApp supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between NetApp storage systems and does not affect the behavior of the storage systems as seen by the servers.

³ In addition to the multipathing options detailed in the matrix above, NetApp offers storage system clustering. This configuration is certified to work as well with the exception of: Linux Guest operating systems are only supported if using the vmxlsiologic SCSI emulation driver. For configuration details of changes to guest operating system support, check *What's New in ESX Server* at: www.vmware.com/support/esx25/doc/releasenotes_esx25.html.

⁴ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faaid=1822) for more information.

⁵ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 108. NEC

| iStorage | | | | |
|---|------|-------|-------|-------|
| | S400 | S1400 | S2400 | S2800 |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |
| Clustering support | | | | |
| Boot from SAN | X | X | X | X |

Table 109. Nihon Unisys Ltd

| | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Boot from SAN |
|----------------------------|--------------------|--------------------------------|---|---------------|
| SANARENA 1830 | X | X | X | X |
| SANARENA 1870 | X | X | X | X |
| SANARENA 1890 | X | X | X | X |
| SANARENA 1895 | X | X | X | X |
| SANARENA 18AS | X | X | X | X |
| SANARENA 5200 ¹ | X | X | X | X |
| SANARENA 5800 ¹ | X | X | X | X |

¹ Limited to internal storage configurations only.

Table 110. 3PAR

| | InServ Storage Servers | | | T-Class |
|---|------------------------|------|------|---------|
| | S200 | S400 | S800 | |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |
| Clustering support | | | | |
| Boot from SAN | X | X | X | X |

Table 111. Sun

| StorEdge | |
|---|---|
| 6920 | |
| Basic connectivity | X |
| Multipathing with HBA failover | X |
| Multipathing with storage port failover | X |

Table 111. Sun

| StorEdge | |
|--------------------|---|
| 6920 | |
| Clustering support | |
| Boot from SAN | X |

Table 112. StorageTek

| FlexLine 200/300 Series | | | | | |
|---|---------|---------|--------|---------|-----------|
| | FLX 380 | FLX 280 | FLX240 | FLX 210 | BC84/D178 |
| Basic connectivity | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X |
| Clustering support | | | | | |
| Boot from SAN | X | X | X | X | X |

Table 113. Xiotech

| Magnitude | | | | |
|---|--------------------|--------------------|--------------------|--------------------|
| | Magnitude 3D 1000e | Magnitude 3D 1000s | Magnitude 3D 3000e | Magnitude 3D 3000s |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |
| Clustering support | | | | |
| Boot from SAN | X | X | X | X |

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2.5.1 drivers are based on the Emulex-provided lpfcdd-2xx 2.01g driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Table 114.

| | |
|---|--|
| LP8000, 8000DC | If your HBA has a Dragonfly chip version 2.00 or greater, use firmware version 3.90a7. If your HBA has a Dragonfly chip below version 2.00, use firmware version 3.30a7. |
| LP9000 | Minimum firmware revision 3.90a1 |
| LP9002L, LP9002L-E, LP9002C, 9002DC | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.90a1 |
| LP9802DC | Minimum firmware revision 1.91a5 |
| LP10000, 10000DC, LP10000E | Minimum firmware revision 1.91a5 |
| LP101 | |
| LP952L | Minimum firmware revision 3.91a3 |
| LP982, 9802 | Minimum firmware revision 1.91a5 |
| LP1050, 1050DC, 1050-F2 | Minimum firmware revision 1.91a5 |
| LP7000E | Minimum firmware revision 3.21a0 |
| HP OEM versions of Emulex adapters are not supported. | |

QLogic Fibre Channel Adapters

The default ESX Server 2.5.1 driver is based on the QLogic-provided qla2x00 v 7.0.4 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Note: The HBA that controls the boot LUN must be a QLogic HBA; currently only the QLA-23xx series is supported.

- QLA-2200
- QLA-2300
- QLA-2310/2312 (Blade servers)
- QLA-2340/2342
- QLE-2360/2362

VMware supports the following Dell OEM versions of the QLogic adapters:

- Dell QLogic 2342M (for Dell PowerEdge 1855 blade servers)
- Dell QLogic 2362M (for Dell PowerEdge 6850)

VMware supports the following HP OEM versions of the QLogic adapters:

- HP FCA2210
- HP FCA2214
- HP FCA2214DC

VMware supports the following Sun OEM versions of the QLogic adapters:

Table 115. Supported Sun OEM Versions of QLogic Adapters

| QLogic Adapter | Sun OEM Version |
|---|-----------------------------------|
| QLA2342 | Sun SG-SPC12FC-QF2 ¹ |
| QLA2342R | Sun SG-XPCI2FC-QF2-Z ¹ |
| ¹ This OEM version of the QLogic adapter does not support boot-from-SAN. | |

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 116.

| QLogic Adapter | IBM OEM Version |
|----------------|---|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |
| 48P7061 | IBM HS20 Fibre Channel Expansion |
| 13N2203 | IBM HS20 Fibre Channel Expansion |
| 26K4841 | IBM Bladecenter SFF Fibre Channel Expansion |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 117.

| ESX Server 2.5.1 | |
|---|--------------------------------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 192 + n*32 where n=#physical extents |

¹ When you use an Emulex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs.

² ESX Server 2.5.1 supports a maximum of 160 virtual targets. In some situations (For example, when every virtual target is on a different VMFS volume), that maximum may decrease to 128 virtual targets.

³ In ESX Server 2.5.1, VMFS-2 can span up to 32 partitions on multiple disks, each of which can support 2TB of space.

ESX Server 2.5

Storage Vendor Qualifications and Support

ESX Server 2.5 is supported by the following major storage vendors:

- [“Dell”](#) on page 94
- [“EMC”](#) on page 95
- [“Fujitsu Siemens”](#) on page 95
- [“HP”](#) on page 96
- [“Hitachi Data Systems \(HDS\)”](#) on page 98
- [“IBM”](#) on page 98
- [“Fujitsu”](#) on page 99
- [“NetApp”](#) on page 99
- [“NEC”](#) on page 100
- [“StorageTek”](#) on page 100

Server Clustering

Storage arrays are tested in clustered and non-clustered environments. Clustering refers to the use of Microsoft Cluster Services (Windows 2003 and 2000) in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

ESX Server 2.5 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2000 and 2003:

Table 118.

| Configuration | Description | Restrictions |
|---|---|--------------------------|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | ■ Two-node clusters only |

Table 118.

| Configuration | Description | Restrictions |
|--|---|--|
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only ■ If using SAN path failover, this configuration is fully supported only if the virtual machines share raw disks, not virtual disks. If virtual machines share virtual disks, the cluster fails over before the SAN path fails over. |
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | <ul style="list-style-type: none"> ■ Two-node cluster only |

ESX Server 2.5 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Storage Arrays

VMware ESX Server 2.5 supports a variety of storage arrays in various configurations. The tables below state the VMware supported storage arrays and the supported configurations for each vendor.

Note: All storage products listed in this compatibility guide are supported. For further details about array firmware, storage product configurations, and best practices, please contact the storage vendor.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switches. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Boot from SAN — In this configuration, the ESX Server machine boots from a LUN stored on the SAN rather than in the server itself

Table 119. Dell

| Dell Storage Models | | | | | | |
|---------------------|-------|-------|-------|-------|-------|-------|
| Power Vault 650F | | | | | | |
| | CX200 | CX300 | CX400 | CX500 | CX600 | CX700 |
| | 0 | 0 | 0 | 0 | 0 | 0 |

Table 119. Dell

| | | | | | | | |
|---|---|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Basic connectivity | X | X | X | X | X | X | X |
| Multipathing with HBA failover | | X | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X | X | X |
| Clustering support | | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} |
| Boot from SAN | | X | X | X | X | X | X |

¹ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 120. EMC

| | EMC CLARiiON | | | | | | EMC Symmetrix | |
|---|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | CX200 | CX300 | CX400 | CX500 | CX600 | CX700 | 8000 Series | DMX/DMX2 |
| Basic connectivity | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X |
| Clustering support | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} | X ^{1, 2} |
| Boot from SAN | X | X | X | X | X | X | X | X |

¹ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 121. Fujitsu Siemens

| | FSC Storage Models | | | | | | | |
|--|--------------------|-----|-------|-------|-------|-------|-------|-------|
| | S60 | S80 | CX200 | CX300 | CX400 | CX500 | CX600 | CX700 |
| | | | 0 | 0 | 0 | 0 | 0 | 0 |

Table 121. Fujitsu Siemens

| | | | | | | | | |
|---|----------|---|------------------|------------------|------------------|------------------|------------------|------------------|
| Basic connectivity | X | X | X | X | X | X | X | X |
| | 1Gb only | | | | | | | |
| Multipathing with HBA failover | | X | X | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X | X | X | X |
| Clustering support | | | X ^{1,2} | X ^{1,2} | X ^{1,2} | X ^{1,2} | X ^{1,2} | X ^{1,2} |
| Boot from SAN | | | X | X | X | X | X | X |

¹ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

² This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 122. HP

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clustering support | Boot from SAN |
|--------------------|------|--------------------|--------------------------------|---|--------------------|---------------|
| HP Modular Systems | 1000 | X | X | X | X ^{3,4} | X |
| Array (MSA) | 1500 | X | X | X | X ^{3,4} | X |

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products..

¹ Limited to no more than two physical hosts connected to a single LUN.

² Limited to internal storage configurations only.

³ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

⁴ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

⁵ Active/Passive version (firmware 3.0xx) only.

⁶ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500).

Table 122. HP

| | | Basic connectivity | Multipathing with HBA failover | Multipathing with storage port failover | Clusterin g support | Boot from SAN |
|---|----------------------|-------------------------------|---|--|--------------------------------|------------------------------|
| HP | 3000 ⁵ | X | X | X | X ^{3,4} | X |
| Enterprise Virtual Array (EVA) | 5000 ⁵ | X | X | X | X ^{3,4} | X |
| HP StorageWorks | XP48 | X | X | X | | X |
| | XP512 | X | X | X | | X |
| | XP1024 | X | X | X | | X |
| | XP10000 ² | X | X | X | | X |
| | XP12000 ² | X | X | X | | X |
| Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products.. | | | | | | |
| ¹ Limited to no more than two physical hosts connected to a single LUN. | | | | | | |
| ² Limited to internal storage configurations only. | | | | | | |
| ³ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information. | | | | | | |
| ⁴ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1. | | | | | | |
| ⁵ Active/Passive version (firmware 3.0xx) only. | | | | | | |
| ⁶ Active/passive versions, FW 4.xx (MSA1000) and FW 5.xx (MSA1500). | | | | | | |

Table 123. Hitachi Data Systems (HDS)

| HDS Freedom Storage™ | | | | |
|--|--------------|-------------|--------------|-----------------------------|
| | 9500V Series | 9900 Series | 9900V Series | Tagmastore USP ¹ |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |
| Clustering support | | | | |
| For HDS storage array microcode levels and specific guest operating system, HBA, and switched fabric configurations that HDS supports, please contact your HDS support representative. | | | | |
| ¹ Limited to internal storage configurations only. | | | | |

Table 124. IBM

| | IBM DS Series | | | | IBM ESS/Shark | | | | SVC |
|---|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------|----------------------|-------------------|-----|
| | FAStT 200 | FAStT 500 | 430 0 | 440 0 | 4500 | 800 | F10/ F20 | E10/ E20 | SVC |
| Basic connectivity | X | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X | X |
| Clustering support | X ^{2, 3} | X ^{2, 3} | X ^{2, 3} | X ^{2, 3} | X ^{2, 3} | X ^{1, 2, 3} | X ^{1, 2, 3} | X ^{2, 3} | |
| Boot from SAN | X | X | X | X | X | X | X | X | |

¹ Support is for MSCS on Windows 2000, not Windows 2003.² If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.³ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 125. Fujitsu

| | ETERNUS | ETERNUS |
|---|-------------------|---------|
| | 3000 ¹ | 6000 |
| Basic connectivity | X | X |
| Multipathing with HBA failover | X | X |
| Multipathing with storage port failover | X | X |
| Clustering support | | |
| Boot from SAN | | |

¹ Contact your Fujitsu representative for the required setting to enable support for the ETERNUS 3000.

Table 126. NetApp

| | NetApp Fibre Channel SAN Attached Storage System ¹ | | |
|---|---|-------------------|-------------------|
| | FAS200 Series | F800 Series | FAS900 Series |
| Basic connectivity | X | X | X |
| Multipathing with HBA failover | X | X | X |
| Multipathing with storage port failover | X | X | X |
| Clustering support ⁴ | X ^{5, 6} | X ^{5, 6} | X ^{5, 6} |
| Boot from SAN | X | X | X |

¹ These configurations are also supported with the NetApp NearStore R200 back end.

² VMware certifies the connectivity between the ESX Server machine and the SAN storage device as indicated in the support matrix. In addition, NetApp supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between NetApp storage systems and does not affect the behavior of the storage systems as seen by the servers.

³ In addition to the multipathing options detailed in the matrix above, NetApp offers storage system clustering. This configuration is certified to work as well with the exception of:

⁴ Linux Guest operating systems are only supported if using the vmxlsiologic SCSI emulation driver.

⁵ See definition of clustering, above.

⁶ If Raw Device Mapping LUNs are used with MSCS Clusters across boxes, then you must upgrade to 2.5.2 or later for this functionality. Refer to KB article 1822 (www.vmware.com/support/kb/enduser/std_adp.php?p_faqid=1822) for more information.

⁷ This applies to Windows 2000, its service packs, and Windows 2003 RTM, but not Windows 2003 SP1.

Table 127. NEC

| iStorage | | | | |
|---|-------------|--------------|--------------|--------------|
| | S400 | S1400 | S2400 | S2800 |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |
| Clustering support | | | | |
| Boot from SAN | X | X | X | X |

Table 128. StorageTek

| FlexLine 200/300 Series | | | | | |
|---|----------------|----------------|---------------|----------------|------------------|
| | FLX 380 | FLX 280 | FLX240 | FLX 210 | BC84/D178 |
| Basic connectivity | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X |
| Clustering support | | | | | |
| Boot from SAN | X | X | X | X | X |

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2.5 drivers are based on the Emulex-provided lpfcdd-2xx 2.01g driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Table 129.

| | If your HBA has a Dragonfly chip version 2.00 or greater, use firmware version 3.90a7. |
|---|---|
| LP8000, 8000DC | If your HBA has a Dragonfly chip below version 2.00, use firmware version 3.30a7. |
| LP9000 | Minimum firmware revision 3.90a1 |
| LP9002L, LP9002L-E, LP9002C, 9002DC | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.90a1 |
| LP9802DC | Minimum firmware revision 1.91a5 |
| LP10000, 10000DC, LP10000E | Minimum firmware revision 1.91a5 |
| LP101 | |
| LP952L | Minimum firmware revision 3.91a3 |
| LP982, 9802 | Minimum firmware revision 1.91a5 |
| LP1050, 1050DC, 1050-F2 | Minimum firmware revision 1.91a5 |
| LP7000E | Minimum firmware revision 3.21a0 |
| HP OEM versions of Emulex adapters are not supported. | |

QLogic Fibre Channel Adapters

The default ESX Server 2.5 driver is based on the QLogic-provided qla2x00 v 6.07 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

- QLA-2200
- QLA-2300
- QLA-2310/2312 (Blade servers)
- QLA-2340/2342

VMware also supports the following HP OEM versions of the QLogic adapters:

- HP FCA2210

- HP FCA2214
- HP FCA2214DC

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 130.

| QLogic Adapter | IBM OEM Version |
|----------------|---|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |
| 48P7061 | IBM HS20 Fibre Channel Expansion |
| 13N2203 | IBM HS20 Fibre Channel Expansion |
| 26K4841 | IBM Bladecenter SFF Fibre Channel Expansion |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 131.

| | ESX Server 2.5 |
|---|----------------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |

Table 131.

| ESX Server 2.5 | |
|----------------------------------|--------------------------------------|
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 192 + n*32 where n=#physical extents |

¹ When you use an Emulmex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs.

² ESX Server 2.5 supports a maximum of 160 virtual targets. In some situations, (For example, when every virtual target is on a different VMFS volume), that maximum may decrease to 128 virtual targets.

³ In ESX Server 2.5, VMFS-2 can span up to 32 partitions on multiple disks, each of which can support 2TB of space.

ESX Server 2.1.2

Most compatibility data for ESX Server 2.1.2 is identical to the corresponding compatibility data for ESX Server 2.1.1. This section shows only the compatibility tables that are different. For vendors not shown here, refer to “[ESX Server 2.1.1](#)” on page 105.

Table 132. Hitachi Data Systems (HDS)

| | HDS Freedom Storage™ | | | |
|---|---------------------------|--------------------------|---------------------------|-------------------------------|
| | 9500V Series ¹ | 9900 Series ¹ | 9900V Series ¹ | TagmaStore USP ^{1,2} |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X |
| Clustering support | | | | |

¹ For HDS storage array microcode levels and the specific guest operating system, HBA, and switched fabric configurations that HDS supports, please contact your HDS support representative.

² Limited to internal storage configurations only.

For all other vendors, SAN compatibility is unchanged from ESX Server 2.1.1.

ESX Server 2.1.1

Storage Vendor Qualifications and Support

ESX Server 2.1.1 is supported by the following major storage vendors:

- [“Dell”](#) on page 106
- [“EMC”](#) on page 107
- [“Fujitsu Siemens”](#) on page 107
- [“Hitachi Data Systems \(HDS\)”](#) on page 108
- [“HP”](#) on page 108
- [“IBM”](#) on page 109
- [“NetApp”](#) on page 109
- [“Xitech”](#) on page 109

For specific configurations supported by each storage vendor, please contact your storage vendor support representative.

Server Clustering

Storage arrays are tested in clustered and non-clustered environments. Clustering refers to the use of Microsoft Cluster Services (Windows 2000 and 2003 in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

ESX Server 2.1.1 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2000 and 2003:

Table 133.

| Configuration | Description | Restrictions |
|---|---|---------------------------|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | ■ Two-node clusters only. |

Table 133.

| Configuration | Description | Restrictions |
|--|---|---|
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only. ■ If using SAN path failover, this configuration is fully supported only if the virtual machines share raw disks, not virtual disks. If virtual machines share virtual disks, the cluster fails over before the SAN path fails over. |
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | <ul style="list-style-type: none"> ■ Two-node cluster only. ■ Physical Windows server cannot run multipathing software. |

ESX Server 2.1.1 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Storage Arrays

VMware ESX Server 2.1.1 supports a variety of storage arrays in various configurations. The tables below state, for each vendor, the supported storage arrays and the supported configurations.

Note: All storage products listed in this compatibility guide are supported. For further details about array firmware, storage product configurations, and best practices, please contact the storage vendor.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of the ESX Server machine to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connected to one or more SAN switches; the server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Table 134. Dell

| | |
|--|--------------|
| | Dell Storage |
|--|--------------|

Table 134. Dell

| | Power Vault 650F | CX200 | CX30 0 | CX400 | CX50 0 | CX60 0 | CX70 0 |
|--|---------------------|-------|-----------|-------|-----------|-----------|-----------|
| Basic connectivity | X | X | X | X | X | X | X |
| Multipathing with HBA failover | | X | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X | X | X |
| Clustering support | | X | X | X | X | X | X |

Table 135. EMC

| | EMC CLARiiON | | | | | | EMC Symmetrix | |
|---|--------------|-----------|-----------|-----------|-----------|-----------|--------------------|------------------|
| | CX200 | CX30 0 | CX40 0 | CX50 0 | CX60 0 | CX70 0 | 8000 Serie s | DMX/ DMX 2 |
| Basic connectivity | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X |
| Clustering support | X | X | X | X | X | X | | |

Table 136. Fujitsu Siemens

| | FSC Storage | | | | | | |
|-----------------------------------|-------------|-----------|-------|-----------|-----------|-----------|-----------|
| | S60 | CX20 0 | CX300 | CX40 0 | CX50 0 | CX60 0 | CX70 0 |
| Basic connectivity | X | X | X | X | X | X | X |
| | 1Gb only | | | | | | |
| Multipathing with HBA failover | | X | X | X | X | X | X |

Table 136. Fujitsu Siemens

| | | | | | | |
|---|---|---|---|---|---|---|
| Multipathing with storage port failover | X | X | X | X | X | X |
| Clustering support | X | X | X | X | X | X |

Table 137. Hitachi Data Systems (HDS)

| | HDS Freedom Storage™ | | |
|---|----------------------|-------------|--------------|
| | 9500V Series | 9900 Series | 9900V Series |
| Basic connectivity | X | X | X |
| Multipathing with HBA failover | X | X | X |
| Multipathing with storage port failover | X | X | X |
| Clustering support | | | |

Note: For HDS storage array microcode levels and the specific guest operating system, HBA, and switched fabric configurations that HDS supports, please contact your HDS support representative.

Table 138. HP

| | HP Modular Systems Array (MSA) | HP Enterprise Virtual Array (EVA) | HP XP ¹ | | | | |
|---|--------------------------------|-----------------------------------|--------------------|----|-----|-----|------|
| | 1000 | 3000 ² | 5000 ² | 48 | 128 | 512 | 1024 |
| Basic connectivity | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X |
| Clustering support | X | X | X | | | | |

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products.

¹ For HP XP storage array microcode levels and the specific guest operating system, HBA, and switched fabric configurations that HP supports, please contact your HP support representative.

² Active/Passive version (firmware 3.0xx) only.

Table 139. IBM

| | IBM FAStT | | | | | IBM ESS/Shark ¹ | | |
|---|-----------|-----|-----|-----|-----|----------------------------|---------|---------|
| | 200 | 500 | 600 | 700 | 900 | 800 | F10/F20 | E10/E20 |
| Basic connectivity | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X |
| Clustering support | X | X | X | X | X | | | |

¹ An RPQ is required for IBM support. Please contact your local IBM storage specialist or business partner.

² If you are an existing ESX Server 2.1 customer using MSCS clustering considering upgrading to ESX Server 2.1.1, please contact VMware support.

Table 140. NetApp

| NetApp Fibre Channel SAN Attached Storage System | | | |
|--|---------------|-------------|---------------|
| | FAS200 Series | F800 Series | FAS900 Series |
| Basic connectivity | X | X | X |
| Multipathing with HBA failover | X | X | X |
| Multipathing with storage port failover | X | X | X |
| Clustering support | X | X | X |

¹ These configurations are also supported with the NetApp NearStore R200. VMware certifies the connectivity between the ESX Server machine and the SAN storage device only as indicated in the support matrix. VMware supports any underlying technology, such as SnapMirror or SnapVault, that replicates data between NetApp storage systems and does not affect the behavior of the storage systems as seen by the servers.

² VMware only certifies the connectivity between the ESX server and the SAN storage device as indicated in the support matrix. VMware supports any underlying technology (such as SnapMirror or SnapVault) that replicates data between NetApp storage systems and does not affect the behavior of the storage systems as seen by the servers.

Table 141.**Table 142. Xitech**

| Magnitude | | |
|---|-----------|--------------|
| | Magnitude | Magnitude 3D |
| Basic connectivity | X | X |
| Multipathing with HBA failover | X | X |
| Multipathing with storage port failover | X | X |

Table 142. Xitech

| Magnitude | | |
|--------------------|-----------|--------------|
| | Magnitude | Magnitude 3D |
| Clustering support | | |

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2.1.1 drivers are based on the Emulex-provided fcLINUXfcp version 4.20q and 1.22e drivers. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Table 143.

| | |
|--------------------------|---|
| LP8000, 8000DC | Minimum firmware revision 3.21a0 |
| LP9000 | Minimum firmware revision 3.81a1 |
| LP9002L, LP9002C, 9002DC | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.82a1 |
| LP9802, 9802DC, LP9802-E | Minimum firmware revision 1.91a5 |
| LP10000 | Minimum firmware revision 1.91a5 |

VMware does not currently support HP OEM versions of the Emulex adapters.

QLogic Fibre Channel Adapters

The default ESX Server 2.1.1 driver is based on the QLogic-provided qla2x00 v 6.04.02 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise. The firmware for these devices are loaded by the driver.

- QLA-2200
- QLA-2300
- QLA-2310/2312 (Blade servers)
- QLA-2340/2342

VMware also supports the following HP OEM versions of the QLogic adapters:

- HP FCA2210
- HP FCA2214

■ HP FCA2214DC

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 144.

| QLogic Adapter | IBM OEM Version |
|----------------|---|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |
| 48P7061 | IBM HS20 Fibre Channel Expansion |
| 13N2203 | IBM HS20 Fibre Channel Expansion |
| 26K4841 | IBM Bladecenter SFF Fibre Channel Expansion |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 145.

| | ESX Server 2.1.1 |
|---|-----------------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 2240 |

- ¹ When you use an Emulex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs.
- ² ESX Server 2.1.1 supports a maximum of 160 virtual targets. In some situations, (For example, when all virtual targets are in non-persistent mode), that maximum may decrease to 128 virtual targets.
- ³ In ESX Server 2.1.1, VMFS-2 can span up to 32 partitions on multiple disks, each which can support 2TB of space.

ESX Server 2.1

Storage Vendor Qualifications and Support

ESX Server 2.1 has the following qualifications from major storage vendors:

- EMC Support Matrix. You can view this matrix at <http://www.emc.com/horizontal/interoperability/matrices/EMCSupportMatrix.pdf>
 - Symmetrix 8000 series support with ESX Server native failover functionality
 - Symmetrix DMX/DMX2 series support with ESX Server native failover functionality
 - CLARiiON CX Series support with ESX Server native failover functionality

ESX Server 2.1 is supported by the following major storage vendors:

- “Dell” on page 114
- “EMC” on page 114
- “Fujitsu Siemens” on page 115
- “Hitachi Data Systems (HDS)” on page 115
- “HP” on page 115
- “IBM” on page 116
- “NetApp” on page 116

For specific configurations supported by each storage vendor, please contact your storage vendor support representative.

Server Clustering

Storage arrays are tested in a clustered and non-clustered environment. Clustering refers to the use of Microsoft Cluster Services (Windows 2000 and 2003) in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

ESX Server 2.1 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2000 and 2003:

Table 146.

| Configuration | Description | Restrictions |
|--|---|---|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only. |
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | <ul style="list-style-type: none"> ■ Two-node clusters only. ■ If using SAN path failover, this configuration is fully supported only if the virtual machines share raw disks, not virtual disks. If virtual machines share virtual disks, the cluster fails over before the SAN path fails over. |
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | <ul style="list-style-type: none"> ■ Two-node cluster only. ■ Physical Windows server cannot run multipathing software. |

ESX Server 2.1 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Storage Arrays

VMware ESX Server 2.1 supports a variety of storage arrays in various configurations. The tables below state, for each vendor, the supported storage arrays and the supported configurations.

Note: All storage products listed in this compatibility guide are supported. For further details about array firmware, storage product configurations, and best practices, please contact the storage vendor.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switches. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Table 147. Dell

| | Dell Storage | | | | | | |
|---|------------------|-------|-------|-------|-------|-------|-------|
| | Power Vault 650F | CX200 | CX300 | CX400 | CX500 | CX600 | CX700 |
| Basic connectivity | X | X | X | X | X | X | X |
| Multipathing with HBA failover | | X | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X | X | X |
| Clustering support | | X | X | X | X | X | X |

Table 148. EMC

| | EMC CLARiiON | | | | | | EMC Symmetrix | |
|---|--------------|-------|-------|-------|-------|-------|---------------|----------|
| | CX200 | CX300 | CX400 | CX500 | CX600 | CX700 | 8000 Series | DMX/DMX2 |
| Basic connectivity | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X |
| Clustering support | X | X | X | X | X | X | | |

Table 149. Fujitsu Siemens

| | FSC Storage | | | | | | |
|---|-------------|-------|-------|-------|-------|-------|-------|
| | S60 | CX200 | CX300 | CX400 | CX500 | CX600 | CX700 |
| Basic connectivity | X 1Gb only | X | X | X | X | X | X |
| Multipathing with HBA failover | | X | X | X | X | X | X |
| Multipathing with storage port failover | | X | X | X | X | X | X |
| Clustering support | | X | X | X | X | X | X |

Table 150. Hitachi Data Systems (HDS)

| | HDS Freedom Storage™ | | |
|---|----------------------|-------------|--------------|
| | 9500V Series | 9900 Series | 9900V Series |
| Basic connectivity | X | X | X |
| Multipathing with HBA failover | X | X | X |
| Multipathing with storage port failover | X | X | X |
| Clustering support | | | |

Note: For HDS storage array microcode levels and the specific guest operating system, HBA, and switched fabric configurations that HDS supports, please contact your HDS support representative.

Table 151. HP

| | HP Modular Systems Array (MSA) | HP Enterprise Virtual Array (EVA) | | | | | |
|---|--------------------------------|-----------------------------------|-------------------|----|-----|-----|------|
| | 1000 | 3000 ² | 5000 ² | 48 | 128 | 512 | 1024 |
| Basic connectivity | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X |

Table 151. HP

| | HP Modular Systems Array (MSA) | HP Enterprise Virtual Array (EVA) | HP XP ¹ |
|--------------------|--------------------------------|-----------------------------------|--------------------|
| | 1000 | 3000 ² | 5000 ² |
| Clustering support | X | X | X |

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products.

¹ For HP XP storage array microcode levels and the specific guest operating system, HBA, and switched fabric configurations, please contact your HP support representative.

² Active/Passive version (firmware 3.0xx) only.

Table 152. IBM

| | IBM FAStT | | | | | IBM ESS/Shark ¹ | | |
|---|-----------|-----|-----|-----|-----|----------------------------|-------------|--|
| | 200 | 500 | 600 | 700 | 900 | F10/ F20 | E10/ E20 | |
| Basic connectivity | X | X | X | X | X | | | |
| Multipathing with HBA failover | X | X | X | X | X | | | |
| Multipathing with storage port failover | X | X | X | X | X | | | |
| Clustering support | X | X | X | X | X | | | |

¹ VMware has become aware of a potential issue during extended (over two hours) online maintenance operations using ESX Server 2.1 with IBM/ESS storage. Under exceptional circumstances, the storage controller can be unavailable to the ESX Server machine for an extended period. Under these unlikely conditions, writes can fail to complete properly without notification.

While we do not have specific evidence that this situation occurs in normal use, we have made a fix available and are taking the precautionary measure of advising customers.

Workaround: If your configuration is affected, you should upgrade to ESX Server 2.1.1.

Table 153. NetApp

| | NetApp Fibre Channel SAN Attached Storage System ¹ | | |
|--------------------------------|---|-------------|---------------|
| | FAS200 Series | F800 Series | FAS900 Series |
| Basic connectivity | X | X | X |
| Multipathing with HBA failover | X | X | X |

Table 153. NetApp

| NetApp Fibre Channel SAN Attached Storage System ¹ | | | |
|---|---------------|-------------|---------------|
| | FAS200 Series | F800 Series | FAS900 Series |
| Multipathing with storage port failover | X | X | X |
| Clustering support ⁴ | X | X | X |
| Boot from SAN | X | X | X |

¹ These configurations are also supported with the NetApp NearStore R200.

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2.1 drivers are based on the Emulex-provided fcLINUXfc version 4.20q and 1.22e drivers. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Table 154.

| | |
|--------------------------|---|
| LP8000, 8000DC | Minimum firmware revision 3.21a0 |
| LP9000 | Minimum firmware revision 3.81a1 |
| LP9002L, LP9002C, 9002DC | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.82a1 |
| LP9802, 9802DC | Minimum firmware revision 1.91a5 |
| LP10000 | Minimum firmware revision 1.91a5 |

VMware does not currently support HP OEM versions of the Emulex adapters.

QLogic Fibre Channel Adapters

The default ESX Server 2.1 driver is based on the QLogic-provided qla2x00 v 6.04.02 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise. The firmware for these devices is loaded by the driver.

- QLA-2200
- QLA-2300

- QLA-2310/2312 (Blade servers)
- QLA-2340/2342

VMware also supports the following HP OEM versions of the QLogic adapters:

- HP FCA2210
- HP FCA2214
- HP FCA2214DC

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 155.

| QLogic Adapter | IBM OEM Version |
|----------------|----------------------------------|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |
| 48P7061 | IBM HS20 Fibre Channel Expansion |
| 13N2203 | IBM HS20 Fibre Channel Expansion |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 156.

| | ESX Server 2.1 |
|---|----------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |

Table 156.

| | ESX Server 2.1 |
|---|-----------------------|
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 2240 |

¹ When you use an Emulex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs.

² ESX Server 2.1 supports a maximum of 160 virtual targets. In some situations, (For example, when all virtual targets are in non-persistent mode), that maximum may decrease to 128 virtual targets.

³ In ESX Server 2.1, VMFS-2 can span up to 32 partitions on multiple disks, each of which can support 2TB of space.

ESX Server 2.0.1

Storage Vendor Qualifications and Support

ESX Server 2.0.1 has the following qualifications from major storage vendors:

- EMC Support Matrix. You can view this matrix at: <http://www.emc.com/horizontal/interoperability/matrices/EMCSupportMatrix.pdf>
 - Symmetrix 8000 series support with ESX Server native failover functionality
 - Symmetrix DMX/DMX2 series support with ESX Server native failover functionality
 - CLARiiON CX Series support in single path configuration
- IBM. You can view this matrix at: <http://wwstorage.ibm.com/proven/>
 - TotalStorage Proven for ESS/"Shark"

ESX Server 2.0.1 is supported by the following major storage vendors:

- ["Dell"](#) on page 121
- ["EMC"](#) on page 121
- ["Fujitsu Siemens"](#) on page 121
- ["Hitachi Data Systems \(HDS\)"](#) on page 122
- ["HP"](#) on page 122
- ["IBM"](#) on page 122

- “NetApp” on page 123

For specific configurations supported by each storage vendor, please contact your storage vendor support representative.

Server Clustering

Storage arrays are tested in clustered and non-clustered environments. Clustering refers to the use of Microsoft Cluster Services (Windows 2000 and 2003) in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

ESX Server 2.0.1 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2000 and 2003:

Table 157.

| Configuration | Description | Restrictions |
|--|---|---|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | <ul style="list-style-type: none"> • Two-node clusters only. |
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | <ul style="list-style-type: none"> • Two-node clusters only. • If using SAN path failover, this configuration is fully supported only if the virtual machines share raw disks, not virtual disks. If virtual machines share virtual disks, the cluster will fail over before the SAN path fails over. |
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | <ul style="list-style-type: none"> • Two-node cluster only. • Physical Windows server cannot run software. |

ESX Server 2.0.1 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Storage Arrays

VMware ESX Server 2.0.1 supports a variety of storage arrays in various configurations. The tables below state, for each vendor, the supported storage arrays and the supported configurations.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switches. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Table 158. Dell

| Dell Storage | | | | |
|---|--------------------|-------|-------|-------|
| | PowerVault 650F | CX200 | CX400 | CX600 |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | | | | |
| Multipathing with storage port failover | | | | |
| Clustering support | | | | |

Table 159. EMC

| EMC CLARiiON | | | EMC Symmetrix | | |
|---|-------|-------|---------------|-------------|-----------|
| | CX200 | CX400 | CX600 | 8000 Series | DMX/DMX 2 |
| Basic connectivity | X | X | X | X | X |
| Multipathing with HBA failover | | | | X | X |
| Multipathing with storage port failover | | | | X | X |
| Clustering support | | | | | |

Table 160. Fujitsu Siemens

| FSC Storage | | | | |
|---|-----|-------|-------|-------|
| | S60 | CX200 | CX400 | CX600 |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | | | |
| Multipathing with storage port failover | X | | | |
| Clustering support | | | | |

Table 161. Hitachi Data Systems (HDS)

| | HDS Freedom Storage™ | | |
|---|----------------------|-------------|--------------|
| | 9500V Series | 9900 Series | 9900V Series |
| Basic connectivity | X | X | X |
| Multipathing with HBA failover | X | X | X |
| Multipathing with storage port failover | X | X | X |
| Clustering support | | | |

Note: For HDS storage array microcode levels and the specific guest operating system, HBA, and switched fabric configurations that HDS supports, please contact your HDS support representative.

Table 162. HP

| | HP Modular Systems Array (MSA) | HP Enterprise Virtual Array (EVA) | | | | | |
|---|--------------------------------|-----------------------------------|-------------------|--------------------|-----|-----|------|
| | 1000 | 3000 ² | 5000 ² | HP XP ¹ | | | |
| | | | | 48 | 128 | 512 | 1024 |
| Basic connectivity | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X |
| Clustering support | | | | | | | |

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products.

¹ For HP XP storage array microcode levels and the specific guest operating system, HBA, and switched fabric configurations, please contact your HP support representative.

² Active/Passive version (firmware 3.0xx) only.

Table 163. IBM

| | IBM FAStT | | | | | IBM ESS/Shark | | |
|--------------------|-----------|-----|-----|-----|-----|---------------|-------------|-------------|
| | 200 | 500 | 600 | 700 | 900 | 800 | F10/ F20 | E10/ E20 |
| Basic connectivity | X | X | X | X | X | X | X | X |

Table 163. IBM

| | IBM FAStT | | | | | IBM ESS/Shark | | |
|---|-----------|-----|-----|-----|-----|---------------|-------------|-------------|
| | 200 | 500 | 600 | 700 | 900 | 800 | F10/ F20 | E10/ E20 |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X |
| Clustering support | X | X | X | X | X | X | X | X |

Note: Clustering was tested with IBM ESS 2105 E20 with firmware level EC 2.1.1.100.

Table 164. NetApp

| NetApp Fibre Channel SAN Attached Storage System | | |
|--|-------------|---------------|
| | F800 Series | FAS900 Series |
| Basic connectivity | X | X |
| Multipathing with HBA failover | X | X |
| Multipathing with storage port failover | X | X |
| Clustering support | | |

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2 driver is based on the Emulex-provided fcLINUXfcp version 4.20q driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Table 165.

| | |
|--------------------------|----------------------------------|
| LP8000, 8000DC | Minimum firmware revision 3.21a0 |
| LP9000 | Minimum firmware revision 3.81a1 |
| LP9002L, LP9002C, 9002DC | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.82a1 |
| LP9802, 9802DC | Minimum firmware revision 1.91a5 |

VMware does not currently support HP OEM versions of the Emulex adapters.

QLogic Fibre Channel Adapters

The default ESX Server 2.0.1 driver is based on the QLogic-provided qla2x00 v 6.04.02 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise. The firmware for these devices are loaded by the driver.

- QLA-2200
- QLA-2300
- QLA-2310/2312 (Blade servers)
- QLA-2340/2342

VMware supports the following HP OEM versions of the QLogic adapters:

- HP FCA2210
- HP FCA2214
- HP FCA2214DC

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 166.

| QLogic Adapter | IBM OEM Version |
|----------------|-----------------|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 167.

| | ESX Server 2.0.1 |
|------------------------|------------------|
| Maximum LUNs per array | 128 |

Table 167.

| | ESX Server 2.0.1 |
|---|-----------------------|
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 2240 |

¹ When you use an Emulex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs.

² ESX Server 2.0.1 supports a maximum of 160 virtual targets. In some situations, (for example, when all virtual targets are in non-persistent mode), that maximum may decrease to 128 virtual targets.

³ In ESX Server 2.0.1, VMFS-2 can span up to 32 partitions on multiple disks, each which can support 2TB of space.

ESX Server 2.0

Storage Arrays

VMware ESX Server 2.0 supports a variety of storage arrays in various configurations. The tables below state, for each vendor, the supported storage arrays and the supported configurations.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switches. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Clustering

Storage arrays are tested in a clustered and non-clustered environment. Clustering refers to the use of Microsoft Cluster Services (Windows 2003 and 2000) in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

ESX Server 2.0 supports the following virtual machine clustering configurations with Microsoft Cluster Services on Windows 2000 and 2003:

Table 168.

| Configuration | Description | Restrictions |
|--|---|--|
| Virtual machines on the same ESX Server system. | Clustering of virtual machines which reside on the same physical system. These virtual machines can share local storage or SAN-based storage. | <ul style="list-style-type: none"> Two-node clusters only. |
| Virtual machines on separate ESX Server systems. | Clustering of virtual machines residing on separate physical systems. These virtual machines share storage through SAN-based storage. | <ul style="list-style-type: none"> Two-node node clusters only. Supported without use of SAN multipathing. |
| Virtual machine clustered with a physical machine. | Clustering of a virtual machine on an ESX Server system with a physical Windows server. | <ul style="list-style-type: none"> Two-node node cluster only. Supported without use of SAN multipathing. |

ESX Server 2.0 supports this level of clustering on certain SAN storage devices as marked below. Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

Table 169. IBM

| Storage Array | IBM FAStT | | | | | IBM ESS/ Shark | | |
|---|-----------|-----|-----|-----|-----|----------------|-------------|-------------|
| Model | 200 | 500 | 600 | 700 | 900 | 800 | F10/ F20 | E10/ E20 |
| Basic connectivity | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X |
| Clustering support | X | X | X | X | X | X | X | X |

Note: Clustering was tested with IBM ESS 2105 E20 with firmware level EC 2.1.1.100.

Table 170. EMC

| Storage Array | EMC CLARiiON/Dell OEMs | | | EMC Symmetrix | |
|---|------------------------|-------|-------|-----------------------|-----------|
| Model | CX200 | CX400 | CX600 | Symmetrix 8000 Series | DMX/DMX 2 |
| Basic connectivity | X | X | X | X | X |
| Multipathing with HBA failover | | | | | |
| Multipathing with storage port failover | | | | | |
| Clustering support | | | | | |

Table 171. Dell

| Storage Array | Dell Storage | | | |
|---|-----------------|-------|-------|-------|
| Model | PowerVault 650F | CX200 | CX400 | CX600 |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | | | | |
| Multipathing with storage port failover | | | | |
| Clustering support | | | | |

Table 172. HP

| Storage Array | HP Modular Systems Array (MSA) | HP Enterprise Virtual Array (EVA) |
|---|--------------------------------|-----------------------------------|
| Model | 1000 | 5000 ¹ |
| Basic connectivity | X | X |
| Multipathing with HBA failover | | |
| Multipathing with storage port failover | | |
| Clustering support | | |

Please contact your local HP account or service representative for definitive information about supported HP storage product configurations including Guest OS types, array firmware and best practices when used with VMware products.

¹ Active/Passive version (firmware 3.0xx) only.

Table 173. Fujitsu Siemens

| Storage Array | FSC Storage | | | |
|---|-------------|-------|-------|-------|
| Model | S60 | CX200 | CX400 | CX600 |
| Basic connectivity | X | X | X | X |
| Multipathing with HBA failover | X | | | |
| Multipathing with storage port failover | X | | | |
| Clustering support | | | | |

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server 2 driver is based on the Emulex-provided fcLINUXfc version 4.20q driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise.

Table 174.

| | |
|------------------|----------------------------------|
| LP8000, 8000DC | Minimum firmware revision 3.21a0 |
| LP9000 | Minimum firmware revision 3.81a1 |
| LP9002L, LP9002C | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.82a1 |
| LP9802 | Minimum firmware revision 1.91a5 |

VMware does not currently support HP OEM versions of the Emulex adapters.

QLogic Fibre Channel Adapters

The default ESX Server 2 driver is based on the QLogic-provided qla2x00 v 6.04.02 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise. The firmware for these devices are loaded by the driver.

- QLA-2200
- QLA-2300

- QLA-2310/2312 (Blade servers)
- QLA-2340/2342

VMware also supports the following HP OEM versions of the QLogic adapters:

- HP FCA2210
- HP FCA2214
- HP FCA2214DC

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 175.

| QLogic Adapter | IBM OEM Version |
|----------------|-----------------|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 176.

| | ESX Server 2.0 |
|---|----------------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 60 |
| Maximum virtual targets per Linux virtual machine | 60 |
| Maximum virtual targets for all concurrent virtual machines | 128-160 ² |
| Maximum number of VMFS file systems per server | 128 |

Table 176.

| | ESX Server 2.0 |
|----------------------------------|-----------------------|
| Maximum disk space per VMFS | 2TB x 32 ³ |
| Maximum file size per VMFS file | 27TB |
| Maximum number of files per VMFS | 2240 |

¹ When you use an Emulex HBA, we recommend no more than 128 LUNs if using a single HBA, 64 LUNs if using two HBAs, and 32 LUNs if using more than two HBAs.

² ESX Server 2.0 supports a maximum of 160 virtual targets. In some situations, (For example, when all virtual targets are in non-persistent mode), that maximum may decrease to 128 virtual targets.

³ In ESX Server 2.0, VMFS-2 can span up to 32 partitions on multiple disks, each which can support 2TB of space.

ESX Server 1.5.2

Storage Vendor Qualifications

ESX Server 1.5.2 has the following qualifications from major storage vendors:

- EMC Support Matrix. You can view this matrix at: <http://www.emc.com/horizontal/interoperability/matrices/EMCSupportMatrix.pdf>
 - Symmetrix 8000 series
 - Symmetrix DMX/DMX2 series
- IBM. You can view this matrix at: <http://www.storage.ibm.com/proven/>
 - TotalStorage Proven for FASSt 600 and 900 and ESS/"Shark"

Storage Arrays

VMware ESX Server 1.5.2 supports a variety of storage arrays in various configurations. The tables below state, for each vendor, the supported storage arrays and the supported configurations.

In ESX Server 1.5.2, "Failover" refers to the use of the QLogic failover driver first shipped by VMware in its 1.5.1 release. Failover is not supported with the Emulex HBA family, and storage array support is HBA-dependent in ESX Server 1.5.2.

VMware tests the following configurations:

Basic Connectivity — The ability of ESX Server to recognize and inter operate with the storage array. This configuration does not allow for multipathing or any type of failover.

Multipathing — The ability of ESX Server to handle multiple paths to the same storage device.

HBA Failover — In this configuration, the server is equipped with multiple HBAs connecting to one or more SAN switches. The server is robust to HBA and switch failure only.

Storage Port Failover — In this configuration, the server is attached to multiple storage ports and is robust to storage port failures.

Each configuration is tested in a clustered and non-clustered environment. Clustering refers to the use of Microsoft Cluster Services in a shared disk configuration where multiple virtual machines on multiple physical servers share storage on an array.

When virtual machines are clustered, ESX Server 1.5.2 supports the concept of SCSI reservation in a non-multipathing environment only with certain storage arrays, as marked below. Clustering in a multipathing environment is not supported in this release. Clustering has been tested using Microsoft Windows 2000 Server.

Before installing VMware ESX Server with your storage array, please examine the list below to find if your array and configuration are supported.

QLogic HBAs

Table 177. IBM

| Storage Array | IBM FAStT | | | | | IBM ESS/ Shark ¹ | | |
|---|-----------|-----|-----|-----|-----|-----------------------------|-------------|-------------|
| Model | 200 | 500 | 600 | 700 | 900 | 800 | F10/ F20 | E10/ E20 |
| Basic connectivity | X | X | X | X | X | X | X | X |
| Multipathing with HBA failover | X | X | X | X | X | X | X | X |
| Multipathing with storage port failover | X | X | X | X | X | X | X | X |
| Clustering support without multipathing | | | | | | X | X | X |

¹ Clustering was tested with IBM ESS F800 Model firmware level R6G.8B021021 (copper shark). The F800 model firmware level R6U.FB020801C (silver shark) are unsupported for this configuration.

Table 178. EMC/Dell/Fujitsu Siemens

| Storage Array | EMC CLARiON/Dell and FSC OEMs | | | | EMC Symmetrix ¹ | |
|---|-------------------------------|-------|-------|-------|----------------------------|-----------|
| Model | Dell PowerVault 650F | CX200 | CX400 | CX600 | Symmetrix 5 | DMX/DMX 2 |
| Basic connectivity | X | X | X | X | X | X |
| Multipathing with HBA failover | | | | | | |
| Multipathing with storage port failover | | | | | | |
| Clustering support without multipathing | | | | | | |

¹ Tested with QLogic 2200, firmware level 1.79, and the qla driver version 6.03b6.

Emulex HBAs

Table 179. IBM

| Storage Array | IBM FAStT | | | | | IBM ESS/Shark | | |
|--------------------|-----------|-----|-----|-----|-----|---------------|---------|---------|
| Model | 200 | 500 | 600 | 700 | 900 | 800 | F10/F20 | E10/E20 |
| Basic connectivity | X | X | X | X | X | X | X | X |

Table 180. EMC/Dell/Fujitsu Siemens

| Storage Array | EMC CLARiiON/Dell and FSC OEMs | | | | EMC Symmetrix | |
|--------------------|--------------------------------|-------|-------|-------|---------------|------------|
| Model | Dell PowerVault 650F | CX200 | CX400 | CX600 | Symmetrix | DM X/DM X2 |
| Basic connectivity | X | X | X | X | X | X |

Host Bus Adapters

Emulex Fibre Channel Adapters

The ESX Server driver is based on the Linux port of the Emulex produced fcLINUXfcp version 4.20p driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise. Due to the complexities of the Emulex driver implementation, we recommend that you engage VMware pre-sales support before attempting to configure Emulex adapters with ESX Server, or consider deploying QLogic adapters with ESX Server.

Table 181.

| | |
|------------------|----------------------------------|
| LP850 | Minimum firmware revision 3.21a0 |
| LP7000E | Minimum firmware revision 3.81a1 |
| LP8000, 8000DC | Minimum firmware revision 3.21a0 |
| LP9000 | Minimum firmware revision 3.81a1 |
| LP9002L, LP9002C | Minimum firmware revision 3.93a0 |
| LP9402DC | Minimum firmware revision 3.82a1 |
| LP9802 | Minimum firmware revision 1.91a5 |

QLogic Fibre Channel Adapters

ESX Server ships two drivers to support QLogic adapters: a failover and non-failover version. The ESX Server non-failover driver is based on the EMC Certified Linux port of the QLogic qla2x00 version 4.47.16 driver. The ESX Server default failover driver is based on the Linux port of the qla2x00 version 5.38.6 driver. VMware recommends the optional 6.03b8 driver. This driver has been tested with ESX Server in various fabric configurations. Fibre Channel Arbitrated Loop configurations are currently not supported. Point-to-point or direct connections are not supported unless noted otherwise. The firmware for the QLogic adapter is loaded by the driver.

- QLA-2100
- QLA-2200
- QLA-2300
- QLA-2340

VMware supports the following IBM OEM versions of the QLogic adapters:

Table 182.

| QLogic Adapter | IBM OEM Version |
|----------------|-----------------|
| QLA2200F | IBM DS4000 HBA |
| QLA2202F | IBM QLA2202F/66 |
| QLA2342L | IBM QLA2342-IBM |
| QLA2340L | IBM DS4000 HBA |
| QLA2310FL | IBM FC2/66 |
| QLA2300F | IBM FC2/66 |

Maximum Storage Specifications Supported

The following system and virtual maximums are supported for ESX Server:

Table 183.

| | ESX Server 1.5.2 |
|---|------------------|
| Maximum LUNs per array | 128 |
| Maximum LUNs per system ¹ | 128 |
| Maximum HBAs per system | 16 |
| Maximum virtual HBAs per virtual machine | 4 |
| Maximum virtual targets per virtual HBA | 15 |
| Maximum virtual targets per Windows virtual machine | 33 |
| Maximum virtual targets per Linux virtual machine | 60 |

Table 183.

| ESX Server 1.5.2 | |
|---|-----|
| Maximum virtual targets for all concurrent virtual machines | 64 |
| Maximum number of VMFS file systems per server | 128 |
| Maximum disk space per VMFS | 1TB |
| Maximum file size per VMFS file | 1TB |
| Maximum number of files per VMFS | 256 |

¹ When you use an Emulex HBA, we recommend no more than 32 LUNs.

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VMware, Inc. 3401 Hillview Avenue Palo Alto, CA 94304 www.vmware.com

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