12 P6000/EVA storage system rules

This chapter describes specific rules for the following storage systems:

- EVA4000/4100
- EVA4400
- EVA6000/6100
- EVA8000/8100
- EVA6400/8400
- P6300/P6500 EVA
- P6350/P6550 EVA

ⓘ **IMPORTANT:** HP P6000 storage was formerly called the HP Enterprise Virtual Array product family. General references to HP P6000 can also refer to earlier versions of HP EVA products.

This chapter describes the following topics:

For information about the EVA iSCSI Connectivity Option, see "EVA and EVA4400 iSCSI Connectivity Option " (page 345).

P6000/EVA storage

Before implementation, contact an HP storage representative for information about support for specific configurations, including the following elements:

- Storage system firmware
- HBA firmware and driver versions

Heterogeneous SAN support

P6000/EVA HSV-based controller storage systems support shared access with any combination of operating systems listed in Table 129 (page 221).

Table 129 P6000/EVA heterogeneous SAN support

Storage systems[1]	Firmware[2]	Switches	Operating systems[3]
EVA4000/4100 EVA6000/6100 EVA8000/8100	XCS 6x	B-series C-series H-series M-series	Apple Mac Citrix Xen Server HP-UX IBM AIX Microsoft Windows OpenVMS Red Hat Linux Sun Solaris
EVA4400	XCS 09x XCS 10x		
EVA6400/8400	XCS 095x XCS 10x		SUSE Linux Tru64 UNIX[4]
P6300/P6500 EVA	XCS 10x	B-series C-series H-series	VMware ESX **Note**: For the latest information on storage system support, see the SPOCK website at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.
P6350/P6550 EVA	XCS 11x		

[1] EVA4100/6100/8100 requires XCS firmware 6.2x minimum.

[2] Contact an HP storage representative for switch model and operating system support when using XCS 10x, 09x or 6x.

[3] For the supported operating system versions, see "Heterogeneous server rules" (page 163).

[4] The P63xx/P65xx EVA, EVA6400/8400 and EVA4400 are not supported with Tru64 UNIX.

Configuration rules

Table 130 (page 221) lists configuration rules for heterogeneous SAN storage with P6000/EVA storage systems.

Table 130 P6000/EVA storage system rules

Rule number	Description
1	P6000/EVA storage systems are supported in all SAN fabric topology configurations described in this guide.
2	Unless otherwise specified, P6000/EVA storage systems can be configured in a SAN using the switch models listed in this guide. See the following tables: • Table 54 (page 137) (H-series switches) • Table 22 (page 89) through Table 24 (page 91) (B-series) • Table 39 (page 121) (C-series) • Table 62 (page 146) and Table 63 (page 146) (M-series)
3	For SANs with more than 1,024 HBAs, an HSV controller must be zoned for a maximum of 1,024 HBAs. Add a zone to a SAN to satisfy the 1,024 HBA limit.
4	When using HP P6000 Continuous Access, the zoning limit is 256 HBAs.
5	For shared access and heterogeneous platform zoning requirements, see "Heterogeneous SAN storage system coexistence" (page 205).

Table 130 P6000/EVA storage system rules *(continued)*

Rule number	Description
6	For EVA4400 storage systems with the EVA4400 Embedded Switch Module, 8 Gb Brocade connectivity rules, see "B-series Fibre Channel switch fabric rules" (page 99). HP recommends setting the switch port speed to autonegotiate.
7	EVA4400 (without the embedded switch module) with XCS 09*x* and EVA4000/4100/6000/6100/6400/8000/8100/8400 are supported with 8 Gb/s, 4 Gb/s, or 2 Gb/s switch or HBA direct connectivity only (see rule 9). • EVA6400/8400 requires XCS 095*x* minimum. • EVA4100/6100/8100 requires XCS 6.2*x* minimum. • P6300/P6500 EVA requires XCS 10001000 minimum. • P6350/P6550 EVA requires XCS 11001000 minimum. • All Fibre Channel host port connections to P6000/EVA controllers must be set to autonegotiate, 8 Gb/s (P63*xx*/P65*xx* EVA only), 4 Gb/s, or 2 Gb/s. HP recommends setting the port speed to autonegotiate. • Fibre Channel 1 Gb/s components or fabric segments are allowed, including 1 Gb/s links for SAN extension using long-distance direct Fibre Channel, WDM, or FCIP with 8 Gb/s, 4 Gb/s or 2 Gb/s EVA models. • P6000/EVA storage management server, Storage Management Appliance, and other supported server connections to P6000/EVA controllers are allowed at 1 Gb/s when connected to a Fibre Channel switch, provided that the P6000/EVA port is connected at 8 Gb/s, 4 Gb/s, or 2 Gb/s. **Note**: This rule applies to P6000/EVA controllers connected to a Fibre Channel switch and to P6000/EVA controllers using direct connect to a server or HBA (also see rule 9).
8	EVA4000/4100/4400/6000/6100/6400/8000/8100/8400 supports active/active failover. Active/active failover and active/passive failover require a minimum of two Fibre Channel HBAs and native operating system or layered multipathing driver functionality. For exceptions, see "Single path implementation" in the *HP StorageWorks 4x00/6x00/8x00 Enterprise Virtual Array User Guide*, available at http://www.hp.com/support/manuals. In the Storage section, click **Disk Storage Systems**, and then select your product.
9	P6000/EVA storage systems are supported in configurations with a combination of fabric attached and direct connect servers (direct connect uses no Fibre Channel switch). This is subject to the system maximum for host connections. EVA XL storage system support includes support for mixed Fibre Channel speeds on different host ports (4 Gb/s and 2 Gb/s) when using 4 Gb/s controllers. • HP-UX, Linux, and Microsoft Windows are supported for direct connect. • In a Linux environment, direct connect is supported with Emulex HBAs, except when booting from Itanium servers. Direct connect is not supported with Brocade or QLogic HBAs (except where listed below). • Direct connect to blade servers is not supported. Note the following direct connect restrictions for the EVA6400/8400: • In a Windows environment (4 and 8 Gb), direct connect is supported with Emulex HBAs, except when booting the operating system from the EVA. Direct connect and direct connect boot are supported with QLogic HBAs. Direct connect is not supported with Brocade HBAs. • In a Linux environment, direct connect is supported with Emulex 4 and 8 Gb HBAs, except when booting the operating system from the EVA. Direct connect and direct connect boot are supported with QLogic 8 Gb HBAs. Direct connect is not supported with Brocade HBAs. • In an HP-UX environment, direct connect is not supported with 2 Gb HBAs or Emulex 4 Gb PCI-e HBAs. Direct connect is not supported with Brocade HBAs. Use the EVA OCP or WOCP to specify the proper topology setting for the controller host ports (P63*xx*/P65*xx*/EVA4000/4100/6000/6100/6400/8000/8100/8400). • **For fabric**—Set the applicable HSV controller host ports to `Fabric`. • **For direct connect**—Set the applicable HSV controller host ports to `Direct Connect`. For information about the OCP or WOCP, see the P6000/EVA storage system documentation for your model.

Table 130 P6000/EVA storage system rules *(continued)*

Rule number	Description
	For information about configuring direct connect, see the *HP 4400 Enterprise Virtual Array Installation Guide.*
10	All P6000/EVA host ports must contain a cable or a loopback connector; otherwise, host port error events will persist. If the P6000/EVA host port is empty, perform the following steps: **1.** From the OCP or WOCP, set the port to `direct connect` mode. **2.** Insert a loopback connector when a P6000/EVA host port is not connected to a switch or an HBA (for direct connect).
11	Supports connection of single HBA servers. Contact an HP storage representative for the white paper *Connecting Single HBA Servers to the Enterprise Virtual Array without Multipathing Software.* Servers without native or layered multipathing software are not supported for HP P6000 Continuous Access.
12	Overlapping zones are supported with disk and tape.
13	Overlapping storage port zones are supported if multiple operating systems share an array port.
14	Use storage system LUN presentation to enable/disable LUN access to specific hosts.
15	All host table entries must have the operating system type parameter set (based on the operating system accessing the assigned LUNs).
16	Servers that share access to the same storage LUN require special application software (such as cluster software) to preserve data.

For information about configuring the Storage Management Appliance with storage systems in the same SAN fabric, see "Storage management server integration" (page 229).

Configuration parameters

This section describes general P6000/EVA configuration parameters. Specific solutions, such as high-availability clusters, or applications, such as HP P6000 Continuous Access (see "HP P6000 Continuous Access SAN integration" (page 227)), can define additional configuration parameters or requirements. Solution requirements must be observed as specified by the solution configuration documentation.

Table 131 (page 224) lists the maximum number of connections supported by P6000/EVA storage, and the storage limits for each platform. The maximums are for access to a single P6000/EVA storage system with redundant dual controllers. If the connection requirements for the number of servers in a particular SAN exceed the maximum, deploy multiple storage systems in the SAN.

General maximums are as follows:

- 1,024 HBAs
- Up to 256 LUN presentations per a single virtual disk
- Up to 8,192 LUN presentations for all LUNs

For more information about P6000/EVA maximums, see the *HP P6000 Enterprise Virtual Array Compatibility Reference.*

A LUN presentation is the number of hosts presented to, regardless of how many adapters are in each host. For example, if a LUN is presented to eight hosts, that LUN has eight LUN presentations. If a LUN is presented to two hosts, that LUN has two LUN presentations.

```
LUNs #001 through #032 are presented to 8-node cluster      = 0256 LUN presentations
LUNs #033 through #064 are presented to 8-node cluster      = 0256 LUN presentations
LUNs #065 through #096 are presented to 8-node cluster      = 0256 LUN presentations
LUNs #097 through #128 are presented to 8-node cluster      = 0256 LUN presentations
```

LUNs #129 through #160 are presented to 8-node cluster   = 0256 LUN presentations
LUNs #161 through #192 are presented to 4-node cluster   = 0128 LUN presentations
LUNs #193 through #200 are presented to single host   = 0008 LUN presentations

When all LUNs are presented to all hosts, the number of LUNs multiplied by the number of hosts must not exceed 8,192.

Table 131 (page 224) lists the maximum number of EVA storage systems that can be configured on a single server. There is no limit on the maximum number of EVA storage systems in a SAN.

Table 131 EVA single-server maximum configurations

Storage systems	Operating systems[1, 2]	EVA storage systems per HBA[3]	LUNs per HBA target[3, 4]
EVA4000/4100 EVA6000/6100 EVA8000/8100	NAS EFS Clustered Gateway - Linux Edition SUSE SLES 9	8	255
	NAS EFS Clustered Gateway - Windows Edition Windows Storage Server 2003	8	64
EVA4000/4100/4400 EVA6000/6100 EVA8000/8100 EVA6400/8400 P6300/P6500 EVA P6350/P6550 EVA	Tru64 UNIX[5]	64	255
	IBM AIX	16	255
	HP-UX	32	255
	Linux (2.6 kernel)	16	255
	Linux (2.4 kernel)	16	128
	OpenVMS	32	255
	Sun Solaris	16	255
	VMware ESX 4.0, 3.x[6]	15	256 (per server)
	VMware ESX 2.5.x[6]	15	128 (per server)
	Windows 2000[7] Windows 2003 Windows 2008	16	255 (per server)
	Xen	16	255

[1] For the supported operating system versions, see "Heterogeneous server rules" (page 163).

[2] The maximum number of HBAs supported per server depends on the server model. (See the server documentation.) For Tru64 UNIX, the maximum is 64 HBAs per server when using 5.1a (or earlier), 255 HBAs per server when using 5.1b (or later).

[3] Multipath software may impose additional restrictions:

- Windows MPIO supports up to 32 paths per LUN.

- Secure Path for AIX supports up to 32 LUNs per HBA.

[4] The maximum number of configurable LUNs per HBA target may be less based on performance requirements.

[5] The P63xx/P65xx EVA is not supported with Tru64 UNIX.

[6] VMware maximums are per VMware server, regardless of the number of guest operating systems. EVA6400/8400 is not supported with ESX 2.5.x. The P63xx/P65xx EVA is not supported with ESX 2.5.x/3.x

[7] Windows 2000 is not supported with the P63xx/P65xx EVA or EVA4400/6400/8400.

P6000/EVA data migration

The P6000/EVA family of Fibre Channel storage systems supports data migration using the HP StorageWorks MPX200 Multifunction Router data migration feature. This feature provides for block (LUN) level data movement between source and destination storage systems.

MPX200 Multifunction Router with data migration

The MPX200 Multifunction Router supports iSCSI, FCoE, data migration, and FCIP. The base functionality is iSCSI/FCoE, with the option to add either data migration or FCIP (one other license-enabled function) for standalone or concurrent operation. This section describes data migration usage and support.

- For information about FCoE, see "FCoE SAN fabrics" (page 24).
- For information about iSCSI configurations, see "MPX200 Multifunction Router with iSCSI for P6000/EVA storage" (page 333), "MPX200 Multifunction Router with iSCSI for XP storage" (page 343), and "MPX200 Multifunction Router with iSCSI for P10000/3PAR storage" (page 340).
- For information about FCIP, see "MPX200 Multifunction Router with FCIP" (page 283).

A license is required to enable the data migration feature in the MPX200. All licenses are chassis-based, enabling data migration to be configured in both bays (slots) in a dual-blade chassis configuration.

The following licenses are available for data migration:

- **HP Storage Works MPX200 1TB Full Chassis Data Migration License**—Includes the license to migrate 1 TB of data using an MPX200 chassis.
- **HP Storage Works MPX200 5TB Full Chassis Data Migration License**—Includes the license to migrate 5 TB of data using an MPX200 chassis.
- **HP Storage Works MPX200 Full Chassis 1 Array Data Migration License**—Includes the license to migrate data from or to a single array using an MPX200 chassis.

> **NOTE:** The MPX200 data migration has a unique fan-in/fan-out licensing model. Using this particular license, you can migrate data from multiple arrays to a single array or from a single array to multiple arrays. This license cannot be used when performing an iSCSI to iSCSI data migration. For iSCSI to iSCSI data migration, you must use 1TB or 5TB capacity licenses.

Table 132 (page 225) describes the supported source and destination storage systems when using the MPX200 data migration feature. All arrays listed are supported for offline and online data migration, except where noted. Table 133 (page 226) describes the operating system support for online data migration. For information about configuring the MPX200 for data migration, see the *HP StorageWorks MPX200 Multifunction Router Data Migration Solution Guide*.

Table 132 P6000/EVA data migration source-destination storage systems

Source storage systems	P6000/EVA destination storage systems
• All HP MSA (Fibre Channel) and P6000/EVA models • P9500/XP24000/20000, XP12000/10000	• EVA4400/4400 with embedded switch • EVA4000/4100/6000/6100/8000/8100

Table 132 P6000/EVA data migration source-destination storage systems *(continued)*

Source storage systems	P6000/EVA destination storage systems
• SVSP • 3PAR S-Class	
Third-party array models: • Dell EqualLogic family (iSCSI), Compellent Series 30 and 40 Controllers • EMC CLARiiON AX series, CX Series, Symmetrix DMX Series, Symmetrix VMAX SE, VNX5500 • Fujitsu ETERNUS DX400, DX440 S2, DX8400 • Hitachi Data Systems V series, AMS Family, WMS, USP, VSP families, TagmaStore Network StorageController model NSC55 • IBM DS3000 series, DS4000 series, DS5000 series, DS6000 series, DS8000 series, XIV Storage System family, nlStorwize V7000 Unified disk system • NEC D-Series SAN Storage arrays • NetApp FAS270, FAS2000 Series, FAS3100 Series, FAS6000 Series (Fibre Channel and iSCSI) • Xiotech Emprise 5000, Mag3D 4000	• EVA6400/8400 • P6300/P6500 EVA • P6350/P6550

Table 133 Online data migration operating system support

MPX200 online data migration support[1]	Online data migration destination storage system and firmware (minimum)
• HP-UX 11iv3, 11iv2, Clusters (Service Guard) • IBM AIX 6.1, 5.3 • Microsoft Windows 2008 and 2003, Failover Clustering and MSCS • Red Hat 6, 5 U4 , 4 U8, U7, U6, U3, Clusters (RH 6) • SUSE 11, 10 SP3, SP1, Clusters (SUSE 11 U1) • Sun Solaris 10, Clusters 3.3 • VMware ESXi 5.0, 4.1, 4.0, Clusters	• P2000 G3 FC (TS230P006) • P4000 (9.0) • P6350/P6550 (11001000) • P6500/P6300 (10001000) • EVA8000/6000/4000 (6.200) • EVA8100/6100/4100 (6.220) • EVA8400/6400/4400 (09534000) See "P6000/EVA data migration" (page 224). • P9500 (70-00-50-00) • XP24000/20000 (60-06-10-00) • XP12000/10000 (50-09-83-00) See "P9000/XP data migration" (page 237) • P10000 3PAR V-Class (3.1.1) **Note:** Requires MPX200 FW 3.3.1.0 minimum. • 3PAR F-Class, T-Class, 2.3.1 (MU42) See "3PAR data migration" (page 250).

[1] For operating system updates, the minimum supported version is specified.

For current data migration storage system support and up-to-date operating system version support, see the SPOCK website at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.

Data migration considerations

MPX200 connectivity to P6000/EVA storage as a data migration destination array is obtained through a Fibre Channel switch configured in the same fabric as the MPX200 Fibre Channel ports. When the data migration operation is complete, server connectivity to the P6000/EVA storage system must be configured based on current P6000/EVA support for operating systems, HBAs, and multipath software. For current operating system/version and data migration storage system support, see the SPOCK website at http://www.hp.com/storage/spock. You must sign up for an HP Passport to enable access.

HP P6000 Continuous Access SAN integration

HP P6000 Continuous Access is supported in a heterogeneous SAN, provided that you follow the rules described in Table 134 (page 227).

Table 134 HP P6000 Continuous Access heterogeneous SAN configuration rules

Rule number	Description
1	HP strongly recommends that all HP P6000 Continuous Access deployments implement level 4 NSPOF SANs using two or more separate fabrics. See "Data availability" (page 38). HP P6000 Continuous Access supports a subset of operating systems listed in this guide, which limits the types of servers that can reside in the HP P6000 Continuous Access management zone. For more information, see the *HP P6000 Enterprise Virtual Array Compatibility Reference* at http://h18006.www1.hp.com/products/storage/software/conaccesseva/index.html.
2	The maximum number of switches and switch hops supported in a fabric with HP P6000 Continuous Access is based on the limits for B-series, C-series, H-series, and M-series fabrics. All active and standby links must conform to the switch hop limits, including the host-to-local storage link, the local storage-to-remote storage link, and the local host-to-remote storage link. For more information, see the *HP P6000 Continuous Access Implementation Guide* at http://h18006.www1.hp.com/products/storage/software/conaccesseva/index.html and the switch and fabric rules. For switch and fabric rules, see: • "B-series switches and fabric rules" (page 87) • "C-series switches and fabric rules" (page 118) • "H-series switches and fabric rules" (page 136) • "M-series switches and fabric rules" (page 145) For HP P6000 Continuous Access with XCS version 09534000 (or later), HP supports two storage system data replication protocols: the HP-FC protocol and the HP SCSI-FCP protocol. You must configure the Fibre Channel switches based on which data replication protocol you use. For H-series switches, you must use the HP SCSI FC Compliant Data Replication Protocol.
3	Shared usage of HP P6000 Continuous Access-configured storage systems by non-HP P6000 Continuous Access-configured servers (for example, a single HBA or an operating system without multipathing support) or non-HP P6000 Continuous Access-supported operating systems is not supported.
4	For information about supported versions of clustering software and Secure Path, contact an HP storage representative.
5	Each HP P6000 Continuous Access implementation can contain 16 EVAs; each EVA is limited to 256 HBAs. With 2 HBAs per server, 128 servers are possible. Multiple HP P6000 Continuous Access solutions can exist in the same SAN, provided that no solution exceeds the 16-array limit, imposed by zoning.
6	The maximum number of copy sets, DR groups, and remote copy sets is based on the EVA storage system model and controller software version (see the *HP P6000 Enterprise Virtual Array Compatibility Reference*). On all storage systems, the limit is the total number of DR groups and copy sets that are either a source or a destination. When replicating across storage systems with different limits, the lower limit applies to the storage system replication pair.
7	The HP P6000 Continuous Access link supports mixed heterogeneous SAN, HP P6000 Continuous Access, and OpenVMS host-based shadowing traffic.
8	Two Storage Management Appliance Command View element managers are required: one active and one either active in standby mode or in powered-off, passive mode. The active appliance and HP P6000

Table 134 HP P6000 Continuous Access heterogeneous SAN configuration rules *(continued)*

Rule number	Description
	Command View can be used for initial setup of HP P6000 Continuous Access storage. Management of the operational HP P6000 Continuous Access environment is done through the HP Replication Solutions Manager and other products installed on the Storage Management Appliances. For more information, see the *HP P6000 Continuous Access Implementation Guide*, available at http://h18006.www1.hp.com/products/storage/software/conaccesseva/index.html.
9	When adding EVA storage systems to a zone, use the controller port WWNs when implementing a straight-cable configuration. Use the storage system WWN when implementing a cross-cable configuration. For more information, see "Cabling" (page 230) and the *HP P6000 Continuous Access Implementation Guide*.

Zoning

These zoning rules apply to a heterogeneous SAN with P6000/EVA storage:

- Zoning is required for all operating systems that access P6000/EVA storage systems. See "Heterogeneous server rules" (page 163).
- P6000/EVA storage can be in multiple operating system zones.

For configurations that support common server access to multiple storage system types, see "Common server access, different storage system types" (page 206).

Table 135 (page 228) lists zoning rules for heterogeneous SANs with P6000/EVA storage.

Table 135 P6000/EVA configuration zoning rules

Rule number	Description
1	If a storage management server resides in the fabric, each operating system type must be in a separate zone or VSAN. For more information, see "Storage management server integration" (page 229).
2	For C-series switches, each operating system type must be in a separate zone or VSAN.

Tape storage

The following rules apply to tape storage support in a SAN with P6000/EVA storage:

- Overlapping zones are supported with disk and tape.
- Separate or common HBAs for disk and tape connections are supported.
- For a VLS, multiple heterogeneous initiators and multiple ports of the VLS device are supported in the same fabric zone.
- HP recommends using a separate tape-to-HBA connection for servers with backups that require more than four DLT8000 tape drives or two Ultrium (LTO) tape drives.

For more information about tape storage support, contact your HP representative.

P6000/EVA SAN boot support

For current storage system support, see the Boot from SAN website at http://h18006.www1.hp.com/storage/networking/bootsan.html and the SPOCK website at http://www.hp.com/storage/spock. For the SPOCK website, you must sign up for an HP Passport to enable access.

For HP P6000 Continuous Access, if the operating system supports boot from SAN, replication of the boot disk is supported.

SAN boot through the B-series MP Router is not supported.

Storage management server integration

A management server is required to manage an P6000/EVA storage system. The management server can be an SMA, GPS, management station (dedicated server), or HP Storage Server. The management server communicates with storage systems in-band through a Fibre Channel connection.

NOTE: Command View EVA 6.0 (or later) includes a more flexible security feature, which requires the establishment of read/write (ability to manipulate storage) and/or read-only accounts. Before using P6000 Command View or Command View EVA, be sure to review and implement the Command View account security feature setup procedures. Once you enable security, you cannot disable it.

Table 136 (page 229) describes the rules for using a management server for P6000/EVA storage systems.

Table 136 Storage management server configuration rules

| Rule number	Description
1	A storage management server is required for any fabric that contains a P6000/EVA storage system.
2	P6000 Command View 9.4 (or later) is required for P6300/P6500 EVA. P6000 Command View 10.1 (or later) is required for P6350/P6550 EVA.
3	Command View EVA 9.0 (or later) is required for the EVA6400/8400.
4	Command View EVA 8.0 (or later) is required for the EVA4400.
5	Command View EVA 5.0 (or later) supports management of multiple fabrics from a single instance.
6	Command View EVA 5.0 (or later) is required for the EVA iSCSI Connectivity Option.
7	Command View EVA 4x (or later) supports EVA4000/4100/6000/6100/8000/8100 storage systems using XCS 6x (or later).
8	If a storage management server resides in the fabric, it is recommended that it be configured in a separate zone from all operating systems. Create a storage management zone for the storage management server and the elements it will monitor and manage.
9	It is not necessary to include the switch WWNs or server HBA WWNs in the storage management server zone. Management communication to these devices from the storage management server is done out-of-band or outside the fabric via TCP/IP.
10	EVA Element Manager can operate in a dual-fabric configuration. Up to 16 P6000/EVA storage systems can be managed from a single instance of Command View Element Manager.
11	Multiple storage management servers per fabric are allowed. A single P6000/EVA can be zoned with more then one instance of HP P6000 Command View, independent of where HP P6000 Command View is loaded (SMA, GPS, management station, or HP Storage Server).
12	Each storage system can be managed by only one active storage management server. Any standby storage management server can be powered on, but the HP P6000 Command View or HP P6000 Continuous Access user interface must not control the storage system. For more information, see the *HP P6000 Continuous Access Implementation Guide*, available at http://h18006.www1.hp.com/products/storage/software/conaccesseva/index.html.
13	For fabrics with more than 1,024 HBAs, the HSV controller must be zoned to limit access to a maximum of 1,024 HBAs. Add zones to the fabric as needed to adhere to the 1,024 HBA limit.

Cabling

This section describes cabling options for high-availability multipathing configurations for P6000/EVA storage systems.

Level 4 NSPOF configuration

Figure 77 (page 230) through Figure 80 (page 232) show cabling options when implementing a level 4, high-availability, NSPOF configuration. For a description of availability levels, see "Data availability" (page 38).

Figure 77 (page 230) shows the physical connections for a straight-cable, high-availability NSPOF configuration for EVA4000/4100/6000/6100 storage systems. This cabling scheme supports non-HP P6000 Continuous Access configurations and HP P6000 Continuous Access configurations with EVA4000/4100/6000/6100 storage systems.

Figure 77 EVA4000/4100/6000/6100 straight-cable, high-availability configuration
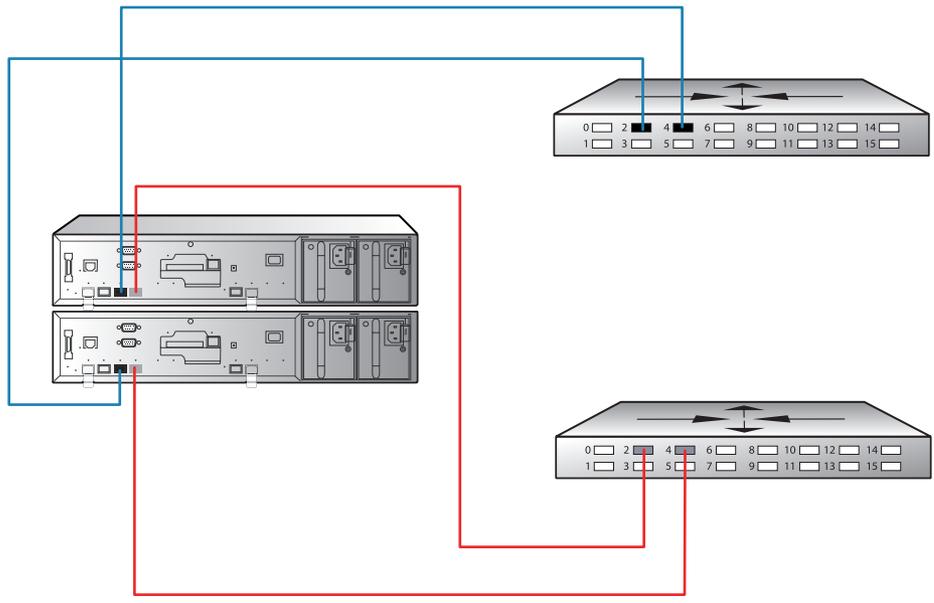
25130b

Figure 78 (page 231) shows the physical connections for a straight-cable, high-availability NSPOF configuration for EVA4400 storage systems. This cabling scheme is also supported for HP P6000 Continuous Access.
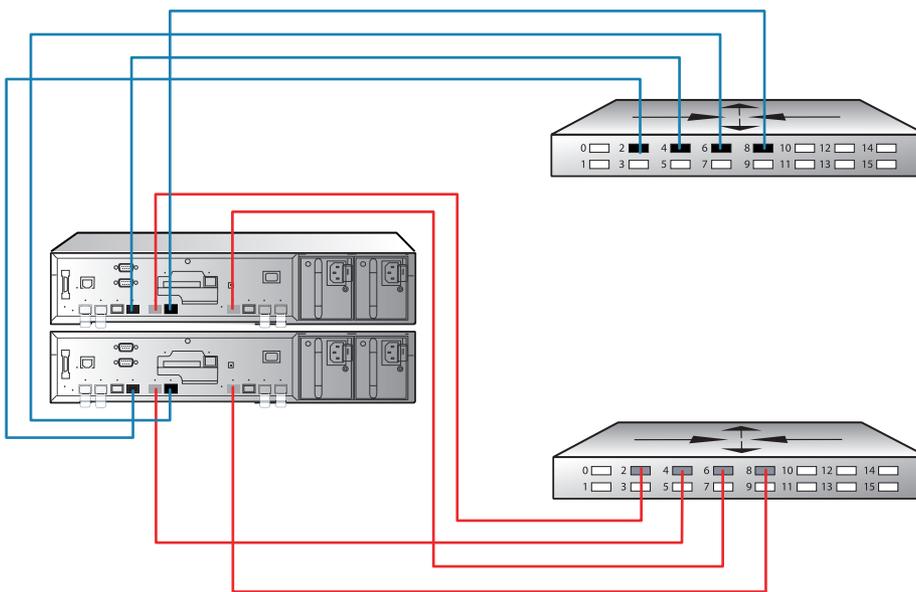
Figure 78 EVA4400 9x straight-cable configuration
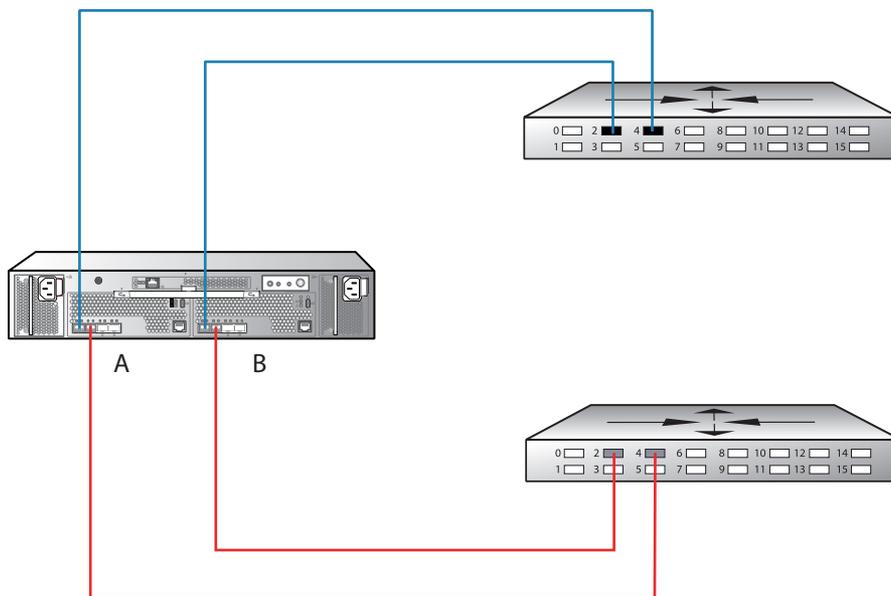
26408a

Figure 79 (page 231) shows the cabling scheme for both non-HP P6000 Continuous Access and HP P6000 Continuous Access configurations for EVA8000/8100 storage systems.

**Figure 79 EVA8000/8100 straight-cable configuration**

25131b

Figure 80 (page 232) shows an EVA8000/8100 configuration in which all controller host ports support two independent, dual-redundant SANs. In this configuration, SAN 1 represents a dual-redundant SAN with Fabric A and Fabric B. Path failover is available between Fabric A and Fabric B. SAN 2 represents a second dual-redundant SAN with Fabric C and Fabric D. Path failover is available between Fabric C and Fabric D.

A modified version of this configuration allows for up to eight fabrics, two configured in a dual-redundant SAN with up to six independent fabrics. A minimum of two fabrics must be configured as a dual-redundant SAN to provide redundant access for the EVA management server.

Figure 80 EVA8000/8100 two independent, dual-redundant SAN configuration
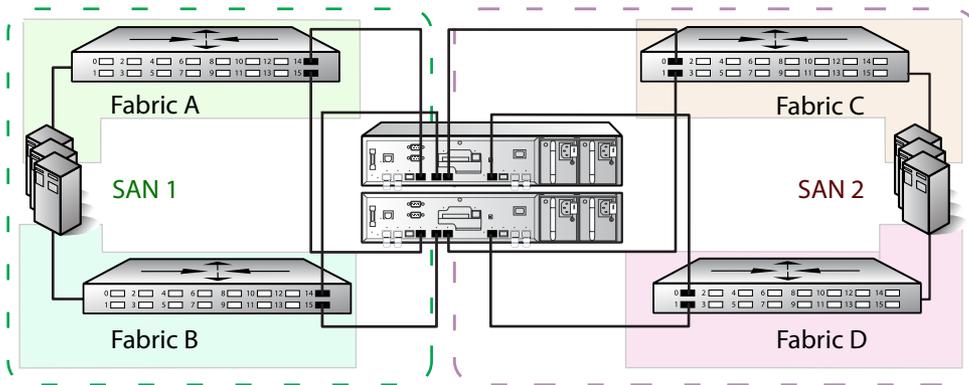

25132a

Dual-channel HBA configurations

Use dual-channel HBAs when the number of server PCI slots is limited. Most installations are configured as shown in Figure 81 (page 232) or Figure 82 (page 232). Both configurations are implemented using a single PCI slot to provide access to the same targets or LUNs, or to a different set of storage targets or LUNs through separate ports on the HBA.

Each dual-channel HBA provides greater performance than a single-channel HBA for a single PCI slot.

Target ranges are examples only. The number of storage controller targets and LUNs associated with each accessible target is operating system dependent.

Figure 81 (page 232) shows two HBA paths connected to the same Fibre Channel switch.

Figure 81 Single PCI slot with dual-channel HBA and one switch
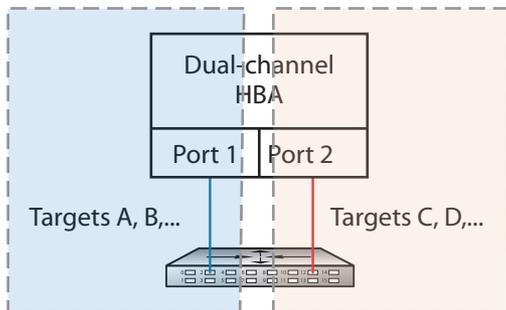
25137b

The configuration shown in Figure 82 (page 232) provides increased availability during a single switch failure. For example, availability to a specific set of targets is increased by configuring access to targets A, B on both paths.
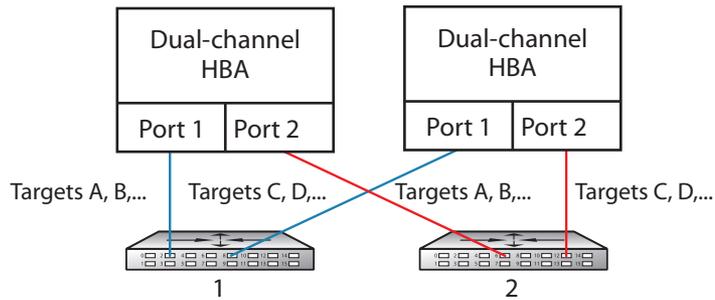
Figure 82 Single PCI slot with dual-channel HBA and two switches
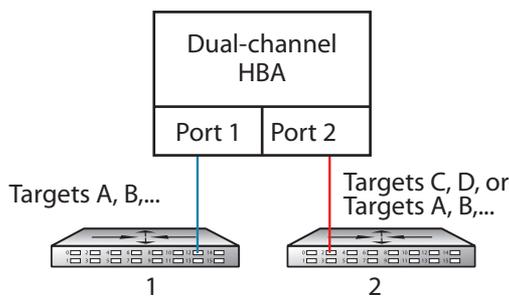
25138b

Figure 83 (page 233) shows a sample NSPOF solution with two dual-channel HBAs. This availability solution is equivalent to using two single-channel HBAs. For more information, see "Data availability" (page 38).

Figure 83 Two dual-channel HBAs (NSPOF)