hp Storageworks
Fabric Interoperability: Merging Fabrics Based on C-Series and B-Series Fibre Channel Switches

Sixth Edition (August 2006)

Part Number: AA-RV1ZF-TE

This document summarizes. the steps required to merge two SAN fabrics, where one is constructed with C-Series SAN switches and the other is constructed with B-Series SAN switches

For the latest version of these Application Notes and other SAN fabric interoperability documentation, access the HP storage web site at: http://www.hp.com/country/us/eng/prodserv/storage.html

About this document

This section describes the content reflected in this document, including:

Application notes information

These Application Notes cover the following major topics:

Intended audience

This document is intended for customers who are considering merging SAN fabrics where one fabric is constructed with C-Series SAN switches and the other fabric is constructed with B-Series SAN switches.

Other SAN interoperability documentation

Other SAN interoperability documents include:

- SAN Design Reference Guide
- Fabric Interoperability: Merging Fabrics Based on M-Series and B-Series SAN Switches

Additional documentation, including white papers and best practices documents, are available via the HP web site at: http://www.hp.com..

Introduction

This application notes discusses the details on how to configure and merge HP C-series and B-series switches into a single standards based interoperable fabric. This document also provides information on supported configurations, expected behavior and any exceptions in the interoperability mode.

How to read this document

If you are going to configure and merge the C-series and B-series fabrics, read sections

- Check list for merging fabrics, page 5
- Merging fabrics and verification, page 13
- Troubleshooting, page 27

If you are interested only in supported features, configurations and switch/os/storage system versions, read sections

- Expected behavior from Fibre Channel services, page 15
- Interoperability mode behavior summary by switch type, page 16
- Supported configuration rules and guidelines, page 24

Check list for merging fabrics

B-Series

Complete the following steps before merging the fabrics:

C-Series

Complete the following steps before merging the fabrics:

B-Series configuration steps

The following steps provide information on how to verify, configure B-series switches for Interoperability. While it is possible to accomplish this by using either the Fabric Manager or the embedded Web Tools or the CLI, the following steps use only CLI (telnet) for demonstrating this.

Step B1: verify switch firmware versions

Before merging the fabrics, make sure all the B-Series switches in the fabric have the right firmware version. See Table 2 for the supported firmware version to be used and update the switches if necessary. Login to the switch as an admin and verify firmware version using the telnet command "version". Given below is an example.

```
Switch: login
Password: xxxxxxxx
Switch:admin>
Switch:admin> version
Kernel:        2.4.19
Fabric OS:    v4.1.1
Made on:      Wed Jun 18 02:59:09 2003
Flash:        Thu Sep 4 19:36:06 2003
BootProm:     3.2.4
Switch:admin>
```

For firmware upgrade procedures refer to *B-series Fabric OS Procedures Version 3.1.x/4.1.x User Guide* available at:

http://h18006.www1.hp.com/products/storageworks/fcsanswitch216/index.html

Steps B2, B3: verify/configure switch domain IDs & verify switch/fabric default settings

Ensure that all the switches between the two fabrics have unique domain IDs before they are merged. List the domain ID addresses of each switch in both the fabrics and verify there are no duplicate IDs. If any duplicate addresses exist, change the IDs by assigning different domain numbers. Given below is an example on how to change domain IDs on B-series switches.

Use telnet session to perform the domain ID configurations. This requires disabling the switch temporarily, so plan accordingly.

```
Switch:admin> switchdisable
Switch:admin>


Switch:admin> configure
Configure...
```

```
    Fabric parameters (yes, y, no, n): [no] y


  Domain: (1..239) [97]  ← Select the domain ID in the range 97-127, if change is
                            required
  BB credit: (1..27) [16]
    R_A_TOV: (4000..120000) [10000]  ← Ensure this value is 10000, should be
                                        same for all switches in the fabric


  E_D_TOV: (1000..5000) [2000]  ← Ensure this value is 2000, should be same for all
                                   switches in the fabric


  WAN_TOV: (1000..120000) [0]
    Data field size: (256..2112) [2112]
    Sequence Level Switching: (0..1) [0]
    Disable Device Probing: (0..1) [0]
    Suppress Class F Traffic: (0..1) [0]
    SYNC IO mode: (0..1) [0]
    VC Encoded Address Mode: (0..1) [0]
    Core Switch PID Format: (0..1) [1]
    Per-frame Route Priority: (0..1) [0]
    Long Distance Fabric: (0..1) [0]


  Virtual Channel parameters (yes, y, no, n): [no]
  Zoning Operation parameters (yes, y, no, n): [no]
  RSCN Transmission Mode (yes, y, no, n): [no]
  Arbitrated Loop parameters (yes, y, no, n): [no]
  System services (yes, y, no, n): [no]
  Portlog events enable (yes, y, no, n): [no]


No changes.


Switch:admin>
```

Step B4: disable management server

It is required to disable platform management services fabric wide before enabling the interopmode and merging the fabrics. The following command when executed will deactivate the Platform Database Management Service of each switch in the fabric.

```
Switch:admin> msPlMgmtDeactivate
This will erase all Platform entries. Are you sure?  (yes, y,
no, n): [no] y
Committing configuration...done.


Request Fabric to Deactivate Platform Management services....


Done.
Switch:admin>
```

Note: It is required that you reboot the switch after executing this command. However, you may wait to reboot the switch until completing the next step (B5), so that rebooting multiple times can be avoided.

Step B5: verify/configure fabric operating mode

For B-Series switches the "interopmode 1" must be enabled before merging with C-series switches. This command enables interopmode on individual switches only and hence must be executed on all B-Series switches in the fabric. Use the following telnet command to change the operating mode.

```
login: admin
Password:xxxxxxxx


Switch:admin> switchDisable
Switch:admin> 0x101a8dd0 (tThad): Jan 20 10:47:55
    WARNING FW-STATUS_SWITCH, 3, Switch status changed from
    HEALTHY/OK to Marginal/Warning


Switch:admin>


Switch:admin> interopmode 1
The switch effective configuration will be lost when the
operating mode is changed; do you want to continue? (yes, y,
no, n): [no] y
Committing configuration...done.
```

```
cfgDisable: no EFFECTIVE configuration

interopMode is 1

NOTE: It is required that you boot this switch to make this
change take effect

Switch:admin> fastboot
```
← **reboots the switch quicker, bypassing POST**

Step B6: verify proper zoning configuration is in place

Check for Duplicate Zone Sets (zones): To ensure proper zoning merge and operation, verify there are no duplicate active ZoneSets or Zones across the two fabrics that need to be merged. If any duplicate zones exist then rename them. The following telnet commands can be used to accomplish this. See B-series software manual for detailed explanation of these commands.

■ cfgShow

■ zoneCreate

■ cfgCreate

Verify Proper Zone Naming

Ensure that zone names adhere to the following guidelines.

■ All characters must be ASCII

■ A name must be between 1 and 64 characters in length

■ The first character of a name must be a letter. A letter is defined as either an uppercase [A-Z] or lower case [a-z] character

■ Any character other than the first character must be either a lower case character [a-z] or an upper case character [A-Z] or a number [0-9] or the symbol (_).

Configure Zones using only PWWNs

In the interoperability mode all the zone members must be defined using port WWNs only and defining them in any other way is not supported. For example, we can not define zones using FC port addresses or domain, port combinations etc. If there are any zones not defined as stated above, redefine them using proper PWWNs.

C-Series configuration steps

The following steps provide information on how to verify, configure C-series switches for Interoperability. While it is possible to accomplish this by using either the Fabric Manager or the CLI, the following steps use only CLI (telnet) for demonstrating this.

Step C1: verify switch firmware versions

Verify all C-series switches are configured with the correct firmware version as shown in **Table 3.** If necessary upgrade the switches with the supported firmware and refer to the *MDS 9000 Family Configuration Guide* that can be accessed through the links provided at the URL below.

http://h18006.www1.hp.com/products/storageworks/cmds9506/leavinghp-cisco.html

```
MDS9509# show ver

Cisco Storage Area Networking Operating System (SAN-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (c) 1986-2002 by cisco Systems, Inc.
Software
  kickstart: version 1.0(1) [build 1.0(0.260c)] [gdb]
  system:    version 1.0(1) [build 1.0(0.260c)] [gdb]
Hardware
  RAM 1932864 kB
  bootflash: 503808 blocks (block size 512b)
  slot0:          0 blocks (block size 512b)
kickstart compile time: 11/7/2002 21:00:00
system compile time: 11/7/2002 20:00:00
```

Step C2: verify switch/fabric default settings

It may be necessary to change the Fibre Channel timers as well if they have been changed from the system defaults. The MDS 9000 and B-series FC Error Detect (ED_TOV) and Resource Allocation (RA_TOV) timers default to the same values. They can be changed if needed. The RA_TOV default is 10 seconds, and the ED_TOV default is 2 seconds. Per the FC-SW2 standard, these values must be the same on each switch within the fabric.

MDS9509 login: admin

Password: xxxxxxxx

MDS9509# show fctimer

F_S_TOV : 5000 milliseconds

D_S_TOV : 5000 milliseconds

E_D_TOV : 2000 milliseconds

R_A_TOV : 10000 milliseconds

To modify these values, use the following commands. Note that these changes can not be made unless all VSANs in the switch are suspended.

```
MDS9509# config t
MDS9509(config)# vsan database
MDS9509(config-vsan-db)# vsan 1 suspend


MDS9509# config t
MDS9509(config)# fctimer e_d_tov 2000
  <1000-100000>  E_D_TOV in milliseconds(1000-100000)


MDS9509(config)# fctimer r_a_tov 10000
  <5000-100000>  R_A_TOV in milliseconds(5000-100000)
```

Step C3: verify the fabrics are in proper operating mode

To enable interoperability mode on C-series switches, the first step is to place the VSAN of the E_Ports(s) that connect to the B-series in interoperability mode.

```
MDS9509# config t
MDS9509(config)# vsan database
MDS9509(config-vsan-db)# vsan 1 interop
```

Step C4: verify/configure switch domain IDs

The next step is to assign a domain ID in the range of 97 (0x61) through 127 (0x7F), while in interoperability mode, we are limited to a total of 31 switches in the fabric. In the MDS the default is to request an ID from the principal switch. If the *preferred* keyword is used, the MDS will request a specific ID, but still join the fabric if the principal switch assigns a different ID. If the *static* keyword is used, the MDS will not join the fabric unless the principal switch agrees, and assigns the requested ID.

```
MDS9509# config t
MDS9509(config)# fcdomain domain 100 preferred vsan 1
```

When making changes to the domain, you may restart the MDS domain manager function for the altered VSAN. You may force a fabric reconfiguration with the *disruptive* keyword.

```
MDS9509(config)# fcdomain restart disruptive vsan 1
```

Or not force a fabric reconfiguration

```
MDS9509(config)# fcdomain restart vsan 1
```

Step C5: verify proper zoning configuration is in place

Check for Duplicate Zone Sets (zones): To ensure proper zoning merge and operation, verify there are no duplicate active ZoneSets or Zones across the two fabrics that need to be merged. If any duplicate zones exist then rename them. You can verify zoning information by using the "show zone" command.

For example, to verify all active zones …

```
MDS9509# show zoneset active
zoneset name mdscore vsan 1
  zone name vz1 vsan 1
  * fcid 0x630500 [pwwn 50:06:01:60:88:02:90:cb]
  * fcid 0x610400 [pwwn 10:00:00:00:c9:24:3d:90]

  zone name vz2 vsan 1
  * fcid 0x630400 [pwwn 10:00:00:00:c9:24:3f:75]
  * fcid 0x6514e2 [pwwn 21:00:00:20:37:a7:ca:b7]
  * fcid 0x6514e4 [pwwn 21:00:00:20:37:a7:c7:e0]
  * fcid 0x6514e8 [pwwn 21:00:00:20:37:a7:c7:df]

  zone name vz3 vsan 1
  * fcid 0x651500 [pwwn 10:00:00:e0:69:f0:43:9f]
  * fcid 0x6105dc [pwwn 21:00:00:20:37:28:31:6d]
  * fcid 0x6105e0 [pwwn 21:00:00:20:37:28:24:7b]
  * fcid 0x6105e1 [pwwn 21:00:00:20:37:28:22:ea]
  * fcid 0x6105e2 [pwwn 21:00:00:20:37:28:2e:65]
  * fcid 0x6105e4 [pwwn 21:00:00:20:37:28:26:0d]

  zone name $default_zone$ vsan 1
```

Verify Proper Zone Naming

Ensure that zone names adhere to the following guidelines.

- All characters must be ASCII

- A name must be between 1 and 64 characters in length

- The first character of a name must be a letter. A letter is defined as either an uppercase [A-Z] or lower case [a-z] character

- Any character other than the first character must be either a lower case character [a-z] or an upper case character [A-Z] or a number [0-9] or the symbol (_).

Configure Zones using only PWWNs

In the interoperability mode all the zone members must be defined using port WWNs only and defining them in any other way is not supported. For example, we can not define zones using FC port addresses or domain, port combinations etc. If there are any zones not defined as stated above, redefine them using proper PWWNs.

Merging fabrics and verification

After configuring both the fabrics individually as described above, now the identified E-ports from both sides can be connected to merge them. The fabric should now reconfigure and merge itself into a single fabric.

To verify the fabric has merged properly, run the following commands on both B-series and C-series switch and ensure they are no segmentations or other errors.

On the B-series, open a telnet from one of the switches and execute the following command.

```
login: admin
Password:


BR38_09:admin>
BR38_09:admin> switchshow
switchName:      BR38_09
switchType:      9.1
switchState:     Online
switchMode:      Interop       ← verify mode
switchRole:      Principal
switchDomain:    101           ← verify domain ID
switchId:        fffc65
switchWwn:       10:00:00:60:69:50:04:f4
switchBeacon:    OFF
Zoning:          OFF
port  0: id N2 No_Light
port  1: id N2 No_Light
port  2: id N2 Online          F-Port 50:06:0b:00:00:12:55:a0
port  3: id N2 No_Light
port  4: id N2 Online          F-Port 10:00:00:00:c9:28:fd:96
port  5: id N2 No_Light
port  6: id N2 No_Light
port  7: id N2 No_Light
port  8: id N2 No_Light
port  9: id N2 No_Light
port 10: id N2 No_Light
port 11: id N2 No_Light
port 12: id N2 No_Light
port 13: id N2 Online          E-Port 20:00:00:0d:ec:00:e1:c0
(downstream)
port 14: -- N2 No_Module
port 15: -- N2 No_Module
BR38_09:admin>
```

On the C-series

```
MDS9509# show vsan 1
vsan 1 information
         name:VSAN0001  state:active
         interoperability mode:yes  ← verify mode
     loadbalancing:src-id/dst-id/oxid
         operational state:up
MDS9509# show fcdomain vsan 1
The local switch is a Subordinated Switch.

Local switch run time information:
        State: Stable
        Local switch WWN:    20:01:00:05:30:00:51:1f
        Running fabric name: 10:00:00:60:69:22:32:91
        Running priority: 128
        Current domain ID: 0x64(100)  ← verify domain id

Local switch configuration information:
        State: Enabled
        Auto-reconfiguration: Disabled
        Contiguous-allocation: Disabled
        Configured fabric name: 41:6e:64:69:61:6d:6f:21
        Configured priority: 128
        Configured domain ID: 0x64(100) (preferred)

Principal switch run time information:
        Running priority: 2

Interface               Role          RCF-reject
----------------      -------------   ------------
fc2/1                 Downstream      Disabled
fc2/2                 Downstream      Disabled
fc2/7                 Upstream        Disabled
```

Expected behavior from Fibre Channel services

While in "Interoperability mode", all the fibre channel services from each of the switch types may not work the same as in Native Mode. However, the following behavior is expected in an interoperating fabric.

■ **Zoning:** All zones will be done with PWWNs only. Thus each switch type will implement zoning in its native form as if only PWWNs were used. Other types of zoning definition are not supported.

■ **FSPF:** The routing of frames within the fabric is not changed by the introduction of interoperability mode. However, note that the MDS-9000 will continue to use src-id/dst-id/ox-id to load balance across multiple ISL links, while B-Series will use their default src-id/dst-id, so the return route may be different from the initial route when passing through an MDS-9000.

■ **Trunking/Port-Channels:** Trunking and Port-channels continue to work between C-series switches. See Table 1 for more details.

■ **Domain IDs:** A switch may have to change its domain ID to the range 97-127. This is to accommodate 32 domain address limitation followed by some vendors. If a domain ID is changed (which can be a disruptive event to the switch), all devices attached to the switch will need to re login to the switch. When domain IDs are changed, the switch itself will need to reregister with the principal switch in the fabric to verify domain ID uniqueness.

— **Disruptive:** This is a switch wide event on B-series and hence requires disabling the switch temporarily. So plan accordingly when changing the domain ID.

— **Non-Disruptive:** This event is limited to the vsan on C-series where the change is taking place. The MDS switch can perform this action, as the domain manager process for this vsan is restarted and not the entire switch. This still would require any devices logged into the vsan on that switch to relogin to obtain a new FCID.

Interoperability mode behavior summary by switch type

The following is a summary of interoperability mode behavior on C-Series switches.

C-Series

The MDS series of switches are limited in the following areas when interoperating with other non-MDS switches:

- "Interop Mode" only affects the specified vsan. The MDS-9000 can still operate with full functionality in other non-interop mode vsans. All switches that partake in the interoperable vsan, should have that vsan set to "interop mode," even if they do not have any end devices.

- Domain IDs are restricted to the range 97-127. This is to accommodate   nominal restriction to this same range by some vendors. They can either be setup *statically* (the MDS will only accept one domain ID, if it doesn't get that domain ID it isolates itself from the fabric), or *preferred* (if it doesn't get its requested domain ID, it'll take any other domain ID.)

- TE ports and Port-Channels cannot be used to connect MDS to non-MDS switches. Only E-Ports can be used to connect to non-MDS switches. *However, TE ports and Port-Channels can still be used to connect an MDS to other MDS switches even when in "interop mode."*

- Only the active zoneset is distributed to other switches.

- The "default zone" behavior changes with the enabling of "interop mode." The default zone policy becomes "deny."

- Modifying timers require all vsans across the switch to be put into the "suspended" state.

Table 1: C-Series interoperability mode summary

Minimum Firmware Level	1.2.1(a)
Supported Switches	B-Series, see Table 2
VSANs	Only VSANs explicitly set for "interop mode" are affected. All others maintain their independence.
High Availability	Fully redundant dual supervisor modules maintain full functionality.
Domains	Domain IDs restricted to 97-127.
Port-Channels and TE ports.	Can still be used to directly connect two MDS-9000 switches together, even while in interoperability mode. However, they cannot be used to directly connect to a non-MDS switch. Standard E ports are required to connect to non-MDS switches.
Zones and Zonesets	Only the active zoneset is propagated. Up to 2000 zones can be supported by the MDS-9000. The "default zone" policy changes to "deny."

Table 1: C-Series interoperability mode summary (Continued)

Fabric Manager and Element Manager	Can still be used to fully manage the MDS-9000, and create zones to be distributed to the non-MDS platforms. FM can still view the entire mixed topology.
Security	Ssh, telnet, snmp-v3 are supported.
Device Support	Fabric pt2pt F-mode

B-Series

The following is a summary of interoperability mode behavior on B-series switches.

■ "Msplmgmtdeactivate" must explicitly be run prior to connecting it to any C-series or else the fabric will be segmented.

■ Zoning can only be done with pwwns. Port numbers and nwwns are not valid fields to zone by.

■ In order to manage zoning administration from a B-series switch, all B-series must be interconnected. This is to facilitate the forwarding of the inactive zone configuration also.

■ Domain IDs are restricted to the range 97-127. This is to accommodate nominal restriction by some vendors.

■ Private loop targets will automatically be registered in the Fabric using translative mode.

■ Fabric Watch is restricted to Brocade switches only.

■ The full zoneset (configuration) is distributed to all switches in the fabric, but C-series accepts only active zoneset.

■ Disabled Services:

— Secure Fabric OS is not supported.

— Management Server is not supported

— Virtual Channels are disabled.

— Quickloop is disabled.

— Domain/port representation in zones is not valid.

— Trunking between B-series is not supported

Merging zones-examples

In this example, we first create three zones vz1, vz2 and vz3 on one of the C-series switches and verify these zones propagate to all the C-series and B-series switches in the interoperating fabric.

```
MDS9509# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
MDS9509(config)# zone name vz1 vsan 1
MDS9509(config-zone)# member pwwn 50:06:01:60:88:02:90:cb
MDS9509(config-zone)# member pwwn 10:00:00:00:c9:24:3d:90
MDS9509(config-zone)# exit
MDS9509(config)#
MDS9509(config)# zone name vz2 vsan 1
MDS9509(config-zone)#
MDS9509(config-zone)# member pwwn 10:00:00:00:c9:24:3f:75
MDS9509(config-zone)# member pwwn 21:00:00:20:37:a7:ca:b7
MDS9509(config-zone)# member pwwn 21:00:00:20:37:a7:c7:e0
MDS9509(config-zone)# member pwwn 21:00:00:20:37:a7:c7:df
MDS9509(config-zone)#
MDS9509(config-zone)# exit
MDS9509(config)#
MDS9509(config)# zone name vz3 vsan 1
MDS9509(config-zone)#
MDS9509(config-zone)# member pwwn 10:00:00:e0:69:f0:43:9f
MDS9509(config-zone)# member pwwn 21:00:00:20:37:28:31:6d
MDS9509(config-zone)# member pwwn 21:00:00:20:37:28:24:7b
MDS9509(config-zone)# member pwwn 21:00:00:20:37:28:22:ea
MDS9509(config-zone)# member pwwn 21:00:00:20:37:28:2e:65
MDS9509(config-zone)# member pwwn 21:00:00:20:37:28:26:0d
MDS9509(config-zone)#
MDS9509(config-zone)# exit
MDS9509(config)#
MDS9509(config)#
MDS9509(config)# zoneset name mdscore vsan 1
MDS9509(config-zoneset)# member vz1
MDS9509(config-zoneset)# member vz2
MDS9509(config-zoneset)# member vz3
MDS9509(config-zoneset)# exit
MDS9509(config)#
```

At this point we have created 3 zones, vz1, vz2 and vz3. We have also created a "zoneset" titled "mdscore".

Now we will activate the zoneset MDSCORE

```
MDS9509(config)# zoneset activate name mdscore vsan 1
Zoneset Activation initiated. check zone status
MDS9509(config)#


MDS9509(config)#
MDS9509(config)# exit

```

Now we will view each switch in the fabric to verify the zoning we defined is in place.

```
MDS9509# show zoneset active
zoneset name mdscore vsan 1
  zone name vz1 vsan 1
  * fcid 0x630500 [pwwn 50:06:01:60:88:02:90:cb]
  * fcid 0x610400 [pwwn 10:00:00:00:c9:24:3d:90]

  zone name vz2 vsan 1
  * fcid 0x630400 [pwwn 10:00:00:00:c9:24:3f:75]
  * fcid 0x6514e2 [pwwn 21:00:00:20:37:a7:ca:b7]
  * fcid 0x6514e4 [pwwn 21:00:00:20:37:a7:c7:e0]
  * fcid 0x6514e8 [pwwn 21:00:00:20:37:a7:c7:df]

  zone name vz3 vsan 1
  * fcid 0x651500 [pwwn 10:00:00:e0:69:f0:43:9f]
  * fcid 0x6105dc [pwwn 21:00:00:20:37:28:31:6d]
  * fcid 0x6105e0 [pwwn 21:00:00:20:37:28:24:7b]
  * fcid 0x6105e1 [pwwn 21:00:00:20:37:28:22:ea]
  * fcid 0x6105e2 [pwwn 21:00:00:20:37:28:2e:65]
  * fcid 0x6105e4 [pwwn 21:00:00:20:37:28:26:0d]

  zone name $default_zone$ vsan 1
```

We should see the same information from other C-series switches that are connected in the same fabric.

B-series switches

Using the telnet on B-series switches verify that the zoning information has propagated properly. On B-series you will see the active configuration as well as any defined configurations that are not part of active configuration.

```
Switch3800:admin> cfgshow
Defined configuration:
 cfg:        bzones       bz1, bz2
 zone:       bz1    10:00:00:00:c9:24:3d:90; 50:06:01:60:88:02:90:cb
 zone:       bz2
             10:00:00:00:c9:24:3f:75; 21:00:00:20:37:a7:ca:b7;
             21:00:00:20:37:a7:c7:e0; 21:00:00:20:37:a7:c7:df
Effective configuration:
 cfg:        mdscore
 zone:       vz1    50:06:01:60:88:02:90:cb
                    10:00:00:00:c9:24:3d:90
 zone:       vz2    10:00:00:00:c9:24:3f:75
                    21:00:00:20:37:a7:ca:b7
                    21:00:00:20:37:a7:c7:e0
                    21:00:00:20:37:a7:c7:df
 zone:       vz3    10:00:00:e0:69:f0:43:9f
                    21:00:00:20:37:28:31:6d
                    21:00:00:20:37:28:24:7b
                    21:00:00:20:37:28:22:ea
                    21:00:00:20:37:28:2e:65
                    21:00:00:20:37:28:26:0d
```

Any other B-series switches in the same fabric should display the same information.

All switches in the Fabric now have the correct zoning information.

Creating zones on the B-Series

We will now create the zones and a zoneset on the B-series. It will be activated, and we will then verify each switch in the fabric has the correct zoning in place. The zone members in the examples will be the same as used in the previous example, but the zone names and zoneset name will change.

We will start by clearing the zoning configuration. If this switch is part of the fabric, all switches will have no zoning in effect after this command is issued.

```
Switch3800:admin> cfgClear
Do you really want to clear all configurations?  (yes, y, no, n)
: [no] yes
Clearing All zoning configurations...
Switch3800:admin> cfgShow
Defined configuration:
 no configuration defined
Effective configuration:
 no configuration in effect
```

Now let us create three new zones vz11, vz22, and vz33.

```
Switch3800:admin> zoneCreate :"vz11", "10:00:00:00:c9:24:3d:90;
50:06:01:60:88:02:90:cb"

Switch3800:admin> zoneCreate "vz22", "10:00:00:00:c9:24:3f:75;
21:00:00:20:37:a7:ca:b7; 21:00:00:20:37:a7:c7:e0;
21:00:00:20:37:a7:c7:df"

Switch3800:admin> zoneCreate "vz33", "10:00:00:e0:69:f0:43:9f;
21:00:00:20:37:28:31:6d; 21:00:00:20:37:28:24:7b;
21:00:00:20:37:28:22:ea"
```

Let us add more members to the zone vz33

```
Switch3800:admin> zoneAdd "vz33", "21:00:00:20:37:28:2e:65;
21:00:00:20:37:28:26:0d"
```

Now check the zones before making them active.

```
Switch3800:admin> zoneShow
Defined configuration:
 zone:      vz11  10:00:00:00:c9:24:3d:90; 50:06:01:60:88:02:90:cb
 zone:      vz22  10:00:00:00:c9:24:3f:75; 21:00:00:20:37:a7:ca:b7;
                  21:00:00:20:37:a7:c7:e0; 21:00:00:20:37:a7:c7:df
 zone:      vz33  10:00:00:e0:69:f0:43:9f; 21:00:00:20:37:28:31:6d;
                  21:00:00:20:37:28:24:7b; 21:00:00:20:37:28:22:ea;
                  21:00:00:20:37:28:2e:65; 21:00:00:20:37:28:26:0d
Effective configuration:
 no configuration in effect
```

Now we create the configuration, which when activated, will be known on the MDS as the active zone set.

```
Switch3800:admin> cfgCreate "mdscore1", "vz11; vz22; vz33"
```

Now we activate the configuration

```
Switch3800:admin> cfgEnable "mdscore1"
zone config "mdscore1" is in effect
Updating flash ...
```

Let's check the display on this switch.

```
Switch3800:admin> cfgShow
Defined configuration:
 cfg:       mdscore1
            vz11; vz22; vz33
 zone:      vz11  10:00:00:00:c9:24:3d:90; 50:06:01:60:88:02:90:cb
 zone:      vz22  10:00:00:00:c9:24:3f:75; 21:00:00:20:37:a7:ca:b7;
            21:00:00:20:37:a7:c7:e0; 21:00:00:20:37:a7:c7:df
 zone:      vz33  10:00:00:e0:69:f0:43:9f; 21:00:00:20:37:28:31:6d;
                  21:00:00:20:37:28:24:7b; 21:00:00:20:37:28:22:ea;
                  21:00:00:20:37:28:2e:65; 21:00:00:20:37:28:26:0d
```

```
          Effective configuration:
           cfg:         mdscore1
           zone:        vz11  10:00:00:00:c9:24:3d:90
                              50:06:01:60:88:02:90:cb
           zone:        vz22  10:00:00:00:c9:24:3f:75
                              21:00:00:20:37:a7:ca:b7
                              21:00:00:20:37:a7:c7:e0
                              21:00:00:20:37:a7:c7:df
           zone:        vz33  10:00:00:e0:69:f0:43:9f
                              21:00:00:20:37:28:31:6d
                              21:00:00:20:37:28:24:7b
                              21:00:00:20:37:28:22:ea
                              21:00:00:20:37:28:2e:65
                              21:00:00:20:37:28:26:0d
```

This is correct. The new configuration is effective and defined.

Now let us have a look at the other switches in the fabric.

C-Series switches

```
MDS9509# show zoneset active
zoneset name mdscore1 vsan 1
  zone name vz11 vsan 1
  * fcid 0x610400 [pwwn 10:00:00:00:c9:24:3d:90]
  * fcid 0x630500 [pwwn 50:06:01:60:88:02:90:cb]

  zone name vz22 vsan 1
  * fcid 0x630400 [pwwn 10:00:00:00:c9:24:3f:75]
  * fcid 0x6514e2 [pwwn 21:00:00:20:37:a7:ca:b7]
  * fcid 0x6514e4 [pwwn 21:00:00:20:37:a7:c7:e0]
  * fcid 0x6514e8 [pwwn 21:00:00:20:37:a7:c7:df]

  zone name vz33 vsan 1
  * fcid 0x651500 [pwwn 10:00:00:e0:69:f0:43:9f]
  * fcid 0x6105dc [pwwn 21:00:00:20:37:28:31:6d]
  * fcid 0x6105e0 [pwwn 21:00:00:20:37:28:24:7b]
  * fcid 0x6105e1 [pwwn 21:00:00:20:37:28:22:ea]
  * fcid 0x6105e2 [pwwn 21:00:00:20:37:28:2e:65]
  * fcid 0x6105e4 [pwwn 21:00:00:20:37:28:26:0d]

  zone name $default_zone$ vsan 1
```

Notice the 'show zone' command displays the zones we created earlier on this switch.

```
MDS9509# show zone vsan 1
zone name vz1 vsan 1
  pwwn 50:06:01:60:88:02:90:cb
  pwwn 10:00:00:00:c9:24:3d:90

zone name vz2 vsan 1
  pwwn 10:00:00:00:c9:24:3f:75
  pwwn 21:00:00:20:37:a7:ca:b7
  pwwn 21:00:00:20:37:a7:c7:e0
  pwwn 21:00:00:20:37:a7:c7:df

zone name vz3 vsan 1
  pwwn 10:00:00:e0:69:f0:43:9f
  pwwn 21:00:00:20:37:28:31:6d
  pwwn 21:00:00:20:37:28:24:7b
  pwwn 21:00:00:20:37:28:22:ea
  pwwn 21:00:00:20:37:28:2e:65
  pwwn 21:00:00:20:37:28:26:0d
```
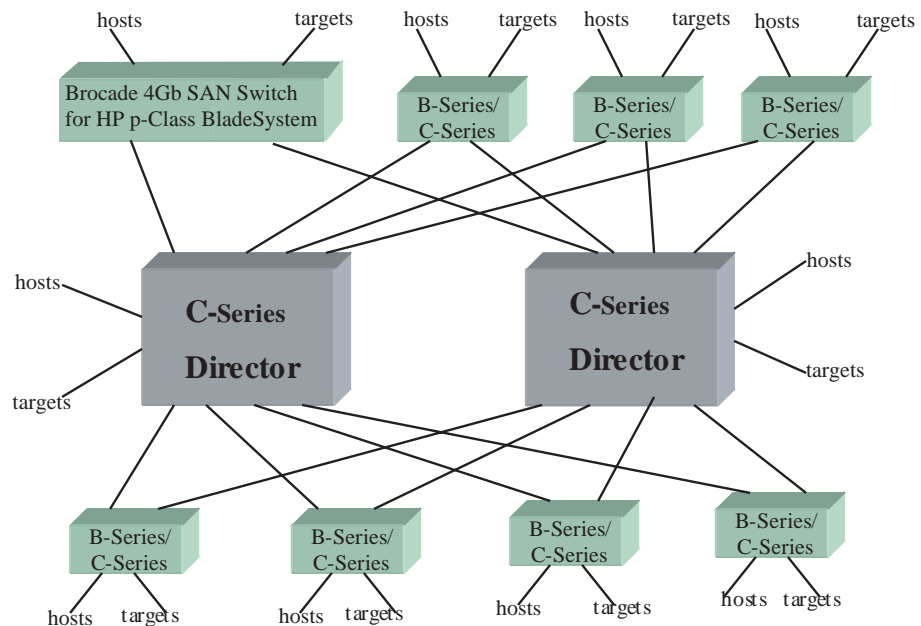
Supported configuration rules and guidelines

The following fabric configuration rules apply when mixing the two fabrics:

■ Switches listed in Table 2 and Table 3 may be used together in a fabric.

■ Only the standards-based interoperability mode, Mode-1, is supported on MDS switches.

■ Use the C-Series Fabric Manager for all zoning administration. This includes creating, modifying, enabling, and disabling zones in the combined fabric.

■ If you notice longer fabric reconfiguration times, select one of the B-series switches as the principal switch.

■ If SAN boot is required and the HBA is connected to a B-Series switch, then lock the switch port as a G-port using the `portcfggport` command. This prevents the HBA coming up in loop topology.

■ Continuous Access EVA and Continuous Access XP storage systems are supported in a C-Series and B-Series interoperable heterogeneous switch fabric configurations. See Table 5 for supported EVA and XP firmware versions.

Recommended IOP configuration diagram

Figure 1: Recommended IOP configuration diagram

Table 2: Supported B-Series product line switches

HP StorageWorks Switch Name		Firmware Version	Number of Ports
HP StorageWorks SAN Switch 2/8 EL, 2/8 power pack		3.1.1, 3.1.1c 3.1.3a 3.2.1a	8
HP StorageWorks SAN Switch 2/16, 2/16 EL, 2/16 power pack			16
HP StorageWorks SAN Switch 2/8V TAA, 2/8V TAA power pack, 2/16V, 2/16V TAA, 2/16N FF, 2/16N TAA power pack, 2/32, 2/32 power pack		4.1.1, 4.1.2b, 4.2.2a, 5.0.1d 5.1.0b	8, 16, 32
Brocade 4Gb SAN Switch for HP p-Class BladeSystem		5.0.1d 5.0.3b	8 internal, 4 external
HP Switch Name	**Compaq StorageWorks Switch Name**		**Number of Ports**
HP Brocade 2400 (HP reseller)	Compaq StorageWorks SAN Switch 8	2.6.1 2.6.1c 2.6.2b	8
N/A	Compaq StorageWorks SAN Switch 8-EL		8
HP Brocade 2800 (HP reseller)	Compaq StorageWorks SAN Switch 16		16
N/A	Compaq StorageWorks SAN Switch 16-EL		16
HP Surestore FC Switch 6164 (64 ISL Ports)	Compaq StorageWorks SAN Switch Integrated/32 (64 ISL Ports)		32 (counts as 6 switches and 2 hops when applying configuration rules)
HP Surestore FC Switch 6164 (32 ISL Ports)	Compaq StorageWorks SAN Switch Integrated/64 (32 ISL Ports)		64 (counts as 6 switches and 2 hops when applying configuration rules)
HP Surestore FC 1Gb/2Gb Entry Switch 8B	N/A	3.1.1, 3.1.1c 3.1.3a 3.2.1a	8
N/A	Compaq StorageWorks SAN Switch 2/8-EL		8
N/A	Compaq StorageWorks SAN Switch 2/16-EL		16
HP Surestore FC 1Gb/2Gb Switch 8B	N/A		8
HP Surestore FC 1Gb/2Gb Switch 16B	Compaq StorageWorks SAN Switch 2/16		16

Table 3: Supported C-Series product line switches

Switch Name	Firmware Version	Number of Ports
MDS 9506	1.2.1(a) 1.2.1(b) 2.0.(1b) 2.1(2d) 3.0(2a)	Up to 128
MDS 9509		Up to 224
MDS 9216		Up to 48
MDS 9120		20
MDS 9140		40

Table 4: Supported operating system versions

OS	OS Version	Multi Path Software	HBA	Driver/ Firmware/BIOS (minimum required)
Windows 2000	AS SP3	Secure Path 4.0c	QLA 2342, LP8000	8.2.0.71 / 1.33 5-4.82a16 / 3.91a1 / 1.63a1
Windows 2003	AS SP2	Secure Path 4.0c	LP952	5-4.82a16 / 3.91a1 / 1.63a1
HP-UX	11.00/11.11	Auto Path 2.01.02	A6795A	11.00.10 PHSS_26798 11.11.09 PHKL_26799 PDC 42.19
OVMS	7.3-1	Native	DS-KGPSA-CA	Native/ 3.91a1
Tru64	5.1B	Native	DS-KGPSA-CA	Native/ 3.91a1

Table 5: Supported storage system versions

Storage System	Represents Architecture	Firmware Version (minimum required)
EMA/ESA12000, EMA16000, MA/RA8000, MA6000	HSG 80	ACS 8.7F Patch 2&3
EVA 5000 EVA 3000 EVA 4000/6000/8000	HSV 110, HSV 100 HSV 210, HSV 200	VCS: v3.025 minimum FW v3.028 recommended FW XCS: v5.031 minimum FW v5.1 recommended FW
XP 1024	XP 128, XP 1024	V21.13.02.00/00

Table 6: HP BladeSystem Support

HP BladeSystem p-class	Operating System	Fibre Channel interface	Embedded switch	Storage
BL20p	Microsoft Windows 2003, Windows 2000 RedHat Enterprise Linux 3 and 4 (X86) Sles8 (X86) Sles9 (X86)	Qlogic ISP2312 based dual port Fibre Channel card	Brocade 4 Gb SAN switch for HP p-class BladeSystem	XP, EVA
BL60p	HP-UX 11i	Qlogic ISP2312 Fibre Channel Ports (2Gb/s)		

Troubleshooting

1. If you see segmentation errors on any of the switches after merging the fabrics, then verify that interoperability mode is enabled on all switches in the fabric.

2. Ensure all the time out values are set properly, especially E_D_TOV (2 secs) and R_A_TOV (10 secs).

3. If you see segmentation errors and messages like "Platform Management Database Inconsistency" on B-series switches, then disable the management server on B-series switches using the "msPlMgmtDeactivate" telnet command, as described in the earlier sections.

4. If you notice any zoning related issues, verify that there were no duplicate zonesets or zones before merging. Also ensure all zones are configured using pWWN only.