

# HP StorageWorks

## Fabric interoperability: Merging fabrics based on C-series and B-series Fibre Channel switches application notes

### Abstract

This document is intended for customers who are merging one SAN fabric constructed with C-series SAN switches and another fabric constructed with B-series SAN switches.

**Legal and notice information**

© Copyright 2004-2009 Hewlett-Packard Development Company, L.P.

The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Microsoft® and Windows® are U.S. registered trademarks of Microsoft Corporation.

# Introduction

This document discusses the details on merging fabrics based on C-series and B-series Fibre Channel switches into a single, standards-based, interoperable fabric. This document also provides information on:

- Supported configurations
- Expected behavior
- Exceptions in the interoperability mode.

# How to use this document

To configure and merge the C-series and B-series fabrics, see:

- [Checklists for merging fabrics](#), page 3
- [Merging fabrics and verification](#), page 9

For information about supported features, configurations, switch, OS, and storage system versions, see:

- [Expected behavior from Fibre Channel services](#), page 10
- [Interoperability mode behavior summary by switch type](#), page 11
- [Supported configuration rules and guidelines](#), page 16

# Checklists for merging fabrics

This section lists the procedures for merging SAN fabrics based on B-series and C-series switches.

<b>B-series merge preparation</b>	
<a href="#">Step 1: Verify switch firmware versions</a> , page 4	
<a href="#">Step 2: Verify/configure switch domain IDs and verify switch/fabric default settings</a> , page 4	
<a href="#">Step 3: Disable management server</a> , page 5	
<a href="#">Step 4: Verify and configure fabric operating mode</a> , page 5	
<a href="#">Step 5: Verify zoning configuration</a> , page 6	

C-series merge preparation	
Step 1: Verify switch firmware versions, page 6	
Step 2: Verify switch/fabric default settings, page 7	
Step 3: Verify the fabric operating mode, page 7	
Step 4: Verify and configure switch domain IDs, page 8	
Step 5: Verify zoning configuration, page 8	

## B-series configuration steps

The following steps provide information about verifying and configuring B-series switches for interoperability with a C-series SAN fabric. Although Fabric Manager, the embedded Web Tools, or the CLI (through Telnet) can be used to configure the switches, the following steps use CLI.

### Step 1: Verify switch firmware versions

Before merging the fabrics, ensure that all the B-series switches in the fabric have supported firmware. See [Table 2](#) for the supported firmware version to be used and update the switches if necessary. Login to the switch as `admin` and verify the firmware version using the Telnet `version` command. An example follows:

```
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 see the B-series documentation available on the HP B-series Switches website:

[http://h18006.www1.hp.com/storage/networking/b\\_switches/index.html](http://h18006.www1.hp.com/storage/networking/b_switches/index.html)

### Step 2: Verify/configure switch domain IDs and verify switch/fabric default settings

Ensure that all the switches in both fabrics have unique domain IDs before the merge. List the domain ID addresses of each switch in each fabric and verify there are no duplicate IDs. If any duplicate addresses exist, change the IDs by assigning different domain numbers.

Use a Telnet session to perform the domain ID configurations. This requires disabling the switch temporarily. In the following example, domain IDs on B-series switches are changed:

```
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 for all switches in the fabric]
E_D_TOV: (1000..5000) [2000] [Ensure this value is 2000 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 3: Disable management server

Platform management services must be disabled fabric-wide before enabling the interopmode and merging the fabrics. The `msPlMgmtDeactivate` command deactivates 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:

You must reboot the switch after executing the `msPlMgmtDeactivate` command. However, you can avoid multiple reboots by delaying the switch reboot until after completing the next step (4).

---

### Step 4: Verify and 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 therefore, must be executed on each B-series switch 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 faster, bypassing POST]
```

## Step 5: Verify zoning configuration

### Inspect for duplicate zone sets (zones)

To ensure proper zoning merge and operation, verify there are no duplicate active zone sets or zones across the two fabrics that are to be merged. If any duplicate zones exist, rename them using the following Telnet commands. For detailed explanation of these commands, see the B-series software manual.

- `cfgShow`
- `zoneCreate`
- `cfgCreate`

### Verify 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, either an upper case (A–Z) or lower case (a–z) character
- Any character other than the first character must be either an upper case (A–Z) or lower case (a–z) letter, a number (0–9), or an underscore symbol (`_`).

### Configure zones using port WWNs

In interoperability mode, all zone members must be defined using port World Wide Names (WWNs). Defining them any other way is not supported. Zones cannot be defined using Fibre Channel port addresses or domain and port combinations. If there are any zones not defined with the port WWN, you must redefine them.

## C-series configuration steps

This section provides information about how to configure C-series switches for interoperability. Although you can use either the Fabric Manager or the CLI, the following steps use CLI (Telnet).

### Step 1: Verify switch firmware versions

Verify all C-series switches are configured with supported firmware as shown in [Table 3](#). If necessary, upgrade the switches with the supported firmware and see the *Cisco MDS 9000 Family Configuration Guide*, available for download from the HP Manuals website:

<http://www.hp.com/support/manuals>

In the Storage section, click **Storage Networking**, and then select your C-series switch.

Use the `show ver` command to verify the firmware version:

```
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 2: Verify switch/fabric default settings

Verify that the Fibre Channel timers are set to the system default values. The MDS 9000 and B-series FC Error Detect (ED\_TOV) and Resource Allocation (RA\_TOV) timers default to the same values. However, they can be changed if necessary. 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.

Verify the timer values as follows:

```
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 the timer values, use the following commands. Note that these changes cannot 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 3: Verify the fabric operating mode

To enable interoperability mode on C-series switches, you must place the VSAN of the E\_Ports that connect to the B-series in interoperability mode.

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

## Step 4: Verify and configure switch domain IDs

Assign a domain ID in the range of 97–127 (0x61–0x7F). There is a maximum of 31 switches allowed in the fabric while in interoperability mode. In the MDS the default is to request an ID from the principal switch. If the *preferred* keyword is used, the MDS requests 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.

To configure the switch domain ID:

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

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

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

However, forcing a fabric reconfiguration is a requirement when restarting:

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

## Step 5: Verify zoning configuration

To ensure proper zoning merge and operation, verify there are no duplicate active zone sets or zones across the two fabrics that need to be merged. If any duplicate zones exist, you must rename them. You can verify zoning information with 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 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, either an upper case (A–Z) or lower case (a–z) character



- Any character other than the first character must be either an upper case (A–Z) or lower case (a–z) letter, a number (0–9) or an underscore symbol (\_).

## Configure zones using port WWNs

In interoperability mode, all zone members must be defined using port WWNs. Defining them any other way is not supported. Zones cannot be defined using Fibre Channel port addresses or domain and port combinations. If there are any zones not defined with the port WWN, you must redefine them.

## Merging fabrics and verification

After configuring both fabrics individually as described in these application notes, the identified E\_Ports from both sides can be connected to merge them. The interop fabric reconfigures and merges into a single fabric.

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

**On the B-series**, open a Telnet session to one of the switches and execute the `switchshow` 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**, enter the `show vsan 1` command.

```
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, some of the Fibre Channel services from each of the switch types might not work as in native mode. However, the following behavior is expected in an interoperating fabric.

- **Zoning:** All zones will be defined with port WWNs only. Therefore, each switch type implements zoning in its native form as if only port WWNs 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, the MDS-9000 will continue to use src-id/dst-id/ox-id to load balance across multiple ISL links, and B-series will use their default src-id/dst-id. Therefore, the return route can 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 details.
- **Domain IDs:** A switch may have to change its domain ID to the range 97–127. This is to accommodate the 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 must re-login to the switch. When domain IDs are changed, the switch itself must reregister with the principal switch in the fabric to verify domain ID uniqueness.
  - **Disruptive:** This is a switch-wide event on B-series and requires disabling the switch temporarily. Be sure to 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 requires any devices logged into the VSAN on that switch to relogin to obtain a new FCID.

# Interoperability mode behavior summary by switch type

This section provides information about interoperability mode behavior the switches.

## C-series

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

- Interop mode only affects the specified VSAN. The MDS-9000 can 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 of 97–127. This is to accommodate nominal restriction by some vendors. They can either be setup *statically*, or *preferred*.
- 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 <a href="#">Table 2</a>
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 are 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 zone sets	Only the active zoneset is propagated. Up to 2,000 zones can be supported by the MDS-9000. The default zone policy changes to <i>deny</i> .
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. Fabric Manager 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.

- The `Msp1mgmtdeactivate` command must be run prior to connecting it to any C-series, or else the fabric will be segmented.
- Zoning can only be defined with port WWNs. Port numbers and NWWNs are not valid fields to zone by.
- To manage zoning administration from a B-series switch, all B-series must be interconnected to facilitate the forwarding of the inactive zone configuration also.
- Domain IDs are restricted to the range 97–127 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

This example depicts the creation of three zones (vz1, vz2, and vz3) on one of the C-series switches; and then the verification that 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 three zones have been created; vz1, vz2, and vz3; as well as a zoneset titled MDScore.

To activate the MDScore zoneset:

```

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

```

View each switch in the fabric to verify the newly-defined zoning 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

```

You can view the same information from other C-series switches that are connected in the same fabric.

## B-series switches

Use Telnet on B-series switches to 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.

Use the `configshow` command to verify the 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

```

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

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

## Creating zones on the B-series

This section describes how to create the zones and a zoneset on the B-series, as well as activating the zoning, and verifying that each switch in the fabric has the correct zoning in place. The zone members in the examples are the same as used in the previous section, but the zone names and zoneset name are different.

The first step is to clear the zoning configuration. If the switch is part of the fabric, all switches will have no zoning in effect after the `cfgClear` command is issued.

To clear the zoning configuration:

```

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

```

Use the `zoneCreate` command to create zones. The following example shows how to 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"

```

Use the `zoneAdd` command to add members to the zone. For example, to add more members to zone vz33:

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

Verify 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
```

The following example shows how to create the configuration, which when activated, will be known on the MDS as the active zone set.

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

Use the `cfgEnable` command to activate the configuration, for example:

```
Switch3800:admin> cfgEnable "mdscore1"
```

```
zone config "mdscore1" is in effect
```

```
Updating flash ...
```

Use the `cfgShow` command to view 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
```

The new configuration is effective and defined.

Verify the other switches in the fabric.

## C-series switches

For C-series switches, use the `show zoneset active` command:

```

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 that were 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 merging the two fabrics:

- Switches listed in [Table 2](#) and [Table 3](#) can 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, lock the switch port as a G\_Port using the `portcfggport` command. This prevents the HBA from appearing in loop topology.
- Cisco NPV mode is supported with SAN-OS 3.2(1a) or later.



**NOTE:**

Cisco NPV mode can be supported with Brocade fabric configured in interopmode or Native mode. If the MDS9124e NPV is connected to an external fabric comprising of only Brocade switches, use Brocade Native mode only. If the MDS 9124e NPV is connected to an external fabric with a mix of Brocade and Cisco switches, then Brocade (and Cisco) switches must be set to interopmode 1.

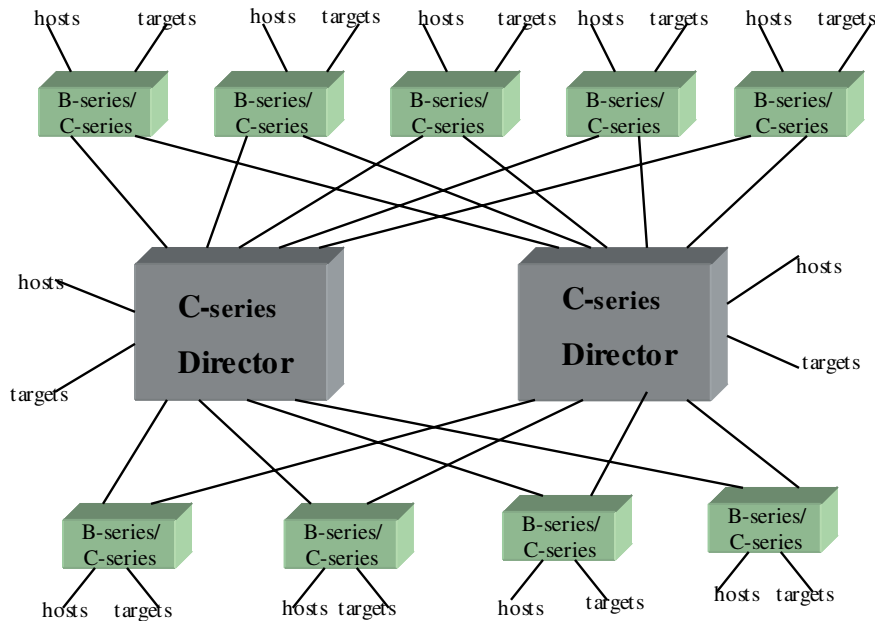
- Brocade AG mode is supported with FOS-OS 5.2.1b or later.

**NOTE:**

Brocade AG mode can be supported with Cisco fabric configured in interopmode or Native mode. If the AG is connected to an external fabric comprising of only Cisco switches, use Cisco Native mode only. If the AG is connected to an external fabric with a mix of Cisco and Brocade switches, then Brocade (and Cisco) switches must be set to interopmode 1.

Brocade AG interoperability with Cisco is supported with Emulex HBAs only (no QLogic HBA support).

- 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**

<b>HP StorageWorks switch name</b>	<b>Firmware version</b>	<b>Number of ports</b>
HP StorageWorks SAN Switch 2/8 EL, 2/8 power pack	3.2.1a	8
HP StorageWorks SAN Switch 2/16, 2/16 EL, 2/16 power pack	3.2.1b	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 HP StorageWorks SAN Director 2/128	5.0.1d 5.1.0b 5.1.0d 5.2.1b 5.3.0 5.3.0b 5.3.1a 5.3.1b	8, 16, 32, 128
HP StorageWorks SAN Switch 4/64, 4/32, 4/16, 4/8 HP StorageWorks SAN Director 4/256	5.0.1d 5.1.0b 5.1.0d 5.2.1b 5.3.0 5.3.0b 5.3.1a	8, 16, 32, 64, 256
Brocade 4Gb SAN Switch for HP p-Class BladeSystem	5.0.3b 5.0.5a 5.2.1b 5.3.0 5.3.0b 5.3.1a	8 internal, 4 external
HP StorageWorks Core Switch 2/64	5.0.5a 5.0.5f	64
Brocade 4Gb SAN Switch for HP c-Class BladeSystem	5.0.5 5.0.5c 5.2.1b 5.3.0 5.3.0b 5.3.1a	16 internal, 8 external

HP switch name	Compaq StorageWorks switch name	Firmware version	Number of ports
HP Brocade 2400 (HP reseller)	Compaq StorageWorks SAN Switch 8	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	3.2.1a 3.2.1b	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 9513	2.1(2d) 3.0(2a) 3.0(3) 3.1(2a) 3.1(3) 3.1.(3a) 3.2(1a) 3.2(2c) 3.2(3) 3.3(1a) 3.3(1c)	Up to 528
MDS 9506		Up to 128
MDS 9509		Up to 224
MDS 9216		Up to 48
MDS 9216A		Up to 64
MDS 9216i		Up to 62 (48+14) FC ports and 2 GigE ports
MDS 9120		20
MDS 9140		40
MDS 9124		Up to 24
MDS 9124e		Up to 24
MDS 9134		Up to 34
MDS 9222i		Up to 66 (48+16) FC ports and 4 GigE ports

**Table 4 Supported operating system versions**

<b>OS</b>	<b>OS version</b>	<b>Multipath software</b>	<b>HBA</b>	<b>Driver/firmware/BIOS (minimum required)</b>
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
OpenVMS	7.3-1	Native	DS-KGPSA-CA	Native/ 3.91a1
Tru64 UNIX	5.1B	Native	DS-KGPSA-CA	Native/ 3.91a1
AIX	5.3	N/A	FC6239	Native
Solaris	10	N/A	QLA2342	Patch119130-26

**Table 5 Supported storage system versions**

<b>Storage system</b>	<b>Represents architecture</b>	<b>Firmware version (minimum required)</b>
EMA/ESA12000 EMA16000 MA/RA8000 MA6000	HSG 80	ACS 8.7F Patch 2 and 3
EVA3000/5000 EVA4x00/6x00/8x00	HSV 110, HSV 100 HSV 210, HSV 200	VCS: 3.x and 4.x XCS: 5.x and 6.x
XP1024	XP128/1024	V21.13.02.00/00
XP12000	XP12000/10000	50.07.69.00/00

**Table 6 HP p-Class BladeSystem support**

HP p-Class BladeSystem	Operating system	Fibre Channel interface	Embedded switch	Storage systems
BL20p	Microsoft Windows 2003 Windows 2000 Red Hat Enterprise Linux 3 and 4 (X86) SLES 8 (X86) SLES 9 (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 (2 Gb/s)		

**Table 7 HP c-Class BladeSystem support**

HP c-Class BladeSystem	Operating system	Fibre Channel interface	Embedded switch	Storage systems
BL460c BL465c BL480c	Microsoft Windows 2003 Windows 2000 Red Hat Enterprise Linux 3 and 4 (X86) SLES 8 (X86) SLES 9 (X86)	Emulex LPe1105 QLogic QMH2462	Brocade 4 Gb SAN switch for HP c-Class BladeSystem (Switch Mode or AG Mode) Cisco MDS 9124e Fabric Switch for HP c-Class BladeSystem (Switch Mode or NPV Mode)	XP EVA MSA

## Troubleshooting

This section provides basic troubleshooting tips.

1. If you see segmentation errors on any of the switches after merging the fabrics, verify that interoperability mode is enabled on all switches in the fabric.
2. Ensure that all the time out values are set properly, especially E\_D\_TOV (2 seconds) and R\_A\_TOV (10 seconds).
3. If you see segmentation errors and messages such as Platform Management Database Inconsistency on B-series switches, disable the management server on B-series switches using the `msPlMgmtDeactivate` Telnet command, as described in these application notes.
4. If you notice any zoning related issues, verify that there were no duplicate zone sets or zones before merging. Also ensure all zones are configured using port WWN only.

## Related information

Documents:

- *HP StorageWorks SAN design reference guide*

- *HP StorageWorks Fabric interoperability: Merging fabrics based on M-series and B-series Fibre Channel switches*
- *HP StorageWorks Fabric interoperability: Merging fabrics based on M-series and C-series Fibre Channel switches*

Additional documentation, including white papers and best practices documents, are available on the HP website: <http://www.hp.com>.

