IBM System Storage N series
Brocade 200E and Brocade 5000 Switch Configuration Guide

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Table of Contents

Preface

About this guide

This guide describes how Brocade® 200E and Brocade 5000 switch models operate with a MetroCluster, how to configure a Brocade switch in a fabric-attached MetroCluster, and how to set up a fabric-attached MetroCluster. The guide also describes how to cable virtual channels and how to use zoning and traffic isolation zoning.

Audience

This guide is for system administrators who are familiar with operating systems that run on the storage system's clients, such as UNIX®, Linux®, and Windows® 2003. It also assumes that you are familiar with how to configure the storage system and how the NFS, CIFS, and HTTP protocols are used for file sharing or transfers. This guide does not cover basic system or network administration topics, such as IP addressing, routing, and network topology; it emphasizes the characteristics of the storage system.

Supported features

IBM® System Storage™ N series systems and expansion boxes are driven by NetApp® Data ONTAP® software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details. Information about supported features can also be found at the following Web site:

www.ibm.com/storage/support/nas/

A listing of currently available N series products and features can be found at the following Web site:

www.ibm.com/storage/nas/

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM System Storage N series product, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected properly.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.
- Use an IBM discussion forum on the IBM Web site to ask questions.

Using the documentation

Information about the N series product and Data ONTAP software is available in printed documents and a documentation CD that comes with your system. The same documentation is available as PDF files on the IBM NAS support Web site:

www.ibm.com/storage/support/nas/

Data ONTAP software publications are available as PDF files on the IBM NAS support Web site:

www.ibm.com/storage/support/nas/

Web sites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates.

- For NAS product information, go to the following Web site:

  www.ibm.com/storage/nas/
- For NAS support information, go to the following Web site:

  www.ibm.com/storage/support/nas/
- For AutoSupport information, go to the following Web site:

  www.ibm.com/storage/support/nas/
- You can order publications through the IBM Publications Ordering System at the following Web site:

  www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi/

Accessing online technical support

For online Technical Support for your IBM N series product, visit the following Web site:

www.ibm.com/storage/support/nas/

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following Web site for support telephone numbers:

www.ibm.com/planetwide

Supported servers and operating systems

IBM N series products attach to many servers and many operating systems. To determine the latest supported attachments, visit the following Web site:

www.ibm.com/storage/support/nas/

Drive firmware updates

As with all devices, it is recommended that you run the latest level of firmware, which can be downloaded by visiting the following Web site:

www.ibm.com/storage/support/nas/

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support. See the *Software Setup Guide* for more information on updating firmware.

Terminology

Storage systems that run Data ONTAP are sometimes also referred to as *appliances*, *storage appliances*, or *systems*. The name of the graphical user interface for Data ONTAP (*FilerView*) reflects one of these common usages.

FilerView as an alternative to commands

As a storage system administrator, you can perform tasks by entering commands at the console, in configuration files, or through a Telnet session or Remote Shell connection.

Another method of performing common tasks is to use the FilerView® graphical management interface for viewing and managing a storage system from a Web browser. FilerView is easy to use, and it includes Help that explains FilerView features and how to use them.

For more information about accessing a storage system using FilerView, and about FilerView Help, see the *Storage Management Guide*.

Command conventions

You can enter storage system commands on the system console or from any client that can obtain access to the storage system using a Telnet session. In examples that illustrate commands executed on a UNIX workstation, the command syntax and output might differ, depending on your version of UNIX.

Formatting conventions

The following table lists different character formats used in this guide to set off special information.

Formatting convention	Type of information
Italic type	◆ Words or characters that require special attention. ◆ Placeholders for information you must supply. For example, if the guide requires you to enter the `fctest` *adaptername* command, you enter the characters "fctest" followed by the actual name of the adapter. ◆ Book titles in cross-references.
`Monospaced` font	◆ Command and daemon names. ◆ Information displayed on the system console or other computer monitors. ◆ The contents of files.
`Bold monospaced` font	Words or characters you type. What you type is always shown in lowercase letters, unless your program is case-sensitive and uppercase letters are necessary for it to work properly.

Keyboard conventions

This guide uses capitalization and some abbreviations to refer to the keys on the keyboard. The keys on your keyboard might not be labeled exactly as they are in this guide.

What is in this guide…	What it means…
hyphen (-)	Used to separate individual keys. For example, Ctrl-D means holding down the Ctrl key while pressing the D key.
Enter	Used to refer to the key that generates a carriage return; the key is named Return on some keyboards.
type	Used to mean pressing one or more keys on the keyboard.
enter	Used to mean pressing one or more keys and then pressing the Enter key.

Special messages

This guide contains special messages that are described as follows:

Note

A note contains important information that helps you install or operate the system efficiently.

Attention

An attention notice contains instructions that you must follow to avoid damage to the equipment, a system crash, or loss of data.

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Brocade and IBM product and model number matrix

The following table identifies IBM products that are equivalent to the Brocade products mentioned in this publication.

Brocade product name	IBM product name	IBM machine type and model number
Brocade 5000	SAN32B-3	2005 Models B5K and 5KB
Brocade Silkworm 200E	SAN16B-2	2005 Models B16 and 16B

Brocade MetroCluster Overview 1

About this chapter

This chapter introduces the MetroCluster configuration and provides an overview of virtual channels and switch fabrics.

Topics in this chapter

This chapter discusses the following topic: “Brocade 200E and Brocade 5000 MetroCluster Overview” on page 2.

Brocade 200E and Brocade 5000 MetroCluster Overview

Data ONTAP® requirements for MetroCluster switches

For the latest information about which Data ONTAP releases support these switches in a MetroCluster configuration, search for the *Active/Active Configuration Guide* at http://www.ibm.com/support/documentation for Data ONTAP 7.2.5 or later.

Description of a MetroCluster configuration

The MetroCluster configuration uses two storage systems that are connected to provide high availability and data mirroring. You can place these two systems in different locations. When the distance between the two systems is greater than 500 meters, you use four Brocade Fibre Channel switches in a fabric configuration to connect the two systems. This configuration is called a *fabric-attached MetroCluster.*

Definition of MetroCluster switch fabrics

A fabric-attached MetroCluster contains two switch fabrics. A *switch fabric* consists of a switch on the local half of the MetroCluster connected to a switch on the remote half of the MetroCluster. The two switches are connected to each other through long-distance Inter-Switch Link (ISL) cables, as shown in the following illustration.

Note

Do not mix Brocade 200E and Brocade 5000 switches within a single fabric-attached MetroCluster or across a fabric-attached MetroCluster.

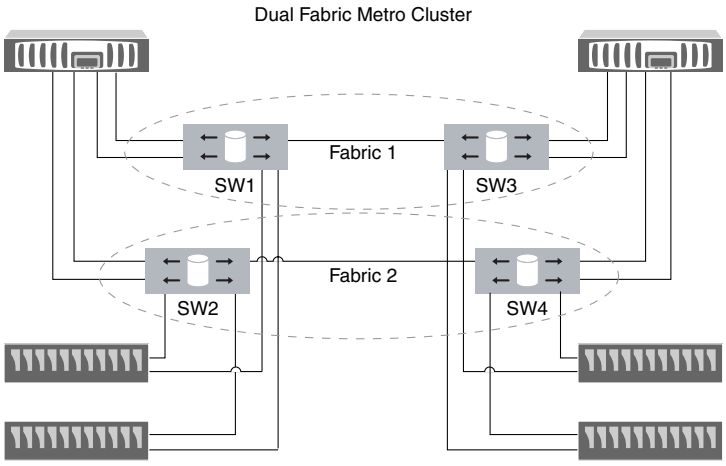
Sample diagram of a MetroCluster switch fabric

For example, consider a MetroCluster configuration in which the first fabric begins at Switch 1 on the local node and is completed by connecting the ISL cable to the first switch (Switch 3) on the remote node. The second fabric is created using Switch 2 on the local node, connected through a second ISL cable to the second switch (Switch 4) on the remote node.

This example is illustrated in the following diagram.

Note

Each fabric supports only one ISL.



MetroCluster ISL distance limitations

When you are using a Brocade 200E switch, the maximum ISL distance is 50 kilometers at 4 gigabits, but with a Brocade 5000 switch, the ISL distance increases to 100 kilometers.

Brocade Switch Cabling and Ports 2

About this chapter

This chapter illustrates Brocade 200E and Brocade 5000 switch ports and how they are divided into banks, quadrants, and pools.

Topics in this chapter

This chapter discusses the following topics:

How switch ports are divided

Definitions of switch banks, quadrants, and pools

Fibre Channel switches are divided into *banks* and *quadrants*. Quadrants are combined to form *pools*.

Each switch has two banks that divide the switch into two equal parts. (See the switch illustrations that follow.)

The banks are further divided into two quadrants of two, four, or eight ports each (depending on the number of ports in the switch).

These quadrants combine to form pools, which function identically in a fabric-attached MetroCluster and a mirrored cluster. Quadrants 1 and 3 belong to Pool 0, while Quadrants 2 and 4 belong to Pool 1. Each switch bank contains a Pool 0 and a Pool 1.

Number of ports in Brocade 200E and Brocade 5000 switches

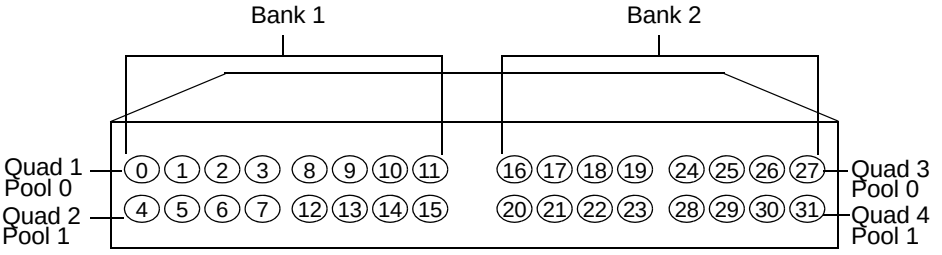
The Brocade 5000 switch has 32 ports.

The Brocade 200E switch has 16 ports, but can also be licensed as an 8-port switch.

Switch port diagrams

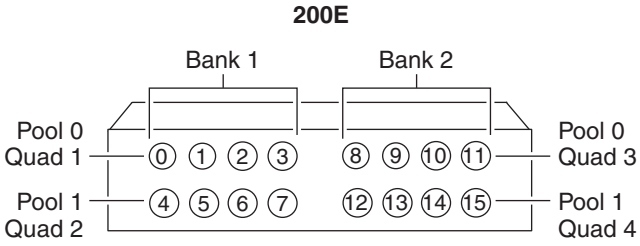
Brocade 5000 32-port switch diagram

The Brocade 5000 switch has ports 0 through 31 licensed and operational, as shown in the following diagram.



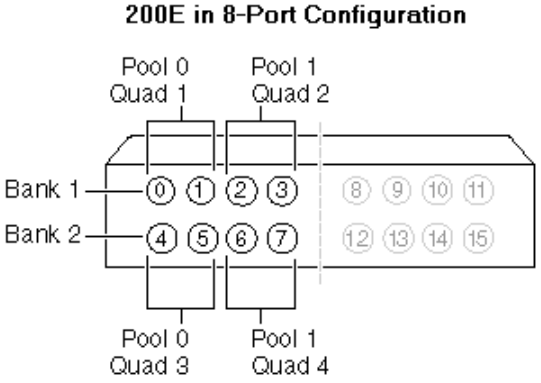
Brocade 200E 16-port switch diagram

When licensed for 16 ports, the Brocade 200E switch has ports 0 through 15 licensed and operational, as shown in the following diagram.



Brocade 200E 8-port switch diagram

When licensed for 8 ports, the Brocade 200E switch has ports 0 through 7 licensed and operational, as shown in the following diagram.



Note

If your Brocade 200E switch is licensed for only 8 ports, do not install Small Form Pluggables (SFPs) in non-licensed ports 8 through 15. This might cause Data ONTAP to operate as if the switch is a 16-port switch and erroneously assign pools to the unlicensed ports, preventing the MetroCluster from functioning correctly.

Virtual Channel Cabling 3

About this chapter

This chapter describes the Brocade virtual channel feature and cabling for virtual channels.

Topics in this chapter

This chapter discusses the following topics:

Description of the Brocade virtual channel feature

Virtual channel feature requirement

To use Brocade's virtual channel feature, which you can use to isolate interconnect traffic from the storage traffic stream and prevent port blocking, your storage system platforms must use software-based disk ownership.

What the virtual channel feature does

The Brocade virtual channel feature logically partitions bandwidth within each ISL into eight virtual channels. Storage system platforms that support software-based disk ownership enable you to move away from physical quadrant cabling and instead use virtual channel technology to isolate interconnect traffic from the storage traffic stream.

Virtual channel technology applies only to ISLs. Each of the eight virtual channels within an ISL includes a physical circuit as well as components for flow control and buffer credit management.

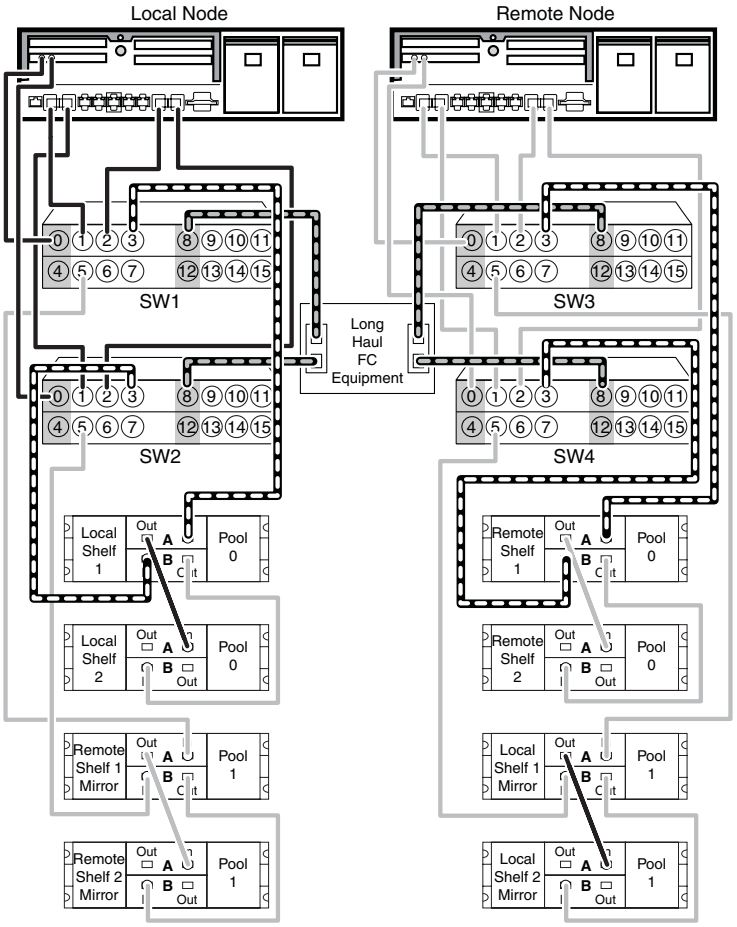
Advantages of the virtual channel feature

You can use the virtual channel feature to separate interconnect traffic from storage traffic. This ensures ISL reliability by preventing port blocking. When you use virtual channel technology, no single node can monopolize all the bandwidth of an ISL and block out traffic from other nodes.

Software-based cabling diagrams for virtual channels

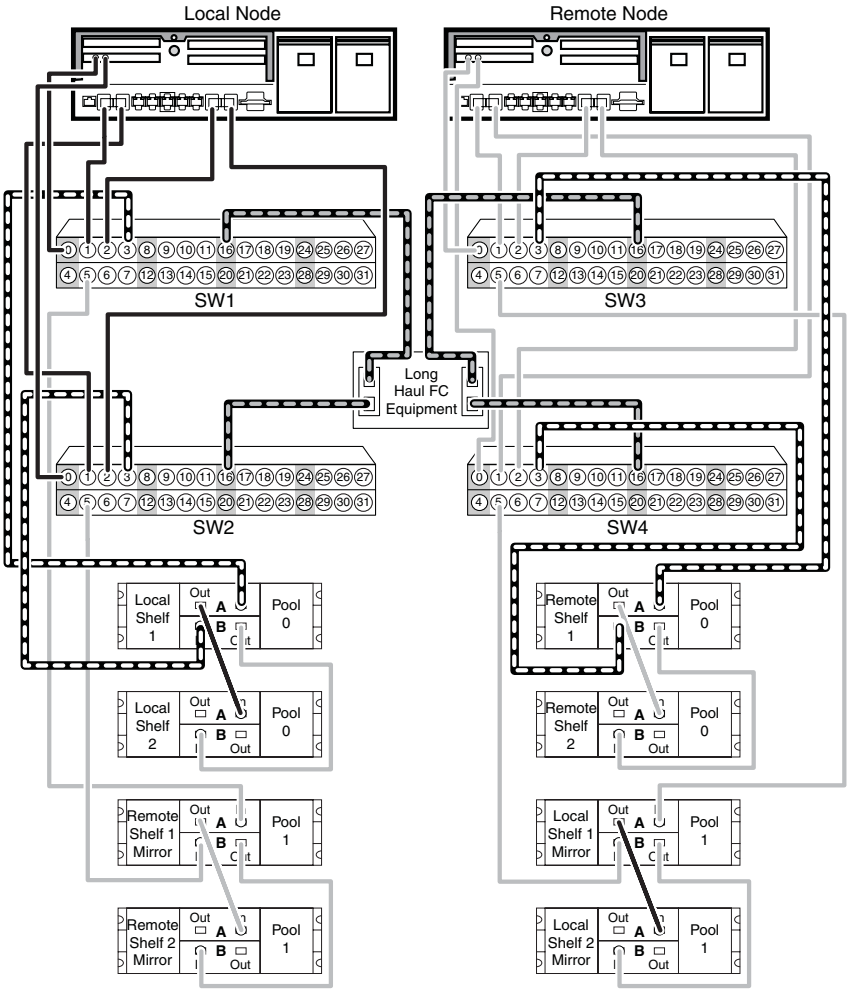
Sample diagram of Brocade 200E 16-port cabling for virtual channels

The following diagram shows how to cable storage systems using software-based disk ownership for virtual channel technology, using Brocade 200E 16-port switches.



Sample diagram of Brocade 5000 32-port cabling for virtual channels

The following illustration shows how to cable storage systems using software-based disk ownership for virtual channel technology, using Brocade 5000 32-port switches.



Virtual channel and destination port maps

Virtual channel and destination port mapping limitations

You can map each virtual channel to up to eight destination ports—two on an 8-port Brocade 200E switch, four on a 16-port Brocade 200E switch, and eight on a 32-port Brocade 5000 switch.

The eight virtual channels are numbered 0 through 7. You can use virtual channels 2 through 5 for either Class 2 or Class 3 data traffic.

The following tables show the mapping of virtual channels to specific destination ports.

Virtual channel distance limitations

Virtual channels for an 8-port Brocade 200E switch and a 16-port Brocade 200E switch work only at distances of less than 10 kilometers. If the ISL port is configured for a distance greater than 10 kilometers on these switches, all four virtual channels (2 through 5) collapse into one channel. Virtual channels for a 32-port Brocade switch work at distances up to 100 kilometers.

Map of virtual channels to ports on an 8-port switch

The following table shows the virtual channels and destination ports for a Brocade 200E 8-port switch.

Virtual channel	Destination port
2	0, 4
3	1, 5
4	2, 6
5	3, 7

Map of virtual channels to ports on a 16-port switch

The following table shows the virtual channels and destination ports for a Brocade 200E 16-port switch.

Note

You can also use this configuration for a Brocade 5000 switch that is licensed for 16 ports.

Virtual channel	Destination port
2	0, 4, 8, 12
3	1, 5, 9, 13
4	2, 6, 10, 14
5	3, 7, 11, 15

Map of virtual channels to ports on a 32-port switch

The following table shows the virtual channels and destination ports for a Brocade 5000 32-port switch.

Virtual channel	Destination port
2	0, 4, 8, 12, 16, 20, 24, 28
3	1, 5, 9, 13, 17, 21, 25, 29
4	2, 6, 10, 14, 18, 22, 26, 30
5	3, 7, 11, 15, 15, 19, 23, 27, 31

Configuring Brocade Switches 4

About this chapter

This chapter explains how to configure a Brocade 200E or Brocade 5000 switch.

Topics in this chapter

This chapter discusses the following topics:

Configuring a Brocade switch

Before you begin

Configuring a Brocade 200E or Brocade 5000 switch for a fabric-attached MetroCluster includes the following tasks:

- Configuring the switch initially
- Setting the switch parameters

Before you begin the configuration, note the following information:

- These procedures must be performed on each switch in the MetroCluster configuration.
- You must use these procedures instead of the switch configuration procedures in the *Cluster Installation and Administration Guide* or the *Active/Active Configuration Installation and Administration Guide*.

Configuring a switch initially

To configure a switch initially, complete the following steps.

Step	Action
1	If this switch has not been configured before, log in to the switch, using the console port and your Windows HyperTerminal application (not available in Windows Vista versions), and set the following values, as described in the Brocade switch hardware reference manual for your switch: ◆ IP address ◆ Default account passwords (administrator and user) ◆ Date and time **Note** Use the `telnet` command for subsequent switch login sessions, using the switch IP address.

Step	Action
2	Display the licenses installed on the switch by entering the following command: **`licenseshow`** **Result:** You should have the following licenses: ◆ Fabric License (or two Domain Licenses) ◆ Extended Fabric License (for ISL distances over 10 km) If you do not have these licenses, contact your sales representative before proceeding.
3	Set the switch name, if needed, by entering the following command: **`switchname`** ***`switch_name`*** **Note** Use a name that is meaningful, such as node name and switch.
4	Determine the switch firmware by entering the following command: **`version`** **Result:** The currently installed switch firmware is displayed.
5	Access the *IBM Compatibility Matrix* at http://www.ibm.com to identify the currently supported version of the switch firmware.
6	If your switch firmware is not the supported version, complete the following substeps: **a.** Download the switch firmware from www.brocade.com/support/downloads.jsp and install it, as described in the Brocade switch hardware reference manual for your switch. **b.** Reboot the switch.

Setting the switch parameters

After performing the initial switch configuration, set the switch parameters by completing the following steps.

Step	Action
1	Disable the switch by entering the following command: **`switchdisable`**
2	Clear any preexisting configuration by entering the following commands: **`cfgclear`** **`cfgdisable`** **`cfgsave`**
3	Configure the switch with default settings by entering the following command: **`configdefault`**
4	Set the switch parameters by entering the following command: **`configure`** **Note** The domain ID might be specified by your system administrator. If not, you can use any unique number, for example, 1, 2, 3, or 4. You should set only the following parameters: ◆ `Fabric parameters = y` ❖ `Domain_id = XXX` ❖ `Disable device probing = 1` ◆ `Arbitrated Loop parameters = y` ❖ `Send FAN frames = 0`

Completing the configuration

Steps

After setting the switch parameters, complete the configuration by performing these steps.

Step	Action
1	Exit the configuration utility by entering the following command: **`ctrl-d`**
2	Reboot the switch so that the new settings take effect by entering the following command: **`fastboot`**
3	Log in to the switch and disable it by entering the following command: **`switchdisable`**
4	Complete the following substeps only for the ports to which disks are attached: **a.** Set all ports attached to disk loops to half duplex by entering the following command for each port number: **`portCfgLPort <disk_port>,0,0,1`** **b.** Set all ports attached to disk loops to Locked L-Port by entering the following command for each port number: **`portCfgLPort <disk_port>,1,0,1`**
5	Ensure that the disk loop port is showing ON in both the Locked L_Port and Locked Loop HD fields by entering the following commands: **`portCfgShow`** **`portCfglport`** **Result:** ON is displayed in both the Locked L_Port and Locked Loop HD fields.

Step	Action
6	If your switch has the trunking license installed, disable trunking on the ISL port by entering the following command: **portcfgtrunkport <*ISL_port#*> 0**
7	To configure the long-distance ISL port for your ISL length, enter the following command: **portcfglongdistance [*slotnumber/portnumber*] [*distance_level*] [*VC_Translation_Link_Init*] [*desired_distance*]** *distance_level* is one of the following values: ◆ As a normal switch port, use LO. ◆ For distances up to 10 km, use LE. ◆ For distances beyond 10 km, use LS. Specify 1 to activate long-distance link initialization sequence, or specify 0 to deactivate this mode. Then specify the distance. **Example:** If your ISL length is 18 km and your ISL is connected to port 13, you use the following command: **portCfgLongDistance 13 LS 1 18**
8	Enable the switch by entering the following command: **switchenable**
9	Verify that the switch settings are correct by entering the following command: **configshow**

Brocade Switch Zoning 5

About this chapter

This chapter describes how to configure zones on the primary and secondary fabric of a Brocade 200E or Brocade 5000 switch.

Topics in this chapter

This chapter discusses the following topics:

Brocade Zoning feature description

Zoning feature requirements

No additional license is needed for zoning. The zoning license is enabled by default when the switches are shipped.

Zoning feature uses

You can use the Brocade zoning feature to set up two or more *zones* on the same switch. Zones let you arrange fabric-connected storage devices into logical groups, or zones, over the physical configuration of the fabric.

Zone members can access only other members of the same zone. You can use zones to provide controlled access to fabric segments and to establish barriers between operating environments. For example, you can isolate systems with different uses or protect systems in a heterogeneous environment.

Configuring zones on the primary and secondary fabric

Configuration rules

You need to create two zones on a Brocade switch—a zone for a Fibre Channel Virtual Interface (FCVI) from a local node to a remote node, and a second zone from the local node to local storage shelves.

You configure these zones on a primary and a secondary fabric.

Note
You must configure the primary and the secondary fabrics separately.

Note
You cannot include the ISL port in a zone. You can use any other port in any of the four quadrants. For more information, search for the *Active/Active Configuration Guide* at http://www.ibm.com/support/documentation for Data ONTAP 7.2.5 or later.

Configuring zones on the primary fabric

To configure zones on the primary fabric of a Brocade switch, complete the following steps.

Step	Action
1	Connect to port 1 of the switch in the primary fabric by using the `telnet` command. For example, log in to switch DOMAIN ID 1.

Step	Action
2	Create a zone for the FCVI traffic by entering the following command: **zonecreate "*zonename*", "*member,port; member,port*"** *zonename* is the name of the zone. *member* is the switch ID and port number you want to include in this zone. **Example** The following example creates a zone called “FCVI” that includes switch 1, port 15 on the local node, and switch 2, port 15 on the remote node. **zonecreate "FCVI", "1,15; 2,15"**
3	Create a zone for the storage traffic from the local node to local disk shelves by entering the following command: **zonecreate "*zonename*", *member;member*** *zonename* is the name of the zone. *member* is the switch ID and port number you want to include in this zone. **Example** The following example creates a zone “STOR” that includes switch 1, port 0; switch 1, port 4; switch 1, port 8; switch 2, port 0; switch 2, port 8; and switch 2, port 12, all on your local node. **zonecreate "STOR", "1,0; 1,4; 1,8; 2,0; 2,8; 2,12"**
4	Create the zoned configuration by entering the following command: **cfgcreate "*Zone_<name>*" *<zonename>; <zonename>*** Enter the zoned configuration name followed by the names of the zones you created in the previous steps. **Example** The following example creates a zoned configuration named “Zone_net” that includes the zones named FCVI and STOR. **cfgcreate "Zone_net", FCVI; STOR**

Step	Action
5	Save and enable the zoned configuration by entering the following command: **`cfgenable "Zone_<name>"`** **Example** The following example saves and enables the Zone-net zoned configuration. **`cfgenable "Zone_net"`** **Note** Alternatively, you can save the zoned configuration into flash memory by using the command **`sfgsave`** instead of **`cfgenable`**.
6	View the effective zoned configuration at any time by entering the following command: **`cfgshow`**

Configuring zones on the secondary fabric

Repeat the previous procedure to configure zones on the secondary fabric. Follow these steps.

Step	Action
1	Connect to port 1 of the switch in the secondary fabric by using the `telnet` command. For example, log in to switch DOMAIN ID 1.

Step	Action
2	Create a zone for the FCVI traffic by entering the following command: **`zonecreate "zonename", member;member`** *zonename* is the name of the zone. *member* is the switch ID and port number you want to include in this zone. **Example** The following example creates a zone called “FCV12” that connects switch 3, port 15 on your local node and switch 4, port 15. on your remote node. **`zonecreate "FCV12", "3,15; 4,15"`**
3	Create a zone for the storage traffic from the local node to local disk shelves by entering the following command: **`zonecreate "zonename", member;member`** *zonename* is the name of the zone. *member* is the switch ID and port number you want to include in this zone. **Example** The following example creates zone “STOR2” that includes switch 3, port 0; switch 3, port 4; switch 3, port 8; switch 4, port 0; switch 4, port 8; and switch 4, port 12, all on your local node. **`zonecreate "STOR2", "3,0; 3,4; 3,8; 4,0; 4,8; 4,12"`**
4	Create the zoned configuration by entering the following command: **`cfgcreate "Zone_<name>" <zonename>; <zonename>`** Enter the zoned configuration name followed by the names of the zones you created in the previous steps. **Example** The following example creates a zoned configuration named “Zone_net2” that includes the zones named FCVI2 and STOR2. **`cfgcreate "Zone_net2", FCVI2; STOR2`**

Step	Action
5	Save and enable the zoned configuration by entering the following command: **`cfgenable "Zone_<name>"`** **Example** The following example saves and enables the Zone-net2 zoned configuration. **`cfgenable "Zone_net2"`** **Note** Alternatively, you can save the zoned configuration into flash memory by using the command **`cfgsave`** instead of **`cfgenable`**.
6	View the effective zoned configuration at any time by entering the following command: **`cfgshow`**

Brocade 5000 Traffic Isolation 6

About this chapter

This chapter describes the Traffic Isolation (TI) features available for the Brocade 5000 switch, including TI zone failover, TI zone rules, and configuration of TI zones.

Topics in this chapter

Traffic Isolation feature description

Description of the Traffic Isolation feature

In the Brocade Fabric Operating System 6.0b and later, you can dedicate Inter-Switch links (ISLs) to certain traffic. The TI feature enables you to control the flow of ISL traffic by creating a dedicated path for traffic flowing from a specific set of source ports (N_Ports).

The TI feature helps Fibre Channel Virtual Interface (FCVI) messages, which are considered high-priority traffic, avoid interruption or congestion caused by storage traffic.

Traffic Isolation feature requirements

Note the following requirements for using the TI feature:

- The TI feature is supported only on the Brocade 5000 switch.
- The TI feature requires Data ONTAP 7.2.6 or later.
- Ports in a TI zone must belong to switches that run Brocade Fabric OS 6.0b or later.

TI feature usage examples

You can use the TI feature in the following scenarios:

- When you want to dedicate an ISL to high-priority, host-to-target traffic such as cluster interconnect traffic.
- When you want to force high-volume, low-priority traffic onto a particular ISL to limit the effect of this high traffic pattern on the fabric.

How TI zones work

Implementing traffic isolation involves using a special zone, called a Traffic Isolation zone (TI zone). A TI zone indicates the set of ports and ISLs that will be used for a specific traffic flow.

When you activate a TI zone, the fabric attempts to isolate all ISL traffic entering from a member of the zone to only those ISLs that are included in the zone. The fabric also attempts to exclude traffic not in the TI zone from using ISLs within that TI zone.

TI zone failover operation

Failover operation when TI zone failover is enabled

The TI feature contains a TI zone failover setting that you can enable or disable. When paths within a TI zone go offline, the TI zone failover setting determines the outcome. If you use the default settings when you create a TI zone, failover is automatically enabled.

When failover is enabled in traffic flow with TI zones, the following situations occur:

- If a TI-zoned route fails, traffic is moved to another E_Port in the same TI zone.

  If no other E_Ports are available in that TI zone, traffic is moved to another equivalent-cost E_Port, if available.
- When a failed TI-zoned route is restored, traffic is automatically failed back to the original route.
- If the dedicated ISL fails, traffic is routed onto the non-dedicated ISL, because it is the only available route.

Failover operation when TI zone failover is disabled

When failover is disabled in traffic flow with TI zones and the TI-zoned E_Port fails, the following occurs:

- A Registered State Change Notification is generated listing the path failure.

  TI moves traffic to another E_Port in the same TI zone, if one is available, but does not move traffic to an E_port outside of the TI zone.
- When a failed TI-zoned route is restored, traffic automatically fails back to the original route and a Registered State Change Notification is generated listing the path restoration.
- If the dedicated ISL fails, traffic is not routed onto the nondedicated ISL and the TI-zoned route remains inoperable.

TI zone configuration rules

Configuration rules for TI zones

The following configuration rules apply to TI zones:

- A given N_Port can be a member of only a single TI zone.

  This rule is enforced during zone creation or modification.
- An E_Port can be a member of only a single TI zone.

  The same checking is done as described for N_Ports.
- If multiple E_Ports on the lowest-cost route to a domain are configured, the various source ports for that zone are load balanced across the specified E_Ports.
- The TI zones appear in the defined zone configuration only and do not appear in the effective zone configuration.

  A TI zone only provides Traffic Isolation and is not a "regular" zone.
- A TI zone must include a set (two or more) of E_Ports forming an end-to-end path.

  Inclusion of N_Ports is optional.
- Each TI zone is interpreted by each switch, and each switch considers only the routing required for its local ports.

  No consideration is given to the overall topology or to whether the TI zones accurately provide dedicated paths through the whole fabric.
- You use the `zone` command with options to create and modify TI zones.

  You cannot use other zoning commands, such as `zoneCreate`, `aliCreate`, and `cfgCreate` to manage TI zones.

TI zone command syntax

TI zone command syntax

You can use the following commands when configuring TI zoning.

Note

`zone` commands are used only with the TI feature, not with existing zoning.

Note

A `cfgenable` command is required to commit all TI zone commands. See the example procedures in "Configuring TI zones with failover enabled" on page 35 and "Configuring TI zones with failover disabled" on page 39.

- Create a TI zone with specified options and port list by entering the following command:

  zone --create [-t *objtype*] [-o *optionlist*} *zonename* -p [*portlist*]

  -t *objtype* is the type of zone. You use **ti** to specify a TI zone.

  -o *optionlist* is a list of options for activating the zone and controlling failover mode.

  - **a** means activate
  - **d** means deactivate
  - **n** means disable failover
  - **f** means enable failover

  zonename is the name that you want to give to the TI zone.

  -p *portlist* is the list of ports to be included in the TI zone. You designate ports by using the "*domain, index*" format. Multiple ports are separated by a semicolon, followed by a space.

  The following example creates a TI zone called "fcvi_ti" with failover enabled and the TI zone activated. The example includes Domain 1 switch 1, port 30 and switch 1, port 31; and Domain 3 switch 2, port 10 and switch 2, port 4.

Note

Failover enabled (option f) and TI zone activated (option a) are default settings, so you do not have to enter them in the command.

```
zone --create -t ti "fcvi_ti" -p "1,30; 1,31; 3,10; 3,4"
```

- Activate a TI zone by entering the following command:

  zone --activate <*zonename*>
- Deactivate a zone by entering the following command:

  zone --deactivate <*zonename*>
- Delete TI zones from the defined configuration by entering the following command:

  zone --delete <*zonename*>
- View the effective TI zone configuration at any time by entering the following command:

  zone --show

Configuring TI zones

Configuring TI zones with failover enabled

To create a TI zone with failover enabled and the TI zone activated on a primary fabric and a secondary fabric, complete the following steps.

The following sample procedure shows how to create a configuration that includes a TI zone, an FCVI zone, and a storage zone.

Note
You must configure the zones in the primary and the secondary fabrics separately.

Step	Action
1	Connect to port 1 of a switch in the primary fabric by using the `telnet` command. For example, log in to switch DOMAIN ID 1.
2	Create a configuration on the primary fabric by using the `cfgcreate` command: **`cfgcreate`** "*`configuration name`*", "*`zonetype`*; *`zonetype`*; *`zonetype`*" *`configuration name`* is the name you give the configuration and *`zonetype`* is the type of zone you want to include in the configuration. ◆ `fcvi_ti` designates an FCVI TI zone. ◆ `fcvi_zone` designates an FCVI zone. ◆ `sto_zone` designates a storage zone. For example, the following command creates a configuration named config1 that includes a TI zone, an FCVI zone, and a storage zone: **`cfgcreate "config1", "fcvi_ti; fcvi_zone; sto_zone"`**

Step	Action
3	Create the TI zone on the primary fabric by using the `zone --create` command. For detailed command syntax, see "TI zone command syntax" on page 33. **zone --create** [-t *objtype*] [-o *optionlist*} *zonename* -p [*portlist*] The following example creates a TI zone called fcvi_ti with failover enabled and the TI zone activated. The example includes Domain 1 switch 1, port 30 and switch 1, port 31; and Domain 2 switch 2, port 10 and switch 2, port 4. **Note** Failover enabled (option f) and TI zone activated (option a) are default settings, so you do not have to enter them in the command. **zone --create -t ti "fcvi_ti" -p "1,30; 1,31; 2,10; 2,4"**
4	Create the FCVI zone on the primary fabric by using the `zonecreate` command: **zonecreate** "*zonename*", "*switch,port*; *switch,port*" *zonename* is the name of the zone, and *switch,port* is the switch ID and port number that you want to include in this zone. The following example creates a zone called fcvi_zone that includes switch 1, port 30 on the local node, and switch 2, port 10 on the remote node. **zonecreate "fcvi_zone", "1,30; 2,10"**
5	Create the storage zone on the primary fabric by using the `zonecreate` command: **zonecreate** "*zonename*", "*switch,port; switch,port*" *zonename* is the name of the zone, and *switch,port* is the switch ID and port number that you want to include in this zone. The following example creates a zone called sto_zone that includes switch 1, ports 1, 2, 3, and 15 on the local node; and switch 2, ports 1, 2, 3, and 15 on the remote node. **zonecreate "sto_zone", "1,1; 1,2; 1,3; 1;15; 2,1; 2,2; 2,3; 2,15"**
6	Save the configuration by using the `cfgsave` command: **cfgsave**

Step	Action
7	Commit all commands and enable the configuration by using the `cfgenable` command: **`cfgenable`** "*`configuration name`*" For example, using the configuration name “config1”: **`cfgenable "config1"`**
8	Connect to port 1 of a switch in the secondary fabric by using the `telnet` command. For example, log in to switch DOMAIN ID 3.
9	Create a configuration on the secondary fabric by using the `cfgcreate` command: **`cfgcreate`** "*`configuration name`*", "*`zonetype; zonetype; zonetype`*" *`configuration name`* is the name you give the configuration and *`zonetype`* is the type of zone you want to include in the configuration. ◆ `fcvi_ti` designates an FCVI TI zone. ◆ `fcvi_zone` designates an FCVI zone. ◆ `sto_zone` designates a storage zone. For example, the following command creates a configuration named config2 that includes a TI zone, an FCVI zone, and a storage zone: **`cfgcreate "config2", "fcvi_ti; fcvi_zone; sto_zone"`**
10	Create the TI zone on the secondary fabric by using the `zone --create` command. For detailed command syntax, see “TI zone command syntax” on page 33. **`zone --create`** `[-t` *`objtype`*`] [-o` *`optionlist`*`}` *`zonename`* `-p [`*`portlist`*`]` The following example creates a TI zone called fcvi_ti with failover enabled and the TI zone activated. The example includes Domain 3 switch 3, port 30 and switch 3, port 31; and Domain 4 switch 4, port 10 and switch 4, port 4. **Note** Failover enabled (option f) and TI zone activated (option a) are default settings, so you do not have to enter them in the command. **`zone --create -t ti "fcvi_ti" -p "3,30; 3,31; 4,10; 4,4"`**

Step	Action
11	Create the FCVI zone on the secondary fabric by using the `zonecreate` command: `zonecreate "`*`zonename`*`", "`*`switch,port; switch,port`*`"` *`zonename`* is the name of the zone, and *`switch,port`* is the switch ID and port number that you want to include in this zone. The following example creates a zone called fcvi_zone that includes switch 3, port 30 on the local node, and switch 4, port 10 on the remote node. **`zonecreate "fcvi_zone", "3,30; 4,10"`**
12	Create the storage zone on the secondary fabric by using the `zonecreate` command: `zonecreate "`*`zonename`*`", "`*`switch,port; switch,port`*`"` *`zonename`* is the name of the zone, and *`switch,port`* is the switch ID and port number that you want to include in this zone. The following example creates a zone called sto_zone that includes switch 3, ports 1, 2, 3, and 15 on the local node; and switch 4, ports 1, 2, 3, and 15 on the remote node. **`zonecreate "sto_zone", "3,1; 3,2; 3,3; 3;15; 4,1; 4,2; 4,3; 4,15"`**
13	Save the configuration by using the `cfgsave` command: **`cfgsave`** "*`configuration name`*" For example, using the configuration name “config2”: **`cfgsave "config2"`**
14	Commit all commands and enable the configuration by using the `cfgenable` command: **`cfgenable`** "*`configuration name`*" For example, using the configuration name “config2”: **`cfgenable "config2"`**

Configuring TI zones with failover disabled

To create a TI zone with failover disabled and the TI zone deactivated on a primary fabric and a secondary fabric, complete the following steps.

The following sample procedure shows how to create a configuration that includes a TI zone, an FCVI zone, and a storage zone.

Note

You must configure the primary and the secondary fabrics separately.

Step	Action
1	Connect to port 1 of a switch in the primary fabric by using the `telnet` command. For example, log in to switch DOMAIN ID 1.
2	Create a configuration on the primary fabric by using the `cfgcreate` command: **`cfgcreate`** "*`configuration name`*", "*`zonetype; zonetype; zonetype`*" *`configuration name`* is the name you give the configuration and *`zonetype`* is the type of zone you want to include in the configuration. ◆ `fcvi_ti` designates an FCVI TI zone. ◆ `fcvi_zone` designates an FCVI zone. ◆ `sto_zone` designates a storage zone. For example, the following command creates a configuration named config1 that includes a TI zone, an FCVI zone, and a storage zone: **`cfgcreate "config1", "fcvi_ti; fcvi_zone; sto_zone"`**
3	Create the TI zone on the primary fabric by using the `zone --create` command. For detailed command syntax, see "TI zone command syntax" on page 33. **`zone --create`** [-t *objtype*] [-o *optionlist*} *zonename* -p [*portlist*] The following example creates a TI zone called fcvi_ti with the options set for zone deactivated (option d) and failover disabled (option n). The example includes Domain 1 switch 1, port 31 and switch 1, port 30; and Domain 3 switch 2, port 10 and switch 2, port 4. **`zone --create -t ti -o dn "fcvi_ti" -p "1,31; 1,30; 3,10; 3,4"`**
4	Optional step: You can activate the TI zone after you create it in a deactivated state by using the `zone -- activate` command: **`zone --activate "fcvi_ti"`**

Step	Action
5	Create the FCVI zone on the primary fabric by using the `zonecreate` command: **zonecreate** "*zonename*", "*switch,port; switch,port*" *zonename* is the name of the zone, and *switch,port* is the switch ID and port number that you want to include in this zone. The following example creates a zone called fcvi_zone that includes switch 1, port 30 on the local node, and switch 2, port 10 on the remote node. **zonecreate "fcvi_zone", "1,30; 2,10"**
6	Create the storage zone on the primary fabric by using the `zonecreate` command: **zonecreate** "*zonename*", "*switch,port; switch,port*" *zonename* is the name of the zone, and *switch,port* is the switch ID and port number that you want to include in this zone. The following example creates a zone called sto_zone that includes switch 1, ports 1, 2, 3, and 15 on the local node; and switch 2, ports 1, 2, 3, and 15 on the remote node. **zonecreate "sto_zone", "1,1; 1,2; 1,3; 1;15; 2,1; 2,2; 2,3; 2,15"**
7	Save the configuration by using the `cfgsave` command: **cfgsave** "*configuration name*" For example, using the configuration name “config1”: **cfgsave "config1"**
8	Commit all commands and enable the configuration by using the `cfgenable` command: **cfgenable** "*configuration name*" For example, using the configuration name “config1”: **cfgenable "config1"**
9	Connect to port 1 of a switch in the secondary fabric by using the `telnet` command. For example, log in to switch DOMAIN ID 3.

Step	Action
10	Create a configuration on the primary fabric by using the `cfgcreate` command: **`cfgcreate`** "*`configuration name`*", "*`zonetype; zonetype; zonetype`*" Where *`configuration name`* is the name you give the configuration and `zonetype` is the type of zone you want to include in the configuration. ◆ `fcvi_ti` designates an FCVI TI zone. ◆ `fcvi_zone` designates an FCVI zone. ◆ `sto_zone` designates a storage zone. For example, the following command would create a configuration named config2 that includes a TI zone, an FCVI zone, and a storage zone: **`cfgcreate "config2", "fcvi_ti; fcvi_zone; sto_zone"`**
11	Define the TI zone on the secondary fabric by using the `zone --create` command. For detailed command syntax, see "TI zone command syntax" on page 33. **`zone --create`** `[-t` *`objtype`*`] [-o` *`optionlist`*`}` *`zonename`* `-p [`*`portlist`*`]` The following example creates a TI zone called fcvi_ti with the options set for zone deactivated (option d) and failover disabled (option n). The example includes Domain 3 switch 3, port 31 and switch 3, port 30; and Domain 4 switch 4, port 10 and switch 4, port 4. **`zone --create -t ti -o dn "fcvi_ti" -p "3,31; 3,30; 4,10; 4,4"`**
12	Optional step: You can activate the TI zone after you create it in a deactivated state by using the `zone -- activate` command: **`zone --activate "fcvi_ti"`**
13	Create the FCVI zone on the secondary fabric by using the `zonecreate` command: `zonecreate` "*`zonename`*", "*`switch,port; switch,port`*" *`zonename`* is the name of the zone, and *`switch,port`* is the switch ID and port number that you want to include in this zone. The following example creates a zone called fcvi_zone that includes switch 3, port 30 on the local node, and switch 4, port 10 on the remote node. **`zonecreate "fcvi_zone", "3,30; 4,10"`**

Step	Action
14	Create the storage zone on the secondary fabric by using the `zonecreate` command: `zonecreate` "*`zonename`*", "*`switch,port; switch,port`*" *`zonename`* is the name of the zone, and *`switch,port`* is the switch ID and port number that you want to include in this zone. The following example creates a zone called sto_zone that includes switch 3, ports 1, 2, 3, and 15 on the local node; and switch 4, ports 1, 2, 3, and 15 on the remote node. **`zonecreate "sto_zone", "3,1; 3,2; 3,3; 3;15; 4,1; 4,2; 4,3; 4,15"`**
15	Save the configuration by using the `cfgsave` command: **`cfgsave`** "*`configuration name`*" For example, using the configuration name “config2”: **`cfgsave "config2"`**
16	Commit all commands and enable the configuration by using the `cfgenable` command: **`cfgenable`** "*`configuration name`*" For example, using the configuration name “config2”: **`cfgenable "config2"`**

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