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Cisco MDS 9000 Family Switch-to-Switch Interoperability Configuration Guide

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Preface

This preface describes the purpose, audience, organization, and conventions of the *Cisco MDS 9000 Family Switch-to-Switch Interoperability Configuration Guide*. It also explains how to obtain related documentation.

Purpose

This document provides a reference for the configuration and implementation of interoperable fabrics using the Cisco MDS 9000 Family of multilayer directors and fabric switches. It focuses on interoperability modes and their effects on a fabric. In addition to the Cisco MDS 9000 Family, this document also describes McData and Brocade devices, and includes examples and sample configurations for setting up a multi-vendor fabric.

The configurations and components used herein have been tested and validated by Cisco Solution-Interoperability Engineering to support risk-free deployment of fabrics using the Cisco MDS 9000 Family of multilayer directors and fabric switches.

Audience

This document is designed for use by Cisco TAC, sales, support engineers, professional service partners, systems administrators, and others who are responsible for the design and deployment of storage area networks in the data center environment.

Organization

This guide is organized as follows:

Chapter	Title	Description
Chapter 1	Interoperability Overview	Describes interoperability and the MDS 9000 Family interoperability modes, and the Fibre Channel features that are affected by interoperability.
Chapter 2	Interoperability Limitations	Describes the restrictions and limitations imposed on specific vendor switches when working in interoperabilty mode.

Chapter	Title	Description
Chapter 3	MDS 9000 Core with Brocade Edge Topology (Interop Mode 1)	Describes how to set up a basic core-edge topology with MDS 9000 switches (configured for interop mode 1) and Brocade switches.
Chapter 4	MDS 9000 Core with Brocade and McData Edge Topology (Interop Mode 1)	Describes how to set up a basic core-edge topology with MDS 9000 switches (configured for interop mode 1), Brocade switches, and McData switches.
Chapter 5	MDS 9000 Switch and McData Dual Core Topology (Interop Mode 1)	Describes how to set up a basic dual core topology with MDS 9000 switches (configured for interop mode 1) and McData 6064 switches.
Chapter 6	MDS 9000 Core with Brocade 3900/12000 Edge Topology	Describes how to set up a basic core-edge topology with MDS 9000 switches (configured for interop mode 1) and Brocade 3900/12000 switches.
Chapter 7	MDS 9000 Legacy Switch Interop Mode 2	Describes how to set up a basic legacy switch interop mode 2 topology, with two MDS 9000 switches and two Brocade switches in a serial topology.
Chapter 8	MDS 9000 Legacy Switch Interop Mode 3	Describes how to set up a basic legacy switch interop mode 3 topology, with MDS SAN-OS VSANs and Brocade 16 port switches.
Chapter 9	MDS 9000 Legacy Switch Interop Mode 4	Describes how to set up a basic legacy switch interop mode 4 topology, with MDS SAN-OS VSANs and McData switches running in McData Fabric 1.0 mode.
Chapter 10	MDS 9020 Switch Interoperability	Describes how to connect the Cisco MDS 9020 fabric switch to a third-party switch.
Chapter 11	Interoperability with Inter-VSAN Routing	Describes how to set up IVR with interop mode.
Chapter 12	IBM BladeCenter	Describes how to set up MDS 9000 switches with IBM BladeCenters.
Chapter 13	Standards Perspectives	Describes the common standards that relate to interoperability.
Chapter 14	Caveats	Describes release specific behavior for certain versions of Brocade, McData, or IBM BladeCenter firmware.

Document Conventions

Command descriptions use these conventions:

Convention	Indication
boldface font	Commands and keywords are in boldface.
italic font	Arguments for which you supply values are in italics.
[ ]	Elements in square brackets are optional.
{x | y | z }	Required alternative keywords are grouped in braces and separated by vertical bars.
[x | y | z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.

Screen examples use these conventions:

Convention	Indication
`screen` font	Terminal sessions and information the switch displays are in `screen` font.
`boldface screen` font	Information you must enter is in **`boldface screen`** font.
`italic screen` font	Arguments for which you supply values are in *`italic screen`* font.
< >	Nonprinting characters, such as passwords are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

This document uses the following conventions:

Note Means reader *take note*. Notes contain helpful suggestions or references to material not covered in the manual.

Tip Means *the following information will help you solve a problem*. These tips are suggested as best practices and are based on in-depth knowledge of the Cisco MDS 9000 Family platform and experience implementing SANs.

Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Related Documentation

The documentation set for the Cisco MDS 9000 Family includes the following documents. To find a document online, use the Cisco MDS SAN-OS Documentation Locator at:
http://www.cisco.com/en/US/products/ps5989/products_documentation_roadmap09186a00804500c1.html.
For information on IBM TotalStorage SAN Volume Controller Storage Software for the Cisco MDS 9000 Family, refer to the IBM TotalStorage Support website:
http://www.ibm.com/storage/support/2062-2300/

Release Notes

- *Cisco MDS 9000 Family Release Notes for Cisco MDS SAN-OS Releases*
- *Cisco MDS 9000 Family Release Notes for Storage Services Interface Images*
- *Cisco MDS 9000 Family Release Notes for Cisco MDS SVC Releases*
- *Cisco MDS 9000 Family Release Notes for Cisco MDS 9000 EPLD Images*

Compatibility Information

- *Cisco MDS 9000 SAN-OS Hardware and Software Compatibility Information*
- *Cisco MDS 9000 Family Interoperability Support Matrix*
- *Cisco MDS SAN-OS Release Compatibility Matrix for IBM SAN Volume Controller Software for Cisco MDS 9000*
- *Cisco MDS SAN-OS Release Compatibility Matrix for Storage Service Interface Images*

Regulatory Compliance and Safety Information

- *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*

Hardware Installation

- *Cisco MDS 9500 Series Hardware Installation Guide*
- *Cisco MDS 9200 Series Hardware Installation Guide*
- *Cisco MDS 9216 Switch Hardware Installation Guide*
- *Cisco MDS 9100 Series Hardware Installation Guide*
- *Cisco MDS 9020 Fabric Switch Hardware Installation Guide*

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Cisco Fabric Manager

- *Cisco MDS 9000 Family Fabric Manager Quick Configuration Guide*
- *Cisco MDS 9000 Family Fabric Manager Configuration Guide*
- *Cisco MDS 9000 Fabric Manager Online Help*
- *Cisco MDS 9000 Fabric Manager Web Services Online Help*

Command-Line Interface

- *Cisco MDS 9000 Family Software Upgrade and Downgrade Guide*
- *Cisco MDS 9000 Family CLI Quick Configuration Guide*
- *Cisco MDS 9000 Family CLI Configuration Guide*
- *Cisco MDS 9000 Family Command Reference*
- *Cisco MDS 9000 Family Quick Command Reference*
- *Cisco MDS 9020 Fabric Switch Configuration Guide and Command Reference*
- *Cisco MDS 9000 Family SAN Volume Controller Configuration Guide*

Troubleshooting and Reference

- *Cisco MDS 9000 Family Troubleshooting Guide*
- *Cisco MDS 9000 Family MIB Quick Reference*
- *Cisco MDS 9020 Fabric Switch MIB Quick Reference*
- *Cisco MDS 9000 Family SMI-S Programming Reference*
- *Cisco MDS 9000 Family System Messages Reference*
- *Cisco MDS 9020 Fabric Switch System Messages Reference*

Installation and Configuration Note

- *Cisco MDS 9000 Family SSM Configuration Note*

Cisco MDS 9000 Family Port Analyzer Adapter Installation and Configuration Note

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

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http://www.cisco.com

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

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Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

From this site, you will find information about how to:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories, security notices, and security responses for Cisco products is available at this URL:

http://www.cisco.com/go/psirt

To see security advisories, security notices, and security responses as they are updated in real time, you can subscribe to the Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed. Information about how to subscribe to the PSIRT RSS feed is found at this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

Reporting Security Problems in Cisco Products

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- For Emergencies only—security-alert@cisco.com

  An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.
- For Nonemergencies—psirt@cisco.com

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

Tip We encourage you to use Pretty Good Privacy (PGP) or a compatible product (for example, GnuPG) to encrypt any sensitive information that you send to Cisco. PSIRT can work with information that has been encrypted with PGP versions 2.*x* through 9.*x*.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

The link on this page has the current PGP key ID in use.

If you do not have or use PGP, contact PSIRT at the aforementioned e-mail addresses or phone numbers before sending any sensitive material to find other means of encrypting the data.

Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Technical Support & Documentation website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

Cisco Technical Support & Documentation Website

The Cisco Technical Support & Documentation website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, at this URL:

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Access to all tools on the Cisco Technical Support & Documentation website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Note Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support & Documentation website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests, or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—An existing network is down, or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of the network is impaired, while most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The *Cisco Product Quick Reference Guide* is a handy, compact reference tool that includes brief product overviews, key features, sample part numbers, and abbreviated technical specifications for many Cisco products that are sold through channel partners. It is updated twice a year and includes the latest Cisco offerings. To order and find out more about the Cisco Product Quick Reference Guide, go to this URL:

  http://www.cisco.com/go/guide

- Cisco Marketplace provides a variety of Cisco books, reference guides, documentation, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

  http://www.cisco.com/go/marketplace/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

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  http://ciscoiq.texterity.com/ciscoiq/sample/

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

- Networking products offered by Cisco Systems, as well as customer support services, can be obtained at this URL:

  http://www.cisco.com/en/US/products/index.html

- Networking Professionals Connection is an interactive website for networking professionals to share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:

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CHAPTER 1

Interoperability Overview

This chapter provides an overview of interoperability and the Fibre Channel features that are affected by interoperability. It includes the following sections:

Understanding Interoperability

Interoperability is the facet of an implementation where multiple vendor products come in contact with each other. Fibre Channel standards have been put in place to guide vendors toward common external Fibre Channel interfaces. (For additional information about Fibre Channel standards that relate to interoperability, see Chapter 13, "Standards Perspectives.")

If all vendors followed the standards in the same manner, then interconnecting different products would become a trivial exercise; however, the Fibre Channel standards are open to interpretation and contain many optional areas. Vendors also have extended the features laid out in the standards documents to add advanced capabilities and functionality to their feature sets. Because these features are often proprietary, vendors have had to implement interoperability *modes* to accommodate these heterogeneous environments.

MDS 9000 Family Interoperability Modes

The MDS 9000 Family of multilayer directors and fabric switches supports various types of interoperability, depending on the release.

- **Default or Native Mode** —This is the default mode or behavior for a VSAN that is communicating between a SAN composed entirely of MDS 9000 switches.
- **Interop Mode 1**—This is the standard interoperability mode. It interoperates with Brocade and McData switches that have been configured for their own interoperability modes. Brocade and McData switches must be running in interop mode to work with this VSAN mode. See Chapter 6, "MDS 9000 Core with Brocade 3900/12000 Edge Topology".

- **Interop Mode 2** —This mode, also known as legacy switch interop mode 2, allows seamless integration with specific Brocade switches running in their own native mode of operation. Brocade switches must be configured with "core pid = 0" to work with this mode. See Chapter 7, "MDS 9000 Legacy Switch Interop Mode 2".
- **Interop Mode 3**—Similar to interop mode 2, interoperability mode 3 was introduced for Brocade switches that contained more than 16 ports. With this VSAN-based interop mode, Brocade switches will not have to be altered from their native mode (core pid = 1) and can be seamlessly added to a new or existing MDS SAN-OS VSAN. This mode is also known as legacy switch interop mode 3. See Chapter 8, "MDS 9000 Legacy Switch Interop Mode 3".
- **Interop Mode 4**— This mode, also known as legacy switch interop mode 4, provides seamless integration between MDS VSANs and McData switches running in McData Fabric 1.0 interop mode. See Chapter 9, "MDS 9000 Legacy Switch Interop Mode 4".

IVR

Inter-VSAN routing (IVR) allows a device that is located in one VSAN to communicate with a device that is located in another VSAN. IVR supports routing between all interop mode VSANs.

Firmware Version Requirements

The following switches have been tested with the Cisco MDS 9513, MDS 9509, MDS 9506, MDS 9216, MDS 9216i, MDS 9140, and MDS 9120 for interoperability:

- Brocade 2400, 2800, 3200, 3800, 3900, and 12000
- McData 3032 and 6064
- IBM BladeCenter

The following are minimum Cisco MDS SAN-OS versions for interop mode support:

- Release 1.0(1)+ (standard interop mode, 1)
- Release 1.2(1)+ (legacy switch interop mode 2)
- Release 1.3(2a)+ (legacy switch interop mode 3)
- Release 1.3(4a)+ (IVR with all interop modes)
- Release 2.1(2b) (MDS 9020 support)
- Release 3.0(1) (legacy switch interop mode 4)

Note Refer to the *Cisco MDS 9000 Family Interoperability Support Matrix* for current firmware version support.

Fibre Channel Features Affected by Interoperability

Each vendor (Cisco, McData, and Brocade) has its own *native* mode and an equivalent interoperability mode, which has the purpose of turning off specific advanced or proprietary features and providing the product with a more standards-compliant implementation.

Various functions and parameters are affected by interoperating with other vendor switches. The following areas are affected:

- **Domain IDs**—The domain ID, which is part of the FC ID, may be limited to a range less than the full 239 values provided in the Fibre Channel standard. A switch may have to change its domain ID to the 97 to 127 range to accommodate the McData 31 domain address limitation. If a domain ID is changed (which can be a disruptive event to the switch), all devices attached to the switch will need to log into the switch again. 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**—The impact of this event is switch-wide. Brocade and McData require the entire switch to be taken offline and/or rebooted when changing domain IDs.
  - **Nondisruptive**—This event is limited to the VSAN where the event is taking place. The MDS 9000 switch can perform this action, as the domain manager process for this VSAN is restarted and not the entire switch. This event still requires any devices logged into the VSAN on that switch to log in again to obtain a new FC ID.
- **Fabric Shortest Path First (FSPF)**—The routing of frames within the fabric is not changed by the introduction of an interoperability mode. However, the MDS 9000 switch will continue to use the default src-id/dst-id/ox-id (or src-id/dst-id, if configured) to load balance across multiple Inter-Switch Links (ISLs), while Brocade and McData switches will use their default src-id/dst-id. When passing through an MDS 9000 switch, the return route may be different from the initial route.
- **Timers**—All Fibre Channel timers must be the same on all switches as these values are exchanged by E ports when establishing an ISL. The timers are:
  - F_S_TOV (fabric stability time out value)
  - D_S_TOV (distributed services time out value)
  - E_D_TOV (error detect time out value)
  - R_A_TOV (resource allocation time out value)
- **Trunking and PortChannels**—Trunking and PortChannels are not supported between two different vendor switches. However, some vendors can continue to use trunking and PortChannels between their own switches while in interop mode. This feature may be disabled on a per-port or per-switch basis, and continue to work as expected only if they are allowed by the interoperability mode of the vendor.
- **FC Aliases**—FC aliases are never propagated as part of an active zone set in any mode. FC aliases are propagated as part of the full database, if propagation of the full database is allowed in that specific mode.
- **Default Zone Behavior**—The default zone behavior of permit (all nodes can see all other nodes) or deny (all nodes are isolated when not explicitly placed in a zone) may change. The default zone parameter is restricted to the switch on which it is configured, and it is not propagated to other switches.
- **Zoning Membership**—Zones may be limited to the pWWN, while other proprietary zoning methods (physical port number) may be eliminated. Not all vendors can support the same number of zones. Determine which vendor is the lowest common denominator and limit the fabric to that value. The zoning methods are described in Table 1-1.

Table 1-1 Zoning Types in Interop Mode

Zoning Type	Allowed MDS 9000 Switch Interop Modes
Port WWN	All
FC ID	Non-interop mode only

Table 1-1 Zoning Types in Interop Mode

Zoning Type	Allowed MDS 9000 Switch Interop Modes
Fabric port WWN	Non-interop mode only
FC Alias	All
domain/port	Legacy switch interop modes 2, 3, 4
Symbolic node name	Non-interop mode only
<interface, switch wwn>	Non-interop mode only

- **Zone Propagation**—Some vendors only distribute the active zone set (configuration) while others continue to use a proprietary format to distribute the full zone set database (configuration). The behavior is described in Table 1-2.

Table 1-2 Full Zone Set Distribution

Mode	Default Behavior	Effect of "distribute full" Option
Non-interop mode	Full database is not distributed. It is always parsed if received from a remote switch.	Full database distribution can be turned on and off using this command.
Interop Mode 1	Full database is neither distributed nor parsed due to possible interoperability problems.	No effect.
Legacy switch mode (2,3)	Full database is distributed and parsed.	No effect.
Legacy switch mode 4	Full database is not distributed.	No effect.

See Chapter 13, "Standards Perspectives," for additional insight into the Fibre Channel standards with respect to interoperability.

Implementing an Interoperable Fabric

Before implementing an interoperable fabric, the following general steps should be taken:

Step 1 Verify zone compliance. All zones need to be made from pWWNs exclusively when using the standard interop mode (1). In legacy switch interop modes (domain/port), zoning should only be used on non-MDS switches.

Step 2 Verify FC timers. All timers need to match exactly including E_D_TOV and R_A_TOV.

Step 3 Assign domain IDs. Whether assigning them statically or restricting them to a specific range (97 to 127), these unique values should be planned or set up in advance of establishing the fabric.

Step 4 Enable interop mode. This action can be either a disruptive or nondisruptive process to the switch and can even result in the total reboot of the switch on which this mode is being enabled.

Step 5 Verify the name server. Verify that all switches have the correct values in their respective name server database.

Step 6 Verify zone propagation. Verify that the active zone set or zone configuration has correctly propagated to the other switches in the fabric.

CHAPTER 2

Interoperability Limitations

This chapter describes the restrictions and limitations imposed on specific vendor switches when working in interoperability mode. It includes the following sections:

Cisco MDS 9000 Family

The standard interoperability mode, which has been a fully functional feature since MDS SAN-OS Release 1.0(1), enables the MDS 9000 switch to interoperate with Brocade and McData switches when they are configured for interoperability. The standard interoperability mode allows the MDS 9000 switch to communicate over a standard set of protocols with these vendor switches.

Note The MDS 9020 switch does not support individual interop modes. To see how to interoperate the MDS 9020 with third-party switches, see Chapter 10, "MDS 9020 Switch Interoperability."

Standard Interoperability Mode Limitations

When a VSAN is configured for the default interoperability mode, the MDS 9000 Family of switches is limited in the following areas when interoperating with non-MDS switches:

- Interop mode only affects the specified VSAN. The MDS 9000 switch 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 97 to 127 range, to accommodate McData's nominal restriction to this same range. Domain IDs can either be set up statically (the MDS 9000 switch will only accept one domain ID; if it does not get that domain ID, it isolates itself from the fabric), or preferred (if the MDS 9000 switch does not get the requested domain ID, it takes any other domain ID).
- TE ports and PortChannels cannot be used to connect an MDS 9000 switch to a non-MDS switch. Only E ports can be used to connect an MDS 9000 switch to a non-MDS switch. However, TE ports and PortChannels can still be used to connect an MDS 9000 switch to other MDS 9000 switches, even when in interop mode.
- Only the active zone set is distributed to other switches.

- In MDS SAN-OS Release 1.3(x), Fibre Channel timers can be set on a per VSAN basis. Modifying the times, however, requires the VSAN to be suspended. Prior to SAN-OS Release 1.3, modifying timers required all VSANs across the switch to be put into the suspended state.
- If a Brocade switch issues a **cfgsave** command, the MDS 9000 switch rejects this vendor specific command. The full zone database on the MDS 9000 switch is not updated. You must manually update the full zone database or copy the active zone set to the full zone database.
- The MDS 9000 switch still supports the following zoning limits per switch across all VSANs:
  - 2000 zones (as of SAN-OS 3.0, 8000 zones)
  - 20000 aliases
  - 1000 zone sets
  - 20000 members
  - 8000 LUN members
  - 256 LUN members per zone/alias

Note Before configuring this number of zones in a mixed environment, determine the maximum number that can be supported by the other vendors present in the environment.

Table 2-1 provides a summary of features and behaviors in standard interop mode for an MDS 9000 switch.

Table 2-1 Summary of Features in Standard Interop Mode for an MDS 9000 Switch

Feature	Requirement / Behavior
Minimum Firmware Level	1.0(1) standard interop mode.
VSANs	Only the 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 the 97 to 127 range.
PortChannels and TE Ports	They can still be used to directly connect two MDS 9000 switches together, even while in interop mode. However, they cannot be used to directly connect to a non-MDS 9000 switch. Standard E ports are required to connect to non-MDS switches.
Zones and Zone Sets	Only the active zone set is propagated. Up to 2000 zones (8000 for SANOS 3.0+) can be supported by the MDS 9000 switch. The default zone policy changes to deny.
Fabric Manager and Device Manager	They can still be used to fully manage the MDS 9000 switch, and to create zones to be distributed to the non-MDS platforms. Fabric Manager can still view the entire mixed topology.

Table 2-1 Summary of Features in Standard Interop Mode for an MDS 9000 Switch (continued)

Feature	Requirement / Behavior
Security	SSH, Telnet, SNMP-v3, RADIUS and TACACS+ are supported.
Device Support	Fabric (F), Public Loop (FL), and Translative Loop (TL) are fully supported.
Inter-VSAN Routing (IVR)	Fully supported in SAN-OS Release 1.3(4a) and later with all interop modes.

Legacy Switch Interoperability Modes (2 and 3)

Starting in MDS SAN-OS Release 1.2(1) and continuing in Release 1.3(2a), two legacy switch interoperability modes were introduced:

- **Interop Mode 2**—Introduced in MDS SAN-OS Release 1.2(1), legacy switch interoperability mode 2 allows an MDS VSAN to communicate seamlessly with a Brocade 2100, 2400, 2800 or 3800 series switch without having to modify the configuration of the Brocade switch. Chapter 7, "MDS 9000 Legacy Switch Interop Mode 2," provides additional information and a tutorial using this mode.
- **Interop Mode 3**—Introduced in MDS SAN-OS Release 1.3(2a), legacy switch interoperability mode 3 allows an MDS VSAN to communicate seamlessly with a Brocade 3900 or 12000 model switch without having to take the Brocade switch offline. Chapter 8, "MDS 9000 Legacy Switch Interop Mode 3,"provides additional information about this mode.

When a VSAN is configured for one of the legacy switch interoperability modes, the Cisco MDS 9000 Family of switches is limited in the following areas when interoperating with Brocade switches:

- Legacy switch interop modes only affect the specified VSAN. The MDS 9000 switch 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 Legacy Switch Interop, even if they do not have any end devices.
- TE ports and PortChannels cannot be used to connect an MDS 9000 switch to non-MDS switches. Only E ports can be used to connect an MDS 9000 switch to a non-MDS switch. However, TE ports and PortChannels can still be used to connect an MDS 9000 switch to other MDS 9000 switches, even when in interop mode.
- The active zone set and full zone databases are distributed to other switches.
- In MDS SAN-OS Release 1.3(x), Fibre Channel timers can be set on a per VSAN basis. Modifying times, however, requires the VSAN to be suspended. Prior to Release 1.3, modifying timers required all VSANs across the switch to be put into the suspended state.
- If new zones are added and the **cfgsave** command is issued on the Brocade switch, vendor specific frames are sent to the other switches in the fabric. The MDS 9000 switch parses these frames and modifies the full database accordingly. However, the MDS 9000 switch does not save the full database to nonvolatile memory unless the **copy running startup** command is issued. Using the MDS **zoneset distribute vsan #** command causes the MDS 9000 switch to emulate the Brocade **cfgsave** behavior by instructing other switches to save their configuration. The MDS 9000 switch will not save its own configuration unless a **copy running-configuration startup-configuration** is issued. When a zone set is activated by the MDS 9000 switch, it implicitly sends a **cfgsave** command to the Brocade switches.

- The MDS 9000 switch continues to support the following zoning limits per switch across all VSANs:
  - 2000 zones (8000 in SANOS 3.0)
  - 2000 aliases
  - 1000 zone sets
  - 20000 members
  - 8000 LUN members
  - 256 LUN members per zone/alias

Note Before configuring this number of zones in a multi-vendor environment, determine the maximum number that can be supported by the other vendors present in the environment.

Table 2-2 provides a summary of features and behaviors in legacy switch interop mode for an MDS 9000 switch.

Table 2-2 Summary of Features in Legacy Switch Interop Mode for an MDS 9000 Switch

Feature	Requirement / Behavior
Minimum MDS SAN-OS Release	1.2(1) for legacy switch interop mode 2; 1.3(2a) for legacy switch interop mode 3.
VSANs	Only the VSANs explicitly set for interop mode are affected. All others maintain their independence.
High Availability	Fully redundant dual supervisor modules maintain full functionality.
PortChannels and TE Ports	They can still be used to directly connect two MDS 9000 switches together, even while in interop 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.
Zone and Zone Sets	Only the active zone set is propagated. Up to 2000 zones can be supported by the MDS 9000 switch.
Fabric Manager and Device Manager	They can still be used to fully manage the MDS 9000 switch, and to create zones to be distributed to the non-MDS platforms. Fabric Manager can still view the entire mixed topology.
Security	SSH, Telnet, SNMP-v3 and RADIUS are supported.
Device Support	Fabric (F), Public Loop (FL), and Translative Loop (TL) are fully supported.
Inter-VSAN Routing	Fully supported in SAN-OS Release 1.3(4a) and higher with all interop modes.

Legacy Switch Interoperability Mode 4

In Cisco MDS SAN-OS Release 3.0(1), legacy switch interoperability mode 4 was introduced to enable seamless integration with McData switches that are running in McData Fabric 1.0 mode. Chapter 9, "MDS 9000 Legacy Switch Interop Mode 4" provides additional information about this mode.

When a VSAN is configured for interoperability mode 4, the Cisco MDS 9000 Family of switches is limited in the following areas when interoperating with McData switches:

- Legacy switch interop modes only affect the specified VSAN. The MDS 9000 switch 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 legacy switch interop mode 4, even if they do not have any end devices.
- TE ports and PortChannels cannot be used to connect an MDS 9000 switch to non-MDS switches. Only E ports can be used to connect an MDS 9000 switch to a non-MDS switch. However, TE ports and PortChannels can still be used to connect an MDS 9000 switch to other MDS 9000 switches, even when in interop mode, and TE ports and PortChannels can carry interop mode 4 VSANs.
- Only the active zone set is distributed to other switches.
- In MDS SAN-OS Release 1.3(x), Fibre Channel timers can be set on a per VSAN basis. Modifying timers, however, requires the VSAN to be suspended. Prior to Release 1.3, modifying timers required all VSANs across the switch to be put into the suspended state.
- The MDS 9000 switch continues to support the following zoning limits per switch across all VSANs:
  - 2000 zones (8000 in SANOS 3.0)
  - 20000 aliases
  - 1000 zone sets
  - 20000 members
  - 8000 LUN members
  - 256 LUN members per zone/alias

Note Before configuring this number of zones in a multi-vendor environment, determine the maximum number that can be supported by the other vendors present in the environment.

Table 2-2 provides a summary of features and behaviors in legacy switch interop mode for an MDS 9000 switch.

Table 2-3 Summary of Features in Legacy Switch Interop Mode 4 for an MDS 9000 Switch

Feature	Requirement / Behavior
Minimum MDS SAN-OS Release	SAN OS 3.0(1)
VSANs	Only the VSANs explicitly set for interop mode 4 is affected. All others maintain their independence.
High Availability	Fully redundant dual supervisor modules maintain full functionality.

Table 2-3 Summary of Features in Legacy Switch Interop Mode 4 for an MDS 9000 Switch

Feature	Requirement / Behavior
PortChannels and TE Ports	They can still be used to directly connect two MDS 9000 switches together, even while in interop 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.
Zone and Zone Sets	Only the active zone set is propagated. Up to 2000 zones (8000 in MDS SAN-OS Release 3.0) can be supported by the MDS 9000 switch.
Fabric Manager and Device Manager	They can still be used to fully manage the MDS 9000 switch, and to create zones to be distributed to the non-MDS platforms. Fabric Manager can still view the entire mixed topology.
Security	SSH, Telnet, SNMP-v3 and RADIUS are supported.
Device Support	Fabric (F), Public Loop (FL), and Translative Loop (TL) are fully supported.
Inter-VSAN Routing	Fully supported in MDS SAN-OS Release 1.3(4a) and higher with all interop modes.

Inter-VSAN Routing (IVR)

Inter-VSAN routing (IVR) allows a device that is in one VSAN to communicate with a device that is located in another VSAN. IVR was introduced in MDS SAN-OS Release 1.3(2a).

MDS SAN-OS Release 1.3(4a) introduced IVR for all interop modes within a configuration, so that inter-VSAN routing is now possible between all interop mode VSANs.

See Chapter 11, "Interoperability with Inter-VSAN Routing," for more information on IVR and interoperability.

McData Switches

Note Prior to performing an installation, see "McData Switches" in Chapter 14, "Caveats," for the latest issues with McData switch interoperability.

When configured for interoperability mode (Open Fabric 1.0), McData switches have the following restrictions and limitations:

- Interoperability mode is switch-wide.
- Enabling interoperability mode is a disruptive process to the entire switch.
- Zoning is restricted to pWWN, and port number zoning is not allowed.
- The default zone behavior changes to deny (devices that are not explicitly in a zone are isolated from all other devices).

- Domain IDs are restricted to the 97 to 127 range. However, when configuring domain IDs on the McData switch, a range of 1-31 is specified. McData uses an offset of 96 between the configured domain ID and what is actually distributed in the fabric (on the wire).
- Fabric Config Server (FCS) is not supported.

When configured for McData Fabric 1.0, in conjunction with an MDS interop mode 4 VSAN (see Chapter 9, "MDS 9000 Legacy Switch Interop Mode 4"), McData switches have the following restrictions and limitations:

- McData Fabric 1.0 is configured switch wide, and all McData switches must be configured in the same mode.
- FC IDs are restricted to the 97 to 127 range. However, when configuring domain IDs on the McData switch, a range of 1-31 is specified. McData uses an offset of 96 between the configured domain ID and what is actually distributed in the fabric (on the wire).
- McData SANtegrity features are not supported with an MDS switch in interop mode 4.

Brocade Switches

Note Prior to performing an installation, see "Brocade Switches" in Chapter 14, "Caveats," for the latest issues with Brocade interoperability.

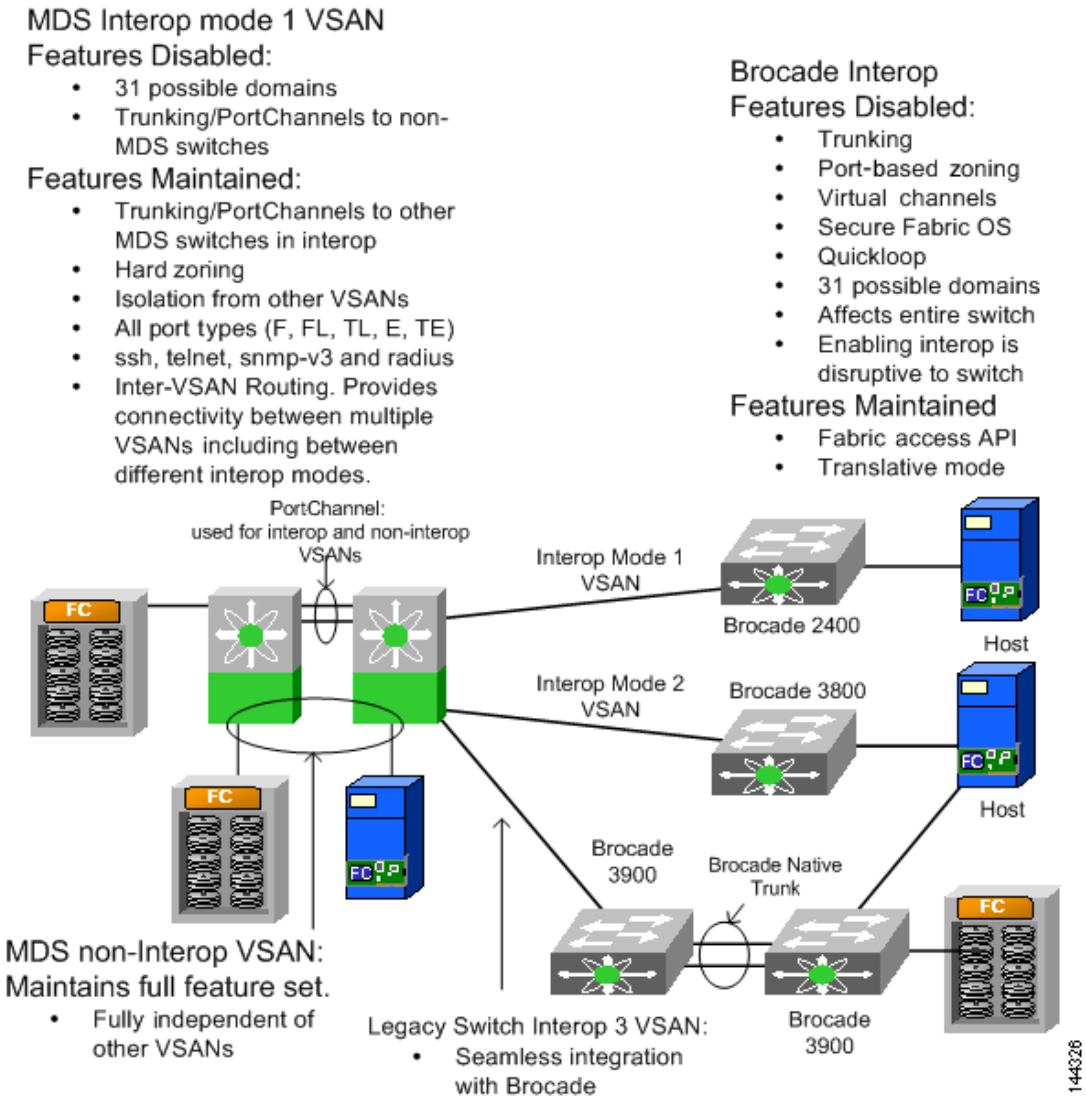
When interoperability mode is set, the Brocade switch has the following limitations:

- All Brocade switches should be in Fabric OS 2.4 or later.
- Interop mode affects the entire switch. All switches in the fabric must have interop mode enabled.
- **Msplmgmtdeactivate** must be run prior to connecting the Brocade switch to either an MDS 9000 switch or a McData switch. This command uses Brocade proprietary frames to exchange platform information. The MDS 9000 switch and McData switches do not understand these proprietary frames, and rejection of these frames causes the common E ports to become isolated.
- Enabling interoperability mode is a disruptive process to the entire switch. It requires the switch to be rebooted.
- If there are no zones defined in the effective configuration, the default behavior of the fabric is to allow no traffic to flow. If a device is not in a zone, it is isolated from other devices.
- Zoning can only be done with pWWNs. You cannot zone by port numbers or nWWNs.
- To manage the fabric from a Brocade switch, all Brocade switches must be interconnected. This interconnection facilitates the forwarding of the inactive zone configuration.
- Domain IDs are restricted to the 97 to 127 range to accommodate McData's nominal restriction to this same range.
- Brocade WebTools will show a McData switch or an MDS 9000 switch as an anonymous switch. Only a zoning configuration of the McData switch or the MDS 9000 switch is possible.
- Private loop targets will automatically be registered in the fabric using translative mode.
- Fabric watch is restricted to Brocade switches only.
- The full zone set (configuration) is distributed to all switches in the fabric. However, the full zone set is distributed in a proprietary format, which only Brocade switches accept. Other vendors reject these frames, and accept only the active zone set (configuration).

- The following services are not supported:
  - The Alias Server
  - Secure Fabric OS
  - Management Server
- The following services are disabled:
  - Virtual Channels
  - Quickloop
  - QuickLoop Fabric Assist zones
- The following services are not valid:
  - Broadcast zones
  - Domain/port representation in zones
  - Trunking

Figure 2-1 displays the features and functionality that are maintained or disabled in a sample MDS 9000 switch to Brocade fabric.

Figure 2-1 Sample Topology with Interop Mode Features



CHAPTER 3

MDS 9000 Core with Brocade Edge Topology (Interop Mode 1)

This chapter describes how to set up a basic core-edge topology with two MDS 9000 switches configured for interop mode 1 at the core and three Brocade switches at the edge. All devices are connected to the edge switches. However, all traffic must flow through the core switch to reach its destination.

This chapter includes the following sections:

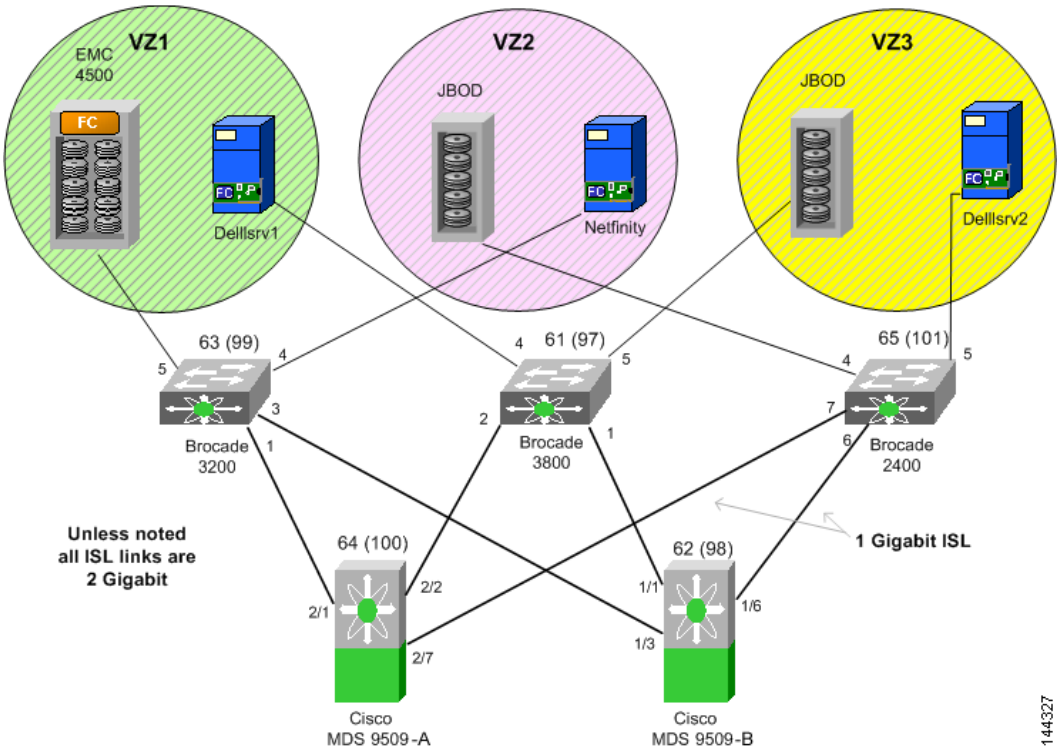
Specifications

The following switches and code levels were used for this example configuration:

- MDS 9509 running SAN-OS Release 1.0(1)
- Brocade 3800 Version 3.0.2
- Brocade 3200 Version 3.0.2
- Brocade 2400 Version 2.4.1h

Figure 3-1 shows the topology used for this example configuration.

Figure 3-1 Dual MDS 9509 Core with Brocade Edge Topology



Expected Topology Behavior

This section covers the Fibre Channel services and features that act differently in this topology (Figure 3-1) as compared to a homogeneous, single-vendor implementation. It covers the specifics that relate to this topology as outlined in the Fibre Channel Features Affected by Interoperability section in Chapter 1, "Interoperability Overview" on page 1-2.

This section includes the following topics:

Zoning

All zone members will be pWWNs in the core-edge topology using standard interop mode because the Brocade domain/port nomenclature is not a valid form (per the FC standard). When a zone set (or configuration in Brocade terminology) is made at the core, the zone merge request reaches all switches at the same time because all the switches are one hop away (except for the other core switch which is two hops away).

The Brocade edge switches provide all of the zone security because the MDS 9000 switch does not check the source or destination of the frame when traversing E ports. Brocade switches only check the zoning information on the egress port of the fabric.

Note After two active zone sets successfully merge, always copy the active zone set to the full zone set database prior to modifying it on the MDS 9000 switch.

FSPF

All links within the topology appear with the link cost of 500, except for the two paths leading to the Brocade 2400. These paths are running at 1 Gbps and appear with a cost of 1000.

The Brocade switches load balance their routes using source/destination; the ingress edge switch uses the same core switch for all traffic that has the same source/destination pair. If the Brocade switch could load balance using source/destination/ox-id, then it could choose either of the two core switches for the route through the fabric. The two-level core does not allow the MDS 9000 switch, which can load balance using source/destination/ox-id, to load balance across multiple edge switches.

Trunking and PortChannels

The lack of MDS 9000 switch-to-MDS 9000-switch connections prohibit the topology from containing TE ports or PortChannels. While in interop mode, the Brocade switches do not support trunked ports of any type. Only standard E ports are used for the ISLs.

Domain IDs

The domain IDs are restricted to the 97 to 127 range to reflect McData's inability to use IDs outside of that range. A McData switch is not present in this configuration, but the decision to have a single interoperability mode for the Brocade and MDS 9000 switch causes this side effect. While Brocade switches and MDS 9000 switches can handle domain IDs outside of this range, their implementation of interoperability mode includes this limitation.

Domain ID modifications can be handled in two ways, disruptively or nondisruptively:

- **Disruptive**—This event impacts the entire switch. When changing domain IDs, Brocade requires the entire switch to be taken offline and/or rebooted.
- **Nondisruptive**—This event is limited to the VSAN where the event is taking place. Only the MDS 9000 switch can perform this action, as the domain manager process for this VSAN is restarted and not the entire switch. This restart requires any devices logged into the VSAN to log into the fabric again to obtain a new FC ID.

Configuration

This section describes the configuration process and includes the following topics:

Configuring the MDS 9509 Switch

Follow these steps to configure the first MDS 9509 switch (MDS 9509-A) in the example.

Step 1 Place the VSAN of the E port(s) that connects to the OEM switch in interoperability mode.

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

Step 2 Assign a domain ID in the range of 97 (0x61) through 127 (0x7F). This is a limitation imposed by the McData switches. In interop mode, the fabric is limited to a total of 31 switches. In the MDS 9509 switch, the default is to request an ID from the principal switch. If the preferred keyword is used, the MDS 9509 switch requests a specific ID, but still joins the fabric if the principal switch assigns a different ID. If the static keyword is used, the MDS 9509 switch does 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
```

Step 3 Change the Fibre Channel timers if they have been changed from the system defaults. The FC error detect (ED_TOV) and resource allocation (RA_TOV) timers for MDS 9000 switches, Brocade, and McData switches, default to the same values. The RA_TOV defaults to 10 seconds, and the ED_TOV defaults to 2 seconds. These values can be changed. According to the FC-SW2 standard, these timer values must be the same on each switch in the fabric.

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

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

Step 4 After making changes to the domain, restart the MDS 9000 switch domain manager function for the altered VSAN. To do this, suspend and then resume the VSAN:

```
MDS9509(config)# vsan database
MDS9509(config-vsan-db)# vsan 1 suspend
MDS9509(config-vsan-db)# no vsan 1 suspend
```

Configuring the second MDS 9509 switch (MDS 9509-B) in interoperability mode follows the same procedure as the first with the exception of choosing a different preferred domain ID.

Follow these steps to configure the second MDS 9509 switch (MDS 9509-B) in the example.

Step 1 Place the VSAN of the E port(s) that connects to the OEM switch in interoperability mode.

```
MDS9509B# config t
MDS9509B(config)# vsan database
MDS9509B(config-vsan-db)# vsan 1 interop
```

Step 2 Assign a domain ID in the range of 97 (0x61) through 127 (0x7F).

```
MDS9509B# config t
MDS9509B(config)# fcdomain domain 98 preferred vsan 1
```

Step 3 Change the Fibre Channel timers if they have been changed from the system defaults. According to the FC-SW2 standard, these values must be the same on each switch in the fabric.

```
MDS9509B# config t
MDS9509B(config)# fctimer e_d_tov ?
  <1000-100000>  E_D_TOV in milliseconds(1000-100000)

MDS9509B(config)# fctimer r_a_tov ?
  <5000-100000>  R_A_TOV in milliseconds(5000-100000)
```

Step 4 Restart the MDS 9000 switch domain manager function for the altered VSAN. To do this, suspend and then resume the VSAN.

```
MDS9509(config)# vsan database
MDS9509(config-vsan-db)# vsan 1 suspend
MDS9509(config-vsan-db)# no vsan 1 suspend
```

Configuring the Brocade 3800 Switch

Follow these steps to configure the Brocade 3800 switch in interoperability mode.

Step 1 Disable the switch. This is a disruptive process.

```
B3800_IBM_SAN:admin> switchdisable
```

Step 2 Enter the configuration dialog.

```
B3800_IBM_SAN:admin> configure

Configure...

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

Domain: (1..239) [1] 97  <==== Assign domain id in the 97-127 range
BB credit: (1..27) [16]
R_A_TOV: (4000..120000) [10000]  <==== Must match other switches in the fabric
E_D_TOV: (1000..5000) [2000]  <==== Must match other switches in the fabric
WAN_TOV: (0..2000) [0]
MAX_HOPS: (7..13) [7]
WAN_RTT_DLY_MAX: (0..9500) [200]
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) [0]
```

```
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]
NS Operation Parameters (yes, y, no, n): [no] y

Pre-zoned responses Mode
(0 = Standard Mode, 1 = Pre-zoning On): (0..1) [0]  <==== Confirm standard mode

  Arbitrated Loop parameters (yes, y, no, n): [no]
  System services (yes, y, no, n): [no]
  Portlog events enable (yes, y, no, n): [no]
Committing configuration...done.
```

Step 3 Disable platform management services. Failure to disable this service isolates E ports that connect to non-Brocade switches:

```
B3800_IBM_SAN: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.
```

Step 4 Set interoperability mode to on at the command line and then reboot.

```
B3800_IBM_SAN:admin> interopmode 1 <==== Set interop mode on
Committing configuration...done.
interopMode is 1
NOTE: It is recommended that you boot this switch for this change to take effect
```

Note Do not ignore this warning message. Anomalies were experienced that required a switch reboot.

```
B3800_IBM_SAN:admin> fastboot
```

To return to non-interop mode, you must disable the switch. Reconfigure the switch and set interoperability mode equal to 0, and then reboot.

Configuring the Brocade 3200 Switch

Follow these steps to configure the Brocade 3200 switch in interoperability mode.

Step 1 Disable the switch. This is a disruptive process.

```
3200_TOP:admin> switchdisable
```

Step 2 Enter the configuration dialog.

```
3200_TOP:admin> configure

Configure...

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

Domain: (1..239) [1] 99   <==== Assign domain id in the 97-127 range
BB credit: (1..27) [16]
```

```
R_A_TOV: (4000..120000) [10000]  <==== Must match other switches in the fabric
E_D_TOV: (1000..5000) [2000]  <==== Must match other switches in the fabric
WAN_TOV: (0..2000) [0]
 MAX_HOPS: (7..13) [7]
WAN_RTT_DLY_MAX: (0..9500) [200]
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) [0]
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]
NS Operation Parameters (yes, y, no, n): [no] y
Pre-zoned responses Mode
(0 = Standard Mode, 1 = Pre-zoning On): (0..1) [0]  <==== Confirm standard mode

  Arbitrated Loop parameters (yes, y, no, n): [no]
  System services (yes, y, no, n): [no]
  Portlog events enable (yes, y, no, n): [no]
Committing configuration...done.
```

Step 3 Disable platform management services. Failure to disable this service isolates E ports that connect to non-Brocade switches.

```
3200_TOP: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.
```

Step 4 Set interoperability mode to on at the command line and then reboot.

```
3200_TOP:admin> interopmode 1  Set interop mode on
Committing configuration...done.
interopMode is 1
NOTE: It is recommended that you boot this switch to make this change take effect
```

Note Do not ignore the warning message. Anomalies were experienced that required a switch reboot.

```
3200_TOP:admin> fastboot
```

To return to non-interop mode, disable the switch. Reconfigure the switch, set interoperability mode equal to 0, and then reboot.

Configuring the Brocade 2400 Switch

Follow these steps to configure the Brocade 2400 switch in interoperability mode.

Step 1 Disable the switch. This is a disruptive process.

```
B2400_IBM_SAN:admin> switchdisable
```

Step 2 Enter into the configuration dialog.

```
B2400_IBM_SAN:admin> configure

Configure...

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

  Domain: (1..239) [97] 101 <==== Assign domain id in the 97-127 range
  BB credit: (1..27) [16]
  R_A_TOV: (4000..120000) [10000]  <==== Must match other switches in the fabric
  E_D_TOV: (1000..5000) [2000]  <==== Must match other switches in the fabric
  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) [0]
  Per-frame Route Priority: (0..1) [0]
  Long Distance Fabric: (0..1) [0]

  Virtual Channel parameters (yes, y, no, n): [no]
  Switch Operating Mode (yes, y, no, n): [no] y

    Interoperability Mode: (0..1) [0] 1 <==== Set interopmode on

  Zoning Operation parameters (yes, y, no, n): [no] y

    Standard Mode: (0..1) [0] 1  <==== Set standard mode on
    Enable TransactZoneManagement: (0..1) [1]
    Disable NodeName Zone Checking: (0..1) [0]
  Arbitrated Loop parameters (yes, y, no, n): [no]
  System services (yes, y, no, n): [no]
  Portlog events enable (yes, y, no, n): [no]
Committing configuration...done.
```

Step 3 Disable platform management services. Failure to disable this service isolates E ports that connect to non-Brocade switches.

```
B2400_IBM_SAN: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.
```

Step 4 Reboot the switch.

```
B2400_IBM_SAN:admin> fastboot
```

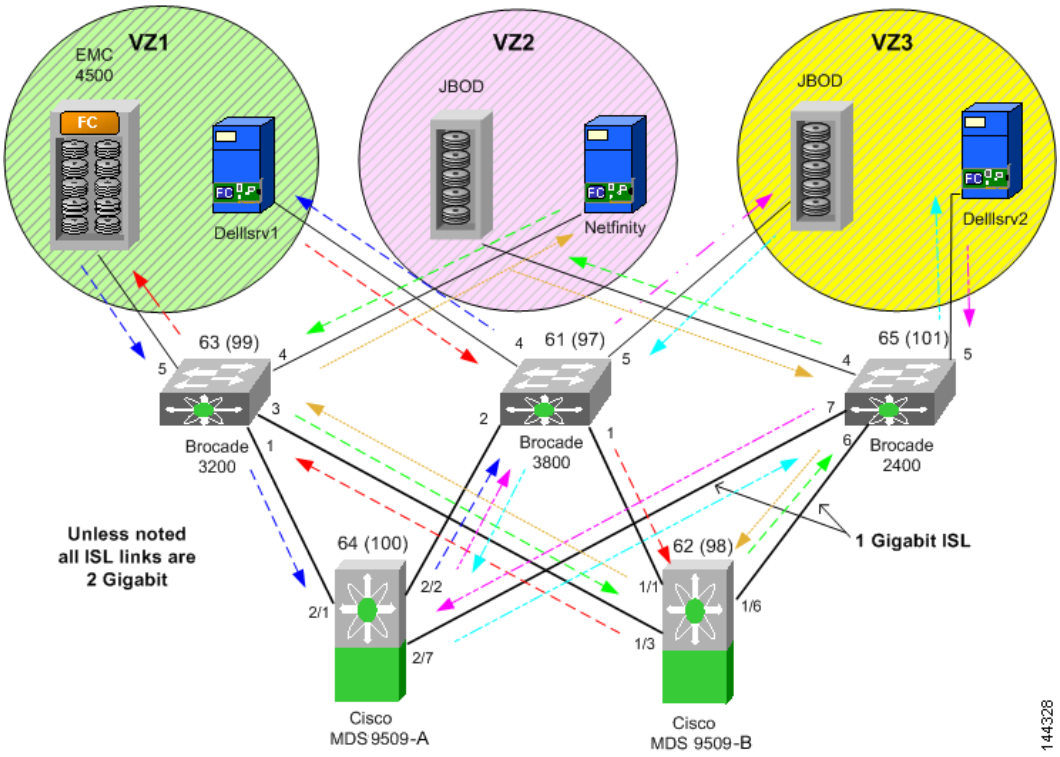
To return to non-interop mode, you must disable the switch. Reconfigure the switch, set interoperability mode equal to 0, and then reboot.

Verification

This section highlights the commands used to verify that the fabric is up and running in interoperability mode, and it includes the following topics:

The example configuration now includes the paths for frame flow as a result of the FSPF algorithm. (See Figure 3-2.)

Figure 3-2 Data Flow of Dual MDS 9509 Core with Brocade Edge Topology



Verifying the MDS 9509 Switch

The following examples show the configuration for the first MDS 9509 switch (MDS (9509-A).

```
MDS9509# show version
Copyright (c) 2001-2005
Cisco Systems, Inc.

Software
  kickstart: version 1.0(1) [build 1.0(0.253e)] [gdb]
  System:    version 1.0(1) [build 1.0(0.253e)] [gdb]

Hardware
  RAM 1932864 kB

  bootflash: 503808 blocks (block size 512b)
  slot0:          0 blocks (block size 512b)

  Compile Time: 10/26/2002 2:00:00

MDS9509# show interface brief

Interface  Vsan   Admin  Admin   Status          Oper  Oper   Port-channel
                  Mode   Trunk                   Mode  Speed
                         Mode                           (Gbps)
-------------------------------------------------------------------
fc2/1      1      auto   on      up              E     2      --
fc2/2      1      auto   on      up              E     2      --
fc2/3      1      auto   on      fcotAbsent      --    --     --
fc2/4      1      auto   on      down            --    --     --
fc2/5      1      auto   on      down            --    --     --
fc2/6      1      auto   on      down            --    --     --
fc2/7      1      auto   on      up              E     1      --
fc2/8      1      auto   on      fcotAbsent      --    --     --
fc2/9      1      auto   on      down            --    --     --
fc2/10     1      auto   on      down            --    --     --

MDS9509# show run

Building Configuration ...

 interface fc2/1
no shutdown

 interface fc2/2
no shutdown

 interface fc2/3
 interface fc2/4
 interface fc2/5
 interface fc2/6
 interface fc2/7
no shutdown

 interface fc2/8
 interface fc2/9
 interface fc2/10

<snip>

interface fc2/32

 interface mgmt0
```

```
ip address 6.1.1.96 255.255.255.0
switchport encap default
no shutdown

vsan database
vsan 1 interop

boot system bootflash:/m9500-isan-253e.bin sup-1
boot kickstart bootflash:/m9500-kickstart-253e.bin sup-1
boot system bootflash:/m9500-isan-253e.bin sup-2
boot kickstart bootflash:/m9500-kickstart-253e.bin sup-2
callhome

fcdomain domain 100 preferred vsan 1

ip route 6.1.1.0 255.255.255.0 6.1.1.1
ip routing
line console
  databits 5
  speed 110
logging linecard
ssh key rsa 512 force
ssh server enable
switchname MDS9509
username admin password 5 $1$Li8/fBYX$SNc72.xt4nTXpSnR9OUFB/  role network-admin

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
----------------    -------------    ------------
```

```
MDS9509# show fcdomain domain-list vsan 1

Number of domains: 5
Domain ID              WWN
---------    -----------------------
 0x61(97)    10:00:00:60:69:50:0c:fe
 0x62(98)    20:01:00:05:30:00:47:9f
 0x63(99)    10:00:00:60:69:c0:0c:1d
0x64(100)    20:01:00:05:30:00:51:1f [Local]
0x65(101)    10:00:00:60:69:22:32:91 [Principal]
---------    -----------------------

MDS9509# show fspf internal route vsan 1

FSPF Unicast Routes
---------------------------
 VSAN Number  Dest Domain   Route Cost    Next hops
----------------------------------------------
           1     0x61(97)          500      fc2/2
           1     0x62(98)         1000      fc2/1
                                          fc2/2
           1     0x63(99)          500      fc2/1
           1    0x65(101)         1000      fc2/7

MDS9509# show fcns data vsan 1

VSAN 1:
-----------------------------------------------------------------
FCID    TYPE  PWWN                    (VENDOR) FC4-TYPE:FEATURE
-----------------------------------------------------------------
0x610400    N     10:00:00:00:c9:24:3d:90 (Emulex)     scsi-fcp
0x6105dc    NL    21:00:00:20:37:28:31:6d (Seagate)    scsi-fcp
0x6105e0    NL    21:00:00:20:37:28:24:7b (Seagate)    scsi-fcp
0x6105e1    NL    21:00:00:20:37:28:22:ea (Seagate)    scsi-fcp
0x6105e2    NL    21:00:00:20:37:28:2e:65 (Seagate)    scsi-fcp
0x6105e4    NL    21:00:00:20:37:28:26:0d (Seagate)    scsi-fcp
0x630400    N     10:00:00:00:c9:24:3f:75 (Emulex)     scsi-fcp
0x630500    N     50:06:01:60:88:02:90:cb              scsi-fcp
0x6514e2    NL    21:00:00:20:37:a7:ca:b7 (Seagate)    scsi-fcp
0x6514e4    NL    21:00:00:20:37:a7:c7:e0 (Seagate)    scsi-fcp
0x6514e8    NL    21:00:00:20:37:a7:c7:df (Seagate)    scsi-fcp
0x651500    N     10:00:00:e0:69:f0:43:9f (JNI)

Total number of entries = 12
```

Note The MDS 9509 switch name server shows both local and remote entries and does not time out the entries.

The following example shows the configuration for the second MDS 9509 switch (MDS 9509-B).

```
MDS9509B# show ver
Copyright (c) 2001-2005
Cisco Systems, Inc.

Software
  kickstart: version 1.0(1) [build 1.0] [gdb]
  System:    version 1.0(1) [build 1.0] [gdb]

Hardware
  RAM 963116 kB

  bootflash: 503808 blocks (block size 512b)
  slot0:          0 blocks (block size 512b)
```

```
  Compile Time: 10/26/2002 2:00:00

MDS9509B# show int brief

-----------------------------------------------------------------
Interface  Vsan   Admin  Admin   Status          Oper  Oper   Port-channel
                  Mode   Trunk                   Mode  Speed
                         Mode                           (Gbps)
-----------------------------------------------------------------
fc1/1      1      auto   on      up              E     2      --
fc1/2      1      auto   on      fcotAbsent      --    --     --
fc1/3      1      auto   on      up              E     2      --
fc1/4      1      auto   on      down            --    --     --
fc1/5      1      auto   on      down            --    --     --
fc1/6      1      auto   on      up              E     1      --
fc1/7      1      auto   on      fcotAbsent      --    --     --
fc1/8      1      auto   on      fcotAbsent      --    --     --
fc1/9      1      auto   on      down            --    --     --

MDS9509B# show run

Building Configuration ...

 interface fc1/1
no shutdown

 interface fc1/2

 interface fc1/3
switchport speed 2000
no shutdown

 interface fc1/4
 interface fc1/5
 interface fc1/6
switchport speed 1000
no shutdown

 interface fc1/7
 interface fc1/8
 interface fc1/9

<snip>

 interface mgmt0
ip address 6.1.1.95 255.255.255.0
no shutdown

vsan database
vsan 1 interop

boot system bootflash:/m9500-isan.bin
boot kickstart bootflash:/m9500-kickstart.bin
callhome

fcdomain domain 98 preferred vsan 1

line console
  databits 5
  speed 110
logging linecard
switchname MDS9509B
username admin password 5 MF7UQdWLEqUFE  role network-admin
```

```
MDS9509B# show vsan 1
vsan 1 information
         name:VSAN0001  state:active
         interoperability mode:yes  <==== verify interoperability
         loadbalancing:src-id/dst-id/oxid
         operational state:up

MDS9509B# show fcdomain vsan 1
The local switch is a Subordinated Switch.

Local switch run time information:
        State: Stable
        Local switch WWN:    20:01:00:05:30:00:47:9f
        Running fabric name: 10:00:00:60:69:22:32:91
        Running priority: 128
        Current domain ID: 0x62(98)  <==== verify domain

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: 0x62(98) (preferred)

Principal switch run time information:

        Running priority: 2

Interface               Role          RCF-reject
----------------    -------------    ------------
fc1/1               Upstream         Disabled
fc1/3               Non-principal    Disabled
fc1/6               Non-principal    Disabled
----------------    -------------    ------------

MDS9509B# show fcdomain domain-list vsan 1

Number of domains: 5
Domain ID               WWN
---------    -----------------------
 0x61(97)    10:00:00:60:69:50:0c:fe
 0x62(98)    20:01:00:05:30:00:47:9f [Local]
 0x63(99)    10:00:00:60:69:c0:0c:1d
0x64(100)    20:01:00:05:30:00:51:1f
0x65(101)    10:00:00:60:69:22:32:91 [Principal]
---------    -----------------------

MDS9509B# show fspf internal route vsan 1

FSPF Unicast Routes
---------------------------
 VSAN Number  Dest Domain   Route Cost    Next hops
----------------------------------------------
           1    0x61(97)           500        fc1/1
           1    0x63(99)           500        fc1/3
           1    0x64(100)         1000        fc1/1
                                              fc1/3
           1    0x65(101)         1000        fc1/6
```

```
MDS9509B# show fcns data vsan 1

VSAN 1:
-----------------------------------------------------------------
FCID    TYPE  PWWN                    (VENDOR)  FC4-TYPE:FEATURE
-----------------------------------------------------------------
0x610400    N     10:00:00:00:c9:24:3d:90 (Emulex)     scsi-fcp
0x6105dc    NL    21:00:00:20:37:28:31:6d (Seagate)    scsi-fcp
0x6105e0    NL    21:00:00:20:37:28:24:7b (Seagate)    scsi-fcp
0x6105e1    NL    21:00:00:20:37:28:22:ea (Seagate)    scsi-fcp
0x6105e2    NL    21:00:00:20:37:28:2e:65 (Seagate)    scsi-fcp
0x6105e4    NL    21:00:00:20:37:28:26:0d (Seagate)    scsi-fcp
0x630400    N     10:00:00:00:c9:24:3f:75 (Emulex)     scsi-fcp
0x630500    N     50:06:01:60:88:02:90:cb              scsi-fcp
0x6514e2    NL    21:00:00:20:37:a7:ca:b7 (Seagate)    scsi-fcp
0x6514e4    NL    21:00:00:20:37:a7:c7:e0 (Seagate)    scsi-fcp
0x6514e8    NL    21:00:00:20:37:a7:c7:df (Seagate)    scsi-fcp
0x651500    N     10:00:00:e0:69:f0:43:9f (JNI)

Total number of entries = 12
```

Verifying the Brocade 3800 Switch

The following examples show the configuration for the Brocade 3800 switch.

```
B3800_IBM_SAN:admin> version
Kernel:     5.3.1
Fabric OS:  v3.0.2
Made on:    Thu Jan 10 17:41:15 PST 2002
Flash:      Thu Jan 10 17:42:37 PST 2002
BootProm:   Wed May 23 12:37:30 PDT 2001

B3800_IBM_SAN:admin> licenseshow
R99yydyQzcSAAzz1:
    Web license
    Zoning license
    Fabric license
SSbdSSQRR9TTceT8:
    QuickLoop license
B3800_IBM_SAN:admin> switchshow
switchName:B3800_IBM_SAN
switchType:9.1
switchState:Online
switchMode:Interop  <==== verify mode
switchRole:Subordinate
switchDomain:97  <==== verify domain
switchId:fffc61
switchWwn:10:00:00:60:69:50:0c:fe
switchBeacon:OFF
Zoning:      OFF
port  0: -- N2 No_Module
port  1: id 2G Online       E-Port 20:01:00:05:30:00:47:9f (downstream)
port  2: id 2G Online       E-Port 20:01:00:05:30:00:51:1f (upstream)
port  3: id 1G No_Light
port  4: id N1 Online       F-Port 10:00:00:00:c9:24:3d:90
port  5: id N1 Online       L-Port 5 private, 1 phantom
port  6: -- N2 No_Module
port  7: -- N2 No_Module
port  8: id N2 No_Light
port  9: -- N2 No_Module
port 10: id N2 No_Light
```

```
port 11: id N2 No_Light
port 12: -- N2 No_Module
port 13: -- N2 No_Module
port 14: id N2 No_Light
port 15: id N2 No_Light

B3800_IBM_SAN:admin> topologyshow

5 domains in the fabric; Local Domain ID: 97

Domain   Metric   Hops  Out Port  In Ports   Flags  Bandwidth   Name
----------------------------------------------------------------------
98        500     1       1     0x00000034    D     2 (Gbs)   Unreachable
99       1000     2       2     0x00000020    D     2 (Gbs)   "3200_TOP"
                          1     0x00000010    D     2 (Gbs)
100       500     1       2     0x00000032    D     2 (Gbs)   Unreachable
101      1500     2       2     0x00000020    D     2 (Gbs)  "BR2400_IBM_SAN"
                          1     0x00000010    D     2 (Gbs)

B3800_IBM_SAN:admin> interopmode
interopMode is 1

B3800_IBM_SAN:admin> nsshow
{
 Type Pid    COS     PortName                NodeName                 TTL(sec)
 N    610400;    2,3;10:00:00:00:c9:24:3d:90;20:00:00:00:c9:24:3d:90; na
    FC4s: FCP
    Fabric Port Name: 20:04:00:60:69:50:0c:fe
 NL   6105dc;      3;21:00:00:20:37:28:31:6d;20:00:00:20:37:28:31:6d; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:05:00:60:69:50:0c:fe
 NL   6105e0;      3;21:00:00:20:37:28:24:7b;20:00:00:20:37:28:24:7b; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:05:00:60:69:50:0c:fe
 NL   6105e1;      3;21:00:00:20:37:28:22:ea;20:00:00:20:37:28:22:ea; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:05:00:60:69:50:0c:fe
 NL   6105e2;      3;21:00:00:20:37:28:2e:65;20:00:00:20:37:28:2e:65; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:05:00:60:69:50:0c:fe
 NL   6105e4;      3;21:00:00:20:37:28:26:0d;20:00:00:20:37:28:26:0d; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:05:00:60:69:50:0c:fe

The Local Name Server has 6 entries }

B3800_IBM_SAN:admin> nsallshow
{
  610400 6105dc 6105e0 6105e1 6105e2 6105e4 630400 630500
  6514e2 6514e4 6514e8 651500
12 Nx_Ports in the Fabric }
```

Note The Brocade remote name server entries time out of the cache after 900 seconds (15 minutes).

```
B3800_IBM_SAN:admin> urouteshow

Local Domain ID: 97

In Port  Domain   Out Port  Metric Hops    Flags    Next (Dom, Port)
----------------------------------------------------------------------
```

```
  1 100       2        500    1       D          100,65793
  2  98       1        500    1       D           98,65536
  4  98       1        500    1       D           98,65536
     99       1       1000    2       D           98,65536
    100       2        500    1       D          100,65793
    101       1       1500    2       D           98,65536
  5  98       1        500    1       D           98,65536
     99       2       1000    2       D          100,65793
    100       2        500    1       D          100,65793
    101       2       1500    2       D          100,65793
```

Verifying the Brocade 3200 Switch

The following examples show the configuration for the Brocade 3200 switch.

```
3200_TOP:admin> version
Kernel:     5.3.1
Fabric OS:  v3.0.2
Made on:    Thu Jan 10 17:41:15 PST 2002
Flash:      Thu Jan 10 17:42:37 PST 2002
BootProm:   Tue Oct 30 10:24:38 PST 2001

3200_TOP:admin> licenseshow
R9bdbybzSQSAcecJ:
    Web license
bQyecQdSbScRzfd7:
    Zoning license
RbbSed9RRSSccTfd:
    QuickLoop license
b99dde9cSdcAAeer:
    Fabric license

3200_TOP:admin> switchshow
switchName:3200_TOP
switchType:16.2
switchState:Online
switchMode:Interop   <==== Verify mode
switchRole:Subordinate
switchDomain:99   <==== Verify domain
switchId:fffc63
switchWwn:10:00:00:60:69:c0:0c:1d
switchBeacon:OFF
Zoning:      OFF
port  0: id N2 No_Light
port  1: id N2 Online       E-Port 20:01:00:05:30:00:51:1f (upstream)
port  2: id N2 No_Light
port  3: id 2G Online       E-Port 20:01:00:05:30:00:47:9f
port  4: id N1 Online       F-Port 10:00:00:00:c9:24:3f:75
port  5: id N1 Online       F-Port 50:06:01:60:88:02:90:cb
port  6: id N2 No_Light
port  7: -- N2 No_Module

3200_TOP:admin> topologyshow

5 domains in the fabric; Local Domain ID: 99

Domain   Metric  Hops  Out Port  In Ports   Flags   Bandwidth   Name
-----------------------------------------------------------------
97        1000    2          1   0x00000020    D      2 (Gbs)   "B3800_IBM_SAN"
                             3   0x00000010    D      2 (Gbs)
98         500    1          3   0x00000032    D      2 (Gbs)   Unreachable
```

```
100        500    1          1   0x00000038    D      2 (Gbs)   Unreachable
101       1500    2          1   0x00000020    D      2 (Gbs)  "BR2400_IBM_SAN"
                             3   0x00000010    D      2 (Gbs)

3200_TOP:admin> interopmode
interopMode is 1

3200_TOP:admin> nsallshow
{  610400 6105dc 6105e0 6105e1 6105e2 6105e4 630400 630500
  6514e2 6514e4 6514e8 651500
12 Nx_Ports in the Fabric }
```

Note The Brocade remote name server entries time out of the cache after 900 seconds (15 minutes).

```
3200_TOP:admin> urouteshow

Local Domain ID: 99

In Port  Domain  Out Port  Metric  Hops    Flags    Next (Dom, Port)
-------------------------------------------------------------------
   1  98      3       500     1      D           98,65538
   3 100      1       500     1      D          100,65792
   4  97      3      1000     2      D           98,65538
      98      3       500     1      D           98,65538
     100      1       500     1      D          100,65792
     101      3      1500     2      D           98,65538
   5  97      1      1000     2      D          100,65792
      98      3       500     1      D           98,65538
     100      1       500     1      D          100,65792
     101      1      1500     2      D          100,65792
```

Verifying the Brocade 2400 Switch

The following examples show the configuration for the Brocade 2400 switch.

```
BR2400_IBM_SAN:admin> version
Kernel:     5.3.1
Fabric OS:  v2.4.1h
Made on:    Fri Dec 7 15:14:10 PST 2001
Flash:      Fri Dec 7 15:15:10 PST 2001
BootProm:   Thu Jun 17 15:20:39 PDT 1999

BR2400_IBM_SAN:admin> licenseshow
R9dedRQRyRSAefek:
    Fabric license
yzbyzbccSz0cB1Z:
    Release v2.2 license
SccydbdycSTddzet:
    Web license
    Zoning license
    SES license
bdzzdeyRdcce00e1:
    QuickLoop license

BR2400_IBM_SAN:admin> switchshow
switchName:BR2400_IBM_SAN
switchType:3.4
switchState:Online
```

```
switchRole:Principal
switchDomain:101       <==== verify domain
switchId:fffc65
switchWwn:10:00:00:60:69:22:32:91
switchBeacon:OFF
port  0: id  No_Light
port  1: sw  No_Light
port  2: --  No_Module
port  3: sw  No_Light
port  4: cu  Online        L-Port  3 public
port  5: sw  Online        F-Port  10:00:00:e0:69:f0:43:9f
port  6: id  Online        E-Port  20:01:00:05:30:00:47:9f
port  7: sw  Online        E-Port  20:01:00:05:30:00:51:1f (downstream)

BR2400_IBM_SAN:admin> topologyshow

5 domains in the fabric; Local Domain ID: 101

Domain    Metric  Hops  Out Port  In Ports    Flags    Name
----------------------------------------------------------------
  97      1500     2       7      0x00000020  D      "B3800_IBM_SAN"
                           6      0x00000010  D
  98      1000     1       6      0x000000b0  D      Unreachable
  99      1500     2       7      0x00000020  D      "3200_TOP"
                           6      0x00000010  D
 100      1000     1       7      0x00000070  D      Unreachable

BR2400_IBM_SAN:admin> interopmode
interopMode is 1

BR2400_IBM_SAN:admin> nsshow
The Local Name Server has 4 entries {
 Type Pid    COS     PortName                NodeName                 TTL(sec)
 NL   6514e2;      3;21:00:00:20:37:a7:ca:b7;20:00:00:20:37:a7:ca:b7; na
    FC4s: FCP [SEAGATE ST318451FC      0001]
    Fabric Port Name: 20:04:00:60:69:22:32:91
 NL   6514e4;      3;21:00:00:20:37:a7:c7:e0;20:00:00:20:37:a7:c7:e0; na
    FC4s: FCP [SEAGATE ST318451FC      0001]
    Fabric Port Name: 20:04:00:60:69:22:32:91
 NL   6514e8;      3;21:00:00:20:37:a7:c7:df;20:00:00:20:37:a7:c7:df; na
    FC4s: FCP [SEAGATE ST318451FC      0001]
    Fabric Port Name: 20:04:00:60:69:22:32:91
 N    651500;      3;10:00:00:e0:69:f0:43:9f;10:00:00:e0:69:f0:43:9f; na
    Fabric Port Name: 20:05:00:60:69:22:32:91
}

BR2400_IBM_SAN:admin> nsallshow
36 Nx_Ports in the Fabric {
  610400 610400 610400 6105dc 6105dc 6105dc 6105e0 6105e0
  6105e0 6105e1 6105e1 6105e1 6105e2 6105e2 6105e2 6105e4
  6105e4 6105e4 630400 630400 630400 630500 630500 630500
  6514e2 6514e2 6514e2 6514e4 6514e4 6514e4 6514e8 6514e8
  6514e8 651500 651500 651500
}
```

Note Due to a display anomaly, the Brocade 2400 switch in this example shows each edge device three times.

Note The Brocade remote name server entries time out of the cache after 900 seconds (15 minutes).

```
BR2400_IBM_SAN:admin> urouteshow
```

```
Local Domain ID: 101

In Port    Domain    Out Port    Metric    Hops    Flags    Next (Dom, Port)
--------------------------------------------------------------------------
   4        97          6        1500       2       D           98,65541
            98          6        1000       1       D           98,65541
            99          6        1500       2       D           98,65541
           100          7        1000       1       D          100,65798

   5        97          7        1500       2       D          100,65798
            98          6        1000       1       D           98,65541
            99          7        1500       2       D          100,65798
           100          7        1000       1       D          100,65798
   6       100          7        1000       1       D          100,65798
   7        98          6        1000       1       D           98,65541
```

Zoning

In this example, the zone is created on the MDS 9509 switch and the zone set is activated. After activation, the verification process confirms that the Brocade switches properly learn the zones and zone sets. In Brocade terminology, the zone set is known as the configuration. On Brocade switches, the MDS 9509 switch *active zone set* is known as the *effective configuration*.

The example shows how to use the name server database as a tool when building the zones. When predefining zones, you may use pWWNs of equipment not attached, or in the name server database.

Zones that are defined while the switch is in interop mode *must* be zoned by pWWN. Zoning by alias or FC ID is not permitted while the Brocade switch is operating in interop mode. This limits the Brocade 2100, 2400, 2800 and 3800 switches to soft zoning. The Brocade 3900 and 12000 switches continue to implement hardware enforced zoning. The MDS 9509 switch always implements hardware enforced zoning.

Creating Zones on the MDS 9509 Switch

Follow these steps to create zones on the MDS 9509 switch.

Step 1 Display the name server database to see the pWWN information.

```
MDS9509# show fcns data vsan 1

VSAN 1:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)     FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x610400    N     10:00:00:00:c9:24:3d:90 (Emulex)        scsi-fcp
0x6105dc    NL    21:00:00:20:37:28:31:6d (Seagate)       scsi-fcp
0x6105e0    NL    21:00:00:20:37:28:24:7b (Seagate)       scsi-fcp
0x6105e1    NL    21:00:00:20:37:28:22:ea (Seagate)       scsi-fcp
0x6105e2    NL    21:00:00:20:37:28:2e:65 (Seagate)       scsi-fcp
0x6105e4    NL    21:00:00:20:37:28:26:0d (Seagate)       scsi-fcp
0x630400    N     10:00:00:00:c9:24:3f:75 (Emulex)        scsi-fcp
0x630500    N     50:06:01:60:88:02:90:cb                 scsi-fcp
0x6514e2    NL    21:00:00:20:37:a7:ca:b7 (Seagate)       scsi-fcp
0x6514e4    NL    21:00:00:20:37:a7:c7:e0 (Seagate)       scsi-fcp
0x6514e8    NL    21:00:00:20:37:a7:c7:df (Seagate)       scsi-fcp
```

```
0x651500    N     10:00:00:e0:69:f0:43:9f (JNI)

Total number of entries = 12
MDS9509#
```

Step 2 Now that the pWWNs are visible, use tools like cut and paste to create the zones.

```
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 three zones (VZ1, VZ2 and VZ3). We have also created a zone set named MDSCORE.

Step 3 Activate the zone set MDSCORE.

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

MDS9509(config)#
MDS9509(config)# exit
```

Step 4 View each switch in the fabric to verify that zoning is in place.

a. Show the zone and zone set. The running config on the MDS 9509 switch shows the zone and zone set because they were created on this switch.

```
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
```

b. Show the active zone set on the second MDS 9509 switch (MDS 9509-B). (The running config does not show this information because the zone was not created on this MDS 9509 switch.)

```
MDS9509B# 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
```

c. Show the configuration on the Brocade 3200 switch. There is a defined configuration and an effective configuration.

```
3200_TOP:admin> cfgshow
Defined configuration:
 cfg:     Interop     Dell; Netfinity
 zone:    Dell  10:00:00:00:c9:24:3d:90; 50:06:01:60:88:02:90:cb
 zone:    Netfinity
          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
```

d. Show the configuration on the Brocade 3800 switch.

```
B3800_IBM_SAN:admin> cfgshow
Defined configuration:
 cfg:     Interop     Dell; Netfinity
 zone:    Dell  10:00:00:00:c9:24:3d:90; 50:06:01:60:88:02:90:cb
 zone:    Netfinity
          10:00:00: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
```

e. Show the configuration on the Brocade 2400 switch.

```
BR2400_IBM_SAN:admin> cfgshow
Defined configuration:
 cfg:     Interop     Dell; Netfinity
 zone:    Dell  10:00:00:00:c9:24:3d:90; 50:06:01:60:88:02:90:cb
 zone:    Netfinity
          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[c7]
                 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[ff]
                 21:00:00:20:37:28:2e:65[fc]
                 21:00:00:20:37:28:26:0d
```

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

Creating Zones on the Brocade 3800 Switch

The next example shows how to create the zones and a zone set on the Brocade 3800 switch, activate the zone set, and verify that each switch in the fabric has the correct zoning in place. The zone members in this example are the same as used in the previous example, but the zone names and zone set name are different.

Step 1 Clear the zoning configuration. If this command is issued and this switch is part of the fabric, all switches will have no zoning in effect.

```
B3800_IBM_SAN:admin> cfgclear
Do you really want to clear all configurations?  (yes, y, no, n): [no] yes
Clearing All zoning configurations...

B3800_IBM_SAN:admin> cfgshow
Defined configuration:
 no configuration defined

Effective configuration:
 no configuration in effect
```

Step 2 Create the zones. In this example, the zones are named vz11, vz22, and vz33.

```
B3800_IBM_SAN:admin> zonecreate :"vz11", "10:00:00:00:c9:24:3d:90;
50:06:01:60:88:02:90:cb"

B3800_IBM_SAN: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"
```

Due to command line limitations, and the number of members, zone vz33 is created with some members, and the rest are added.

```
B3800_IBM_SAN: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"

B3800_IBM_SAN:admin> zoneadd "vz33", "21:00:00:20:37:28:2e:65; 21:00:00:20:37:28:26:0d"
```

Step 3 Check the zones before making them active.

```
B3800_IBM_SAN: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
```

Step 4 Create the configuration. When the configuration is activated, it is known on the MDS 9509 switch as the active zone set.

```
B3800_IBM_SAN:admin> cfgcreate "mdscore1", "vz11; vz22; vz33"
```

Step 5 Activate the configuration.

```
B3800_IBM_SAN:admin> cfgenable "mdscore1"
zone config "mdscore1" is in effect
Updating flash ...
```

Step 6 Check the display on the Brocade 3800 switch.

```
B3800_IBM_SAN: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 in effect and defined.

Step 7 Look at the other switches in the fabric.

a. Display the configuration on the Brocade 3200 switch.

```
3200_TOP: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
```

b. Display the configuration on the other Brocade 3800 switch.

```
B3800_IBM_SAN: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
```

c. Display the configuration on the Brocade 2400 switch.

```
BR2400_IBM_SAN: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[6]
 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[29]
 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
```

d. Show the active zone set on the first MDS 9509 switch (MDS 9509-A).

```
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

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
```

Note The **show zone** command displays the zones that were created earlier on this switch.

e. Check the running configuration on the MDS 9509 switch.

```
MDS9509# show run

Building Configuration...

 interface fc2/1
no shutdown

<snip>

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

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

zone name vz3 vsan 1
  member pwwn 10:00:00:e0:69:f0:43:9f
  member pwwn 21:00:00:20:37:28:31:6d
  member pwwn 21:00:00:20:37:28:24:7b
  member pwwn 21:00:00:20:37:28:22:ea
```

```
    member pwwn 21:00:00:20:37:28:2e:65
    member pwwn 21:00:00:20:37:28:26:0d

  zoneset name mdscore vsan 1
    member vz1
    member vz2
    member vz3

  <snip>

  MDS9509#
```

Note The running configuration and the active zone set are different.

f. Show the active zone set on the second MDS 9509 switch (MDS 9509-B).

```
MDS9509B# 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
```

The zone set (configuration) created on the Brocade 3800 switch is now active and effective in all switches in the fabric.

The zones created on the MDS 9509 switch are propagated to the Brocade switches. Although the **cfgshow** command does not show these zones under a defined configuration, if the switch is isolated and rebooted, then the correct zone configuration is effective.

On the MDS switch, the active zone configuration is always saved to memory. It is not displayed in the running configuration. If the switch is isolated and rebooted, the last active zone set is reinstated as the current active zone set.

Changes to the zones or zone set while the switch is isolated will need to pass a zone merge validation when the ISLs are activated.

CHAPTER 4

MDS 9000 Core with Brocade and McData Edge Topology (Interop Mode 1)

This chapter describes how to set up a basic core-edge topology with an MDS 9000 switch configured for interop mode 1 at the core, and two Brocade switches and one McData switch at the edge. All devices are connected to the edge switches. However, all traffic must flow through the core switch to reach its destination.

This chapter includes the following sections:

Specifications

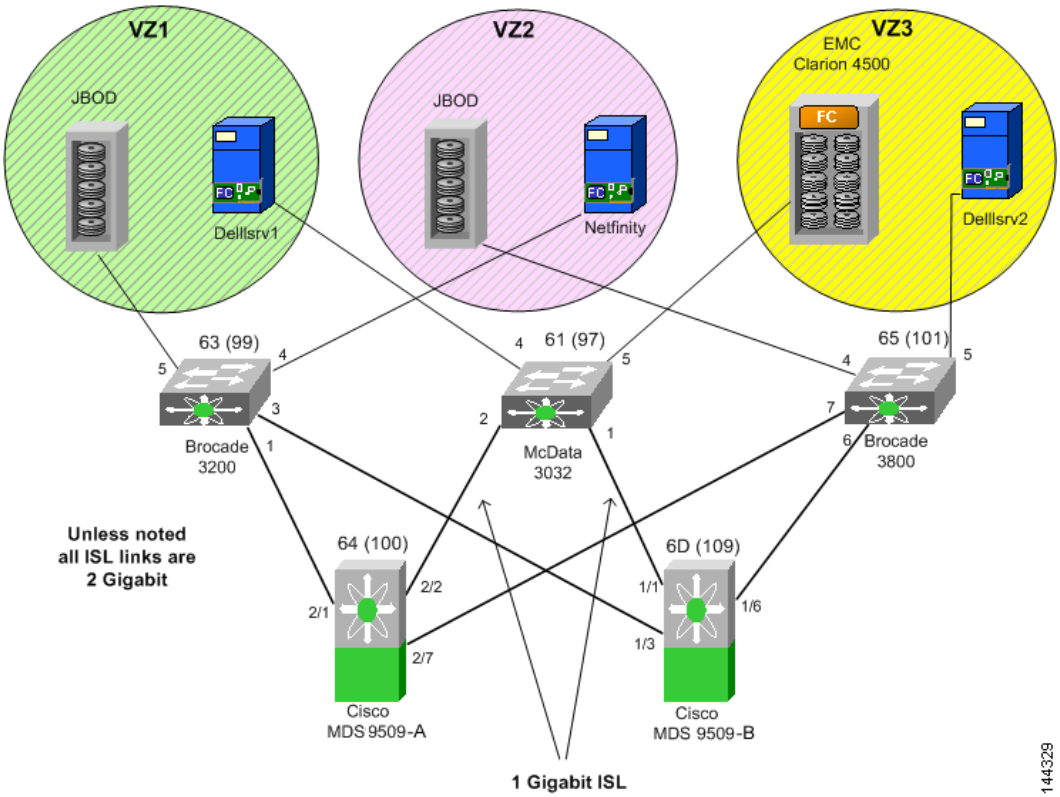
The following switches and code levels were used for this example configuration:

- MDS 9509 running MDS SAN-OS Release 1.0(1)
- Brocade 3800 Version 3.0.2
- Brocade 3200 Version 3.0.2
- McData 3032 Version 04.01.00 12

The example configuration uses MDS 9509 switches in the core, and Brocade 3200, Brocade 3800, and McData 3032 switches on the edge.

Figure 4-1 shows the topology used for this example configuration.

Figure 4-1 Dual MDS 9509 Switch Core with Brocade and McData Switch Edge Topology



Note The VZ1 JBOD is an arbitrated loop with three public drives, and the VZ2 JBOD is an arbitrated loop with seven private drives.

Expected Topology Behavior

This section covers the Fibre Channel services and features that act differently in this topology (Figure 4-1) as compared to a homogeneous, single-vendor implementation.

This section includes the following topics:

Zoning

All zone members will be pWWNs in the core-edge topology because the Brocade domain/port nomenclature is not a valid form (per the FC standard), and the McData switch only supports zone members based upon pWWNs. When a zone set (or configuration, in Brocade terminology) activation is made at the core, the zone set activation reaches all switches at the same time because all the switches are one hop away (except for the other core switch, which is two hops away).

The edge switches provide all of the zone security, because the MDS 9000 switch does not check the source or destination of the frame when traversing E ports. Brocade switches only check the zoning information on the egress port of the fabric.

Note After two active zone sets successfully merge, always copy the active zone set to the full zone set database prior to modifying it on the MDS 9000 switch.

FSPF

All links within the topology appear with the link cost of 500, except for the two paths leading to the McData 3032 switches. These paths are running at 1 Gbps and appear with a cost of 1000.

The Brocade switches load balance their routes using source and destination; the ingress edge switch uses the same core switch for all traffic that has the same source and destination pair. If the Brocade switch could load balance using source/destination/ox-id, then it could choose either of the two core switches for the route through the fabric. The two-level core does not allow the MDS 9000 switch, which can load balance using source/destination/ox-id, to load balance across multiple edge switches.

Trunking and PortChannels

The lack of MDS 9000 switch-to-MDS 9000-switch connections prohibits the topology from containing TE ports or PortChannels. While in interop mode, the Brocade switches do not support trunked ports of any type. Only standard E ports are used for the ISLs.

Domain IDs

The domain IDs are limited to the 97 to 127 range due to a restriction imposed by McData's inability to handle IDs outside of that range. While Brocade switches and MDS 9000 switches can handle domain IDs outside of this range, their implementation of interoperability mode includes this limitation.

Domain ID modifications can be handled in two ways, disruptively or nondisruptively:

- **Disruptive**—This event impacts the entire switch. When changing domain IDs, Brocade and McData both require the entire switch to be taken offline and/or rebooted.
- **Nondisruptive**—This event is limited to the VSAN where the event is taking place. Only the MDS 9000 switch can perform this action, as the domain manager process for this VSAN is restarted and not the entire switch. This requires any device logged into the VSAN to log into the fabric again to obtain a new FC ID.

Configuration

This section describes the configuration process and includes the following topics:

Configuring the McData 3032 Switch

In this example, the McData 3032 switch is configured for interop mode using Telnet and the CLI. The switch is placed in an offline state, the default zone is set to deny, the domain ID is set, and timers are altered to match the fabric.

Follow these steps to configure the McData 3032 switch.

Step 1 Display current switch information.

```
Root> show switch
Switch Information
State:                  Online
BB Credit:              16
R_A_TOV:                100    <==== must match other fabric switches
E_D_TOV:                20     <==== must match other fabric switches
Preferred Domain ID:    1
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           McDATA Fabric 1.0          <==== non interop mode
Active Domain ID:       1
World Wide Name:        10:00:08:00:88:60:A0:DB
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

Step 2 Alter the timers, RA_TOV and ED_TOV, if needed. These options are listed in the **config switch** menu.

```
Root> config switch
Config.Switch>
..                - Move back one level
bbCredit          - Set the buffer to buffer credit value for the switch
commadelim        - Toggle comma-delimited display mode
domainRSCN        - Set the Domain RSCN state for the switch
edTOV             - Set the E_D_TOV for the switch
insistDomainId    - Set the Insistent Domain ID state for the switch
interopMode       - Set the Interoperability mode for the switch
login             - Login to CLI under different access rights
logout            - Logout of CLI
prefDomainId      - Set the preferred domain id for the switch
priority          - Set the switch priority
raTOV             - Set the R_A_TOV for the switch
rerouteDelay      - Enable or disable the reroute delay
root              - Move back to root level
show              - Display the switch configuration
speed             - Set the switch operating speed
```

Step 3 Set the switch offline. The switch must be offline before changing the mode to interop.

```
Config.Switch> interopmode open
Error 45:  Not Allowed While Switch Online
```

Note To change to interop mode, the switch must be set to offline.

```
Root> maint
Maint> system
Maint.System> setOnlineState 0
Maint.System> .
Maint> .

Root> show switch
Switch Information
State:                  Offline    <==== switch is now offline
BB Credit:              16
R_A_TOV:                100
E_D_TOV:                20
Preferred Domain ID:    1
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           McDATA Fabric 1.0
Active Domain ID:       1
World Wide Name:        10:00:08:00:88:60:A0:DB
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

Step 4 Set the default zone to deny, and set the mode to interop. As shown in this example, the switch cannot be set to interop mode without first setting the default zone to deny.

```
Root> config switch
Config.Switch> interopmode open
Error 81:  Default Zone Enabled

Root> config zoning
Config.Zoning> setDefZoneState 0
Config.Zoning> ..
Config> switch

Config.Switch> interopmode open
Config.Switch> ..
Config> ..

Root> show switch
Switch Information
State:                  Offline    <==== still offline
BB Credit:              16
R_A_TOV:                100
E_D_TOV:                20
Preferred Domain ID:    1
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           Open Fabric 1.0      <==== now in interop mode
Active Domain ID:       1
World Wide Name:        10:00:08:00:88:60:A0:DB
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

Step 5 Set the preferred domain ID, with an offset of 0x60. In this example, the McData switch is domain ID 0x61 (97). The FC_IDs for nodes on this switch are 61xxxx.

```
Root> config switch
Config.Switch> prefDomainId 1

Config.Switch> ..
Config> ..
Root> maint
Maint> system
Maint.System> setonlinestate 1
Maint.System> ..
Maint> ..

Root> show switch
Switch Information
State:                  Online            <==== online
BB Credit:              16
R_A_TOV:                100
E_D_TOV:                20
Preferred Domain ID:    1
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           Open Fabric 1.0   <==== interop mode
Active Domain ID:       0
World Wide Name:        10:00:08:00:88:60:A0:DB
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

Configuring the MDS 9000 Switch and the Brocade Switches

See Chapter 3, "MDS 9000 Core with Brocade Edge Topology (Interop Mode 1)," for examples of how to set the MDS 9000 switch and Brocade switches to interop mode.

Verification

This section highlights the commands used to verify that the fabric is up and running in interoperability mode. It includes the following topics:

Verifying the MDS 9509 Switch

The following examples show the commands used to verify the configuration of the first MDS 9509 switch (MDS 9509-A) (see Figure 4-1).

```
MDS9509A# 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

MDS9509A# show int brief

--------------------------------------------------------------------------------
Interface  Vsan   Admin  Admin   Status          Oper  Oper   Port-channel
                  Mode   Trunk                   Mode  Speed
                         Mode                          (Gbps)
--------------------------------------------------------------------------------
fc2/1      1      auto   on      up              E     2      --
fc2/2      1      auto   off     up              E     1      --
fc2/3      1      auto   on      notConnected    --    --     --
fc2/4      1      auto   on      down            --    --     --
fc2/5      1      auto   on      notConnected    --    --     --
fc2/6      1      auto   on      down            --    --     --
fc2/7      1      auto   on      up              E     2      --
fc2/8      1      auto   on      notConnected    --    --     --
fc2/9      1      auto   on      notConnected    --    --     --
fc2/10     1      auto   on      fcotAbsent      --    --     --
fc2/11     1      SD     --      up              SD    1      --
fc2/12     1      auto   on      notConnected    --    --     --
fc2/13     1      auto   on      down            --    --     --
fc2/14     4094   auto   on      down            --    --     --
fc2/15     4094   auto   on      fcotAbsent      --    --     --
fc2/16     1      auto   on      notConnected    --    --     --

--------------------------------------------------------------------------------
Interface          Status   IP Address              Speed        MTU
--------------------------------------------------------------------------------
sup-fc0            up       --                      1 Gbps       2596

--------------------------------------------------------------------------------
Interface          Status   IP Address              Speed        MTU
--------------------------------------------------------------------------------
mgmt0              up       6.1.1.96/24             100 Mbps     1500


MDS9509A# show run
Building Configuration ...

 interface fc2/1
```

```
no shutdown

 interface fc2/2
switchport speed 1000
switchport trunk mode off
no shutdown

 interface fc2/3
no shutdown

 interface fc2/4

 interface fc2/5
no shutdown

 interface fc2/6

 interface fc2/7
no shutdown

 interface fc2/8
no shutdown

 interface fc2/9
no shutdown

 interface fc2/10
no shutdown

 interface fc2/11
switchport mode SD
switchport speed 1000
no shutdown

 interface fc2/12
no shutdown

 interface fc2/13
 interface fc2/14
 interface fc2/15
 interface fc2/16
no shutdown
 interface mgmt0
ip address 6.1.1.96 255.255.255.0
no shutdown

vsan database
vsan 1 interop
vsan 4094 interface fc2/14
vsan 4094 interface fc2/15

aaa accounting logsize 30000
boot system curr-isan.img_1419289659 sup-1
boot kickstart curr-ks.img_3653485566 sup-1
boot system curr-isan.img_1419289659 sup-2
boot kickstart curr-ks.img_3653485566 sup-2

fcdomain priority 254 vsan 1
fcdomain fabric-name 41:6e:64:69:61:6d:6f:21 vsan 1
fcdomain domain 100 preferred vsan 1

[snip]
```

```
MDS9509A# sh vsan 1
vsan 1 information
         name:VSAN0001  state:active
         interoperability mode:yes
         loadbalancing:src-id/dst-id/oxid
         operational state:up

MDS9509A# sh 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: 10:00:00:60:69:50:0c:fe
        Running priority: 254
        Current domain ID: 0x64(100)

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: 254
        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
----------------    -------------    ------------

MDS9509A# sh fcdomain domain-list vsan 1

Number of domains: 5
Domain ID              WWN
---------    -----------------------
 0x61(97)    10:00:08:00:88:60:a0:db
 0x63(99)    10:00:00:60:69:c0:0c:1d
0x64(100)    20:01:00:05:30:00:51:1f [Local]
0x65(101)    10:00:00:60:69:50:0c:fe [Principal]
0x6d(109)    20:01:00:05:30:00:47:9f
---------    -----------------------

MDS9509A# sh fspf internal route vsan 1
 FSPF Unicast Routes
---------------------------
 VSAN Number  Dest Domain   Route Cost    Next hops
-----------------------------------------------
           1     0x61(97)         1000        fc2/2
           1     0x63(99)          500        fc2/1
           1    0x65(101)          500        fc2/7
           1    0x6d(109)         1000        fc2/1
                                            fc2/7
```

```
MDS9509A# sh fcns data vsan 1

VSAN 1:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x610813    N     10:00:00:00:c9:24:3d:90 (Emulex)        scsi-fcp
0x610a13    N     50:06:01:60:88:02:90:cb                 scsi-fcp
0x630400    N     10:00:00:00:c9:24:3f:75 (Emulex)        scsi-fcp
0x6305e2    NL    21:00:00:20:37:a7:ca:b7 (Seagate)       scsi-fcp
0x6305e4    NL    21:00:00:20:37:a7:c7:e0 (Seagate)       scsi-fcp
0x6305e8    NL    21:00:00:20:37:a7:c7:df (Seagate)       scsi-fcp
0x6504dc    NL    21:00:00:20:37:28:34:9e (Seagate)       scsi-fcp
0x6504e0    NL    21:00:00:20:37:28:23:8a (Seagate)       scsi-fcp
0x6504e1    NL    21:00:00:20:37:28:31:70 (Seagate)       scsi-fcp
0x6504e2    NL    21:00:00:20:37:28:28:c2 (Seagate)       scsi-fcp
0x6504e4    NL    21:00:00:20:37:28:2f:46 (Seagate)       scsi-fcp
0x6504e8    NL    21:00:00:20:37:28:26:0d (Seagate)       scsi-fcp
0x6504ef    NL    21:00:00:20:37:28:2e:65 (Seagate)       scsi-fcp
0x650500    N     10:00:00:e0:69:f0:43:9f (JNI)

Total number of entries = 14
```

The following examples show the commands used to verify the configuration of the second MDS 9509 switch (MDS 9509-B) (see Figure 4-1).

```
MDS9509B# show version
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 963116 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 21:00:00

MDS9509B# sh int brief
Interface  Vsan   Admin  Admin   Status          Oper  Oper   Port-channel
                  Mode   Trunk                   Mode  Speed
                         Mode                          (Gbps)
--------------------------------------------------------------------------------
fc1/1      1      auto   on      up              E     1      --
fc1/2      1      auto   on      fcotAbsent      --    --     --
fc1/3      1      auto   on      up              E     2      --
fc1/4      1      auto   on      notConnected    --    --     --
fc1/5      1      auto   on      notConnected    --    --     --
fc1/6      1      auto   on      up              E     2      --
fc1/7      1      auto   on      fcotAbsent      --    --     --
fc1/8      1      auto   on      fcotAbsent      --    --     --
fc1/9      1      auto   on      notConnected    --    --     --
fc1/10     1      SD     --      fcotAbsent      --    --     --
fc1/11     1      auto   off     fcotAbsent      --    --     --
fc1/12     1      auto   on      notConnected    --    --     --
fc1/13     1      auto   on      fcotAbsent      --    --     --
```

```
fc1/14     1      auto   on      notConnected     --    --     --
fc1/15     1      auto   on      fcotAbsent       --    --     --
fc1/16     1      auto   on      fcotAbsent       --    --     --

--------------------------------------------------------------------------------
Interface          Status   IP Address               Speed        MTU
--------------------------------------------------------------------------------
sup-fc0            up       --                       1 Gbps       2596

--------------------------------------------------------------------------------
Interface          Status   IP Address               Speed        MTU
--------------------------------------------------------------------------------
mgmt0              up       6.1.1.95/24              100 Mbps     1500

MDS9509B# sh run

Building Configuration ...

 interface fc1/1
no shutdown


 interface fc1/2
no shutdown


 interface fc1/3
no shutdown


 interface fc1/4
no shutdown


 interface fc1/5
no shutdown


 interface fc1/6
no shutdown


 interface fc1/7
no shutdown


 interface fc1/8
no shutdown


 interface fc1/9
no shutdown


 interface fc1/10
switchport mode SD
switchport speed 2000
no shutdown


 interface fc1/11
switchport trunk mode off
no shutdown
```

```
 interface fc1/12
no shutdown


 interface fc1/13
no shutdown


 interface fc1/14
no shutdown


 interface fc1/15
no shutdown


 interface fc1/16
no shutdown
interface mgmt0
ip address 6.1.1.95 255.255.255.0
no shutdown

vsan database
vsan 1 interop

aaa accounting logsize 30000
boot system bootflash:/m9200-ek9-mzg.1.0.0.260c.bin
boot kickstart bootflash:/m9200-ek9-kickstart-mzg.1.0.0.260c.bin

fcdomain fabric-name 41:6e:64:69:61:6d:6f:21 vsan 1
fcdomain domain 109 preferred vsan 1

line console
  speed 38400
switchname MDS9509B

MDS9509B# sh vsan 1
vsan 1 information
         name:VSAN0001  state:active
         interoperability mode:yes
         loadbalancing:src-id/dst-id/oxid
         operational state:up

MDS9509B# sh fcdomain vsan 1
The local switch is a Subordinated Switch.

Local switch run time information:
        State: Stable
        Local switch WWN:    20:01:00:05:30:00:47:9f
        Running fabric name: 10:00:00:60:69:50:0c:fe
        Running priority: 128
        Current domain ID: 0x6d(109)

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: 0x6d(109) (preferred)

Principal switch run time information:
        Running priority: 2
```

```
Interface               Role          RCF-reject
----------------    -------------    ------------
fc1/1               Upstream         Disabled
fc1/3               Non-principal    Disabled
fc1/6               Non-principal    Disabled
----------------    -------------    ------------

MDS9509B# sh fcdomain domain-list vsan 1

Number of domains: 5
Domain ID              WWN
---------    -----------------------
 0x61(97)    10:00:08:00:88:60:a0:db
 0x63(99)    10:00:00:60:69:c0:0c:1d
0x64(100)    20:01:00:05:30:00:51:1f
0x65(101)    10:00:00:60:69:50:0c:fe [Principal]
0x6d(109)    20:01:00:05:30:00:47:9f [Local]
---------    -----------------------
MDS9509B# sh fspf internal route vsan 1

FSPF Unicast Routes
---------------------------
 VSAN Number  Dest Domain   Route Cost    Next hops
----------------------------------------------
           1     0x61(97)         1000        fc1/1
           1     0x63(99)          500        fc1/3
           1    0x64(100)         1000        fc1/3
                                              fc1/6
           1    0x65(101)          500        fc1/6


MDS9509B# sh fcns data vsan 1

VSAN 1:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x610813    N     10:00:00:00:c9:24:3d:90 (Emulex)        scsi-fcp
0x610a13    N     50:06:01:60:88:02:90:cb                 scsi-fcp
0x630400    N     10:00:00:00:c9:24:3f:75 (Emulex)        scsi-fcp
0x6305e2    NL    21:00:00:20:37:a7:ca:b7 (Seagate)       scsi-fcp
0x6305e4    NL    21:00:00:20:37:a7:c7:e0 (Seagate)       scsi-fcp
0x6305e8    NL    21:00:00:20:37:a7:c7:df (Seagate)       scsi-fcp
0x6504dc    NL    21:00:00:20:37:28:34:9e (Seagate)       scsi-fcp
0x6504e0    NL    21:00:00:20:37:28:23:8a (Seagate)       scsi-fcp
0x6504e1    NL    21:00:00:20:37:28:31:70 (Seagate)       scsi-fcp
0x6504e2    NL    21:00:00:20:37:28:28:c2 (Seagate)       scsi-fcp
0x6504e4    NL    21:00:00:20:37:28:2f:46 (Seagate)       scsi-fcp
0x6504e8    NL    21:00:00:20:37:28:26:0d (Seagate)       scsi-fcp
0x6504ef    NL    21:00:00:20:37:28:2e:65 (Seagate)       scsi-fcp
0x650500    N     10:00:00:e0:69:f0:43:9f (JNI)

Total number of entries = 14
```

Verifying the Brocade 3800 Switch

The following examples show the commands used to verify the configuration of the Brocade 3800 switch (see Figure 4-1).

```
B3800_IBM_SAN:admin> version
Kernel:     5.3.1
Fabric OS:  v3.0.2
Made on:    Thu Jan 10 17:41:15 PST 2002
Flash:      Thu Jan 10 17:42:37 PST 2002
BootProm:   Wed May 23 12:37:30 PDT 2001

B3800_IBM_SAN:admin> licenseshow
R99yydyQzcSAAzz1:
    Web license
    Zoning license
    Fabric license
SSbdSSQRR9TTceT8:
    QuickLoop license

B3800_IBM_SAN:admin> switchshow
switchName:     B3800_IBM_SAN
switchType:     9.1
switchState:    Online
switchMode:     Interop
switchRole:     Principal
switchDomain:   101
switchId:       fffc65
switchWwn:      10:00:00:60:69:50:0c:fe
switchBeacon:   OFF
Zoning:         OFF
port  0: -- N2 No_Module
port  1: -- N2 No_Module
port  2: id 1G No_Light
port  3: id 1G No_Light
port  4: id N1 Online       L-Port 7 private, 1 phantom
port  5: id N1 Online       F-Port 10:00:00:e0:69:f0:43:9f
port  6: id N2 Online       E-Port 20:01:00:05:30:00:47:9f
port  7: id N2 Online       E-Port 20:01:00:05:30:00:51:1f (downstream)
port  8: id N2 No_Light
port  9: -- N2 No_Module
port 10: -- N2 No_Module
port 11: -- N2 No_Module
port 12: -- N2 No_Module
port 13: -- N2 No_Module
port 14: -- N2 No_Module
port 15: -- N2 No_Module

B3800_IBM_SAN:admin> topologyshow

5 domains in the fabric; Local Domain ID: 101

Domain   Metric   Hops   Out Port   In Ports   Flags   Bandwidth   Name
-----------------------------------------------------------------------
  97      1500      2        6     0x00000020    D      2 (Gbs)   Unreachable
                             7     0x00000010    D      2 (Gbs)

  99      1000      2        7     0x00000020    D      2 (Gbs)   "3200_TOP"
                             6     0x00000010    D      2 (Gbs)

 100       500      1        7     0x00000070    D      2 (Gbs)   Unreachable
```

```
 109       500      1        6     0x000000b0    D      2 (Gbs)   Unreachable

B3800_IBM_SAN:admin> nsshow
{
 Type Pid    COS     PortName                NodeName                 TTL(sec)
 NL   6504dc;      3;21:00:00:20:37:28:34:9e;20:00:00:20:37:28:34:9e; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:04:00:60:69:50:0c:fe
 NL   6504e0;      3;21:00:00:20:37:28:23:8a;20:00:00:20:37:28:23:8a; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:04:00:60:69:50:0c:fe
 NL   6504e1;      3;21:00:00:20:37:28:31:70;20:00:00:20:37:28:31:70; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:04:00:60:69:50:0c:fe
 NL   6504e2;      3;21:00:00:20:37:28:28:c2;20:00:00:20:37:28:28:c2; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:04:00:60:69:50:0c:fe
 NL   6504e4;      3;21:00:00:20:37:28:2f:46;20:00:00:20:37:28:2f:46; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:04:00:60:69:50:0c:fe
 NL   6504e8;      3;21:00:00:20:37:28:26:0d;20:00:00:20:37:28:26:0d; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:04:00:60:69:50:0c:fe
 NL   6504ef;      3;21:00:00:20:37:28:2e:65;20:00:00:20:37:28:2e:65; na
    FC4s: FCP [SEAGATE ST118202FC      FDF6]
    Fabric Port Name: 20:04:00:60:69:50:0c:fe
 N    650500;      3;10:00:00:e0:69:f0:43:9f;10:00:00:e0:69:f0:43:9f; na
    Fabric Port Name: 20:05:00:60:69:50:0c:fe

The Local Name Server has 8 entries }

B3800_IBM_SAN:admin> nsallshow
{
  610813 610a13 630400 6305e2 6305e4 6305e8 6504dc 6504e0
  6504e1 6504e2 6504e4 6504e8 6504ef 65050014 Nx_Ports in the Fabric }

B3800_IBM_SAN:admin> urouteshow

Local Domain ID: 101

In Port    Domain    Out Port    Metric    Hops    Flags    Next (Dom, Port)
-------------------------------------------------------------------------------
   4         97          7        1500       2       D          100,65798
             99          6        1000       2       D          109,65541
            100          7         500       1       D          100,65798
            109          6         500       1       D          109,65541

   5         97          6        1500       2       D          109,65541
             99          7        1000       2       D          100,65798
            100          7         500       1       D          100,65798
            109          6         500       1       D          109,65541

   6        100          7         500       1       D          100,65798

   7        109          6         500       1       D          109,65541
```

You can use Fabric Manager and Device Manager to verify the current state of the fabric. Figure 4-2 shows the fabric topology using Fabric Manager.

Figure 4-2 MDS 9509 Switch Fabric Manager Map

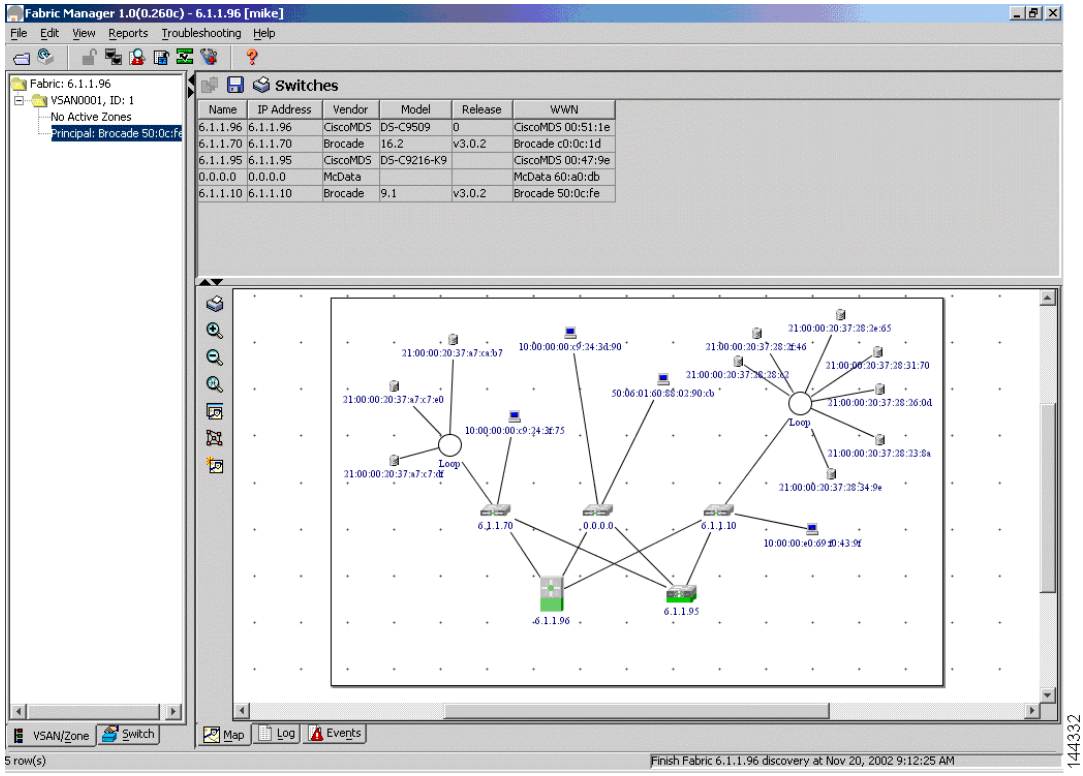


Figure 4-3 shows the Cisco Device Manager on an MDS 9509 switch in the example topology. This shows which ports are active E ports.

Figure 4-3 MDS 9509 Switch Device Manager

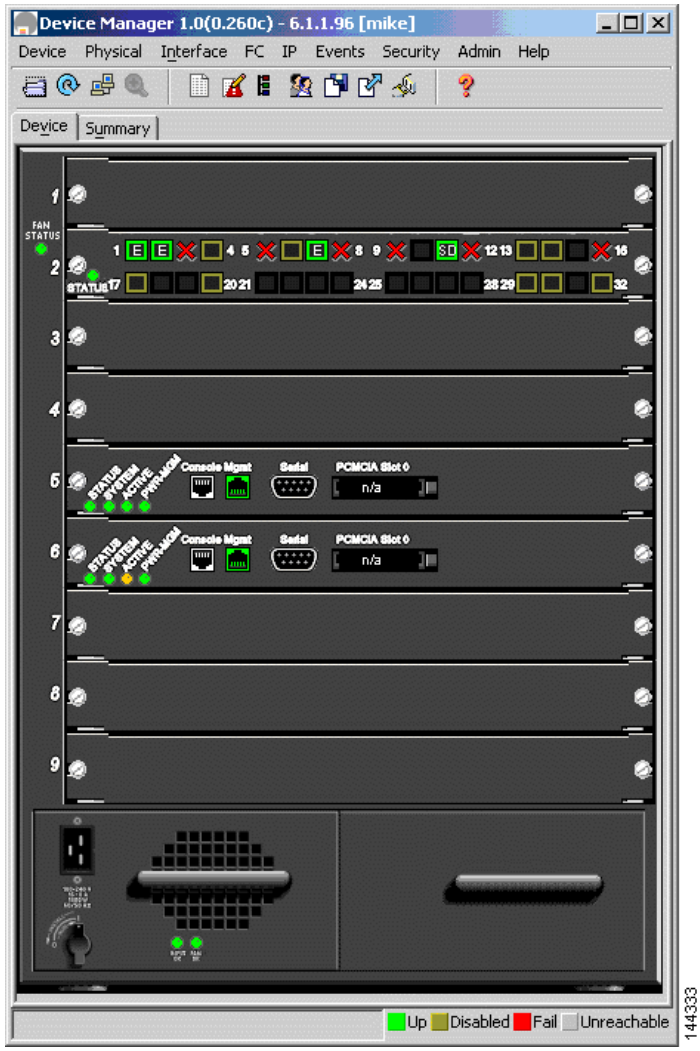


Figure 4-4 shows the status of the E ports and can verify link speed.

Figure 4-4 MDS 9509 Switch E ports

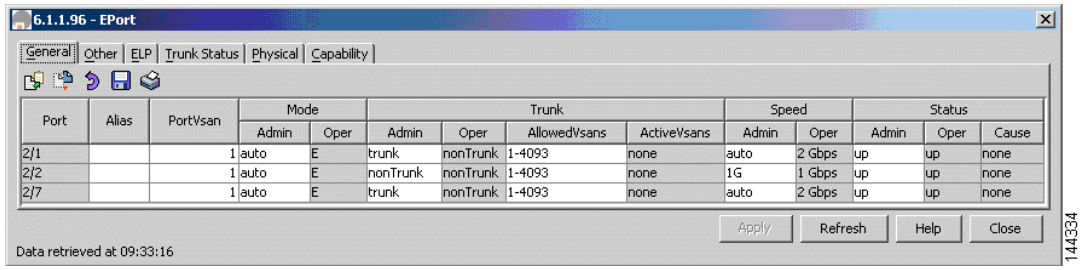


Figure 4-5 shows the domain ID of the switches in the fabric.

Figure 4-5 MDS 9509 Switch Domain Manager

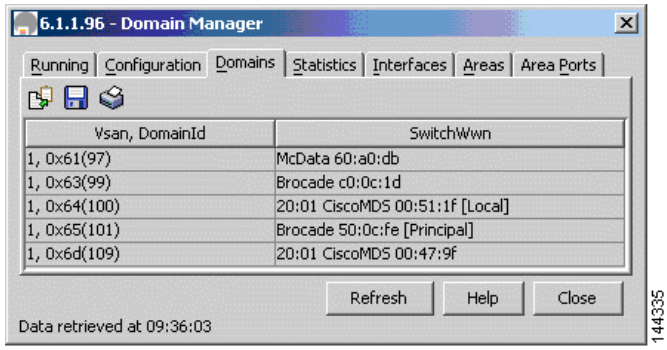


Figure 4-6 shows that VSAN 1 is operating in interop mode.

Figure 4-6 VSAN 1 Operating in Interop Mode on an MDS 9509 Switch

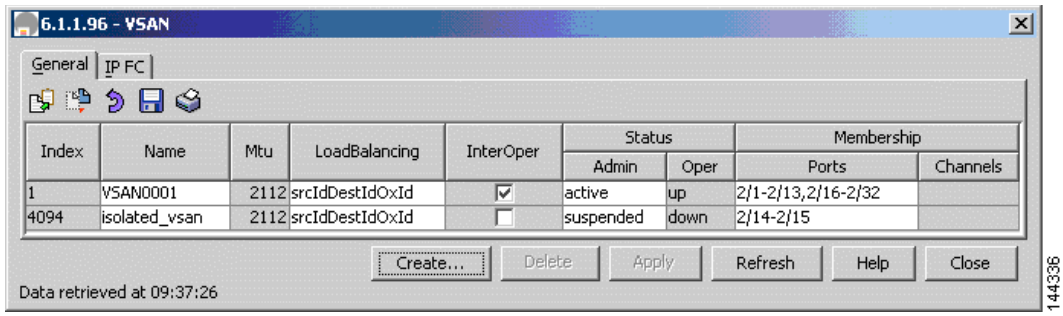


Figure 4-7 shows the MDS 9509 switch name server. This shows the edge devices that have registered.

Figure 4-7 MDS 9509 Switch Name Server Showing McData and Brocade Devices

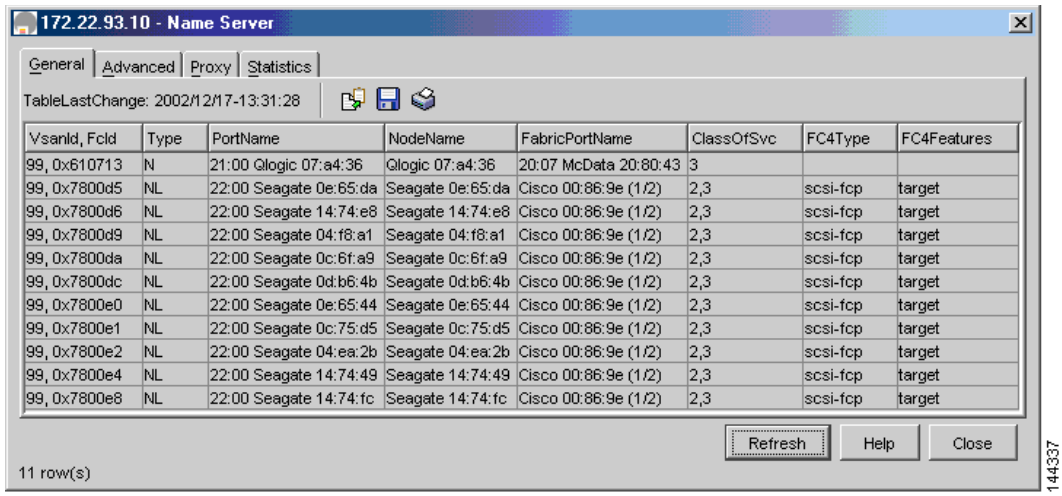
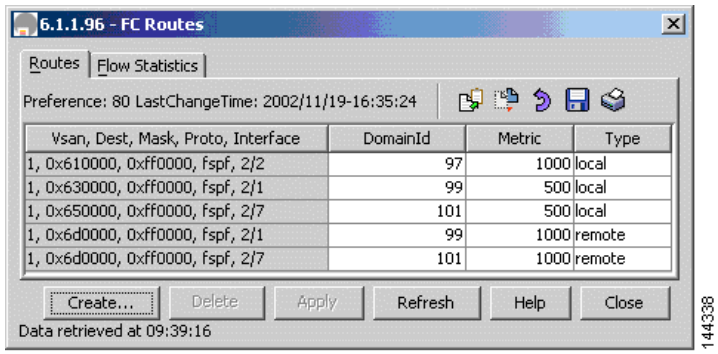


Figure 4-8 shows the FSPF routes as calculated by this switch.

Figure 4-8 MDS 9509 Switch Showing FC Routes



Verifying the Brocade 3200 Switch

The following examples show the commands used to verify the configuration of the Brocade 3200 switch (see Figure 4-1).

```
3200_TOP:admin> version
Kernel:     5.3.1
Fabric OS:  v3.0.2
Made on:    Thu Jan 10 17:41:15 PST 2002
Flash:      Thu Jan 10 17:42:37 PST 2002
BootProm:   Tue Oct 30 10:24:38 PST 2001

3200_TOP:admin> licenseshow
R9bdbybzSQSAcecJ:
    Web license
bQyecQdSbScRzfd7:
    Zoning license
RbbSed9RRSSccTfd:
    QuickLoop license
b99dde9cSdcAAeer:
    Fabric license

3200_TOP:admin> switchshow
switchName:     3200_TOP
switchType:     16.2
switchState:    Online
switchMode:     Interop
switchRole:     Subordinate
switchDomain:   99
switchId:       fffc63
switchWwn:      10:00:00:60:69:c0:0c:1d
switchBeacon:   OFF
Zoning:         OFF
port  0: id N2 No_Light
port  1: id N2 Online       E-Port 20:01:00:05:30:00:51:1f (upstream)
port  2: id N2 No_Light
port  3: id N2 Online       E-Port 20:01:00:05:30:00:47:9f
port  4: id N1 Online       F-Port 10:00:00:00:c9:24:3f:75
port  5: id N1 Online       L-Port 3 public
port  6: id N2 No_Light
port  7: -- N2 No_Module
```

```
3200_TOP:admin> topologyshow

5 domains in the fabric; Local Domain ID: 99

Domain   Metric   Hops   Out Port   In Ports   Flags   Bandwidth   Name
-----------------------------------------------------------------------
  97      1500      2        1     0x00000020    D      2 (Gbs)   Unreachable
                             3     0x00000010    D      2 (Gbs)

 100       500      1        1     0x00000038    D      2 (Gbs)   Unreachable

 101      1000      2        1     0x00000020    D      2 (Gbs)   "B3800_IBM_SAN"
                             3     0x00000010    D      2 (Gbs)

 109       500      1        3     0x00000032    D      2 (Gbs)   Unreachable


3200_TOP:admin> nsshow
{
 Type Pid    COS     PortName                NodeName                 TTL(sec)
 N    630400;    2,3;10:00:00:00:c9:24:3f:75;20:00:00:00:c9:24:3f:75; na
    FC4s: FCP
    Fabric Port Name: 20:04:00:60:69:c0:0c:1d
 NL   6305e2;      3;21:00:00:20:37:a7:ca:b7;20:00:00:20:37:a7:ca:b7; na
    FC4s: FCP [SEAGATE ST318451FC      0001]
    Fabric Port Name: 20:05:00:60:69:c0:0c:1d
 NL   6305e4;      3;21:00:00:20:37:a7:c7:e0;20:00:00:20:37:a7:c7:e0; na
    FC4s: FCP [SEAGATE ST318451FC      0001]
    Fabric Port Name: 20:05:00:60:69:c0:0c:1d
 NL   6305e8;      3;21:00:00:20:37:a7:c7:df;20:00:00:20:37:a7:c7:df; na
    FC4s: FCP [SEAGATE ST318451FC      0001]
    Fabric Port Name: 20:05:00:60:69:c0:0c:1d

The Local Name Server has 4 entries }

3200_TOP:admin> nsallshow
{
  610813 610a13 630400 6305e2 6305e4 6305e8 6504dc 6504e0
  6504e1 6504e2 6504e4 6504e8 6504ef 650500
14 Nx_Ports in the Fabric }

3200_TOP:admin> urouteshow

Local Domain ID: 99

In Port    Domain    Out Port    Metric    Hops    Flags    Next (Dom, Port)
-------------------------------------------------------------------------------
   1        109          3         500       1       D          109,65538

   3        100          1         500       1       D          100,65792
   4         97          3        1500       2       D          109,65538
            100          1         500       1       D          100,65792
            101          3        1000       2       D          109,65538
            109          3         500       1       D          109,65538


   5         97          1        1500       2       D          100,65792
            100          1         500       1       D          100,65792
            101          1        1000       2       D          100,65792
            109          3         500       1       D          109,65538
```

Verifying the McData 3032 Switch

Issue the **show switch** command to show current switch information.

```
Root> show switch
Switch Information
State:                  Online
BB Credit:              16
R_A_TOV:                100
E_D_TOV:                20
Preferred Domain ID:    1
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           Open Fabric 1.0    Interop mode
Active Domain ID:       1
World Wide Name:        10:00:08:00:88:60:A0:DB
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

Issue the **show system** command to show current system information.

```
Root> show system
System Information
Name:                McData_3032
Description:         Fibre Channel Switch
Contact:             RTP_SAN_team
Location:            End User Premise (please configure)
Date/Time:           11/19/2002 16:41:11
Serial Number:       S200138
Type Number:         ES3032
Model Number:        ES
EC Level:            -
Firmware Version:    04.01.00 12
Beaconing:           Disabled
```

Issue the **show port status** command to verify that the correct ports are online and are of type E port or F port.

```
Root> show port status
Port  State                Type   Attached WWN             Beaconing  Reason
----  ------------------   -----  -----------------------  ---------  ------
0     No Light             gPort  00:00:00:00:00:00:00:00  Off
1     Online               ePort  20:01:00:05:30:00:47:9F  Off
2     Online               ePort  20:01:00:05:30:00:51:1F  Off
3     Not Installed        gPort  00:00:00:00:00:00:00:00  Off
4     Online               fPort  10:00:00:00:C9:24:3D:90  Off
5     Inactive             gPort  00:00:00:00:00:00:00:00  Off        28
6     Online               fPort  50:06:01:60:88:02:90:CB  Off
7     Not Installed        gPort  00:00:00:00:00:00:00:00  Off
8     Not Installed        gPort  00:00:00:00:00:00:00:00  Off
9     Not Installed        gPort  00:00:00:00:00:00:00:00  Off
10    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
11    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
12    No Light             gPort  00:00:00:00:00:00:00:00  Off
13    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
14    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
15    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
16    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
17    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
18    No Light             gPort  00:00:00:00:00:00:00:00  Off
19    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
```

```
20    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
21    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
22    No Light            gPort  00:00:00:00:00:00:00:00  Off
23    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
24    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
25    No Light            gPort  00:00:00:00:00:00:00:00  Off
26    No Light            gPort  00:00:00:00:00:00:00:00  Off
27    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
28    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
29    No Light            gPort  00:00:00:00:00:00:00:00  Off
30    No Light            gPort  00:00:00:00:00:00:00:00  Off
31    Not Installed       gPort  00:00:00:00:00:00:00:00  Off

28: Optics Speed Conflict
```

The **show nameserver** command shows that the EMC Clarion 4500 and Dellsrv1 host have logged into the McData switch.

```
Root> show nameserver
Type  Port Id  Port Name                Node Name                COS  FC4 Types
----  -------  -----------------------  -----------------------  ---  ----------
fPort 610813   20:00:00:00:C9:24:3D:90  10:00:00:00:C9:24:3D:90  2-3  2
fPort 610A13   50:06:01:60:11:02:90:CB  50:06:01:60:88:02:90:CB  3    2

0. ISO/IEC 8802-2 LLC
1. ISO/IEC 8802-2 LLC/SNAP
2. SCSI-FCP
3. SCSI-GPP
4. IPI-3 Master
5. IPI-3 Slave
6. IPI-3 Peer
7. CP IPI-3 Master
8. CP IPI-3 Slave
9. CP IPI-3 Peer
10. SBCCS-Channel
11. SBCCS-Cntrl Unit
12. FC Srvcs
13. FC-FG
14. FC-XS
15. FC-AL
16. SNMP
17. HIPPI-FP
18. Vendor Unique

Root> show loginserver
Port  BB Crdt  RxFldSz  COS  Port Name                Node Name
----  -------  -------  ---  -----------------------  -----------------------
4     64       2048     2-3  20:00:00:00:C9:24:3D:90  10:00:00:00:C9:24:3D:90
6     4        1024     3    50:06:01:60:11:02:90:CB  50:06:01:60:88:02:90:CB
```

To view the FSPF routes used by the McData 3032 switch, use the WebTools GUI (see Figure 4-9 and Figure 4-10). There is no command line display available to show this information.

Figure 4-9 McData 3032 Switch FSPF Routes

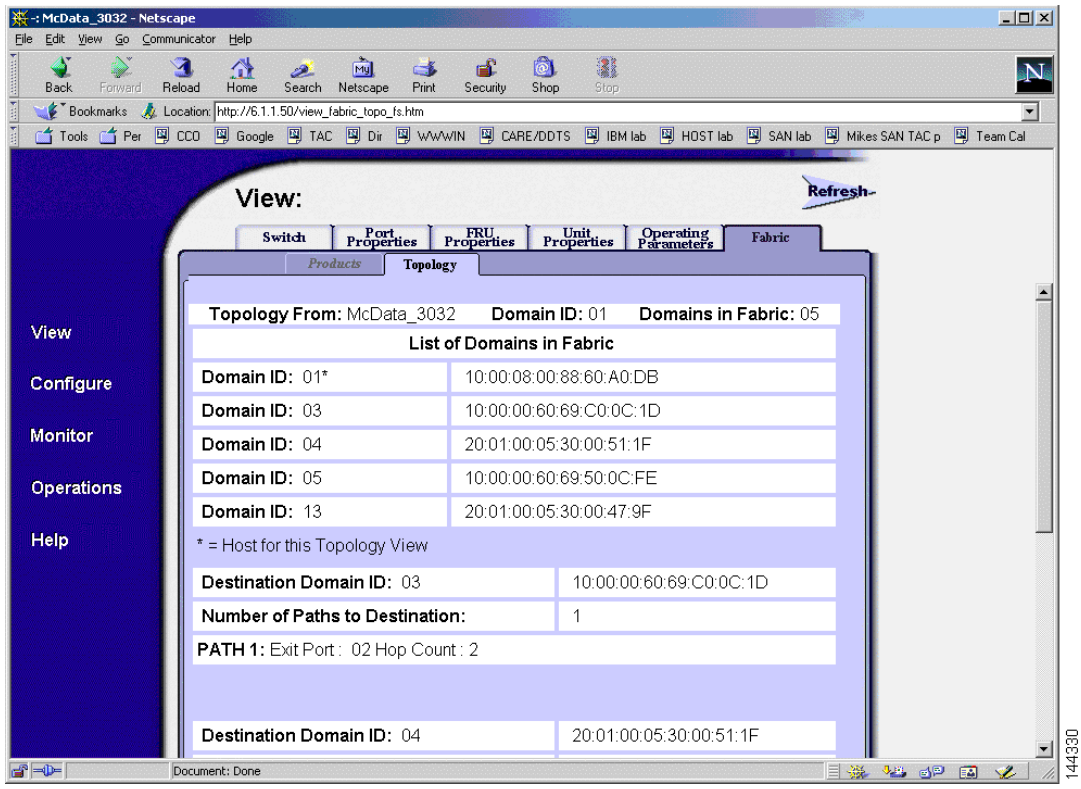
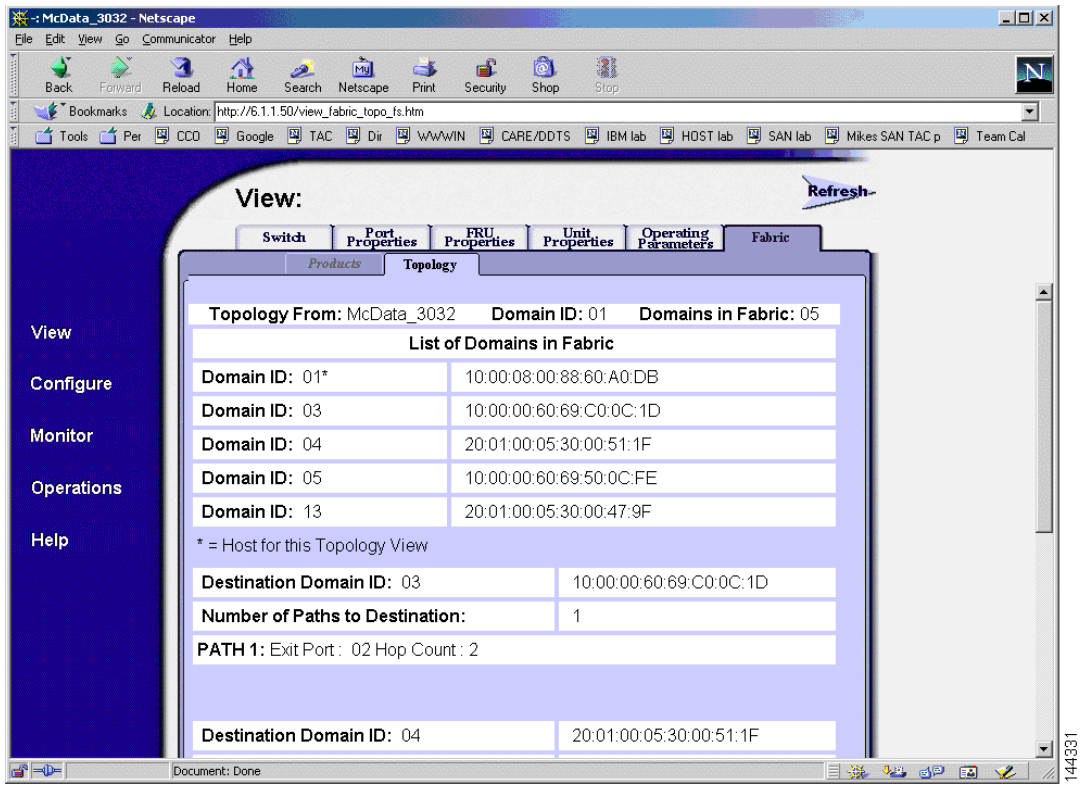


Figure 4-10 McData 3032 Switch Topology View

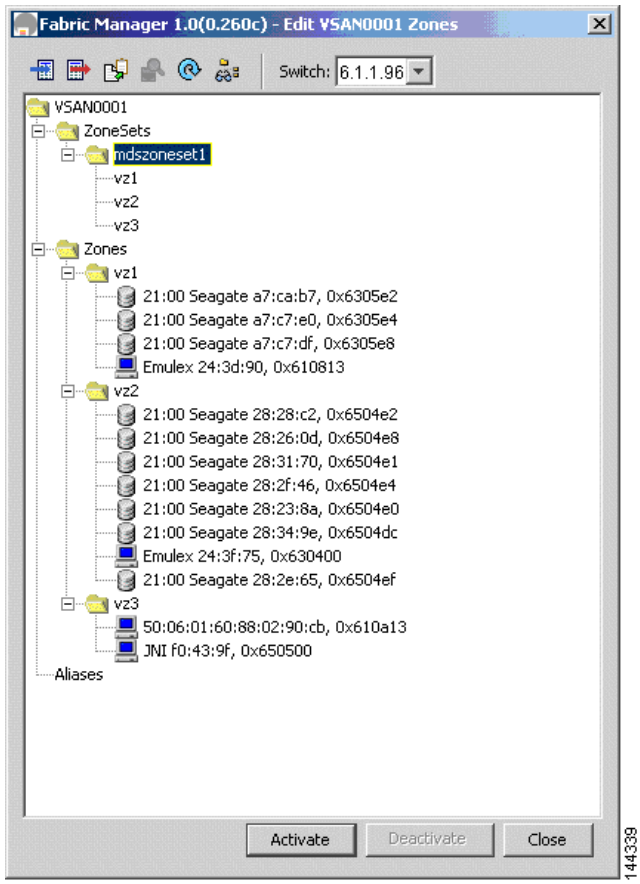


Zoning

In this section, the zones and zone sets are created using the Fabric Manager (see Figure 4-11.) The Fabric Manager is also used to verify the zoning, along with the Brocade and McData switch command line displays.

This section includes the following topics:

Figure 4-11 Configuring Zones in Fabric Manager



Verifying Zoning with Fabric Manager

Figure 4-12 shows the zone VZ1 on the Fabric Manager.

Figure 4-12 Highlighting Zone VZ1 in Fabric Manager

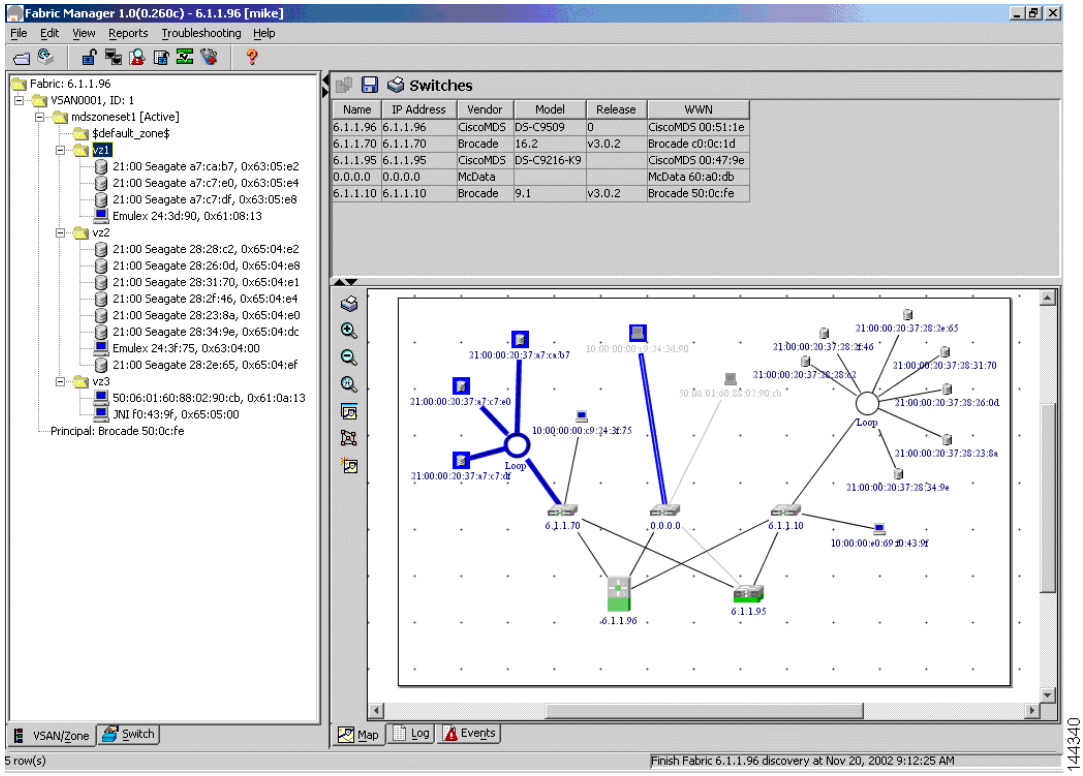


Figure 4-13 shows the zone VZ2 on the Fabric Manager.

Figure 4-13 Highlighting Zone VZ2 in Fabric Manager

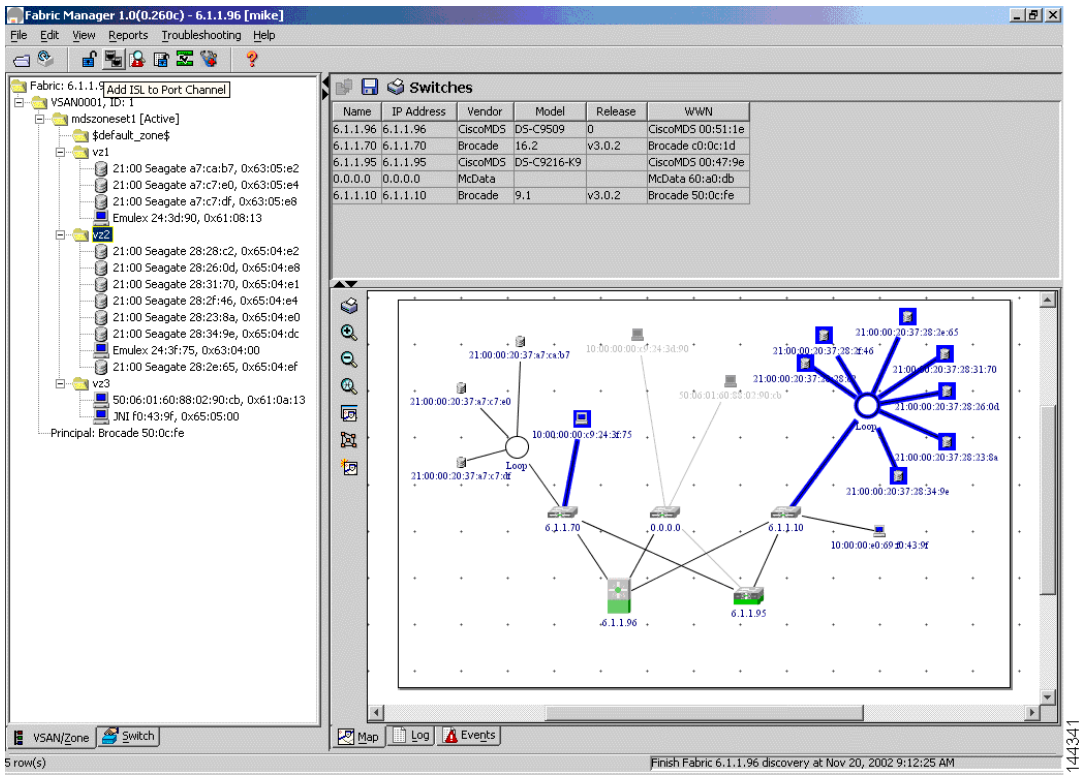
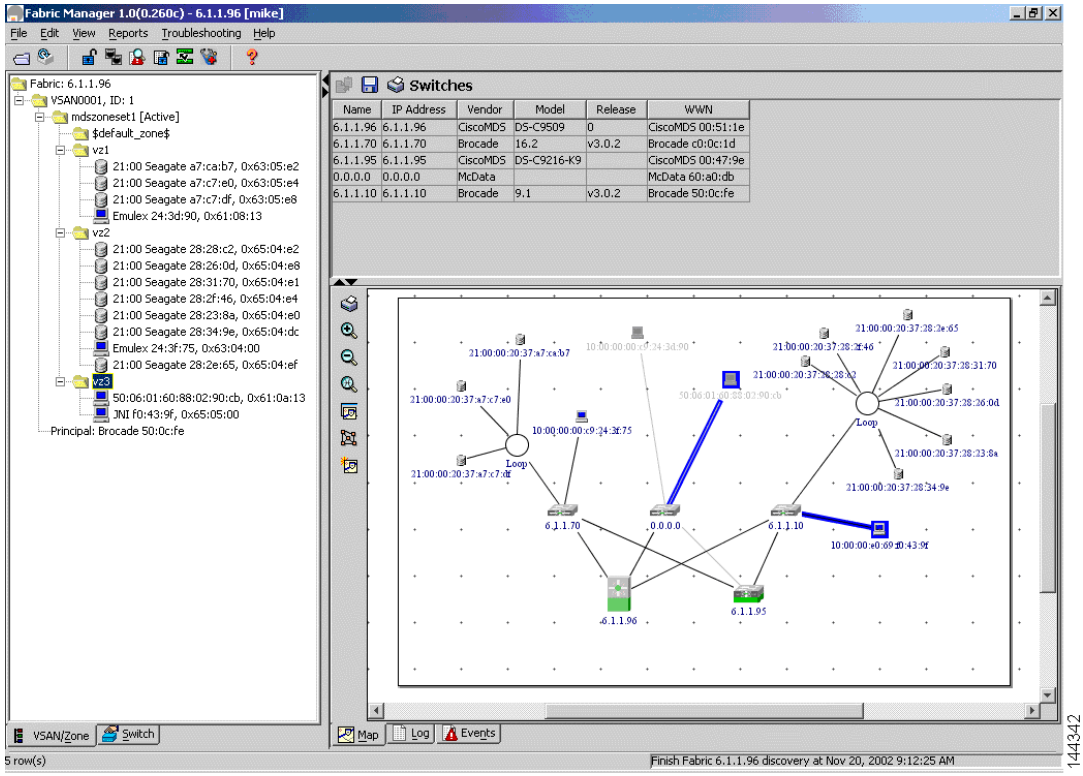


Figure 4-14 shows the zone VZ3 on the Fabric Manager.

Figure 4-14 Highlighting Zone VZ3 in Fabric Manager



Verifying Zoning with the Brocade 3800 Switch

The following examples show the commands used to verify zoning for the Brocade 3800 switch (see Figure 4-1).

```
B3800_IBM_SAN:admin> cfgshow

Defined configuration:
 no configuration defined

Effective configuration:
 cfg:   mdszoneset1
 zone:  vz1     21:00:00:20:37:a7:ca:b7
                21:00:00:20:37:a7:c7:e0
                21:00:00:20:37:a7:c7:df
                10:00:00:00:c9:24:3d:90
 zone:  vz2     21:00:00:20:37:28:28:c2
                21:00:00:20:37:28:26:0d
                21:00:00:20:37:28:31:70
                21:00:00:20:37:28:2f:46
                21:00:00:20:37:28:23:8a
                21:00:00:20:37:28:34:9e
                10:00:00:00:c9:24:3f:75
                21:00:00:20:37:28:2e:65
 zone:  vz3     50:06:01:60:88:02:90:cb
                10:00:00:e0:69:f0:43:9f
```

Verifying Zoning with the Brocade 3200 Switch

The following examples show the commands used to verify zoning for the Brocade 3200 switch (see Figure 4-1).

```
3200_TOP:admin> cfgshow
Defined configuration:
 no configuration defined

Effective configuration:
 cfg:   mdszoneset1
 zone:  vz1     21:00:00:20:37:a7:ca:b7
                21:00:00:20:37:a7:c7:e0
                21:00:00:20:37:a7:c7:df
                10:00:00:00:c9:24:3d:90
 zone:  vz2     21:00:00:20:37:28:28:c2
                21:00:00:20:37:28:26:0d
                21:00:00:20:37:28:31:70
                21:00:00:20:37:28:2f:46
                21:00:00:20:37:28:23:8a
                21:00:00:20:37:28:34:9e
                10:00:00:00:c9:24:3f:75
                21:00:00:20:37:28:2e:65
 zone:  vz3     50:06:01:60:88:02:90:cb
                10:00:00:e0:69:f0:43:9f
```

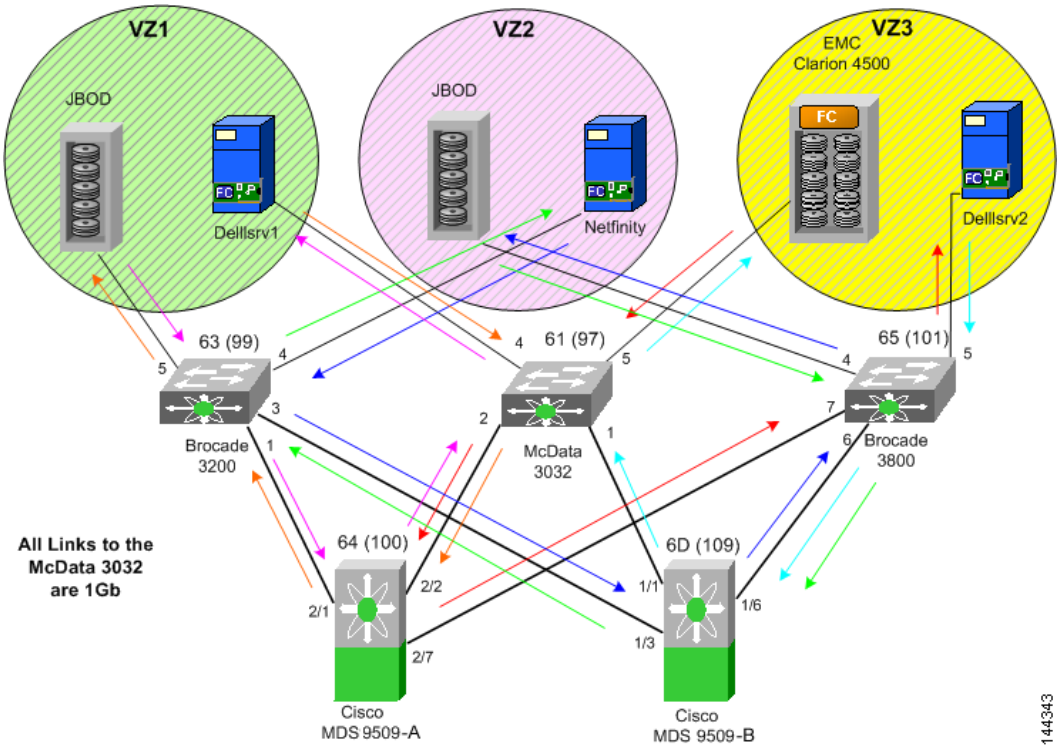
Verifying Zoning with the McData 3032 Switch

The following examples show the commands used to verify zoning for the McData 3032 switch in the configuration (see Figure 4-1).

```
Root> show zoning
Active Zone Set
Default Zone Enabled:    False
Zone Set:  mdszoneset1
  Zone:  vz1
    Zone Member:  21:00:00:20:37:A7:CA:B7
    Zone Member:  21:00:00:20:37:A7:C7:E0
    Zone Member:  21:00:00:20:37:A7:C7:DF
    Zone Member:  10:00:00:00:C9:24:3D:90
  Zone:  vz2
    Zone Member:  21:00:00:20:37:28:28:C2
    Zone Member:  21:00:00:20:37:28:26:0D
    Zone Member:  21:00:00:20:37:28:31:70
    Zone Member:  21:00:00:20:37:28:2F:46
    Zone Member:  21:00:00:20:37:28:23:8A
    Zone Member:  21:00:00:20:37:28:34:9E
    Zone Member:  10:00:00:00:C9:24:3F:75
    Zone Member:  21:00:00:20:37:28:2E:65
  Zone:  vz3
    Zone Member:  50:06:01:60:88:02:90:CB
    Zone Member:  10:00:00:E0:69:F0:43:9F
```

Figure 4-15 shows the FSPF traffic flow in this multi-vendor fabric.

Figure 4-15 Data Flow of Dual MDS 9509 Switch Core with Brocade and McData Switch Edge Topology



CHAPTER 5

MDS 9000 Switch and McData Dual Core Topology (Interop Mode 1)

This chapter describes how to set up a basic dual-core topology with an MDS 9000 switch configured for interop mode 1 and a McData 6064 switch. Devices are connected to both core switches and all traffic must flow through both cores to reach its destination.

This chapter includes the following sections:

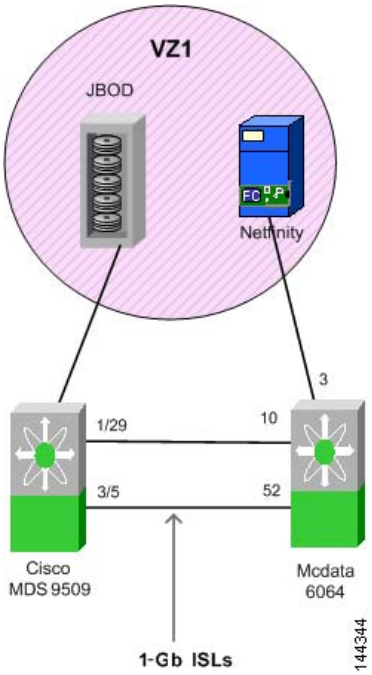
Specifications

The following switches and code levels were used for this example configuration:

- MDS 9509 running SAN-OS Release 1.0(1)
- McData 6064 Version 04.01.00 12

Figure 5-1 shows the topology used for this example configuration.

Figure 5-1 MDS 9509 Switch and McData Switch Dual Core Topology



Note The VZ1 JBOD is an arbitrated loop with 7 private drives.

Expected Topology Behavior

This section covers the Fibre Channel services and features that act differently in this topology (Figure 5-1) as compared to a homogeneous, single-vendor implementation.

It contains the following topics:

Zoning

In the core-core topology, zone members are all pWWNs, because the McData domain/port nomenclature is not a valid form according to the FC standard. When a zone set activation is made at one core switch, the zone set activation is sent to the other core switch. Either core switch may make zoning changes and have them be propagated to the other core switch.

Both core switches provide all of the zone security for the device attached ports because the MDS 9000 switch and the McData switches do not check the source and destination of the frame when traversing E ports. The MDS 9000 switch only provides hardware enforced security on the ingress ports to the fabric, while the McData switch only provides soft zoning.

Note After two active zone sets successfully merge, always copy the active zone set to the full zone set database prior to modifying it on the MDS 9000 switch.

FSPF

All links within the topology show the link cost of 1000, because the McData 6064 switch used in this example only supports 1Gbps.

The McData switches load balance their routes using source/destination; the ingress edge switch uses the same ISL for all traffic that has the same source/destination pair. If the McData switch can load balance using source/destination/ox-id, then it can choose either of the ISLs for the route through the fabric. The MDS switch continues to load balance across ISLs using source/destination/ox-id of the frame.

Trunking and PortChannels

The lack of MDS 9000 switch-to-MDS 9000-switch connections prohibits the topology from containing TE ports or PortChannels. Only standard E ports are used for the ISLs.

Domain IDs

The domain IDs are limited to the 97 to 127 range due to a restriction imposed by McData's inability to handle IDs outside of that range. While the MDS 9000 switch can handle domain IDs outside of this range in its normal mode of operation, the implementation of interoperability mode includes this limitation.

Domain ID modifications can be handled in two ways, disruptively or nondisruptively:

- **Disruptive**—This event impacts the entire switch. When changing domain IDs, McData requires the entire switch to be taken offline and/or rebooted.
- **Nondisruptive**—This event is limited to the VSAN where the event is taking place. Only the MDS 9000 switch can perform this action, as the domain manager process for this VSAN is restarted and not the entire switch. This restart requires any device logged into the VSAN to log into the fabric again to obtain a new FC ID.

Configuration

This section describes the configuration process and includes the following topics:

Configuring the McData 6064 Switch

In this example, the McData 6064 switch is configured for interop mode using Telnet and the CLI. The switch is placed in an offline state, the default zone is set to deny, the domain ID is set to 0x61 (97), and timers are altered to match the fabric.

Follow these steps to configure the McData 6064 switch.

Step 1 Display current switch information.

```
Root> show switch
Switch Information
State:                  Online
BB Credit:              16
R_A_TOV:                100        <==== must match other fabric switches
E_D_TOV:                20         <==== must match other fabric switches
Preferred Domain ID:    2
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           Open Fabric 1.0    <==== non interop mode
Active Domain ID:       2
World Wide Name:        10:00:08:00:88:20:80:43
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

Step 2 Alter the timers, RA_TOV and ED_TOV, if needed. These options are listed in the **config switch** menu.

```
Root> config switch
Config.Switch>
..                - Move back one level
bbCredit          - Set the buffer to buffer credit value for the switch
commadelim        - Toggle comma-delimited display mode
domainRSCN        - Set the Domain RSCN state for the switch
edTOV             - Set the E_D_TOV for the switch
insistDomainId    - Set the Insistent Domain ID state for the switch
interopMode       - Set the Interoperability mode for the switch
login             - Login to CLI under different access rights
logout            - Logout of CLI
prefDomainId      - Set the preferred domain id for the switch
priority          - Set the switch priority
raTOV             - Set the R_A_TOV for the switch
rerouteDelay      - Enable or disable the reroute delay
root              - Move back to root level
show              - Display the switch configuration
speed             - Set the switch operating speed
```

Step 3 Set the switch offline. The switch must be offline before changing the mode to interop.

```
Config.Switch> interopmode open
Error 45:  Not Allowed While Switch Online
```

Note To change to interop mode, the switch must be set to offline.

```
Root> maint
Maint> system
Maint.System> setOnlineState 0
Maint.System> .
Maint> .
```

```
Root> show switch
Switch Information
State:                  Offline    <==== switch is now offline
BB Credit:              16
R_A_TOV:                100
E_D_TOV:                20
Preferred Domain ID:    1
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           McDATA Fabric 1.0
Active Domain ID:       1
World Wide Name:        10:00:08:00:88:20:80:43
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

Step 4 Set the default zone to deny, and set the mode to interop. As shown in this example, the switch cannot be set to interop mode without first setting the default zone to deny.

```
Root> config switch
Config.Switch> interopmode open
Error 81:  Default Zone Enabled

Root> config zoning
Config.Zoning> setDefZoneState 0
Config.Zoning> ..
Config> switch

Config.Switch> interopmode open
Config.Switch> ..
Config> ..

Root> show switch
Switch Information
State:                  Offline    <==== still offline
BB Credit:              16
R_A_TOV:                100
E_D_TOV:                20
Preferred Domain ID:    1
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           Open Fabric 1.0      <==== now in interop mode
Active Domain ID:       1
World Wide Name:        10:00:08:00:88:20:80:43
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

Step 5 Set the preferred domain ID, with an offset of 0x60. In this example, the McData switch is domain ID 0x61 (decimal 97). The FC IDs for nodes on this switch are 61xxxx.

```
Root> config switch
Config.Switch> prefDomainId 1

Config.Switch> ..
Config> ..
Root> maint
Maint> system
Maint.System> setonlinestate 1
Maint.System> ..
Maint> ..
```

```
Root> show switch
Switch Information
State:                  Online          <==== online
BB Credit:              16
R_A_TOV:                100
E_D_TOV:                20
Preferred Domain ID:    1
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           Open Fabric 1.0   <=== interop mode
Active Domain ID:       0
World Wide Name:        10:00:08:00:88:20:80:43
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

Configuring the MDS 9000 Switch

See Chapter 3, "MDS 9000 Core with Brocade Edge Topology (Interop Mode 1)," for examples of how to set the MDS 9000 switch to interop mode.

Verification

This section highlights the commands used to verify that the fabric is up and running in interoperability mode. It includes the following topics:

- Verifying the McData 6064 Switch, page 5-6
- Verifying the MDS 9509 Switch, page 5-9

Verifying the McData 6064 Switch

The following examples show the commands used to verify the configuration of the McData 6064 switch.

```
Root> show switch
Switch Information
State:                  Online
BB Credit:              16
R_A_TOV:                100
E_D_TOV:                20
Preferred Domain ID:    1
Switch Priority:        Default
Speed:                  1 Gb/sec
Rerouting Delay:        Disabled
Operating Mode:         Open Systems
Interop Mode:           Open Fabric 1.0
Active Domain ID:       1
World Wide Name:        10:00:08:00:88:20:80:43
Insistent Domain ID:    Disabled
Domain RSCN:            Disabled
```

```
Root> show system
System Information
Name:                 6064-01
Description:          FC Director Class Switch
Contact:
Location:             Lab
Date/Time:            12/17/2002 12:50:18
Serial Number:        -
Type Number:          ED6064
Model Number:         64
EC Level:             -
Firmware Version:     04.01.00 12
Beaconing:            Disabled
```

Issue the **show port status** command to verify that the correct ports are online, and are type E port or F port.

```
Root> show port status
Port  State                Type   Attached WWN             Beaconing
----  ------------------   -----  -----------------------  ---------
0     No Light             gPort  00:00:00:00:00:00:00:00  Off
1     No Light             gPort  00:00:00:00:00:00:00:00  Off
2     No Light             gPort  00:00:00:00:00:00:00:00  Off
3     Online               fPort  21:00:00:E0:8B:07:A4:36  Off
4     Not Installed        gPort  00:00:00:00:00:00:00:00  Off
5     Not Installed        gPort  00:00:00:00:00:00:00:00  Off
6     Not Installed        gPort  00:00:00:00:00:00:00:00  Off
7     Not Installed        gPort  00:00:00:00:00:00:00:00  Off
8     No Light             gPort  00:00:00:00:00:00:00:00  Off
9     No Light             gPort  00:00:00:00:00:00:00:00  Off
10    Online               ePort  20:63:00:05:30:00:86:9F  Off
11    No Light             gPort  00:00:00:00:00:00:00:00  Off
12    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
13    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
14    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
15    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
16    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
17    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
18    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
19    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
20    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
21    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
22    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
23    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
24    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
25    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
26    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
27    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
28    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
29    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
30    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
31    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
32    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
33    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
34    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
35    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
36    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
37    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
38    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
39    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
40    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
41    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
42    Not Installed        gPort  00:00:00:00:00:00:00:00  Off
```

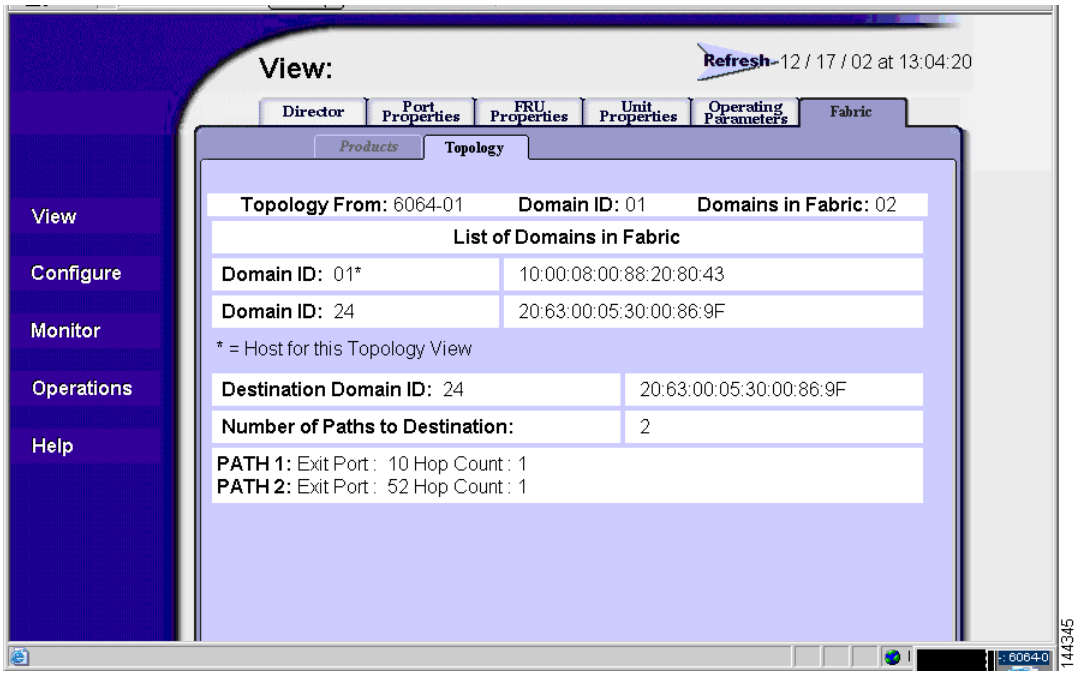
```
43    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
44    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
45    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
46    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
47    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
48    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
49    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
50    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
51    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
52    Online              ePort  20:63:00:05:30:00:86:9F  Off
53    No Light            gPort  00:00:00:00:00:00:00:00  Off
54    No Light            gPort  00:00:00:00:00:00:00:00  Off
55    No Light            gPort  00:00:00:00:00:00:00:00  Off
56    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
57    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
58    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
59    Not Installed       gPort  00:00:00:00:00:00:00:00  Off
60    No Light            gPort  00:00:00:00:00:00:00:00  Off
61    No Light            gPort  00:00:00:00:00:00:00:00  Off
62    No Light            gPort  00:00:00:00:00:00:00:00  Off
63    No Light            gPort  00:00:00:00:00:00:00:00  Off
```

The **show nameserver** command shows that the Netfinity host has logged into the McData switch.

```
Root> show nameserver
Type  Port Id  Port Name                Node Name                COS  FC4 Types
----  -------  -----------------------  -----------------------  ---  ------
fPort 610713   20:00:00:E0:8B:07:A4:36  21:00:00:E0:8B:07:A4:36  3    N/A

0. ISO/IEC 8802-2 LLC
1. ISO/IEC 8802-2 LLC/SNAP
2. SCSI-FCP
3. SCSI-GPP
4. IPI-3 Master
5. IPI-3 Slave
6. IPI-3 Peer
7. CP IPI-3 Master
8. CP IPI-3 Slave
9. CP IPI-3 Peer
10. SBCCS-Channel
11. SBCCS-Cntrl Unit
12. FC Srvcs
13. FC-FG
14. FC-XS
15. FC-AL
16. SNMP
17. HIPPI-FP
18. Vendor Unique

Root> show loginserver
Port  BB Crdt  RxFldSz  COS  Port Name                Node Name
----  -------  -------  ---  -----------------------  -----------------------
3     3        2048     3    20:00:00:E0:8B:07:A4:36  21:00:00:E0:8B:07:A4:36
```

To view the FSPF routes used by the McData 3032 switch, use the Web GUI tool (Figure 5-2). There is no command line entry available to show this information.

Figure 5-2 McData Core Displaying Routes



Verifying the MDS 9509 Switch

The following examples show the commands used to verify the configuration of the MDS 9509 switch.

```
switch# show version
Cisco Storage Area Networking Operating System (SAN-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (c) 2002 by Cisco Systems, Inc. All rights reserved.
The copyright for certain works contained herein are owned by
Andiamo Systems, Inc. and/or other third parties and are used and
distributed under license.


Software
  BIOS:      version 1.0.2
  loader:    version 1.0(1)
  kickstart: version 1.0(1)
  system:    version 1.0(1)

  BIOS compile time:       10/18/02
  kickstart image file is: bootflash:/boot-1.0.1.bin
  kickstart compile time:  12/4/2002 21:00:00
  system image file is:    bootflash:/isan-1.0.1.bin
  system compile time:     12/4/2002 21:00:00


Hardware
  RAM 1027636 kB

  bootflash: 503808 blocks (block size 512b)
  slot0:          0 blocks (block size 512b)

  172.22.93.10 uptime is 0 days 2 hours 16 minute(s) 21 second(s)
```

```
  Last reset
    Reason: Watchdog Timeout/External Reset
    System version: 1.0(1)

switch# show int br

--------------------------------------------------------------------------------
Interface  Vsan   Admin  Admin   Status          Oper  Oper   Port-channel
                  Mode   Trunk                   Mode  Speed
                         Mode                           (Gbps)
--------------------------------------------------------------------------------
fc1/1      1      FX     --      fcotAbsent      --    --     --
fc1/2      99     TL     --      up              TL    1      --
fc1/3      1      FX     --      fcotAbsent      --    --     --
fc1/4      1      FX     --      fcotAbsent      --    --     --
fc1/5      1      FX     --      fcotAbsent      --    --     --
fc1/6      1      FX     --      fcotAbsent      --    --     --
fc1/7      1      FX     --      fcotAbsent      --    --     --
fc1/8      1      FX     --      fcotAbsent      --    --     --
fc1/9      1      FX     --      fcotAbsent      --    --     --
fc1/10     1      FX     --      fcotAbsent      --    --     --
fc1/11     1      FX     --      fcotAbsent      --    --     --
fc1/12     1      FX     --      fcotAbsent      --    --     --
fc1/13     1      FX     --      fcotAbsent      --    --     --
fc1/14     1      FX     --      fcotAbsent      --    --     --
fc1/15     1      FX     --      fcotAbsent      --    --     --
fc1/16     1      FX     --      fcotAbsent      --    --     --
fc1/17     1      FX     --      fcotAbsent      --    --     --
fc1/18     1      FX     --      fcotAbsent      --    --     --
fc1/19     1      FX     --      fcotAbsent      --    --     --
fc1/20     1      FX     --      fcotAbsent      --    --     --
fc1/21     1      FX     --      fcotAbsent      --    --     --
fc1/22     1      FX     --      fcotAbsent      --    --     --
fc1/23     1      FX     --      fcotAbsent      --    --     --
fc1/24     1      FX     --      fcotAbsent      --    --     --
fc1/25     1      FX     --      fcotAbsent      --    --     --
fc1/26     1      FX     --      fcotAbsent      --    --     --
fc1/27     1      FX     --      fcotAbsent      --    --     --
fc1/28     1      FX     --      fcotAbsent      --    --     --
fc1/29     99     E      auto    up              E     1      --
fc1/30     1      FX     --      fcotAbsent      --    --     --
fc1/31     1      FX     --      fcotAbsent      --    --     --
fc1/32     1      FX     --      fcotAbsent      --    --     --
fc3/1      1      auto   on      fcotAbsent      --    --     --
fc3/2      1      auto   on      fcotAbsent      --    --     --
fc3/3      1      auto   on      fcotAbsent      --    --     --
fc3/4      1      auto   on      fcotAbsent      --    --     --
fc3/5      99     auto   off     up              E     1      --
fc3/6      1      auto   on      fcotAbsent      --    --     --
fc3/7      1      auto   on      fcotAbsent      --    --     --
fc3/8      1      auto   on      fcotAbsent      --    --     --
fc3/9      1      E      on      fcotAbsent      --    --     --
fc3/10     1      auto   on      fcotAbsent      --    --     --
fc3/11     1      auto   on      fcotAbsent      --    --     --
fc3/12     1      auto   on      fcotAbsent      --    --     --
fc3/13     1      E      off     notConnected    --    --     --
fc3/14     1      auto   on      fcotAbsent      --    --     --
fc3/15     1      auto   on      fcotAbsent      --    --     --
fc3/16     1      auto   on      fcotAbsent      --    --     --

--------------------------------------------------------------------------------
```

```
Interface          Status                            Speed
                                                     (Gbps)
--------------------------------------------------------------------------------
sup-fc0            up                                1
--------------------------------------------------------------------------------
Interface          Status   IP Address               Speed        MTU
--------------------------------------------------------------------------------
mgmt0              up       172.22.93.10/24          100 Mbps     1500


switch#  show vsan 99
vsan 99 information
         name:VSAN0099  state:active
         interoperability mode:yes
         loadbalancing:src-id/dst-id/oxid
         operational state:up

switch# show fcdomain v 99
The local switch is the Principal Switch.

Local switch run time information:
        State: Stable
        Local switch WWN:    20:63:00:05:30:00:86:9f
        Running fabric name: 20:63:00:05:30:00:86:9f
        Running priority: 2
        Current domain ID: 0x78(120)

Local switch configuration information:
        State: Enabled
        Auto-reconfiguration: Disabled
        Contiguous-allocation: Disabled
        Configured fabric name: 20:01:00:05:30:00:28:df
        Configured priority: 128
        Configured domain ID: 0x00(0) (preferred)

Principal switch run time information:
        Running priority: 2

Interface               Role          RCF-reject
----------------    -------------    ------------
fc1/29              Downstream       Disabled
fc3/5               Non-principal    Disabled
----------------    -------------    ------------

switch# show fcdomain domain-list v 99

Number of domains: 2
Domain ID              WWN
---------    -----------------------
0x78(120)    20:63:00:05:30:00:86:9f [Local] [Principal]
 0x61(97)    10:00:08:00:88:20:80:43
---------    -----------------------


switch# show fspf internal route vsan 99

FSPF Unicast Routes
---------------------------
 VSAN Number  Dest Domain   Route Cost    Next hops
-----------------------------------------------
          99     0x61(97)         1000        fc3/5
                                            fc1/29
```

```
switch# show fcns database vsan 99

VSAN 99:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x610713    N     21:00:00:e0:8b:07:a4:36 (QLogic)
0x7800d5    NL    22:00:00:20:37:0e:65:da (Seagate)       scsi-fcp:target
0x7800d6    NL    22:00:00:20:37:14:74:e8 (Seagate)       scsi-fcp:target
0x7800d9    NL    22:00:00:20:37:04:f8:a1 (Seagate)       scsi-fcp:target
0x7800da    NL    22:00:00:20:37:0c:6f:a9 (Seagate)       scsi-fcp:target
0x7800dc    NL    22:00:00:20:37:0d:b6:4b (Seagate)       scsi-fcp:target
0x7800e0    NL    22:00:00:20:37:0e:65:44 (Seagate)       scsi-fcp:target
0x7800e1    NL    22:00:00:20:37:0c:75:d5 (Seagate)       scsi-fcp:target
0x7800e2    NL    22:00:00:20:37:04:ea:2b (Seagate)       scsi-fcp:target
0x7800e4    NL    22:00:00:20:37:14:74:49 (Seagate)       scsi-fcp:target
0x7800e8    NL    22:00:00:20:37:14:74:fc (Seagate)       scsi-fcp:target

Total number of entries = 11
```

You can use Fabric Manager and Device Manager to verify the current state of the fabric. Figure 5-3 shows the fabric topology from Fabric Manager.

Figure 5-3 MDS 9000 Switch and McData Dual Core Displayed in Fabric Manager

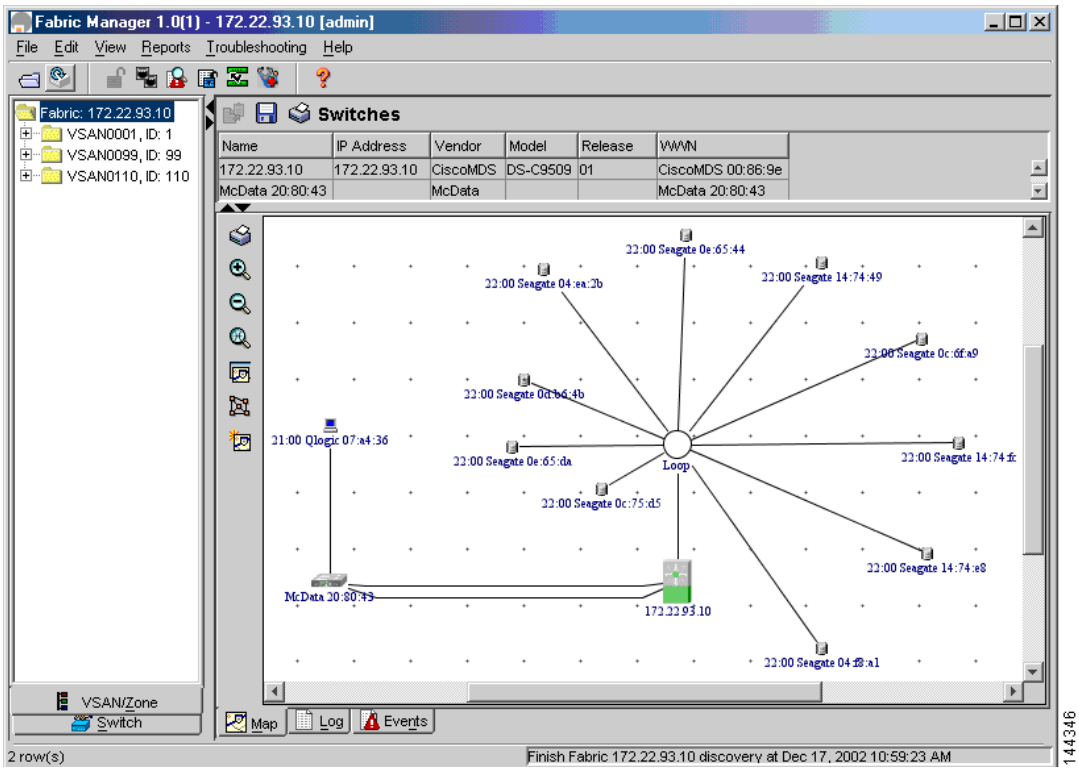


Figure 5-4 shows Device Manager on the MDS 9509 switch in the example topology. It shows which ports are active as E ports.

Figure 5-4 MDS 9509 Switch Device Manager Showing Active Ports

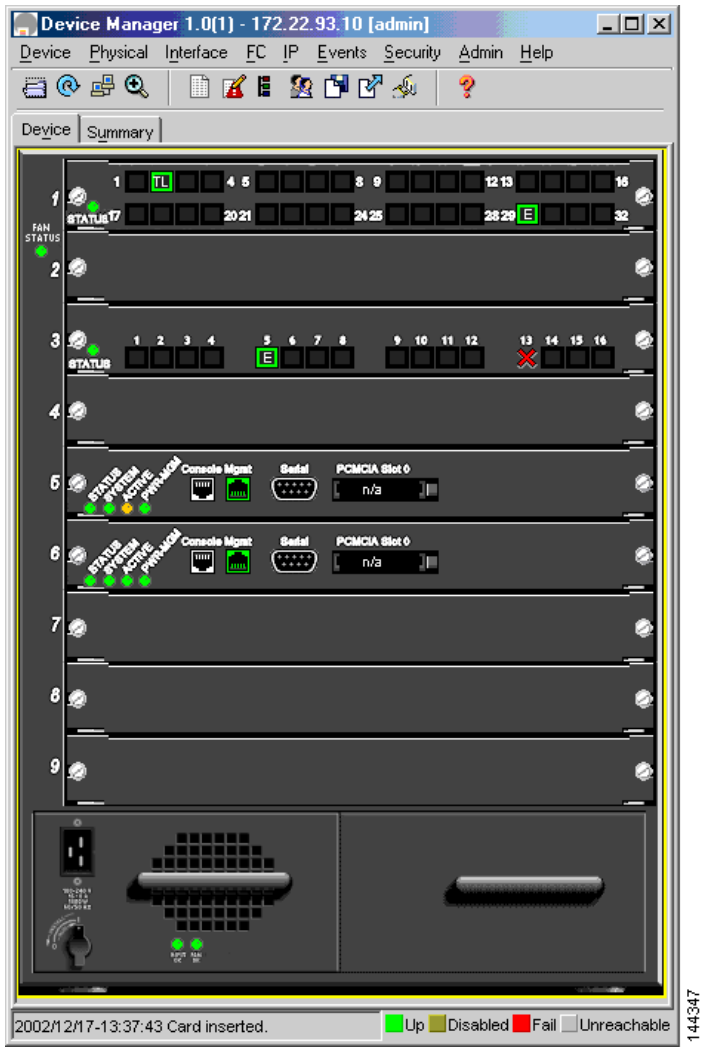
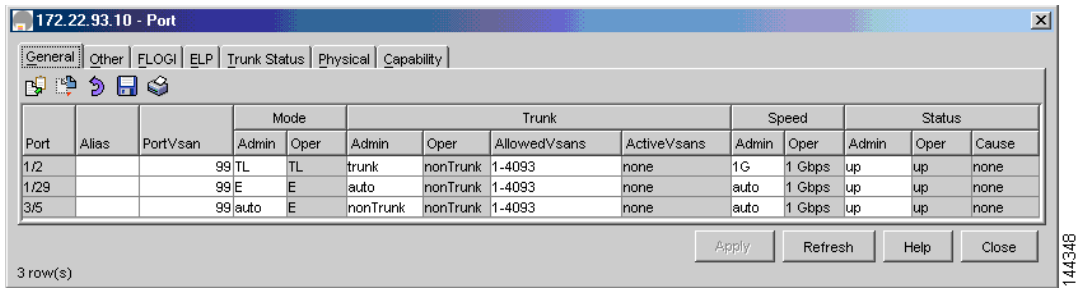


Figure 5-5 shows the status of the E ports and can verify link speed.

Figure 5-5 Fabric Manager Verifying Port Status and Type



Port	Alias	PortVsan	Mode Admin	Mode Oper	Trunk Admin	Trunk Oper	Trunk AllowedVsans	Trunk ActiveVsans	Speed Admin	Speed Oper	Status Admin	Status Oper	Status Cause
1/2		99	TL	TL	trunk	nonTrunk	1-4093	none	1G	1 Gbps	up	up	none
1/29		99	E	E	auto	nonTrunk	1-4093	none	auto	1 Gbps	up	up	none
3/5		99	auto	E	nonTrunk	nonTrunk	1-4093	none	auto	1 Gbps	up	up	none

Figure 5-6 shows the domain ID of the switches in the fabric.

Figure 5-6 Fabric Manager Verifying Domains

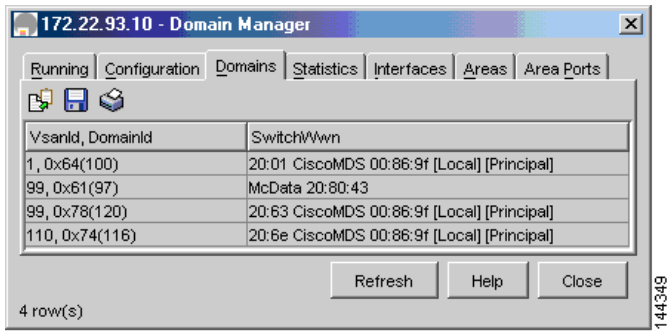


Figure 5-7 shows that VSAN 99 is operating in interop mode.

Figure 5-7 Verifying Interop Mode is Set

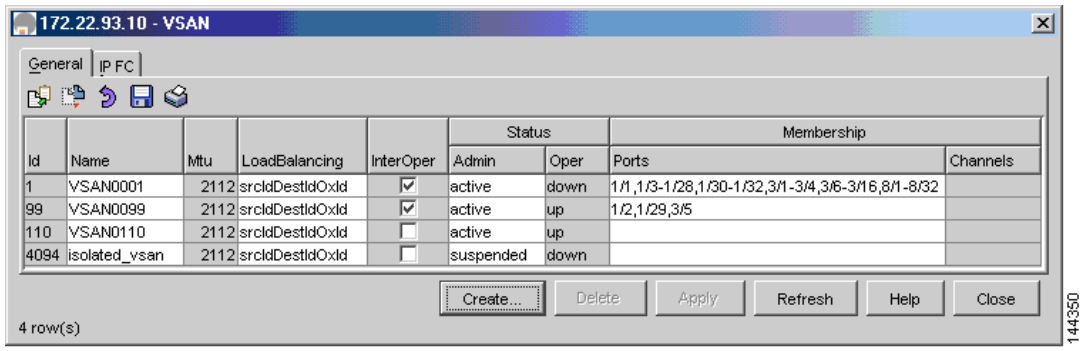


Figure 5-8 shows the MDS 9509 switch name server. This shows the edge devices that have registered.

Figure 5-8 MDS 9509 Switch Name Server Entries

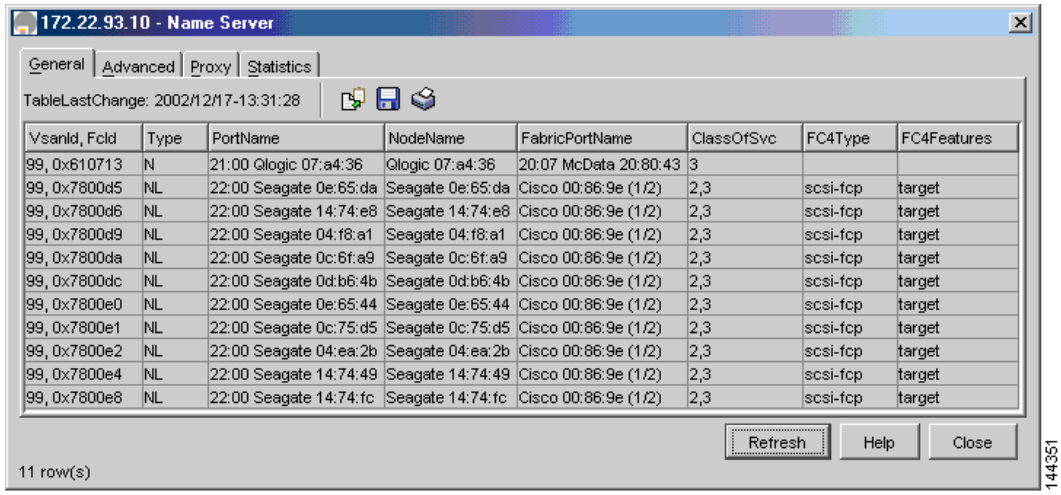
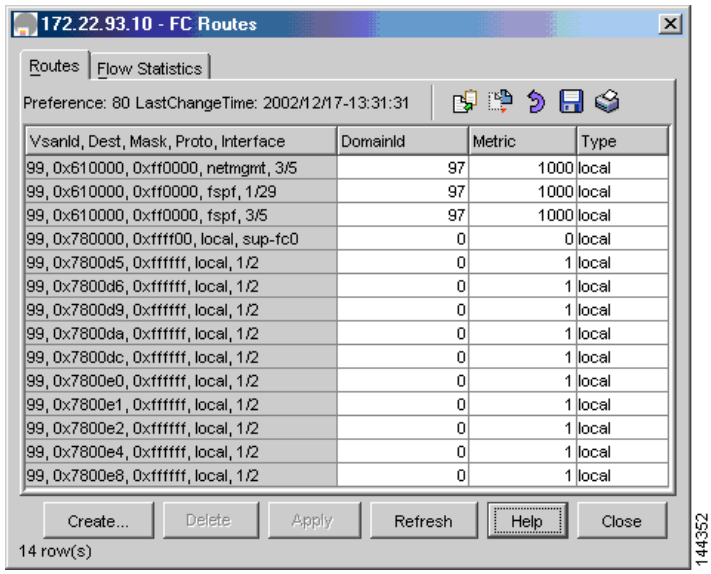


Figure 5-9 shows the FSPF routes as calculated by this switch.

Figure 5-9 FSPF Calculations in Fabric Manager



VsanId, Dest, Mask, Proto, Interface	DomainId	Metric	Type
99, 0x610000, 0xff0000, netmgmt, 3/5	97	1000	local
99, 0x610000, 0xff0000, fspf, 1/29	97	1000	local
99, 0x610000, 0xff0000, fspf, 3/5	97	1000	local
99, 0x780000, 0xffff00, local, sup-fc0	0	0	local
99, 0x7800d5, 0xffffff, local, 1/2	0	1	local
99, 0x7800d6, 0xffffff, local, 1/2	0	1	local
99, 0x7800d9, 0xffffff, local, 1/2	0	1	local
99, 0x7800da, 0xffffff, local, 1/2	0	1	local
99, 0x7800dc, 0xffffff, local, 1/2	0	1	local
99, 0x7800e0, 0xffffff, local, 1/2	0	1	local
99, 0x7800e1, 0xffffff, local, 1/2	0	1	local
99, 0x7800e2, 0xffffff, local, 1/2	0	1	local
99, 0x7800e4, 0xffffff, local, 1/2	0	1	local
99, 0x7800e8, 0xffffff, local, 1/2	0	1	local

Zoning

In this example topology, Fabric Manager was used to create zones and zone sets. Fabric Manager displays are also used to verify the zone and zone set information.

Figure 5-10 shows the zones and zone sets displayed in Fabric Manager.

Figure 5-10 Zoning Configuration for MDS 9000 Switch and McData Dual Core Topology

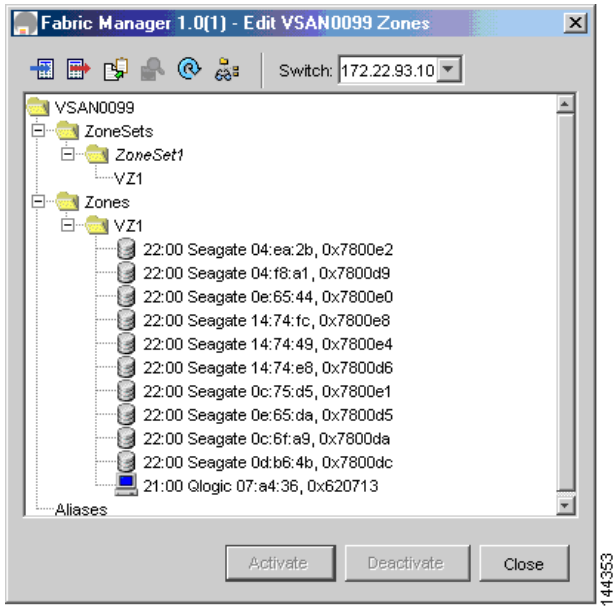


Figure 5-11 shows the zone VZ1.

Figure 5-11 Zone VZ1 Displayed in Fabric Manager

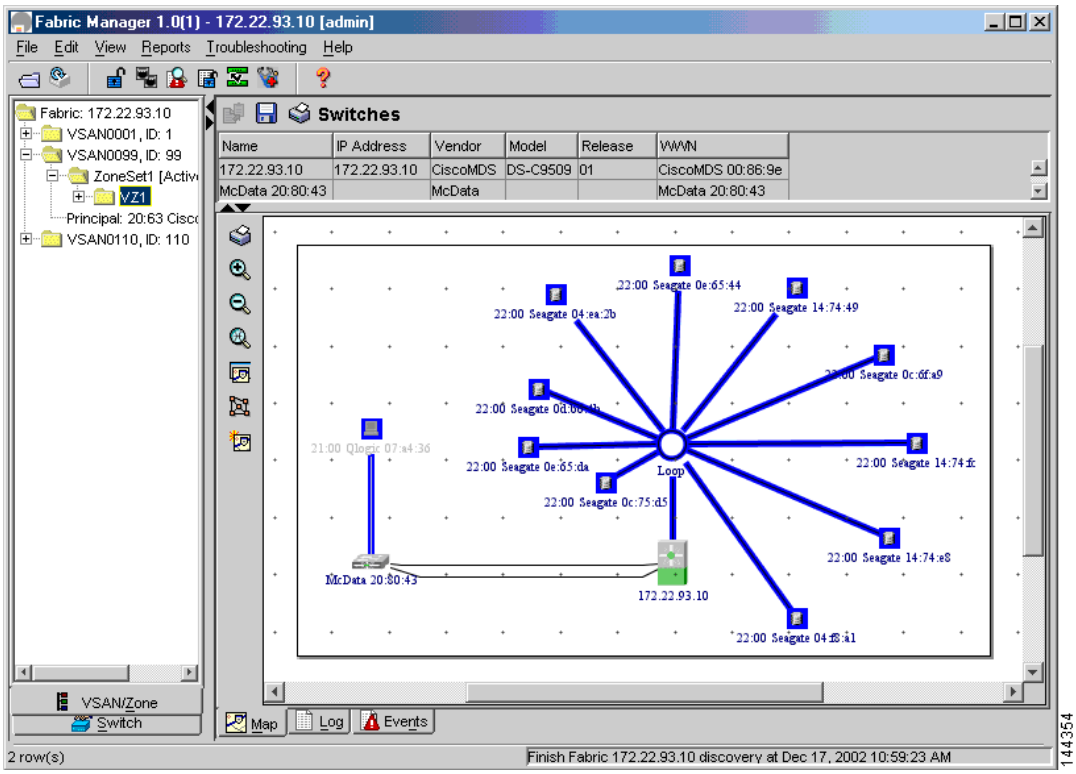
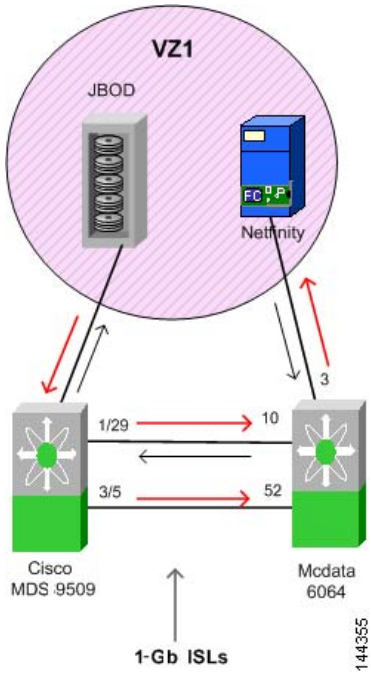


Figure 5-12 shows the FSPF traffic flow in this multi-vendor fabric.

Figure 5-12 MDS 9000 Switch and McData Dual Core FSPF Data Flow



CHAPTER 6

MDS 9000 Core with Brocade 3900/12000 Edge Topology

This chapter describes how to set up a basic core-edge topology with one MDS 9000 switch configured for interop mode 1 at the core and two Brocade switches at the edge. All devices are connected to the edge switches. However, all traffic must flow through the core switch to reach its destination.

This chapter includes the following sections:

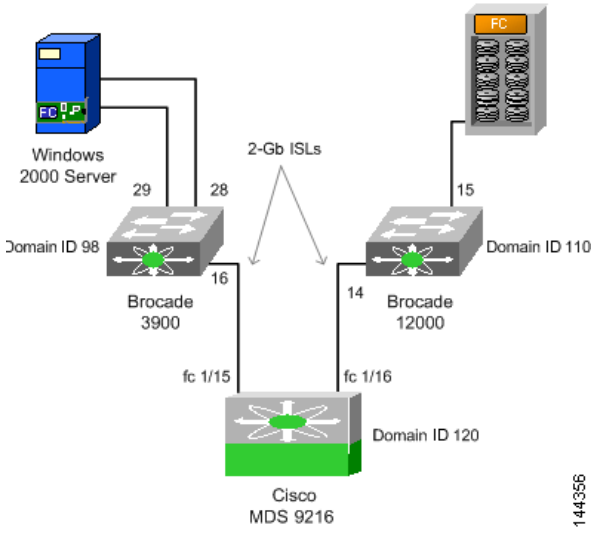
Specifications

The following switches and code levels were used for this example configuration:

- MDS 9216 running MDS SAN-OS Release 1.1(1)
- Brocade 3900 Version 04.0.2d
- Brocade 12000 Version 4.0.2c

Figure 6-1 shows the topology used for this example configuration.

Figure 6-1 MDS 9000 Switch Core Switch with Brocade 3900 and 12000 Edge Switch Topology



Expected Topology Behavior

This section covers the Fibre Channel services and features that act differently in this topology (Figure 6-1) as compared to a homogeneous, single-vendor implementation.

This section contains the following topics:

Zoning

In the core-edge topology (using standard interop mode), zone members are all pWWNs because the Brocade domain/port nomenclature is not a valid form according to the FC standard. When a zone set (or *configuration*, in Brocade terminology) activation is made at the core switch, the zone set activation reaches all switches at the same time because they are all the same distance from the core.

The Brocade edge switches provide all of the zone security because the MDS 9000 switch does not check the source and destination of the frame when traversing E ports. Brocade switches only check the zoning information on the egress port of the fabric.

Note After two active zone sets successfully merge, always copy the active zone set to the full zone set database prior to modifying it on the MDS 9000 switch.

FSPF

All links within the topology show the link cost of 500.

Because the Brocade switches load balance their routes using source and destination, the ingress edge switch uses the same core switch for all traffic that has the same source and destination pair. If the Brocade switch could load balance using source/destination/ox-id, then it could choose either of the two core switches for the route through the fabric.

Trunking and PortChannels

The lack of MDS 9000 switch-to-MDS 9000-switch connections prohibits the topology from containing TE ports or PortChannels. While in interop mode, the Brocade switches do not support trunked ports of any type. Only standard E ports are used for the ISLs.

Domain IDs

The domain IDs are limited to the 97 to 127 range due to a restriction imposed by McData's inability to handle IDs outside of that range. While Brocade switches and MDS 9000 switches can handle domain IDs outside of this range, their implementation of interoperability mode includes this limitation.

Domain ID modifications can be handled in two ways, disruptively or nondisruptively:

- **Disruptive**—This event impacts the entire switch. When changing domain IDs, Brocade requires the entire switch to be taken offline and/or rebooted.
- **Nondisruptive**—This event is limited to the VSAN where the event is taking place. Only the MDS 9000 switch can perform this action, as the domain manager process for this VSAN is restarted and not the entire switch. This restart requires any device logged into the VSAN to log into the fabric again to obtain a new FC ID.

Configuration

This section describes the configuration process and includes the following topics:

Configuring the MDS 9000 Switch

Follow these steps to configure the MDS 9000 switch.

Step 1 Place the VSAN of the E ports(s) that connect to the OEM switch in interoperability mode.

```
MDS9000# config t
MDS9000(config)# vsan database
MDS9000(config-vsan-db)# vsan 1 interop
```

Step 2 Assign a domain ID in the range of 97 (0x61) through 127 (0x7F). This interop mode limitation restricts the fabric to a total of 31 switches.

In the MDS 9000 switch, the default is to request an ID from the principal switch. If the **preferred** keyword is used, the MDS 9000 switch requests a specific ID, but still joins the fabric if the principal switch assigns a different ID. If the **static** keyword is used, the MDS 9000 switch will not join the fabric unless the principal switch agrees, and assigns the requested ID.

```
MDS9000# config t
MDS9000(config)# fcdomain domain 120 preferred vsan 1
```

Step 3 Change the Fibre Channel timers if they have been changed from the system defaults. The FC error Detect (ED_TOV) and Resource Allocation (RA_TOV) timers on the MDS 9000 switch and Brocade switches default to the same values. The RA_TOV defaults to 10 seconds, and the ED_TOV defaults to 2 seconds. These values can be changed. According to the FC-SW2 standard, these values must be the same on each switch in the fabric.

```
MDS9000# config t
MDS9000(config)# fctimer e_d_tov ?
  <1000-100000>  E_D_TOV in milliseconds(1000-100000)

MDS9000(config)# fctimer r_a_tov ?
  <5000-100000>  R_A_TOV in milliseconds(5000-100000)
```

Step 4 After making changes to the domain, restart the MDS 9000 switch domain manager function for the altered VSAN. To do this, suspend and then resume the VSAN.

```
MDS9509(config)# vsan database
MDS9509(config-vsan-db)# vsan 1 suspend
MDS9509(config-vsan-db)# no vsan 1 suspend
```

Configuring the Brocade 3900 Switch

Follow these steps to configure the Brocade 3900 switch in interoperability mode.

Step 1 Disable the switch. This is a disruptive process.

```
CA3900:admin> switchdisable
```

Step 2 Enter the configuration dialog.

```
CA3900:admin> configure

Configure...

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

    Domain: (97..239) [98] 98   <==== Assign domain id in the 97-127 range
    R_A_TOV: (4000..120000) [10000]  <==== Must match other switches in the fabric
    E_D_TOV: (1000..5000) [2000]  <==== Must match other switches in the fabric
    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]
    VC Encoded Address Mode: (0..1) [0]
    Per-frame Route Priority: (0..1) [0]
    BB credit: (1..16) [16]
```

```
  Virtual Channel parameters (yes, y, no, n): [no]
  Zoning Operation parameters (yes, y, no, n): [no]
  RSCN Transmission Mode (yes, y, no, n): [no]
  NS Operation Parameters (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]
```

Step 3 Disable platform management services. Failure to do this will isolate any E ports that connect to non-Brocade switches.

```
CA3900: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.
```

Step 4 Configure interoperability mode, and then reboot.

```
CA3900:admin> interopmode 1  Set interop mode on
Committing configuration...done.
interopMode is 1

NOTE: It is recommended that you reboot the switch to make this change take effect
```

Note Do not ignore the warning message. Anomalies were experienced that required a switch reboot.

```
CA3900:admin> fastboot
```

To return to non-interop mode, you must disable the switch. Reconfigure the switch, set the interoperability mode to 0, and then reboot.

Configuring the Brocade 12000 Switch

Follow these steps to configure the Brocade 12000 switch in interoperability mode.

Step 1 Disable the switch. This is a disruptive process.

```
CA12000:admin> switchdisable
```

Step 2 Enter the configuration dialog.

```
CA12000:admin> configure

Configure...

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

    Domain: (97..239) [110] 110   <==== Assign domain id in the 97-127 range
    R_A_TOV: (4000..120000) [10000]  <==== Must match other switches in the fabric
    E_D_TOV: (1000..5000) [2000]  <==== Must match other switches in the fabric
    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]
```

```
    VC Encoded Address Mode: (0..1) [0]
    Per-frame Route Priority: (0..1) [0]
    BB credit: (1..16) [16]

  Virtual Channel parameters (yes, y, no, n): [no
  Zoning Operation parameters (yes, y, no, n): [n
  RSCN Transmission Mode (yes, y, no, n): [no]
  NS Operation Parameters (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]
```

Step 3 Disable platform management services. Failure to do this will isolate E ports that connect to non-Brocade switches.

```
CA12000: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.
```

Step 4 Configure interoperability mode at the command line, and then reboot.

```
CA12000:admin> interopmode 1 Set interop mode on
Committing configuration...done.
interopMode is 1
NOTE: It is recommended that you boot this switch to make this change take effect
```

Note Do not ignore the above warning message. Anomalies were experienced that required a switch reboot.

```
CA12000:admin> fastboot
```

To return to non-interop mode, disable the switch. Reconfigure the switch, set interoperability mode to 0, and then reboot.

Verification

The following section highlights the commands used to verify that the fabric is up and running in interoperability mode.

In this example topology, there are only single ISLs. If there were multiple ISLs connecting the edge Brocade switches to the core MDS 9000 switch, the Brocade switches would load balance their routes using source and destination, and the ingress edge switch would use the same ISL for all traffic that has the same source and destination pair. The MDS 9000 switch would continue to load balance across ISLs using the source/destination/ox-id of the frame. This principle is illustrated in Figure 5-12.

Verifying the MDS 9000 Switch

The following examples show verification of the MDS 9000 switch.

```
MDS9000# show version
Cisco Storage Area Networking Operating System (SAN-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (c) 2002-2003 by Cisco Systems, Inc. All rights reserved.
The copyright for certain works contained herein are owned by
Andiamo Systems, Inc. and/or other third parties and are used and
distributed under license.


Software
  BIOS:      version 1.0.7
  loader:    version 1.0(3a) [last : 1.0(4)]
  kickstart: version 1.1(1)
  system:    version 1.1(1)

  BIOS compile time:       03/20/03
  kickstart image file is: bootflash:/m9200-ek9-kickstart-mz.1.1.1.bin
  kickstart compile time:  5/23/2003 0:00:00
  system image file is:    bootflash:/m9200-ek9-mz.1.1.1.bin
  system compile time:     5/23/2003 0:00:00


Hardware
  RAM 963116 kB

  bootflash: 500736 blocks (block size 512b)
  slot0:          0 blocks (block size 512b)

  MDS9000 uptime is 1 days 21 hours 38 minute(s) 3 second(s)

  Last reset at 412363 usecs after Wed Jul  2 02:40:38 2003
    Reason: Reset Requested by management application
    System version: 1.1(1)

MDS9000# show interface brief

--------------------------------------------------------------------------------
Interface  Vsan   Admin  Admin   Status          Oper  Oper   Port-channel
                  Mode   Trunk                   Mode  Speed
                         Mode                          (Gbps)
--------------------------------------------------------------------------------
fc1/1      1      auto   on      notConnected    --           --
fc1/2      1      auto   on      notConnected    --           --
fc1/3      1      auto   on      down            --           --
fc1/4      1      auto   on      down            --           --
fc1/5      1      auto   on      down            --           --
fc1/6      1      auto   on      down            --           --
fc1/7      1      auto   on      down            --           --
fc1/8      1      auto   on      down            --           --
fc1/9      1      auto   on      down            --           --
fc1/10     1      auto   on      down            --           --
fc1/11     1      auto   on      down            --           --
fc1/12     1      auto   on      down            --           --
fc1/13     1      auto   on      down            --           --
fc1/14     1      auto   on      down            --           --
fc1/15     1      auto   on      up              E     2      --
fc1/16     1      E      on      up              E     2      --
```

```
--------------------------------------------------------------------------------
Interface          Status                             Speed
                                                             (Gbps)
--------------------------------------------------------------------------------
sup-fc0                up                                 1

--------------------------------------------------------------------------------
Interface               Status     IP Address        Speed        MTU
--------------------------------------------------------------------------------
mgmt0                    up         172.22.36.255/23  100 Mbps     1500

--------------------------------------------------------------------------------
Interface          Status   IP Address                Speed        MTU
--------------------------------------------------------------------------------
vsan1               up    --                       1 Gbps       1500

MDS9000# show running-config

Building Configuration ...
vsan database
vsan 1 interop


 interface vsan1


snmp-server community public rw
snmp-server user admin network-admin auth md5 0xe649424ae4a77d12a40f7dd86f55965
 localizedkey
snmp-server host 10.10.3.20 traps version 1 public
snmp-server host 171.69.122.33 traps version 2c public udp-port 2162
snmp-server host 171.71.188.65 traps version 2c public udp-port 4058

boot system bootflash:/m9200-ek9-mz.1.1.1.bin
boot kickstart bootflash:/m9200-ek9-kickstart-mz.1.1.1.bin

ip default-gateway 172.22.36.1
kernel core module 1 level ram
kernel core module 2 level ram
kernel core module 3 level ram
kernel core module 4 level ram
kernel core module 5 level ram
kernel core module 6 level ram
kernel core module 7 level ram
kernel core module 8 level ram
kernel core module 9 level ram
kernel core module 10 level ram
kernel core module 11 level ram
kernel core module 12 level ram
kernel core module 13 level ram
kernel core module 14 level ram
kernel core module 15 level ram



switchname MDS9000
username admin password 5 AOpL5dCXKyzng  role network-admin
zone name Bro12000 vsan 1
  member pwwn 21:01:00:e0:8b:29:8b:3e
  member pwwn 21:00:00:e0:8b:09:8b:3e
  member pwwn 50:06:0e:80:03:4e:95:32
```

```
zone default-zone permit vsan 2-4

zoneset name BrocadeZoneSet vsan 1
  member Bro12000

zoneset  activate name BrocadeZoneSet vsan 1

 interface fc1/1
no shutdown


 interface fc1/2
no shutdown


 interface fc1/3


 interface fc1/4


 interface fc1/5


 interface fc1/6


 interface fc1/7


 interface fc1/8


 interface fc1/9


 interface fc1/10


 interface fc1/11


 interface fc1/12


 interface fc1/13


 interface fc1/14


 interface fc1/15
no shutdown


 interface fc1/16
switchport mode E
no shutdown


 interface mgmt0
ip address 172.22.36.255 255.255.254.0
```

```
MDS9000#  show vsan 1
vsan 1 information
         name:VSAN0001  state:active
         interoperability mode:yes
         loadbalancing:src-id/dst-id/oxid
         operational state:up

MDS9000# show fcdomain vsan 1
The local switch is a Subordinated Switch.

Local switch run time information:
        State: Stable
        Local switch WWN:    20:01:00:05:30:00:68:5f
        Running fabric name: 10:00:00:60:69:90:08:2f
        Running priority: 128
        Current domain ID: 0x78(120)  <==== Verify domain id

Local switch configuration information:
        State: Enabled
        FCID persistence: Disabled
        Auto-reconfiguration: Disabled
        Contiguous-allocation: Disabled
        Configured fabric name: 20:01:00:05:30:00:28:df
        Configured priority: 128
        Configured domain ID: 0x00(0) (preferred)

Principal switch run time information:
        Running priority: 2

Interface               Role          RCF-reject
----------------    -------------    ------------
fc1/15              Upstream         Disabled
fc1/16              Downstream    Disabled
----------------    -------------    ------------

MDS9000# show fcdomain domain-list vsan 1

Number of domains: 3
Domain ID               WWN
---------    ------------------------
 0x62(98)    10:00:00:60:69:90:08:2f [Principal]  <==== Brocade 3900
0x6e(110)    10:00:00:60:69:80:1d:cf       <==== Brocade 12000
0x78(120)    20:01:00:05:30:00:68:5f [Local]      <==== MDS9216

MDS9000# show fspf internal route vsan 1

FSPF Unicast Routes
---------------------------
 VSAN Number  Dest Domain   Route Cost    Next hops
----------------------------------------------
           1     0x62(98)          500       fc1/15
           1    0x6e(110)          500       fc1/16

MDS9000# show fspf internal route vsan 1

FSPF Unicast Routes
---------------------------
 VSAN Number  Dest Domain   Route Cost    Next hops
----------------------------------------------
           1     0x62(98)          500       fc1/15
           1    0x6e(110)          500       fc1/16
```

```
MDS9000# show fcns database vsan 1

VSAN 1:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x621c00    N     21:01:00:e0:8b:29:8b:3e (QLogic)
0x621d00    N     21:00:00:e0:8b:09:8b:3e (QLogic)
0x6e0e00    N     50:06:0e:80:03:4e:95:32                 scsi-fcp

Total number of entries = 3
```

Note The MDS name server shows both local and remote entries, and it does not time out the entries.

Verifying the Brocade 3900 Switch

The following examples show verification of the Brocade 3900 switch.

```
CA3900:admin> version
Kernel:     2.4.2
Fabric OS:  v4.0.2d
Made on:    Sat Apr 5 00:22:58 2003
Flash:      Mon Jun 23 18:49:49 2003
BootProm:   3.1.18

CA3900:admin> licenseshow
edcczbyc9pedd0X:
    Web license
    Zoning license
    Fabric license
    Fabric Watch license
    Trunking license

CA3900:admin> switchshow
switchName:     CA3900
switchType:     12.1
switchState:    Online
switchRole:     Principal
switchDomain:   98
switchId:       fffc62
switchWwn:      10:00:00:60:69:90:08:2f
switchBeacon:   OFF

Port Gbic Speed State
=========================
  0   --    N2   No_Module
  1   --    N2   No_Module
  2   --    N2   No_Module
  3   --    N2   No_Module
  4   --    N2   No_Module
  5   --    N2   No_Module
  6   --    N2   No_Module
  7   --    N2   No_Module
  8   --    N2   No_Module
  9   --    N2   No_Module
 10   --    N2   No_Module
 11   --    N2   No_Module
 12   --    N2   No_Module
 13   --    N2   No_Module
```

```
 14   --    N2   No_Module
 15   id    N2   No_Light
 16   id    N2   Online    E-Port  20:01:00:05:30:00:68:5f (downstream)
 17   --    N2   No_Module
 18   --    N2   No_Module
 19   --    N2   No_Module
 20   --    N2   No_Module
 21   --    N2   No_Module
 22   --    N2   No_Module
 23   --    N2   No_Module
 24   --    N2   No_Module
 25   --    N2   No_Module
 26   --    N2   No_Module
 27   --    N2   No_Module
 28   id    N2   Online    F-Port  21:01:00:e0:8b:29:8b:3e
 29   id    N2   Online    F-Port  21:00:00:e0:8b:09:8b:3e
 30   id    N2   No_Light
 31   id    N2   No_Light


CA3900:admin> topologyshow

3 domains in the fabric; Local Domain ID: 98

Domain:         110
Metric:         1000
Name:           CA12000
Path Count:     1

        Hops:                   2
        Out Port:               16
        In Ports:               28 29
        Total Bandwidth:        2 Gbps
        Bandwidth Demand:       200 %
        Flags:                  D

Domain:         120
Metric:         500
Name:           Unknown
Path Count:     1

        Hops:                   1
        Out Port:               16
        In Ports:               28 29
        Total Bandwidth:        2 Gbps
        Bandwidth Demand:       200 %
        Flags:                  D

CA3900:admin> interopmode
InteropMode: On

Usage: InteropMode 0|1
         0: to turn it off
         1: to turn it on

CA3900:admin> nsallshow
3 Nx_Ports in the Fabric {
  621c00 621d00 6e0e00
}
```

Note The Brocade switch remote name server entries time out of the cache after 900 seconds (15 minutes).

```
CA3900:admin> urouteshow

Local Domain ID: 98

In Port    Domain    Out Port    Metric    Hops    Flags    Next (Dom, Port)
-------------------------------------------------------------------------------
  28        110         16        1000       2       D          120,65550
            120         16         500       1       D          120,65550
```

Verifying the Brocade 12000 Switch

The following examples show the commands used to verify the configuration of the Brocade 12000 switch.

```
CA12000:admin> version
Kernel:     2.4.2
Fabric OS:  v4.0.2c
Made on:    Wed Jan 22 04:17:49 2003
Flash:      Thu Mar 20 23:48:04 2003
BootProm:   3.1.18

CA12000:admin> licenseshow
SQeRRcyyRzdRfSSz:
    Web license
    Zoning license
    Fabric Watch license
    Trunking license
Rzb9SzQc99S0cATc:
    Fabric license

CA12000:admin> switchshow
switchName:     CA12000
switchType:     10.1
switchState:    Online
switchRole:     Subordinate
switchDomain:   110
switchId:       fffc6e
switchWwn:      10:00:00:60:69:80:1d:cf
switchBeacon:   OFF
blade7 Beacon:  OFF

Area Slot Port Gbic Speed State
=====================================
  0    7    0   id    N2   No_Light
  1    7    1   id    N2   No_Light
  2    7    2   id    N2   No_Light
  3    7    3   id    N2   No_Light
  4    7    4   id    N2   No_Light
  5    7    5   id    N2   No_Light
  6    7    6   id    N2   No_Light
  7    7    7   id    N2   No_Light
  8    7    8   id    N2   No_Light
  9    7    9   id    N2   No_Light
 10    7   10   id    N2   No_Light
 11    7   11   id    N2   No_Light
 12    7   12   id    N2   No_Light
 13    7   13   id    N2   No_Light
 14    7   14   id    N2   Online    F-Port  50:06:0e:80:03:4e:95:32
 15    7   15   id    N2   Online    E-Port  20:01:00:05:30:00:68:5f (upstream)
```

```
CA12000:admin> topologyshow

3 domains in the fabric; Local Domain ID: 110

Domain:         98
Metric:         1000
Name:           CA3900
Path Count:     1

        Hops:                   2
        Out Port:               7/15
        In Ports:               7/14
        Total Bandwidth:        2 Gbps
        Bandwidth Demand:       100 %
        Flags:                  D

Domain:         120
Metric:         500
Name:           Unknown
Path Count:     1

        Hops:                   1
        Out Port:               7/15
        In Ports:               7/14
        Total Bandwidth:        2 Gbps
        Bandwidth Demand:       100 %
        Flags:                  D

CA12000:admin> interopmode
InteropMode: On

Usage: InteropMode 0|1
         0: to turn it off
         1: to turn it on

CA12000:admin> nsshow
The Local Name Server has 1 entry {
 Type Pid    COS     PortName                NodeName                 TTL(sec)
 N    6e0e00;      3;50:06:0e:80:03:4e:95:32;50:06:0e:80:03:4e:95:32; na
    FC4s: FCP [HITACHI OPEN-3          2105]
    Fabric Port Name: 20:0e:00:60:69:80:1d:cf

}
CA12000:admin> nsallshow
3 Nx_Ports in the Fabric {
  621c00 621d00 6e0e00
}
```

Note The Brocade switch remote name server entries time out of the cache after 900 seconds (15 minutes).

```
CA12000:admin> urouteshow

Local Domain ID: 110

In Port    Domain    Out Port    Metric    Hops    Flags    Next (Dom, Port)
-------------------------------------------------------------------------------
  14         98         15        1000       2       D          120,65551
            120         15         500       1       D          120,65551
```

Zoning

In this example, the zone is created on the MDS 9000 switch and the zone set is activated. After activation, the verification process confirms that the Brocade switches properly learn the zones and zone sets. In Brocade terminology, the zone set is known as the configuration. On Brocade switches, the MDS 9000 *active zone set* is known as the *effective configuration*.

The example shows how to use the name server database as a tool when building the zones. When predefining zones, you may use pWWNs of equipment not attached, or in the name server database.

Zones that are defined while the switch is in interop mode *must* be zoned by pWWN. Zoning by alias or FC ID is not permitted while the Brocade switch is operating in interop mode. This limits the Brocade switches to soft zoning. The MDS 9000 switch will always implement hardware-enforced zoning.

Creating Zones on the MDS 9000 Switch

Follow these steps to create zones on the MDS 9000 switch.

Step 1 Display the name server database to see the pWWN information.

```
MDS9000# show fcns database vsan 1

VSAN 1:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x621c00    N     21:01:00:e0:8b:29:8b:3e (QLogic)
0x621d00    N     21:00:00:e0:8b:09:8b:3e (QLogic)
0x6e0e00    N     50:06:0e:80:03:4e:95:32                 scsi-fcp

Total number of entries = 3
```

Step 2 Now that the pWWNs are visible, use tools like cut and paste to create the zones.

```
MDS9000# conf t
Enter configuration commands, one per line.  End with CNTL/Z.

MDS9000(config)# zone name Bro12000 vsan 1
MDS9000(config-zone)# member pwwn 21:01:00:e0:8b:29:8b:3e
MDS9000(config-zone)# member pwwn 21:00:00:e0:8b:09:8b:3e
MDS9000(config-zone)# member pwwn 50:06:0e:80:03:4e:95:32

MDS9000(config)#
MDS9000(config)# zoneset name BrocadezoneSet vsan 1

MDS9000(config-zoneset)# member Bro12000
```

At this point, we have created one zone (Bro12000) within the zone set named BrocadeZoneSet.

Step 3 Activate the zone set BrocadeZoneSet.

```
MDS9000(config)# zoneset activate name BrocadeZoneSet vsan 1
Zoneset Activation initiated. check zone status
MDS9000(config)# exit
```

Step 4 View each switch in the fabric to verify that the defined zoning is in place. The running config will show the zone and zone set, because they were created on this switch.

```
MDS9000# show zoneset active vsan 1
zoneset name BrocadeZoneSet vsan 1
```

```
zone name Bro12000 vsan 1
* fcid 0x621c00 [pwwn 21:01:00:e0:8b:29:8b:3e]
* fcid 0x621d00 [pwwn 21:00:00:e0:8b:09:8b:3e]
* fcid 0x6e0e00 [pwwn 50:06:0e:80:03:4e:95:32]
```

Verifying Zoning on the Brocade 12000 Switch

The Brocade 12000 switch does not have a defined configuration, but it does contain an effective configuration. The effective configuration was passed to it by the MDS 9000 switch when the MDS 9000 switch full zone set was activated.

```
CA12000:admin> cfgshow
   Defined configuration:
   no configuration defined

   Effective configuration:
   cfg:   BrocadeZoneSet
   zone:  Bro12000
                21:01:00:e0:8b:29:8b:3e
                21:00:00:e0:8b:09:8b:3e
             50:06:0e:80:03:4e:95:32
```

Verifying Zoning on the Brocade 3900 Switch

The following example shows commands used to verify the configuration of the Brocade 3900 switch.

```
CA3900:admin> cfgshow
   Defined configuration:
   no configuration defined


 Effective configuration:
 cfg:   BrocadeZoneSet
 zone:  Bro12000
             21:01:00:e0:8b:29:8b:3e
             21:00:00:e0:8b:09:8b:3e
             50:06:0e:80:03:4e:95:32
```

Note The zones created in the MDS 9000 switch are propagated to the Brocade switches. Although the **cfgshow** command does not show these zones as the defined configuration, if the switch is isolated and rebooted, the correct zone configuration is effective.

On the MDS 9000 switch, the active zone configuration is always saved to memory. It will not display in the running configuration. If the switch is isolated and rebooted, the last active zone set is reinstated as the current active zone set.

Any changes to the zones or zone set while the switch is isolated will need to pass a zone merge validation when the ISLs are activated.

CHAPTER 7

MDS 9000 Legacy Switch Interop Mode 2

This chapter describes how to set up a basic interop mode 2 topology, with two MDS 9000 switches and two Brocade switches in a serial topology.

This chapter includes the following sections:

Specifications

With standard interop mode 1, interoperability between the MDS 9000 switch and the Brocade switches requires an outage in the Brocade fabric, because the Brocade switch must be reconfigured into interoperability mode. MDS SAN-OS Release 1.2 introduced a new interoperability mode that does not require the Brocade switch to be reconfigured from its native operational mode.

MDS SAN-OS Release 1.2 supports three modes of operation for interoperability:

- **Default or Native Mode**—This is the default mode or behavior for a VSAN communicating between a SAN composed entirely of MDS 9000 switches.
- **Interop Mode 1**—This is the standard interoperability mode that interoperates with Brocade and McData switches that have also been configured for their own interoperability modes. Prior to MDS SAN-OS Release 1.2, this was the only interoperability mode available to the MDS 9000 switch. Brocade and McData switches must be running in interop mode to work with this VSAN mode.
- **Interop Mode 2**—Also referred to as legacy switch interop mode, this mode was introduced in MDS SAN-OS Release 1.2 and allows seamless integration with specific Brocade switches running in their own native mode of operation. Brocade switches must be configured with core pid = 0 to work with this mode.

The following are key characteristics of legacy switch interop mode:

- It works with Brocade 2400, 2800, 3200, and 3800 switches configured with core pid = 0.
- Brocade switches have been tested in the default configuration. Modifications to the default configuration will be analyzed on a case by case basis.
- Adding MDS 9000 switches to existing Brocade fabrics does not require outages.

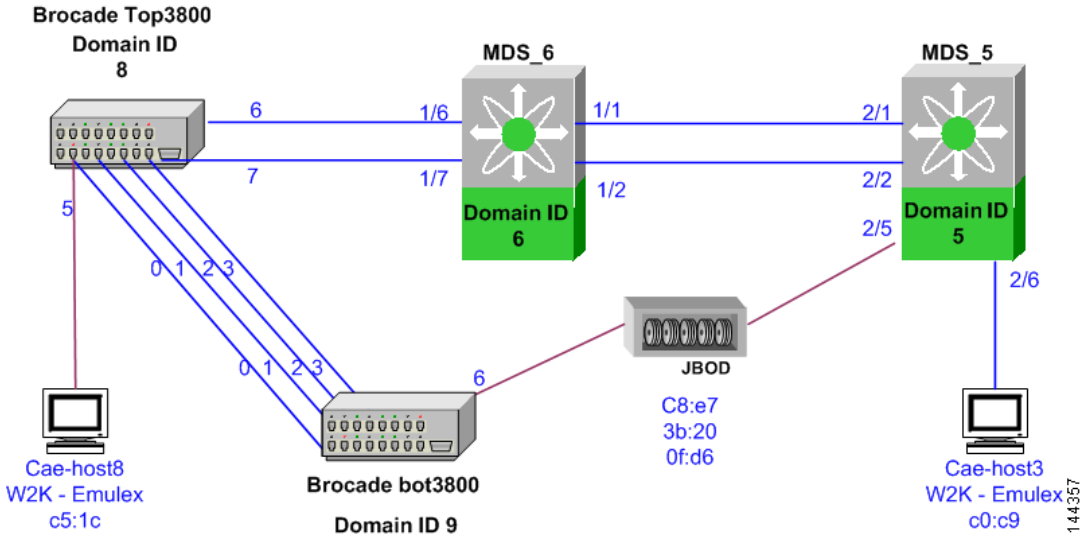
- The MDS 9000 switch interop mode only affects the configured VSAN; all other VSANs are unaffected.
- MDS 9000 switch TE ports can carry VSANs that are running any or all interop modes, along with MDS 9000 switch native mode, simultaneously.
- No configuration changes are needed to the Brocade switches.
- Brocade features are not affected.
- Zone sets can be activated from any Brocade switch or any MDS 9000 switch within the fabric.

The following switches and code levels were used for this example configuration:

- MDS SAN-OS Release 1.2 or later is required.
- Brocade 2400/2800 Version 2.6.x or later
- Brocade 3200/3800 Version 3.0.2k or later

Figure 7-1 shows the topology used for this example configuration.

Figure 7-1 MDS 9000 Switch Legacy Switch Interop Topology



Expected Topology Behavior

This section covers switch-specific features and identifies features that cannot be used or that behave differently in this topology (Figure 7-1) as compared to a homogeneous MDS 9000 switch or Brocade fabric.

This section contains the following topics:

Zoning

An MDS 9000 switch configured for legacy switch interop mode can be attached without any detrimental effect on the Brocade fabric. When an MDS VSAN in legacy switch mode is connected to a Brocade fabric, the rules for zoning depend on where the device being zoned is located.

For devices attached to an MDS 9000 switch, zoning must be done by pWWN. For devices attached to Brocade switches, zoning can be done either by pWWN or domain/port (a Brocade native mode zoning format). Domain/port zoning cannot be used for MDS-attached hosts because the Brocade switches do not understand the MDS 9000 switch fWWN interface nomenclature. Brocade switches use a proprietary zone set activation sequence that does not follow the FC-SW3 standard. The sequence is:

1. **ACA**—Acquire Change Authorization. Acquires a lock from all switches.
2. **SFC**—Stage Fabric Configuration Update. Distribute zone set.
3. **UFC—**Update Fabric Configuration. Makes the zone set active.
4. **RCA—**Release Change Authorization. Releases the lock acquired with ACA.

When a zone set (configuration, in Brocade terminology) is activated by the Brocade switch, proprietary frames are sent and acknowledged by all switches including MDS 9000 switches. The Brocade proprietary-zone frames appear as two 0x70 frames on a Fibre Channel analyzer or the MDS 9000 switch internal FC analyzer.

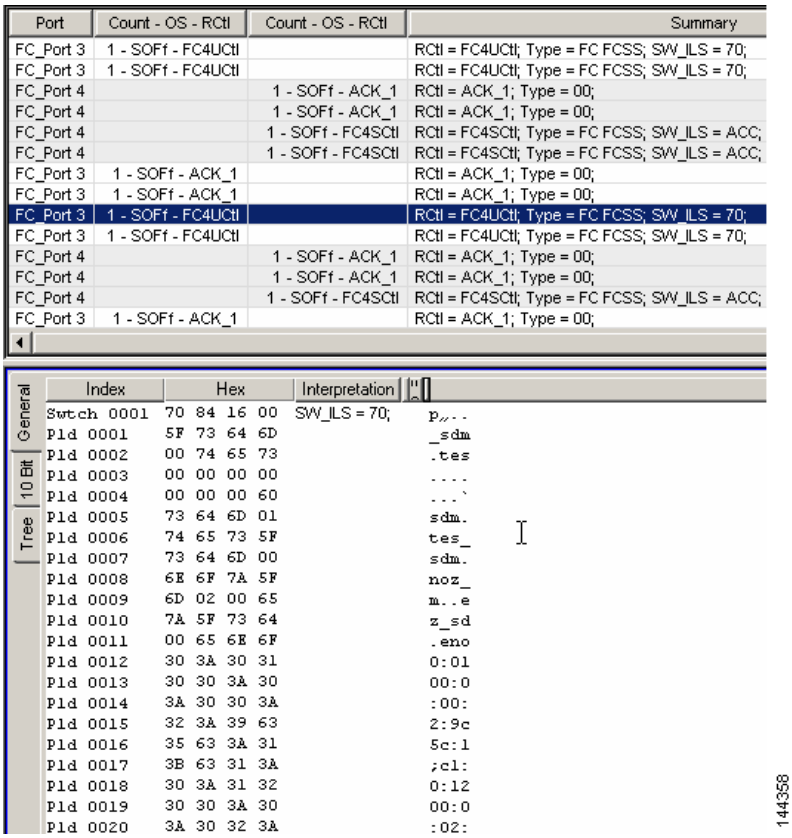
Zone set and zone names cannot use the “$” or “-” symbols.

The zone merge process has stronger restrictions in this mode. The following additional restrictions apply:

- The active zone set name should be the same. Otherwise, the link is isolated.
- All the common zone sets, zones, and FCaliases on both sides should have *exactly* the same definitions. Otherwise, the link is isolated.

Note In Figure 7-2, the payload appears to be backwards (sdm instead of mds) in ASCII format. This has no significance to configuration or performance, but it is noted to help troubleshoot traces.

Figure 7-2 Brocade Proprietary Zoning Frames



Port	Count - OS - RCtl	Count - OS - RCtl	Summary
FC_Port 3	1 - SOFf - FC4UCtl		RCtl = FC4UCtl; Type = FC FCSS; SW_ILS = 70;
FC_Port 3	1 - SOFf - FC4UCtl		RCtl = FC4UCtl; Type = FC FCSS; SW_ILS = 70;
FC_Port 4		1 - SOFf - ACK_1	RCtl = ACK_1; Type = 00;
FC_Port 4		1 - SOFf - ACK_1	RCtl = ACK_1; Type = 00;
FC_Port 4		1 - SOFf - FC4SCtl	RCtl = FC4SCtl; Type = FC FCSS; SW_ILS = ACC;
FC_Port 4		1 - SOFf - FC4SCtl	RCtl = FC4SCtl; Type = FC FCSS; SW_ILS = ACC;
FC_Port 3	1 - SOFf - ACK_1		RCtl = ACK_1; Type = 00;
FC_Port 3	1 - SOFf - ACK_1		RCtl = ACK_1; Type = 00;
FC_Port 3	1 - SOFf - FC4UCtl		RCtl = FC4UCtl; Type = FC FCSS; SW_ILS = 70;
FC_Port 3	1 - SOFf - FC4UCtl		RCtl = FC4UCtl; Type = FC FCSS; SW_ILS = 70;
FC_Port 4		1 - SOFf - ACK_1	RCtl = ACK_1; Type = 00;
FC_Port 4		1 - SOFf - ACK_1	RCtl = ACK_1; Type = 00;
FC_Port 4		1 - SOFf - FC4SCtl	RCtl = FC4SCtl; Type = FC FCSS; SW_ILS = ACC;
FC_Port 3	1 - SOFf - ACK_1		RCtl = ACK_1; Type = 00;

Index	Hex	Interpretation	
Swtch 0001	70 84 16 00	SW_ILS = 70;	p...
Pld 0001	5F 73 64 6D		_sdm
Pld 0002	00 74 65 73		.tes
Pld 0003	00 00 00 00		....
Pld 0004	00 00 00 60		...`
Pld 0005	73 64 6D 01		sdm.
Pld 0006	74 65 73 5F		tes_
Pld 0007	73 64 6D 00		sdm.
Pld 0008	6E 6F 7A 5F		noz_
Pld 0009	6D 02 00 65		m..e
Pld 0010	7A 5F 73 64		z_sd
Pld 0011	00 65 6E 6F		.eno
Pld 0012	30 3A 30 31		0:01
Pld 0013	30 30 3A 30		00:0
Pld 0014	3A 30 30 3A		:00:
Pld 0015	32 3A 39 63		2:9c
Pld 0016	35 63 3A 31		5c:1
Pld 0017	3B 63 31 3A		;c1:
Pld 0018	30 3A 31 32		0:12
Pld 0019	30 30 3A 30		00:0
Pld 0020	3A 30 32 3A		:02:

Note After two active zone sets successfully merge, always copy the active zone set to the full zone set database prior to modifying it on the MDS 9000 switch.

ISL Flow Control

Brocade uses a proprietary flow control called Virtual Channel (VC) flow control. VC flow control is used by Brocade for fair traffic distribution during congested fabrics by prioritizing management traffic.

When an ISL between an MDS 9000 switch and Brocade switch comes up, the ISL negotiates for the standards-based buffer-to-buffer flow control during ELP. The MDS 9000 switch rejects the Brocade proprietary VC flow control and responds with the standards-based buffer-to-buffer flow control.

To enable Brocade to accept the standards-based flow control on Brocade firmware versions 3.1.0 and 4.1.1 so that the ISL will complete negotiation, use the **portcfgislmode slot/port 1** command on the Brocade switch. Switches running version 2.x firmware do not require this command.

This does not affect any other ISLs in the fabric. All Brocade-to-Brocade ISLs can still be native VC flow control and MDS 9000 switch-to-MDS 9000 switch ISLs can still be TE (trunking or multi-VSAN) ISLs. Having a Brocade-to-MDS 9000 switch ISL using buffer-to-buffer flow control should have no noticeable impact to the fabric.

Trunking and PortChannels

Brocade's trunking feature is comparable to MDS 9000 switch PortChannels. Trunking is not supported between MDS 9000 switches and Brocade switches. Trunking between two Brocade switches is supported when adding an MDS 9000 switch in legacy switch interop mode 2 to a Brocade fabric. PortChannels between two MDS 9000 switches are also supported.

Domain IDs

There is no limitation to the domain ID range when the MDS 9000 switch is operating in legacy switch interop mode 2. When an MDS 9000 switch in legacy switch interop mode 2 joins a Brocade fabric, there is no disruption to domain assignment and the complete domain ID range is available to all switches in the fabric. In the default interoperability mode (mode 1), Brocade switches and MDS 9000 switches require domain IDs in the 97 to 127 range.

Quickloop

Brocade's Quickloop feature can only be used between two Brocade switches. The MDS 9000 switch cannot participate in the quickloop. However, the MDS 9000 switch can join a fabric that has quickloop configured between Brocade switches.

Management Server Platform Database

This Brocade feature does not have to be disabled. An MDS 9000 switch responds as Management Server Platform capable. In comparison, standard interop mode 1 requires this Brocade feature to be disabled.

Configuration

This section describes how to set up a simple fabric consisting of Brocade switches running in native mode and MDS 9000 switches with a VSAN configured for legacy switch interop mode 2. (See Figure 7-1.)

This section includes the following topics:

Before You Begin

Check for the proper MDS SAN-OS and Brocade firmware version levels.

Step 1 On the MDS 9000 switch, issue the **show version** command.

```
MDS_5# show version
Cisco Storage Area Networking Operating System (SAN-OS) Software
```

```
TAC support: http://www.cisco.com/tac
Copyright (c) 2002-2003 by Cisco Systems, Inc. All rights reserved.
The copyright for certain works contained herein are owned by
Andiamo Systems, Inc. and/or other third parties and are used and
distributed under license.


Software
  BIOS:      version 1.0.7
  loader:    version 1.0(3a)
  kickstart: version 1.2(1) [build 1.2(0.96a)]
  system:    version 1.2(1) [build 1.2(0.96a)]

  BIOS compile time:       03/20/03
  kickstart image file is: bootflash:/k96a
  kickstart compile time:  7/29/2003 0:00:00
  system image file is:    bootflash:/s96a
  system compile time:     7/29/2003 0:00:00


Hardware
  RAM 1027584 kB

  bootflash: 500736 blocks (block size 512b)
  slot0:          0 blocks (block size 512b)

  MDS_5 uptime is 0 days 20 hours 59 minute(s) 50 second(s)

  Last reset at 840233 usecs after Mon Aug 11 15:52:48 2003
    Reason: Reset Requested by CLI command reload
   System version: 1.2(1)
```

Step 2 On the Brocade switch, issue the **version** command.

```
Top3800:admin> version
Kernel:     5.3.1
Fabric OS:  v3.0.2k
Made on:    Fri Nov 15 10:46:10 PST 2002
Flash:      Fri Nov 15 10:47:31 PST 2002
BootProm:   Tue Oct 30 10:24:38 PST 2001
```

Configuring the MDS 9000 Switch

To configure the MDS 9000 switch, follow these steps:

Step 1 Create a VSAN and place this VSAN in legacy switch interop mode 2.

```
MDS_5# config t
MDS_5 (config)# vsan database
MDS_5 (config-vsan-db)# vsan 113 interop 2

MDS_6# config t
MDS_6 (config)# vsan database
MDS_6 (config-vsan-db)# vsan 113 interop 2
```

Step 2 Assign interfaces to the legacy switch interop mode 2 VSAN. For example, enter the following commands on all MDS 9000 switches that have interfaces that need to be placed in VSAN 113, the legacy switch interop mode 2 VSAN created in Step 1.

```
MDS_5 (config-vsan-db)# vsan 113 interface 2/6  Host1
MDS_5 (config-vsan-db)# vsan 113 interface 2/5  JBOD

MDS_5 (config-vsan-db)# vsan 113 interface 2/1  ISL to MDS_6
MDS_5 (config-vsan-db)# vsan 113 interface 2/2  ISL to MDS_6

MDS_6 (config-vsan-db)# vsan 113 interface 1/1  ISL to MDS_5
MDS_6 (config-vsan-db)# vsan 113 interface 1/2  ISL to MDS_5

MDS_6 (config-vsan-db)# vsan 113 interface 2/1  ISL to Top3800
MDS_6 (config-vsan-db)# vsan 113 interface 2/2  ISL to Top3800
```

Step 3 Lower the MDS 9000 switch ISL buffer-to-buffer credits (BB_credits) to match the Brocade BB_credits, because the Brocade switch cannot handle more than 16 BB_credits on an ISL.

```
MDS_6(config)# interface fc 1/6-7
MDS_6(config-if)# switchport fcrxbbcredit 16
MDS_6(config-if)# no shut
```

Note MDS 9000 switch trunking mode does not need to be turned off because it autonegotiates to standard E port when the TE port negotiation fails.

Configuring the Brocade Switch

Now that the MDS 9000 switch is configured, there will be no configuration or disruption to the Brocade fabric. All that is required is to enable the new ISL ports.

```
Top3800:admin> portcfgislmode 6 1   <== required for 2400/2800/3200/3800 code 3.1.0 higher
and 12000/3900 code 4.1.1 or higher
Top3800:admin> portcfgislmode 7,1
Top3800:admin> portenable 6
Top3800:admin> portenable 7
```

Verification

This section highlights the commands used to verify that the fabric is up and running in legacy switch interop mode 2. The output is based on the example topology shown in Figure 7-1.

This section includes the following topics:

Verifying the MDS 9000 Switch Settings

The following examples show the commands used to verify the MDS 9000 switch settings.

```
MDS_6# show run

Building Configuration ...
vsan database
vsan 100 name Rob_mds
```

```
vsan 113 name Rob_interop interop 2      <==== interop mode 2 VSAN


MDS_6# show vsan 113
vsan 113 information
         name:Rob_native  state:active
         interoperability mode:2        <==== Legacy Switch Interop
         loadbalancing:src-id/dst-id/oxid
      operational state:up

MDS_6# show fcdomain domain-list vsan 113

Number of domains: 4
Domain ID              WWN
---------    -----------------------
  0x05(5)    20:71:00:05:30:00:87:9f [Principal]     <==== MDS_5
  0x06(6)    20:71:00:0b:46:79:f2:41 [Local]         <==== MDS_6
  0x08(8)    10:00:00:60:69:51:29:71                 <==== Top_3800
  0x09(9)    10:00:00:60:69:51:3a:60                 <==== Bot_3800

MDS_6# show fspf internal route vsan 113

FSPF Unicast Routes
---------------------------
 VSAN Number  Dest Domain   Route Cost    Next hops
-----------------------------------------------
         113      0x05(5)          250 port-channel 1
         113      0x08(8)          500        fc1/6
                                              fc1/7
         113      0x09(9)         1000        fc1/6
                                              fc1/7

MDS_6# show fcns database vsan 113

VSAN 113:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x050001    N     10:00:00:05:30:00:87:a3 (Cisco)         ipfc
0x050002    N     10:00:00:00:c9:30:c0:c9 (Emulex)        scsi-fcp
0x0501ca    NL    22:00:00:20:37:5a:7f:5a (Seagate)       scsi-fcp
0x0501cc    NL    22:00:00:20:37:60:9c:ae (Seagate)       scsi-fcp
0x0501cd    NL    22:00:00:20:37:6e:fc:97 (Seagate)       scsi-fcp
0x0501ce    NL    22:00:00:20:37:46:0f:d6 (Seagate)       scsi-fcp
0x0501d1    NL    22:00:00:20:37:5b:c8:e7 (Seagate)       scsi-fcp
0x0501d3    NL    22:00:00:20:37:5a:63:06 (Seagate)       scsi-fcp
0x0501d5    NL    22:00:00:20:37:73:3b:20 (Seagate)       scsi-fcp
0x060001    N     10:00:00:0b:46:79:f2:45 (Cisco)         ipfc
0x081500    N     10:00:00:00:c9:21:c5:1c (Emulex)        scsi-fcp
0x0916ca    NL    21:00:00:20:37:5a:7f:5a (Seagate)       scsi-fcp
0x0916cc    NL    21:00:00:20:37:60:9c:ae (Seagate)       scsi-fcp
0x0916cd    NL    21:00:00:20:37:6e:fc:97 (Seagate)       scsi-fcp
0x0916ce    NL    21:00:00:20:37:46:0f:d6 (Seagate)       scsi-fcp
0x0916d1    NL    21:00:00:20:37:5b:c8:e7 (Seagate)       scsi-fcp
0x0916d3    NL    21:00:00:20:37:5a:63:06 (Seagate)       scsi-fcp
0x0916d5    NL    21:00:00:20:37:73:3b:20 (Seagate)       scsi-fcp

Total number of entries = 18
```

Note The MDS name server shows both local and remote entries, and it does not time out remote entries after 15 minutes as the Brocade name server does.

Verifying the Brocade 3800 Switch Settings

The following examples show the commands used to verify the Brocade 3800 switch settings.

```
Bot3800:admin> msPlCapabilityShow
                                Platform
Switch WWN                  Service Capable   Capability  Name
=========================   ===============   ==========  =======
20:71:00:05:30:00:87:9f          Yes          0x00000007  "MDS_5"
20:71:00:0b:46:79:f2:41          Yes          0x00000007  "MDS_6"
10:00:00:60:69:51:29:71          Yes          0x0000008f  "Top3800"
10:00:00:60:69:51:3a:60          Yes          0x0000008f  "Bot3800"

        Capability Bit Definitions:
                Bit 0: Basic Configuration Service Supported.
                Bit 1: Platform Management Service Supported.
                Bit 2: Topology Discovery Service Supported.
                Bit 3: Unzoned Name Server Service Supported.
                Bit 4: M.S. Fabric Zone Service Supported.
                Bit 5: Fabric Lock Service Supported.
                Bit 6: Timer Service Supported.
                Bit 7: RSCN Small Payload Supported.
                Others: Reserved.

Bot3800:admin> licenseshow
SzSebezc9RT0TfcA:
    Web license
    Zoning license
    Fabric license

Top3800:admin> switchshow
switchName:     Top3800
switchType:     9.2
switchState:    Online
switchMode:     Native Native Brocade Mode
switchRole:     Subordinate
switchDomain:   8
switchId:       fffc08
switchWwn:      10:00:00:60:69:51:29:71
switchBeacon:   OFF
Zoning:         ON (native_zoneset)
port  0: id N2 Online       E-Port 10:00:00:60:69:51:3a:60 "Bot3800" (downstream
)
port  1: id N2 Online       E-Port 10:00:00:60:69:51:3a:60 "Bot3800"
port  2: id N2 Online       E-Port 10:00:00:60:69:51:3a:60 "Bot3800"
port  3: id N2 Online       E-Port 10:00:00:60:69:51:3a:60 "Bot3800"
port  4: -- N2 No_Module
port  5: id N1 Online       F-Port 10:00:00:00:c9:21:c5:1c
port  6: id N2 Online       E-Port 20:00:00:0b:46:79:f2:40
port  7: id N2 Online       E-Port 20:00:00:0b:46:79:f2:40 (upstream)
port  8: -- N2 No_Module
port  9: -- N2 No_Module
port 10: -- N2 No_Module
port 11: -- N2 No_Module
port 12: -- N2 No_Module
port 13: -- N2 No_Module
port 14: -- N2 No_Module
port 15: -- N2 No_Module

Bot3800:admin> switchshow
switchName:     Bot3800
switchType:     9.2
switchState:    Online
```

```
switchMode:     Native
switchRole:     Subordinate
switchDomain:   9
switchId:       fffc09
switchWwn:      10:00:00:60:69:51:3a:60
switchBeacon:   OFF
Zoning:         ON (native_zoneset)
port  0: id N2 Online       E-Port 10:00:00:60:69:51:29:71 "Top3800" (upstream)
port  1: id N2 Online       E-Port 10:00:00:60:69:51:29:71 "Top3800"
port  2: id N2 Online       E-Port 10:00:00:60:69:51:29:71 "Top3800"
port  3: id N2 Online       E-Port 10:00:00:60:69:51:29:71 "Top3800"
port  4: -- N2 No_Module
port  5: -- N2 No_Module
port  6: id N1 Online       L-Port 7 public
port  7: id N2 No_Light
port  8: -- N2 No_Module
port  9: -- N2 No_Module
port 10: -- N2 No_Module
port 11: -- N2 No_Module
port 12: -- N2 No_Module
port 13: -- N2 No_Module
port 14: -- N2 No_Module
port 15: -- N2 No_Module
```

Note In this example, Brocade's proprietary zoning is enabled.

```
Bot3800:admin> topologyshow

4 domains in the fabric; Local Domain ID: 9

Domain   Metric   Hops   Out Port   In Ports   Flags   Bandwidth   Name
-----------------------------------------------------------------------
   5      1250      3        0     0x00000040    D      2 (Gbs)   "MDS_5"
                            1     0x00000000    D      2 (Gbs)
                            2     0x00000000    D      2 (Gbs)
                            3     0x00000000    D      2 (Gbs)

Type <CR> to continue, Q<CR> to stop:

   6      1000      2        0     0x00000040    D      2 (Gbs)   "MDS_6"
                            1     0x00000000    D      2 (Gbs)
                            2     0x00000000    D      2 (Gbs)
                            3     0x00000000    D      2 (Gbs)

Type <CR> to continue, Q<CR> to stop:

   8       500      1        1     0x00000040    D      2 (Gbs)   "Top3800"
                            0     0x00000000    D      2 (Gbs)
                            2     0x00000000    D      2 (Gbs)
                            3     0x00000000    D      2 (Gbs)

Type <CR> to continue, Q<CR> to stop:

Bot3800:admin> interopmode
interopMode is 0
```

Note In this example, the Brocade switch is in standard proprietary mode.

```
Top3800:admin> portshow 6
portFlags: 0x28057      portLbMod: 0x0   PRESENT ACTIVE E_PORT G_PORT U_PORT LOG
IN LED
portType:  4.1
portState: 1    Online
portPhys:  6    In_Sync
portScn:   5    E_Port    Flow control mode 2   <==== B2B Standards Flow Control
portRegs:  0x81060000
portData:  0x10282a20
portId:    081600
portWwn:   20:06:00:60:69:51:29:71
portWwn of device(s) connected:         20:06:00:0b:46:79:f2:40
Distance:  normal
Speed:     N2Gbps

Interrupts:        62094      Link_failure: 0          Frjt:         0
Unknown:           72         Loss_of_sync: 28         Fbsy:         0
Lli:               133        Loss_of_sig:  7
Proc_rqrd:         61928      Protocol_err: 0
Timed_out:         0          Invalid_word: 0
Rx_flushed:        0          Invalid_crc:  0
Tx_unavail:        0          Delim_err:    0
Free_buffer:       0          Address_err:  5
Overrun:           0          Lr_in:        7
Suspended:         0          Lr_out:       14
Parity_err:        0          Ols_in:       7
                              Ols_out:      0
Top3800:admin> portshow 1
portFlags: 0x28057      portLbMod: 0x0   PRESENT ACTIVE E_PORT G_PORT U_PORT LOG
IN LED
portType:  4.1
portState: 1    Online
portPhys:  6    In_Sync
portScn:   5    E_Port     <==== VC Flow Control to Brocade 3800Bot
portRegs:  0x81010000
portData:  0x101f70c0
portId:    081100
portWwn:   20:01:00:60:69:51:29:71
portWwn of device(s) connected:         20:01:00:60:69:51:3a:60
Distance:  normal
Speed:     N2Gbps

Interrupts:        181162     Link_failure: 1          Frjt:         0
Unknown:           23         Loss_of_sync: 2          Fbsy:         0
Lli:               23         Loss_of_sig:  1
Proc_rqrd:         181119     Protocol_err: 0
Timed_out:         0          Invalid_word: 0
Rx_flushed:        0          Invalid_crc:  0
Tx_unavail:        0          Delim_err:    0
Free_buffer:       0          Address_err:  0
Overrun:           0          Lr_in:        5
Suspended:         0          Lr_out:       1
Parity_err:        0          Ols_in:       1
                              Ols_out:      4

Bot3800:admin> nsallshow
{
  050001 050002 0501ca 0501cc 0501cd 0501ce 0501d1 0501d3
  0501d5 060001 081500 0916ca 0916cc 0916cd 0916ce 0916d1
  0916d3 0916d5
18 Nx_Ports in the Fabric }
```

Note The Brocade remote name server entries time out of the cache after 900 seconds (15 minutes).

```
Bot3800:admin> urouteshow

Local Domain ID: 9

In Port    Domain    Out Port    Metric    Hops    Flags    Next (Dom, Port)
-------------------------------------------------------------------------------
   6          5          0        1250       3       D            8,0
              6          0        1000       2       D            8,0
              8          1         500       1       D            8,1

Bot3800:admin> configshow
Ethernet addresses: 0:60:69:51:3a:60

Nvram datadata: fei(0,0)host:/usr/switch/firmware e=172.22.36.137:fffffe00 g=172
.22.36.1 u=user tn=Bot3800

Type <CR> to continue, Q<CR> to stop:
diag.postDisable:       0
fabric.domain:  9
fabric.ops.BBCredit:    16
fabric.ops.E_D_TOV:     2000
fabric.ops.R_A_TOV:     10000
fabric.ops.dataFieldSize:       2112
fabric.ops.max_hops:    7
fabric.ops.mode.SeqSwitching:   0
fabric.ops.mode.fcpProbeDisable:        0
fabric.ops.mode.isolate:        0
fabric.ops.mode.longDistance:   0
fabric.ops.mode.noClassF:       0
fabric.ops.mode.pidFormat:      0
```

When operating with legacy switch interop mode 2 VSANs, verify that the core PID format is 0. If the Brocade fabric has switches with more than 16 ports (such as Brocade models 3900 and 12000), the core PID will be set to 1. On earlier switches with fewer than 16 ports, Brocade initially allocated one nibble of the FC ID / PID in area field 0x0 - F for the port number. This limited the port count to 16.

When the core PID is set to 1, the allocated bytes in the FC ID/PID allow the use of port numbers 0x00 - FF.

- FC ID / PID 0x021F00 = Core PID 0 means domain ID 02, 1 always set, port is 15, 00 is assigned for N port or ALPA.
- FC ID / PID 0x021F00 = Core PID 1 means domain ID 02, port is 31, 00 is assigned address or ALPA. Even though the FC ID is the same, the entire second byte is used for the port number.

Zoning

In this example, zones, zone sets, and configurations, FCalias and aliases are created and activated from the following management platforms:

- Brocade WebTools GUI
- Brocade CLI
- Cisco Fabric Manager GUI
- Cisco MDS SAN-OS CLI

After the zone set is activated, commands are issued to verify that the MDS 9000 switch and the Brocade switches properly learn the alias, zones, and zone sets. In Brocade terminology, the zone set is known as the *configuration*. The active zone set in the MDS 9000 switch is known as the *effective configuration* on the Brocade switches.

In the following examples, the same alias, zones, and zone sets are created using each management platform. This provides a direct comparison between the various tools. Because the **show** command output would not vary based on the management platform used to create the zoning information, the **show** commands used to verify the zone configuration are shown once at the end of each section.

When creating zones, you can only use pWWNs for MDS 9000 switch attached nodes, and either pWWN or domain/port for Brocade attached nodes. Aliases can also be used by either switch, but the alias of devices attached to the MDS 9000 switch must be by pWWN only. Aliases for devices attached to Brocade switches can be either pWWN or domain/port.

The following zone configuration will be created on each of the management platforms. This configuration relates to the topology shown in Figure 7-1.

One alias (a3800top_port5_pwwn) with two members

- One member by domain and port on 3800Top—8,5 (domain ID, port number)
- One member by pWWN attached to MDS—22:00:00:20:37:5b:c8:e7

Two zones

- First zone—alias_zone with three members
  - First two members from alias a3800_port5_pwwn
  - Third member by pWWN attached to Brocade—21:00:00:20:37:73:3b:20
- Second zone—host1_pwwn_zone with two members
  - First member by pWWN attached to MDS—10:00:00:00:c9:30:c0:c9
  - Second member by pWWN attached to Brocade—21:00:00:20:37:46:0f:d6

One zone set (native_zoneset) with two zones assigned

- First zone—alias_zone
- Second zone—host1_pwwn_zone

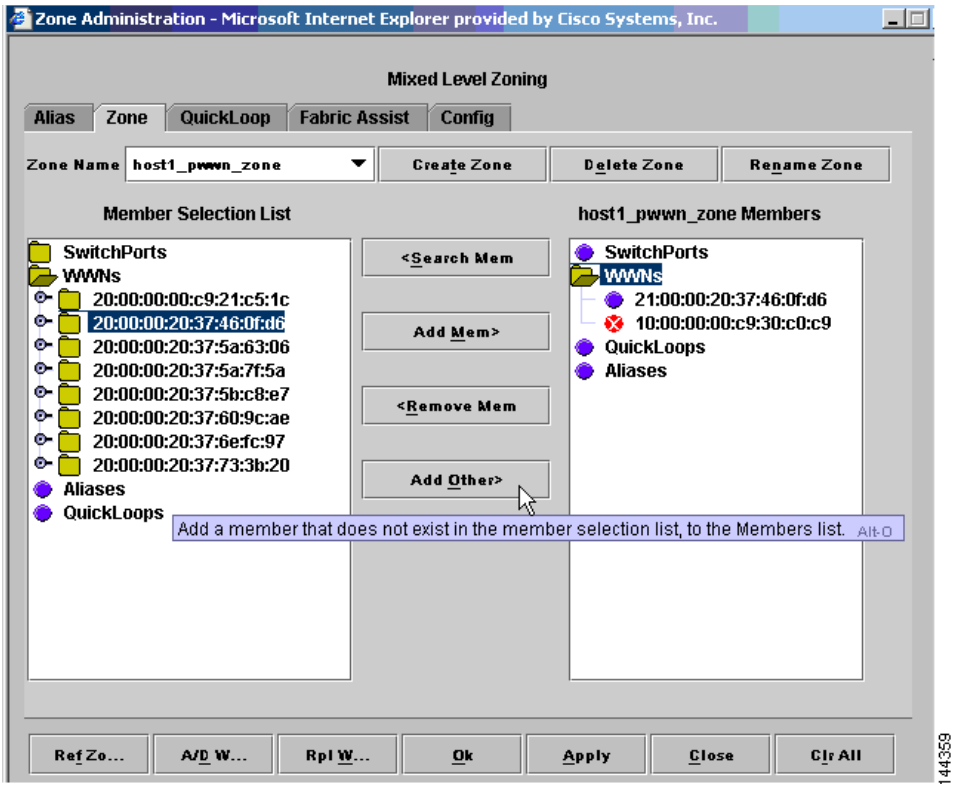
Using the Brocade WebTools GUI

To use the Brocade WebTools GUI for zoning, follow these steps:

Step 1 Open Brocade WebTools by pointing a web browser to the IP address of the Brocade switch. Enter a valid user name and password for WebTools. The default credentials are **admin** and **password**.

Step 2 Choose **Zone Admin** from Brocade WebTools. Notice in Figure 7-3 that the two MDS 9000 switches do not show a physical representation, only X.

Figure 7-3 Brocade WebTools Zone Administration

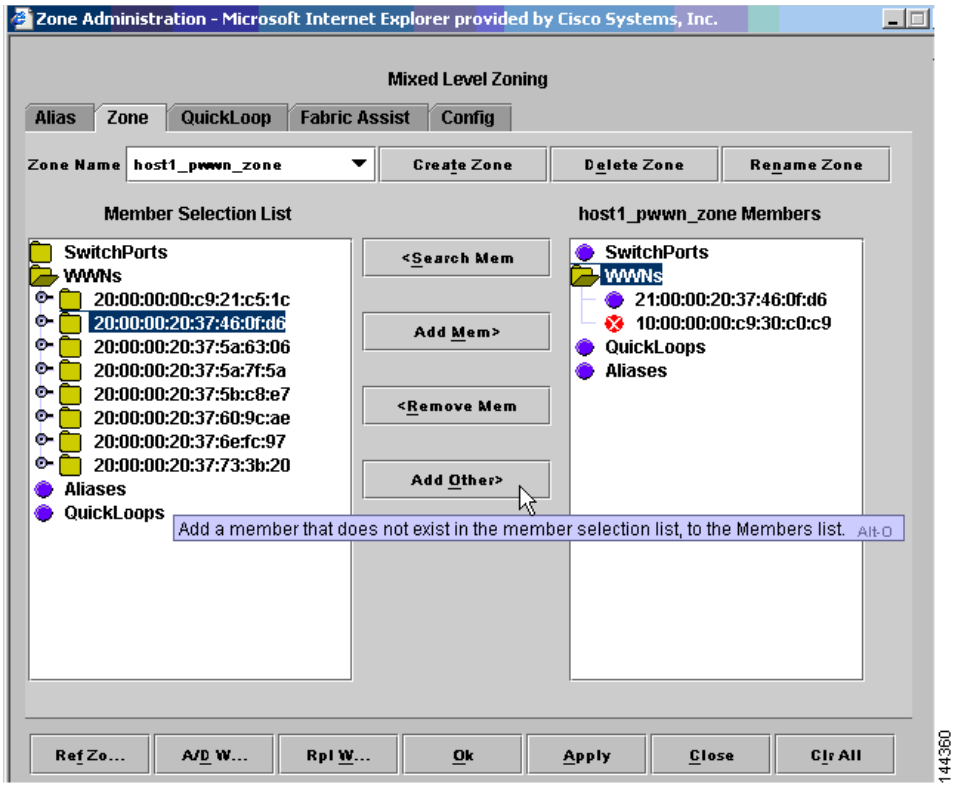


Step 3 Click the **Zone** tab and then click **Create Zone**. Enter the zone name. The first zone example uses the name host1_pwwn_zone.

Step 4 Choose the members to add into the zone named host1_pwwn_zone. In the example, the pWWN 21:00:00:20:37:46:0f:d6 connected to Bot3800 port 6 is added to the zone.

Note Members attached to MDS 9000 switches do not appear on Brocade's WebTools GUI, but they do appear on the MDS 9000 switch name server and are logged into the fabric. You can work around this issue by clicking **Add Other** from the Brocade Web Tools Zone tab. In Figure 7-4, the Host1 pWWN 10:00:00:00:c9:30:c0:c9 attached to MDS_5 port 2/6 is added.

Figure 7-4 Brocade WebTools Zone Administration, Add Other



Step 5 Verify that Host1 is logged into the fabric by viewing name server data, using the MDS SAN-OS CLI. For example:

```
MDS_6# show fcns database v 113

VSAN 113:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x050000    N     10:00:00:00:c9:30:c0:c9 (Emulex)        scsi-fcp
0x050003    N     10:00:00:05:30:00:87:a3 (Cisco)         ipfc
0x0501ca    NL    22:00:00:20:37:5a:7f:5a (Seagate)       scsi-fcp
0x0501cc    NL    22:00:00:20:37:60:9c:ae (Seagate)       scsi-fcp
0x0501cd    NL    22:00:00:20:37:6e:fc:97 (Seagate)       scsi-fcp
0x0501ce    NL    22:00:00:20:37:46:0f:d6 (Seagate)       scsi-fcp
0x0501d1    NL    22:00:00:20:37:5b:c8:e7 (Seagate)       scsi-fcp
0x0501d3    NL    22:00:00:20:37:5a:63:06 (Seagate)       scsi-fcp
0x0501d5    NL    22:00:00:20:37:73:3b:20 (Seagate)       scsi-fcp
0x060002    N     10:00:00:0b:46:79:f2:45 (Cisco)         ipfc
0x081500    N     10:00:00:00:c9:21:c5:1c (Emulex)        scsi-fcp
0x0916ca    NL    21:00:00:20:37:5a:7f:5a (Seagate)       scsi-fcp
0x0916cc    NL    21:00:00:20:37:60:9c:ae (Seagate)       scsi-fcp
0x0916cd    NL    21:00:00:20:37:6e:fc:97 (Seagate)       scsi-fcp
0x0916ce    NL    21:00:00:20:37:46:0f:d6 (Seagate)       scsi-fcp
0x0916d1    NL    21:00:00:20:37:5b:c8:e7 (Seagate)       scsi-fcp
0x0916d3    NL    21:00:00:20:37:5a:63:06 (Seagate)       scsi-fcp
0x0916d5    NL    21:00:00:20:37:73:3b:20 (Seagate)       scsi-fcp
```

Step 6 Create an alias. Click the **Alias** tab, and then click **Create Alias**.

In the example, we created an alias named a3800top_port5_pwwn, with one Brocade attached member by domain/port (8.5)t, and one MDS 9000 switch attached member by pWWN (22:00:00:20:37:5b:c8:e7).

Step 7 Create a second zone. Choose **Zone Admin**, click the **Zone** tab, and then click **Create Zone**. Enter the zone name. In this example, the second zone is named alias_zone. This zone will have the alias named a3800top_port5_pwwn, two members, and one additional Brocade member by pWWN 21:00:00:20:37:73:3b:20.

Step 8 Choose **Config** from WebTools, and create a configuration. In the example, the configuration is named native_zoneset.

Step 9 From the **Config** dialog, click **zones** on the left pane, and choose **host1_pwwn_zone**. When the zone is highlighted, click **Add Member**.

Step 10 Click **Enable config** on the bottom pane, and choose native_zone.

Using the Brocade CLI

Follow these steps to create the same configuration using the Brocade CLI.

Step 1 Create the zone and add members.

```
Top3800:admin> zonecreate "host1_pwwn_zone", "10:00:00:00:c9:30:c0:c9;
21:00:00:20:37:46:0f:d6"
```

Step 2 Create the alias with a domain_port member and a pWWN member.

```
Top3800:admin> alicreate "a3800top_port5_pwwn", "8,5; 22:00:00:20:37:5b:c8:e7"
```

Step 3 Create a zone with an alias as a member and an additional member.

```
Top3800:admin> zonecreate "alias_zone", "a3800top_port5_pwwn; 21:00:00:20:37:73:3b:20"
```

Step 4 Create the zone set and assign zones to the zone set.

```
Top3800:admin> cfgcreate "native_zoneset", "host1_pwwn_zone; alias_zone"
```

Step 5 Activate the zone set.

```
Top3800:admin> cfgenable "native_zoneset"
zone config "native_zoneset" is in effect
Updating flash ...
Top3800:admin>
```

Step 6 Save the zone database to all switches in the fabric, and save zone information to the Brocade Flash memory.

```
Top3800:admin> cfgsave
```

Using the Cisco Fabric Manager GUI

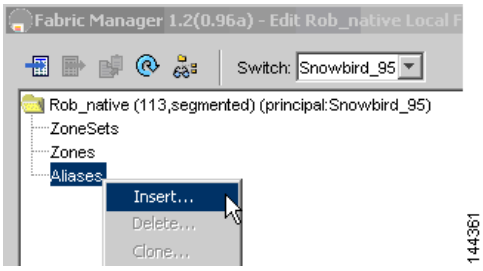
Follow these steps to create the same configuration using Fabric Manager.

Step 1 Launch Fabric Manager by clicking the **FabricManager** icon, or use your web browser to download and launch Fabric Manager. Enter the user name and password. If an SNMP user name has not been created, go to the MDS SAN-OS CLI and enter the **snmp-server user** command. For example, to create a user named admin with the password *mypassword*, enter:

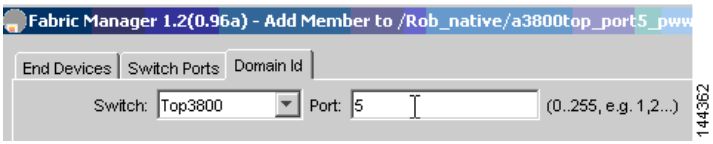
```
snmp-server user admin network-admin auth md5 mypassword
```

Step 2 From Fabric Manager, choose **Logical** and the VSAN to be edited. Then choose **Zone > Edit Full Database on Switch**.

Step 3 Create the alias by right-clicking **Aliases** and choosing **Insert** (see the following screen).



Step 4 Enter the alias name. (In this example, the alias name is a3800top_port5_pwwn.) Right-click **a3800top_port5_pwwn** and choose **Add Members**. Click the **Domain ID** tab and add member Brocade domain port of 8,5 (see the following screen). Then click the **End Devices** tab and choose **MDS 9000 switch member pWWN 21:00:00:20:37:5b:c8:e7**.



The alias named a3800top_port5_pwwn is created with members Brocade domain port of 8,5 and MDS 9000 switch member pWWN 21:00:00:20:37:5b:c8:e7.

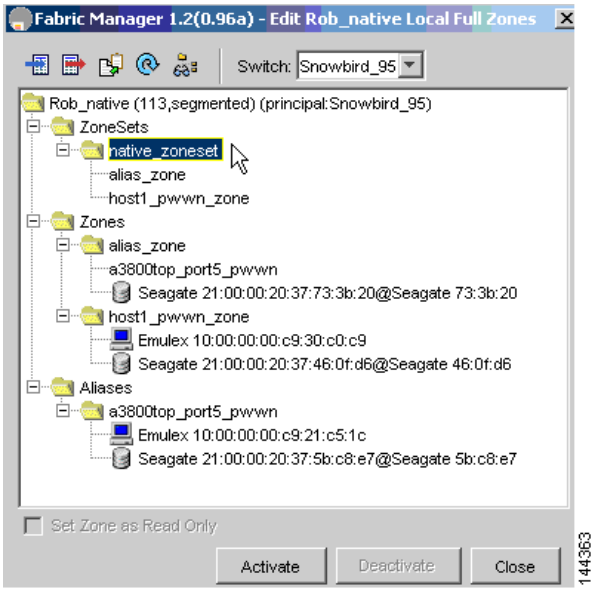
Step 5 Right-click **Zones** and choose **Insert**. Enter the zone name **alias_zone**.

Step 6 Right-click **alias_zone** and choose **Insert**. Click the **Aliases** tab and choose the new alias, **a3800top_port5_pwwn**.

Step 7 Click the **End Devices** tab and add MDS 9000 switch member 21:00:00:20:37:73:3b:20.

Now you can create the second zone, host1_pwwn_zone, with Brocade member pWWN 21:00:00:20:37:46:0f:d6 and MDS 9000 switch member pWWN 10:00:00:00:c9:30:c0:c9 by following the same steps as previously described.

Step 1 Create a zone set named native_zoneset. Right-click **zoneset** and choose **Insert**. Highlight the new zones named alias_zone and host1_pwwn_zone. At this point, the zone set named native_zoneset is ready to be activated.



Step 2 Activate the zone set. Highlight **native_zoneset** and choose **Activate**.

Using the Cisco MDS SAN-OS CLI

Follow these steps to create the same configuration using the Cisco MDS SAN-OS CLI.

Step 1 Display the name server database to see the pWWN information.

```
MDS_5# show fcns database vsan 113

VSAN 113:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x0500ca    NL    22:00:00:20:37:5a:7f:5a (Seagate)       scsi-fcp:target
0x0500cc    NL    22:00:00:20:37:60:9c:ae (Seagate)       scsi-fcp:target
0x0500cd    NL    22:00:00:20:37:6e:fc:97 (Seagate)       scsi-fcp:target
0x0500ce    NL    22:00:00:20:37:46:0f:d6 (Seagate)       scsi-fcp:target
0x0500d1    NL    22:00:00:20:37:5b:c8:e7 (Seagate)       scsi-fcp:target
0x0500d3    NL    22:00:00:20:37:5a:63:06 (Seagate)       scsi-fcp:target
0x0500d5    NL    22:00:00:20:37:73:3b:20 (Seagate)       scsi-fcp:target
0x050100    N     10:00:00:05:30:00:87:a3 (Cisco)         ipfc
0x050101    N     10:00:00:00:c9:30:c0:c9 (Emulex)        scsi-fcp:init
0x060002    N     10:00:00:0b:46:79:f2:45 (Cisco)         ipfc
0x081500    N     10:00:00:00:c9:21:c5:1c (Emulex)        scsi-fcp:init
0x0916ca    NL    21:00:00:20:37:5a:7f:5a (Seagate)       scsi-fcp:target
0x0916cc    NL    21:00:00:20:37:60:9c:ae (Seagate)       scsi-fcp:target
0x0916cd    NL    21:00:00:20:37:6e:fc:97 (Seagate)       scsi-fcp:target
0x0916ce    NL    21:00:00:20:37:46:0f:d6 (Seagate)       scsi-fcp:target
0x0916d1    NL    21:00:00:20:37:5b:c8:e7 (Seagate)       scsi-fcp:target
0x0916d3    NL    21:00:00:20:37:5a:63:06 (Seagate)       scsi-fcp:target
0x0916d5    NL    21:00:00:20:37:73:3b:20 (Seagate)       scsi-fcp:target
```

Step 2 Now that the pWWNs are visible, use tools such as cut and paste to create the zones. Start by creating an alias with a Brocade member by domain and port, and an MDS 9000 switch member with pWWN.

```
MDS_5# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
MDS_5(config)# fcalias name a3800top_port5_pwwn vsan 113
MDS_5(config-fcalias)# member domain-id 8 port-number 5
MDS_5(config-fcalias)# member pwwn 22:00:00:20:37:5b:c8:e7
```

Step 3 Create a zone set named native_zoneset, with two zones named alias_zone and host1_pwwn_zone. Add an alias member named a3800top_port5_pwwn and a member named pWWN 21:00:00:20:37:73:3b:20 to the zone named alias_zone. Add two members, 10:00:00:00:c9:30:c0:c9 and 21:00:00:20:37:46:0f:d6, to the zone named host1_pwwn_zone.

```
MDS_5(config)# zoneset name native_zoneset vsan 113

MDS_5(config-zoneset)# zone name alias_zone
MDS_5(config-zoneset-zone)# member fcalias a3800top_port5_pwwn
MDS_5(config-zoneset-zone)# member pwwn 21:00:00:20:37:73:3b:20

MDS_5(config-zoneset)# zone name host1_pwwn_zone
MDS_5(config-zoneset-zone)# member pwwn 10:00:00:00:c9:30:c0:c9
MDS_5(config-zoneset-zone)# member pwwn 21:00:00:20:37:46:0f:d6
```

Step 4 Activate the zone set named native_zoneset.

```
MDS_5(config)# zoneset activate name native_zoneset vsan 113
Zoneset activation initiated. check zone status
```

Verifying Zone Set and Configuration Activation

Use the following commands to view the MDS 9000 switch and Brocade switches in the fabric to verify the defined zoning is in place. Zoning could have been created by any MDS 9000 switch or any Brocade switch, using either the CLI or the GUI.

MDS Show Commands

Step 1 Display the active zone set.

```
MDS_5# show zoneset active vsan 113
zoneset name native_zoneset vsan 113
  zone name alias_zone vsan 113
  * fcid 0x0916d5 [pwwn 21:00:00:20:37:73:3b:20]
  * fcid 0x081500 [domain-id   8 port-number   5]
  * fcid 0x0500d1 [pwwn 22:00:00:20:37:5b:c8:e7]

  zone name host1_pwwn_zone vsan 113
  * fcid 0x050101 [pwwn 10:00:00:00:c9:30:c0:c9]
  * fcid 0x0916ce [pwwn 21:00:00:20:37:46:0f:d6]
```

Note The * indicates that the device is logged into the fabric. This is an effective troubleshooting tool that can be used to verify that the zoning is correct and attached devices are logged in.

Step 2 Show the full zone database. When using a legacy switch interop mode 2 VSAN, the output from this command and the active zone set command in Step 1 should match because the Brocade switch sends the entire zone database when a zone set is activated.

Note The * does not apply when displaying the full zone database.

```
MDS_5# show zoneset vsan 113
zoneset name native_zoneset vsan 113
  zone name alias_zone vsan 113
    pwwn 21:00:00:20:37:73:3b:20
    fcalias name a3800top_port5_pwwn vsan 113
      domain-id   8 port-number   5
      pwwn 22:00:00:20:37:5b:c8:e7


  zone name host1_pwwn_zone vsan 113
    pwwn 10:00:00:00:c9:30:c0:c9
    pwwn 21:00:00:20:37:46:0f:d6

MDS_5# show zoneset brief v 113
zoneset name native_zoneset vsan 113
  zone alias_zone
  zone host1_pwwn_zone

MDS_5# show fcalias vsan 113
fcalias name a3800top_port5_pwwn vsan 113
  domain-id   8 port-number   5
  pwwn 22:00:00:20:37:5b:c8:e7
```

Brocade Show Commands

The Brocade *defined configuration* is comparable to the MDS 9000 switch full zone database, and the *effective configuration* is comparable to the MDS 9000 switch active zone set. No matter where the zone set is activated, both should be the same because the MDS 9000 switch follows the Brocade standard of sending all zone database and alias information when activating a zone set.

```
Top3800:admin> cfgshow
Defined configuration:
 cfg:   native_zoneset
                alias_zone; host1_pwwn_zone
 zone:  alias_zone
                21:00:00:20:37:73:3b:20; a3800top_port5_pwwn
 zone:  host1_pwwn_zone
                10:00:00:00:c9:30:c0:c9; 21:00:00:20:37:46:0f:d6
 alias: a3800top_port5_pwwn
                8,5; 22:00:00:20:37:5b:c8:e7

Effective configuration:
 cfg:   native_zoneset
 zone:  alias_zone
                21:00:00:20:37:73:3b:20
                8,5
                22:00:00:20:37:5b:c8:e7
 zone:  host1_pwwn_zone
                10:00:00:00:c9:30:c0:c9
                21:00:00:20:37:46:0f:d6
```

CHAPTER 8

MDS 9000 Legacy Switch Interop Mode 3

This chapter describes how to set up an MDS 9000 legacy switch interop mode 3 topology, with MDS 9000 VSANs and Brocade 16-port switches.

This chapter includes the following sections:

Specifications

Legacy switch interoperability mode 3 for Brocade switches with more than 16 ports (currently, the Brocade 3900 and 12000 models) was introduced with MDS SAN-OS Release 1.3. With this VSAN-based interop mode, Brocade switches do not have to be altered from their native mode and can be seamlessly added to a new or existing MDS SAN-OS VSAN.

The primary difference between legacy switch interop mode 3 and legacy switch interop mode 2 is how the Brocade switch sets the core PID. If a Brocade fabric has switches with more than 16 ports, the core PID will be set to 1. For switches with fewer than 16 ports, Brocade initially allocated one nibble of the FC ID / PID in area field 0x0 - F for the port number. This limited the port count to16. When the core PID is set to 1, the allocated bytes in the FC ID / PID allow the use of port numbers 0x00 - FF.

- FC ID / PID 0x021F00—Core PID 0 means domain ID 02, 1 is always set, port is 15, 00 is assigned N port or ALPA.
- FC ID / PID 0x021F00—Core PID 1 means domain ID 02, port is 31, 00 is assigned address or ALPA. Even though the FC ID is the same, the entire second byte is used for the port number.

For VSANs running in legacy switch interop mode 3, the core PID on the Brocade switch is set to 1. This can be verified with the Brocade **configshow** command.

Configuration

The configuration of the Brocade switch and the MDS 9000 switch is the same as the configuration for legacy switch interop mode 2 with the exception that the interop mode parameter is changed from 2 to 3.

```
MDS_5# config t
MDS_5 (config)# vsan database
MDS_5 (config-vsan-db)# vsan 113 interop 3
```

You need to make the same modifications related to **portcfgislmode** on the Brocade switches as specified in Chapter 7, "MDS 9000 Legacy Switch Interop Mode 2." See the "Configuration" section on page 7-5 for more information on setting up an MDS 9000 switch and a Brocade switch for interoperability without having to change the Brocade switch from its native interoperability mode.

CHAPTER 9

MDS 9000 Legacy Switch Interop Mode 4

This chapter covers legacy switch interop mode 4 for connecting MDS9000 switches to McData switches running in McData Fabric 1.0 mode. It includes the following sections:

Specifications

Legacy switch interoperability mode 4, introduced in Cisco SAN-OS Release 3.0(1), provides the means to non-disruptively connect a McData switch running in McData Fabric 1.0 mode with an MDS 9000 switch.

While in this mode, the MDS VSAN emulates the behavior of a McData switch, including the use of offsets when referring to domain IDs and FC IDs, and in its ability to only establish an Inter-Switch Link (ISL) with another switch that uses McData's OUI (08:00:88).

Note

- If an MDS 9000 switch is using IVR to provide access between McData connected devices and devices in other VSANs, all zoning should be done from the MDS switch.
- Cisco Fabric Manager running Cisco MDS SAN-OS Release 3.0(1) or higher must be used to manage fabrics containing interop mode 4 VSANs.

VSAN World Wide Name

A VSAN running in interop mode 4 must be configured to use a WWN that follows a specific set of rules regarding the following format:

2y:yy:08:00:88:zz:zz:zz

- **Mandatory:** The first byte must begin with 2.
- **Mandatory:** y = 0:00 or hex representation of the VSAN number. (For example, 0:0a for VSAN 10.)
- **Mandatory:** 3rd, 4th and 5th bytes of the WWN must be 08:00:88 (McData OUI).
- **Recommended:** z = last three bytes of the switch WWN.
- **Mandatory:** The chosen WWN must be unique across the fabric.

Note Because the WWN has a McData OUI, the WWN can conflict only with McData switches or other MDS switches with VSANs running in interop mode 4.

Tip The easiest method to obtain a WWN that meets these conditions is to use the system assigned Local switch WWN and replace the OUI. Notice that 0xbc0 is 3008 in decimal.

```
switch# show fcdomain vsan 3008
The local switch is the Principal Switch.

Local switch run time information:
        State: Stable
        Local switch WWN:    2b:c0:00:0c:85:e9:d2:c1
        Running fabric name: 2b:c0:00:0c:85:e9:d2:c1
        Running priority: 128
        Current domain ID: 0x0a(10)
```

The VSAN WWN cannot be configured unless the VSAN is in a suspended state. Set the WWN using the following command:

```
switch# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
switch(config)# wwn vsan <VSAN #> vsan-wwn <wwn>
```

Domain and FC IDs

A McData switch refers to domain IDs in the range of 1 to 31, while FC IDs are used within the range 97 to 127, with an offset of 96. The interop mode 4 VSAN emulates the same behavior as the McData switch. Therefore, when configuring static domain IDs on an MDS switch, the range 1 to 31 should be used; however, devices that log into the VSAN (even physically located on the MDS switch) receive an FC ID whose domain ID is 97-127.

Note If a static domain ID is configured on the MDS switch, it must be in the range 1 to 31 for the interop mode 4 VSAN. However, persistent FC IDs must be configured in the range 97 to 127.

For example, in the following output, a device in VSAN 3008 is assigned an FC ID that contains domain ID 0x6a (106), but upon examining the domain-list, domain ID 10 is displayed. McData's offset of 96 is the difference between the device's FC ID and the domain ID within the domain-list.

```
switch# show flogi database vsan 3008
--------------------------------------------------------------------------------
INTERFACE  VSAN    FCID            PORT NAME               NODE NAME
--------------------------------------------------------------------------------
fc2/5      3008  0x6a0000 50:06:0e:80:04:27:e0:46  50:06:0e:80:04:27:e0:46

Total number of flogi = 1.

switch# show fcdomain domain-list vsan 3008

Number of domains: 2
Domain ID              WWN
---------    -----------------------
  0x06(6)    10:00:08:00:88:a0:ee:f7 [Principal]
 0x0a(10)    2b:c0:08:00:88:e9:d2:c1 [Local]
```

Note If IVR-1 is configured, the domain that is in non-interop mode 4 must have a domain ID in the range 97 to 127 because IVR-1 does not modify the domain ID or FC ID unlike, IVR-2 (NAT).

No modifications to the McData switch are required to connect to the MDS switch. A short procedure is required on the MDS switch prior to establishing the ISL. Cisco Fabric Manager running Cisco SAN-OS Release 3.0(1) or higher should be used to manage an MDS based fabric that contains an interop mode 4 VSAN.

Configuration

To establish connectivity between the McData switch and an MDS switch, follow these steps:

Step 1 Create the VSAN.

```
switch# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
switch(config)# vsan database
switch(config-vsan-db)# vsan 3008
```

Step 2 Record the Local switch WWN:

```
switch(config-vsan-db)# do show fcdomain vsan 3008
The local switch is the Principal Switch.

Local switch run time information:
        State: Stable
        Local switch WWN:    2b:c0:00:0c:85:e9:d2:c1
        Running fabric name: 2b:c0:00:0c:85:e9:d2:c1
        Running priority: 128
        Current domain ID: 0x0a(10)
```

Step 3 Suspend the VSAN.

```
switch(config-vsan-db)# vsan 3008 suspend
```

Step 4 Configure interop mode 4 for the VSAN.

```
switch(config-vsan-db)# vsan 3008 interop 4
```

Step 5 Configure the VSAN WWN for the VSAN according to the rules specified in VSAN World Wide Name, page 9-1.

```
switch(config-vsan-db)# do show wwn switch
Switch WWN is 20:00:00:0c:85:e9:d2:c0
switch(config-vsan-db)# wwn vsan 3008 vsan-wwn 2b:c0:08:00:88:e9:d2:c1
switch(config)#
```

Step 6 Unsuspend the VSAN.

```
switch(config)# vsan database
switch(config-vsan-db)# no vsan 3008 suspend
```

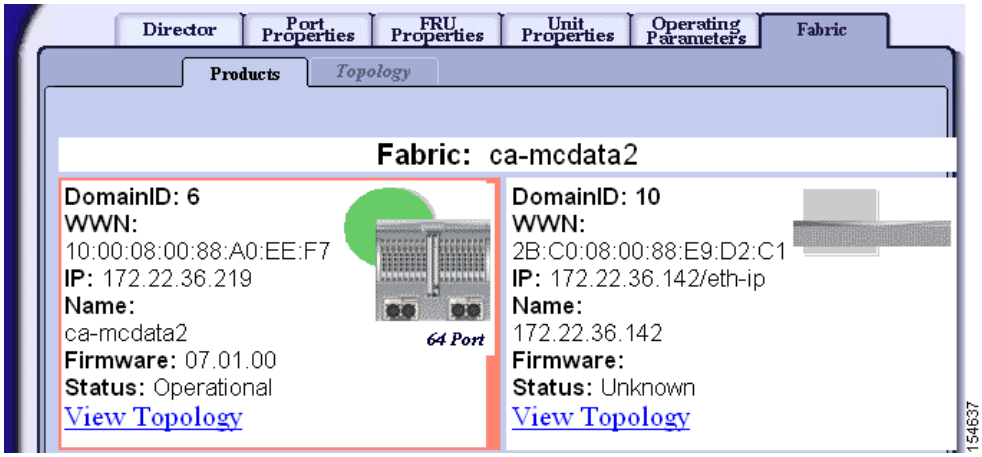
Step 7 Add the ISL to the VSAN and verify connectivity.

```
switch# show fcdomain domain-list vsan 3008

Number of domains: 2
Domain ID              WWN
---------    ------------------------
```

```
  0x06(6)    10:00:08:00:88:a0:ee:f7 [Principal]
 0x0a(10)    2b:c0:08:00:88:e9:d2:c1 [Local]

switch# show topology vsan 3008
FC Topology for VSAN 3008 :
--------------------------------------------------------------------
       Interface  Peer Domain Peer Interface     Peer IP Address
--------------------------------------------------------------------
           fc2/15   0x06(6)         Port 63    ::
```

Figure 9-1 show how the McData GUI displays the MDS switch and the domain IDs of 6 and 10.

Figure 9-1 McData GUI Displaying an MDS Switch in Interop Mode 4



At this point, devices within the VSAN can be zoned using either the Cisco SAN-OS command-line interface, Cisco Fabric Manager, or the McData GUI.

CHAPTER 10

MDS 9020 Switch Interoperability

This chapter describes how to connect the Cisco MDS 9020 fabric switch to a third-party switch, and it includes the following sections:

Note See Chapter 14, "Caveats," for the latest issues regarding MDS 9020 interoperability. The caveats are listed under the respective third-party switch to which the MDS 9020 is connected.

Specifications

The following switches and code levels were used for this example configuration.

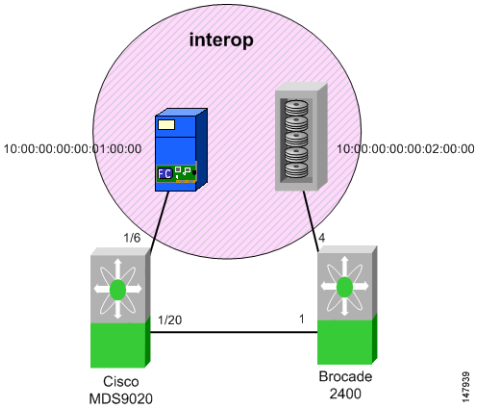
- MDS 9020 running SAN-OS Release 2.1(2)
- Brocade 2400 running Fabric OS Version 2.6.0d

Note

- Check the current supported firmware versions. See the"Firmware Version Requirements" section on page 1-2.
- Always verify zone compliance prior to the merge as outlined in the "Implementing an Interoperable Fabric" section on page 1-4.

Figure 10-1 shows the topology used for this example configuration.

Figure 10-1 MDS 9020 Switch and Brocade Switch Dual Core Topology



Note The interop JBOD is an arbitrated loop with one private drive.

Expected Topology Behavior

This section covers the Fibre Channel services and features that act differently than the topology shown in Figure 10-1, as compared to a homogeneous, single-vendor implementation.

This section contains the following topics:

Zoning

In the core-core topology, zone members are all pWWNs, because the Brocade domain/port nomenclature is not a valid form according to the FC standard. When a zone set activation is made at one core switch, the zone set activation is sent to the other core switch.

Tip Make post-merge zoning changes from the MDS 9020 switch.

Both switches provide all of the zone security for the device-attached ports because the MDS 9000 switch and the Brocade switches do not check the source and destination of the frame when traversing E ports.

Note After two active zone sets successfully merge, always copy the active zone set to the full zone set database prior to modifying it on the MDS 9020 switch.

FSPF

All links within the topology show the link cost of 1000, because the Brocade 2400 switch used in this example only supports 1 Gbps.

The Brocade switches load balance their routes using source/destination; the ingress edge switch uses the same ISL for all traffic that has the same source/destination pair. The MDS switch will continue to load balance across ISLs using the source/destination of the frame.

Trunking and PortChannels

Only standard E ports can be used for the ISLs.

Domain IDs

The domain IDs are limited to the 97 to 127 range, a restriction imposed by McData's inability to handle IDs outside of that range. Although there is no McData switch in this topology, it is possible that there could be and so the respective interop modes from both Cisco and Brocade must abide by this lowest common denominator. While both the MDS 9020 and Brocade 2400 switches can handle domain IDs outside of this range in their normal mode of operation, the implementation of interoperability mode 1 includes this limitation.

Domain ID modifications are handled disruptively on both platforms:

- When changing the domain ID on an MDS 9020 switch, all devices on the MDS 9020 must log out and log back in.
- This event impacts the entire switch. When changing domain IDs on a Brocade switch, the entire switch must be taken offline and/or rebooted.

Configuration

This section describes the configuration process and includes the following topics:

- Configuring the MDS 9020 Switch, page 10-7
- Configuring the Brocade 2400 Switch, page 10-8

Configuring the MDS 9020 Switch

No configuration changes are required for the MDS 9020 switch to work with a Brocade switch in interop mode. However, the domain ID for the MDS 9020 does need to be in the 97 to 127 range.

Warning **Changing the domain ID of a switch causes all devices currently logged into that domain to log in again (FLOGI) to the switch to retrieve a new domain ID. This process is disruptive to those devices.**

If the MDS 9020 is not already in the 97 to 127 range, follow these steps:

Step 1 Assign the domain ID to the switch.

```
top-9020# config t
top-9020(config)# fcdomain domain 101 static
```

Step 2 Restart the domain to make the new domain active.

```
top-9020(config)# fcdomain restart disruptive
```

Step 3 Display the new domain ID.

```
top-9020# sh fcdomain
The local switch is the Principal Switch.

Local switch run time information:
        Local switch WWN:    10:00:00:0d:ec:19:cc:12
        Running fabric name: 10:00:00:0d:ec:19:cc:12
        Running priority:    2
        Current domain ID:   0x65(101)

Local switch configuration information:
        Configured priority:    128
        Configured domain ID:   0x65(101) (static)

Principal switch run time information:
        Running priority: 2
```

Configuring the Brocade 2400 Switch

In this example, the Brocade switch is configured for interop mode using Telnet and the CLI. The switch is placed in an offline state, and the switch is configured for interop mode.

To configure the Brocade 2400 switch, follow these steps:

Step 1 Place the Brocade switch in the disabled state, which is disruptive to the Brocade switch.

```
BR2400_IBM_SAN:admin> switchdisable
BR2400_IBM_SAN:admin>
```

Step 2 Configure the switch for interop mode.

```
BR2400_IBM_SAN:admin> interopmode 1
Committing configuration...done.
interopMode is 1
It is recommended that the system be rebooted to avoid unexpected behavior.
BR2400_IBM_SAN:admin>
```

Step 3 Save the configuration.

```
BR2400_IBM_SAN:admin> cfgsave
Updating flash ...
0x102f9df0 (tShell): Dec 13 14:26:59
    INFO ZONE-MSGSAVE, 4, cfgSave completes successfully.
BR2400_IBM_SAN:admin>
```

Step 4 Plug in the ISL between the two switches. The ISL will not come up because the Brocade switch is disabled.

Step 5 As recommended, reboot the Brocade switch.

```
BR2400_IBM_SAN:admin> fastboot
```

When the switch finishes rebooting, verify the domain ID and interop mode, and that the ISL is up and running.

```
BR2400_IBM_SAN:admin> switchshow

switchName: BR2400_IBM_SAN
switchType: 3.4
switchState: Online
switchMode: Interop
switchRole: Subordinate
switchDomain: 100
switchId: fffc64
switchWwn: 10:00:00:60:69:22:32:91
switchBeacon: OFF
Zoning: ON (int)
port 0: -- No_Module
port 1: sw Online E-Port 10:00:00:0d:ec:19:cc:12 "top-9020" (upstream)
port 2: -- No_Module
port 3: -- No_Module
port 4: cu Online L-Port 4 public
port 5: -- No_Module
port 6: -- No_Module
port 7: -- No_Module
```

Verification

The section highlights the commands used to verify that the fabric is up and running in interoperability mode. This section includes the following topics:

- Verifying the MDS 9020 Switch, page 10-9
- Verifying the Brocade 2400 Switch, page 10-10

Verifying the MDS 9020 Switch

To verify that the ISL is up and the link is not isolated, enter the following commands on the MDS 9020 switch.

```
top-9020# sh int brief

-------------------------------------------------------------
Interface  Admin       Status            FCOT  Oper     Oper
           Mode                               Mode     Speed
                                                       (Gbps)
-------------------------------------------------------------
fc1/1      auto        notConnected      swl
fc1/2      auto        down              swl
fc1/3      auto        down              swl
fc1/4      auto        sfpAbsent         --
fc1/5      auto        sfpAbsent         --
fc1/6      auto        up                swl    F          2
fc1/7      auto        sfpAbsent         --
fc1/8      auto        sfpAbsent         --
fc1/9      auto        down              swl
fc1/10     auto        sfpAbsent         --
fc1/11     auto        sfpAbsent         --
```

```
fc1/12     auto        sfpAbsent         --
fc1/13     auto        sfpAbsent         --
fc1/14     auto        sfpAbsent         --
fc1/15     auto        sfpAbsent         --
fc1/16     auto        down              swl
fc1/17     auto        sfpAbsent         --
fc1/18     auto        sfpAbsent         --
fc1/19     auto        sfpAbsent         --
fc1/20     auto        up                swl    E          1

top-9020# sh fcdomain domain-list

Number of domains: 2
Domain ID             WWN
---------   -----------------------
0x64(100)   10:00:00:60:69:22:32:91
0x65(101)   10:00:00:0d:ec:19:cc:12 [Local] [Principal]


top-9020# sh fcns database
--------------------------------------------------------------------------
FCID      TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x640000  N     10:00:00:00:00:02:00:00
0x6404e0  NL    21:00:00:20:37:a7:ca:b7 (Seagate)
0x6404e1  NL    21:00:00:20:37:19:12:a2 (Seagate)
0x6404e2  NL    21:00:00:20:37:a7:a0:c8 (Seagate)
0x6404e8  NL    21:00:00:20:37:a7:c7:df (Seagate)
0x650500  N     10:00:00:00:00:01:00:00

Total number of entries = 6

top-9020# show zoneset active
zoneset name int
  zone name interop
    pwwn 10:00:00:00:00:02:00:00
    pwwn 10:00:00:00:00:01:00:00
```

Verifying the Brocade 2400 Switch

Enter the following commands on the Brocade 2400 switch to verify that the ISL is up.

```
BR2400_IBM_SAN:admin> switchshow
switchName:BR2400_IBM_SAN
switchType:3.4
switchState:Online
switchMode:Interop
switchRole:Subordinate
switchDomain:100
switchId:fffc64
switchWwn:10:00:00:60:69:22:32:91
switchBeacon:OFF
Zoning:      ON (int)
port  0: --  No_Module
port  1: sw  Online        E-Port  10:00:00:0d:ec:19:cc:12 "top-9020" (upstream)
port  2: --  No_Module
port  3: --  No_Module
port  4: cu  Online        L-Port  4 public
port  5: --  No_Module
port  6: --  No_Module
port  7: --  No_Module
```

```
BR2400_IBM_SAN:admin> fabricshow
Switch ID   Worldwide Name           Enet IP Addr    FC IP Addr      Name
--------------------------------------------------------------------------
100: fffc64 10:00:00:60:69:22:32:91  172.18.172.61   0.0.0.0         "BR2400_IBM_SAN"
101: fffc65 10:00:00:0d:ec:19:cc:12  172.18.172.160  0.0.0.0        >"top-9020"

The Fabric has 2 switches

BR2400_IBM_SAN:admin> zoneshow
Defined configuration:
 no configuration defined

Effective configuration:
 cfg:int
 zone:interop  Protocol:ALL
       10:00:00:00:00:02:00:00
       10:00:00:00:00:01:00:00

BR2400_IBM_SAN:admin> nsallshow
{
  640000 650500
2 Nx_Ports in the Fabric }
```

CHAPTER 11

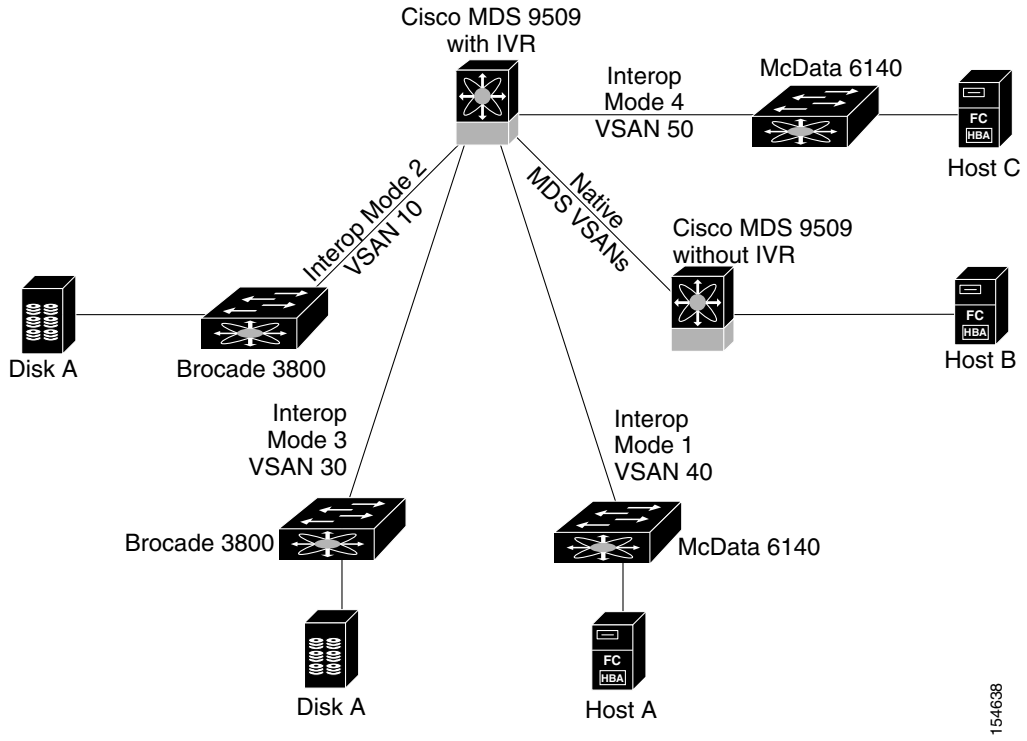
Interoperability with Inter-VSAN Routing

With the introduction of Inter-VSAN routing (IVR) in Cisco MDS SAN-OS Release 1.3(2a), it became possible to have a device in a native (or interop mode 1) VSAN communicate with another device within a native (interop mode 1) VSAN. Cisco MDS SAN-OS Release 1.3(4a) allows a device in any mode VSAN to communicate with a device in another VSAN of any mode.

This ability allows the MDS 9000 switch to consolidate multiple physical fabrics of different modes into a single physical fabric separated by VSANs, while leveraging IVR to provide the necessary connectivity between the VSANs on a per device basis. IVR provides additional benefits, including the ability to connect a core PID 0 Brocade switch to a core PID 1 Brocade switch. Normally, an outage would be required to change the core PID of one of the switches. IVR allows the MDS 9000 switch to act as a conduit between two different legacy switch interop modes. Third-party switches are allowed to be members of an IVR transit VSAN.

Topologies such as the one shown in Figure 11-1 are now possible.

Figure 11-1 Coexisting with Third Party Switches



In Figure 11-1, IVR would enable Host A (which is in VSAN 40 on a McData 6140) to access the storage attached to the Brocade 3800 (Disk A). Prior to MDS SAN-OS Release 1.3(4a), an outage would be required on both the McData director and the Brocade 3800 to configure them for a common interop mode. Host C, residing on a McData 6140, can also access devices on any other VSAN.

Setting Up IVR with Interop Mode

To set up IVR with interop mode VSANs, follow these steps:

Step 1 Establish ISL connectivity between the MDS 9000 switch and the third-party switch. VSANs, ISLs, and third-party switches should be configured as specified in the appropriate sections of this document.

Step 2 Enable RDI mode for IVR on the interop mode VSANs using the command: **ivr virtual-fcdomain-add <VSAN range>.**

Step 3 Configure IVR topologies, zones, and zone sets on the IVR-enabled MDS 9000 switch as specified in the *Cisco MDS 9000 Family CLI Configuration Guide*.

Note When third party switches are involved in an IVR configuration, use the **ivr virtual-fcdomain-add** command to enable RDI mode, as third party switches do not often query the remote name server unless it is present in the domain list. Issuing this command causes all virtual domains to appear in the domain list. This command should only be issued in the VSANs (border VSANs) in which the specified switch

is present. Issuing the **ivr virtual-fcdomain-add** command is required only in edge or border VSANs. It is not required in MDS native VSANs.

Enabling RDI mode on a VSAN which already has an active IVR zoneset can potentially be disruptive to the IVR traffic in that VSAN. If the VSAN does not have any active IVR zones, then enabling RDI mode is not disruptive.

If multiple IVR-enabled switches exist in an edge or border VSAN, the following error message may be displayed in the system messages: (`DEVICE_ON_WRONG_NATIVE_VSAN`). This message can be ignored.

Common commands issued on a Brocade switch show the expected information when working with devices presented via IVR. For example:

```
Top3800:admin> topologyshow

4 domains in the fabric; Local Domain ID: 8

Domain   Metric   Hops   Out Port   In Ports   Flags   Bandwidth   Name
-----------------------------------------------------------------------
   1      1500      2       10     0x00000040    D      2 (Gbs)   "IVR-9509"
 109       500      1       10     0x00000040    D      2 (Gbs)   "ca-9506"
 239      1501      3       10     0x00000040    D      2 (Gbs)   "IVR-9509"
```

Notice that domain 239 is on the same switch as domain 1, but it has a cost of one more. The higher cost is because IVR adds 1 for converting from one VSAN to another. However, the Brocade thinks it is actually another hop.

```
Top3800:admin> nsallshow
{
  0816dc ef0004       <==== FCID ef0004 is created by IVR
2 Nx_Ports in the Fabric }

Top3800:admin> cfgshow
Defined configuration:
cfg:   iscsi   iscsi_vsan114; IVRZ_AIX5_JBOD1123 <= All IVR zones are prefixed with "IVRZ"

 zone:  IVRZ_AIX5_JBOD1123
                21:00:00:20:37:4b:9a:bc; 10:00:00:00:c9:34:a5:be
 zone:  iscsi_vsan114
                23:23:23:23:23:23:23:23; 22:00:00:20:37:14:74:e8;
                22:00:00:20:37:14:74:49; 22:00:00:20:37:04:ea:2b;

Effective configuration:
 cfg:   iscsi
 zone:  IVRZ_AIX5_JBOD1123
                21:00:00:20:37:4b:9a:bc
                10:00:00:00:c9:34:a5:be
 zone:  iscsi_vsan114
                23:23:23:23:23:23:23:23
                22:00:00:20:37:14:74:e8
                22:00:00:20:37:14:74:49
                22:00:00:20:37:04:ea:2b
```

When working with IVR-1 there are two caveats that should be noted:

1. When routing between an interop mode 1 or 4 VSAN and a non-interop mode 1 or 4 VSAN, make sure that there are no domains in the native, or legacy switch interop modes 2 or 3 VSANs that are outside of the 97 to 127 range. Domains outside of this range cannot be created in the interop mode 1 VSAN. This is not a limitation of IVR-1, but a restriction imposed upon the configuration by interop mode 1. Since IVR-2 rewrites the domain ID and FCID of the device in the non-interop mode 1 or 4 VSAN, this is not an issue.

2. If an IVR zone set is active in a VSAN running in an interop mode, regular zone changes (such as zone set activation, reactivation or deactivation for zones that do not require IVR services) should always be initiated from the IVR border switch (the IVR-enabled MDS 9000 switch) for that VSAN. This prevents disruption to ongoing traffic between IVR initiators and targets that are allowed by both the previous active zone set and the new active zone set. Otherwise, traffic disruption is expected in the aforementioned case and a zone change may also fail, because only the border switch has the IVR configuration for that VSAN.

CHAPTER 12

IBM BladeCenter

The IBM BladeCenter has an option to install a two-port embedded Fibre Channel switch. This switch provides the internal blades with the ability to connect to an MDS 9000 Family switch via a standard E port connection. The MDS 9000 switch can then be leveraged to provide other fabric services such as FCIP, IVR, or network based storage virtualization.

This chapter describes interoperability with the IBM BladeCenter, and includes the following sections:

Note Prior to performing an installation, refer to the "IBM BladeCenter (QLogic Switch)" section on page 14-5 in Chapter 14, "Caveats,"for the latest information on IBM BladeCenter SAN Switching Module interoperability.

Configuration

There is no special configuration required to set up the connection between the MDS 9000 switch and the IBM BladeCenter two-port Fibre Channel switching module. The switching module will autonegotiate with a standard MDS 9000 switch FC port to a 2-Gbps, non-trunking E port. The VSAN that the module will be a member of does not need to be placed into an interoperability mode, and can be left in the MDS 9000 switch native mode. The module cannot autonegotiate to a trunking E port (TE port) because it does not have the ability to understand VSANs or the trunking protocol. Therefore, the switching module and all of the blades attached to the module will be members of the same VSAN.

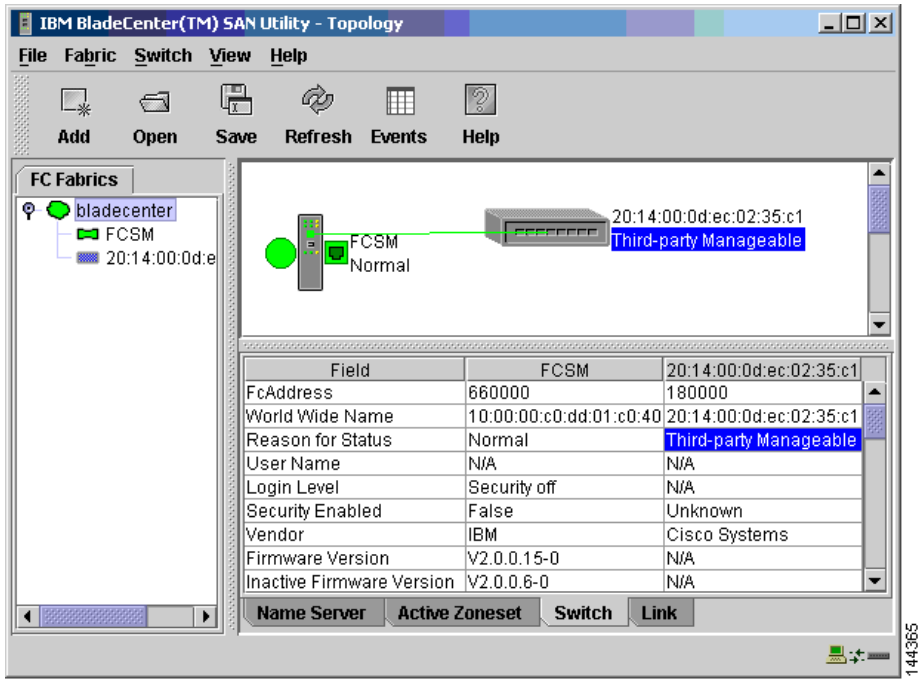
Zoning

Zoning can be performed from either the MDS 9000 switch or from the BladeCenter SAN Utility. However, the zone set database on the MDS 9000 switch or the IBM BladeCenter switching module does not get propagated. The MDS 9000 switch does not distribute the zone set database to the switching module, nor does it receive one.

Note After two active zone sets successfully merge, always copy the active zone set to the full zone set database prior to modifying it on the MDS 9000 switch.

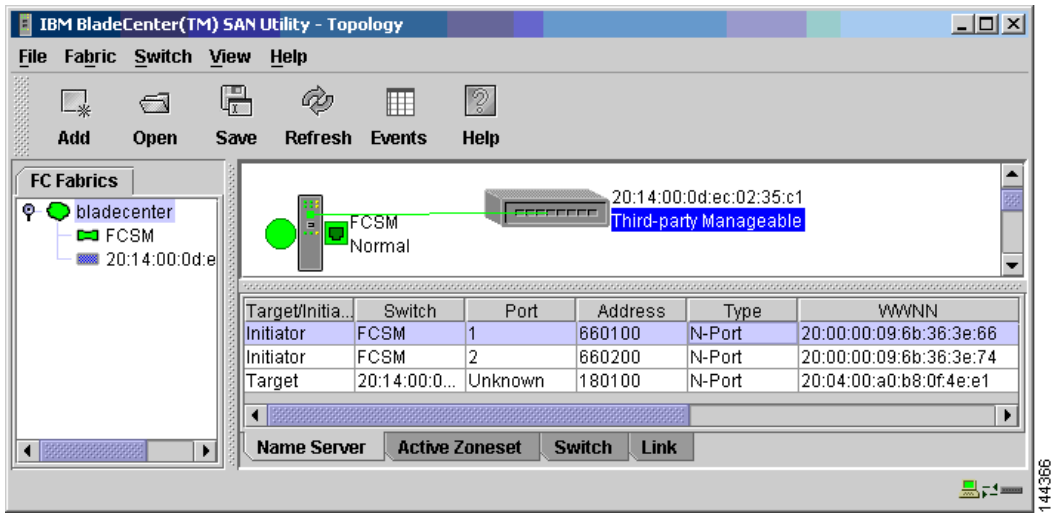
Figure 12-1 shows the IBM SAN Utility after connecting an MDS 9000 switch to the SAN Module. The MDS 9000 switch is identified as a Cisco System switch with the switch WWN listed. The FcAddress field lists the domain ID (0x180000) of the VSAN in the MDS 9000 switch to which the BladeCenter is attached.

Figure 12-1 Identifying MDS Using the IBM BladeCenter SAN Utility



The name server in the IBM SAN Utility lists devices present on the switching module and the MDS 9000 switch. Devices that are on the switching module are listed on the switch FCSM, while devices on the MDS 9000 switch are listed with the MDS 9000 switch WWN. (See Figure 12-2.)

Figure 12-2 Examining the Name Server Using the IBM BladeCenter SAN Utility



Examining the MDS 9000 switch port provides the expected information for a non-trunking device. For example:

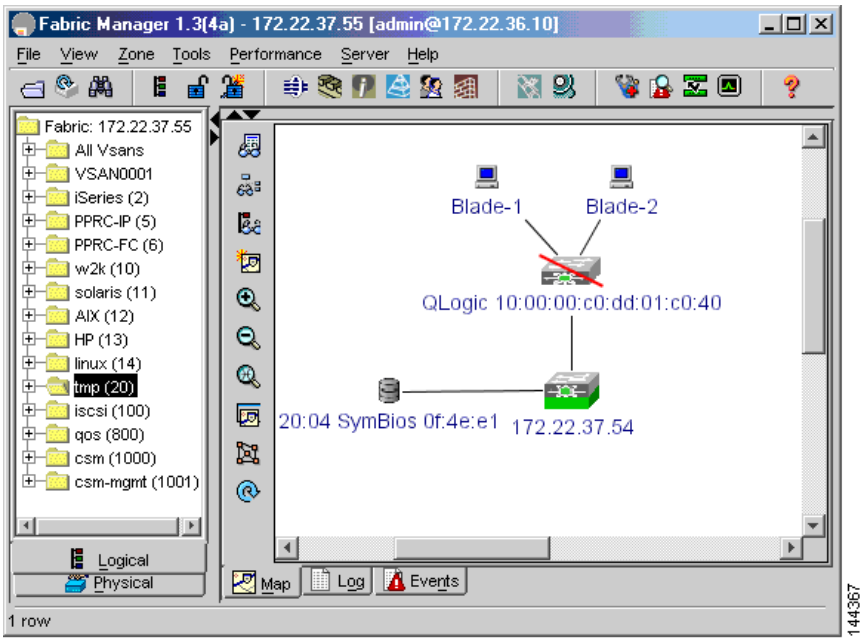
```
MDS-9506# show int fc1/1
fc1/1 is up
    Port description is ISL-bladeCenter-14
    Hardware is Fibre Channel, FCOT is short wave laser
    Port WWN is 20:01:00:0d:ec:02:35:c0
    Peer port WWN is 20:0f:00:c0:dd:01:c0:40    WWN of IBM Switching Module
    Admin port mode is auto, trunk mode is on
    Port mode is E, FCID is 0x180000        <==== Autonegotiated to E port
    Port vsan is 20
    Speed is 2 Gbps Autonegotiated to 2Gb
    Transmit B2B Credit is 12
    Receive B2B Credit is 255
    Receive data field Size is 2112
    Beacon is turned off
    5 minutes input rate 681152 bits/sec, 85144 bytes/sec, 591 frames/sec
    5 minutes output rate 170664 bits/sec, 21333 bytes/sec, 591 frames/sec
      346300 frames input, 49794748 bytes
        0 discards, 0 errors
        0 CRC,  0 unknown class
        0 too long, 0 too short
      346136 frames output, 12520204 bytes
        0 discards, 0 errors
      5 input OLS, 3 LRR, 0 NOS, 6 loop inits
      4 output OLS, 3 LRR, 3 NOS, 6 loop inits
      255 receive B2B credit remaining
      12 transmit B2B credit remaining
```

Querying the MDS 9000 Fabric Configuration Server shows that the IBM switching module does not support FCS, but this is not a serious problem because FCS is not a mandatory Fibre Channel service. The only impact is that the MDS 9000 switch cannot determine the IP address of the IBM switching module. For example:

```
MDS-9506# show fcs database vsan 20

FCS Local Database in VSAN: 20
------------------------------
Switch WWN                : 20:14:00:0d:ec:02:35:c1
Switch Domain Id          : 0x18(24)
Switch Mgmt-Addresses     : http://172.22.37.54/eth-ip
                            snmp://172.22.37.54/eth-ip
Fabric-Name               : 20:14:00:0d:ec:02:35:c1
Switch Logical-Name       : Excal-54
Switch Information List   : [Cisco Systems, Inc.*DS-C9216-K9*1.3(4a)*20:00:00:0d:
ec:02:35:c0]
Switch Ports:
-------------------------------------------------------------------
Interface  fWWN                     Type     Attached-pWWNs
-------------------------------------------------------------------
fc1/1      20:01:00:0d:ec:02:35:c0  E        20:0f:00:c0:dd:01:c0:40
fc1/11     20:0b:00:0d:ec:02:35:c0  F        20:04:00:a0:b8:0f:4e:e3

MDS-9506# show fcs ie vsan 20

IE List for VSAN: 20
---------------------------------------------------------------------------
IE-WWN                    IE-Type           Mgmt-Id          Mgmt-Addr
---------------------------------------------------------------------------
10:00:00:c0:dd:01:c0:40  Switch (Adjacent) (No FCS support)None
20:14:00:0d:ec:02:35:c1  Switch (Local)    0xfffc18         172.22.37.54
[Total 2 IEs in Fabric]
```

When using Fabric Manager to examine the fabric (see Figure 12-3), Fabric Manager shows the IBM BladeCenter SAN Switching module as a Qlogic switch. The module is displayed with a red slash through the icon because the IP address of the module cannot be determined using FCS.

Figure 12-3 Fabric Manager Displaying Blade Center SAN Module



Standards based Fibre Channel rules still apply to a fabric built with the IBM BladeCenter SAN Switching module, just as they would in any MDS 9000 switch native mode VSAN.

CHAPTER 13

Standards Perspectives

This chapter describes common standards that relate to interoperability and it includes the following sections:

Active and Full Database Distribution

To understand the definition and differences between active and full databases, refer to the *Cisco MDS 9000 Family CLI Configuration Guide*. The Fibre Channel Switch Fabric - 2 (FC SW-2) standard also includes some details about this topic.

According to the FC SW-2 standard, full database distribution is optional in both Merge Request (MR) and Change Requests (SFC). The standard also recommends not sending the full database information to prevent possible interoperability problems. (Refer to sections 10.4.4, 10.6.3 FC SW-2 Rev 5.4.)

Domain/Port Based Zoning

FC SW-2 and Fibre Channel Generic Services - 3 (FC GS-3) standards have a definition of domain/port based zoning. However, the Fibre Channel Methodologies for Interconnects Technical Report (FC-MI) standard prohibits this type of zoning, because there is no standard meaning specified for port number in the zoning section. Each vendor may interpret it differently, causing interoperability problems. (Refer to section 7.2.7.1 FC MI Rev 1.92.)

FC Alias Distribution

There is some confusion about FC aliases in the standards. The FC SW-2 standard, which is used for switch-to-switch zoning communication, defines zoning based on FC aliases. But the FC GS-3 standard, which is used for the inband management of zoning, does not have any details about FC aliases. This confusion may be resolved in future FC SW-3 and FC GS-4 standards.

The FC SW-2 standard mentions that aliases can be part of the full database, but should not be part of the active database. For example, FC alias definitions should be expanded in the active zone set. (Refer to 10.4.4, 10.6.3 FC SW-2 Rev 5.4.)

Vendor Specific Zoning Mechanisms

The FC SW-2 and FC GS-3 standards define some standard mechanisms for zoning, such as zoning based on port world wide name (pWWN), FC ID, alias, and so on. Each of these members are specified in <Type, Length, Value> format. Along with these standard zoning mechanisms, the standard allows some member types to support vendor specific zoning mechanisms. By this facility, any vendor who wants to support or introduce some non-standard zoning mechanisms can consume one member type from this pool and distribute the zoning information using standard FC formats.

When taking the above standard issues into consideration, the MDS 9000 switch zoning behavior varies between different interop modes and in non-interop mode.

Name Server Support for Symbolic Names

According to the FC SW-2 standard (Section 9.3.3, Name Server Objects), Port Symbolic Name and Node Symbolic Name are not mandatory fields in the small name server object. The MDS 9000 switch implements this optional field in the name server, as some HBAs use it to list firmware, driver or platform information pertinent to the HBA, driver, or host.

CHAPTER 14

Caveats

This chapter describes release-specific behavior for certain versions of Brocade, McData, or IBM BladeCenter firmware, and includes the following sections:

Brocade Switches

- If IVR is used while connecting to a Brocade switch running firmware version 5.x and greater, and the VSAN is configured for interop mode 1,2 or 3, RDI mode should be configured on that VSAN. RDI mode is automatically enabled in interop modes 2 and 3, but must be manually enabled for interop mode 1. To enable RDI mode the command: **ivr virtual-fcdomain-add vsan-ranges <VSAN #s>**.
- If an MDS 9020 is running FabricWare Release 2.1(2) and is the only MDS switch in a fabric, or if the MDS 9020 is used as the seed switch for Fabric Manager, devices connected to a third-party switch may not be displayed properly in Fabric Manager. The devices are fully accessible via the CLI and are functioning properly. This issue is being tracked with DDTS CSCsc77866.
- On Brocade switches running version 3.1.1 and version 4.1.1, ISL ports need to be set to ISLMODE 1 using the command **portcfgislmode** <*port number*>**, 1**. This is required for Brocade switch models 3800, 3900, and 12000. However, Brocade models 2800 and below do not require this. Brocade 3800s running version 3.0.x do not have this command.
- If there is an attempt to merge a Brocade switch that in its active configuration is an fcalias in which one of its members is listed twice with an MDS VSAN, the MDS switch will isolate the Inter-Switch Link (ISL). **Workaround:** This is resolved in SANOS 3.0(2a). This issue is tracked in DDTS CSCsd81137. A duplicate member looks like this:

```
alias: L1PNL2b_LTO1
       6,14; 6,14;
```

- Brocade switch models 3800 and 2800 running core PID mode 1 should be treated as if they were Brocade 3900s. Legacy switch interop mode 3 should be used.
- When using Brocade switches running version 4.1.1 (typically, the Brocade 3900 or12000), force the ISLs on the MDS 9000 switch to E port. If this is not done, a link flap might crash the Brocade 3900 or 12000.

- The MDS 9000 switch exec command **zoneset distribute vsan** should be used to emulate the Brocade command **cfgsave**. The command will distribute the full zone set database, and the Brocade switches will implicitly save their configuration to nonvolatile memory. Activating a zone set from the MDS 9000 switch will implicitly send a **cfgsave** to the other Brocade switches in VSAN.
- Even though the zone sets have the same zones and members in legacy switch interop mode 2 and 3, a fabric merge with Brocade might fail due to the exact order of the zones and members not matching. To resolve this issue, make sure one of the merging fabrics has a null full or active zone database.
- If the MDS 9000 switch ISL is not forced to a specific buffer-to-buffer (B2B) credit using the MDS SAN-OS command **switchport fcrxbbcredit 16**, the ISL may fail to come up and the following error message will be displayed on the Brocade switch:

  ```
  elpFailureInvalidFlowCTLParam
  ```

- The Brocade 3800 model has trouble tolerating domain SW-RSCNs in version 3.1.1. It often fails to function when it receives one.
  Workaround: Use the **rscn suppress domain-swrscn vsan** command to suppress domain SW-RSCNs. This Brocade bug is tracked in DDTS as CSCec75477.
- Brocade core PID definitions:
  - **CorePID 0 (Native Mode)**—Introduced in the 2000 series of Brocade fabric switches supporting up to 16 ports. Uses only 4 bits of the area_ID in the FC ID for the port number. Use this setting with MDS 9000 switches in legacy switch interop mode 2.

    FC ID / PID 0x021F00—Core PID 0 means domain ID 02, 1 always set, port 15, 00 is assigned for N port or ALPA.
  - **CorePID 1 (Core Mode)**—Introduced in the 3900/12000 series of Brocade switches with more than 16 ports. Uses all 8 bits of the area_ID in the FC ID for the port number. Can support up to 256 ports per switch. Use this setting with MDS 9000 switches in legacy switch interop mode 3.

    FC ID / PID 0x021F00—Core PID 1 means domain ID 02, port is 31, 00 is assigned address or ALPA. Even though the FC ID is the same, the entire second byte is used for the port number.
  - **CorePID 2 (Extended Edge)**—Introduced in Brocade version 2.6.2, version 3.1.2 and version 4.2.0. Uses the same format PID as native mode, however it can be used on switches with up to 128 ports. This mode is only used when a core PID 1 switch must connect to a core PID 0 switch that absolutely cannot be rebooted.

    For example, a 16 port Brocade switch may be set for core PID = 1 if it was previously attached to a fabric with other core PID = 1 switches (such as Brocade models 3900 and 12000).

    To configure core PID = 1:

    ```
    Herlaar:admin> configure

    Configure...

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

        Domain: (1..239) [98]
        BB credit: (1..27) [16]
        R_A_TOV: (4000..120000) [10000]
        E_D_TOV: (1000..5000) [2000]
        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]   <==== 0 for interop 2; 1 for interop 3
```

- When setting up interoperability with a Brocade 3800 (version 3.1.1) or 12000 (version 4.1.1) switch, the following error message can be seen on the Brocade console when the MDS 9000 switches connect to the Brocade in interop mode 1, 2, or 3:

  ```
  fabric: Reconfiguring (Mon Jan 26 19:59:56 2004)
   5  4  3  2  1
  10  9  8  7  6  5  4  3  2  1
  fabric: Principal switch
  fabric: Domain 103
  Received unknown interswitch command 1000000
  Received unknown interswitch command 1000000
  Received unknown interswitch command 1000000
  Received unknown interswitch command 1000000
  Received unknown interswitch command 1000000
  ```

  Each time the E port is flapped, FDMI FC-CT-Reserved frames are sent from the MDS 9000 switch to the Brocade switch. These frames can cause a memory leak on the Brocade switch, which can then lead to the Brocade switch failing to function. This problem is not seen on Brocade 2800 switches running version 2.6.1a, as it correctly rejects the FDMI frames with the valid reason code Command Not Supported, which is the expected behavior.
  Workaround: Execute the **fdmi suppress-updates vsan** *vsan-id* command in configuration mode, for the VSAN that the Brocade switch is a member of. This bug is tracked in DDTS as CSCed56659.

- If changes to a VSAN would typically require the MDS domain to be restarted (FC timers, domain IDs, and so on), suspend and then no suspend the VSAN rather than using the **fcdomain restart disruptive vsan** command. The RCF frame (Reconfigure Fabric) can cause the links to become isolated.

- If a Brocade switch displays with a red X through it in the Fabric Manager map, and placing the mouse over the Brocade switch results in a SNMP timeout message, then enable SNMP version 1 on the Brocade switch.

To modify the Brocade switch using Fabric Manager, follow these steps:

Step 1 Launch a web browser using the IP address of the Brocade switch as the URL.

Step 2 Click **Admin** on the front panel and log into the switch.

Step 3 Click the **SNMP** tab.

Step 4 Enter the IP address of the system where Fabric Manager is running in the Recipient column of the Community/Trap table for private and public community strings.

Step 5 Enter the IP address of your desktop under the Access SW Host column of the table and set it to ReadWrite access list. To do this, just modify an empty row that has 0.0.0.0.

McData Switches

- If IVR is used while connecting to a McData switch, and the VSAN is configured for interop mode 1 or 4, RDI mode should be configured on that VSAN. RDI mode is automatically enabled in interop modes 4, but must be manually enabled for interop mode 1. To enable RDI mode the command: **ivr virtual-fcdomain-add vsan-ranges <VSAN #s>**.

- If you are using interop mode 4 on an MDS 9000 switch running Cisco SAN-OS 3.1(1) or earlier with a McData switch and IVR is enabled, we recommend using auto-topology for the IVR configuration.
  Workaround: Configure IVR with auto-topology instead of manual topology. This issue is being tracked in DDTS as CSCsh60422.
- If more than two devices exist with the same area byte in their respective FC IDs (for example, McData attached: 0x101100, MDS 9000 switch attached: 0x201100, 0x201101, and 0x201102), the device(s) attached to the McData will not be able to access the MDS 9000 switch devices because the McData switch drops the frames. This situation occurs because the McData switch has trouble with an FC ID that uses all three bytes of the FC ID (domain,area,port). McData switches only use two bytes in the FC ID (domain,area,00).
  Workaround: Configure the devices on the MDS 9000 switches using preconfigured persistent FC IDs that have 00 for the port fields in the FC ID (0x####00). This issue is resolved in McData firmware version 7.01. This issue is tracked in DDTS as CSCee34298.
- If a McData switch is running firmware version 8.1, and the MDS 9000 switch is configured for IVR, then zone activations from the MDS switch may fail.
  Workaround: Configure IVR in the interop VSAN for RDI mode by executing the **ivr virtual-fcdomain-add vsan-ranges** *vsan-range* command in configuration mode**.** RDI mode is the default mode for switches running MDS SAN-OS Release 2.1(1b), and enabling RDI mode may be disruptive to IVR traffic for switches running MDS SAN-OS Release 2.1(2b) or later. RDI mode should be enabled prior to activating the IVR zone set.
- If an MDS 9020 switch is running FabricWare Release 2.1(2) and is the only MDS switch in a fabric, or if the MDS 9020 is used as the seed switch for Fabric Manager, devices connected to a third-party switch may not be displayed properly in Fabric Manager. The devices are fully accessible via the CLI and are functioning properly. This is being tracked with DDTS CSCsc77866.
- In McData firmware versions 4.01.xx and 5.01.xx, the Mcdata switch might not send a domain RSCN to a connected host when a new switch joins the fabric. If this occurs, the host might not see the remote target.
  Workaround: Plug/unplug the host cable.
- When a McData switch with firmware versions 4.01.xx/5.01.xx/5.02.xx in open-fabric mode is attached to an MDS 9000 switch, and there are hosts attached to the MDS 9000 switch which register a symbolic port or node name with the FCNS, the name server on the McData switch may send ABTS (abort sequences) to devices that are locally attached to the McData switch. According to the FC SW-2 standard, (Section 9.3.3 Name Server Objects), Port Symbolic Name and Node Symbolic Name are not mandatory fields in the small name server object. The result is that an end device that successfully registers a symbolic port/node name with an MDS 9000 switch may cause the McData switch name server to malfunction. End devices that log into the McData name server will receive abort sequences (ABTS).
  Workaround: Plug all devices that register symbolic node/port world wide names into the McData switch. This issue is resolved in MDS SAN-OS Release 1.3(4a) and the MDS 9000 switch no longer distributes symbolic port or node names as part of interop mode 1 VSANs.

```
MDS SAN-OS CLI command: show fcns database detail

Device registered with Symbolic Node Name:
------------------------
VSAN:1     FCID:0xea0100
------------------------
port-wwn (vendor)     :21:00:00:e0:8b:08:96:22 (Qlogic)
node-wwn              :20:00:00:e0:8b:08:96:22
class                 :3
node-ip-addr          :0.0.0.0
ipa                   :ff ff ff ff ff ff ff ff
```

```
fc4-types:fc4_features:scsi-fcp:init
symbolic-port-name    :
symbolic-node-name    :QLA23xx FW:v3.01.19 DVR:v8.2.2.25 (W2K VI)
port-type             :N
port-ip-addr          :0.0.0.0
fabric-port-wwn       :20:41:00:05:30:00:94:9e
hard-addr             :0x000000

Device that does not register a symbolic name:
------------------------
VSAN:1     FCID:0x7d0200
------------------------
port-wwn (vendor)     :20:00:00:e0:69:40:8d:63 (JNI)
node-wwn              :10:00:00:e0:69:40:8d:63
class                 :2,3
node-ip-addr          :0.0.0.0
ipa                   :ff ff ff ff ff ff ff ff
fc4-types:fc4_features:ipfc
symbolic-port-name    :
symbolic-node-name    :
port-type             :N
port-ip-addr          :0.0.0.0
fabric-port-wwn       :20:0c:00:0b:be:57:70:40
hard-addr             :0x000000
```

- When routing with IVR between an interop mode 1 VSAN and a non-interop mode 1 VSAN, make sure that there are no domains outside the 97 to 127 range in the native mode, or in the legacy interop mode 2 or 3 VSANs. Domains outside of this range cannot be created in the interop mode 1 VSAN. This is not a limitation of IVR, but a restriction imposed upon the configuration by interop mode 1.
- When using the McData EFCM application (also know as HAFM when purchased through HP), the McData switch needs to be the principal switch in the fabric. If the McData switch is not the principal switch in the fabric, the application will not work correctly.
- If changes to a VSAN require the MDS 9000 switch domain to be restarted (FC Timers, domain IDs, and so on), suspend and no suspend the VSAN instead of using the **fcdomain restart disruptive vsan** command. The RCF frame can cause the links to become isolated.

IBM BladeCenter (QLogic Switch)

- If the IBM BladeCenter is involved in an IVR configuration, the **ivr virtual-fcdomain-add** command should be used because the specified switches do not query the remote name server unless it is present in the domain list. Issuing this command causes all virtual domains to appear in the domain list. This command only needs to be issued in the VSANs (border VSANs) in which the specified switch is present. With MDS SAN-OS Release 1.3(4a) or later, issue this command only in edge or border VSANs and not in transit VSANs. If multiple IVR-enabled switches exist in an edge or border VSAN, the following error message may be displayed in the system messages: (`DEVICE_ON_WRONG_NATIVE_VSAN`). This message can be ignored.
- Enabling IOStreamGuard will prevent RSCNs from being sent to the blades in the BladeCenter. Therefore, a blade will not be notified if a target joins or leaves the fabric. The BladeCenter **show config port** command displays the status. This feature is disabled by default.
- If the Fabric Manager is unable to see initiators on the IBM BladeCenter, verify that the InbandEnabled parameter on the IBM switch module is set to true. Use the following CLI commands to verify that InbandEnabled is set to true.

```
Sanbox2 login: admin
    Password: ********
```

```
#> show config switch
```

```
The following displays:

Switch Configuration Information
--------------------------------
AdminState Online
BroadcastEnabled True
* InbandEnabled True
```

If InbandEnabled is set to false, use the following CLI commands to change the setting.

```
#> admin start
(admin)#> config edit
(admin-config)#> set config switch
```

A list of attributes with formatting and current values displays. Enter a new value or press ENTER to accept the current value. If you want to terminate this process before reaching the end of the list, press **q** + **Enter** or **Q** + **Enter**.

```
AdminState (1=Online, 2=Offline, 3=Diagnostics) [Online]
BroadcastEnabled (True / False) [True]
InbandEnabled (True / False) [False] True
DefaultDomainID (decimal value, 1-239) [6]
```

This configuration must be saved (using the **config save** command) and activated (using the **config activate** command) before it can take effect. If you want to discard this configuration, use the **config cancel** command.

```
(admin-config) #> config save
(admin) #> config act
```

The Fabric Manager is now able to display the initiators present in the IBM fabric within its topology map.

Send documentation comments to mdsfeedback-doc@cisco.com

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