Brocade Distributed Fabrics

User's Guide Version 3.1.0/4.1.0

Publication Number: 53-0000516-02
Publication Date: 04/25/03

 Publication Number: 53-0000516-02

Brocade Communications Systems, Incorporated

Corporate Headquarters
1745 Technology Drive
San Jose, CA 95110
T: (408) 487-8000
F: (408) 487-8101
Email: info@brocade.com

Asia-Pacific Headquarters
Shiroyama JT Trust Tower 36th Floor
4-3-1 Toranomon, Minato-ku
Tokyo, Japan 105-6036
T: +81 35402 5300
F: +81 35402 5399
Email: apac-info@brocade.com

European Headquarters
29, route de l'Aeroport
Case Postale 105
CH-1211 Geneva 15,
Switzerland
T: +41 22 799 56 40
F: +41 22 799 56 41
Email: europe-info@brocade.com

Latin America Headquarters
5201 Blue Lagoon Drive
Miami, FL 33126
T: (305) 716-4165
Email: latinam-sales@brocade.com

Document History

The table below lists all versions of the *Brocade Distributed Fabrics User's Guide*.

Document Title	Publication Number	Publication Date
Brocade Distributed Fabrics User's Guide v2.2	53-0001557-02	May 2000
Brocade Distributed Fabrics User's Guide v3.0	53-0000132-03	July 2001
Brocade Distributed Fabrics User's Guide v3.1/4.1	53-0000516-01	March 2002
Brocade Distributed Fabrics User's Guide v3.1.0/4.1.0	53-0000516-02	April 2003

Contents

Index

Preface

About This Manual

This manual provides comprehensive information to help you administer your SilkWorm switch and storage area network (SAN). This manual was developed to help technical experts operate, maintain, and troubleshoot SAN products. A list of additional SAN resource reference materials is also included. The sections that follow provide:

- A summary of updates to this document.
- The intended audience for this document.
- Information to help you use Brocade documentation.
- Information on additional SAN resources.
- How to get Technical Support.

What's New in This Book

The following changes have been made since this book was last released (part number 53-0000xxx-0x):

- Information that was added:
  - R_RDY Mode added to chapter 1.
- Information that was modified:
  - The document has been re-organized.
- Information that was removed:
  -

Intended Audience

This document is intended for use by systems administrators and technicians experienced with networking, Fibre Channel, and SAN technologies.

Manual Conventions

This section lists text formatting conventions and important notices formats used in this document.

Formatting

The following table describes the formatting conventions that are used in this book:

Convention	Purpose
bold text	• identifies command names • identifies GUI elements • identifies keywords/operands • identifies text to enter at the GUI or CLI
italic text	• provides emphasis • identifies variables • identifies paths and internet addresses • identifies book titles and cross references
`code` text	• identifies CLI output • identifies syntax examples

Notes, Cautions, and Warnings

The following notices appear in this document:

Note: A note provides a tip, emphasizes important information, or provides a reference to related information.

Caution: A caution alerts you to potential damage to hardware, firmware, software, or data.

Warning: A warning alerts you to potential danger to personnel.

Related Publications

This section lists additional documentation that you may find helpful.

Brocade Documentation

The following related publications are provided on the Brocade Documentation CD-ROM and on the Brocade Partner Web site:

- **Brocade Fabric OS documentation**
  - *Brocade Diagnostic and System Error Message Reference*
  - *Brocade Fabric OS Procedures Guide*
  - *Brocade Fabric OS Reference*
- **Brocade Fabric OS optional features documentation**
  - *Brocade Advanced Performance Monitoring User's Guide*
  - *Brocade Advanced Web Tools User's Guide*
  - *Brocade Advanced Zoning User's Guide*
  - *Brocade Fabric Watch User's Guide*
  - *Brocade ISL Trunking User's Guide*
  - *Brocade QuickLoop User's Guide (v 3.1 only)*
  - *Brocade Secure Fabric OS User's Guide*
  - *Secure Fabric OS QuickStart Guide*
- **Brocade Hardware documentation**
  - *Brocade SilkWorm 12000 Hardware Reference (for v.4.1 software)*
  - *Brocade SilkWorm 12000 QuickStart Guide (for v4.1 software)*
  - *Brocade SilkWorm 3900 Hardware Reference (for v.4.1 software)*
  - *Brocade SilkWorm 3800 Hardware Reference (for v.3.1 software)*
  - *Brocade SilkWorm 3200 Hardware Reference (for v.3.1 software)*

Release notes are available on the Brocade Partner Web site and are also bundled with the Fabric OS.

Additional Resource Information

For practical discussions about SAN design, implementation, and maintenance, *Building SANs with Brocade Fabric Switches* is available through:

http://www.amazon.com

For additional Brocade documentation, visit the Brocade SAN Info Center and click on the Resource Library location:

http://www.brocade.com

For additional resource information, visit the Technical Committee T11 Web site. This Web site provides interface standards for high-performance and mass storage applications for fibre channel, storage management, as well as other applications:

http://www.t11.org

For information about the Fibre Channel industry, visit the Fibre Channel Industry Association Web site:

http://www.fibrechannel.org

How to Get Technical Support

Contact your switch support supplier for hardware, firmware, and software support, including product repairs and part ordering. To assist your support representative and to expedite your call, have the following three sets of information immediately available when you call:

1. **General Information**
   - Technical Support contract number, if applicable
   - switch model
   - switch operating system version
   - error messages received
   - **supportshow** command output
   - detailed description of the problem and specific questions
   - description of any troubleshooting steps already performed and results
2. **Switch Serial Number**

   The switch serial number and corresponding bar code are provided on the serial number label, as shown below.

   ```
   *FT00X0054E9
   ```
   FT00X0054E9

   The serial number label is located as follows:
   - *SilkWorm 2000 series switches:* Bottom of chassis
   - *SilkWorm 3200 and 3800 switches:* Back of chassis
   - *SilkWorm 3900 switches:* Bottom of chassis
   - *SilkWorm 6400 and 12000 switches:* Inside front of chassis, on wall to left of ports
3. **Worldwide Name (WWN)**
   - *SilkWorm 3900 and 12000 switches:* Provide the license ID. Use the **licenseidshow** command to display the license ID.
   - *All other SilkWorm switches:* Provide the switch WWN. Use the **wwn** command to display the switch WWN.

Chapter

1

Introducing Brocade Distributed Fabrics

Overview

The Brocade Distributed Fabrics feature is a combination of the Brocade Remote Switch and Brocade Extended Fabric features. Though documented together, Remote Switch and Extended Fabric are separately licensed features.

Remote Switch	Remote Switch enables you to connect two remote Brocade fabrics over an IP network, enabling communication of IP or ATM protocols as well as the normal Fibre Channel traffic.
Extended Fabrics	Extended Fabrics extends the distance of ISL connections up to 100 km. It enables switches to communicate across distances of between 60 km and 100 km with line speed performance of close to full 2 Gbit/sec Fibre Channel speed.

Brocade Remote Switch

The Brocade Remote Switch feature functions with the aid of a “bridging device” or network bridge. The network-bridge supports both a Fibre Channel physical interface and a secondary non-Fibre Channel physical interface such as IP or ATM. Brocade Remote Switch functions as an E_port. With Remote Switch on both sides of a fabric, the network-bridge accepts Fibre Channel frames from one side of a fabric, tunnels them across the network, and then passes them to the other side of the fabric. From the viewpoint of the connected hosts and storage devices, fabrics using Brocade Remote Switch interact the same as locally connected switches.

Brocade Remote Switch provides:

- Coordinated fabric services: The Remote Switch fabric configuration fully supports all fabric services, including Distributed Name Services, Registered State Change Notifications, and Alias Services.
- Distributed management: Management tools such as Brocade Advanced Web Tools, Fabric OS, and SNMP, are available from both the local switch and the remote switch. Switch management is routed through the Fibre Channel connection, thus no additional network connection is required between sites.
- Support for inter-switch links (ISLs): Sites requiring redundant configurations can connect multiple E_ports to remote sites by using multiple gateways. Standard Brocade Fabric OS routing facilities automatically maximize throughput, and provide automatic failover and failback during interruption on the WAN connection.

Extended Fabrics

The Brocade Extended Fabrics feature enables inter-switch links ISLs to extend up to 100 km. This is achieved by optimizing the internal buffering algorithm used by Brocade SilkWorm switches. It provides maximum buffering between E_ports connected over an extended distance. The buffer reconfiguration results in line speed performance of close to full Fibre Channel speed for switches interconnected at 60 to 100 kilometers.

Note: Performance may vary depending on the condition of the fiber optic connections between the switches. Losses due to splicing, connectors, tight bends, and other degradation can affect the performance over the link and the maximum distance possible.

R_RDY Mode

To enable R_RDY on a port use the portcfgislmode command. For more information on R_RDY mode refer to the Fabric OS Procedures Guide or Fabric OS Reference Guide.

Switch ports usually initialize using Exchange Link Parameters (ELP) Mode 1; however Gateways expect an initialization that uses ELP mode 2. Enabling ISL R_RDY mode simplifies Gateway connections by causing the port initialization to use the expected method (ELP mode 2). Therefore, the WAN gateway does not need to support a special mode for these switches.

License Activation

Before using a feature, it is good practice to verify that the specific license is activated. Use the *licenseShow* command to view a list of all licenses activated on your switch, as shown in the example below. If the necessary license is not included in the list, continue with *License Activation Using Telnet* on page 1-3 or *License Activation Using Brocade Advanced Web Tools* on page 1-4.

To view a list of all licenses activated on your switch:

1. Log onto the switch by telnet using an account that has administrative privileges.
2. Enter the **`licenseshow`** command on the telnet command line. A list of all activated licenses on the switch is generated as shown in the example.

   Example:

```
switch:admin> licenseshow
SdcReRcbSbjedSfa:
    Web license
SdcReRcbSbjedSfb:
    Zoning license
SdcReRcbSbjedSd:
    QuickLoop license
SdcReRcbSbjedSfe:
    Fabric license
SdcReRcbSbjedSff:
    Remote Switch license
SdcReRcbSbjedSfg:
    Remote Fabric license
SdcReRcbSbjedSfh:
    Extended Fabric license
SdcReRcbSbjedSfj:
    Entry Fabric license
SdcReRcbSbVedSfM:
    Fabric Watch license
SdcReRcbSbXedSfO:
    Performance Monitor license
SdcReRcbSbbedSfS:
    Trunking license
SdcReRcbSbjedSfy:
    Security license
switch:admin>
```

License Activation Using Telnet

To activate your license follow these steps:

1. On the command line enter the following command but replace the word "*key*" is the license key provided to you, surrounded by double quotes. The license key is case sensitive and must be entered exactly as given.

   licenseadd "*key***"**

2. Verify the license was added by entering the **licenseshow** command, as shown in Figure Example. The feature is now activated and available.

License Activation Using Brocade Advanced Web Tools

If a Web Tools license is activated, Web Tools can be used to activate additional licenses.

1. Launch a web browser, enter the switch name or IP address in the **Location/Address** field of the browser, and press **Enter**. Brocade Advanced Web Tools launches, displaying the Fabric View.
2. Click the **Admin** button on the relevant switch panel. The logon window is displayed.
3. Enter a logon name and password with administrative privileges and press **Enter**. The Administration View is displayed. Select the **License Admin** tab.
4. Enter the license key in the **License Key** field and click the **Add** button. The feature is now activated.

Configuring a Remote Switch Fabric

Chapter 2

The Brocade Remote Switch feature operates in conjunction with a gateway. The gateway provides an E_port interface that links to the SilkWorm E_port. After the link between the two E_ports has been negotiated, the gateway E_port moves to pass-through mode and passes Fibre Channel traffic from the SilkWorm E_port to the WAN.

The gateway accepts Fibre Channel frames from one side of a Brocade Remote Switch fabric, transfers them across a WAN, and passes them to the other side of the Brocade Remote Switch fabric, as shown in Figure 2-1.

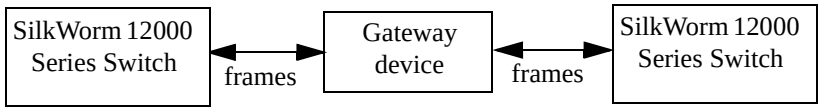

Figure 2-1

Configuring a Brocade Remote Switch Fabric

Note: Only active GBICs should be used when using Brocade Remote Switch.

The SilkWorm switches on each side of the gateway must have identical configurations. Brocade Remote Switch can be used for any gateway device including Fibre Channel over ATM, Fibre Channel over IP, Fibre Channel over SONET, and Fibre Channel over DWDM. Most of these gateway devices include a large number of buffers to cover data transfer over WAN.

In addition to normal switch configuration options, it may be useful to configure the following parameters, depending on the gateway requirements:

- R_A_TOV: Resource Allocation Timeout Value
- E_D_TOV: Error Detect Timeout Value
- Data field size: Maximum Fibre Channel data field reported by the fabric
  BB credit: Number of Buffer-to-Buffer credits for Nx_port devices

- Suppress Class F Traffic: Disable class F traffic

Note: Verify the maximum data field size the network-bridge can handle. Some bridges may not be able to handle a maximum data field size of 2112.

Note: Some network-bridge devices may not have a provision for handling class F frames. Therefore the transmission of class F frames throughout the entire Remote Switch fabric must be suppressed.

In the example, the default value was accepted for R_A_TOV.

Example:

```
switch:admin> configure

Configure...

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

    Domain: (97..127) [97]
    BB credit: (1..27) [16]
    R_A_TOV: (4000..120000) [10000]
    E_D_TOV: (1000..5000) [2000]
    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]
    Core Switch PID Format: (0..1) [1]
    Per-frame Route Priority: (0..1) [0]
    Long Distance Fabric: (0..1) [0]

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

No changes.

switch:admin>
```

Chapter 3

Extended Fabric Connection

Overview

The Extended Fabric feature achieves long distance connections by allocating more frame buffers for Fibre Channel traffic. Long distance connections require more frame buffers than regular ISL connections. The greater the distance level of a ISL long distance connection, the more frame buffers are required. This affects the amount of buffers left over in the quad. A quad is defined as a group of four adjacent ports that share a common pool of frame buffers. In a SilkWorm switch (or port card in the SilkWorm 12000), ports 0 - 3 belong to a single quad, ports 4 - 7 belong to a single quad, and so on.

Since the total number of frame buffers is limited in quad when one port in a quad is configured as a long distance port, all remaining ports in the same quad must be configured appropriately. Refer to the Long Distance Port Matrix in Table 3-1 on page 3-6.

Configuring long distance connections between core switches impacts available ISL ports, because normal ISLs are required for connections from core switches to edge switches. When configuring long distance ISLs, make sure to balance the need between long distance ISL connections and core-to-edge ISL connections within a switch. Configuring long distance ISLs between core and edge switches is possible, but is not a recommended practice.

Long Distance Configuration

The long distance extended fabrics configuration needs to be set only once for each fabric at the edge switch E-port. The configuration should be between any same series switch. Long distance ports consume more buffers than regular ISL ports, which means that a long distance port could disable other ports in the same quad due to lack of buffers. Refer to the *Long Distance Port Matrix* on page 3-6 for buffer credit information.

Figure 3-1 is a Sample of an Extended Fabric Configuration, using SilkWorm 3800, 3900, and 12000.

Note: Trunking is not supported with LE, L1, and L2 modes.

Note: Only active GBICs should be used when using Brocade Extended Fabric.

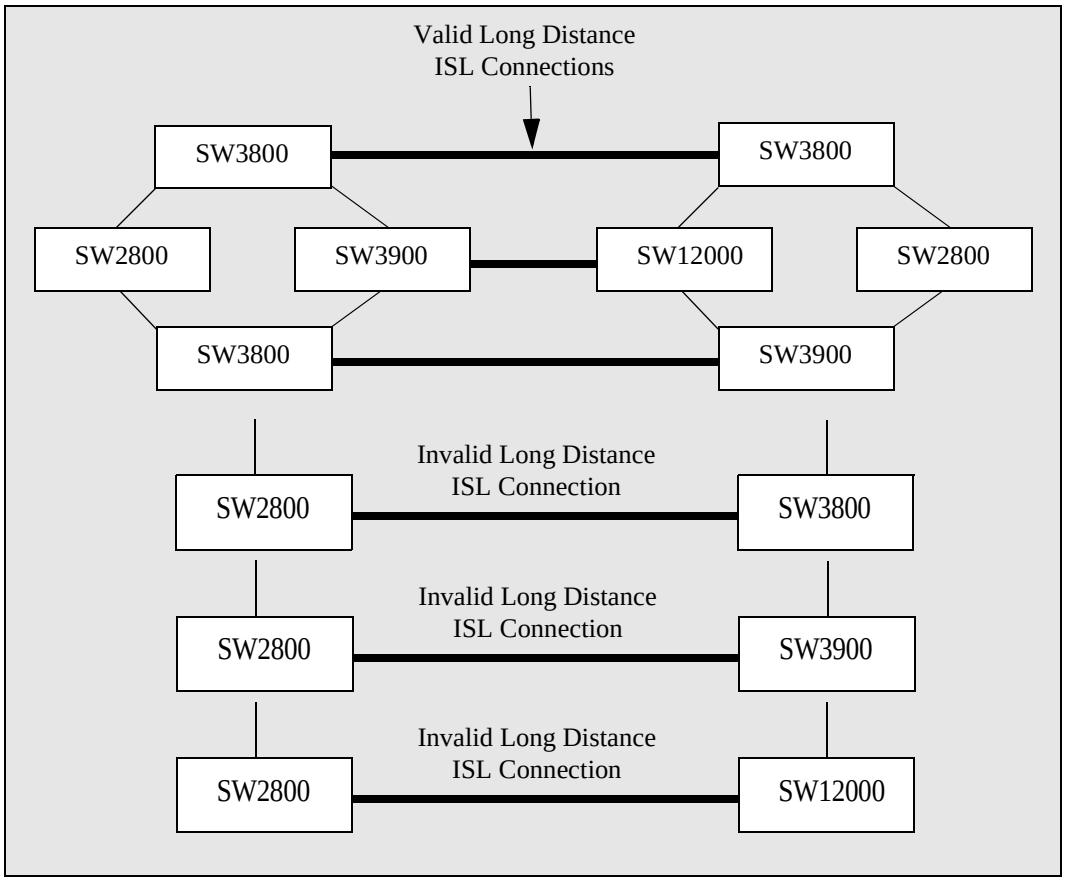

Figure 3-1 Extended Fabric Configuration

Note: Long distance between SW3800 and SW12000 or SW3900 ports is NOT supported when Long Distance Fabric Parameter is set.

Configuring an Extended Fabric Connection

If the fabric contains one or more switches running Brocade Fabric OS v2.x or v3.0.x or the switch has a long distance ISL, the following parameters need to be set to configure Brocade Extended Fabrics.

- Port configuration: the long distance fabric parameter set to 1
- Switch configuration must be set to enable long distance - **on switches running FOS 2.x**

Note: The long distance ISL ports must have the same configuration or the fabric will be segmented.

Note: If one switch in the fabric has the long distance fabric parameter set to 1, all switches in the fabric must have the parameter set to 1. Otherwise the fabric will be segmented

Note: ISL Trunking is not supported on a long distance ISL.

Enabling Long Distance Fabric Mode on a SilkWorm 2000 Series Switch

To configure a SilkWorm 2000 series switch to enable long distance, set the long distance fabric mode bit, as shown in the example below.

1. Log into the switch as the admin user.
2. Enter the **switchdisable** command to disable the switch.
3. Enter the **configure** command.
4. Enter "**yes**" at the **Fabric Parameters** prompt.
5. Press **Enter** to scroll through the **Fabric Parameters** without changing their values, until you reach the **Long Distance Fabric** parameter.
6. At the prompt, specify a value of 1 to enable the **Long Distance Fabric** parameter.
   ```
   Long Distance Fabric [0]: 1
   ```

Example:

```
switch:admin> switchdisable
switch:admin> configure

Configure...

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

    Domain: (1..239) [3] 5
    R_A_TOV: (4000..120000) [10000]
    E_D_TOV: (1000..5000) [2000]
    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]
    Long Distance Fabric: (0..1) [0] 1
    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]
Committing configuration...done.

switch:admin>
```

Configuring Long Distance Fabric Mode on a SilkWorm 3000 and 12000 Series Switch

Note: Only active SFPs should be used when using Brocade Extended Fabric.

Note: Trunking is not supported with LE, L1, L0.5, and L2 modes.

This procedure is used to configure the ports in a long distance ISL connection. Both ports must be configured to the same distance level.

To configure the distance level for a Extended Fabric ISL port:

1. Login to the switch as the admin user.
2. Issue the following command:

   portcfglongdistance [*slot/*]*port* [*distance_level*][*vc_translation_link_init*]

   where:

   slot — Specify the slot number in a SilkWorm 12000 switch. The slot number must be followed by a slash (/) and the port number.

port Specify the port number where you want to initiate the long distance ISL port.

distance This indicates the long distance mode to be set on the port.

The example shows a configuration for the distance level.

Example:

```
switch:admin> portcfglongdistance 1/1 LD 1
done.
switch:admin>
```

Select from the following port levels:

Normal E_port	This is the standard default value of all ports on the switch. Normal E_port – supports up to **10km at 1G and up to 5km at 2G**. This operation is sometimes referred to as L0 in documents. L0 and normal E_ports is one and the same.
Fx	F_port or FL_port.
Level E (LE)	An Extended Fabric license is not required. Supports up to **10km 1G and 2G**. This mode was created to support 2G up to 10km and uses EF principles. This mode does not support trunking with other ports
Level 1(L1)	An Extended Fabric license is required. Extended Fabric port which can support up to **50km at both 1G and 2G.** This mode does not support trunking with other ports.
Level 2(L2)	An Extended Fabric license is required. Extended Fabric port which can support up to **100 km at 1G up to 60km 1G and 2G.** This mode does not support trunking with other ports.
Level 0.5 (L0.5)	Supports **up to 25km 1G and 2G**. This mode was created to support 2G up to 10km and uses EF principles. This mode does not support trunking with other ports.
(Lx)	Any of L1, L2, LE, L0.5, and LD.
Level D (LD) (Dynamic long distance configuration)	LD mode dynamically assigns buffers based on the link round trip timing calculation. Ports will be disabled once the buffer pool has been depleted. For example, if two ports are configured at LD and each is connected at 100km, all buffers will be utilized and the remaining two ports will be disabled. This mode supports up to **100km at 1G and 60km at 2G**.

3. Repeat step 2 for the remote long distance ISL port. Both the local and remote long distance ISL ports must be configured to the same distance level for the connection to work. When the connection is initiated, the fabric will reconfigure.

VC Translation Mode

The VC Translation mode is used to initiate long distance connections.

VC_Translation_Link_Init	Specify **1** to activate long distance link initialization sequence. This mode is used to initiate long distance connections. When configuring a long distance connection, the first port configured does not require this mode. When configuring the second port of a connection, use this mode to initiate communication between the ports.

Long Distance Port Matrix

Since the total number of frame buffers in a quad is limited, the Long Distance Port Matrix, shown in Table 3-1, introduces a combination of long distance ports that are available. Ports A, B, C, and D are the four consecutive ports in a quad. A quad is the group of ports managed by an ASIC.

Table 3-1 Long Distance Port Matrix

Fabric OS	Speed	Port A	Port B	Port C	Port D
Brocade FOS versions: 2.x	1 Gbps	L2	E/L1	LE/L0.5/Fx	Disabled
	1 Gbps	L2	L0.5	L0.5/LE/Fx	Disabled
	1 Gbps	L2	L0.5	LE/Fx	LE
	1 Gbps	L2	LE/Fx	LE/Fx	LE/Fx
	1 Gbps	E/L1/L0.5/LE/Fx	E/L1/LE/L0.5/Fx	E/L1/LE/L0.5/Fx	E/L1/LE/L0.5/Fx
	1 Gbps	LD	LD	LD	LD
Brocade FOS versions: 3.0, 3.0.1, 3.0.2, 4.0, 4.0.2	1 Gbps	L2	E/L1	Fx	Disabled
	1 Gbps	L2	Fx	Fx	Fx
	1 Gbps	E/Fx/L1	E/Fx/L1	E/Fx/L1	E/Fx/L1
Brocade FOS versions: 3.0, 3.0.1, 3.0.2, 4.0, 4.0.2	2 Gbps	L2	Disabled	Disabled	Disabled
	2 Gbps	L1	L1	Disabled	Disabled
	2 Gbps	L1	E	E/LE/Fx	Disabled
	2 Gbps	L1	LE/Fx	LE/Fx	Fx
	2 Gbps	E/LE/Fx	E/LE/Fx	E/LE/Fx	E/LE/Fx

Table 3-1 Long Distance Port Matrix (Continued)

Fabric OS	Speed	Port A	Port B	Port C	Port D
Brocade FOS Version: 3.1 and 4.1	1 Gbps	L2	E/L1	LE/L0.5/Fx	Disabled
	1 Gbps	L2	L0.5	LE/L0.5/Fx	Disabled
	1 Gbps	L2	L0.5	LE/Fx	LE
	1 Gbps	L2	LE/Fx	LE/Fx	LE/Fx
	1 Gbps	E/L1/L0.5/LE/Fx	E/L1/L0.5/LE/Fx	E/L1/L0.5/LE/Fx	E/L1/L0.5/LE/Fx
	1 Gbps	LD	LD	LD	LD
Brocade FOS Version: 3.1 and 4.1	2 Gbps	L2	E	Fx	Disabled
	2 Gbps	L2	LE/Fx	LE/Fx	Disabled
	2 Gbps	L2	L0.5	Disabled	Disabled
	2 Gbps	L1	L1	Disabled	Disabled
	2 Gbps	L1	E	E/LE/Fx	Disabled
	2 Gbps	L1	LE/Fx	LE/Fx	Fx
	2 Gbps	L1	L0.5	LE/Fx	Disabled
	2 Gbps	L0.5	L0.5	L0.5	Disabled
	2 Gbps	L0.5	E/L0.5/LE/Fx	E/LE/Fx	Disabled
	2 Gbps	L0.5	E/L0.5/LE/Fx	LE/Fx	LE/Fx
	2 Gbps	L0.5	E/LE/Fx	E/LE/Fx	LE/Fx
	2 Gbps	E/LE/Fx	E/LE/Fx	E/LE/Fx	E/LE/Fx
	2 Gbps	LD	LD	LD	LD

Index