



SilkWorm 4100

Hardware Reference Manual

Supporting Fabric OS v4.4.0

Supporting SilkWorm 4100

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Brocade Communications Systems, Incorporated

Corporate Headquarters
Brocade Communications Systems, Inc.
1745 Technology Drive
San Jose, CA 95110
Tel: 1-408-333-8000
Fax: 1-408-333-8101
Email: info@brocade.com

Asia-Pacific Headquarters
Brocade Communications Singapore Pte. Ltd.
9 Raffles Place
#59-02 Republic Plaza 1
Singapore 048619
Tel: +65-6538-4700
Fax: +65-6538-0302
Email: apac-info@brocade.com

European and Latin American Headquarters
Brocade Communications Switzerland Sàrl
Centre Swissair
Tour A - 2ème étage
29, Route de l'Aéroport
Case Postale 105
CH-1215 Genève 15
Switzerland
Tel: +41 22 799 56 40
Fax: +41 22 799 56 41
Email: emea-info@brocade.com

Document History

The following table lists all versions of the *Brocade SilkWorm 4100 Hardware Reference Manual*.

Document Title	Publication Number	Summary of Changes	Publication Date
<i>SilkWorm 4100 Hardware Reference Manual</i>	53-0000563-01	None; this is a new document.	July 2004
<i>SilkWorm 4100 Hardware Reference Manual</i>	53-0000563-02	Added Japanese power cord statement and revised copyright.	March 2008

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About This Document

This document is written for network administrators to provide a complete set of Brocade SilkWorm 4100 switch installation procedures and an overview of the switch hardware. This document is specific to the Brocade SilkWorm 4100 switch running Fabric OS 4.4.0.

“About This Document” contains the following sections:

- [“How This Document Is Organized,”](#) next
- [“Supported Hardware and Software”](#) on page viii
- [“What’s New in This Document”](#) on page viii
- [“Document Conventions”](#) on page viii
- [“Additional Information”](#) on page ix
- [“Getting Technical Help”](#) on page xi
- [“Document Feedback”](#) on page xii

How This Document Is Organized

This document is organized to help you find the particular information that you want as quickly and easily as possible. The document begins with an introduction to the SilkWorm 4100 switch and gradually proceeds through installation and operation procedures.

The document contains the following components:

- [Chapter 1, “Introducing the SilkWorm 4100”](#) provides a brief overview of the switch itself.
- [Chapter 2, “Installing and Configuring the SilkWorm 4100”](#) describes the installation procedures for the switch.
- [Chapter 3, “Operating the SilkWorm 4100”](#) provides an overview of switch operation.
- [Appendix A, “Product Specifications”](#) provides all of the technical specifications for the switch.
- The glossary defines both terms specific to Brocade technology and common industry terms with uses specific to Brocade technology.
- The index points you to the exact pages on which specific information is located.

Supported Hardware and Software

Although many different software and hardware configurations are tested and supported by Brocade Communications Systems, Inc. for the SilkWorm 4100, documenting all possible configurations and scenarios is beyond the scope of this document.

What's New in This Document

This is a new document; there are no changes. For any last-minute changes or updates, refer to the Fabric OS release notes.

Document Conventions

This section describes text formatting conventions and important notices formats.

Text Formatting

The following table describes the narrative-text formatting conventions that are used in this document.

Convention	Purpose
bold text	<ul style="list-style-type: none">• Identifies command names• Identifies GUI elements• Identifies keywords/operands• Identifies text to enter at the GUI or CLI
<i>italic text</i>	<ul style="list-style-type: none">• Provides emphasis• Identifies variables• Identifies paths and internet addresses• Identifies document titles and cross references
code text	<ul style="list-style-type: none">• 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.

For definitions of SAN-specific terms, visit the Storage Networking Industry Association online dictionary at <http://www.snia.org/education/dictionary>.

Additional Information

This section lists additional Brocade and industry-specific documentation that you might find helpful.

Brocade Resources

The following related documentation is provided on the Brocade Documentation CD-ROM and on the Brocade Web site, through Brocade Connect.



Note

Go to <http://www.brocade.com> and click **Brocade Connect** to register at no cost for a user ID and password.

SilkWorm 4100

- *Fixed Rack Mount Kit Installation Procedure*
- *SilkWorm 4100 Fan Assembly Replacement Procedure*
- *SilkWorm 4100 Power Supply Replacement Procedure*
- *SilkWorm 4100 QuickStart Guide*
- *SilkWorm Switch Safety Guide*
- *Slide Rack Mount Kit Installation Procedure*

Fabric OS

- *Diagnostic and System Error Message Reference Manual*
- *Fabric OS Command Reference Manual*
- *Fabric OS Procedures Guide*
- *MIB Reference Manual*

Fabric OS Optional Features

- *Advanced Performance Monitoring User's Guide*
- *Advanced Web Tools Administrator's Guide*
- *Fabric OS Features Guide*
- *Secure Fabric OS QuickStart Guide*
- *Secure Fabric OS User's Guide*

For practical discussions about SAN design, implementation, and maintenance, you can obtain *Building SANs with Brocade Fabric Switches* through:

<http://www.amazon.com>

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

<http://www.brocade.com>

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

Other Industry Resources

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>

Getting Technical Help

Contact your switch support supplier for hardware, firmware, and software support, including product repairs and part ordering. To expedite your call, have the following information available:

1. General Information

- Technical Support contract number, if applicable
- Switch model
- Switch operating system version
- Error numbers and 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 here:



The serial number label is located as follows:

- *SilkWorm 2000-series switches*: Bottom of chassis.
- *SilkWorm 3200, 3250, 3800, and 3850 switches*: Back of chassis.
- *SilkWorm 3900 switch*: Bottom of chassis.
- *SilkWorm 4100 switch*: On the switch ID pull-out tab located on the port side of the switch and on the inside of the chassis, near power supply # 1 (the power supply on the right when looking at the nonport side of the switch).
- *SilkWorm 12000 and 24000 directors*: Inside the front of the chassis, on the wall to the left of the ports.
- *SilkWorm Fabric AP7420*: On the bottom of the chassis and on the back of the chassis.

3. World Wide Name (WWN)

- *SilkWorm 3250, 3850, 3900, and 4100 switches and SilkWorm 12000 and 24000 directors*: Provide the license ID. Use the **licenseIdShow** command to display the license ID.
- *SilkWorm Fabric AP7420*: Provide the switch WWN. Use the **switchShow** command to display the switch WWN.
- *All other SilkWorm switches*: Provide the switch WWN. Use the **wwn** command to display the switch WWN.

Document Feedback

Because quality is our first concern at Brocade, we have made every effort to ensure the accuracy and completeness of this document. However, if you find an error or an omission, or you think that a topic needs further development, we want to hear from you. Forward your feedback to documentation@brocade.com. Provide the title and version number and as much detail as possible about your issue, including the topic heading and page number and your suggestions for improvement.

Introducing the SilkWorm 4100

This chapter provides the following information:

- “Overview of Brocade SilkWorm 4100,” next
- “Port Side of the SilkWorm 4100” on page 1-2
- “Nonport Side of the SilkWorm 4100” on page 1-4
- “Managing the SilkWorm 4100” on page 1-4
- “Supported Features” on page 1-6

Overview of Brocade SilkWorm 4100

The SilkWorm 4100 is a 1U Fibre Channel switch with 32 fixed Fibre Channel SFP ports that supports link speeds up to 1, 2, or 4 Gbit/sec. The SilkWorm 4100 has two field-replaceable power supplies and three field-replaceable fan units. It includes the Brocade Fabric Operating System and is compatible with the entire Brocade SilkWorm product family. It can operate in a fabric containing multiple switches or independently.

The SilkWorm 4100 provides the following features:

- 32 fixed autosensing 1-, 2-, or 4-Gbit/sec Fibre Channel ports
- redundant, hot-swappable fans and power supplies
- universal AC power supply
- 19 inch wide (48.3 cm) rack mount, 1U (1.75 inches; 4.44 cm) height, 24 inches (61cm) deep

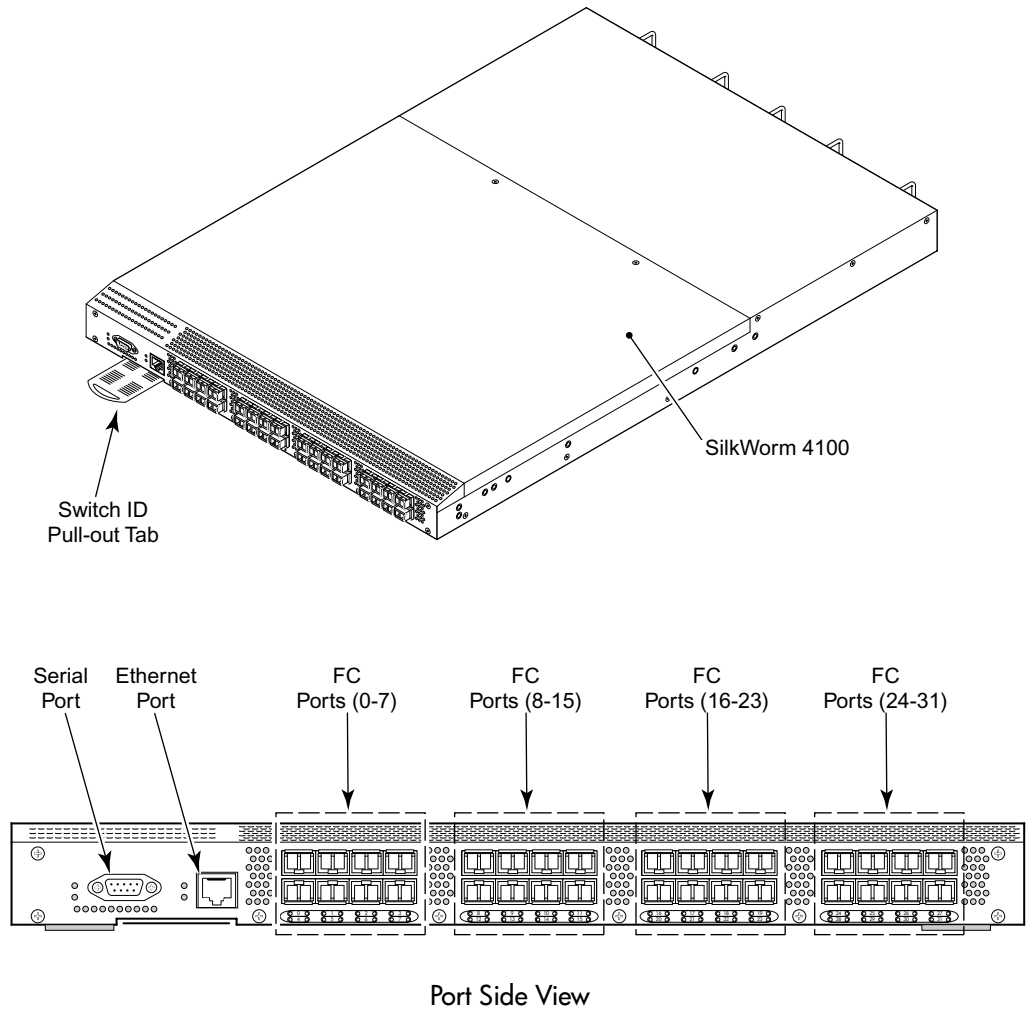
Ports On Demand

The SilkWorm 4100 has 32 ports. By default, ports 0-15 are enabled. To enable additional ports, you must install Ports On Demand (POD) licenses. To enable ports 16 through 23, you must install the POD1 license. To enable ports 24 through 31, you must install the POD2 license. Although you can install the POD2 license without having the POD1 license installed, you cannot use ports 16 through 23 until the POD1 license is *enabled*. For detailed information on enabling additional ports using the Ports on Demand license, refer to the *Fabric OS Procedures Guide*.

Port Side of the SilkWorm 4100

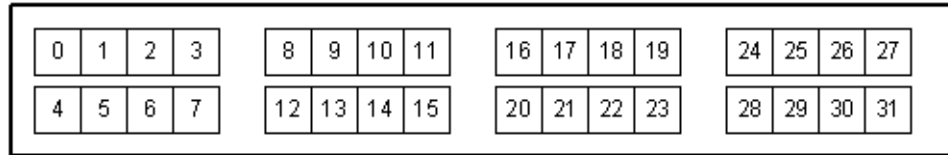
Figure 1-1 shows the port side of the SilkWorm 4100.

Figure 1-1 Port Side View of the SilkWorm 4100



The Fibre Channel ports are numbered from left to right, in eight-port groups, and are also numbered on the faceplate (see [Figure 1-2](#)).

Figure 1-2 Port Numbering in the SilkWorm 4100



Note

Blade port numbers (physical port numbers) do not correspond directly to user port numbers (which are displayed in [Figure 1-2](#)).

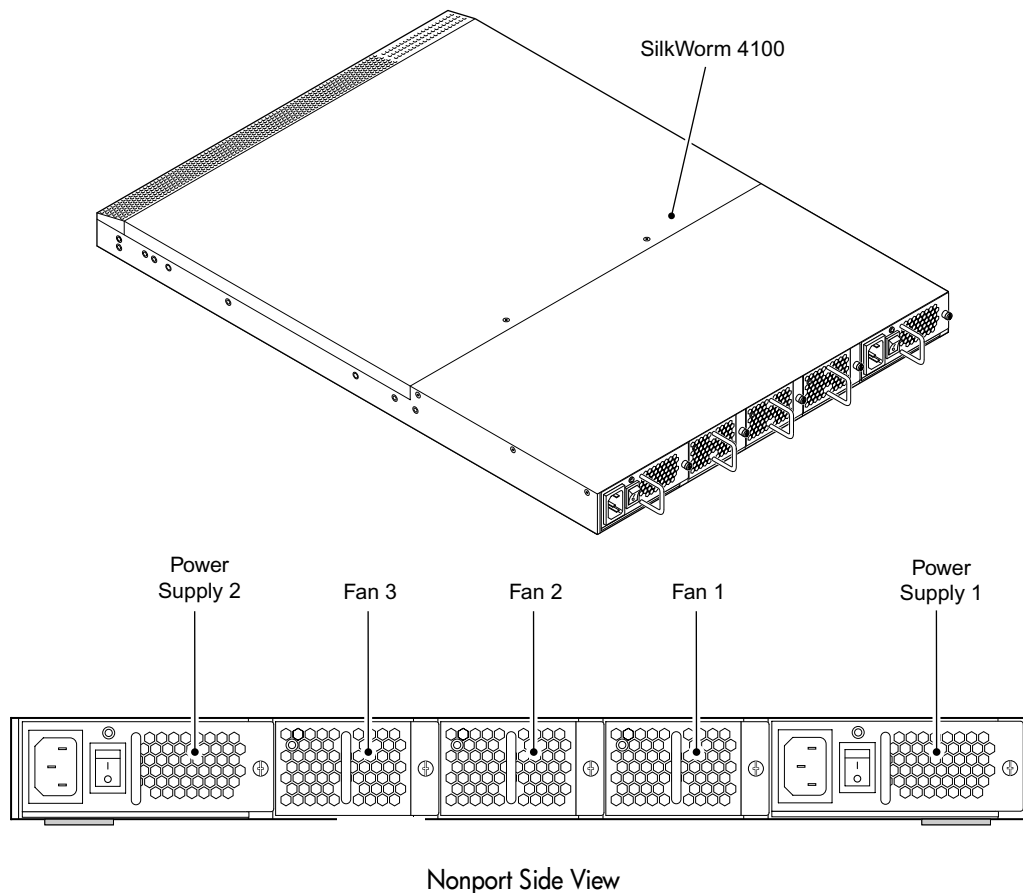
Brocade ISL Trunking is an optionally licensed software that allows you to create trunking groups of ISLs between adjacent switches. For more information about Brocade ISL Trunking, refer to the *Brocade Fabric OS Features Guide*.

The port side of the SilkWorm 4100 also displays the system status LED, power status LED, port status LEDs, and port speed LEDs (see [Figure 3-1 on page 3-2](#)).

Nonport Side of the SilkWorm 4100

Figure 1-3 shows the nonport side of the SilkWorm 4100, which contains the power supplies (including the AC power receptacle and AC power switch) and fans.

Figure 1-3 Nonport side of the SilkWorm 4100



Managing the SilkWorm 4100

You can use the management functions built into the SilkWorm 4100 to monitor the fabric topology, port status, physical status, and other information to help you analyze switch performance and to accelerate system debugging.



Note

The SilkWorm 4100 automatically performs power-on self-test (POST) each time it is turned on. Any errors are recorded in the error log. For more information about POST, see [“POST and Boot Specifications” on page A-8](#).

For information about upgrading the version of Fabric OS installed on your switch, refer to the *Brocade Fabric OS Procedures Guide*.

You can manage the SilkWorm 4100 using any of the management options listed in [Table 1-1](#).

Table 1-1 Management Options for the SilkWorm 4100

Management Tool	Out-of-band Support	In-band Support
Command line interface Up to two admin sessions and four user sessions simultaneously. For more information, refer to the <i>Brocade Fabric OS Procedures Guide</i> and the <i>Brocade Fabric OS Command Reference Manual</i> .	Ethernet or serial connection	IP over Fibre Channel
Brocade Fabric Manager For information, refer to the <i>Brocade Fabric Manager User's Guide</i> .	Ethernet or serial connection	IP over Fibre Channel
Brocade Advanced Web Tools For information, refer to the <i>Brocade Advanced Web Tools Administrator's Guide</i> .	Ethernet or serial connection	IP over Fibre Channel
Standard SNMP applications For information, refer to the <i>Brocade MIB Reference Manual</i> .	Ethernet or serial connection	IP over Fibre Channel
Management Server For information, refer to the <i>Brocade Fabric OS Procedures Guide</i> and the <i>Brocade Fabric OS Command Reference Manual</i> .	Ethernet or serial connection	Native in-band interface (over HBA only)



Note

To achieve in-band support for IP over Fibre Channel, the software must be run on both the HBA and the switch, and it must be supported by both the HBA and HBA driver.

Supported Features

The SilkWorm 4100 supports the following optional Brocade software, which you can activate by purchasing a corresponding license key:

- Brocade Advanced Performance Monitoring
- Brocade Advanced Web Tools
- Brocade Advanced Zoning
- Brocade Extended Fabrics
- Brocade Fabric Watch
- Brocade ISL Trunking
- Brocade Ports on Demand (1 and 2)
- Brocade Remote Switch
- Brocade Secure Fabric OS

For information on these features, refer to the *Brocade Fabric OS Features Guide*.

Installing and Configuring the SilkWorm 4100

This chapter provides the following information:

- [“Installation and Safety Considerations,”](#) next
- [“Items Included with the SilkWorm 4100”](#) on page 2-2
- [“Setting Up the SilkWorm 4100 as a Standalone Unit”](#) on page 2-3
- [“Installing the SilkWorm 4100 in an EIA Cabinet”](#) on page 2-3
- [“Configuring the SilkWorm 4100”](#) on page 2-3
- [“Recommendations for Cable Management”](#) on page 2-10

Installation and Safety Considerations

You can install the SilkWorm 4100 in the following three ways:

- As a standalone unit on a flat surface. For instructions and more information, refer to [“Setting Up the SilkWorm 4100 as a Standalone Unit”](#) on page 2-3.
- In an EIA cabinet using the Fixed Rack Mount Kit provided with the switch. For more information, refer to [“Installing the SilkWorm 4100 in an EIA Cabinet”](#) on page 2-3. For detailed instructions, refer to the *Fixed Rack Mount Kit Installation Procedure*.
- In an EIA cabinet using the Slide Rack Mount Kit provided with the switch. For more information, refer to [“Installing the SilkWorm 4100 in an EIA Cabinet”](#) on page 2-3. For detailed instructions, refer to the *Slide Rack Mount Kit Installation Procedure*.

To install and operate the switch successfully, ensure that the following requirements are met:

- The primary AC input is 100-240 VAC (switch autosenses input voltage), 47-63 Hz.
- The primary outlet is correctly wired, protected by a circuit breaker, and grounded in accordance with local electrical codes.
- The supply circuit, line fusing, and wire size are adequate, as specified by the electrical rating on the switch nameplate.

For power supply information, refer to [Power Supply Specifications on page A-3](#).

To ensure adequate cooling, install the switch with the nonport side, which contains the air intake vents, facing a cool-air aisle.

Verify that a minimum of 47 cubic feet/minute (79.8 cubic meters/hour) of air flow is available to the air intake vents on the nonport side of the switch.

Verify that the ambient air temperature does not exceed 40° Celsius (104° Fahrenheit) and that the ambient humidity remains between 20 percent and 85 percent while the switch is operating.

If installing the switch in a cabinet:

- The cabinet must be a standard EIA cabinet.
- Plan a cabinet space that is 1 rack unit high (1.75 inches; 4.44 cm), 19 inches (48.3 cm) wide, and at least 24 inches (61cm) deep.
- Ground all equipment in the cabinet through a reliable branch circuit connection and maintain ground at all times. Do not rely on a secondary connection to a branch circuit, such as a power strip.
- Ensure that airflow and temperature requirements are met on an ongoing basis, particularly if the switch is installed in a closed or multirack assembly.
- Verify that the additional weight of the switch does not exceed the cabinet's weight limits or unbalance the cabinet in any way.
- Secure the cabinet to ensure stability in case of unexpected movement.

For additional installation, electrical, environmental, and other considerations, refer to the *SilkWorm Switch Safety Guide*.

Items Included with the SilkWorm 4100

The following items are included with the standard shipment of the SilkWorm 4100:

- The SilkWorm 4100 switch, containing three fan assemblies and two power supplies
- The Fixed Rack Mount Kit, with installation instructions
- One accessory kit, containing the following items:
 - The *SilkWorm 4100 QuickStart Guide*
 - The Brocade Documentation CD-ROM
 - 32 SFP (small-form-factor pluggable) transceivers (optional)
 - Rubber mounting feet (to be used when setting up the SilkWorm 4100 as a standalone unit)
 - Two grounded 6-ft. (approximately 1.83 meters) power cords.
 - The power plug type is NEMA5-15
 - Power plug current/voltage rating: 15A/125V
 - Cordage type: SVT
 - Current rating/wire gauge: 10A/ 18AWG
 - Connector at system end of cordset: IEC 60320/ C13
 - One serial cable, 10-ft. (approximately 3 meters) long, which can be converted from a DB-9 serial cable to an RJ-45-style serial cable by removing the adapter on the end of the cable

Setting Up the SilkWorm 4100 as a Standalone Unit

The SilkWorm 4100 can be configured as a standalone unit, which means that it resides outside of a rack.

To configure the SilkWorm 4100 as a standalone unit:

1. Unpack the SilkWorm 4100 and verify that all ordered items are present.
2. Clean the four corner depressions on the bottom of the switch and place a rubber foot in each one. This helps prevent the switch from accidentally sliding off the supporting surface.
3. Place the switch on a stable, flat surface.

Installing the SilkWorm 4100 in an EIA Cabinet

Refer to the *Fixed Rack Mount Kit Installation Procedure* that shipped with your unit for instructions on installing the SilkWorm 4100 in a fixed rack.

Refer to the *Slide Rack Mount Kit Installation Procedure* (optional) for detailed instructions on installing the SilkWorm 4100. The switch can be installed using the slide rack mount kit in two ways:

- To allow the port side of the switch to slide out of the exhaust-air side of the cabinet. In this installation, the port side of the switch is flush with the edge of the cabinet.
- To allow the nonport side of the switch to slide out the cool-air side of the cabinet. In this installation, the port side of the switch is set three inches back from the edge of the cabinet, allowing a more gradual bend in the fiber-optic cables.

Configuring the SilkWorm 4100

The SilkWorm 4100 must be configured correctly before it can operate within a network and fabric. For instructions on configuring the switch to operate in a fabric containing switches from other vendors, refer to the *Brocade Fabric OS Procedures Guide*.

The following items are required for configuring and connecting the SilkWorm 4100 for use in a network and fabric:

- The SilkWorm 4100, installed and connected to a power source
- A workstation computer that has a terminal emulator application (such as HyperTerminal for Windows)
- An unused IP address and corresponding subnet mask and gateway address
- The serial cable provided with the switch
- An Ethernet cable
- SFP transceivers and compatible fibre cables, as required
- Access to an FTP server, for backing up the switch configuration

To configure the SilkWorm 4100, you must perform the following tasks:

1. [“Providing Power to the Switch” on page 2-4](#)
2. [“Creating a Serial Connection” on page 2-4](#)

3. [“Connecting to the Switch Using the Serial Connection” on page 2-5](#)
4. [“Setting the Switch IP Address” on page 2-5](#)
5. [“Creating an Ethernet Connection” on page 2-6](#)
6. [“Completing Switch Configuration” on page 2-6](#)



Caution

Do not connect the switch to the network until the IP address is correctly set. For instructions on how to set the IP address, see [“Configuring the SilkWorm 4100” on page 2-3](#).

Providing Power to the Switch

To provide electrical power to the SilkWorm 4100:

1. Connect the power cords to both power supplies and then to power sources on separate circuits to protect against AC failure. Ensure that the cords have a minimum service loop of 6 inches available and are routed to avoid stress.
2. Power on the power supplies by flipping both AC switches to “1”. The power supply LED lights up green, and the switch begins running POST. The switch requires a minimum of three minutes to boot and complete POST.



Note

Power is supplied to the switch as soon as the first power supply is connected and turned on.

3. After POST is complete, verify that the switch power and status LEDs on the left of the port side of the switch are green.

Creating a Serial Connection

To create a serial connection to the SilkWorm 4100:

1. Remove the plug from the serial port and insert the serial cable provided with the SilkWorm 4100.
2. Connect the serial cable to the serial port on the switch and to an RS-232 serial port on the workstation. If the serial port on the workstation is RJ-45 instead of RS-232, you can remove the adapter on the end of the serial cable and insert the exposed RJ-45 connector into the RJ-45 serial port on the workstation.
3. Disable any serial communication programs running on the workstation.
4. Open a terminal emulator application (such as HyperTerminal for Windows or TERM in a UNIX environment) and configure the application as follows:

- In a Windows 95, 98, 2000, or NT environment:

Bits per second:	9600
Databits:	8
Parity:	None
Stop bits:	1

Flow control: None

- In a UNIX environment, enter the following string at the prompt:

```
tip /dev/ttyb -9600
```

Connecting to the Switch Using the Serial Connection

To log in to the switch through the serial connection:

1. Verify that the switch has completed POST. When POST is complete, the port status and switch power and status LEDs return to a standard healthy state; for information about LED signals, refer to [“Interpreting LED Activity” on page 3-1](#).
2. When the terminal emulator application stops reporting information, press **Enter** to display the login prompt.

Setting the Switch IP Address

To replace the default IP address and related information:

1. Enter the **ipAddrSet** command at the terminal emulator application prompt, and enter the requested information at the prompts:

```
switch:admin> ipaddrset
Ethernet IP Address [10.77.77.77]:10.32.53.47
Ethernet Subnetmask [255.0.0.0]:255.255.240.0
Fibre Channel IP Address [0.0.0.0]:
Fibre Channel Subnetmask [0.0.0.0]:
Gateway IP Address [0.0.0.0]:10.32.48.1
Set IP address now? [y = set now, n = next reboot]:y
IP address being changed...
Committing configuration...Done.
switch:admin>
```

2. Optionally, verify that the address was correctly set by typing the **ipAddrShow** command at the prompt.
3. Record the IP address on the pull out tab (see [Figure 1-1 on page 1-2](#)) provided for this purpose on the port side of the SilkWorm 4100.
4. If the serial port is no longer required, log out of the serial console, remove the serial cable, and replace the plug in the serial port.

Creating an Ethernet Connection

To create an Ethernet connection to the SilkWorm 4100:

1. Remove the plug from the Ethernet port.
2. Connect an Ethernet cable to the switch Ethernet port and to the workstation or to an Ethernet network containing the workstation.



Note

At this point, the switch can be accessed remotely, by command line or by Brocade Advanced Web Tools. Ensure that the switch is not being modified from any other connections during the remaining tasks.

Completing Switch Configuration

To complete the switch configuration:

1. Log on to the switch by telnet, using the administrative account.
2. Modify the domain ID if required.

The default domain ID is 1. If the switch is not powered on until after it is connected to the fabric and the default domain ID is already in use, the domain ID for the new switch is automatically reset to a unique value. If the switch is connected to the fabric after it has been powered on and the default domain ID is already in use, the fabric segments. To find the domain IDs that are currently in use, run the **fabricShow** command on another switch in the fabric.

- a. Disable the switch by typing the **switchDisable** command.
 - b. Enter the **configure** command.
The command prompts display sequentially; enter a new value or press **Enter** to accept each default value.
 - c. Enter **y** after the “Fabric parameters” prompt:

```
Fabric parameters (yes, y, no, n): [no] y
```
 - d. Enter a unique domain ID (such as the domain ID used by the previous switch, if still available):

```
Domain: (1..239) [1] 3
```
 - e. Complete the remaining prompts or press **Ctrl-D** to accept the remaining settings without completing all the prompts.
 - f. Reenable the switch by entering the **switchEnable** command.
3. Optionally, specify any custom status policies:
 - a. Enter the **switchStatusPolicySet** command at the prompt.
This command sets the policy parameters that determine overall switch status.
 - b. Customize the status policies as desired.
To deactivate the alarm for a condition, type **0** at the prompt for that condition.
 4. Install the SFP transceivers in the Fibre Channel ports, as required. The ports selected for use in trunking groups must meet specific requirements. For a list of these requirements, refer to the *Brocade Fabric OS Features Guide*.

- a. Remove the plugs from the ports to be used.
- b. Position a transceiver so that it is oriented correctly and insert it into a port until it is firmly seated and the latching mechanism clicks.

For instructions specific to the type of transceiver, refer to the transceiver manufacturer's documentation.



Note

The transceivers are keyed to ensure correct orientation. If a transceiver does not install easily, ensure that it is correctly oriented.

- c. Repeat Steps a and b for the remaining ports, as required.
5. Connect the cables to the transceivers.

The cables used in trunking groups must meet specific requirements. For a list of these requirements, refer to the *Brocade Fabric OS Features Guide*.



Caution

A 50-micron cable should not be bent to a radius less than 2 inches under full tensile load and 1.2 inches with no tensile load.

Tie wraps are not recommended for optical cables because they are easily overtightened.

- a. Orient a cable connector so that the key (the ridge on one side of connector) aligns with the slot in the transceiver. Then, insert the cable into the transceiver until the latching mechanism clicks. For instructions specific to cable type, refer to the cable manufacturer's documentation.



Note

The cable connectors are keyed to ensure correct orientation. If a transceiver does not install easily, ensure that it is correctly oriented.

- b. Repeat Step a for the remaining transceivers as required.
6. Check the LEDs to verify that all components are functional. For information about LED patterns, refer to [“Interpreting LED Activity” on page 3-1](#).
 7. Verify the correct operation of the SilkWorm 4100 by typing the **switchShow** command from the workstation.

This command provides information about switch and port status.

8. Verify the correct operation of the SilkWorm 4100 in the fabric by typing the **fabricShow** command from the workstation.

This command provides general information about the fabric.

9. Back up the switch configuration to an FTP server by typing the **configUpload** command and following the prompts.

This command uploads the switch configuration to the server, making it available for downloading to a replacement switch if necessary.

Brocade recommends backing up the configuration on a regular basis to ensure that a complete configuration is available for downloading to a replacement switch. For specific instructions about how to back up the configuration, refer to the *Fabric OS Procedures Guide*. The **switchShow**, **fabricShow**, and **configUpload** commands are described in detail in the *Fabric OS Command Reference Manual*.

Setting the Switch Date and Time

The date and time switch settings are used for logging events. Switch operation does not depend on the date and time; a switch with an incorrect date and time value still functions properly.

You can synchronize the local time of the principal or primary fabric configuration server (FCS) switch to that of an external Network Time Protocol (NTP) server.

To set the date and time of a switch:

1. Log in to the switch as admin.
2. Type the **date** command at the command line using the following syntax:

```
date "MMDDhhmm[CC]YY"
```

The values represent the following:

- MM is the month (01-12).
- DD is the date (01-31).
- hh is the hour (00-23).
- mm is minutes (00-59).
- CC is the century (19-20).
- YY is the year (00-99).

Year values greater than 69 are interpreted as 1970-1999; year values less than 70 are interpreted as 2000-2069. The date function does not support Daylight Savings Time or time zones, so changes will have to be reset manually.

Example

```
switch:admin> date  
Fri May 5 21:50:00 UTC 1989  
switch:admin>  
switch:admin> date "0624165203"  
Tue Jun 24 16:52:30 UTC 2003  
switch:admin>
```

Synchronizing Local Time with an External Source

Use this procedure to synchronize the local time of the principal or primary FCS switch with that of an external NTP server:

1. Log in as admin.
2. Enter the **tsClockServer** [ipaddr] command

The *ipaddr* variable represents the IP address of the NTP server that the switch can access. This argument is optional; by default, its value is “LOCL”.

Example

```
switch:admin> tsclockserver
LOCL
switch:admin> tsclockserver 132.163.135.131
switch:admin>
```

Correcting the Time Zone of a Switch

If the time of your switch(es) is off by hours (and not minutes), use the following procedure on all switches to set the time zone:

1. Log in as admin.
2. Enter the **tsTimeZone** command as follows:

```
ts timezone [houroffset [, minuteoffset]]
```

- For Pacific Standard Time, enter **tsTimeZone -8,0**
- For Central Standard Time, enter **tsTimeZone -6,0**
- For Eastern Standard Time, enter **tsTimeZone -5,0**

The default time zone for switches is Universal Time Conversion (UTC), which is eight hours ahead of Pacific Standard Time. Additional time zone conversions are listed later in this section.

The parameters listed do not apply if the time zone of the switch(es) has already been changed from the default (eight hours ahead of PT).

Refer to the **tsTimeZone** command in the *Fabric OS Command Reference Manual* for more detailed information about the command parameters.

3. Repeat Steps 1 and 2 on all switches for which the time zone needs to be set.

This needs to be done only once, because the value is stored in nonvolatile memory.

For U.S. time zones, use the [Table 2-1](#) to determine the correct parameter for the **tsTimeZone** command.

Table 2-1 tsTimeZone Command Parameter Selection

Local Time	tsTimeZone parameter (difference from UTC)
Atlantic Standard	-4,0
Atlantic Daylight	-3,0
Eastern Standard	-5,0
Eastern Daylight	-4,0
Central Standard	-6,0
Central Daylight	-5,0

Table 2-1 tsTimeZone Command Parameter Selection

Local Time	tsTimeZone parameter (difference from UTC)
Mountain Standard	-7,0
Mountain Daylight	-6,0
Pacific Standard	-8,0
Pacific Daylight	-7,0
Alaskan Standard	-9,0
Alaskan Daylight	-8,0
Hawaiian Standard	-10,0

Recommendations for Cable Management

Cables can be organized and managed in a variety of ways, such as by using cable channels or patch panels. Following is a list of recommendations:

- Plan cable management before installing the switch in a rack.
- Leave at least one meter of slack for each port cable. This provides room to remove and replace the switch, allows for inadvertent movement of the rack, and helps prevent the cables from being bent to less than the minimum bend radius.



Caution

A 50-micron cable should not be bent to a radius less than 2 inches under full tensile load and 1.2 inches with no tensile load.

Tie wraps are not recommended for optical cables because they are easily overtightened.

- If using Brocade ISL Trunking:
 - It might be useful to group cables by trunking groups.
 - The cables used in trunking groups must meet specific requirements. For a list of these requirements, refer to the *Brocade Fabric OS Features Guide*.
- For easier maintenance, label the fiber-optic cables and record the devices to which they are connected.
- Keep LEDs visible by routing port and other cables directly down or otherwise away from the LEDs.

Operating the SilkWorm 4100

This chapter provides the following information:

- [“Powering the SilkWorm 4100 On and Off,”](#) next
- [“Interpreting LED Activity”](#) on page 3-1
- [“Interpreting POST Results”](#) on page 3-6
- [“Maintaining the SilkWorm 4100”](#) on page 3-6

Powering the SilkWorm 4100 On and Off

To power the SilkWorm 4100 on, connect one or both power cords to the power connectors on the power supplies and to a power source; then, set the AC power switches to “I”. Power is supplied to the switch as soon as the first power supply is connected and powered on.

The switch runs POST by default each time it is powered on; it requires a minimum of three minutes to boot and complete POST.

To power the SilkWorm 4100 off, power off both power supplies by setting each AC power switch to “O”. All devices are returned to their initial state the next time the switch is powered on.

Interpreting LED Activity

System activity and status can be determined through the activity of the LEDs on the switch.

There are three possible LED states: no light, a steady light, and a flashing light. The lights are in one of the following colors:

- Green
- Amber

Sometimes, the LEDs flash any of the colors during boot, POST, or other diagnostic tests. This is normal; it does not indicate a problem unless the LEDs do not indicate a healthy state after all boot processes and diagnostic tests are complete.

LEDs on the Port Side of the Switch

The port side of the switch has the following LEDs:

- One system status LED (above) on the left side
- One power status LED (below) on the left side
- One port status LED below pairs of Fibre Channel ports (left LED)
- One port speed LED below pairs of Fibre Channel ports (right LED)



Note

The pairs of port LEDs for all 32 ports are arrayed below the bottom of row ports. The pairs of port LEDs are located in the array in the same relative positions as the ports.

Figure 3-1 shows the port side of the SilkWorm 4100.

Figure 3-1 LEDs on Port Side of SilkWorm 4100

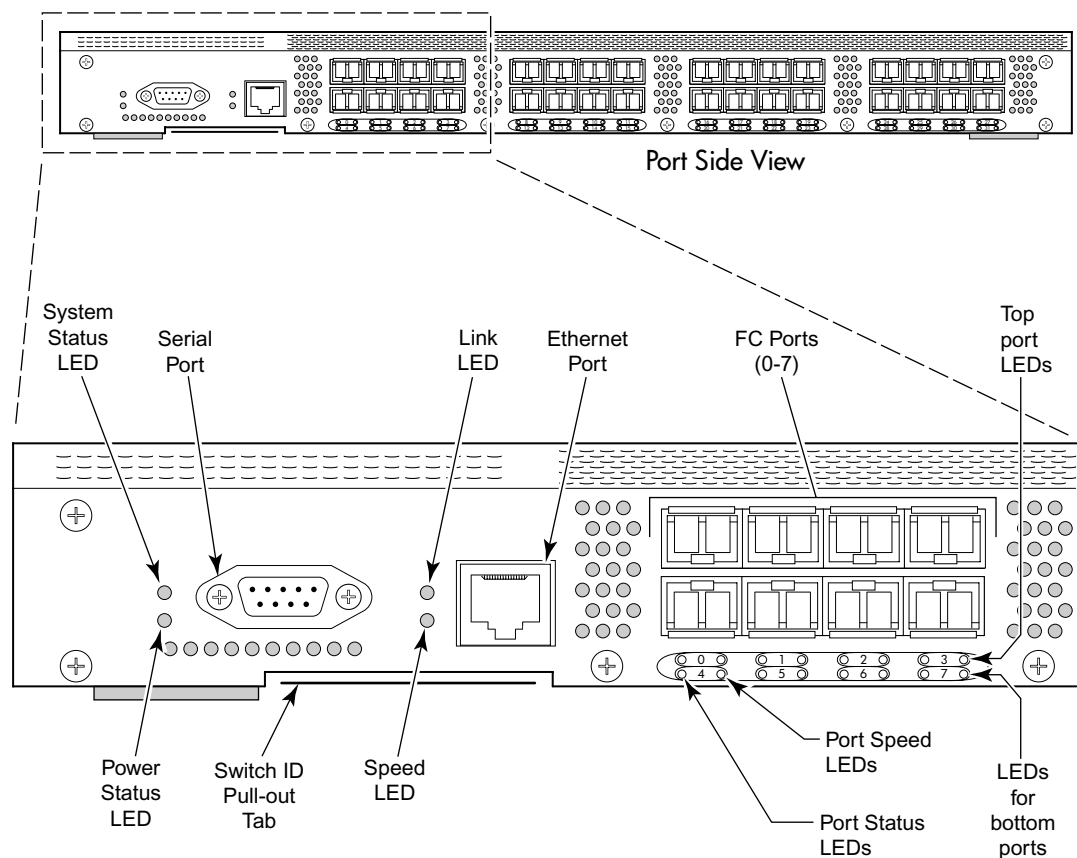


Table 3-1 describes the LEDs and their actions on the port side of the switch.

Table 3-1 Port Side LED Patterns During Normal Operation

LED Name	LED Color	Status of Hardware	Recommended Action
Power Status	No light	System is off or there is an internal power supply failure.	Verify that system is on. If the system is on, the unit is faulty. Contact Technical Support.
	Steady green	System is on and power supplies are functioning properly.	No action required.
System Status	No light	System is off, boot is not complete, or boot failed.	Verify that system is on and has completed booting.
	Steady green	System is on and power supplies are functioning properly.	No action required.
	Steady amber (for more than five seconds)	Boot failed, the system is faulty.	Perform the following steps: 1. Connect a serial cable to the system. 2. Reboot the system. 3. Check the failure indicated on the system console. 4. Contact Technical Support.
	Flashing amber/green	Attention is required. A number of variables can cause this status including a single power supply failure, a fan failure, or one or more environmental ranges has exceeded.	Check the management interface and the error log for details on the cause of status. Contact Technical Support if required.
Ethernet Speed	No light	Port speed is 10 Mb/sec.	No action required.
	Steady green	Port speed is 100 Mb/sec.	No action required.
Ethernet Link	No light	There is no link.	Verify that the Ethernet cable is connected correctly.
	Steady amber	There is a link.	No action required.
	Flashing amber/no light	There is link activity (traffic).	No action required.
Port Speed	No light	Port is transmitting/receiving at 1 Gbit/sec.	No action required.
	Steady green	Port is transmitting/receiving at 2 Gbit/sec.	No action required.
	Steady amber	Port is transmitting/receiving at 4 Gbit/sec.	No action required.

Table 3-1 Port Side LED Patterns During Normal Operation (Continued)

LED Name	LED Color	Status of Hardware	Recommended Action
Port Status	No light	No signal or light carrier (media or cable) detected.	Check transceiver and cable.
	Slow flashing green (flashing in two-second intervals)	Port is online but segmented because of a lookback cable or incompatible switch connection.	No action required.
	Fast flashing green (flashing in half-second intervals)	Port is online and an internal loopback diagnostic test is running.	No action required.
	Flickering green (steady with random flashes)	Port is online and frames are flowing through the port.	No action required.
	Steady green	Port is online (connected to external device) but has no traffic.	No action required.
	Slow flashing amber (flashing in two-second intervals)	Port is disabled (because of diagnostics or the portDisable command).	Verify that the diagnostic tests are not running. Reenable the port using the portEnable command.
	Fast flashing amber (flashing in half-second intervals)	Port is faulty.	Check the management interface and the error log for details on the cause of status. Contact Technical Support if required.
	Steady amber (for more than five seconds)	Port is receiving light or signal carrier at 4 Gbit/sec; but is not yet online.	No action required.

LEDs on the Nonport Side of the Switch

The nonport side of the switch has the following LEDs:

- One power supply LED next to the AC power switch on each power supply
- One fan status LED at the top of each fan assembly (inside the bezel)

Figure 3-2 shows the nonport side of the switch.

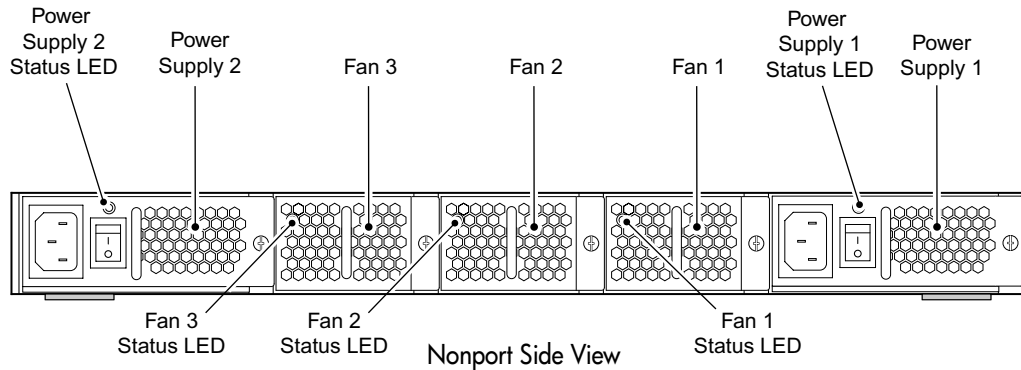
Figure 3-2 LEDs on Nonport Side of SilkWorm 4100

Table 3-2 describes the LEDs on the nonport side of the switch.

Table 3-2 Nonport Side LED Patterns During Normal Operation

LED Name	LED Color	Status of Hardware	Recommended Action
Power Supply Status	No light	Power supply is not receiving power or is off.	Verify that the power supply is on and seated and the power cord is connected to a functioning power source.
	Steady green	Power supply is operating normally.	No action required.
	Steady amber (for more than five seconds)	Power supply fault for one of the following reasons: <ul style="list-style-type: none"> power cable is disconnected power supply is off the power supply has failed 	Try the following: <ul style="list-style-type: none"> check the power cable connection verify that the power supply is powered on replace the power supply
Fan Status	No light	Fan assembly is not receiving power.	No action required.
	Steady green	Fan assembly is operating normally.	No action required.
	Steady amber (for more than five seconds)	Fan fault for one of the following reasons: <ul style="list-style-type: none"> one or more of the fan(s) in the fan assembly has failed the fan FRU was disabled by the user 	Verify that the fan FRU is enabled. If the fan FRU is enabled, the FRU is faulty and should be replaced.

Interpreting POST Results

POST is a system check that is performed each time the switch is powered on, rebooted, or reset, and during which the LEDs flash different colors.

To determine whether POST completed successfully and whether any errors were detected:

- Verify that the LEDs on the switch indicate that all components are healthy (LED patterns are described in [Table 3-1 on page 3-3](#) and [Table 3-2 on page 3-5](#)). If one or more LEDs do not display a healthy state:
 1. Verify that the LEDs are not set to “beacon” (this can be determined through the **switchShow** command or Advanced Web Tools). For information about how to turn beaconing on and off, refer to the *Brocade Fabric OS Procedures Guide* or the *Brocade Advanced Web Tools Administrator’s Guide*.
 2. Follow the recommended action for the observed LED behavior, as listed in [Table 3-1 on page 3-3](#) or [Table 3-2 on page 3-5](#).

- Verify that the switch prompt displays on the terminal of a computer workstation that is connected to the switch.

If the prompt does not display when POST completes, press **Enter**. If the prompt still does not display, open another telnet session or access the switch through another management tool. If this is not successful, the switch did not successfully complete POST; contact your switch supplier for repair.

- Review the system log for errors.

Any errors detected during POST are written to the system log, which is accessible through the **errShow** command. For information about this command, refer to the *Brocade Fabric OS Command Reference Manual*. For information about error messages, refer to the *Brocade Diagnostic and System Error Message Reference Manual*.

Maintaining the SilkWorm 4100

The SilkWorm 4100 does not require any regular physical maintenance and is designed for high availability and to minimize the chance of failure. It includes diagnostic tests and field-replaceable units, described in the following sections.

Diagnostic Tests

In addition to POST, Fabric OS includes diagnostic tests to help you troubleshoot the hardware and firmware. This includes tests of internal connections and circuitry, fixed media, and the transceivers and cables in use. The tests are implemented by command, either through a telnet session or through a terminal set up for a serial connection to the switch. Some tests require the ports to be connected by external cables, to allow diagnostics to verify the serializer/deserializer interface, transceiver, and cable. Some tests require loop back plugs.

Diagnostic tests are run at link speeds of 1 Gbit/sec, 2 Gbit/sec, and 4 Gbit/sec.



Note

Diagnostic tests might temporarily lock the transmit and receive speed of the links during diagnostic testing.

For information about specific diagnostic tests, refer to the *Brocade Fabric OS Procedures Guide*.

Field Replaceable Units (FRUs)

You can replace the power supplies and fan assemblies onsite without the use of special tools. The power supplies and fan assemblies are keyed to ensure correct orientation during installation. Replacement instructions are provided with all replacement units ordered.



Warning

The SilkWorm 4100 has two power cords. To remove all power from the switch, disconnect both power cords before servicing.

Power Supplies

The two power supplies are hot-swappable if replaced one at a time. They are identical and fit into either power supply slot.

Fabric OS identifies the power supplies as follows (viewing the switch from the nonport side):

- Power supply #1 is on the right
- Power supply #2 is on the left

Any of the following methods can be used to determine whether a power supply requires replacing:

- Check the power supply status LED next to the On/Off switch (see [“LEDs on the Nonport Side of the Switch”](#) on page 3-4)
- Type the **psShow** command at the command prompt to display power supply status as shown below:

```
switch:admin> psshow

Power Supply #1 is OK
V10415, QW2M0000269 , 60-0000849-01,X4, DPSN-210BB A, S4, QW2M0000
Power Supply #2 is OK
V10415, LX2M000020 , 60-0000849-01,X4, DPSN-210BB A, S3, LX2M0000
```

- In Advanced Web Tools, click the **Power Status** icon.

Fan Assemblies

The three fan assemblies are hot-swappable if replaced one at a time. They are identical and fit into any fan assembly slot.

Each fan assembly contains two fans, identified by Fabric OS as follows (viewing the switch from the nonport side):

- Fan assembly #1 is on the right.
- Fan assembly #2 is in the center.
- Fan assembly #3 is on the left.

Any of the following methods can be used to determine whether a fan assembly requires replacing:

- Check the fan status LED on the face of the fan assembly (see [“LEDs on the Nonport Side of the Switch” on page 3-4](#))
- Type the **fanShow** command at the command prompt.

```
switch:admin> fanshow
Fan 1 sensor 1 is OK, speed is 5625 RPM
Fan 1 sensor 2 is OK, speed is 5578 RPM
Fan 2 sensor 1 is OK, speed is 5720 RPM
Fan 2 sensor 2 is OK, speed is 6026 RPM
Fan 3 sensor 1 is OK, speed is 5921 RPM
Fan 3 sensor 2 is OK, speed is 5818 RPM
```

- In Advanced Web Tools, click the **Fan Status** icon.

Product Specifications

This appendix provides the following information:

- [“Switch Components,”](#) next
- [“Weight and Physical Dimensions”](#) on page A-2
- [“Facility Requirements”](#) on page A-2
- [“Power Supply Specifications”](#) on page A-3
- [“Power Cords \(Japan, Denan\)”](#) on page A-3
- [“Environmental Requirements”](#) on page A-4
- [“General Specifications”](#) on page A-5
- [“Data Transmission Ranges”](#) on page A-6
- [“Memory Specifications”](#) on page A-6
- [“Fibre Channel Port Specifications”](#) on page A-6
- [“Serial Port Specifications”](#) on page A-7
- [“POST and Boot Specifications”](#) on page A-8
- [“Regulatory Compliance”](#) on page A-9

Switch Components

The SilkWorm 4100 switch includes the following components:

- Cabinet-mountable 1U chassis designed to be mounted in a 19-inch cabinet space, with forced-air cooling that flows from the nonport side of the switch to the port side.
- 32 Fibre Channel ports, compatible with short wavelength (SWL), long wavelength (LWL), and extended long wavelength (ELWL) SFP transceivers.
- One RS-232 serial port on the port side of the switch (DB-9 connector)
- One IEEE-compliant RJ-45 connector on the port side of the switch for use with 10/100 MB/sec Ethernet
- 64 port LEDs, 1 switch power LED, 1 switch status LED, 2 Ethernet LEDs, 2 power supply LEDs, and 3 fan LEDs.
- Two universal AC input and redundant power supplies with AC switches and built-in fans.
- Three fan assemblies containing two fans each.

The fans have two speeds, which are set automatically and cannot be modified. They default to high speed upon boot, then switch to low speed as Fabric OS comes online, returning to high speed only as required.

- Field-replaceable motherboard assembly, enclosed in a grounded EMI cage.

Weight and Physical Dimensions

[Table A-1](#) lists the weight and dimensions of the SilkWorm 4100.

Table A-1 Physical Specifications

Dimension	Value
Height	1U = 42.44 mm (1.67 inches)
Depth	584.2 mm (23.0 inches)
Width	429 mm (16.89 inches)
Weight (with two power supplies and three fan assemblies installed)	10.16 kg (22.4 lbs)

Facility Requirements

To ensure correct operation of the switch, the facility where the switch is in use must meet the following requirements:

- Electrical:
 - Primary AC input 100-240 VAC (switch autosenses input voltage), 47-63 Hz.
 - Correctly wired primary outlet, protected by a circuit breaker and grounded in accordance with local electrical codes.
 - Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the switch nameplate.
 - Electrical interference must be less than the levels stated in the standards listed in [Table A-4 on page A-5](#), under “Immunity.”
- Thermal:
 - Air flows from the non-port side to the port side. A minimum air flow of 47 cubic feet/minute (79.8 cubic meters/hour) available in the immediate vicinity of the switch.
 - Ambient air temperature must not exceed 40° Celsius (104° Fahrenheit) while the switch is operating.
- Environmental: The specifications listed in [Table A-3 on page A-4](#)
- Cabinet:
 - Cabinet space of one rack unit in a 19-inch cabinet.
 - All equipment in cabinet must be grounded through a reliable branch circuit connection.
 - The additional weight of the switch must not exceed the cabinet’s weight limits.
 - The cabinet must be secured to ensure stability in case of unexpected movement.

Power Supply Specifications

The power supplies are universal and capable of functioning worldwide without voltage jumpers or switches. They meet IEC 61000-4-5 surge voltage requirements and are autoranging in terms of accommodating input voltages and line frequencies. Each power supply has a built-in fan for cooling, pushing air towards the port side of the switch.

Table A-2 lists the power supply specifications for the SilkWorm 4100.

Table A-2 Power Supply Specifications

Specification	Value
Outlet	The outlet must be a correctly wired, primary with earth ground
Maximum output	210 Watts
System power consumption	120 Watts maximum, 80 Watts typical
Input voltage	90 - 264 VAC, Universal
Input line frequency	47 - 63 Hz
Harmonic distortion	Active power factor correction per EN61000-3-2
BTU rating at 80% efficiency	120 Watts / 0.8 X 3.412 BTU/hr/Watts = 512 BTU/hr
Inrush current	Maximum of 15 amps for period between 10-150 ms at 50 degrees Celsius (122 degrees Fahrenheit), hot or cold start
Input line protection	Fused in both hot and neutral lines, using independent fuses

Power Cords (Japan, Denan)



注意 - 添付の電源コードを他の装置や用途に使用しない

添付の電源コードは本装置に接続し、使用することを目的として設計され、その安全性が確認されているものです。決して他の装置や用途に使用しないでください。火災や感電の原因となる恐れがあります。

Caution

Never use the power cord packed with your equipment for other products.

Environmental Requirements

Table A-3 lists the acceptable environmental ranges for both operating and nonoperating (such as during transportation or storage) conditions.

Table A-3 Environmental Requirements

Condition	Acceptable During Operation	Acceptable During Non-Operation
Ambient Temperature	0° to 40° Celsius (32° to 104° Fahrenheit)	-25° to 70° Celsius (-13° to 158° Fahrenheit)
Humidity	20% to 85% RH non-condensing, at 40° Celsius (104° Fahrenheit), with maximum gradient of 10% per hour	10% to 85% RH non-condensing, at 70° Celsius (158° Fahrenheit)
Altitude	0 to 3 kilometers (10,000 feet) above sea level	0 to 12 kilometers (40,000 feet) above sea level
Shock	20 G, 6 ms, half-sine wave	15 G, 12-18 milliseconds, trapezoid
Vibration	0.5 G, 5-500 Hz	2.0 G, 5-500 Hz
Air flow	25 cubic feet/minute (42.5 cubic meters/hour)	None required.

General Specifications

Table A-4 lists the general specifications for the SilkWorm 4100.

Table A-4 General Specifications

Specification	Description
Configurable port types	F_Port, FL_Port, and E_Port
EMC (electromagnetic compatibility)	<p><i>Emissions</i></p> <p>An operating SilkWorm 4100 conforms to the emissions requirements specified by the following regulations:</p> <ul style="list-style-type: none"> • FCC Rules & Regulations, Part 15 subpart B, Class A • CSA C108.8 Class A • VCCI Class A ITE • CISPR 22 Class A • EN55022 Class A • AS/NZF 3548: 1995 Class A • Korean EMC Requirements • BSMI Standard CNS 13438 • EMC Directive 89/336/EEC • EN5022 Level A • EN50082-2/EN55024: 1998 • CNS13438 Class A • ICES-003 Class A <p><i>Immunity</i></p> <ul style="list-style-type: none"> • IEC 61000-4-2 Severity Level 3 for Electrostatic Discharge • IEC 61000-4-3 Severity Level 3 for Radiated Fields • IEC 61000-4-4 Severity Level 3 for Fast Transients • IEC 61000-4-5 Severity Level 3 for Surge Voltage • IEC 61000-4-6 Conducted Emissions • IEC 61000-4-11 Voltage Variations • EN 61000-4-12 Oscillatory Waves Immunity • EN 61000-3-2 Limits for Harmonic Current Emissions • EN 61000-3-3 JEIDA
System architecture	Nonblocking shared-memory switch
System processor	PowerPC 440GP, 400 MHz CPU
ANSI Fibre Channel protocol	FC-PH (Fibre Channel Physical and Signalling Interface standard)
Modes of operation	Fibre Channel Class 2 and Class 3
Fabric initialization	Complies with FC-SW-3 Rev. 6.6
FC-IP (IP over Fibre Channel)	Complies with FC-IP 2.3 of FCA profile
Aggregate switch I/O bandwidth	256 Gbit/sec if all 32 ports are running at 4 Gbit/sec, full duplex
Port-to-port latency	Less than 2 microseconds with no contention (destination port is free)

Data Transmission Ranges

Table A-5 provides the data transmission ranges for different cable types and port speeds.

Table A-5 Laser Data Transmission Ranges

Port Speed	Cable Size (microns)	Short Wavelength (SWL)	Long Wavelength (LWL)	Extended Long Wavelength (ELWL)
1 Gbit/sec	50	1,640 feet (500 meters)	6.2 miles (10 km)	n.a
	62.5	984 feet (300 meters)	6.2 miles (10 km)	n.a
	9	n.a	6.2 miles (10 km)	24.8 miles (40 km)
2 Gbit/sec	50	984 feet (300 meters)	6.2 miles (10 km)	n.a
	62.5	492 feet (150 meters)	6.2 miles (10 km)	n.a
	9	n.a	10 km (6.2 miles) without a Brocade Extended Fabrics license; 50 to 100 km with a Brocade Extended Fabrics license	24.8 miles (40 km)
4 Gbit/sec	50	492 feet (150 meters)	n.a	n.a
	62.5	230 feet (70 meters)	n.a	n.a
	9	n.a	n.a	n.a

Memory Specifications

The SilkWorm 4100 has four types of memory devices:

- Boot flash: 4 MB
- Kernel flash: 16 MB
- Compact flash: 512 MB
- Main memory (SDRAM): 512 MB- 1 GB

Fibre Channel Port Specifications

The Fibre Channel ports in the SilkWorm 4100 are compatible with SWL, LWL, and ELWLW SFP transceivers. The strength of the signal is determined by the type of transceiver in use.

The ports meet all required safety standards. For more information about these standards, see [“Regulatory Compliance” on page A-9](#).

The ports are capable of operating at 1, 2, or 4 Gbit/sec and are able to autonegotiate to the higher of 1 or 2 Gbit/sec. Operation at 4 Gbit/sec must be manually set.

Serial Port Specifications

The serial port is located on the port side of the switch. It is a three-wire RS-232 port with a DB-9 male connector, designed to connect to a DTE port.



Note

To protect the serial port from dust and ESD, keep the cover on the serial port whenever the port is not in use.

The serial port can be used to connect to a computer workstation to configure the switch IP address without connecting to the fabric. The serial port's parameters are fixed at 9600 baud, 8 data bits, and no parity, with flow control set to None.

The port requires a straight serial cable with a female 9-pin subminiature-D connector. Only pins 2, 3, and 5 are supported.

[Table A-6](#) lists the cable pinouts.

Table A-6 Cabling Pinouts

PIN	Signal	Description
1	Not supported	Not supported
2	RxData	Receive data
3	TxData	Transmit data
4	Not supported	Not supported
5	GND	Logic ground
6	Not supported	Not supported
7	Not supported	Not supported
8	Not supported	Not supported
9	Not supported	Not supported

A 10 ft. (3.0 m) serial cable is provided with the switch. It can be converted from a DB-9 serial cable to an RJ-45 serial cable by removing the adapter on the end of the cable.

To remove the adapter from the end of the DB-9 serial cable:

1. Ensure the cable and both screws have been disengaged.
2. Pull the adapter straight out, without moving it from side to side, to loosen seating of the connector. If you move the adapter side to side, you might damage the adapter.



Caution

When removing the DB-9 male connector from the DTE port, do not use excessive force; otherwise the DB-9 connector will split into two parts easily so that the switch's DTE port is not damaged.

POST and Boot Specifications

The switch performs POST by default each time it is powered on or rebooted or the system is reset. Boot time with POST is a minimum of three minutes.

POST can be skipped after subsequent reboots by entering the **fastBoot** command. For more information about this command, refer to the *Brocade Fabric OS Command Reference*.

POST

The success/fail results of the diagnostic tests that run during POST can be monitored through LED activity, the error log, or a command-line interface.

POST includes the following tasks:

1. Conducting preliminary POST diagnostics.
2. Initializing the operating system.
3. Initializing hardware.
4. Running diagnostic tests on several functions, including circuitry, port functionality, memory, statistics counters, and serialization.

Boot

Boot completes in a minimum of three minutes if POST is run. In addition to POST, boot includes the following tasks after POST is complete:

1. Performing universal port configuration.
2. Initializing links.
3. Analyzing fabric. If any ports are connected to other switches, the switch participates in a fabric configuration.
4. Obtaining a domain ID and assigning port addresses.
5. Constructing unicast routing tables.
6. Enabling normal port operation.

Regulatory Compliance

This section describes the regulatory compliance requirements for the SilkWorm 4100. It contains:

- “FCC Warning (USA only),” next
- “VCCI Statement” on page A-10
- “CE Statement” on page A-10
- “Canadian Requirements” on page A-10
- “Laser Compliance” on page A-11
- “RTC Battery” on page A-11
- “Electrical Safety” on page A-11
- “Regulatory Certifications” on page A-12

FCC Warning (USA only)

This equipment has been tested and complies with the limits for a Class A computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user’s own expense.

사용자 안내문 : A 급기기

이 기기는 업무용으로 전자파 적합등록을 받은 기기 이오니, 판매자 또는 사용자는 이점을 주의하시기 바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에서 비업무용으로 교환하시기 바랍니다.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

VCCI Statement

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance might arise. When such trouble occurs, the user might be required to take corrective actions.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

CE Statement



Caution

This is a Class A product. In a domestic environment, this product might cause radio interference, and the user might be required to take corrective measures.

The standards compliance label on the SilkWorm 4100 contains the CE mark which indicates that this system conforms to the provisions of the following European Council directives, laws, and standards:

- Electromagnetic Compatibility (EMC) Directive 89/336/EEC and the Complementary Directives 92/31/EEC and 93/68/EEC
- Low Voltage Directive (LVD) 73/23/EEC and the Complementary Directive 93/68/EEC
- EN50082-2/EN55024:1998 (European Immunity Requirements)
 - EN61000-3-2
 - EN61000-3-3/IEIDA (European and Japanese Harmonics Spec)

Canadian Requirements

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations, ICES-003 Class A.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada, NMB-003.

Laser Compliance

This equipment contains Class 1 laser products and complies with FDA Radiation Performance Standards, 21 CFR Subchapter I and the international laser safety standard IEC 825-2.



Caution

Use only optical transceivers that are qualified by Brocade Communications Systems and comply with the FDA Class 1 radiation performance requirements defined in 21 CFR Subchapter I, and with IEC 825-2. Optical products that do not comply with these standards might emit light that is hazardous to the eyes.

RTC Battery



Caution

Do not attempt to replace the real-time clock (RTC) battery. There is danger of explosion if the battery is incorrectly replaced or disposed of. Contact your switch supplier if the real-time clock begins to lose time.

Electrical Safety



Caution

This switch might have more than one power cord. To reduce the risk of electric shock, disconnect both power cords before servicing.



Caution

Connect the power cord only to a grounded outlet.
Apparaten skall an slutas till jordat nattutag.



Caution

This product is designed for an IT power system with phase-to-phase voltage of 230V. After operation of the protective device, the equipment is still under voltage if it is connected to an IT power system.

Regulatory Certifications

Table A-7 lists the safety and EMC (electromagnetic compatibility) specifications for which the SilkWorm 4100 is certified.

Table A-7 SilkWorm 4100 Regulatory Certifications

Country	Safety Specification	EMC Specification
Canada	CSA 22.2 No. 60950 Third Ed.	ICES-003 Class A
United States	UL 60950 Third Ed., Info. Tech. Equip.	FCC Part 15, Subpart B (CFR title 47), Class A
Japan	IEC 60950+A1+A2+A3+A4+A11	VCCI Class A EN 61000-3-2 Harmonics (JEIDA Limits) EN 61000-3-3 Flicker (JEIDA Limits)
International	IEC 60950+A1+A2+A3+A4+A11	CISPR22 Class A
European Union (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom)	EN 60950:92 +A1:93+A2:93+A3:95+A4:96+A11:97 73/23/EEC EN60825-1:1994/A11, -2 TUV (Germany only) IEC 60950+A1+A2+A3+A4+A11 (NEMKO CB Report) (Norway only)	89/336/EEC EN 55022:1998 Class A EN 55024 (Immunity) EN 61000-4-2 Electrostatic Discharge EN 61000-4-3 Radiated Fields EN 61000-4-4 Electrical Fast Transients EN 61000-4-5 Surge Voltage EN 61000-4-6 Conducted Emissions EN 61000-4-8 Magnetic Fields EN 61000-4-11 Voltage Dips and Interruptions EN 61000-3-2 Limits for Harmonic Current Emissions EN 61000-3-3 Flicker
Australia and New Zealand		EN 55022: 1998 Class A

Glossary

#

8b/10b encoding An encoding scheme that converts each 8-bit byte into 10 bits. Used to balance 1s and 0s in high-speed transports.

A

ABTS Abort Basic Link Service. Also referred to as “Abort Sequence.”

ACC Accept link service reply. The normal reply to an Extended Link Service request (such as FLOGI), indicating that the request has been completed.

access fairness A process by which contending nodes are guaranteed access to an arbitrated loop.

active copper A Fibre Channel connection that allows copper cabling up to 33 meters (36 yards) between devices.

address identifier A 24-bit or 8-bit value used to identify the source or destination of a frame. *See also* [S_ID](#) and [D_ID](#).

Advanced Fabric Services, Brocade A Brocade proprietary feature.

Advanced Performance Monitoring, Brocade A Brocade proprietary feature.

Advanced Zoning, Brocade A Brocade proprietary feature.

AL_PA Arbitrated-loop physical address. A unique 8-bit value assigned during loop initialization to a port in an arbitrated loop. Alternately, “arbitrated-loop parameters.”

AL_TIME Arbitrated-loop timeout value. Twice the amount of time it would take for a transmission word to propagate around a worst-case loop. The default value is 15 milliseconds (ms).

alias A logical grouping of elements in a fabric. An alias is a collection of port numbers and connected devices, used to simplify the entry of port numbers and WWNs when creating zones.

alias address identifier	An address identifier recognized by a port in addition to its standard identifier. An alias address identifier can be shared by multiple ports. <i>See also</i> alias .
alias AL_PA	An AL_PA value recognized by an L_Port in addition to the AL_PA assigned to the port. <i>See also</i> AL_PA .
alias server	A fabric software facility that supports multicast group management.
ANSI	American National Standards Institute.
ARB	Arbitrative primitive signal. Applies only to an arbitrated-loop topology. Transmitted as the fill word by an L_Port to indicate that the port is arbitrating access to the loop.
arbitrated loop	A shared 100-Mbit/sec Fibre Channel transport structured as a loop. Can support up to 126 devices and one fabric attachment. <i>See also</i> topology .
arbitration	A method of gaining orderly access to a shared-loop topology.
area number	In Brocade Fabric OS v4.0 and above, ports on a switch are assigned a logical area number. Port area numbers can be viewed by entering the switchshow command. They are used to define the operative port for many Fabric OS commands: for example, area numbers can be used to define the ports within an alias or zone.
ARP	Address Resolution Protocol. A TCP/IP function for associating an IP address with a link-level address.
ARR	Asynchronous response router. Refers to Management Server GS_Subtype Code E4, which appears in portlogdump command output.
ASD	Alias server daemon. Used for managing multicast groups by supporting the create, add, remove, and destroy functions.
ASIC	Application-specific integrated circuit.
ATM	Asynchronous Transfer Mode. A transport used for transmitting data over LANs or WANs that transmit fixed-length units of data. Provides any-to-any connectivity and allows nodes to transmit simultaneously.
authentication	The process of verifying that an entity in a fabric (such as a switch) is what it claims to be. <i>See also</i> digital certificate , switch-to-switch authentication .
autocommit	A feature of the firmwaredownload command. Enabled by default, autocommit commits new firmware to both partitions of a control processor.
autoreboot	Refers to the -b option of the firmwaredownload command. Enabled by default.
AW_TOV	Arbitration wait timeout value. The minimum time an arbitrating L_Port waits for a response before beginning loop initialization.

B

backbone fabric	An optional capability that enables scalable meta-SANs by allowing the networking of multiple FC routers, which connect to the backbone fabric via EB_Port interfaces.
backup FCS switch	Relates to the Brocade Secure Fabric OS feature. The backup fabric configuration server serves as a backup in case the primary FCS switch fails. <i>See also</i> FCS switch , primary FCS switch .
BB fabric	A backbone fabric that connects FC Routers. The FC Routers communicate over the backbone fabric using FCRP (Fibre Channel Router Protocol).
BB_Credit	Buffer-to-buffer credit. The number of frames that can be transmitted to a directly connected recipient or within an arbitrated loop. Determined by the number of receive buffers available. <i>See also</i> buffer-to-buffer flow control , EE_Credit .
beacon	A tool in which all of the port LEDs on a switch are set to flash from one side of the switch to the other, to enable identification of an individual switch in a large fabric. A switch can be set to beacon by a CLI command or through Brocade Advanced Web Tools.
beginning running disparity	The disparity at the transmitter or receiver when the special character associated with an ordered set is encoded or decoded. <i>See also</i> disparity .
BER	Bit error rate. The rate at which bits are expected to be received in error. Expressed as the ratio of error bits to total bits transmitted. <i>See also</i> error .
BISR	Built-in self-repair.
BIST	Built-in self-test.
bit synchronization	The condition in which a receiver is delivering retimed serial data at the required bit error rate.
blind-mate connector	A two-way connector used in some Brocade SilkWorm switches to provide a connection between the motherboard and the power supply.
block	As it applies to Fibre Channel technology, upper-level application data that is transferred in a single sequence.
bloom	The code name given to the third-generation Brocade Fabric ASIC. This ASIC is used in SilkWorm switches 3000 series and beyond.
BOFMS	Brocade open fabric management services.
boot code	Software that initialized the system environment during the early phase of the boot-up process. For example, boot code might determine the amount of available memory and how to access it.
boot flash	Flash (temporary) memory that stores the boot code and boot.
bport	Back-end port of the ASIC.

Brocade MSRS	<i>See</i> MSRS .
broadcast	The transmission of data from a single source to all devices in the fabric, regardless of zoning. <i>See also</i> multicast , unicast .
buffer-to-buffer flow control	Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop. <i>See also</i> BB_Credit .
bypass circuitry	Circuits that automatically remove a device from the data path when valid signals are dropped.

C

CA	Certificate authority. A trusted organization that issues digital certificates. <i>See also</i> digital certificate .
CAM	Content-addressable memory.
CAN	Campus area network. A network comprising a limited area but not just one building. <i>See also</i> LAN , MAN , WAN .
cascade	Two or more interconnected Fibre Channel switches. Brocade SilkWorm 2000 and later switches can be cascaded up to 239 switches, with a recommended maximum of seven interswitch links (no path longer than eight switches). <i>See also</i> fabric , ISL .
CDR	Clock and data recovery circuitry.
CE	Conformité Européenne.
CFG	Configuration.
CFN	Change fabric name. Refers to an ELS field that appears in portlogdump command output.
CHAP	Challenge-Handshake Authentication Protocol. Allows remote servers and clients to securely exchange authentication credentials. Both the server and client are configured with the same shared secret.
chassis	The metal frame in which the switch and switch components are mounted.
CIM	Common Information Model. A management structure enabling disparate resources to be managed by a common application.
CIMOM	Common Information Model Object Manager. A model for describing management information from the DMTF. CIM is implementation independent, allowing different management applications to collect the required data from a variety of sources. CIM includes schemas for systems, networks, applications and devices, and new schemas will be added. It also provides mapping techniques for interchange of CIM data with MIB data from SNMP agents and MIF data from DMI-compliant systems.
circuit	An established communication path between two ports. Consists of two virtual circuits capable of transmitting in opposite directions.

Class 1 service	The class of frame-switching service for a dedicated connection between two communicating ports (also called “connection-oriented service”). Includes acknowledgement of frame delivery or nondelivery.
Class 2 service	A connectionless class of frame-switching service that includes acknowledgement of frame delivery or nondelivery.
Class 3 service	A connectionless class of frame-switching service that does not include acknowledgement of frame delivery or nondelivery. Can be used to provide a multicast connection between the frame originator and recipients, with acknowledgement of frame delivery or nondelivery.
Class 4 service	A connection-oriented service that allows fractional parts of the bandwidth to be used in a virtual circuit.
Class 6 service	A connection-oriented multicast service geared toward video broadcasts between a central server and clients.
Class F service	The class of frame-switching service for a direct connection between two switches, allowing communication of control traffic between the E_Ports. Includes acknowledgement of data delivery or nondelivery.
class of service	A specified set of delivery characteristics and attributes for frame delivery.
CLI	Command line interface. An interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a GUI.
client	An entity that, using its common transport (CT), makes requests of a server.
CLS	Close primitive signal. Used only in an arbitrated loop. Sent by an L_Port that is currently communicating in the loop, to close communication with another L_Port.
CM	Central memory.
CMA	Central memory architecture. An architecture centralizing memory usage in switches.
CMBISR	Central memory built-in self-repair.
CMT	Central memory test.
comma	A unique pattern (either 1100000 or 0011111) used in 8b/10b encoding to specify character alignment within a data stream. <i>See also</i> K28.5 .
community (SNMP)	A relationship between a group of SNMP managers and an SNMP agent, in which authentication, access control, and proxy characteristics are defined. <i>See also</i> SNMP .
compact flash	Flash (temporary) memory that is used in a manner similar to hard disk storage. It is connected to a bridging component that connects to the PCI bus of the processor. Not visible within the processor's memory space.
configuration	(1) A set of parameters that can be modified to fine-tune the operation of a switch. Use the configshow command to view the current configuration of your switch.

(2) In Brocade Zoning, a zoning element that contains a set of zones. The Configuration is the highest-level zoning element and is used to enable or disable a set of zones on the fabric. *See also* [zone configuration](#).

congestion	The realization of the potential of oversubscription. A congested link is one on which multiple devices are contending for bandwidth.
connection initiator	A port that has originated a Class 1 dedicated connection and received a response from the recipient.
connection recipient	A port that has received a Class 1 dedicated connection request and transmitted a response to the originator.
core PID	Core switch port identifier. The core PID must be set for v3.1 and earlier switches included in a fabric of v4.1 switches. This parameter is located in the configure command of firmware versions v3.1 and earlier. All v4.1 switches and above use the core PID format by default; this parameter is not present in the configure command for these switches.
COS	Class of service.
CP	Control processor.
CPLD	Complex PLD. Alternately known as “Enhanced PLD (EPLD),” “Super PAL,” and “Mega PAL.”
credit	As it applies to Fibre Channel technology, the number of receive buffers available to transmit frames between ports. <i>See also</i> BB_Credit , EE_Credit .
CSCN	Common services connection framework.
cut-through	A switching technique that allows the route for a frame to be selected as soon as the destination address is received. <i>See also</i> route .

D

D_ID	Destination identifier. A 3-byte field in the frame header, used to indicate the address identifier of the N_Port to which the frame is headed.
DAS	Direct attached storage.
data word	A type of transmission word that occurs within frames. The frame header, data field, and CRC all consist of data words. <i>See also</i> frame , ordered set , transmission word .
datagram	A Class 3 Fibre Channel service that allows data to be sent quickly to devices attached to the fabric, without receipt confirmation.
DCC	Direct cable connection. DCC does not require network interface cards (NICs), making it relatively inexpensive and simple; however, it provides a limited connection between two PCs, and the data transfer rate is slower than with a true LAN.
DCE	Data Communications Equipment. Usually refers to a modem.

dedicated simplex	A connection method that permits a single N_Port to simultaneously initiate a session with one N_Port as an initiator and have a separate Class 1 connection to another N_Port as a recipient.
defined zone configuration	The set of all zone objects defined in the fabric. Can include multiple zone configurations. <i>See also</i> enabled zone configuration , zone configuration .
deskew	Related to the Brocade Trunking feature. The time difference between traffic traveling over each ISL other than the shortest ISL in the group and traffic traveling over that shortest ISL. The deskew number corresponds to nanoseconds divided by 10. The firmware automatically sets the minimum deskew value of the shortest ISL to 15.
DH-CHAP	Diffie-Hellman Challenge-Handshake Authentication Protocol. An implementation of CHAP using Diffie-Hellman encryption. <i>See also</i> CHAP .
DHCP	Dynamic Host Configuration Protocol.
DHCPD	Dynamic Host Configuration Protocol daemon.
digital certificate	An electronic document issued by a CA (certificate authority) to an entity, containing the public key and identity of the entity. Entities in a secure fabric are authenticated based on these certificates. <i>See also</i> authentication , CA , public key .
director	A Brocade SilkWorm 12000, 24000, or 48000 switch.
disparity	The proportion of 1s and 0s in an encoded character. “Neutral disparity” means an equal number of each, “positive disparity” means a majority of 1s, and “negative disparity” means a majority of 0s.
DLS	Dynamic load-sharing. Dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx_Port or E_Port changes status.
DMTF	Distributed Management Task Force.
domain controller	A domain controller or embedded port communicates with and gets updates from other switches' embedded ports. The well-known address is <i>fffdd</i> , where <i>dd</i> = domain number).
domain ID	A unique identifier for all switches in a fabric, used in routing frames. Usually automatically assigned by the principal switch but can be assigned manually. The domain ID for a Brocade SilkWorm switch can be any integer between 1 and 239.
DTE	Data terminal equipment. Usually refers to a terminal.
DWDM	Dense wave division multiplexing. Allows more wavelengths to use the same fiber. <i>See</i> WDM .

E

E_D_TOV	Error-detect timeout value. The minimum amount of time a target waits for a sequence to complete before initiating recovery. Can also be defined as the maximum time allowed for a round-trip transmission before an error is declared. <i>See also</i> R_A_TOV , RR_TOV .
E_Port	Expansion port. A standard Fibre Channel mechanism that enables switches to network with each other, creating an ISL. <i>See also</i> ISL .

ECCN	Export classification control number. A government classification of encryption. For example, SSH is in the high-encryption category (number 5x02) and therefore has certain restrictions regarding its transfer.
edge fabric	A Fibre Channel fabric connected to an FC router via an EX_Port (where hosts and storage are attached in a meta-SAN).
EE_Credit	End-to-end credit. The number of receive buffers allocated by a recipient port to an originating port. Used by Class 1 and 2 services to manage frame exchange across the fabric, between source and destination. <i>See also</i> BB_Credit , end-to-end flow control .
EIA rack	A storage rack that meets the standards set by the Electronics Industry Association (EIA).
ELP	Exchange link parameters.
ELS	Extended link service. ELSs are sent to the destination N_Port to perform the requested function or service. ELS is a Fibre Channel standard that is sometimes referred to as “Fibre Channel Physical (FC_PH) ELS.”
EM	Environmental monitor. Monitors FRUs and reports failures.
embedded port	An embedded port (or domain controller) communicates and get updates from other switches' embedded ports. The well-known address is <i>fffdd</i> , where <i>dd</i> = domain number.
EMI	Electromagnetic interference.
emulex	A brand of host bus adapter.
enabled zone configuration	The currently enabled configuration of zones. Only one configuration can be enabled at a time. <i>See also</i> defined zone configuration , zone configuration .
end-to-end flow control	Governs flow of Class 1 and 2 frames between N_Ports. <i>See also</i> EE_Credit .
entry fabric	The basic Brocade software license that allows one E_Port per switch.
EOF	End of frame. A group of ordered sets used to mark the end of a frame.
error	As it applies to the Fibre Channel industry, a missing or corrupted frame, timeout, loss of synchronization, or loss of signal (link errors). <i>See also</i> loop failure .
Ethernet	Popular protocols for LANs.
EVMd	Event management database. Delivers FDMI-related events.
EX_Port	A type of E_Port that connects an FC router to an edge fabric. EX_Ports limit the scope of fabric services scope but provide device connectivity using FC-NAT.
exchange	The highest-level Fibre Channel mechanism used for communication between N_Ports. Composed of one or more related sequences, it can work in either one or both directions.

exported device A device that has been mapped between fabrics (a host or storage port in one edge fabric can be exported to any other fabric by using LSAN zoning).

F

F_BSY Fabric port busy frame. A frame issued by the fabric to indicate that a frame cannot be delivered because the fabric or destination N_Port is busy.

F_Port Fabric port. A port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N_Port to a switch. *See also* [FL_Port](#), [Fx_Port](#).

F_RJT Fabric port reject frame. A frame issued by the fabric to indicate that delivery of a frame is being denied, perhaps because a class is not supported, there is an invalid header, or no N_Port is available.

fabric A collection of Fibre Channel switches and devices, such as hosts and storage. Also referred to as a “switched fabric.” *See also* [cascade](#), [SAN](#), [topology](#).

fabric application platform A device that enables fabric-based storage applications such as mirroring, data migration, snapshots, and virtual tape. The Brocade SilkWorm Fabric Application Platform can run in a central location, process data at wire-speed, and reside in existing data paths.

Fabric Manager An optionally licensed Brocade software. Fabric Manager is a GUI that allows for fabric-wide administration and management. Switches can be treated as groups, and actions such as firmware downloads can be performed simultaneously.

Fabric Mode One of two possible modes for an L_Port, in which the L_Port is connected to another port that is not loop capable, using fabric protocol.

fabric name The unique identifier assigned to a fabric and communicated during login and port discovery.

fabric port count The number of ports available for connection by nodes in a fabric.

fabric services Codes that describe the communication to and from any well-known address.

fabric topology The arrangement of switches that form a fabric.

Fabric Watch An optionally licensed Brocade software. Fabric Watch can be accessed through either the command line or Advanced Web Tools, and it provides the ability to set thresholds for monitoring fabric conditions.

failover Describes the Brocade SilkWorm 12000 process of one CP passing active status to another CP. A failover is nondisruptive.

FAN Fabric address notification. Retains the AL_PA and fabric address when a loop reinitializes, if the switch supports FAN.

fan-in The ratio of hosts to storage devices; the view of the SAN from the storage port's perspective.

fan-out The ratio of storage devices to hosts; the view of the SAN from the host port's perspective.

FC router	A platform running the Brocade Fibre Channel Routing Service or FC-to-FC routing (for instance, the SilkWorm Fabric AP7420) that enables two or more fabrics to share resources (such hosts or storage devices) without merging those fabrics. The platform could simultaneously be used as an FC router and as an FCIP tunnel or iSCSI gateway.
FC-0	Lowest layer of Fibre Channel transport. Represents physical media.
FC-1	Layer of Fibre Channel transport that contains the 8b/10b encoding scheme.
FC-2	Layer of Fibre Channel transport that handles framing and protocol, frame format, sequence/exchange management, and ordered set usage.
FC-3	Layer of Fibre Channel transport that contains common services used by multiple N_Ports in a node.
FC-4	Layer of Fibre Channel transport that handles standards and profiles for mapping upper-level protocols such as SCSI and IP onto the Fibre Channel Protocol.
FC-AL-3	The Fibre Channel arbitrated-loop standard defined by ANSI. Defined on top of the FC-PH standards.
FC-AV	Fibre Channel audio visual.
FCC	Federal Communications Commission.
FC-CT	Fibre Channel common transport.
FC-FG	Fibre Channel generic requirements.
FC-FLA	The Fibre Channel fabric loop-attach standard defined by ANSI.
FC-FS	Fibre Channel framing and signaling.
FC-GS	Fibre Channel generic services.
FC-GS-2	Fibre Channel generic services, second generation.
FC-GS-3	Fibre Channel Generic Services, third generation.
FCIP	Fibre Channel over IP.
FC-NAT	Fibre Channel network address translation.
FC-PH	The Fibre Channel physical and signaling standard for FC-0, FC-1, and FC-2 layers of the Fibre Channel Protocol. Indicates signaling used for cable plants, media types, and transmission speeds.
FC-PH-2	Fibre Channel Physical Interface, second generation.
FC-PH-3	Fibre Channel Physical Interface, third generation.
FC-PI	Fibre Channel Physical Interface standard, defined by ANSI.
FC-PLDA	The Fibre Channel Private Loop Direct Attach standard defined by ANSI. Applies to the operation of peripheral devices on a private loop.

FC_SB	Fibre Channel single bytes.
FC_VI	Fibre Channel virtual interface.
FCA	Flow-control acknowledgement (DLSW).
FCIA	Fibre Channel Industry Association. An international organization of Fibre Channel industry professionals. Provides oversight of ANSI and industry-developed standards, among other tasks.
FCIP Tunneling Service	The Brocade Multiprotocol SAN Routing Service that enables SANs to span longer distances than could be supported with native Fibre Channel links. FCIP is a TCP/IP-based tunneling protocol that allows the transparent interconnection of geographically distributed SAN islands through an IP-based network.
FCLC	Fibre Channel Loop Community.
FCP	Fibre Channel Protocol. Mapping of protocols onto the Fibre Channel standard protocols. For example, SCSI FCP maps SCSI-3 onto Fibre Channel.
FCRP	Fibre Channel Router Protocol. A Brocade-authored protocol that enables LSAN switches to perform routing between different edge fabrics, optionally across a backbone fabric.
FCRS	Fibre Channel Routing Service. The Brocade Multiprotocol SAN Routing Service that extends hierarchical networking capabilities to Fibre Channel fabrics. Sometimes called “FC-to-FC routing,” FCRS enables devices located on separate fabrics to communicate without merging the fabrics. It also enables the creation of LSANs.
FCS	Fibre Channel switch; alternatively, Fabric Configuration Server.
FCS switch	Relates to the Brocade Secure Fabric OS feature. One or more designated switches that store and manage security parameters and configuration data for all switches in the fabric. They also act as a set of backup switches to the primary FCS switch. <i>See also</i> backbone fabric , primary FCS switch .
FC-SW-2	The second-generation Fibre Channel Switch Fabric standard defined by ANSI. Specifies tools and algorithms for the interconnection and initialization of Fibre Channel switches to create a multiswitch Fibre Channel fabric.
FDDI	Fibre Distributed Data Interface. An ANSI architecture for a metropolitan area network (MAN); a network based on the use of fiber-optic cable to transmit data at 100 Mbit/sec.
FDMI	Fabric-Device Management Interface. FDMI is a database service provided by the fabric for Nx_Ports. The primary use is by HBA devices that register information about themselves and their ports.
FFFFF5	Well-known Fibre Channel address for a Class 6 multicast server.
FFFFF6	Well-known Fibre Channel address for a clock synchronization server.
FFFFF7	Well-known Fibre Channel address for a security key distribution server.
FFFFF8	Well-known Fibre Channel address for an alias server.
FFFFF9	Well-known Fibre Channel address for a QoS facilitator.

FFFFFFA	Well-known Fibre Channel address for a management server.
FFFFFFB	Well-known Fibre Channel address for a time server.
FFFFFFC	Well-known Fibre Channel address for a directory server.
FFFFFFD	Well-known Fibre Channel address for a fabric controller.
FFFFFFE	Well-known Fibre Channel address for a fabric F_Port.
FFFFFFF	Well-known Fibre Channel address for a broadcast alias ID.
Fibre Channel	The primary protocol used for building SANs to transmit data between servers, switches, and storage devices. Unlike IP and Ethernet, Fibre Channel was designed to support the needs of storage devices of all types. It is a high-speed, serial, bidirectional, topology-independent, multiprotocol, and highly scalable interconnection between computers, peripherals, and networks.
Fibre Channel transport	A protocol service that supports communication between Fibre Channel service providers. <i>See also</i> FSP .
FICON®	A protocol used on IBM mainframes. Brocade SilkWorm switch FICON support enables a SilkWorm fabric to transmit FICON format data between FICON-capable servers and storage.
FID	Fabric ID. Unique identifier of a fabric in a meta-SAN.
FIFO	First in, first out. Refers to a data buffer that follows the first in, first out rule.
fill word	An IDLE or ARB ordered set that is transmitted during breaks between data frames to keep the Fibre Channel link active.
firmware	The basic operating system provided with the hardware.
firmware watermarking	A Brocade SilkWorm switch feature that prevents an incompatible version of the Brocade Fabric OS to be downloaded to the SilkWorm 3000 series of switches.
FL_Port	Fabric loop port. A port that is able to transmit under fabric protocol and also has arbitrated-loop capabilities. Can be used to connect an NL_Port to a switch. <i>See also</i> F_Port , Fx_Port .
flash	Programmable nonvolatile RAM (NVRAM) memory that maintains its contents without power.
FLOGI	Fabric login. The process by which an N_Port determines whether a fabric is present and, if so, exchanges service parameters with it. <i>See also</i> PLOGI .
FOTP	Fiber Optic Test Procedure. Standards developed and published by the Electronic Industries Association (EIA) under the EIA-RS-455 series of standards.
FPD	Field-programmable device. Interchangeable with “PLD”.
FPGA	Field-programmable gate array. An FPD that allows high logic capacity.
fractional bandwidth	The partial use of a link to send data back and forth, with a maximum of 254 Class 4 connections per N_Port.

- frame** The Fibre Channel structure used to transmit data between ports. Consists of a start-of-frame delimiter, header, optional headers, data payload, cyclic redundancy check (CRC), and end-of-frame delimiter. There are two types of frames: link control frames (transmission acknowledgements and so forth) and data frames.
- frame relay** A protocol that uses logical channels, as used in X.25. Provides very little error-checking ability. Discards frames that arrive with errors. Allows a certain level of bandwidth between two locations (known as a "committed information rate": CIR) to be guaranteed by service provider. If CIR is exceeded for short periods (known as "bursts"), the network accommodates the extra data, if spare capacity is available. Frame relay is therefore known as "bandwidth on demand."
- FRU** Field-replaceable unit. A component that can be replaced onsite.
- FS** Fibre Channel service. A service that is defined by Fibre Channel standards and exists at a well-known address. For example, the Simple Name Server is a Fibre Channel service. *See also* [FSP](#).
- FSP** Fibre Channel Service Protocol. The common protocol for all fabric services, transparent to the fabric type or topology. *See also* [FS](#).
- FSPF** Fabric shortest path first. The Brocade routing protocol for Fibre Channel switches.
- FSS** Fabric OS state synchronization. The FSS service is related to high availability (HA). The primary function of FSS is to deliver state update messages from active components to their peer standby components. FSS determines if fabric elements are synchronized (and thus FSS "compliant").
- FTP** File Transfer Protocol.
- FTS** Fiber Transport Services.
- full fabric** The Brocade software license that allows multiple E_Ports on a switch, making it possible to create multiple ISL links.
- full fabric citizenship** A loop device that has an entry in the Simple Name Server.
- full duplex** A mode of communication that allows the same port to simultaneously transmit and receive frames. *See also* [half duplex](#).
- Fx_Port** A fabric port that can operate as either an F_Port or FL_Port. *See also* [F_Port](#), [FL_Port](#).

G

- G_Port** Generic port. A port that can operate as either an E_Port or an F_Port. A port is defined as a G_Port when it is not yet connected or has not yet assumed a specific function in the fabric.
- gateway** Hardware that connects incompatible networks by providing translation for both hardware and software. For example, an ATM gateway can be used to connect a Fibre Channel link to an ATM connection.
- GBIC** Gigabit interface converter. A removable serial transceiver module that allows gigabaud physical-level transport for Fibre Channel and gigabit Ethernet.

Gbit/sec	Gigabits per second (1,062,500,000 bits/second).
GB/sec	Gigabytes per second (1,062,500,000 bytes/second).
GLM	Gigabit Link Module. A semitransparent transceiver that incorporates serializing/deserializing functions.
GMT	Greenwich Mean Time. An international time zone. Also known as "UTC."
GUI	A graphic user interface, such as Brocade Advanced Web Toolsarbitrated-loop topology and Brocade Fabric Manager.

H

HA	High availability. A set of features in Brocade SilkWorm switches that is designed to provide maximum reliability and nondisruptive replacement of key hardware and software modules.
half duplex	A mode of communication that allows a port to either transmit or receive frames at any time except simultaneously (with the exception of link control frames, which can be transmitted at any time). <i>See also full duplex.</i>
hard address	The AL_PA that an NL_Port attempts to acquire during loop initialization.
Hardware Translative Mode	A method for achieving address translation. There are two hardware translative modes available to a QuickLoop enabled switch: Standard Translative Mode and QuickLoop Mode.
HBA	Host bus adapter. The interface card between a server or workstation bus and the Fibre Channel network.
HCPLD	High-capacity PLD. Refers to both CPLDs and FPGAs.
header	A Fibre Channel frame has a header and a payload. The header contains control and addressing information associated with the frame.
HiPPI	High-Performance Parallel Interface. An 800 Mbit/sec interface normally used in supercomputer environments.
hop count	The number of ISLs a frame must traverse to get from its source to its destination.
host	A computer system that provides end users with services like computation and storage access.
hot swappable	A hot swappable component can be replaced under power.
HSSDC	High-speed serial data connection. A form factor that allows quick connections for copper interface.
HSSDC-2	A second-generation HSSDC connector.
HTTP	Hypertext Transfer Protocol. The standard TCP/IP transfer protocol used on the World Wide Web.

hub	A Fibre Channel wiring concentrator that collapses a loop topology into a physical star topology. Nodes are automatically added to the loop when active and removed when inactive.
hunt group	A number of N_Ports registered as a single Alias_ID so that the fabric can route a word to a port that is not busy.
HW	Hardware.

I

I2C	Related to internal circuitry on motherboard.
ICT	Intracircuit test.
ID_ID	Insistent domain ID. A parameter of the configure command in the Brocade Fabric OS.
idle	Continuous transmission of an ordered set over a Fibre Channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.
iFCP	Internet Fibre Channel Protocol. Supports Fibre Channel Layer 4 FCP-Over-TCP/IP. It is a gateway-to-gateway protocol in which TCP/IP switching and routing components enhance/replace Fibre Channel fabric.
iFCS	IP storage fabric configuration server.
IFL	Interfabric link. A connection between a router and an edge fabric. Architecturally, these can be of type EX_Port-to-E_Port or EX_Port-to-EX_Port.
in-band	Transmission of management protocol over the Fibre Channel.
initiator	A server or workstation on a Fibre Channel network that initiates communications with storage devices. <i>See also</i> target .
Insistent Domain ID Mode	Sets the domain ID of a switch as insistent, so that it remains the same over reboots, power cycles, failovers, and fabric reconfigurations. This mode is required to support FICON® traffic.
integrated fabric	The fabric created by a Brocade SilkWorm 6400, consisting of six SilkWorm 2250 switches cabled together and configured to handle traffic seamlessly as a group.
intercabinet	A specification for copper cabling that allows up to 33-meter distances between cabinets.
intermix	Allows any unused bandwidth in a Class 1 connection.
interswitch link	<i>See</i> ISL .
intracabinet	A specification for copper cabling that allows up to a 13-meter (42-foot) distance within a single cabinet.
IOCTL	I/O control.

IOD	In-order delivery. A parameter that, when set, guarantees that frames are either delivered in order or dropped.
IP	Internet Protocol. The addressing part of TCP.
IPI	Intelligent Peripheral Interface.
IQN	iSCSI qualified name.
ISC	Internet Software Consortium.
iSCSI	Internet Small Computer Systems Interface. A protocol that defines the processes for transferring block storage applications over TCP/IP networks by encapsulating SCSI commands into TCP and transporting them over the network via IP.
iSCSI Gateway Service	The Brocade multiprotocol SAN routing service that maps the FCP protocol to the IP transport. This service projects iSCSI hosts onto the backbone fabric of a gateway switch.
ISL	Interswitch link. A Fibre Channel link from the E_Port of one switch to the E_Port of another. <i>See also</i> cascade , E_Port .
ISL oversubscription ratio	The ratio of the number of free ports (non-ISL) to the number of ISLs on a switch.
isolated E_Port	An E_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E_D_TOVs). <i>See also</i> E_Port .
ISP	Internet service provider.
IU	Information unit. A set of information as defined by either an upper-level process protocol definition or upper-level protocol mapping.
J	
Jaycor	A brand of host bus adapter.
JBOD	"Just a bunch of disks." Indicates a number of disks connected in a single chassis to one or more controllers. <i>See also</i> RAID .
jitter	A deviation in timing for a bit stream as it flows through a physical medium.
K	
K28.5	A special 10-bit character used to indicate the beginning of a transmission word that performs Fibre Channel control and signaling functions. The first seven bits of the character are the comma pattern. <i>See also</i> comma .
key	A string of data (usually a numeric value) shared between two entities and used to control a cryptographic algorithm. Usually selected from a large pool of possible keys to make unauthorized identification of the key difficult. <i>See also</i> key pair .

key pair In public key cryptography, a pair of keys consisting of an entity's public and private key. The public key can be publicized, but the private key must be kept secret. *See also* [public key cryptography](#).

L

L_Port Loop port. A node port (NL_Port) or fabric port (FL_Port) that has arbitrated-loop capabilities. An L_Port can be in either Fabric Mode or Loop Mode.

LAN Local area network. A network in which transmissions typically take place over fewer than 5 kilometers (3.4 miles).

latency The time required to transmit a frame. Together, latency and bandwidth define the speed and capacity of a link or system.

LED Light-emitting diode. Used to indicate the status of elements on a switch.

LIFA Loop-initialization fabric-assigned frame. Contains a bitmap of all fabric-assigned AL_PAs and is the first frame transmitted in the loop initialization process after a temporary loop master has been selected.

LIHA Loop-initialization hard-assigned frame. A hard-assigned AL_PA that is indicated by a bit set and is the third frame transmitted in the loop initialization process after a temporary loop master has been selected.

LILP Loop-initialization loop-position frame. The final frame transmitted in a loop initialization process. A returned LIRP contains an accumulation of all of the AL_PA position maps. This allows loop members to determine their relative loop position. This is an optional frame and is not transmitted unless the LIRP is also transmitted.

link control facility A termination, handling physical and logical control of the Fibre Channel link for each mode.

Link Services A protocol for link-related actions.

LIP Loop initialization primitive. The signal used to begin initialization in a loop. Indicates either loop failure or node resetting.

LIPA Loop-initialization previously assigned. The device marks a bit in the bitmap if it did not log in with the fabric in a previous loop initialization.

LIRP Loop-initialization report position frame. The first frame transmitted in the loop initialization process after all L_Ports have selected an AL_PA. The LIRP gets transmitted around the loop so all L_Ports can report their relative physical position. This is an optional frame.

LISA Loop-initialization soft-assigned frame. The fourth frame transmitted in the loop initialization process after a temporary loop master has been selected. L_Ports that have not selected an AL_PA in a LIFA, LIPA, or LIHA frame select their AL_PA here.

LISM Loop-initialization select master frame. The first frame transmitted in the initialization process when L_Ports select an AL_PA. LISM is used to select a temporary loop master or the L_Port that will subsequently start transmission of the LIFA, LIPA, LIHA, LISA, LIRP, or LILP frames.

LM_TOV	Loop master timeout value. The minimum time that the loop master waits for a loop initialization sequence to return.
login server	The unit that responds to login requests.
Loom	The code name given to the second-generation Brocade Fabric ASIC. This is the ASIC used in the SilkWorm 2xxx series of switches.
loop circuit	A temporary bidirectional communication path established between L_Ports.
loop failure	Loss of signal within a loop for any period of time, or loss of synchronization for longer than the timeout value.
Loop_ID	A hexadecimal value representing one of the 127 possible AL_PA values in an arbitrated loop.
loop initialization	The logical procedure used by an L_Port to discover its environment. Can be used to assign AL_PA addresses, detect loop failure, or reset a node.
Loop Mode	One of two possible modes for an L_Port, in which the L_Port is in an arbitrated loop, using loop protocol. An L_Port in Loop Mode can also be in Participating Mode or Nonparticipating Mode.
looplet	A set of devices connected in a loop to a port that is a member of another loop.
LPB	Loop port bypass. A primitive sequence transmitted by an L_Port to bypass one or all L_Ports to which it is directed. It is used only in arbitrated loops.
LPE	Loop port enable. A primitive sequence transmitted by an L_Port to enable one or all L_Ports that have been bypassed with the LPB. It is used only in arbitrated loops.
LPSM	Loop Port State Machine. Logic that monitors and performs the tasks required for initialization and access to the loop. It is maintained by an L_Port to track behavior through different phases of loop operations. Alternatively, the logical entity that performs arbitrated-loop protocols and defines the behavior of L_Ports when they require access to an arbitrated loop.
LR	Link reset. A primitive sequence used during link initialization between two N_Ports in point-to-point topology or an N_Port and an F_Port in fabric topology. The expected response is an LRR.
LRR	Link reset response. A primitive sequence during link initialization between two N_Ports in point-to-point topology or an N_Port and an F_Port in fabric topology. It is sent in response to an LR and expects a response of Idle.
LSAN	Logical storage area network. An LSAN enables device and storage connectivity that spans two or more fabrics. The path between devices in an LSAN can be local to a fabric or cross one or more FC routers and one or more backbone fabrics.
LSAN zone	The mechanism by which LSANs are administered. An FC router attached to two fabrics will “listen” for the creation of matching LSAN zones on both fabrics. If this occurs, it will create phantom domains and FC-NAT entries as appropriate, and insert entries for them into the name servers on the fabrics. LSAN zones are compatible with all standard zoning mechanisms.
LWL	Long wavelength. A type of fiber optic cabling that is based on 1300-nm lasers and supports link speeds of 1.0625 Gbit/sec. Can also refer to the type of GBIC or SFP. <i>See also</i> SWL .

M

MALLOC	Memory allocation. Usually relates to buffer credits.
MAN	Metropolitan area network.
MB/sec	Megabytes per second.
Mbit/sec	Megabits per second.
meta-SAN	The collection of all devices, switches, edge and backbone fabrics, LSANs, and FC routers that make up a physically connected but logically partitioned storage network. LSANs span between edge fabrics using FC routers. In a data network, this would simply be called “the network.” However, an additional term is required to specify the difference between a single-fabric network (“SAN”), a multifabric network without cross-fabric connectivity (“dual-redundant fabric SAN”), and a multifabric network with connectivity (“meta-SAN”).
metric	A relative value assigned to a route to aid in calculating the shortest path (1000 @ 1 Gbit/sec, 500 @ 2 Gbits/sec).
MIA	Media interface adapter. A device that converts optical connections to copper ones, and vice-versa.
MIB	Management Information Base. An SNMP structure to help with device management, providing configuration and device information.
MMF	Multimode fiber. <i>See</i> SWL .
MOF	Managed Object Format file.
MRK	Mark primitive signal. Used only in arbitrated loop, MRK is transmitted by an L_Port for synchronization and is vendor specific.
MS	Management Server. The Management Server allows a storage area network (SAN) management application to retrieve information and administer the fabric and interconnected elements, such as switches, servers, and storage devices. The MS is located at the Fibre Channel well-known address FFFFFAh.
MSD	Management Server daemon. Monitors the MS. Includes the Fabric Configuration Service and the Unzoned Name Server.
MSRS	Multiprotocol SAN Routing Services. An optionally licensed software bundle available on certain Brocade platforms, such as the SilkWorm Fabric AP7420, that includes the Fibre Channel Routing Service, the iSCSI Gateway Service, and the FCIP Tunneling Service.
MTBF	Mean time between failures. An expression of time, indicating the longevity of a device.
multicast	The transmission of data from a single source to multiple specified N_Ports (as opposed to all the ports on the network). <i>See also</i> broadcast , unicast .
multimode	A fiber optic cabling specification that allows up to 500 meters between devices.

N

N_Port	Node port. A port on a node that can connect to a Fibre Channel port or to another N_Port in a point-to-point connection. <i>See also</i> NL_Port , Nx_Port .
Name Server	Simple Name Server (SNS). A switch service that stores names, addresses, and attributes for up to 15 minutes and provides them as required to other devices in the fabric. SNS is defined by Fibre Channel standards and exists at a well-known address. Also referred to as "directory service."
NAS	Network-attached storage. A disk array connected to a controller that gives access via a LAN.
NDMP	Network Data Management Protocol. Used for tape backup without using server resources.
NIC	Network interconnect card.
NL_Port	Node loop port. A node port that has arbitrated-loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL_Port. <i>See also</i> N_Port , Nx_Port .
node	A Fibre Channel device that contains an N_Port or NL_Port.
node count	The number of nodes attached to a fabric.
node name	The unique identifier for a node, communicated during login and port discovery.
Nonparticipating Mode	A mode in which an L_Port in a loop is inactive and cannot arbitrate or send frames but can retransmit received transmissions. This mode is entered if there are more than 127 devices in a loop and an AL_PA cannot be acquired. <i>See also</i> L_Port , Participating Mode .
NOS	Not operational. The NOS primitive sequence is transmitted to indicate that the FC_Port transmitting the NOS has detected a link failure or is offline, waiting for the offline sequence (OLS) to be received.
NR_Port	A normal E_Port used to connect an FC Router to a backbone fabric.
NS	Name Server. The service provided by a fabric switch that stores names, addresses, and attributes related to Fibre Channel objects. Can cache information for up to 15 minutes. Also known as "Simple Name Server" or as a "directory service." <i>See also</i> Simple Name Server (SNS) .
NSCAM	Name Server Cache Manager. Updates the Name Server (NS) databases across switches as a background task.
Nx_Port	A node port that can operate as either an N_Port or NL_Port.

O

OFC	Open fiber control. A method used to enable and disable laser signaling for higher-intensity laser transceivers.
OLS	Primitive sequence offline.
OLTP	Online transaction processing.

- ON** Offline notification. Refers to an ELS field that appears in **portlogdump** command output.
- OPN** Open primitive signal. Applies only to arbitrated loop; sent by an L_Port that has won the arbitration process to open communication with one or more ports on the loop.
- ordered set** A transmission word that uses 8b/10b mapping and begins with the K28.5 character. Ordered sets occur outside of frames and include the following items:
- Frame delimiters.** Mark frame boundaries and describe frame contents.
 - Primitive signals.** Indicate events.
 - Primitive sequences.** Indicate or initiate port states.
- Ordered sets are used to differentiate Fibre Channel control information from data frames and to manage frame transport.
- originator** The Nx_Port that originated an exchange.
- out-of-band** Transmission of management protocol outside of the Fibre Channel network, usually over Ethernet.
- oversubscription** A situation in which more nodes could potentially contend for a resource than the resource could simultaneously support (typically an ISL). Oversubscription could be a desirable attribute in fabric topology, as long as it does not produce unacceptable levels of congestion.
- OX_ID** Originator ID or exchange ID. Refers to the exchange ID assigned by the originator port.

P

- packet** A set of information transmitted across a network. *See also* [frame](#).
- PAL** Programmable Array Logic. A relatively small FPD.
- parallel** The simultaneous transmission of data bits over multiple lines.
- Participating Mode** A mode in which an L_Port in a loop has a valid AL_PA and can arbitrate, send frames, and retransmit received transmissions. *See also* [L_Port](#), [Nonparticipating Mode](#).
- passive copper** A low-cost copper Fibre Channel connection, allowing distances up to 13 meters between devices.
- path selection** The selection of a transmission path through the fabric. Brocade switches use the FSPF protocol. *See also* [FSPF](#).
- payload** A Fibre Channel frame has a header and a payload. The payload contains the information being transported by the frame; it is determined by the higher-level service or FC_4 upper-level protocol. There are many different payload formats, based on protocol.
- PBC** Port bypass circuit. A circuit in hubs or a disk enclosure to open or close a loop to add or remove nodes.
- PCBA** Printed circuit board assembly.
- PCM** Pulse-code modulation. A standard method of encoding analog audio signals in digital form.

Performance Monitoring	A Brocade SilkWorm switch feature that monitors port traffic and includes frame counters, SCSI read monitors, SCSI write monitors, and other types of monitors.
persistent error log	Error messages of a high enough level (by default, Panic or Critical) are saved to flash memory on the switch instead of to RAM. These messages are saved over reboots and power cycles, constituting the persistent error log. Note that each CP on a SilkWorm 12000 has its own unique persistent error log.
phantom address	An AL_PA value that is assigned to a device that is not physically in the loop. Also known as "phantom AL_PA."
phantom device	A device that is not physically in an arbitrated-loop but is logically included through the use of a phantom address.
phantom domain	<i>See</i> xlate domain .
PID	Port identifier. <i>See also</i> core PID .
PKI	Public key infrastructure. An infrastructure that is based on public key cryptography and CA (certificate authority) and that uses digital certificates. <i>See also</i> CA , digital certificate , public key cryptography .
PKI certification utility	Public key infrastructure certification utility. A utility that makes it possible to collect certificate requests from switches and to load certificates to switches. <i>See also</i> digital certificate , PKI .
PLA	Programmable logic array. A small FPD.
PLD	Programmable logic device. Interchangeable with "FPD".
PLDA	Private loop direct-attached. A technical report specifying a logical loop.
PLOGI	Port login. The port-to-port login process by which initiators establish sessions with targets. <i>See also</i> FLOGI .
point-to-point	A Fibre Channel topology that employs direct links between each pair of communicating entities. <i>See also</i> topology .
port	In a Brocade SilkWorm switch environment, an SFP or GBIC receptacle on a switch to which an optic cable for another device is attached.
port address	In Fibre Channel technology, the port address is defined in hexadecimal. In the Brocade Fabric OS, a port address can be defined by a domain and port number combination or by area number. In an ESCON Director, an address used to specify port connectivity parameters and to assign link addresses for attached channels and control units.
port cage	The metal casing extending out of the optical port on the switch, into which the SFP can be inserted.
port card	A hardware component that provides a platform for field-replaceable, hot swappable ports.
port log	A record of all activity on a switch, kept in volatile memory.

port log dump	A view of what happens on a switch, from the switch's point of view. The portlogdump command is used to read the port log.
port name	A user-defined alphanumeric name for a port.
port swapping	Port swapping is the ability to redirect a failed port to another port. This feature is available in Fabric OS v4.1.0 and higher.
port_name	The unique identifier assigned to a Fibre Channel port. Communicated during login and port discovery.
POST	Power-on self-test. A series of tests run by a switch after it is turned on.
PPP	Point-to-Point Protocol.
primary FCS switch	Relates to the Brocade Secure Fabric OS feature. The primary fabric configuration server switch actively manages security and configurations for all switches in the fabric. <i>See also</i> backbone fabric , FCS switch .
primitive sequence	An ordered set that is transmitted repeatedly and continuously. Primitive sequences are transmitted to indicate specific conditions within or conditions encountered by the receiver logic of an FC_Port. <i>See</i> OLS , NOS .
primitive signals	An ordered set that indicates actions or events and requires just one occurrence to trigger a response. IDLE and R_RDY are used in all three topologies: ARB, OPN, and CLS. MRK is used in arbitrated loop.
principal switch	The first switch to boot up in a fabric. Ensures unique domain IDs among roles.
private device	A device that supports arbitrated-loop protocol and can interpret 8-bit addresses but cannot log in to the fabric.
private key	The secret half of a key pair. <i>See also</i> key , key pair .
private loop	An arbitrated loop that does not include a participating FL_Port.
private loop device	A device that supports a loop and can understand 8-bit addresses but does not log in to the fabric.
private NL_Port	An NL_Port that communicates only with other private NL_Ports in the same loop and does not log in to the fabric.
protocol	A defined method and set of standards for communication. Determines the type of error-checking, the data-compression method, how sending devices indicate an end of message, and how receiving devices indicate receipt of a message.
pstate	Port State Machine.
PSU	Power supply unit.
public device	A device that supports arbitrated-loop protocol, can interpret 8-bit addresses, and can log in to the fabric.

public key	The public half of a key pair. <i>See also</i> key , key pair .
public key cryptography	A type of cryptography that uses a key pair, with the two keys in the pair called at different points in the algorithm. The sender uses the recipient's public key to encrypt the message, and the recipient uses the recipient's private key to decrypt it. <i>See also</i> key pair , PKI .
public loop	An arbitrated loop that includes a participating FL_Port and can contain both public and private NL_Ports.
public NL_Port	An NL_Port that logs in to the fabric, can function within either a public or a private loop, and can communicate with either private or public NL_Ports.

Q

QLA	A type of Fibre Channel controller.
QLFA	QuickLoop Fabric Assist. Arbitrated-loop technology.
QoS	Quality of service.
quad	A group of four adjacent ports that share a common pool of frame buffers.
queue	A mechanism for each AL_PA address that allows for collecting frames prior to sending them to the loop.
QuickLoop	A Brocade software product that allows multiple ports on a switch to create a logical loop. Devices connected via QuickLoop appear to each other as if they are on the same arbitrated loop.
QuickLoop Mode	Allows initiator devices to communicate with private or public devices that are not in the same loop.

R

R_A_TOV	Resource allocation timeout value. The maximum time a frame can be delayed in the fabric and still be delivered. <i>See also</i> E_D_TOV , RR_TOV .
R_CTL	Route control. The first 8 bits of the header, which defines the type of frame and its contents.
R_RDY	Receiver ready. A primitive signal indicating that the port is ready to receive a frame.
R_T_TOV	Receiver transmitter timeout value, used by receiver logic to detect loss of synchronization between transmitters and receivers.
radius	The greatest "distance" between any edge switch and the center of a fabric. A low-radius network is better than a high-radius network.
RAID	Redundant array of independent disks. A collection of disk drives that appear as a single volume to the server and are fault tolerant through mirroring or parity checking. <i>See also</i> JBOD .
RAIT	Redundant array of independent tapes.

RCS	Reliable Commit Service. Refers to Brocade-specific ILS command code.
RCS_SFC	RCS Stage Fabric Config. Refers to Brocade-specific ILS command code.
receiver	A device that performs detection and signal processing.
redundancy	Having multiple occurrences of a component to maintain high availability (HA).
remote switch	An optional product for long-distance fabrics, requiring a Fibre Channel-to-ATM or SONET gateway.
repeater	A circuit that uses a recovered clock to regenerate and transmit an outbound signal.
request rate	The rate at which requests arrive at a servicing entity.
resilience	A fabric's ability to adapt to or tolerate a failure of a component within the fabric.
resilient core/ edge topology	Two or more switches acting as a core to interconnect multiple edge switches. Nodes attach to the edge switches.
responder	The N_Port with which an exchange originator attempts to communicate.
retimer	A circuit that uses an independent clock to generate outbound signals.
return loss	The ratio (expressed in dB) of incident power to reflected power, when a component or assembly is introduced into a link or system. Can refer to optical power or to electrical power in a specified frequency range.
RLS	Read Link Status.
route	As it applies to a fabric, the communication path between two switches. Might also apply to the specific path taken by an individual frame, from source to destination. <i>See also</i> FSPF .
routing	The assignment of frames to specific switch ports, according to frame destination.
RR_TOV	Resource recovery timeout value. The minimum time a target device in a loop waits after an LIP before logging out an SCSI initiator. <i>See also</i> E_D_TOV , R_A_TOV .
RSCN	Registered state change notification. A switch function that allows notification of fabric changes to be sent from the switch to specified nodes. The fabric controller issues RSCN requests to N_Ports and NL_Ports, but only if they have registered to be notified of state changes in other N_Ports and NL_Ports. This registration is performed via the State Change Registration (SCR) Extended Link Service. An N_Port or NL_Port can issue an RSCN to the fabric controller without having completed SCR with the fabric controller.
RTWR	Reliable transport with response. Might appear as a task in portlogdump command output.
running disparity	A binary parameter indicating the cumulative disparity (positive or negative) of all previously issued transmission characters.
RW	Read/write. Refers to access rights.
RX	Receiving frames.

RX_ID Responder exchange identifier. A 2-byte field in the frame header that can be used by the responder of the exchange to identify frames as being part of a particular exchange.

S

S_ID Source ID. Refers to the native port address (24 bit address).

SAN Storage area network. A network of systems and storage devices that communicate using Fibre Channel protocols. *See also* [fabric](#).

SAN architecture The overall design of a storage network solution, which includes one or more related fabrics, each of which has a topology.

SAN port count The number of ports available for connection by nodes in the entire SAN.

SCA Type of connector.

scalability One of the properties of a SAN: the size to which a SAN topology can grow port and switch counts with ease.

SCC SC connector. An SC connector is a fiber-optic cable connector that uses a push-pull latching mechanism similar to common audio and video cables. For bidirectional transmissions, two fiber cables and two SC connectors (dual SC) are generally used. SC is specified by the TIA as FOCIS-3.

SCN State change notification. Used for internal state change notifications, not external changes. This is the switch logging that the port is online or is an Fx_Port, not what is sent from the switch to the Nx_Ports.

SCR State change registration. Extended Link Service (ELS) requests the fabric controller to add the N_Port or NL_Port to the list of N_Ports and NL_Ports registered to receive the Registered State Change Notification (RSCN) Extended Link Service.

SCSI Small Computer Systems Interface. A parallel bus architecture and a protocol for transmitting large data blocks to a distance of 15 to 25 meters.

SCSI-2 An updated version of the SCSI bus architecture.

SCSI-3 An SCSI standard that defines transmission of SCSI protocol data over different kinds of links.

SDRAM The main memory for a switch.

sectelnet A protocol similar to telnet but with encrypted passwords for increased security.

Secure Fabric OS An optionally licensed Brocade feature that provides advanced, centralized security for a fabric.

security policy Rules that determine how security is implemented in a fabric. Security policies can be customized through Brocade Secure Fabric OS or Brocade Fabric Manager.

SEQ_ID Sequence identifier. A 1-byte field in the frame header change to identify the frames as being part of a particular exchange sequence between a pair of ports.

sequence	A group of related frames transmitted in the same direction between two N_Ports.
sequence initiator	The N_Port that begins a new sequence and transmits frames to another N_Port.
sequence recipient	Serializing/deserializing circuitry. A circuit that converts a serial bit stream into parallel characters, and vice-versa.
serial	The transmission of data bits in sequential order over a single line.
server	A computer that processes end-user applications or requests.
service rate	The rate at which an entity can service requests. <i>See also</i> request rate .
SES	SCSI Enclosure Services. A subset of the SCSI protocol used to monitor temperature, power, and fan status for enclosed devices.
SFF	Small-form-factor. An industry term for a smaller transceiver. <i>See</i> SFP .
SFP	Small-form-factor pluggable. A transceiver used on 2 GB/sec switches that replaces the GBIC.
SFP cable	A cable specifically designed for use with an SFP. Not compatible with GBICs.
SI	Sequence initiative.
SilkWorm	The brand name for the Brocade family of switches.
Simple Name Server (SNS)	A switch service that stores names, addresses, and attributes for up to 15 minutes and provides them as required to other devices in the fabric. SNS is defined by Fibre Channel standards and exists at a well-known address. Also referred to as “directory service” or “name server.”
Single CP Mode	The -s option of the Fabric OS firmwaredownload command. Using firmwaredownload -s enables Single CP Mode. In the SilkWorm 12000, Single CP Mode enables a user to upgrade a single CP and to select full install, autoreboot, and autocommit.
Single Mode	The fiber-optic cabling standard for devices up to 10 km apart.
S-Link Service	Facilities used between an N_Port and the fabric, or between two N_Ports, for login, sequence/exchange management, and maintaining connections.
SLAP	Switch Link Authentication Protocol.
SLP	Service Location Protocol.
SMDS	Switched Multimegabit Data Service. A good protocol for interconnecting LANs; however, SMDS has less error-checking capability than Frame Relay.
SMF	Single-mode fiber. <i>See</i> LWL .
SMI	Storage Management Initiative. A broad-based initiative sponsored by the Storage Networking Industry Association (SNIA) to standardize all aspects of storage management for multivendor storage networking products.

SMI	Structure of management information. A notation for setting or retrieving SNMP management variables.
SMI-S	Storage Management Initiative Specification. Defines the interface that allows storage management systems to manage and monitor storage area network (SAN) resources.
SNA/SDLC	Systems Network Architecture/Synchronous Data Link Control. A structure for transferring data among a variety of computing platforms.
SNMP	Simple Network Management Protocol. An Internet management protocol that uses either IP for network-level functions and UDP for transport-level functions, or TCP/IP for both. Can be made available over other protocols, such as UDP/IP, because it does not rely on the underlying communication protocols. <i>See also</i> community (SNMP) .
SNS	Simple Name Server.
SOF	Start of frame. A group of ordered sets that marks the beginning of a frame and indicates the class of service the frame will use.
soft zone	A zone consisting of zone members that are made visible to each other through client service requests. Typically, soft zones contain zone members that are visible to devices using Name Server exposure of zone members. The fabric does not enforce a soft zone. Note that well-known addresses are implicitly included in every zone.
SoIP	SCSI-over-IP.
SONET	Synchronous optical network. A standard for optical networks that provides building blocks and flexible payload mappings.
special character	A 10-bit character that does not have a corresponding 8-bit value but is still considered valid. The special character is used to indicate that a particular transmission word is an ordered set. This is the only type of character to have five 1s or 0s in a row.
SPLD	Simple PLD. Usually, either a PLA or PAL.
SPOF	Single point of failure. Any component in a SAN whose malfunction could bring down the entire SAN.
SQ_ID	Sequence ID. Used to identify and track all of the frames within a sequence between a source (S_ID) and destination (D_ID) port pair.
SRM	Storage resource management. The management of disk volumes and file resources.
SSH	Secure shell. Used starting in Brocade Fabric OS v4.1 to support encrypted telnet sessions to the switch. SSH encrypts all messages, including the client sending the password at login.
SSL	Secure sockets layer.
Standard Translative Mode	Allows public devices to communicate with private devices that are directly connected to the fabric.
stealth mode	A method used in some switches to simulate Brocade switches using QuickLoop.

Stitch	The code name given to the first-generation Brocade Fabric ASIC. This is the ASIC that is used in the SilkWorm 1xxx series of switches.
storage	A device used to store data, such as a disk or tape.
store-and-forward	A switching technique that requires buffering an entire frame before making a routing decision.
striping	A RAID technique for writing a file to multiple disks on a block-by-block basis, with or without parity.
switch	A fabric device providing bandwidth and high-speed routing of data via link-level addressing.
switch name	The arbitrary name assigned to a switch.
switch port	A port on a switch. Switch ports can be E_Ports, F_Ports, or FL_Ports.
switch-to-switch authentication	The process of authenticating both switches in a switch-to-switch connection using digital certificates. <i>See also</i> authentication , digital certificate .
SWL	Short wavelength. A type of fiber optic cabling that is based on 850 nm lasers and supports 1.0625 GB/sec link speeds. Can also refer to the type of GBIC or SFP. <i>See also</i> LWL .
syslog	Syslog daemon. Used to forward error messages.

T

T10	A standards committee chartered with creating standards for SCSI.
T11	A standards committee chartered with creating standards for Fibre Channel.
tachyon	A chip that supports FC-0 through FC-2 on a single chip.
target	A storage device on a Fibre Channel network. <i>See also</i> initiator .
TC	Track changes.
TCP/IP	Transmission Control Protocol Internet Protocol.
telnet	A virtual terminal emulation used with TCP/IP. “Telnet” is sometimes used as a synonym for the Brocade Fabric OS CLI.
tenancy	The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as “loop tenancy.”
throughput	The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second or b/sec). <i>See also</i> BB fabric .
tiering	The process of grouping particular SAN devices by function and then attaching these devices to particular switches or groups of switches based on that function.

Time Server	A Fibre Channel service that allows for the management of all timers.
topology	As it applies to Fibre Channel technology, the configuration of the Fibre Channel network and the resulting communication paths allowed. There are three possible topologies: <ul style="list-style-type: none"> Point to point. A direct link between two communication ports. Switched fabric. Multiple N_Ports linked to a switch by F_Ports. Arbitrated loop. Multiple NL_Ports connected in a loop.
TPC	Third-party copy. A protocol for performing tape backups without using server resources.
track changes	A Brocade Fabric OS feature that can be enabled to report specific activities (for example, logins, logouts, and configuration task changes). The output from the track-changes feature is dumped to the error log for the switch.
transceiver	A device that converts one form of signaling to another for transmission and reception; in fiber optics, optical to electrical.
translate domain	<i>See</i> xlate domain .
Translative Mode	A mode in which private devices can communicate with public devices across the fabric.
transmission character	A 10-bit character encoded according to the rules of the 8b/10b algorithm.
transmission word	A group of four transmission characters.
trap (SNMP)	The message sent by an SNMP agent to inform the SNMP management station of a critical error. <i>See also</i> SNMP .
trunking	In Fibre Channel technology, a feature that enables distribution of traffic over the combined bandwidth of up to four ISLs between adjacent switches, while preserving in-order delivery.
trunking group	A set of up to four trunked ISLs.
trunking ports	The ports in a set of trunked ISLs.
TS	Time Server.
TTL	Time-to-live. The number of seconds an entry exists in cache before it expires.
tunneling	A technique for enabling two networks to communicate when the source and destination hosts are both on the same type of network but are connected by a different type of network.
TX	Transmit.

U

U_Port	Universal port. A switch port that can operate as a G_Port, E_Port, F_Port, or FL_Port. A port is defined as a U_Port when it is not connected or has not yet assumed a specific function in the fabric.
UDP	User Datagram Protocol. A protocol that runs on top of IP and provides port multiplexing for upper-level protocols.
UL	Underwriter's Laboratories. A product-safety testing and certification organization; independent, not-for-profit.
ULP	Upper-level protocol. The protocol that runs on top of Fibre Channel. Typical upper-level protocols are SCSI, IP, HIPPI, and IPI.
ULP_TOV	Upper-level timeout value. The minimum time that an SCSI ULP process waits for SCSI status before initiating ULP recovery.
unicast	The transmission of data from a single source to a single destination. <i>See also</i> broadcast , multicast .
UTC	Universal Time Conversion. Also known as “Coordinated Universal Time,” which is an international standard of time. UTC is 8 hours behind Pacific Standard Time and 5 hours behind Eastern Standard Time. <i>See also</i> GMT .

V

W

WAN	Wide area network.
WAN_TOV	Wide area network timeout value.
watchdog	A software daemon that monitors Fabric OS modules on the kernel.
WDM	Wavelength division multiplexer. Allows multiple wavelengths to be combined or filtered on a single cable.
well-known address	As it pertains to Fibre Channel technology, a logical address defined by Fibre Channel standards as assigned to a specific function and stored on the switch.
workstation	A computer used to access and manage the fabric. Also referred to as a “management station” or “host.”
WTV	Write timeout value. Refers to an ELS field that appears in portlogdump command output.
WWN	World Wide Name. An identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

X

X.25 A protocol that uses logical channels. X.25 allows high-quality communications between computers and can accommodate “noisy” data communications through error-detection and -correction (retransmission) algorithms.

xlate domain Translate domain. A router virtual domain that represents an entire fabric. Device connectivity can be achieved from one fabric to another, over the router and through this virtual domain, without merging the two fabrics. Also known as “phantom domains.”

Y

Z

zone A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access to others in the zone but are not visible to any outside the zone.

zone configuration A specified set of zones. Enabling a configuration enables all zones in that configuration. *See also* [defined zone configuration](#), [enabled zone configuration](#).

zoning A feature in fabric switches or hubs that allows segmentation of a node by physical port, name, or address.

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