EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Fabric OS

Version 4.0.2

PROCEDURES MANUAL

P/N 300-000-638
REV A02

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Printed November, 2002

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This class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Warning!
This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

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Trademark Information

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Preface

The EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Fabric OS Procedures Manual provides procedures for many of the basic tasks of administrating and configuring a ED-12000B switch through the Telnet interface. For tasks related to specific features such as zoning, refer to the individual product guides.

If an EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B feature does not function properly or does not function as described in this manual, please contact the EMC Customer Support Center for assistance.

Audience

This manual is part of the EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B documentation set, and is intended for use by administrators of the DS-32B2 and ED-12000B switches.

Readers of this manual are expected to be familiar with the EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B operating environment.

Organization

Here is an overview of where information is located in this manual.

- Chapter 1, *Setting the Initial Configuration*, provides information on initial configuration procedures including logging in and changing passwords.
- Chapter 2, *Basic Configuration Procedures*, provides information on basic configuration procedures.
- Chapter 3, *Working With ED-12000B*, provides information on working with the Management Server platform database.

- Chapter 4, *Working With the Management Server*, provides information about working with the Management Server platform database.
- Chapter 5, *Diagnostics and Status*, provides instructions for displaying port and switch status information.
- Chapter 6, *Updating the Core PID Format*, provides information about updating the Core Switch Port Identifier (PID) Format, including best practices for updating an existing production SAN to the new PID format.
- Appendix A, *Customer Support*, describes the procedure for contacting EMC Corporation when you need help with the EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B.
- The *Glossary* defines terminology used in this manual.

Related Documentation

- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Hardware Reference Manual*
- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Diagnostic and System Error Message Reference Manual*
- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Fabric OS Reference Manual*
- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Management Information Base (MIB) Reference Manual*
- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Web Tools User Guide*
- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Zoning Reference Manual*
- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Fabric Watch Reference Manual*
- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Extended Fabric User Guide*
- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B Interswitch Link (ISL) Trunking User Guide*
- *EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director Model ED-12000B Performance Monitoring User Guide*

Conventions Used in this Manual

EMC uses the following conventions for notes, cautions, warnings, and danger notices.

A note presents information that is important, but not hazard-related.

CAUTION

A caution contains information essential to avoid data loss or damage to the system or equipment. The caution may apply to hardware or software.

WARNING

A warning contains information essential to avoid a hazard that can cause severe personal injury, death, or substantial property damage if you ignore the warning.

DANGER

A danger notice contains information essential to avoid a hazard that will cause severe personal injury, death, or substantial property damage if you ignore the message.

Typographical Conventions

EMC uses the following type style conventions in this manual:

Palatino, bold	◆ Dialog box, button, icon, and menu items in procedures ◆ Selections you can make from the user interface, including buttons, icons, options, and field names
Palatino, italic	◆ New terms or unique word usage in text ◆ Command line arguments when used in text ◆ Book titles
`Courier, italic`	Arguments used in examples of command line syntax.

Courier	System prompts and displays and specific filenames or complete paths. For example:
	`working root directory [/user/emc]:`
	`c:\Program Files\EMC\Symapi\db`

Courier, bold	User entry. For example: **`symmpoll -p`**
AVANT GARDE	Keystrokes

Where to Get Help

Obtain technical support by calling your local sales office.

For service, call:

United States:	**(800) 782-4362 (SVC-4EMC)**
Canada:	**(800) 543-4782 (543-4SVC)**
Worldwide:	**(508) 497-7901**

and ask for Customer Support.

If you are located outside the USA, call the nearest EMC office for technical assistance.

Sales and Customer Service Contacts

For the list of EMC sales locations, please access the EMC website at:

`http://www.emc.com/contact/`

For additional information on the EMC products and services available to customers and partners, refer to the EMC Powerlink website at:

`http://powerlink.emc.com`

Your Comments

Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Please send a message to **`techpub_comments@emc.com`** with your opinions of this manual.

1

Setting the Initial Configuration

The EMC Connectrix Departmental Switch DS-32B2 and Enterprise Director ED-12000B requires two connection to your IP network. This chapter provides information on how to set up initial configuration tasks for a switch.

Configuring and Managing the Switch

For specific switch installation and configuration instructions, refer to the hardware manual for your switch. Setting up and configuring the switch involves the following steps:

- Obtaining IP addresses, subnet masks, and gateway addresses from the network administrator.

  For the ED-12000B, you will need four IP addresses.

- Installing and powering on the switch.
- Creating a serial connection to the switch from a workstation computer that has a terminal emulator application (such as HyperTerminal).
- Configuring the IP address (required to prevent IP conflict) and other settings.
- Creating an ethernet connection to the switch.
- Connecting the switch to the fabric.

After the switch is configured and connected to the network and fabric, you can use any of the following methods to manage the switch:

- Fabric OS command line interface (CLI), through a serial or telnet connection
- Web Tools
- Standard SNMP applications
- Through a third-party application using the API
- Through a third-party application using the Management Server

In general, switch administration should be performed from the admin user level.

Logging in to a Switch

To avoid an IP address conflict, do NOT connect the switch to the IP network until the IP address is correctly set. For instructions on setting the IP address and connecting to the network, refer to the hardware reference manual for your switch.

To log in to a DS-32B2 or ED-12000B switch:

1. Open a connection to the switch:
   - Serial: Connect the switch and workstation by serial cable, then open and configure a terminal emulator application according to the settings provided in the hardware manual.
   - Telnet: Connect the switch and workstation by ethernet cable, then use the configured IP address to open a telnet connection to the switch.
2. Enter the admin login.

   The password prompt displays.
3. Enter the admin password. The default password is *password*.

   When you first log in to a switch as the admin user, you are prompted to change the passwords for all user levels. This prompt continues to display until the passwords are modified.
4. If the login is successful, a prompt that contains both the switch name and the login displays.

Example

```
switch login: admin
Password: xxxxxxxx
Please change your passwords now.
Use Control-C to exit or press 'Enter' key to proceed.

Please change your passwords now.
for user - admin
Changing password for admin
Enter new password:xxxxxxxx
Reenter password:xxxxxxxx
switch:admin>
```

Enabling Licensed Features

Optional licensed features such as Fabric Watch and Performance Monitoring are already loaded onto the switch firmware, but you must enable them with a license key. Once you purchase these features, you receive a transaction key to unlock the feature.

Important You must log on to powrelink or contact EMC Customer Support to convert the transaction key to a license key.

Displaying the Installed Feature Licenses

To display the features that have been enabled on a switch:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `licenseShow`

   This command displays the license keys that have been entered for the switch and the features enabled by those licenses.

Example

```
Licenseshow output:licenseshow
cy99QyeebrzAARk:
    Web license
    Zoning license
    Fabric license
    Extended Fabric license
    Fabric Watch license
    Performance Monitor license
    Trunking license
```

Changing the Admin Password

EMC recommends that you change the admin and user ID and password the first time you log in to the Fabric Operating System.

To change the admin user password:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `Passwd admin` (to change admin password); or

   `Passwd user` (to change user password)
3. An interactive session opens and prompts you for configuration values.
   a. At the **New password** prompt, enter the new password . The new password must be from 8 to 40 characters in length.
   b. At the **Reenter new password** prompt, enter the new password exactly as entered at the previous prompt.
   c. Press ENTER to commit the configuration to the firmware.

Configuring the IP Address

Configuring the IP Address on the ED-12000B

For ED-12000B only:
The ED-12000B switch ships with a default IP address of:
CP0 - 10.77.77.75, CP1 - 10.77.77.74, SW0 - 10.77.77.77, and SW1 - 10.77.77.76 .

To change the default IP Address and configure the Fibre Channel IP address of the switch:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `ipAddrSet`

3. Choose the logical switch or CP that you want to configure. Enter the value that corresponds to that logical region:
   - Enter **0** to configure logical switch 0 (slot 1 through 4)
   - Enter **1** to configure logical switch 1 (slot 7 through 10)
   - Enter **2** to configure control processor 1 (slot 5)
   - Enter **3** to configure control processor 2 (slot 6)
4. If you are configuring a logical switch, enter the following information when prompted:
   - Ethernet IP Address
   - Ethernet Subnetmask
   - FibreChannel IP Address
   - Fibre Channel Subnetmask
5. If you are configuring a control processor, enter the following information when prompted:
   - Ethernet IP Address
   - Ethernet Subnetmask
   - Hostname
   - Gateway IP Address
6. Once you have configured a logical switch or control processor, the `ippaddrset` command verifies the data you entered, and exits.
7. Rerun this command to configure all logical switches and control processors.

8. Optional: Verify the address was correctly set by entering the `ipAddrShow` command at the prompt and enter option 4 (4 for all IP addresses inthe system). This will display the IP address setting for both switches and both CP cards.

Configuring the IP Address on a DS-32B2

To change the default IP Address and configure the Fibre Channel IP address of the switch:

1. Log in to the switch as the admin user.
2. Replace the factory IP address and related information with the IP information provided by your network administrator:
   a. Enter the `ipAddrSet` command at the terminal emulator application prompt.
   b. Enter the requested information at the prompts:
      - `Ethernet IP Address [10.77.77.77]:`
        Enter the new Ethernet IP address.
      - `Ethernet Subnetmask [255.0.0.0]:`
        Enter the new Ethernet subnet mask.
      - `Fibre Channel IP Address [0.0.0.0]:`
        Enter the new Fibre Channel IP address if desired.
      - `Fibre Channel Subnetmask [0.0.0.0]:`
        Enter the new Fibre Channel subnet mask if desired.
      - `Gateway Address [0.0.0.0]:`
        Enter the new gateway address.
      - `Set IP address now? [y = set now, n = next reboot]:`
        Enter **`y`** to set now.
   c. Optional: Verify the address was correctly set by entering the `ipAddrShow` command at the prompt.

Selecting the Slot and Port for the ED-12000B

Many commands used to administer ports in the ED-12000B require you to specify the slot number and port number operands. These operands are used to identify individual ports on the switch.

The slotnumber operand must be followed by the slash (/) and then a value for the port number:

```
portEnable 2/4
```

The ED-12000B has a total of 10 slots counted 1 to 10. Slot number 5 and 6 are control processor cards, and slot 1 through 4, and 7 through 10 are switch cards. On each switch card, there are 16 ports counted from the bottom 0 to 15. A particular port must be represented by both slotnumber (1 through 10) and portnumber (0 through 15). This operand is not required for switches that do not have blades.

Verifying the Switch Operation

To verify that your switch is operating correctly, display information about the switch and port status.

To display information about the switch and port status:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   switchshow

   This command displays a switch summary and a port summary.

   The following example shows a DS-32B2:

```
switch32:admin> switchshow
switchName:     switch32
switchType:     12.1
switchState:    Online
switchRole:     Subordinate
switchDomain:   1
switchId:       fffc01
switchWwn:      10:00:00:60:69:90:03:56
switchBeacon:   OFF

Port Gbic Speed State
=========================
  0   id    N2   Online    E-Port  10:00:00:60:69:c0:05:f4 "switch32"
  1   id    N2   Online    E-Port  10:00:00:60:69:c0:05:f4 "switch32"
  2   id    N2   Online    E-Port  10:00:00:60:69:c0:05:f4 "switch32"
  3   id    N2   Online    E-Port  10:00:00:60:69:c0:05:f4 "switch32"
  4   id    N2   Online    E-Port  10:00:00:60:69:c0:05:f4 "switch32"
  5   id    N2   Online    E-Port  10:00:00:60:69:c0:05:f4 "switch32" (downstream)
  6   id    N2   Online    E-Port  10:00:00:60:69:c0:05:f4 "switch32"
  7   id    N2   Online    E-Port  10:00:00:60:69:c0:05:f4 "switch32"
  8   id    N2   No_Light
  9   id    N2   No_Light
 10   id    N2   No_Light
 11   id    N2   No_Light
 12   id    N2   No_Light
 13   id    N2   No_Light
 14   id    N2   No_Light
 15   id    N1   Online    E-Port  10:00:00:60:69:30:2f:2f "fmgr25_2010" (upstream)
 16   id    N2   No_Light
 17   id    N2   No_Light
 18   id    N2   No_Light
 19   id    N2   No_Light
 20   id    N2   No_Light
 21   id    N2   No_Light
 22   id    N2   No_Light
```

```
 23   id    N2   No_Light
 24   id    N2   No_Light
 25   id    N2   No_Light
 26   id    N2   No_Light
 27   id    N2   No_Light
 28   id    N2   No_Light
 29   id    N2   No_Light
 30   id    N2   No_Light
 31   id    N2   No_Light
switch32:admin>
```

The following example shows an ED-12000B:

```
switch12k:admin> switchshow
switchName:switch12k
switchType:10.1
switchState:Online
switchRole:Subordinate
switchDomain:2
switchId:fffc02
switchWwn:10:00:00:60:69:50:02:8f
switchBeacon:OFF
blade7: Beacon: OFF
Area Slot Port SFP Speed State
=====================================
 0    7    0   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
   (downstream)
 1    7    1   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
 2    7    2   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
 3    7    3   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
 4    7    4   id    N1   Online    E-Port  10:00:00:60:69:12:34:e2 "san180"
 5    7    5   id    1G   No_Light
 6    7    6   --    1G   No_Module
 7    7    7   --    1G   No_Module
 8    7    8   --    1G   No_Module
 9    7    9   id    N2   Online    F-Port  21:00:00:e0:8b:04:1a:76
10    7   10   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
11    7   11   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
12    7   12   --    1G   No_Module
13    7   13   --    1G   No_Module
14    7   14   id    N1   Online    E-Port  10:00:00:60:69:10:9b:06 "san176"
   (upstream)
15    7   15   id    N2   Online    F-Port  10:00:00:00:c9:27:2e:69
switch12k:admin>
```

Verifying the Fabric Connectivity

To verify that you have fabric-wide switch connectivity, display a summary of information about the fabric:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   fabricshow

This command displays a summary of all the switches in the fabric:

```
switch:admin> fabricShow

   Switch ID   Worldwide Name           Enet IP Addr    FC IP Addr      Name
   -------------------------------------------------------------------------
    3: fffc43 10:00:00:60:69:10:60:1f  192.168.64.187  0.0.0.0         "sw187"
    2: fffc42 10:00:00:60:69:00:05:91  192.168.64.60   192.168.65.60   "sw60"
    1: fffc41 10:00:00:60:69:00:02:0b  192.168.64.180  192.168.65.180 >"sw180"
    0: fffc40 10:00:00:60:69:00:06:56  192.168.64.59   192.168.65.59   "sw5"

   The Fabric has 4 switches
```

Verifying the Fabric-Wide Device Count

To verify that you have fabric-wide connectivity when you install a new switch, display the fabric-wide device count from the newly installed switch.

To display the fabric-wide device count from a switch:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   nsAllShow

   This command displays all the connected devices in the fabric:

```
switch:admin> nsAllShow

   17 Nx_Ports in the Fabric {
  190000 1907da 1907dc 1907e0 1907e1 1907e2 1907e4 1907e8
  1907ef 1a07da 1a07dc 1a07e0 1a07e1 1a07e2 1a07e4 1a07e8
  1a07ef
}
switch:admin>
```

Backing Up Critical Switch Information

EMC recommends two types of backups: a print out of all key configuration data, stored in a secure location, and regularly scheduled soft copy backups.

For information about creating a backup of configuration data, refer to *Backing Up the System Configuration Settings* on page 2-4.

EMC recommends that you make a hard copy backup of all key configuration data, including license key information, and store it in a secure place for emergency reference.

Store in a secure locationthe output of the following commands:

- `licenseshow`
- `configshow`
- `ipaddrshow` - (For the ED-12000B only. Select option 4 to display all configured addresses)
- `configupload`

Depending on the security procedures of your company, you may want to keep a record of the user levels and passwords for all switches in the fabric. This is sensitive information and access to such information should be limited.

2

Basic Configuration Procedures

This chapter provides the following information on basic configuration tasks for the DS-32 B2 and ED-12000B switches:

Setting the Telnet Time Out Value

To set a new Telnet time out value:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `timeout x`

   where `x` is the number of minutes before the Telnet connection times out. If you specify `0`, then the connection never times out. Time out is disabled by default.

Displaying the Firmware Version

To display the firmware version:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `version`

   This command displays the Kernel version, Fabric OS release number, and other information about the firmware.

   The following example shows the firmware version information:

```
switch:admin> version
Kernel:     2.4.2
Fabric OS:  v4.0.2a
Made on:    Tue Aug 13 11:15:32 2002
Flash:      Tue Aug 13 19:15:01 2002
BootProm:   3.1.18
switch:admin>
```

Setting the Switch Date and Time

All switches maintain current date and time in nonvolatile memory. Date and time 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.

To set the date and time of a switch:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `date MMDDhhmmYY`

   `where:`

   `MM` is the month, valid values are `01 through 12.`

   `DD` is the day, valid values are `01 through 31.`

   `hh` is the hour, valid values are `00 through 23.`

   `mm` is minutes, valid values are `00 through 59.`

   `YY` is the year, valid values are `00 through 99.`

Year values greater than 69 are interpreted as 1970 through 1999; year values less than 70 are interpreted as 2000 through 2069. The date function does not support daylight savings time or time zones.

Backing Up the System Configuration Settings

This procedure requires access to an FTP server for Fabric OS 4.x, and an FTP or RSHD server for Fabric OS 3.x.

Fabric OS version 4.x does not support the RSH protocol for uploads or downloads. Therefore, you must use the FTP protocol on all workstations to backup or restore the system configuration, and the FTP service must be running before an upload or download can occur.

To upload a backup copy of the configuration settings to a host computer:

1. Verify that the FTP service is running on the host workstation.
2. Log in to the switch as the admin user.
3. At the command line, enter the following command:

   `configUpload`

   You are prompted for the required information.
4. Provide the information requested at the prompts. This command uploads the switch configuration to the designated server, making it available for downloading to a replacement switch if necessary.

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

EMC recommends backing up the switch configuration to a host computer on a regular basis. This ensures that a fairly current configuration is available if required for downloading to a replacement switch.

All filenames/pathnames must be in UNIX syntax even if being executed from a Windows-based system (i.e., `/temp/switch_2.txt`).

Example

```
switch:admin> configupload
   Server Name or IP Address [host]: 192.168.15.42
   User Name [None]: user21
   File Name [config.txt]: config-switch.txt
   Password: xxxxxx
   upload complete
   switch:admin>
```

Displaying the System Configuration Settings

To display the system configuration settings:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `configShow`

   The system configuration settings appear.

System configuration parameters vary depending on switch model and configuration.

Restoring the System Configuration Settings

You must use the FTP protocol on all workstations to backup or restore the system configuration, and the FTP service must be running before an upload or download can occur.

To restore the system configuration settings from a backup:

1. Verify that the FTP service is running on the host workstation.
2. Log in to the switch as the admin user.
3. Shut down the switch by entering the following command:

   switchDisable

4. At the command line, enter the following command:

   configdownload

   The command becomes interactive and you are prompted for the required information.

   For example:

```
switch:admin> configdownload
   Server Name or IP Address [host]: 192.168.15.42
   User Name [None]: user21
   File Name [config.txt]: config-file.txt
   Password: xxxxxx
   download complete
   switch:admin>
```

5. Reboot the switch by entering the following command:

   switchreboot

Disabling a Switch

To disable a switch:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `switchDisable`

All Fibre Channel ports on the switch are taken off line. If the switch was part of a fabric, the remaining switches reconfigure.

Enabling a Switch

To enable a switch:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `switchEnable`

All Fibre Channel ports that passed the `POST` test are enabled. If the switch was part of a fabric, the switch rejoins the fabric.

Disabling a Port

To disable a port:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `portDisable [slotnumber/]portnumber`

   The slotnumber applies only to ED-12000B.

   ---

   where `slotnumber` and `portnumber` are the slot and port number you want to disable. If the port is connected to another switch, the fabric may reconfigure. If the port is connected to one or more devices, these devices are no longer available to the fabric.

The following example shows the `portdisable` command on a DS-32B2, where 1 is the portnumber.

```
switch:admin> portdisable 1
fabric: Reconfiguration due to offline (port 1)
fabric: Reconfiguring (Mon Aug  5 10:51:19 2002)
 5  4  3  2  1

fabric: Subordinate switch
fabric: Domain 52

switch:admin>
```

The following example shows the `portdisable` command on an ED-12000B, where 7 is the slotnumber and 3 is the portnumber.

```
switch12k:admin> portdisable 7/3
switch12k:admin> portshow 7/3
portCFlags: 0x0
portFlags: 0x20801       PRESENT DISABLED LED
portType:  4.1
portState: 2    Offline
portPhys:  6    In_Sync
portScn:   2    Offline
<output truncated>
```

Enabling a Port

To enable a port:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `portEnable [slotnumber/]portnumber`

   where `slotnumber` and `portnumber` are the slot and port number you want to enable. If the port is connected to another switch, the fabric may reconfigure. If the port is connected to one or more devices, these devices will become available on the fabric.

   The slotnumber applies only to ED-12000B.

The following example shows the `portenable` command on a DS-32B2.

```
switch:admin> portenable 1
switch:admin> portshow 1
portCFlags: 0x1  ENABLED
portFlags: 0x228057     PRESENT ACTIVE E_PORT G_PORT U_PORT LOGIN LED
   ACCEPT
portType:  4.1
portState: 1    Online
portPhys:  6    In_Sync
portScn:   5    E_Port
portId:    010100
portWwn:   20:01:00:60:69:90:03:56
portWwn of device(s) connected:
        None
Distance:  normal
Speed: N2Gbps

Interrupts:        20835      Link_failure: 52         Frjt:          0
Unknown:           46         Loss_of_sync: 1820       Fbsy:          0
Lli:               1992        Loss_of_sig:  3
Proc_rqrd:         18832       Protocol_err: 0
Timed_out:         0           Invalid_word: 0
Rx_flushed:        0           Invalid_crc:  0
Tx_unavail:        0           Delim_err:    0
Free_buffer:       0           Address_err:  0
Overrun:           0           Lr_in:        53
Suspended:         0           Lr_out:       38
Parity_err:        0           Ols_in:       33
2_parity_err:      0           Ols_out:      8
CMI_bus_err:       0
switch:admin>
```

The following example shows the `portenable` command on an ED-12000B, where 7 is the slotnumber and 3 is the portnumber.

```
switch12k:admin> portenable 7/3
switch12k:admin> portshow 7/3
portCFlags: 0x1
portFlags: 0x23801b      PRESENT ACTIVE F_PORT G_PORT LOGIN NOELP LED
   ACCEPT
portType:  4.1
portState: 1    Online
portPhys:  6    In_Sync
portScn:   6    F_Port
<output truncated>
```

Changing a Switch Name

To change the name of a switch:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `switchName new_name`

   where `new_name` is the new name for the switch. Switch names can be up to 19 characters long, must begin with a letter, and can contain letters, numbers, or the underscore character.

Setting the Switch Status Policy

There are seven parameters that determine the status of a switch:

- Number of faulty ports
- Missing GBICs (such as, Small Form Factor Pluggable (SFP) transceivers)

  GBIC and SFP are interchangeable terms.

- Power supply status
- Temperature in enclosure
- Fan speed
- Port status
- sgroup ISL status

Each parameter can be adjusted so that a specific threshold must be reached before that parameter changes the overall status of a switch to MARGINAL or DOWN. Only one parameter needs to pass the MARGINAL or DOWN threshold to change the overall status of the switch.

Important Do not modify these parameters unless so notified by EMC Customer Service.

Viewing the Policy Threshold Values

To view the switchStatusPolicy threshold values:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

```
switch:admin> switchStatusPolicyShow
```

The following output displays:

```
switch:admin> switchStatusPolicyShow
The current overall switch status policy parameters:
```

	Down	Marginal
FaultyPorts	2	1
MissingGBICs	0	0
PowerSupplies	2	1
Temperatures	2	1
Fans	2	1
PortStatus	0	0
sgroup ISLStatus	0	0

```
switch:admin>
```

Configuring the Policy Threshold Values

To set the switch status policy threshold values:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

```
switchStatusPolicySet
```

The current switch status policy parameter values are displayed.

3. You are prompted to enter values for each parameters DOWN and MARGINAL threshold:
   - Enter the number of faulty ports required to change the switch status to DOWN and press ENTER.
   - Enter the number of faulty ports required to change the switch status to MARGINAL and press ENTER.

- Enter the number of missing GBICs required to change the switch status to DOWN and press ENTER.
- Enter the number of missing GBICs required to change the switch status to MARGINAL and press ENTER.
- Enter the number of bad Power Supply warnings required to change the switch status to DOWN and pressENTER.
- Enter the number of bad Power Supply warnings required to change the switch status to MARGINAL and press ENTER.
- Enter the number of temperature warnings required to change the switch status to DOWN and press ENTER.
- Enter the number of temperature warnings required to change the switch status to MARGINAL and press ENTER.
- Enter the number of fan speed warnings required to change the switch status to DOWN and press ENTER.
- Enter the number of fan speed warnings required to change the switch status to MARGINAL and press ENTER.
- Enter the number of port down warnings required to change the switch status to DOWN and press ENTER.
- Enter the number of port down warnings required to change the switch status to MARGINAL and press ENTER.
- Enter the number of ISLstatus down warnings required to change the switch status to DOWN and press ENTER.
- Enter the number of ISLstatus down warnings required to change the switch status to MARGINAL and press ENTER.

4. Verify the threshold settings you have configured for each parameter. Enter the following command to view your current switch status policy configuration:

   `switchStatusPolicyShow`

By setting the DOWN and MARGINAL value for a parameter to 0,0 that parameter is ignored in setting the overall status for the switch.

You must not change the settings unless directed to do so by EMC Technical Support.

Enabling the Track Changes Feature

To enable the track changes feature:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `trackChangesSet 1`

   A prompt is displayed verifying that the track changes feature is on. The output from the track changes feature is dumped to the error log for the switch. Use the `errdump` command or `errshow` command to view the error log.

   Trackable changes are:

   - Successful login
   - Unsuccessful login
   - Logout
   - Config file change from task
   - Track changes on
   - Track changes off

   Items in the error log created from the track changes feature are labeled `Error TRACK`. For example:

```
switch:admin> errdump

Error 07
--------
0x17ef (fabos): Mar 24 11:10:27
Switch: 1, Info TRACK-CONFIG_CHANGE, 4, Config file change from
   task:TRACKIPC

Error 06
--------
0x4e7 (fabos): Mar 24 11:10:24
Switch: 1, Info TRACK-TRACK_ON, 4, Track-changes on
```

Displaying Whether Track Changes is Enabled

To display the status of the track changes feature:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `trackChangesShow`

   The status of the track changes feature is displayed as either `on` or `off`. This also displays whether the track changes feature is configured to send SNMP traps. For example:

```
switch:admin> trackchangesshow
Track changes status: ON
Track changes generate SNMP-TRAP: NO
```

Configuring the In-Order Delivery Option

In a stable fabric, frames are always delivered in order, even when the traffic between switches is shared among multiple paths. However, when topology changes occur in the fabric (for instance, a link goes down), traffic is rerouted around the failure. When topology changes occur, some frames may be delivered out of order.

The default behavior disables in-order delivery of frames during fabric topology changes. This enables fast rerouting after a fabric topology change.

Important Do not enable In-Order Delivery unless told to do so by EMC Technical Support.

Forcing In-Order Delivery of Frames

To force in-order delivery of frames during fabric topology changes:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `iodset`

Important This command can cause a delay in the establishment of a new path when a topology change occurs, and should be used with care.

Disabling In-Order Delivery of Frames

To display in-order delivery of frames:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `iodreset`

Displaying Help Information for a Telnet Command

To display help information about a Telnet command:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   help *command*

   where *command* is the command name you would like help with.

Reading Hexadecimal Port Diagrams

Many of the commands return port diagrams in hexadecimal format.

Example

```
switch:admin> bcastShow

Group   Member Ports    Member ISL Ports        Static ISL Ports

-------------------------------------------------------------------
 256     0x00000428        0x00000428              0x00000000
         0x00008020        0x00000020              0x00000000
         0x00000001        0x00000000              0x00000000
switch:admin>
```

To read the hexadecimal port diagrams, they must be converted into binary notation. Each hexadecimal value represents four binary values. Each hexadecimal value is converted into a group of four binary values that represent four ports as follows:

Hex value = Binary value

0 = 0000

1 = 0001

2 = 0010

3 = 0011

4 = 0100

5 = 0101

6 = 0110

7 = 0111

8 = 1000

9 = 1001

A = 1010

B = 1011

C = 1100

D = 1101

E = 1110

F = 1111

Once the hexadecimal value is converted into a binary bitmap, each bit represents a port, where a value of 1 means yes and a value of 0 means no. The bitmap is read from right to left; that is, the least significant bit represents port 0.

For example, if the member port value is displayed in hex as:

```
0     0     0   1    2  0     8     3

0000  0000  0000  0001 0010  0000  1000  0011
```

This bitmap displays the member ports as port 0, 1, 7, 13, and 16. Each switch has a hidden internal port (in the example above, port 16) that is always a member of a broadcast group.

3

Working With ED-12000B

This chapter provides information on working with the ED-12000B. For detailed information about the ED-12000B, refer to *EMC Connectrix Enterprise Director Model ED-12000B Hardware Reference Manual.*

Selecting Ports for the ED-12000B

In previous versions of the Fabric OS (v.2x and v3.x), the primary method for identifying a port within the fabric was the `domain,port` combination. For example, to add port 1 on domain 5 to a zone:

```
switch:admin> zoneadd "bluezone", "5,1"
```

This method of selecting ports cannot be used in the ED-12000B because of its additional slots and high port count. It was replaced in Fabric OS v4.0 by two methods to specify a particular port: the slot/port method and the port area number method.

Slot/Port Method

In the ED-12000B, a new method of selecting ports is required. To select a specific port, you must identify both the slot number and port number with which you are working.

When specifying a particular slot and port for a command, the slot number operand must be followed by the slash (/) and then a value for the port number. For example, to enable port 4 on a switch blade in slot 2, you would specify the following:

```
portEnable 2/4
```

The ED-12000B has a total of 10 slots counted 1 to 10. Slot number 5 and 6 are control processor cards, and slot 1 through 4 and 7 through 10 are switch cards. On each switch card, there are 16 ports counted from the bottom 0 to 15. A particular port must be represented by both slot number (1 through 10) and port number (0 through 15).

No spaces are allowed between the slot number, the slash (/), and the port number.

Port Area Number Method

Some commands, such as zoning commands, require you to specify ports using the area number method. In the Fabric OS v4.0, each port on a particular domain is given a unique area ID.

The 12000 chassis contains two logical switches. The area IDs for both logical 64-port switches range from 0 to 63. Logical switch 0 and 1 both have a port that is referenced with area ID 0.

An area ID for each port is unique inside each logical switch (that is, each assigned domain ID). These are two of the three parts of a 24-bit Fibre Channel address ID:

- 8-bit Domain ID
- 8-bit Area ID
- 8-bit Port ID

Use the `switchshow` command to display all ports on the current (logical) switch and their corresponding area IDs.

Determining Area ID

To determine the Area ID of a particular port:

1. Log in to to the switch as the admin user.
2. Enter the `switchshow` command. This command displays all ports on the current (logical) switch and their corresponding Area IDs.

The following example shows an ED-12000B:

```
switch12k:admin> switchshow
switch:admin> switchshow
switchName:     switch
switchType:     10.1
switchState:    Online
switchRole:     Subordinate
switchDomain:   5
switchId:       fffc05
switchWwn:      10:00:00:60:69:00:54:e9
switchBeacon:   OFF
blade7: Beacon: OFF
blade9: Beacon: OFF

Area Slot Port Gbic Speed State
=====================================
  0    7    0   --    N2   No_Module
  1    7    1   --    N2   No_Module
  2    7    2   --    N2   No_Module
  3    7    3   id    N2   Online    F-Port  10:00:00:00:c9:24:0d:b3
  4    7    4   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
   (upstream)(Trunk master)
  5    7    5   id    N2   Online    E-Port  (Trunk port, master is Slot  7 Port 4)
  6    7    6   id    N2   Online    E-Port  (Trunk port, master is Slot  7 Port 4)
  7    7    7   id    N2   Online    E-Port  (Trunk port, master is Slot  7 Port 4)
  8    7    8   --    N2   No_Module
  9    7    9   --    N2   No_Module
 10    7   10   --    N2   No_Module
 11    7   11   id    N2   No_Light
 12    7   12   id    N2   No_Light
```

```
 13    7   13   id    N2   No_Light
 14    7   14   id    N2   No_Light
 15    7   15   --    N2   No_Module
 32    9    0   --    N2   No_Module
 33    9    1   --    N2   No_Module
 34    9    2   --    N2   No_Module
 35    9    3   --    N2   No_Module
 36    9    4   --    N2   No_Module
 37    9    5   --    N2   No_Module
 38    9    6   --    N2   No_Module
 39    9    7   --    N2   No_Module
 40    9    8   id    N2   Online    E-Port  (Trunk port, master is Slot  9 Port 10)
 41    9    9   id    N2   Online    E-Port  (Trunk port, master is Slot  9 Port 10)
 42    9   10   id    N2   Online    E-Port  10:00:00:60:69:50:08:d5 "sqad11"
   (downstream)(Trunk master)
 43    9   11   id    N2   Online    E-Port  (Trunk port, master is Slot  9 Port 10)
 44    9   12   --    N2   No_Module
 45    9   13   --    N2   No_Module
 46    9   14   id    N2   No_Light
 47    9   15   id    N1   Online    L-Port  2 public
switch:admin>
```

Upgrading the Firmware Level in Version 4.0

The ED-12000B has four IP addresses: one for each switch (switch 0 and switch 1), and one for each of the two CPs (CP0 in slot 5 and CP1 in slot 6). This can only be upgraded by a qualified EMC technician. Contact your local EMC CE to schedule an upgrade of the firmware level in version 4.0. For additional information on the EMC products and services available to customers and partners, refer to the EMC Powerlink website at:

`http://powerlink.emc.com`

Disabling a Port Blade

To disable a port card:

1. Log in to the switch as the admin user.
2. Enter the `slotoff` command with the following syntax:

   `slotoff` *`slotnumber`*

   where *`slotnumber`* is the slot number of the port card you want to disable.

Example

```
switch:admin> slotoff 7
switch:admin>
```

Enabling a Port Blade

To enable a port card:

1. Log in to the switch as the admin user.
2. Enter the `sloton` command with the following syntax:

   `sloton` *`slotnumber`*

   where *`slotnumber`* is the slot number of the port card you want to enable.

Example

```
switch:admin> sloton 7
switch:admin>
```

Powering On a Port Blade

To power on a port card:

1. Log in to the switch as the admin user.
2. Enter the `slotpoweron` command with the following syntax:

   `slotpoweron` *`slotnumber`*

   where *`slotnumber`* is the slot number of the port card you want to power on.

Example

```
switch:admin> slotpoweron 7
Powering on slot 7
switch:admin>
```

Powering Off a Port Blade

To power off a port card:

Before powering off a port card, you must disable it using the `switchdisable` command.

1. Log in to the switch as the admin user.
2. Enter the `slotpoweroff` command with the following syntax:

   `slotpoweroff` *`slotnumber`*

   where *`slotnumber`* is the slot number of the port card you want to power off.

Example

```
switch:admin> slotpoweroff 7
fabric: Reconfiguration due to Offline(port 4)
fabric: Reconfiguring at Sun Mar 24 13:42:22 2002
```

Displaying the Status of All Slots in the Chassis

To display the status of slots in the chassis:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `slotShow`

   This command displays the current status of each slot in the system. The format of the display includes a header and four fields for each slot. The fields and their possible values are as follows:

Slot	Displays the physical slot number.
Care Type	Displays the blade type: ◆ SW BLADE The blade is a Switch. ◆ CP BLADE The blade is a Control Processor. ◆ UNKNOWN The blade is not present or its type is not recognized.
ID	Displays the hardware ID of the blade type.
Status	Displays the Status of the blade: ◆ VACANT — The slot is empty. ◆ INSERTED, NOT POWERED ON — The blade is present in the slot but is turned off. ◆ DIAG RUNNING POST1 — The blade is present, powered on, and running the post initialization power on self tests (POST). ◆ DIAG RUNNING POST2 — The blade is present, powered on, and running the POST. ◆ ENABLED — The blade is on and enabled. ◆ DISABLED — The blade is powered on but disabled. ◆ FAULTY — The blade is faulty because an error was detected. ◆ UNKNOWN — The blade is inserted but its state cannot be determined.

The following example displays the status of all of the slots in the chassis:

```
switch:admin> slotshow

Slot   Blade Type    ID    Status
--------------------------------
  1     UNKNOWN            VACANT
  2     SW BLADE     2     ENABLED
  3     UNKNOWN            VACANT
  4     SW BLADE     2     ENABLED
  5     CP BLADE     1     ENABLED
  6     CP BLADE     1     ENABLED
  7     SW BLADE     2     ENABLED
  8     UNKNOWN            VACANT
  9     SW BLADE     2     ENABLED
 10     UNKNOWN            VACANT

switch:admin>
```

Determining the Active and Standby CPs

The ED-12000B has two control processors: an Active and a Standby. When accessed directly through the telnet, each has a different Fabric OS command set. The Standby control processor has only a subset of the Active control processor commands.

Important Since either control processor can be Active or Standby, it is important to identify which mode they are in prior to issuing commands. The only way to know whether the control processor is Active or Standby is to issue the `hashow` command.

A customer may telnet into a control processor and issue the `hashow` command to learn the status of the control processor. The `hashow` command performs the following functions:

It displays the control processor's status, including:

- Local CP state (slot number and CP id)
- Remote CP state (slot number and CP id)
- High Availability Enabled/Disabled
- Heartbeat Up/Down

Example

```
switch1:admin> hashow
Local CP (Slot 6, CP1): Active
Remote CP (Slot 5, CP0): Standby
HA Enabled, Heartbeat Up
switch1:admin>
```

Setting the Blade Beacon Mode

When beaconing mode is enabled, the port LEDs will flash amber in a running pattern from port 0 through port 15 and back again. The pattern continues until the user turns it off. This can be used to signal the user to a failing unit.

To set the blade beacon mode on:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `bladebeacon slotnumber, mode`

   where `slotnumber` is the blade where you want to enable beacon mode, and mode is `1` to turn on beaconing, and `0` to turn off beaconing.

Displaying Information on Switch FRUs

To view field replaceable unit (FRU) information for a switch:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `chassisShow`

   This command displays the field replaceable unit (FRU) header content for each object in the chassis. This command returns information for each FRU including:

   - Object ID and object number. Valid values include the following:
     - CHASSIS
     - FAN
     - POWER SUPPLY
     - SW BLADE (switch)
     - CP BLADE (control processor)
     - WWN
     - UNKNOWN

     The object number refers to the slot number for blades, and unit number for everything else.
   - FRU header version number
   - The object's power consumption
     - Positive for power supplies
     - Negative for consumers
   - Brocade's part number (up to 14 characters)
   - Brocade's serial number (up to 12 characters)
   - The date the FRU was manufactured
   - The date the FRU header was last updated
   - The cumulative time, in days, that the FRU has been powered on
   - The current time, in days, that the FRU has been powered on
   - The externally supplied ID (up to 10 characters)
   - The externally supplied part number (up to 20 characters)
   - The externally supplied serial number (up to 20 characters)
   - The externally supplied revision number (up to 4 characters)

Example

```
switch:admin> chassisshow

SW BLADE  Slot: 2
Header Version:          2
Power Consume Factor:    -200
Brocade Part Num:        10-9238367-12
Brocade Serial Num:      1013456800
Manufacture:             Day:  7  Month: 12  Year: 2000
Update:                  Day: 23  Month:  3  Year: 2002
Time Alive:              181 days
Time Awake:              3 days
ID:                      555-374757
Part Num:                234-294-12345
Serial Num:              27346589
Revision Num:            A.00

SW BLADE  Slot: 4
Header Version:          2
Power Consume Factor:    -200
Brocade Part Num:        10-9238367-12
Brocade Serial Num:      1013456800
Manufacture:             Day:  7  Month: 12  Year: 2000
Update:                  Day: 23  Month:  3  Year: 2002
Time Alive:              181 days
Time Awake:              3 days
ID:                      555-374757
Part Num:                234-294-12345
Serial Num:              27346589
Revision Num:            A.00

<output truncated>
```

4

Working With the Management Server

This chapter provides the following information about working with the Management Server platform database.

The Management Server allows a storage area network (SAN) management application to retrieve and administer the fabric and interconnect elements such as switches, servers, and storage devices. It is located at the fibre channel well-known address, FFFFFAh.

Management Server Platform service is available only with Fabric OS v2.3 and later. If the Management Server Platform service is started on a fabric that contains any switches with Fabric OS v2.2.x or earlier installed, the fabric segments.

Working With the Management Server

An Access Control List (ACL) of WWN addresses determines which systems have access to the Management Server database. These WWNs are usually associated with the management applications. Access to the Management Server is restricted to the WWNs listed in the ACL. If the list is empty (default), the Management Server is accessible to all systems connected in-band to the Fabric.

Displaying the Access Control List

To display the Management Server Access Control List (ACL):

1. Log in to the switch as the admin user.
2. Enter the `msconfigure` command. The command becomes interactive.
3. At the **Select** prompt enter **`1`** to display the access list.

   A list of WWNs that have access to the Management Server displays.

Example

```
switch:admin> msconfigure

0       Done
1       Display the access list
2       Add member based on its Port/Node WWN
3       Delete member based on its Port/Node WWN
select : (0..3) [2] 1

MS Access List consists of (1): {
 20:01:00:60:69:00:60:01
}

0       Done
1       Display the access list
2       Add member based on its Port/Node WWN
3       Delete member based on its Port/Node WWN
select : (0..3) [1] 0

done ...
switch:admin>
```

Adding a WWN to the Access Control List

To add a WWN to the ACL:

1. Log in to the switch as the admin user.
2. Enter the `msconfigure` command. The command becomes interactive.
3. At the **Select** prompt enter **2** to add a member based on its Port/Node WWN.
4. At the **Port/Node WWN** prompt, enter the WWN of the member you would like to add to the ACL. Press the return key, and the main menu is displayed.
5. At the prompt enter **1** to verify the WWN you entered was added to the ACL.
6. Once you have verified that the WWN was added correctly, enter **0** at the prompt to end the session.
7. At the **Update the FLASH** prompt enter **y**..
8. Press ENTER to update the flash and end the session.

Example

```
switch:admin> msconfigure

0       Done
1       Display the access list
2       Add member based on its Port/Node WWN
3       Delete member based on its Port/Node WWN

select : (0..3) [1] 2

Port/Node WWN (in hex): [00:00:00:00:00:00:00:00]
   20:01:00:60:69:00:60:01
*WWN is successfully added to the MS ACL.

0       Done
1       Display the access list
2       Add member based on its Port/Node WWN
3       Delete member based on its Port/Node WWN

select : (0..3) [2] 1


MS Access List consists of (1): {
 20:01:00:60:69:00:60:01
}
0       Done
```

```
1       Display the access list
2       Add member based on its Port/Node WWN
3       Delete member based on its Port/Node WWN

select : (0..3) [1] 0

done ...
Update the FLASH?  (yes, y, no, n): [yes] y
*Successfully saved the MS ACL to the flash.

switch:admin>
```

Deleting a WWN From the Access Control List

To delete a WWN from the ACL:

1. Log in to the switch as the admin user.
2. Enter the msconfigure command. The command becomes interactive.
3. At the **Select** prompt enter **3** to delete a member based on its Port/Node WWN.
4. At the prompt, enter the WWN of the member you would like to delete from the ACL, then press ENTER. The main menu displays.
5. At the prompt, enter **1** to verify the WWN you entered was deleted from the ACL.
6. Once you have verified that the WWN was deleted correctly, enter **0** at the prompt to end the session.
7. Enter **Y** at the **Update the FLASH** prompt.
8. Press ENTER to update the flash and end the session.

Example

```
switch:admin> msconfigure

0       Done
1       Display the access list
2       Add member based on its Port/Node WWN
3       Delete member based on its Port/Node WWN
select : (0..3) [1] 3

Port/Node WWN (in hex): [00:00:00:00:00:00:00:00]
   20:01:00:60:69:00:60:01
*WWN is successfully deleted from the MS ACL.

0       Done
1       Display the access list
2       Add member based on its Port/Node WWN
3       Delete member based on its Port/Node WWN
select : (0..3) [3] 1

MS Access list is empty
0       Done
1       Display the access list
2       Add member based on its Port/Node WWN
3       Delete member based on its Port/Node WWN
select : (0..3) [1] 0

done ...
```

```
Update the FLASH?  (yes, y, no, n): [yes] y
*Successfully saved the MS ACL to the flash.

switch:admin>
```

Displaying the Management Server Database

To view the contents of the Management Server Platform Database:

1. Log in to the switch as the admin user.
2. Enter the `msplatshow` command at the prompt. The contents of the Management Server Database display.

Example

```
switch:admin> msPlatShow
-------------------------------------
Platform Name: [1] "c"
Platform Type: 9 : STORAGE_DEVICE
Number of Associated M.A.: 2
Associated Management Addresses:
[4] "snmp"
  [4] "http"
Number of Associated Node Names: 1
Associated Node Names:
  01:00:00:00:00:00:00:00

switch:admin>
```

Clearing the Management Server Database

To clear the Management Server Platform database:

1. Log in to the switch as the admin user.
2. Enter the `msplcleardb` command.
3. Enter **`y`** to confirm the deletion. The Platform database is cleared.

Example

```
switch:admin> msplcleardb

MS Platform Management Service is currently enabled.
This will erase Platform databases in the entire
   fabric.

Would you like to continue this operation? (yes, y, no,
   n): [no] y

Fabric-wide Platform DB Clear operation in
   progress.....

*[msPlClearDB]: Fabric-wise Platform DB Delete
   operation in progress...
done ...

switch:admin>
```

Displaying the Fabric Capability for Management Server

To display the capability of a fabric for Management Server support:

1. Log in to the switch as the admin user.
2. Enter the `mscapabilityshow` command. The name, WWN, and specific Management Server capability is displayed for each switch in the fabric.
3. Verify that each switch in the fabric is capable of Management Server support.

Example

```
switch:admin> msCapabilityShow

Platform
Switch WWN                 Service Capable   Capability  Name
========================   ===============   ==========  =======
10:00:00:60:69:04:01:94          Yes         0x0000008f  "switch55"
10:00:00:60:69:10:53:48          Yes         0x0000000b  "switch53"
10:00:00:60:69:10:54:c8          Yes         0x0000000b  "switch52"
10:00:00:60:69:02:39:70          Yes         0x0000000b  "switch54"
10:00:00:60:69:20:10:52          Yes         0x0000000b  "switch43"
10:00:00:60:69:20:10:2b          No          0x00000009  "switch62"
10:00:00:60:69:10:53:3c          Yes         0x0000000b  "switch51"
10:00:00:60:69:04:11:17          Yes         0x0000008f  "switch57"

Capability Bit Definitions:
Bit 0: Basic Configuration Service Supported.
Bit 1: Platform Management Service Supported.
Bit 2: Topology Discovery Service Supported.
Bit 3: Unzoned Name Server Service Supported.
Bit 4: M.S. Fabric Zone Service Supported.
Bit 5: Fabric Lock Service Supported.
Bit 6: Timer Service Supported.
Bit 7: RSCN Small Payload Supported.
Others: Reserved.
WARNING! Platform Management Service CAN NOT BE activated for this
   Fabric!!!
Done.
switch:admin>
```

In the example above, the fabric does not support Platform Management Service because “switch62” is running Fabric OS v2.2.

Activating the Platform Management Service

To activate the Platform Management Service for a fabric:

1. Log in to to the switch as the admin user.
2. Enter the `msplmgmtactivate` command.

Example

```
switch:admin> msplmgmtactivate

Activating Platform Management Service in the Fabric is
   in progress......

*Completed activating Platform Management Service in
   the fabric!

switch:admin>
```

Deactivating the Platform Management Service

To deactivate the Platform Management Service for a fabric:

1. Log in to the switch as the admin user.
2. Enter the `msplmgmtdeactivate` command.
3. Enter **`Y`** to confirm the deactivation.

Example

```
switch:admin> msplmgmtdeactivate

MS Platform Management Service is currently enabled.

This will erase Platform configuration information
as well as Platform databases in the entire fabric.

Would you like to continue disabling? (yes, y, no, n):
   [no] y

Deactivating Platform Management Service is in
   progress......

*Completed deactivating Platform Management Service in
   the fabric!

switch:admin>
```

5

Diagnostics and Status

This chapter provides the following information on displaying port and switch status information:

Diagnostics

The purpose of the diagnostic subsystem is to evaluate the integrity of the system hardware. Diagnostics can be invoked in either of two ways:

- Manually (through the Fabric OS command line)
- During the power-on self test (POST)

During these test activities, the error messages generated are sent to the console, error logs, and possibly to non volatile storage. Each of these destinations may adjust the output format slightly to suit the purpose of the output media.

Manual Operation

During manual operation of diagnostics, the switch or blade typically needs to be in an offline state so as not to affect the fabric in which the switch is placed. There are exceptions to this policy. If a diagnostic needs the switch offline and finds the switch is active, it will not run, and exists without harm to the fabric.

Manual tests are useful in fault isolation and various stress test environments. There is no single test that will give a comprehensive indication of the hardware status. Tests must run in concert to achieve this goal.

Power-On Self Test (POST)

The POST gives a quick indication of hardware readiness when new hardware is brought into operation. These tests do not require user input to function, typically operate within a couple of minutes, and support minimal validation due to the restriction on test duration. Their purpose is to give a basic health check before new hardware is allowed to join a fabric.

These tests are divided into two groups: POST1 and POST2.

- POST1 validates the hardware interconnect of the switch/blade
- POST2 validates the ability of the switch/blade to pass data frames between the ports

Diagnostic Command Set

The diagnostic command set can be divided into two categories:

- Test Commands

  Test commands act on hardware and report anomalies when found.

- Control Commands

  Control commands act to support or evaluate the diagnostic operations independent of performing actual test of hardware circuitry.

Diagnostics can be manually run in two basic modes:

- Normal interactive mode
- Burnin mode

  Burnin mode has additional control commands for its operation.

Diagnostics can also be executed in:

- Power on self test (POST) operation

  In POST, diagnostics do not require user command input. They are automatically activated when FRUs are brought on line.

During all three modes of diagnostic operation, the same tests are executed. For example, the `spinSilk` command executed from the command line is the same SpinSilk executed in POST.

Many diagnostic commands require the switch or port card to be in an offline state. This ensures that the diagnostic test does not interfere with normal fabric traffic. If the switch or port card is not in an offline state, the diagnostic does not run and displays an error message.

The switch or port card can be taken offline by entering the `switchdisable` or the `bladedisable` command, respectively. For more information about these commands, refer to the *Fabric OS Reference Manual*.

The diagnostic commands can be used together to provide an overall picture of the health of the hardware or to isolate and validate the functionality. A series of tests have been structured to allow hardware validation and fault isolation: the `bladediag` and `bladediagshort` commands for the ED-12000B, and the `switchdiag` and `switchdiagshort` commands for the DS-32B2.

Diagnostic Test Commands

The following is a list of diagnostic test commands:

- portRegTest
- sramRetentionTest
- spinSilk
- spinFab
- crossPortTest
- portLoopbackTest
- backPort
- centralMemoryTest
- cmemRetentionTest
- cmiTest
- camTest
- turboramTest
- statsTest
- portLEDtest
- filterTest
- bladeDiag (port card diagnostic for the ED-12000B)
- bladeDiagShort (port card diagnostic for the ED-12000B)
- switchDiag (diagnostic for the DS-32B2)
- switchDiagShort (diagnostic for the DS-32B2)

Diagnostic Control Commands

The following is a list of diagnostic control commands:

- diagEnablePost
- diagDisablePost
- diagModeShow
- statsClear
- diagShow
- diagStatus
- diagReset
- diagCommandShow
- diagHelp
- forceError
- forcePortError

Persistent Error Log

This feature prevents messages of lesser severity from over-writing messages of greater severity. For example, *Warning* messages cannot over write *Error, Critical,* or *Panic* messages. The persistent error log has the following features:

- The error log sub-system supports persistent logging. Each switch has its own persistent log.
- The persistent log is preserved across power cycles and system reboots.
- The persistent log has a default capacity to store 1024 error log entries.
- The persistent log can be resized at run time without having to reboot the switch or the system.
- The persistent log can be resized at run time to configure a maximum of 2048 entries. The persistent log can be resized to anywhere between 1024 and 2048 entries.

The error log sub-system can save a maximum of 1536 messages in RAM, that is, a total of 256 messages for each error message level (Panic, Critical, Error, Warning, Info, and Debug). In addition, important messages are stored in a separate persistent error log to guarantee that they are not lost in case of power outage or system reboot.

- The persistent log is implemented as a circular buffer. When more than maximum entries are added to the persistent log, old entries are over-written by new entries.
- All error messages of levels Panic and Critical are automatically saved in the persistent log as they are logged. This guarantees that critical or panic level messages are not lost in the event of unexpected system reboot or fail-over.
- A new command to control and filter messages to be saved in the persistent error log is provided. For example, you can specify that all log messages of level *Warning* and more severe than *Warning* (basically *Error, Critical, Panic)* should be saved in the persistent error log.

- The commands `errdump` or `errshow` display a superset of the persistent log messages saved during previous system run time cycles and the error log messages generated during the current run time cycle.
- Options are provided to `errdump` command to display three options: all the errors (previous persistent log and the current run time log), only errors from the current run time cycle, or the errors from the persistent error log.
- Options are provided to clear the persistent error log (`errclear -p`).

Only the persistent error log can be resized. The run time error log cannot be resized.

Displaying the Error Log of a Switch

There are two ways to display the error log of a switch:

- Display the error log one page at a time
- Display the error log all at once

To display the switch error log one page at a time:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `ErrShow`

To display the switch error log all at once:

1. Log in to the switch as the admin user.
2. At the command line, enter the following command:

   `ErrDump`

Clearing the Switch Error Log

To clear the error log for a particular switch instance:

1. Log in to the switch as the admin user.
2. Enter the `errclear` command.

Example The following example shows how to clear the persistent error log on the Active CP of the ED-12000B or the DS-32B2.

```
switch:admin> errClear -p
switch:admin>
```

The following examples apply to the ED-12000B switch only.

Example The following example shows how to clear the current run time error log on the Standby CP, for the switch instance 0.

```
switch:admin> errClear -s 0
switch:admin>
```

Example The following example shows how to clear the persistent error log on the Standby CP, for the switch instance 0.

```
switch:admin> errClear -s 0 -p
switch:admin>
```

Setting the Error Save Level

To control the types of messages that are saved in the persistent error log:

1. Log in to the switch as the admin user.
2. Enter the `errsavelvlset` command at the prompt.

Example The following example shows how to enable saving of *Warning*, *Error*, *Critical*, and *Panic* messages in the persistent error log.

```
switch:admin> errSaveLvlSet 3
switch:admin>
```

The following example applies to the ED-12000B switch only.

Example The following example shows how to enable saving of *Warning*, *Error*, *Critical*, and *Panic* messages in the persistent error log on the Standby CP for the switch instance 0.

```
switch:admin> errSaveLvlSet -s 0 3
switch:admin>
```

Displaying the Current Error Save Level

To display the current value of the persistent error log save level for a given switch:

1. Log in to the switch as the admin user.
2. Enter the `errsavelvlshow` command at the prompt.

Example Following example shows how to display current error log save level.

```
switch:admin> errSaveLvlShow

Current message save level is = 3

switch:admin>
```

Resizing the Persistent Error Log

To resize the persistent error log:

1. Log in to the switch as the admin user.
2. Enter the `errnvlogsizeset` command at the prompt.

Example The following example shows how to resize the persistent error log to 1500 entries.

```
switch:admin> errNvLogSizeSet 1500

Persistent error log is resized to store 1500 entries

switch:admin>
```

The following example applies to the ED-12000B switch only.

Example The following example shows how to resize persistent log to save 1500 error log entries on the Standby CP, for switch instance 0. The value -s is added to save the 1500 log entries.

```
switch:admin> errNvLogSizeSet -s 0 1500

Persistent error log size is already 1500 entries

switch:admin>
```

Displaying the Current Persistent Error Log Configuration

To display the current maximum size of the persistent error log for a given switch:

1. Log in to the switch as the admin user.
2. Enter the `errnvlogsizeshow` command at the prompt.

Example The following example shows how to display persistent error log configuration.

```
switch:admin> errNvLogSizeShow
Persistent Error Log can store 1024 entries
```

The following example applies to the ED-12000B switch only.

Example The following example shows how to display persistent error log configuration on the Standby CP, for switch instance -0.

```
switch:admin> errNvLogSizeShow -s 0
Persistent Error Log can store 1024 entries
```

Configuring the Syslog Daemon

The Fabric OS can be configured to use a UNIX style syslog daemon (*syslogd*) process to read system events and forward system messages to users and/or write the events to log files on a remote UNIX host system.

syslogd Overview

The Fabric OS maintains an internal log of all error messages. The internal log buffers are limited in capacity; when the internal buffers are full, new messages overwrite old messages.

A switch can be configured to send error log messages to a UNIX host system that supports syslogd. This host system can be configured to receive error/event messages from the switch and store them in files on the computer hard drive. This enables the storage of switch error log messages on a host system and overcomes the size limitations of the internal log buffers on the switch.

The Syslogd is a process that runs on UNIX or LINUX systems that reads and logs messages to the system console, log files, other machines and users as specified by its configuration file. Refer to the manual pages and related documentation for your particular UNIX host system for more information on the *syslogd* process and its capabilities.

Note that the host system can be running UNIX, Linux or any other operating system as long as it supports standard *syslogd* functionality. The switch by itself does not assume any particular operating system to be running on the host system. The only requirement is that the host system must support standard *syslogd* to receive error log messages from the switch.

Error Message Format

Below is an example of an error/event message received by the remote syslogd host from the switch.

```
Jun 4 18:53:59 sqab186 kernel: 0x299 (fabos): Switch: 0, Info HAMKERNEL-IP_UP, 4,
   (session=16) Heartbeat up from Standby CP
```

The first two items are the event's date and time (as known by the UNIX host machine where syslogd is running) and the machine name that generated the message (In this case it is the name of switch). The word "kernel" is the name of the syslogd facility used by the switch to send error log messages to the remote host. The rest of the message is similar to the error log message output from the `errShow` command

line interface on the switch. The fields that are specific to the switch error log message are:

- ID of the task that generated the error (in the example this is **0x299**)
- Name of the task that generated the error (in the example this is **(fabos)**)
- Switch instance number (in the example this is **Switch 0**)
- Message severity level in word (in the example this is **Info**)
- The error message identifier consisting of the module name (in the example this is **HAMKERNEL**) and the message name (in the example this is **IP_UP**)
- Numeric value of the message severity level defined by the switch (in the example this is **4**)
- A descriptive text string (in the example this is Heartbeat up from Standby CP)

Message Classification

Syslogd messages are classified according to facility and priority (severity code). This enables a system administrator to take different actions depending on the error.

The Fabric OS supports 6 message severity levels for error log messages. The following table provides a mapping between severity levels used by the switch and the syslogd severity levels supported by the UNIX system.

Table 5-1 Severity Levels

Message severity Levels/Numerical Value	UNIX syslogd message severity levels/Numerical Value
Panic (0)	Emergency (LOG_EMERG) (0)
Critical (1)	Alert (LOG_ALERT) (1)
Error (2)	Error (LOG_ERR) (3)
Warning (3)	Warning (LOG_WARNING) (4)
Info (4)	Info (LOG_INFO) (6)
Debug (5)	Debug (LOG_DEBUG) (7)

syslogd Configuration on the Switch

This procedure explains how to configure the switch to dispatch error log messages to a remote *syslogd* host.

To configure the switch to forward switch error log messages to a remote syslogd host:

1. Log in to the switch as admin user.
2. At the command line enter the `syslogdipadd` command using the following syntax:

   `switch:admin>syslogdipadd` "IP address of the remote syslogd host"
3. Verify the IP address was entered correctly using the `syslogdipshow` command.

Example The following example shows how to configure the switch to dispatch error log messages to a remote syslogd host whose IP address is 192.168.148.189

```
switch:admin> syslogdipadd 192.168.148.189
switch:admin> syslogdipshow
syslog.IP.address.1 192.168.148.189
```

To disable sending of error log messages to a previously enabled remote syslogd host:

1. Log in to the switch as Admin user.
2. At the command line enter the `syslogdipremove` command using the following syntax:

   `switch:admin>syslogdipremove "IP address of the remote syslogd host"`
3. Verify the IP address was deleted using the `syslogdipshow` command.

Example The following example shows how to disable sending of error log messages to a previously configured remote syslogd host whose IP address is 192.168.148.189:

```
switch:admin> syslogdipremove 192.168.148.189
```

syslogd Configuration on the Remote Host

The syslogd configuration on the UNIX host provides the syslogd daemon with instructions on how to process different messages it receives from the switch. The following are example entries in the syslog configuration file, /etc/syslog.conf, on how to store switch error log messages received from the switch. Please refer syslog related manual pages on your UNIX system for the full documentation of the syslog configuration file.

The following entry in /etc/syslog.conf causes all messages from the switch of UNIX priority warning or higher (that is, warning, error, critical and panic messages) to be stored in the file `/var/adm/emc`

Example

```
kern.warning /var/adm/emc
```

The following entry in /etc/syslog.conf causes all messages (Debug, Info, Warning, Error, Critical, and Panic) from the switch to be stored in the file `/var/adm/emc`

Example

```
kern.debug /var/adm/emc
```

The kern prefix identifies that the ED-12000B uses “kernel” syslogd facility to dispatch error log messages to the syslogd daemon.

Syslogd CLI Commands

Below is a list of commands that are related to the syslogd configuration. Please refer to the help pages of these commands for more details.

Table 5-2 Commands Related to Syslogd Configuration

Command	Summary
syslogdipadd	Add the IP address of the remote syslogd host to the switch.
syslogdipremove	Remove the IP address of the remote syslogd deamon from the switch.
syslogdipshow	Show the list of configured syslogd IP addresses on the switch.
errshow	Display messages from the error log on the switch.

Solaris 8 Syslogd Functionality Changes

The Solaris syslogd functionality has changed between the Solaris 8 rev that ships on the installation CD and the latest patch. The change is that remotely generated *kernel* facility messages are sorted and logged as if they were *user* facility messages. This means that Solaris syslogd v1.84 and lower sort and log syslog messages from the switch properly with the following section in the /etc/syslog.conf file.

For switches running V4.x if the syslogd is v1.84 or lower:

```
kern.info/var/adm/core_info
kern.notice/var/adm/core_notice
kern.warning/var/adm/core_warning
kern.err/var/adm/core_err
kern.debug/var/adm/core_debug
kern.panic/var/adm/core_panic
kern.critical/var/adm/core_critical
```

For switches running V4.x if the syslogd is v1.87 or higher:

```
user.info/var/adm/core_info
user.notice/var/adm/core_notice
user.warning/var/adm/core_warning
user.err/var/adm/core_err
user.debug/var/adm/core_debug
user.panic/var/adm/core_panic
user.critical/var/adm/core_critical
```

Displaying the Switch Status

The switch status can be either Healthy/OK, Marginal/Warning, or Down. The overall status of a switch is determined by the status of several individual components within the switch. For more information about how the overall switch status is determined, refer to the `switchstatuspolicyset` command in the *Fabric OS Reference*.

To display the overall status of a switch:

1. Log in to the switch as the admin user.
2. Enter the `switchstatusshow` command. The status of the switch should be Healthy/OK. If the status is Marginal/Warning or Down, the components contributing to this status are displayed.

Example

```
switch:admin> switchstatusshow

The overall switch status is Marginal/Warning
Contributing factors:
* 1 bad power supply and 0 missing power supply triggered the Marginal/Warning
   status

switch:admin>
```

Displaying Information About a Switch

To display switch information:

1. Log in to the switch as the admin user.
2. Enter the `switchshow` command. This command displays the following information for a switch:

   - **switchName** - The switch's name
   - **switchType** - The switch's model and firmware version numbers.
   - **switchState** - The switch's state: Online, Offline, Testing, or Faulty.
   - **switchRole** - The switch's role: Principal, Subordinate, or Disabled.
   - **switchDomain** - The switch's Domain ID.
   - **switchId** - The switch's embedded port D_ID.
   - **switchWwn** - The switch's World Wide Name.
   - **switchBeacon** - The switch's beaconing state: either ON or OFF.

   This command also display the following information for ports on the specified switch:

   - **Module type** - The GBIC type if a GBIC is present.
   - **Port speed** - The speed of the Port (1G, 2G, N1, N2, or AN). The speed can be fixed, negotiated, or auto negotiated.
   - **Port state** - The port status.
   - **Comment** - Displays information about the port. This section may be blank or display WWN for F_port or E_port, Trunking state, upstream or downstream status.

Example The following example shows the output of the `switchshow` command on an DS-32B2.

```
switch:admin> switchshow
switchName: switch
switchType: 12.1
switchState: Online
switchRole: Principal
switchDomain: 2
switchId: fffc02
switchWwn: 10:00:00:60:69:90:02:84
switchBeacon:   OFF
```

```
Port Gbic Speed State
=========================
  0   id    N2   No_Light
  1   id    N1   Online    L-Port  2 public
  2   id    N2   No_Light
  3   --    N2   No_Module
  4   --    N2   No_Module
  5   id    N2   Online    L-Port  1 public
  6   --    N2   No_Module
  7   id    N2   No_Light
  8   id    N2   No_Light
  9   --    N2   No_Module
 10   --    N2   No_Module
 11   --    N2   No_Module
 12   id    N2   No_Light
 13   id    N2   No_Light
 14   id    N2   In_Sync
 15   id    N2   In_Sync
 16   --    N2   No_Module
 17   --    N2   No_Module
 18   --    N2   No_Module
 19   --    N2   No_Module
 20   --    N2   No_Module
 21   id    N2   No_Light
 22   id    N2   No_Light
 23   --    N2   No_Module
 24   id    N2   No_Light
 25   id    N2   No_Light
 26   id    N2   Online    F-Port  50:06:01:68:40:04:91:04
 27   --    N2   No_Module
 28   --    N2   No_Module
 29   --    N2   No_Module
 30   --    N2   No_Module
 31   --    N2   No_Module
```

Example The following example shows the output of the `switchshow` command on an ED-12000B.

```
switch12k:admin> switchshow
switchName:switch12k
switchType:10.1
switchState:Online
switchRole:Subordinate
switchDomain:2
switchId:fffc02
switchWwn:10:00:00:60:69:50:02:8f
switchBeacon:OFF
blade7: Beacon: OFF
Area Slot Port SFP Speed State
=====================================
 0    7    0   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
   (downstream)
```

```
 1    7    1   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
 2    7    2   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
 3    7    3   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
 4    7    4   id    N1   Online    E-Port  10:00:00:60:69:12:34:e2 "san180"
 5    7    5   id    1G   No_Light
 6    7    6   --    1G   No_Module
 7    7    7   --    1G   No_Module
 8    7    8   --    1G   No_Module
 9    7    9   id    N2   Online    F-Port  21:00:00:e0:8b:04:1a:76
10    7   10   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
11    7   11   id    N2   Online    E-Port  10:00:00:60:69:00:54:e8 "san94"
12    7   12   --    1G   No_Module
13    7   13   --    1G   No_Module
14    7   14   id    N1   Online    E-Port  10:00:00:60:69:10:9b:06 "san176"
   (upstream)
15    7   15   id    N2   Online    F-Port  10:00:00:00:c9:27:2e:69
switch12k:admin>
```

For more information refer to the `switchshow` command in the *Fabric OS Reference Manual*.

Displaying the Uptime of a Switch

To display the uptime for a switch:

1. Log in to the switch as the admin user.
2. Enter the `uptime` command. This command displays the current time, how long the system has been up, the number of users currently logged in, and the system load averages over the last 1, 5, and 15 minutes.

Example

```
switch:admin> uptime

 10:43am  up 19:42,  4 users,  load average: 0.01, 0.04,
   0.00

switch:admin>
```

Displaying the Status of a Port

There are two types of statistics you can view for a port:

- Software statistics
- Hardware statistics

Displaying Software Statistics for a Port

Software statistics for a port include information such as port state, number of interrupts, number of link failures, number of loss of synchronization warnings, and number of loss of signal warnings.

To display the software statistics for a port:

1. Log in to the switch as the admin user.
2. Enter the `portshow` command using the following syntax:

   `portshow [slotnumber/]portnumber`

   where *`slotnumber`* and *`portnumber`* indicates the port location you want to view.

   The slotnumber is for the ED-12000B only.

   A table of software statistics for the port is displayed.

Example The following example shows the software statistics displayed using the `portshow` command on a DS-32B2.

```
switch:admin> portshow 3
portCFlags: 0x1
portFlags: 0x20041       PRESENT U_PORT LED
portType:  4.1
portState: 2    Offline
portPhys:  4    No_Light
portScn:   0
portId:    010300
portWwn:   20:03:00:60:69:90:03:56
portWwn of device(s) connected:
        None
Distance:  normal
portSpeed: N2Gbps

Interrupts:        56        Link_failure: 6          Frjt:          0
Unknown:           0         Loss_of_sync: 0          Fbsy:          0
Lli:               16         Loss_of_sig:  1
Proc_rqrd:         40         Protocol_err: 0
```

```
Timed_out:          0           Invalid_word: 0
Rx_flushed:         0           Invalid_crc:  0
Tx_unavail:         0           Delim_err:    0
Free_buffer:        0           Address_err:  0
Overrun:            0           Lr_in:        3
Suspended:          0           Lr_out:       3
Parity_err:         0           Ols_in:       3
2_parity_err:       0           Ols_out:      3
CMI_bus_err:        0

switch:admin>
```

Example The following example shows the software statistics displayed using the `portshow` command on an ED-12000B.

```
switch:admin> portshow 7/3
portCFlags: 0x1
portFlags: 0x23801b      PRESENT ACTIVE F_PORT G_PORT LOGIN NOELP LED
   ACCEPT
portType:  4.1
portState: 1    Online
portPhys:  6    In_Sync
portScn:   6    F_Port
portId:    650300
portWwn:   20:03:00:60:69:00:54:e9
portWwn of device(s) connected:
        10:00:00:00:c9:24:0d:b3
Distance:  normal
portSpeed: N2Gbps

Interrupts:         36          Link_failure: 3          Frjt:          0
Unknown:            2           Loss_of_sync: 1          Fbsy:          0
Lli:                11           Loss_of_sig:  0
Proc_rqrd:          23           Protocol_err: 0
Timed_out:          0            Invalid_word: 0
Rx_flushed:         0            Invalid_crc:  0
Tx_unavail:         0            Delim_err:    0
Free_buffer:        0            Address_err:  0
Overrun:            0            Lr_in:        2
Suspended:          0            Lr_out:       2
Parity_err:         0            Ols_in:       2
2_parity_err:       0            Ols_out:      0
CMI_bus_err:        0

switch:admin>
```

For more information on the `portshow` command, refer to the *EMC Connectrix Departmental Switch DS-32B2B and Enterprise Director ED-12000B Fabric OS Reference Manua*l.

Displaying Hardware Statistics for a Port

Hardware statistics for a port include information such as number of frames received, number of frames sent, number of encoding errors received, and number of class 2 and 3 frames received.

To display the hardware statistics for a port:

1. Log in to the switch as the admin user.
2. Enter the `portstatsshow` command using the following syntax:

   `portstatsshow slotnumber/portnumber`

   where `slotnumber` and `portnumber` is the port location you want to view.

   The slotnumber is for the ED-12000B only.

   A table of hardware statistics for the port is displayed.

Example The following example shows the hardware statistics displayed using the `portstatsshow` command on an ED-12000B.

```
switch:admin> portstatsshow 7/3
stat_wtx         353          4-byte words transmitted
stat_wrx         391          4-byte words received
stat_ftx         22           Frames transmitted
stat_frx         23           Frames received
stat_c2_frx      0            Class 2 frames received
stat_c3_frx      23           Class 3 frames received
stat_lc_rx       0            Link control frames received
stat_mc_rx       0            Multicast frames received
stat_mc_to       0            Multicast timeouts
stat_mc_tx       0            Multicast frames transmitted
tim_rdy_pri      0            Time R_RDY high priority
tim_txcrd_z      0            Time BB_credit zero
er_enc_in        0            Encoding errors inside of frames
er_crc           0            Frames with CRC errors
er_trunc         0            Frames shorter than minimum
er_toolong       0            Frames longer than maximum
er_bad_eof       0            Frames with bad end-of-frame
er_enc_out       2400         Encoding error outside of frames
er_disc_c3       0            Class 3 frames discarded
open             0            loop_open
transfer         0            loop_transfer
opened           0            FL_Port opened
```

```
starve_stop      0           tenancies stopped due to starvation
fl_tenancy       0           number of times FL has the tenancy
nl_tenancy       0           number of times NL has the tenancy
switch:admin>
```

For more information on the `portstatsshow` command, refer to the *EMC Connectrix Departmental Switch DS-32B2B and Enterprise Director ED-12000B Fabric OS Reference Manual*.

Displaying a Summary of Port Errors

The `porterrshow` command displays a summary of port errors for all the ports in a single switch.

To display a summary of port errors for a switch:

1. Log in to the switch as the admin user.
2. Enter the `porterrshow` command. The display contains one output line per port.

Example The following example displays the summary of port errors using the `porterrshow` command on an ED-12000B.

```
switch:admin> porterrshow
       frames      enc    crc   too   too   bad   enc disc link loss loss frjt fbsy
         tx        rx       in   err shrt long   eof   out    c3 fail sync   sig
    ================================================================================
 0:      0         0        0     0     0     0     0     0     0     0     0     0     0
 1:      0         0        0     0     0     0     0     0     0     0     0     0     0
 2:      0         0        0     0     0     0     0     0     0     0     0     0     0
 3:     22        23        0     0     0     0     0  2.4k     0     3     1     0     0     0
 4:   144k       96k       0     0     0     0     0    19     0     1     0     0     0     0
 5:   142k       96k       0     0     0     0     0    19     0     1     0     0     0     0
 6:   141k       96k       0     0     0     0     0    19     0     1     0     0     0     0
 7:   145k       96k       0     0     0     0     0    18     0     1     0     0     0     0
 8:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
 9:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
10:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
11:      0         0        0     0     0     0     0     0     0     0     0     1     0     0
12:      0         0        0     0     0     0     0     0     0     0     0     1     0     0
13:      0         0        0     0     0     0     0     0     0     0     0     1     0     0
14:      0         0        0     0     0     0     0     0     0     0     0     1     0     0
15:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
32:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
33:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
34:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
35:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
36:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
37:      0         0        0     0     0     0     0     0     0     0     0     0     0     0
```

```
38:    0    0    0    0    0    0    0    0    0    0    0    0    0    0
39:    0    0    0    0    0    0    0    0    0    0    0    0    0    0
40:   95k 142k   0    0    0    0    0   55    0    1    0    0    0    0
41:   95k 141k   0    0    0    0    0   49    0    1    0    0    0    0
42:   95k 144k   0    0    0    0    0   40    0    1    0    0    0    0
43:   95k 140k   0    0    0    0    0   58    0    1    0    0    0    0
44:    0    0    0    0    0    0    0    0    0    0    0    0    0    0
45:    0    0    0    0    0    0    0    0    0    0    0    0    0    0
46:    0    0    0    0    0    0    0    0    0    0    0    1    0    0
47:   31   39    0    0    0    0    0  6.9m   0    0   20    0    0    0
switch:admin>
```

The following table explains the types of errors counted:

Table 5-3 Error Summary Description

Error Type	Description
frames tx	Frames transmitted.
frames rx	Frames received.
enc in	Encoding errors inside frames.
crc err	Frames with CRC errors.
too shrt	Frames shorter than minimum.
too long	Frames longer than maximum.
bad eof	Frames with bad end-of-frame delimiters.
enc out	Encoding error outside of frames.
disc c3	Class 3 frames discarded.
link fail	Link failures (LF1 or LF2 states).
loss sync	Loss of synchronization.
loss sig	Loss of signal.
frjt	Frames rejected with F_RJT.
fbsy	Frames busied with F_BSY.

For more information on the `porterrshow` command, refer to the *EMC Connectrix Departmental Switch DS-32B2B and Enterprise Director ED-12000B Fabric OS Reference Manual*.

Displaying Fan Status

To display the fan status of a switch:

1. Log in to the switch as the admin user.
2. Enter the `fanshow` command. The possible values for fan status are:

   `OK` – Fan is functioning correctly.

   `Absent` – Fan is not present.

   `Below minimum` – Fan is present but rotating too slowly or stopped.

Example The following example displays the fan status using the `fanshow` command on a DS-32B2.

```
switch:admin> fanshow

Fan #1 is OK, speed is 3214 RPM
Fan #2 is OK, speed is 3245 RPM
Fan #3 is OK, speed is 3214 RPM
Fan #4 is OK, speed is 3308 RPM
Fan #5 is OK, speed is 3154 RPM
Fan #6 is OK, speed is 3341 RPM
switch:admin>
```

Example The following example displays the fan status using the `fanshow` command on an ED-12000B.

```
switch:admin> fanshow

Fan #1 is OK, speed is 2576 RPM
Fan #2 is OK, speed is 2500 RPM
Fan #3 is OK, speed is 2500 RPM
switch:admin>
```

The number of fans and valid range for RPMs varies depending on the type of switch. For more information, refer to the particular hardware reference manual for your switch.

Displaying Power Supply Status

To display the power supply status of a switch:

1. Log in to the switch as the admin user.
2. Enter the `psshow` command. The possible values for power supply status are:
   - **OK** - Power supply present and functioning correctly.
   - **Absent** - Power supply not present.
   - **Faulty** - Power supply present but faulty (no power cable, power switch turned off, fuse blown, or other internal error).

   After the status line, a power supply identification line may be shown. If present, this line contains manufacture date, part numbers, serial numbers, and other identification information.

Example The following example displays the power supply status using the `psshow` command on a DS-32B2.

```
switch:admin> psshow

Power Supply #1 is OK
0216,FF2H0000402,60-0000739-01, A,00011,SP467, F,FF2H0000402
Power Supply #2 is OK
0219,FF2Z0000258,60-0000739-01, A,,DCJ3002-01P,PP,FF2Z0000258
switch:admin>
```

Example The following example displays the power supply status using the `psshow` command on an ED-12000B.

```
switch:admin> psshow

Power Supply #1 is OK
 DELTA DPS-1001AB-1E 23000000601 S1   IXD0130000931
Power Supply #2 is OK
 DELTA DPS-1001AB-1E 23000000601 S1   IXD0130000925
Power Supply #3 is OK
 DELTA DPS-1001AB-1E 23000000601 S1   IXD0130000941
Power Supply #4 is OK
 DELTA DPS-1001AB-1E 23000000601 S1   IXD0130000942
switch:admin>
```

The number of Power Supply units varies depending on the type of switch. For more information, refer to the particular hardware reference manual for your switch.

Displaying Temperature Status

To display the temperature status of a switch:

1. Log in to the switch as the admin user.
2. Enter the `tempShow` command. This command displays current temperature readings from each of the five temperature sensors located on the main printed circuit board of the switch. The sensors are located, approximately, one in each corner and one at the center of the PCB.

Example The following example displays the temperature status using the `tempshow` command on a DS-32B2.

```
switch:admin> tempshow

Index   Slot    State           Centigrade     Fahrenheit
=========================================================
  1       0      Ok                  43             109
  2       0      Ok                  40             104
  3       0      Ok                  22              71
  4       0      Ok                  42             107
  5       0      Ok                  39             102

switch:admin>
```

Example The following example displays the temperature status using the `tempshow` command on an ED-12000B.

```
   switch:admin> tempshow

Index   Slot    State           Centigrade     Fahrenheit
=========================================================
  1       1      Ok                  46             114
  2       2      Absent
  3       3      Ok                  42             107
  4       4      Absent
  5       5      Ok                  23              73
  6       6      Ok                  24              75

switch:admin>
```

The number of temperature sensors, the location of the sensors, and the range of temperatures for safe operation varies depending on the type of switch. For more information, refer to the particular hardware reference manual for your switch.

Running Diagnostic Tests on the Switch Hardware

There are several diagnostic tests you can run on a switch. The following tests are generally run during POST, which is performed each time a switch is booted up:

- camtest
- centralMemoryTest
- cmemRetentionTest
- cmiTest
- crossPortTest
- portLoopbackTest
- sramRetentionTest
- turboRamTest
- statsTest
- spinSilk

supportShow

Display status information of the switch and devices attached to the switch.

The output is very long. The `supportShow` command is used to gather switch information for debugging purposes. Your EMC Customer Service representative may ask you to run this command and capture the output. This information will aid Customer Service in diagnosing problems that could occur on the switch.

Syntax `supportShow [slot/Port1-Port2] [lines]`

The slotnumber is for the ED-12000B only.

Availability All users

Description Use this command to display multiple per selected Telnet user command results with a range of port specified in the user input

Operands This command has the following operands:

slot/port1-port2	Specify the range of ports within the blade specified by the slot to be displayed. Slot must be provided by ED-12000B only.
lines	Specify the number of lines for portlogdump output.

Example **To display switch information for debugging:**

```
switch:admin> supportShow 1/1-3
  version:
  Kernel:     2.4.2
  Fabric OS:  4.0.0t4Feb
  Made on:    Wed Feb 6 17:29:57 2002
  Flash:      Thu Jan 1 00:03:19 1970
  BootProm:   3.1.13b

  uptime:
   9:59pm  up  7 days, 4:25,  2 users,  load average: . . . .

  tempshow:

  Index   Slot    State           Centigrade     Fahrenheit
  ============================================================
     1         1      Ok                  41         105
     2         2      Ok                  39         102
     3         3      Ok                  40         104

       ---< output truncated >---
```

6

Updating the Core PID Format

This chapter provides information about updating the Core Switch Port Identifier (PID) Format, including best practices for updating an existing production SAN to the new PID format.

In addition to the core PID format update process, there are a number of common scenarios in which a device may be assigned a new PID. Therefore the procedures included in this chapter are applicable to other areas of SAN administration, and should be generally useful to any SAN administrator. While this chapter is not comprehensive, it should provide a SAN administrator with the information required to plan and execute a successful core PID format update, and provide useful information for other SAN management tasks.

Overview

Updating the Core Switch PID Format is required when upgrading an existing SAN to support larger port-count switches. When a switch with more than 16 ports such as the DS-32B2 or the ED-12000B is introduced into an existing fabric, this parameter needs to be set on all switches in the fabric.

EMC recommends redundant fabrics and multi-pathing software for uptime-sensitive environments. If a redundant SAN architecture is in place, the Core PID update can take place without application downtime. To ensure maximum ease of administration, this parameter should be set on all switches in a fabric before the fabric enters production, regardless of whether an upgrade to larger switches is planned.

There are two addressing mechanisms used in Fibre Channel; Port Identifier (PID) and World Wide Name (WWN).

- A Port Identifier (PID) is analogous to specifying the physical switch and port to which a device is attached in a network; it is not analogous to an IP address. PIDs are assigned by a Fibre Channel switch when a device logs into the fabric, and a sample PID might look like the following: 011F00. There are numerous situations in which a device's PID may change.
- A WWN is analogous to an Ethernet MAC address. WWNs are assigned by the factory when a device is manufactured, and do not change. An sample WWN might look like the following: 10:00:00:60:69:51:0e:8b.

The method DS-8B, DS-16B, and DS-16B2 switches use to assign PIDs differs from the larger port count products.

The PID format is `XX1YZZ`:

- `XX` is the domain ID
- `1` is a constant (based on a conservative reading of the Fibre Channel standards)
- `Y` is a hexadecimal number which specifies a particular port on a switch
- `ZZ` is the AL_PA

The larger port count format is `XXYYZZ`:

- `XX` is the domain ID

- YY represents a port (using entire middle byte allows addressing up to 256 ports per switch)
- ZZ is the AL_PA

When a switch with the larger port count format is introduced into an existing fabric, the core PID format must be set on all switches in the fabric to prevent segmentation. This does not require application downtime, if redundant fabrics are used. If redundant fabrics are not in use, it is necessary to schedule an outage for the fabric.

EMC recommends redundant fabrics and multi-pathing software for uptime-sensitive environments. If redundant fabrics are *not* used, there are numerous possible failure cases and even routine maintenance scenarios that can result in application downtime.

Examples of scenarios protected by redundant fabrics include:

- Add / move / change operations for devices or switches
- Major upgrades / changes to fabric architecture
- Physical disasters
- Changing the core PID format
- Changing any other fabric-wide parameters, for example ED_TOV
- Erroneous zoning changes / user error

For new fabrics, the PID format should always be set to the larger port count addressing method before the fabric enters production. When updating an existing SAN, there are several scenarios which must be evaluated before changing the PID format.

Proactively setting the core PID format on new fabrics is strongly recommended to save potential administrative effort later on. There is no difference in the behavior of a fabric with either PID format.

Some device drivers map logical disk drives to physical Fibre Channel counterparts by PID. An example in a Windows HBA driver is Drive E: = PID 011F00. Most drivers can either dynamically change PID mappings or use the WWN of the Fibre Channel disk for mapping, not the PID. For example, Drive E: = WWN 10:00:00:60:69:51:0e:8b.

For those few drivers that use static PID binding, when the format is changed (PID à 010F00), the mapping breaks and must be manually fixed. (The driver still has Drive E: = PID 011F00 but the actual device address is now 010F00.) This can be done by rebooting the host, or using a manual update procedure on the host. This is discussed in more detail in the following sections.

- *Collecting Data* on page 6-5 of this chapter discusses in more detail the process of updating to the new PID format. This starts with evaluating a production SAN to see which if any devices bind by PID. Then either an online or offline update procedure is chosen to perform the actual update.
- *Detailed Procedures for HP/UX and AIX* on page 6-14 provides examples of step-by-step instructions for certain PID-bound devices. These procedures are applicable to any of a broad class of routine maintenance tasks; indeed, they would apply to these devices in many scenarios with any Fibre Channel switch in any addressing mode.
- *Frequently Asked Questions* on page 6-18 provides a Q&A format to discuss the issues surrounding a core PID format update.

In the more typical case where WWN or dynamic PID binding is used, changing the device's PID does not affect the mapping, but before updating the PID format, it is necessary to determine whether or not any devices in the SAN bind by PID.

Important EMC strongly recommends against using drivers that bind by PID. There are several routine maintenance procedures which may result in a device receiving a new PID; examples include but are not limited to:

- Changing **Compatibility Mode** settings
- Changing switch domain IDs
- Merging fabrics
- Merging fabrics
- Updating the core PID format
- Using hot spare switch ports to deal with failures

In every case where devices bind by PID, any such procedure becomes difficult or impossible to execute without downtime. In some cases, device drivers allow the user to manually specify persistent bindings by PID. In these cases, such devices must be identified and an appropriate update procedure created. If possible, the procedure should involve changing from PID binding to WWN binding.

Collecting Data

The fabric must be evaluated to find any devices which bind to PIDs, determine how each device driver will respond to the PID format change, and determine how any multi-pathing software will respond to a fabric service interruption. If current details about the SAN are already available, it may be possible to skip the Data Collection step. If not, it is necessary to collect information about each device in the SAN. Any kind of device may be able to bind by PID; each device should be evaluated prior to attempting an online update. This information has broad applicability, since PID-bound devices are not able to seamlessly perform in many routine maintenance or failure scenarios.

Following is a non-comprehensive list of information to collect:

- HBA driver versions
- Fabric OS versions
- RAID array microcode versions
- SCSI bridge code versions
- Multi-pathing software versions
- HBA time-out values
- Multi-pathing software time-out values
- Kernel time-out values
- Configuration

Some device drivers do not automatically bind by PID, but allow the operator to manually create a PID binding. For example, persistent binding of PIDs to logical drives may be done in many HBA drivers. Make a list of all devices that are configured this way. If manual PID binding is in use, consider changing to WWN binding.

Following are some of the device types that may be manually configured to bind by PID:

- HBA drivers (persistent binding)
- RAID arrays (LUN access control)
- SCSI bridges (LUN mapping)

Data Analysis

Once you have determined the code versions of each device on the fabric, they must be evaluated to find out if any automatically bind by PID. It may be easiest to work with the support providers to get this information. If this is not possible, you may need to perform empirical testing. Most devices that are running up-to-date drivers do not bind by PID.

Binding by PID can create management difficulties in a number of scenarios. EMC recommends using up-to-date drivers that do not bind by PID. If the current drivers do bind by PID, EMC recommends upgrading to WWN-binding drivers if possible.

The drivers shipping by default with HP/UX and AIX at the time of this writing still bind by PID, and so detailed procedures are provided for these operating systems are provided in this chapter. Similar procedures can be developed for other operating systems that run HBA drivers that bind by PID.

There is no inherent PID binding problem with either AIX or HP/UX. It is the HBA drivers shipping with these operating systems that bind by PID. Both operating systems are expected to release HBA drivers that bind by WWN, and these drivers may already be available through some support channels. Work with the appropriate support provider to find out about driver availability.

It is also important to understand how multi-pathing software reacts when one of the two fabrics is taken offline. If the time-outs are set correctly, the switchover between fabrics should be transparent to the users.

Empirical Testing

Empirical testing may be required for some devices, to determine whether they bind by PID. If you are not sure about a device, work with the support provider to create a test environment.

Create as close a match as practical between the test environment and the production environment, and perform an update using the Online Update procedure, provided above. Devices that bind by PID are unable to adapt to the new format, and one of three approaches must be taken with them:

- A plan can be created for working around the device driver's limitations in such a way as to allow an online update. See the Detailed Procedures section for examples of how this could be done.
- The device can be upgraded to drivers that do not bind by PID.
- Downtime can be scheduled to reset the device during the core PID update process, which generally allows the mapping to be rebuilt.

If either of the first two options are used, the procedures should again be validated in the test environment.

Determine the behavior of multi-pathing software, including but not limited to:

- HBA time-out values
- Multi-Pathing software time-out values
- Kernel time-out values

Planning the Update Procedure

Whether it is best to perform an offline or online update depends on the uptime requirements of the site.

- An offline update requires less advance planning than an online update. However, it requires that all devices attached to the fabric be offline.
- With careful planning, testing, and general due-diligence, it should be safe to update the core PID format parameter in a live, production environment. This requires dual fabrics with multi-pathing software. Avoid running backups during the update process, as tape drives tend to be very sensitive to I/O interruption. The online update process is only intended for use in `uptime-critical dual-fabric environments, with multi-pathing software` (high-uptime environments should always use a redundant fabric SAN architecture). Schedule a time for the update when the least critical traffic is running.

All switches running any version of Fabric OS 4.x are shipped with the Core Switch PID Format enabled, so it is not necessary to perform the PID format change on these switches.

Migrating from manual PID binding (such as persistent binding on an HBA) to manual WWN binding and/or upgrading drivers to versions that do not bind by PID can often be done before setting the core PID format. This reduces the number of variables in the update process.

Outline for Online Update Procedure

The following steps are intended to provide SAN administrators a starting point for creating site-specific procedures.

1. Back up all data and verify backups.
2. If there is doubt as to whether the multi-pathing software can automatically switchover between fabrics seamlessly, use the software's administrative tools to manually disassociate or mark offline all storage devices on the first fabric to be updated.
3. Verify that I/O continues over the other fabric.
4. Disable all switches in the fabric to be updated, one switch at a time, and verify that I/O continues over the other fabric after each switch disable.
5. Change the PID format on each switch in the fabric (procedure provided below).
6. Re-enable the switches in the updated fabric, one switch at a time. In a core/edge network, enable the core switches first.
7. Once the fabric has re-converged, use the `cfgenable` command to update zoning (procedure provided below).
8. For any devices manually bound by PID, update their bindings. This may involve changing them to the new PIDs, or preferably changing to WWN binding.
9. For any devices automatically bound by PID, two options exist:
   a. Execute a custom procedure to rebuild its device tree online. Examples are provided in the Detailed Procedures section of this chapter.
   b. Reboot the device to rebuild the device tree. Some operating systems require a special command to do this, for example "boot –r" in Solaris.
10. For devices that do not bind by PID or have had their PID binding updated, mark online or re-associate the disk devices with the multi-pathing software and resume I/O over the updated fabric.
11. Repeat with the other fabric(s).

Outline for Offline Update Procedure

The following steps are intended to provide SAN administrators a starting point for creating site-specific procedures.

1. Schedule an outage for all devices attached to the fabric.
2. Back up all data and verify backups.
3. Shut down all hosts and storage devices attached to the fabric.
4. Disable all switches in the fabric.
5. Change the PID format on each switch in the fabric (procedure provided below).
6. One at a time, re-enable the switches in the updated fabric. In a core/edge network, enable the core switches first.
7. Once the fabric has re-converged, use the `cfgenable` command to update zoning (procedure provided below).
8. Bring the devices online in the order appropriate to the SAN. This usually involves starting up the storage arrays first, and the hosts last.
9. For any devices manually bound by PID, bring the device back online, but do not start applications. Update their bindings and reboot again if necessary. This may involve changing them to the new PIDs, or may (preferably) involve changing to WWN binding.
10. For any devices automatically bound by PID, reboot the device to rebuild the device tree (some operating systems require a special command to do this, such as “boot –r” in Solaris).
11. For devices that do not bind by PID or have had their PID binding updated, bring them back up and resume I/O.
12. Verify that all I/O has resumed correctly.

Hybrid Update

It is possible to combine the online and offline methods for fabrics where only a few devices bind by PID. Since any hybrid procedure is extremely customized, it is necessary to work closely with the SAN service provider in these cases.

Procedure for Updating the Core PID Format

This process should be executed as part of the overall online or offline update process. However, it may be implemented in a stand-alone manner on a non-production fabric, or a switch that has not yet joined a fabric.

1. Ensure that all switches in the fabric are running Fabric OS versions that support the new addressing mode. Check the EMC Support Matrix for the most current firmware revisions.

   All switches running any version of Fabric OS 4.x are shipped with the Core Switch PID Format enabled, so it is not necessary to perform the PID format change on these switches.

2. Telnet into one of the switches in the fabric.
3. Disable the switch by entering the `switchdisable` command.
4. Enter the `configure` command (the configure prompts display sequentially).
5. Enter **y** after the **Fabric parameters** prompt.
6. At the **Core Switch PID Format** prompt, enter **1**.
7. Complete the remaining prompts or press **CTRL-D** to accept the remaining settings without completing all the prompts.
8. Re-enable the switch by entering the `switchenable` command.
9. Repeat steps 2 through 8 for the remaining switches in the fabric.

Example

```
switch:admin> switchdisable
switch:admin> configure
Configure...
   Fabric parameters (yes, y, no, n): [no] yes

    Domain: (1..239) [1]
    R_A_TOV: (4000..120000) [10000]
    E_D_TOV: (1000..5000) [2000]
    Data field size: (256..2112) [2112]
    Sequence Level Switching: (0..1) [0]
    Disable Device Probing: (0..1) [0]
    Suppress Class F Traffic: (0..1) [0]
    SYNC IO mode: (0..1) [0]
    VC Encoded Address Mode: (0..1) [0]
    Core Switch PID Format: (0..1) [0] 1
    Per-frame Route Priority: (0..1) [0]
    Long Distance Fabric: (0..1) [0]
    BB credit: (1..27) [16]
```

```
  Virtual Channel parameters (yes, y, no, n): [no]
  Switch Operating Mode (yes, y, no, n): [no]
  Zoning Operation parameters (yes, y, no, n): [no]
  RSCN Transmission Mode (yes, y, no, n): [no]
  Arbitrated Loop parameters (yes, y, no, n): [no]
  System services (yes, y, no, n): [no]
  Portlog events enable (yes, y, no, n): [no]
Committing configuration...done.
switch:admin> switchenable
```

10. Once all switches are updated to use the new PID format and re-enabled, verify that the fabric has fully re-converged (each switch sees the other switches).

Important

To prevent segmentation, it is critical that the fabric be completely re-converged before continuing with the next step.

11. Enter **`cfgenable`** `[active_zoning_config]` on one of the switches in the fabric to update zoning to use the new PID format. This does not change the definition of zones in the fabric, but merely causes the lowest level tables in the zoning database to be updated with the new PID format setting. It is only necessary to do this once per fabric; the zoning update automatically propagates to all switches.

    At this point, all switches in the fabric are operating in the new addressing mode.

Detailed Procedures for HP/UX and AIX

These procedures are not intended to be comprehensive. They provide a starting point from which a SAN administrator could develop a site-specific procedure for a device that binds automatically by PID, and cannot be rebooted due to uptime requirements.

HP/UX

1. Back up all data. Verify backups.
2. If you are not using multi-pathing software, stop all I/O going to all volumes connected through the switch/fabric to be updated.
3. If you are not using multi-pathing software, unmount the volumes from their mount points using umount. The proper usage would be `umount <mount_point>`. For example:

   ```
   umount /mnt/jbod
   ```

4. If you are using multi-pathing software, use that software to remove one fabric's devices from its configuration.
5. Deactivate the appropriate volume groups using vgchange. The proper usage would be `vgchange -a n <path_to_volume_group>`. For example:

   ```
   vgchange -a n /dev/jbod
   ```

6. Make a backup copy of the volume group directory using tar from within /dev. For example:

   ```
   tar -cf /tmp/jbod.tar jbod
   ```

7. Export the volume group using vgexport. The proper usage would be `vgexport -m <mapfile> <path_to_volume_group>`. For example:

   ```
   vgexport -m /tmp/jbod_map /dev/jbod
   ```

8. Log in to each switch in the fabric.
9. Issue the `switchDisable` command.
10. Issue the `configure` command and change the Core Switch PID Format to `1`.

11. Issue the command `cfgEnable [effective_zone_configuration]`. For example:

    ```
    cfgEnable my_zones
    ```

12. Issue the `switchEnable` command. Enable the core switches first, then the edges.
13. Clean the `lvmtab` file by using the `vgscan` command.
14. Change `to /dev` and untar the file that was tared in step 4. For example:

    ```
    tar -xf /tmp/jbod.tar
    ```

15. Import the volume groups using vgimport. The proper usage would be `vgimport -m <mapfile> <path_to_volume_group> <physical_volume_path>`. For example:

    ```
    vgimport -m /tmp/jbod_map /dev/jbod /dev/dsk/c64t8d0
       /dev/dsk/c64t9d0
    ```

16. Activate the volume groups using vgchange. The proper usage would be `vgchange -a y <path_to_volume_group>`. For example:

    ```
    vgexport -a y /dev/jbod
    ```

17. If you are not using multi-pathing software, mount all devices again and restart I/O. For example:

    ```
    mount /mnt/jbod
    ```

18. If you are using multi-pathing software, re-enable the affected path. The preceding steps do not “clean up” the results from ioscan. When viewing the output of ioscan, notice the that the original entry is still there, but now has a status of NO_HW.

Example

```
# ioscan -funC disk
Class       I   H/W Path                    Driver S/W State      H/W Type          Description
-------------------------------------------------------------------------------------------
disk        0   0/0/1/1.2.0                 adisk CLAIMED         DEVICE            SEAGATE ST39204LC
                                            /dev/dsk/c1t2d0 /dev/rdsk/c1t2d0
disk        1   0/0/2/1.2.0                 adisk CLAIMED         DEVICE            HP   DVD-ROM 304
                                            /dev/dsk/c3t2d0 /dev/rdsk/c3t2d0
disk        319 0/4/0/0.1.2.255.14.8.0      adisk CLAIMED         DEVICE            SEAGATE ST336605FC
                                            /dev/dsk/c64t8d0 /dev/rdsk/c64t8d0
disk        320 0/4/0/0.1.18.255.14.8.0     adisk NO_HW           DEVICE            SEAGATE ST336605FC
                                            /dev/dsk/c65t8d0 /dev/rdsk/c65t8d0
```

19. To remove the original (outdated) entry, the `rmsf` command (remove special file) will be needed. The proper usage for this command would be `rmsf -a -v <path_to_device>`. For example:

    ```
    rmsf -a -v /dev/dsk/c65t8d0
    ```

20. Validate that the entry has been removed by using the `ioscan -funC disk` command. Notice in the figure below that the NO_HW entry is no longer listed.

```
het46 (HP-50001)> ioscan -funC disk
Class       I   H/W Path                    Driver S/W State      H/W Type          Description
-------------------------------------------------------------------------------
disk        0   0/0/1/1.2.0                 adisk CLAIMED         DEVICE            SEAGATE ST39204LC
                                            /dev/dsk/c1t2d0 /dev/rdsk/c1t2d0
disk        1   0/0/2/1.2.0                 adisk CLAIMED         DEVICE            HP       DVD-ROM
    304
                                            /dev/dsk/c3t2d0 /dev/rdsk/c3t2d0
disk        319 0/4/0/0.1.2.255.14.8.0      adisk CLAIMED         DEVICE            SEAGATE ST336605FC
                                            /dev/dsk/c64t8d0 /dev/rdsk/c64t8d0
```

21. Repeat for all fabrics.

AIX Procedure

1. Backup all data. Verify backups.
2. If you are not using multi-pathing software, stop all I/O going to all volumes connected through the switch or fabric to be updated.
3. If you are not using multi-pathing software, varyoff the volume groups. The command usage is `varyoffvg <volume_group_name>`. For example:

   ```
   varyoffvg datavg
   ```

4. If you are not using multi-pathing software, unmount the volumes from their mount points using umount. The command usage is `umount <mount_point>`. For example:

   ```
   umount /mnt/jbod
   ```

5. If you are using multi-pathing software, use that software to remove one fabric's devices from its configuration.
6. Remove the device entries for the fabric you are migrating. For example, if the HBA for that fabric is fcs0, execute the command:

   ```
   rmdev -Rdl fcs0
   ```

7. Log in to each switch in the fabric.
8. Issue the `switchDisable` command.

9. Issue the `configure` command and change the Core Switch PID Format to `1`.
10. Issue the `configenable [effective_zone_configuration]` command. For example:

    ```
    configenable my_config
    ```

11. Issue the `switchEnable` command. Enable the core switches first, then the edges.
12. Rebuild the device entries for the affected fabric using the `cfgmgr` command. For example:

    ```
    cfgmgr -v
    ```

    This command may take several minutes to complete.

13. If you are not using multi-pathing software, vary on the disk volume groups. The proper usage would be `varyonvg <volume_group_name>`. For example:

    ```
    varyonvg datavg
    ```

14. If you are not using multi-pathing software, mount all devices again and restart I/O. For example:

    ```
    mount /mnt/jbod
    ```

15. If you are using multi-pathing software, re-enable the affected path.
16. Repeat for all fabrics.

Frequently Asked Questions

Q: What is a PID?
A: A PID is a Port Identifier. PIDs are used by the routing and zoning services in Fibre Channel fabrics to identify ports in the network. They are not used to uniquely identify a device; the World Wide Name (WWN) does that.

Q: What situations can cause a PID to change?
A: Many scenarios cause a device to receive a new PID. For example, unplugging the device from one port and plugging it into a different port (this might happen when cabling around a bad port, or when moving equipment around). Another example is changing the domain ID of a switch, which might be necessary when merging fabrics, or changing compatibility mode settings.

Q: Why do some devices handle a PID change well, and some poorly?
A: Some older device drivers behave as if a PID uniquely identifies a device. These device drivers should be updated if possible to use WWN binding instead. A device's WWN never changes, unlike its PID. PID binding creates problems in many routine maintenance scenarios, and should always be avoided. Fortunately, very few device drivers still behave this way, and these are expected to be updated as well.

Q: Must I schedule downtime for my SAN to perform the PID update?
A: Only if you do not have dual-fabrics or have devices that bind by PID.

Q: Must I stop all traffic on the SAN before performing the update?
A: If you are running dual-fabrics with multi-pathing software, you can update one fabric at a time. Move all traffic onto one fabric in the SAN, update the other fabric, move the traffic onto the updated fabric, and update the final fabric. Without dual-fabrics, stopping traffic is highly recommended. This is the case for many routine maintenance situations, so dual-fabrics are always recommended for uptime-sensitive environments.

Q: How can I avoid having to change PID formats on fabrics in the future?

A: The core PID format can be proactively set on a fabric at initial installation. The update could also be opportunistically combined with any scheduled outage. Setting the format proactively far in advance of adoption of higher port count switches is the best way to ensure administrative ease.

A

Customer Support

This appendix reviews the EMC process for detecting and resolving software problems, and provides essential questions that you should answer before contacting the EMC Customer Support Center.

This appendix covers the following topics:

Overview of Detecting and Resolving Problems

EMC software products are supported directly by the EMC Customer Support Center in the United States.

EMC uses the following process to resolve customer problems with its software products (Figure A-1).

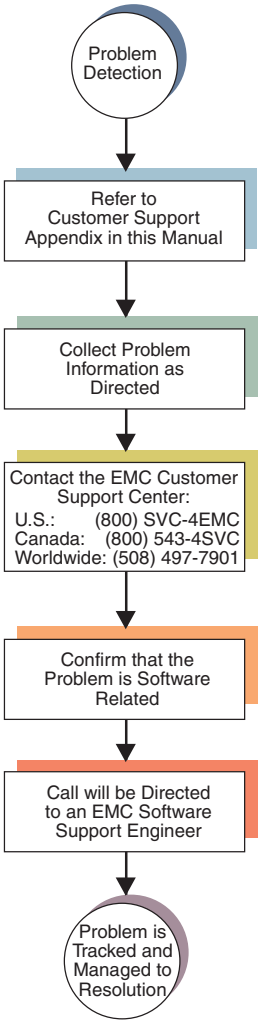

Figure A-1 Problem Detection and Resolution Process

Troubleshooting the Problem

Please perform the relevant diagnostic steps before you contact the EMC Customer Support Center:

1. Read the documentation carefully.
2. Reconstruct the events leading up to the problem and describe them in writing.
3. Run some test cases to reproduce the problem.

If you encounter a problem that requires technical programming or analysis, call the nearest EMC office or contact the EMC Customer Support Center at one of the following numbers:

United States: **(800) 782-4362 (SVC-4EMC)**

Canada: **(800) 543-4782 (543-4SVC)**

Worldwide: **(508) 497-7901**

Please do not request a specific support representative unless one has already been assigned to your particular system problem.

For additional information on the EMC products and services available to customers and partners, refer to the EMC Powerlink website at:

```
http://powerlink.emc.com
```

Before Calling the Customer Support Center

Have the following information available before calling the Customer Support Center or your support representative (if one has been assigned to you):

- ❑ Your company name
- ❑ Your name
- ❑ Your phone number
- ❑ For an existing problem, the problem tracking system ID, if one was previously assigned to the problem by a support representative

Documenting the Problem

If the EMC Customer Support Center requests information regarding the problem, please document it completely, making sure to include the following information:

- ❑ Your company name and address
- ❑ Your name
- ❑ Your telephone number
- ❑ The importance of the problem, so that it can be assigned a priority level

To expedite the processing of your support request, you can photocopy this list and include it with the package.

Reporting a New Problem

For a new problem, please provide the following information:

- ❑ Release level of the software that you are running
- ❑ Software installation parameters
- ❑ Host type on which you are running
- ❑ Operating system you are running and its release number
- ❑ Functions of the software that you are running
- ❑ Whether you can reproduce the problem
- ❑ Previous occurrences of the problem
- ❑ Whether the software has ever worked correctly
- ❑ Time period that the software did work properly
- ❑ Conditions under which the software worked properly
- ❑ Changes to your system between the time the software worked properly and the problem began
- ❑ Exact sequence of events that led to the system error
- ❑ Message numbers and complete text of any messages that the system produced
- ❑ Log file dated near the time the error occurred
- ❑ Results from tests that you have run
- ❑ Other related system output
- ❑ Other information that may help solve the problem

Sending Problem Documentation

Use one of the following methods to send documentation of the problem to the EMC Customer Support Center:

- Email
- FTP
- U.S. Mail to the following address:

  EMC Customer Support Center
  45 South Street
  Hopkinton, MA 01748-9103

  If the problem was assigned a number or a specific support representative, please include that information in the address as well.

Glossary

The terms in the glossary relate to the switch and Fibre Channel connections. Many of these terms are used in this manual.

Numbers

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

16-Port Card The fibre channel port card provided with ED-12000B. Contains 16 fibre channel ports and the corresponding LEDs indicating port status and speed. See also *Port Card*.

A

Access Control List Enables an organization to bind a specific WWN to a specific switch port or set of ports, preventing a port in another physical location from assuming the identity of a real WWN. May also refer to a list of the read/write access of a particular community string. See also *Device Connection Controls*.

Address Identifier A 24-bit value or 8-bit value used to identify the source or destination of a frame.

Admin Account A login account intended for use by the customer to control switch operation.

Alias An alternate name for an element or group of elements in the fabric. Aliases can be 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 may be shared by multiple ports.

Alias Server A fabric software facility that supports multicast group management.

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

ANSI American National Standards Institute. The governing body for Fibre Channel standards in the U.S.A.

API Application programming interface. A defined protocol that allows applications to interface with a set of services.

Arbitrated Loop A shared Fibre Channel transport structured as a loop. Supports up to 126 devices and one fabric attachment. See also *Topology.*

Area Number A number assigned to each potential port location in the ED- 12000B. Used to distinguish ED- 12000B ports that have the same port number but are on different port cards.

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.

Auto-Negotiate Speed Process that allows two devices at either end of a link segment to negotiate common features, speed (e.g., 1 or 2 Gb/s) and functions.

Autosense Process during which a network device automatically senses the speed of another device.

B

Backup FCS Switch Backup fabric configuration server switch. The switch or switches assigned as backup in case the primary FCS switch fails. See also *FCS Switch* and *Primary FCS Switch.*

Bandwidth The total transmission capacity of a cable, link, or system. Usually measured in bps (bits per second). May also refer to the range of transmission frequencies available to a network. See also *Throughput*.

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. See also *Buffer to Buffer Flow Control* and *EE_Credit*.

Beacon When all 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 tTlnet command or through 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. See also *Disparity*.

BER Bit error rate. Tthe rate at which bits are expected to be received in error. Expressed as the ratio of error bits to total bits transmitted. See also *Error*.

Blade See *16-Port Card*.

Block As applies to Fibre Channel, upper-level application data that is transferred in a single sequence.

Blower Assembly A fan that prevents a switch (or individual elements within a switch) from over heating.

Boot Flash Flash memory that stores the boot code and boot parameters. The processor executes its first instructions from boot flash. Data is cached in RAM.

Boot Monitor Code used to initialize the CP (control processor) environment after powering on. Identifies the amount of memory available and how to access it, and retrieves information about system buses.

Broadcast The transmission of data from a single source to all devices in the fabric, regardless of zoning. See also *Multicast* and *Unicast*.

Buffer to Buffer Flow Control Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop. See also *BB_Credit*.

C

Cascade The interconnection means through which data flows from one switch to another in a fabric.

Chassis The metal frame in which the switch and switch components are mounted.

Circuit An established communication path between two ports. Consists of two virtual circuits capable of transmitting in opposite directions. See also *Link*.

Class 1 The class of frame-switching service that provides a dedicated connection between two communicating ports (also called connection- oriented service), with acknowledgment of delivery or nondelivery of frames.

Class 2 A connectionless class of frame switching service that includes acknowledgment of delivery or nondelivery of frames.

Class 3 A connectionless frame switching service that does not include acknowledgment of delivery or nondelivery of frames. Can be used to provide a multicast connection between the originator and recipients, with acknowledgment of delivery or nondelivery of frames.

Class F The class of frame switching service for a direct connection between two switches, allowing communication of control traffic between the E_Ports, with notification of delivery or nondelivery of data.

Class of Service A specified set of delivery characteristics and attributes for frame delivery.

CLI Command line interface. Interface that depends entirely on the use of commands, such as through Telnet or SNMP, and does not involve a graphical user interface.

Comma A unique pattern (either 1100000 or 0011111) used in 8b/10b encoding to specify character alignment within a data stream. See also *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. See also *SNMP*.

Compact Flash Flash memory that stores the run time operating system and is used like hard disk storage. Not visible within the processor's memory space. Data is stored in file system format.

Configuration How a system is set up. May refer to hardware or software.

Hardware: The number, type, and arrangement of components that make up a system or network.

Software: The set of parameters that guide switch operation. May include general system parameters, IP address information, domain ID, and other information. Modifiable by any login with administrative privileges.

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.

Control Panel Refers to the left-side panel of Web Tools, which accesses fabric-wide functions such as zoning and events.

Core Switch A switch whose main task is to interconnect other switches. See also *Edge Switch*

CP Card Control processor card. The central processing unit of the ED-12000B contains two CP card slots to provide redundancy. Provides ethernet, serial, and modem ports with the corresponding LEDs.

CRC Cyclic redundancy check. A check for transmission errors included in every data frame.

Credit As applies to Fibre Channel, the number of receive buffers available for transmission of frames between ports. See also *BB_Credit* and *EE_Credit*.

Cut-through A switching technique that allows the route for a frame to be selected as soon as the destination address is received. See also *Route*.

D

Data Word Type of transmission word that occurs within frames. The frame header, data field, and CRC all consist of data words. See also *Frame*, *Ordered Set*, and *Transmission Word*.

DB-9 Connector A 9-pin version of the RS-232C port interface. May be either the male or female interface. See also *RS-232 Port*.

dBm, dBW Logarithmic units of power used in electronics. Indicates signal strength in decibels above the reference level, which is 1 milliwatt for dBm, and 1 watt for dBW. An increase of 10 dBm or 10 dBW represents a 10-fold increase in power.

DCE Port A data communications equipment port capable of interfacing between a DTE (data terminal equipment) port and a transmission circuit. DTE devices with an RS-232 (or EIA-232) port interface transmit on pin 3, and receive on pin 2. See also *DTE Port* and *RS-232 Port*.

Defined Zone Configuration The set of all zone objects defined in the fabric. May include multiple zone configurations. See also *Zone Configuration*.

Device A disk, a RAID, or an HBA.

Device Connection Controls Enables organizations to bind an individual device port to a set of one or more switch ports. Device ports are specified by a WWN and typically represent HBAs (servers). See also *Access Control List*.

Disparity The relationship of ones and zeros in an encoded character. Neutral disparity means an equal number of each, positive disparity means a majority of ones, and negative disparity means a majority of zeros.

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.

Domain ID As applies to Departmental Switches, a unique number between 1 and 239 that identifies the switch to the fabric and is used in routing frames. Usually automatically assigned by the switch, but can be manually assigned.

DTE Port A data terminal equipment port capable of interfacing to a transmission circuit through a connection to a DCE (data communications equipment) port. DTE devices with an RS-232 (or (EIA-232) port interface transmit on pin 3, and receive on pin 2 in a 9-pin connection (reversed in 25-pin connectors). See also *DCE Port* and *RS-232 Port*.

DWDM Dense wavelength multiplexing. A means to concurrently transmit more than one stream of data through a single fiber by modulating each stream of data on to a different wavelength of light.

E

Edge Switch A switch whose main task is to connect nodes to the fabric. See also *Core Switch*.

E_D_TOV Error detect time-out 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 condition is declared. See also *R_A_TOV*.

E_Port Expansion port. A type of switch port that can be connected to an E_Port on another switch to create an ISL. See also *ISL*.

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 the exchange of frames across the fabric between source and destination. See also *End-to-End Flow Control* and *BB_Credit*.

Effective Zone Configuration The currently enabled configuration of zones. Only one configuration can be enabled at a time. See also *Defined Zone Configuration* and *Zone Configuration*.

EIA Rack A storage rack that meets the standards set by the Electronics Industry Association.

End-to-End Flow Control Governs flow of Class 1 and 2 frames between N_Ports. See also *EE_Credit*.

Error As applies to Fibre Channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal (link errors).

ESN Enterprise Storage Network. A storage network implementation that integrates products, technology, and services offering universal data access for every major computing platform, operating system, and application across any combination of SCSI, Ultra SCSI, Fibre Channel, and ESCON technologies.

Exchange The highest level Fibre Channel mechanism used for communication between N_Ports. Composed of one or more related sequences, and can work in one or both directions.

Extended Fabrics A product that runs on Fabric OS and allows creation of a Fibre Channel fabric interconnected over distances of up to 100 kilometers.

F

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* and *Fx_Port*.

Fabric A Fibre Channel network containing two or more switches in addition to hosts and devices. May also be referred to as a switched fabric. See also *Topology*, *ESN,* and *Cascade*.

Fabric Access Allows the application to control the fabric directly for functions such as discovery, access (zoning) management, performance, and switch control. Consists of a host-based library that interfaces the application to switches in the fabric over an out-of-band TCP/IP connection or in-band using an IP-capable host bus adapter (HBA).

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

Failover The act that causes control to pass from one redundant unit to another.

FC-AL-3 The Fibre Channel Arbitrated Loop standard defined by ANSI. Defined on top of the FC-PH standards.

FCIA Fibre Channel Industry Association. An international organization of Fibre Channel industry professionals. Provides oversight of ANSI and industry-developed standards, among other tasks.

FC-FLA The Fibre Channel Fabric Loop Attach standard defined by ANSI.

FCP Fibre Channel Protocol. Mapping of protocols onto the Fibre Channel standard protocols. For example, SCSI FCP maps SCSI-3 onto Fibre Channel.

FC-PH-1, 2, 3 The Fibre Channel Physical and Signalling Interface standards defined by ANSI.

FC-PI The 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.

FCS Switch Fabric configuration server switch. One or more designated switches that store and manage the configuration and security parameters for all switches in the fabric. FCS switches are designated by WWN, and the list of designated switches is communicated fabric-wide. See also *Backup FCS Switch* and *Primary FCS Switch*.

FC-SW-2 The second generation of the Fibre Channel Switch Fabric standard defined by ANSI. Specifies tools and algorithms for the interconnection and initialization of Fibre Channel switches in order to create a multiswitch Fibre Channel fabric.

Fibre Channel Transport A protocol service that supports communication between Fibre Channel service providers. See also *FSP*.

FIFO First in, First out. May also refer 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 Download The process of loading firmware down from a server into the switch.

Flash Programmable NVRAM memory that maintains its contents.

Flash Partition Two redundant usable areas, called partitions, into which firmware can be downloaded.

FLOGI Fabric Login. The process by which an N_Port determines whether a fabric is present, and if so, exchanges service parameters with it. See also *PLOGI.*

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. See also *F_Port* and *Fx_Port.*

Frame The Fibre Channel structure used to transmit data between ports. Consists of a start-of-frame delimiter, header, any optional headers, the data payload, a cyclic redundancy check (CRC), and an end-of-frame delimiter. There are two types of frames: link control frames (transmission acknowledgements, etc.) and data frames.

FRU Field replaceable unit. A component that can be replaced on site.

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. A routing protocol for Fibre Channel switches.

Full Duplex A mode of communication that allows the same port to simultaneously transmit and receive frames. See also *Half Duplex*.

Full Fabric The EMC software license that allows multiple E_Ports on a switch, making it possible to create multiple ISLs.

Fx_Port A fabric port that can operate as either an F_Port or FL_Port. See also *F_Port* and *FL_Port.*

G

G_Port Generic port. A port that can operate as either an E_Port or 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. GBIC and SFP terms are used interchangeably throughout the documentation, although they are different types of optics and the hardware is not interchangeable. See also *SFP*.

Gb/s Gigabits per second (1,062,500,000 bits/second).

GB/s GigaBytes per second (1,062,500,000 bytes/second).

H

Half Duplex A mode of communication that allows a port to either transmit or receive frames at any time, but not simultaneously (with the exception of link control frames, which can be transmitted at any time). See also *Full Duplex*.

HBA Host bus adapter. The interface card between a server or workstation bus and the Fibre Channel network.

High Availability An attribute of equipment that identifies it as being capable of conducting customer operations well in excess of 99% of the time. Typically, high availability is identified by the number of nines in that percentage. Five nines means the equipment is rated as being capable of conducting customer operations 99.999% of the time without failure.

Host A computer that accesses storage devices over the fabric. May also be referred to as a server. See also *Workstation*.

Hot Pluggable A FRU capability that indicates it may be extracted or installed while customer data is otherwise flowing in the chassis.

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.

I

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.

Initiator A server or workstation on a Fibre Channel network that initiates communications with storage devices. See also *Target*.

Integrated Fabric The fabric created by connecting multiple switches with multiple ISL cables, and configuring the switches to handle traffic as a seamless group.

IOD In-order delivery. A parameter that, when set, guarantees that frames are either delivered in order or dropped.

ISL Interswitch link. A Fibre Channel link from the E_Port of one switch to the E_Port of another. See also *E_Port* and *Cascade*.

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). See also *E_Port*.

IU Information unit. A set of information as defined by either upper-level process protocol definition or upper-level protocol mapping.

J

JBOD Just a bunch of disks. A number of disks connected in a single chassis to one or more controllers. See also *RAID*.

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. See also *Comma*.

Kernel Flash Flash memory that stores the bootable kernel code and is visible within the processor's memory space. Data is stored as raw bits.

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 one of two modes:

- Fabric mode: Connected to a port that is not loop capable, and using fabric protocol.
- Loop mode: In an arbitrated loop and using loop protocol. An L_Port in loop mode can also be in participating mode or nonparticipating mode .

See also *Nonparticipating Mode* and *Participating Mode.*

Latency The period of time required to transmit a frame, from the time it is sent until it arrives.

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

Link As applies to Fibre Channel, a physical connection between two ports, consisting of both transmit and receive fibres. See also *Circuit*.

Link Services A protocol for link-related actions.

LWL Long wavelength. A type of fiber-optic cabling that is based on 1300mm lasers and supports link speeds of 1.0625 Gb/s and 2.125 Gb/s. May also refer to the type of GBIC or SFP. See also *SWL*.

M

Media See *Transceiver*.

MIB Management Information Base. An SNMP structure to help with device management, providing configuration and device information.

Modem Serial Port The upper serial port on the CP card. Can be used to connect the CP card to a country-specific modem. Has a DB-9 connector wired as a ttyS1 DTE device, and can be connected by serial cable to a DCE device. Can be connected to a modem using a standard 9-pin modem cable. A Hayes-compatible modem or Hayes-emulation is required. See also *DCE Port* and *Terminal Serial Port*.

Multicast The transmission of data from a single source to multiple specified N_Ports (as opposed to all the ports on the network). See also *Broadcast* and *Unicast*.

Multimode A fiber-optic cabling specification that allows up to 500 meters for 1 GB Fibre Channel and 300 meters for 2 GB Fibre Channel 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. See also *NL_Port* and *Nx_Port*.

Name Server The term frequently used to indicate Simple Name Server. See also *SNS*.

Node A Fibre Channel device that contains an N_Port or NL_Port.

Negotiate See *Auto-Negotiate Speed* and *Autosense*.

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. See also *N_Port* and *Nx_Port.*

Nonparticipating Mode A mode in which an L_Port in a loop is inactive and cannot arbitrate or send frames, but can retransmit any received transmissions. This mode is entered if there are more than 127 devices in a loop and an AL_PA cannot be acquired. See also *L_Port* and *Participating Mode.*

Nx_Port A node port that can operate as either an N_Port or NL_Port.

O

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 the transport of frames.

P

Packet A set of information transmitted across a network. See also *Frame*.

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* and *Nonparticipating Mode*.

Path Selection The selection of a transmission path through the fabric. EMC switches use the FSPF protocol.

PLOGI Port Login. The port-to-port login process by which initiators establish sessions with targets. See also *FLOGI*.

Point-to-Point A Fibre Channel topology that employs direct links between each pair of communicating entities. See also *Topology*.

Port_Name The unique identifier assigned to a Fibre Channel port. Communicated during login and port discovery.

Port Cage The metal casing extending out of the optical port on the switch, and in which the GBIC or SFP can be inserted.

Port Card A Fibre Channel card that contains optical port interfaces. See also *16-Port Card*.

Port Module A collection of ports in a switch.

POST Power-on self test. A series of tests run by a switch after it is turned on.

Principal Switch The switch that assumes the responsibility to assign Domain IDs. The role of Principle Switch is negotiated after a Build Fabric event.

Primary FCS Switch Primary fabric configuration server switch. The switch that actively manages the configuration and security parameters for all switches in the fabric. See also *Backup FCS Switch* and *FCS Switch.*

Private Device A device that supports arbitrated loop protocol and can interpret 8-bit addresses, but cannot log in to the fabric.

Private Loop An arbitrated loop that does not include a participating FL_Port.

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 a set of standards for communication.

Public Device A device that supports arbitrated loop protocol, can interpret 8-bit addresses, and can log in to the fabric.

Public Loop An arbitrated loop that includes a participating FL_Port, and may contain both public and private NL_Ports.

Public NL_Port An NL_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL_Ports.

Q

Quad A group of four adjacent ports that share a common pool of frame buffers.

R

R_A_TOV Resource allocation time-out value. The maximum time a frame can be delayed in the fabric and still be delivered. See also *E_D_TOV*.

R_RDY Receiver ready. A primitive signal indicating that the port is ready to receive a frame.

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. See also *JBOD*.

Remote Fabric A fabric that spans across WANs by using protocol translation (a process also known as tunneling) such as Fibre Channel over ATM or Fiber Channel over IP.

Request Rate The rate at which requests arrive at a servicing entity. See also *Service Rate*.

Root Account A login used for debugging purposes and is not intended for customer use.

Route As applies to a fabric, the communication path between two switches. May also apply to the specific path taken by an individual frame, from source to destination. See also *SFP*.

Routing The assignment of frames to specific switch ports, according to frame destination.

RS-232 Port A port that conforms to a set of EIA (Electrical Industries Association) standards. Used to connect DTE and DCE devices for communication between computers, terminals, and modems. See also *DCE Port* and *DTE Port*.

RSCN Registered state change notification. A switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

S

SAN Storage area network. A network of systems and storage devices that communicate using Fibre Channel protocols. See also *Fabric*.

SCSI Small computer systems interface. A parallel bus architecture and protocol for transmitting large data blocks to a distance of 15-25 meters.

SDRAM Synchronous dynamic random access memory. The main memory for the switch. Used for volatile storage during switch operation. See also *Flash*.

Sequence A group of related frames transmitted in the same direction between two N_Ports.

Service Rate The rate at which an entity can service requests. See also *Request Rate*.

SES A Brocade product that runs on Fabric OS and allows monitoring, configuring, and maintenance of the Departmental Switch family using SCSI 3 Enclosure Services.

SFP Small form factor pluggable. Optical transceiver used to convert signals between optical fiber cables and switches. GBIC and SFP terms are used interchangeably throughout the documentation, although they are different types of optics and the hardware is not interchangeable. See also *GBIC*.

SI Sequence initiative.

SID/DID Source identifier/destination identifier. S_ID is a 3-byte field in the frame header that is used to indicate the address identifier of the N_Port from which the frame was sent.

Single Mode A Fibre Channel optic cabling standard for use with long-wavelength lasers operating in the infrared portion of the spectrum at 1300 nonmeters (nm).

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. See also *Community (SNMP)*.

SNS Simple Name Server. 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. May also be referred to as directory service. See also *FS*.

Subordinate Switch All switches in the fabric other than the principal switch. See also *Principal Switch*.

Switch Hardware that routes frames according to Fibre Channel protocol and is controlled by software.

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.

SWL Short wavelength. A type of fiber-optic cabling that is based on 850mm lasers and supports link speeds of 1.0625 Gb/s and 2.125 Gb/s. May also refer to the type of GBIC or SFP. See also *LWL*.

T

Target A storage device on a Fibre Channel network. See also *Initiator*.

Terminal Serial Port The lower serial port on the CP card. Receives error messages. Can be used to connect the CP card to a computer terminal. Has a DB-9 connector wires as a ttyS0 DTE device, and can be connected by serial cable to a DCE device. The connector has pins two and three swapped so that a straight-through cable can be used to connected to a terminal. See also *DB-9 Connector, DCE Port*, and *Modem Serial Port*.

Throughput The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second). See also *Bandwidth*.

Topology As applies to Fibre Channel, the configuration of the Fibre Channel network and the resulting communication paths allowed. There are three possible topologies:

- 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.

Transceiver Device that converts one form of signaling to another for transmission and reception. In fiber optics, it refers to optical and electrical.

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. See also *SNMP*.

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.

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.

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 time-out value. The minimum time that a SCSI ULP process waits for SCSI status before initiating ULP recovery.

Unicast The transmission of data from a single source to a single destination. See also *Broadcast* and *Multicast*.

User Account A login intended for use by the customer to monitor, but not control, switch operation.

V

VC Virtual circuit. A one-way path between N_Ports that allows fractional bandwidth.

W

Well-Known Address As pertaining to Fibre Channel, a logical address defined by the Fibre Channel standards as assigned to a specific function, and stored on the switch.

Workstation A computer used to access and manage the fabric. May also be referred to as a management station or host.

WWN World Wide Name. An identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

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 permission to others in the zone, but are not visible to any outside the zone.

Zone Alias A name assigned to a device or group of devices in a zone. Aliases can greatly simplify the zone administrative process.

Zone Configuration A specified set of zones. Enabling a configuration enables all zones in that configuration. See also *Defined Zone Configuration*.

Zone Member A port, node, WWN, or alias, which is part of a zone.

Zone Schemes The level of zoning granularity selected. For example, zoning may be done by switch/port, WWN, or a mixture. See also *Zone Configuration*.

Zone Set See *Zone Configuration*.