EMC® Fibre Channel with QLogic Host Bus Adapters in the Solaris Environment

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As part of an effort to improve and enhance the performance and capabilities of its product line, EMC from time to time releases revisions of its hardware and software. Therefore, some functions described in this document may not be supported by all revisions of the software or hardware currently in use. For the most up-to-date information on product features, refer to your product release notes.

If a product does not function properly or does not function as described in this document, please contact your EMC representative.

This document describes the procedures for installing an EMC-approved QLogic host bus adapter (HBA) into a Sun Solaris host environment and configuring the host for connection to an EMC storage array over Fibre Channel and Configuring a boot device on the EMC storage array.

Note: Review the *EMC Support Matrix* for the latest information on approved HBAs and drivers.

Conventions used in this guide

EMC uses the following conventions for notes and cautions.

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

⚠️ **IMPORTANT**

An important notice contains information essential to operation of the software.

⚠ **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.

Typographical Conventions

EMC uses the following type style conventions in this guide:

bold	• User actions (what the user clicks, presses, or selects) • Interface elements (button names, dialog box names) • Names of keys, commands, programs, scripts, applications, utilities, processes, notifications, system calls, services, applications, and utilities in text
italic	• Book titles • New terms in text • Emphasis in text
Courier	• Prompts • System output • Filenames • Pathnames • URLs • Syntax when shown in command line or other examples
Courier, bold	• User entry • Options in command-line syntax
Courier italic	• Arguments in examples of command-line syntax • Variables in examples of screen or file output • Variables in pathnames
<>	Angle brackets for parameter values (variables) supplied by user.
[]	Square brackets for optional values.
|	Vertical bar symbol for alternate selections. The bar means or.
...	Ellipsis for nonessential information omitted from the example.

Where to get help   EMC support, product, and licensing information can be obtained as follows.

Product information — For documentation, release notes, software updates, or for information about EMC products, licensing, and service, go to the EMC Powerlink website (registration required) at:

http://Powerlink.EMC.com

Technical support — For technical support, go to EMC Customer Service on Powerlink. To open a service request through Powerlink, you must have a valid support agreement. Please contact your EMC sales representative for details about obtaining a valid support agreement or to answer any questions about your account.

Your comments   Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Please send your opinion of this document to:

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Installing and Configuring the HBA and Driver

This chapter describes the procedures for installing an EMC-approved QLogic host bus adapter (HBA) into a Sun Solaris host environment and configuring the host for connection to an EMC storage array over Fibre Channel.

Planning zoning and connections in a fabric environment

Before setting up the hardware in a fabric configuration with an EMC® storage array, you should plan for the connectivity and fan-in/fan-out topologies, including zoning and Access Logix™ (CLARiiON®) or Volume Logix (Symmetrix®) configuration.

For more information, refer to these documents:

◆   Switch manufacturer's user documentation

◆   (Symmetrix) *Volume Logix Product Guide*, EMC P/N 300-999-024

◆   *Connectrix 2 Gb/s Enterprise Storage Network System Planning Guide*, EMC P/N 069-001-174

Refer to "Symmetrix/Fabric case study" on page 38 for a Symmetrix planning example.

Installing the HBA

Follow the instructions included with your adapter, including installation of all required Solaris system patches. The adapter installs into a single slot, and has no user-configurable jumpers or switches.

Installing the HBA driver

Using the QLogic adapter with the Solaris operating system requires HBA I/O driver software. The driver functions at a layer below the Solaris SCSI driver to present Fibre Channel devices to the operating system as if they were standard SCSI devices.

The naming convention for the drivers, associated files, and messages is *QLA*; however, the Solaris SPARC driver supports standard QLogic PCI and SBus boards (*QLAxxxx*), as well as cPCI boards (*QCPxxxx*).

Obtaining the latest driver

Be sure you have the latest qualified driver software. If necessary, you can download the driver from the QLogic website. Refer to release notes provided with the driver for information that might be unique to new driver revisions.

Follow the appropriate procedure to perform a first-time install:

From the QLogic website:
1. Use a web browser to access http://www.qlogic.com.

2. Click **Downloads** at the left side of the QLogic home page.

3. Select **EMC** to the right of **OEM approved/recommended drivers and firmware**.

4. Under your HBA model, locate the **EMC CLARiiON and EMC Symmetrix approved common Solaris driver package** row, and click the **Download** link in the **Download** column.

5. Proceed to "Installing the driver" on page 12.

From the QLogic CD-ROM:
1. Log on to the system as a *superuser*.

2. From the root of the system, create a driver directory:

   mkdir /qlogic_driver

3. Insert the QLogic CD-ROM.

4. Copy the appropriate driver package from the CD-ROM:

If HBA is:	Copy this package:	To this directory:
QLA2200F-EMC QLA2202FS-E QCP2202F-E	**`qla2200.solaris_pkg.Z`**	`/qlogic_driver`
QLA2300F-E-SP QLA2340-E-SP QLA2342-E-SP	**`qla2300.solaris_pkg.Z`**	`/qlogic_driver`

Installing the driver

After you have the latest driver, follow the appropriate procedure:

Type of Installation	Current Driver Version	Go to:
New	N/A	"Installing a new driver" on page 12
Upgrade	3.X	"Upgrading driver version 3.x to 4.07 or higher" on page 15
	4.05 or 4.06	"Upgrading driver version 4.05 or 4.06 to 4.07 or higher" on page 16

Installing a new driver To install a new driver:

1. Change to the `/qlogic_driver` directory; then uncompress the driver file:

If HBA is:	Enter:
QLA2200F-EMC QLA2202FS-E QCP2202F-E	**`uncompress qla2200.solaris_pkg.Z`**
QLA2300F-E-SP QLA2340-E-SP QLA2342-E-SP	**`uncompress qla2300.solaris_pkg.Z`**

2. Install the driver into the host:

If HBA is:	Enter:
QLA2200F-EMC QLA2202FS-E QCP2202F-E	**pkgadd -d qla2200.solaris_pkg**
QLA2300F-E-SP QLA2340-E-SP QLA2342-E-SP	**pkgadd -d qla2300.solaris_pkg**

A list of available packages appears, similar to this QLA2300 example:

```
The following packages are available:
1  QLA2300         QLogic QLA2300 driver
                   (sparc) Solaris, Rev=4.17
2 QLSDMLIB         QLogic SNIA Library (32 and 64 bit) for SNIA 1.0
                   (sparc) Solaris 7-8-9-10, Rev 3.10
3  QLSDMLIB6       QLogic SNIA Library (32 bit) for SNIA 1.0
                   (sparc) Solaris 2.6, Rev 3.10
Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]:
```

Select an HBA driver and press **ENTER**.

3. You are prompted to select the directory into which the driver will be installed. For example:

```
Processing package instance <QLA2300> from </qlogic_driver>
QLogic QLA2300 driver (sparc) Solaris, Rev=4.17
Copyright (c) 1996-2005, by QLogic Corporation. All rights reserved.
Where do you want the driver object installed (default=/kernel/drv):
```

Press **ENTER** to accept the default.

```
Where do you want the driver utilities installed
(default=/opt/QLogic_corporation/drvutil/qla2300):
```

Press **ENTER** to accept the default.

```
Where do you want the drivers conf file backups placed
(default=/opt/QLogic_corporation/confbkup):
```

Press **ENTER** to accept the default.

4. The **pkgadd** program performs a series of checks, and then posts a script warning and asks whether to continue the installation.

    Example:

```
This package contains scripts which will be executed with super-user
permission during the process of installing this package.

Do you want to continue with the installation of <QLA2x00> [y,n,?]
```

    Type **y** and press **ENTER** to continue the driver installation.

5. The **pkgadd** program notifies you when the driver installation is complete.

    When you see the message `Installation of <QLA2x00> was successful`:

    • If the driver is version 4.13 or earlier, reboot the host, and continue with step 6.

    • If the driver is version 4.15.03 or later, continue with step 6. (No need to reboot the host at this point.)

6. Verify that the HBA's FCode is installed. To do this, view the QLogic device pathname in the `/var/adm/messages` file or from the output of the **format** command:

    • If the device pathname contains `QLGC,qla`, the FCode is already installed:

       Example: `/ssm@0,0/pci@19,700000/pci@2/QLGC,qla@5`

       Proceed to step 7.

    • If the device pathname contains `fibre-channel` or `scsi`, the FCode has not yet been installed:

       Examples:
       `/ssm@0,0/pci@19,700000/pci@2/fibre-channel@5`
       `/ssm@0,0/pci@19,700000/pci@2/scsi@5`

       a. Install the FCode as described under "Updating the HBA FCode" on page 33.

       b. Reboot the host.

       c. Proceed to step 7.

7. Edit any necessary files as described under "Configuring host files" on page 19.

8. If the driver is version 4.13 or earlier, reboot the host with the reconfigure option:

```
reboot -- -r
```

If the driver is version 4.15.03 or later, continue with "Dynamically configured Targets/LUNs and driver parameters" on page 30.

Upgrading driver version 3.x to 4.07 or higher

Follow these steps to upgrade QLogic driver version 3.X to version 4.07 or higher:

1. Log on to the system as a *superuser*.

2. Back up the appropriate files:

If HBA is:	Back up file:
QLA2200F-EMC QLA2202FS-E QCP2202F-E	**/kernel/drv/qla2200.conf**
QLA2300F-E-SP QLA2340-E-SP QLA2342-E-SP	**/kernel/drv/qla2300.conf**

3. Remove the old driver:

   a. The first step depends on the HBA and Solaris Operating System (OS):

HBA:	OS version:	Enter:
QLA2200F-EMC QLA2202FS-E QCP2202F-E	2.6	`pkgrm QLA2200-1`
	7	`pkgrm QLA2200-2`
	8, 9	`pkgrm QLA2200-3`
QLA2300F-E-SP QLA2340-E-SP QLA2342-E-SP	2.6	`pkgrm QLA2300-1`
	7	`pkgrm QLA2300-2`
	8, 9	`pkgrm QLA2300-3`

   b. Type **y** and press **ENTER** when prompted:

```
Do you want to remove this package?
```

c. A message describes the driver and prompts you:

```
Do you want to continue with the removal of this package [y,n,?,q]
```

Type **y** and press **ENTER**.

4. Install the driver as described under "Installing the driver" on page 12.

5. After the driver is installed, restore any customized parameter settings in the backup file to /kernel/drv/qla2x00.conf. (Refer to step 2.)

6. Edit any necessary files as described under "Configuring host files" on page 19.

7. Reboot the host with the reconfigure option:

```
reboot -- -r
```

Upgrading driver version 4.05 or 4.06 to 4.07 or higher

Follow these steps to upgrade QLogic driver version 4.05 or 4.06 to version 4.07 or higher:

1. Log on to the system as a *superuser*.

2. Back up the appropriate files:

If HBA is:	Back up file:
QLA2200F-EMC QLA2202FS-E QCP2202F-E	**/kernel/drv/qla2200.conf**
QLA2300F-E-SP QLA2340-E-SP QLA2342-E-SP	**/kernel/drv/qla2300.conf**

3. Using the SANBlade Control FX GUI utility, record the values of the following NVRAM parameters for each adapter instance (for example, adapter 2200 Instance 0):

- **max-frame-length**
- **execution-throttle**
- **enable-adapter-hard-loop-ID**
- **adapter-hard-loop-ID**
- **enable-LIP-full-login**
- **connection-options**
- **data-rate** (QLA23xx only)
- **link-down-error**
- **link-down-timeout**

- **persistent-binding-configuration**
- **fast-error-reporting**
- **extended-logging**

4. Remove the old driver:

   a. The first step depends on the HBA and Solaris Operating System (OS):

HBA:	OS version:	Enter:
QLA2200F-EMC QLA2202FS-E QCP2202F-E	2.6	`pkgrm QLA2200-1`
	7	`pkgrm QLA2200-2`
	8, 9	`pkgrm QLA2200-3`
QLA2300F-E-SP QLA2340-E-SP QLA2342-E-SP	2.6	`pkgrm QLA2300-1`
	7	`pkgrm QLA2300-2`
	8, 9	`pkgrm QLA2300-3`

   b. Type **y** and press **ENTER** when prompted:
   ```
   Do you want to remove this package?
   ```

   c. A message describes the driver and prompts you:

   ```
Do you want to continue with the removal of this package [y,n,?,q]
   ```

   Type **y** and press **ENTER**.

   d. Remove the SANBlade Control FX GUI utility:

OS version:	Enter:
2.6 or 7	`pkgrm scfx2-6`
8 or 9	`pkgrm scfx2-8`

5. Install the driver as described under "Installing the driver" on page 12.

6. After the driver is installed, restore any customized NVRAM parameter settings in the backup file (refer to step 2) or the parameters in step 3 to /kernel/drv/qla2x00.conf.

7. Edit any necessary files as described under "Configuring host files" on page 19.

8. Reboot the host with the reconfigure option:

```
reboot -- -r
```

Driver-related issues

Note these issues (and resolutions) related to installing a QLogic adapter:

Scenario 1 — The Sun qlc driver is present in the host system

To add the QLogic adapter(s) into a host system that has the Sun qlc driver:

1. Install the EMC-qualified QLogic driver into the host system.

2. Halt the host system and power it off.

3. Install the QLogic adapter(s).

4. Boot the system with the reconfigure option (`boot -r`).

Scenario 2 — The server already contains a QLogic HBA that is controlled by the Sun qlc driver

If the additional adapter is installed before installing the QLogic driver, both adapters will be initially controlled by the Sun qlc driver. When the QLogic driver is installed it will indicate that it is installed but has failed to attach. This is okay, since the driver will attach itself to the second adapter after a reboot with the reconfigure option (`reboot -- -r`).

Configuring host files

Once the EMC storage array has devices assigned with device addresses and the directors have been switched on line, the host can see all the target storage array devices assigned to that host interface. Devices are presented to the host in the same manner as devices accessed through a standard SCSI interface.

To insure smooth integration and maximum performance from the host and EMC storage array, you must edit these files:

◆ QLogic driver configuration file `/kernel/drv/qla2x00.conf`, described under "Editing /kernel/drv/qla2x00.conf" on page 20.

◆ Host sd driver configuration file `/kernel/drv/sd.conf`, described under "Editing /kernel/drv/sd.conf" on page 25.

◆ System specification file `/etc/system`, described under "Editing /etc/system" on page 30.

You can modify the driver configuration files as described in the sections referenced above, or by using the SANblade Control FX utility, described under "Editing driver configuration parameters using the SANblade Control FX utility" on page 27.

QLogic persistent binding implementation

QLogic persistent binding can be implemented through either the SANblade Control FX utility or the QLogic driver configuration files `/kernel/drv/qla2x00.conf` and `/kernel/drv/sd.conf`.

◆ To implement persistent binding through the SANblade Control FX utility, proceed to "Editing driver configuration parameters using the SANblade Control FX utility" on page 27. (Refer to step 8 on page 28.)

◆ To implement persistent binding through configuration files `/kernel/drv/qla2x00.conf` and `/kernel/drv/sd.conf`, continue with this section.

The matching between the driver instance number, target ID, and storage array port name happens inside `qla2x00.conf`. Each mapping is considered a single property.

The persistent binding entry must be in this format:

```
hbaX-SCSI-target-id-Y-fibre-channel-port-name="PPPP";
```

where:

- The *x* in hba*X* is the driver instance number of the HBA. This instance number corresponds to the instance entry inside the /etc/path_to_inst.

- The *Y* in SCSI-target-id-*Y* is the device address, as in the address /dev/rdsk/c3tYd0s0.

- The *PPPP* is the target WWPN of the EMC storage array. On a Symmetrix console, this information can be found using the **e2** command. The output is similar to the following example for Fibre Channel director port 13B:

```
WWN      HI      50060482 / 50060482
WWN      LOW     BBFF7A9C / BBFF7A9C
```

The WWPN of Symmetrix Fibre Channel port 13B is 50060482BBFF7A9C.

Editing /kernel/drv/qla2x00.conf

Configuration file qla2x00.conf is created automatically while installing the HBA driver. The file contains important information about how the driver should behave. If necessary, edit the qla2x00.conf file as shown in Table 4 on page 21, which lists the variables in qla2x00.conf. Descriptions of the variables follow the table.

For the changes to the qla2x00.conf file to take effect, do one of the following:

- If the driver is version 4.13 or earlier, reboot the host.

- If the driver is version 4.15.03 or later, issue the command:

  /opt/QLogic_Corporation/drvutil/qla2x00
  ./qlareconfig -d qla2x00

Table 4   Variables in /kernel/drv/qla2.x00.conf

Variable	Default value	Recommended Setting	
		If No PowerPath or VERITAS DMP	If PowerPath or VERITAS DMP
hba0-max-frame-length	1024 bytes	2048 bytes	2048 bytes
hba0-execution-throttle	16	20	20
hba0-login-retry-count	8	8	8
hba0-enable-adapter-hard-loop-ID	0 (disable)	• FC-AL: 1 (enable) • FC-SW: N/A	• FC-AL: 1 (enable) • FC-SW: N/A
hba0-adapter-hard-loop-ID	0	• FC-AL: 125 [a] • FC-SW: N/A	• FC-AL: 125 [a] • FC-SW: N/A
hba0-enable-LIP-reset	0 (disable)	0 (disable)	0 (disable)
hba0-enable-LIP-full-login	1 (enable)	1 (enable)	1 (enable)
hba0-enable-target-reset	0 (disable)	0 (disable)	0 (disable)
hba0-reset-delay	5 (sec)	5 (sec)	5 (sec)
hba0-port-down-retry-count	8	8	8
hba0-port-down-retry-delay	0	0	0
hba0-maximum-lun-per-target	8	N/A	N/A
hba0-connection-options	2	• FC-AL: 0 • FC-SW: 1	• FC-AL: 0 • FC-SW: 1
hba0-fc-tape	1 (enable)	0 (disable)	0 (disable)
hba0-fc-data-rate [b]	2	2	2
hba0-pci-latency-timer	0x40	0x40	0x40
hba0-pci-x-max-memory-read-byte-count [b]	0	0	0
hba0-link-down-error	1 (enable)	0 (disable)	1 (enable)
hba0-link-down-timeout	60 (sec)	60 (sec)	60 (sec)
hba0-persistent-binding-configuration	0	• FC-AL: 0 = No persistent binding 1 = persistent binding • FC-SW: 1	• FC-AL: 0 = No persistent binding 1 = persistent binding • FC-SW: 1
hba0-persistent-binding-by-port-ID	0	0	0
hba0-fast-error-reporting	0	0 (disable)	1 (enable)
hba0-extended-logging	0	0 (disable)	0 (disable)

Table 4   Variables in /kernel/drv/qla2.x00.conf (continued)

Variable	Default value	Recommended Setting	
		If No PowerPath or VERITAS DMP	If PowerPath or VERITAS DMP
hba0-queue-full-retry-count	16	16	16
hba0-queue-full-retry-delay	2	2	2
hba0-security-protocols [b]	0	0	0
hba0-FDMI-support	0	0	0
hba0-VDP-support [b]	0	0	0

a. In a hub environment, the hard loop ID for each HBA must be unique.

b. `qla2300.conf` only.

Descriptions of qla2x00.conf variables

hba0-max-frame-length — Maximum Fibre Channel frame size (512, 1024 or 2048 bytes).

hba0-execution-throttle — Maximum number of commands (1 to 65535) sent to the LUN by the FCode. Exceeding a device's capabilities causes unnecessary command retries, which impact performance.

hba0-login-retry-count — Maximum number (0 to 255) of retries to attempt when login into a device fails. Large values can cause long delays during initialization.

hba0-enable-adapter-hard-loop-ID — Enables/disables the hard loop ID and activates (if enabled) the setting for variable `hba0-adapter-hard-loop-ID`. (See the next item.)

hba0-adapter-hard-loop-ID — Sets (if activated) the hard loop ID (in the range 1 to 125) for the HBA during the Loop Initialization Process (LIP). If `hba0-enable-adapter-hard-loop-ID` and `hba0-adapter-hard-loop-ID` are not set as shown in the table, the LIP might fail and the host might not recognize the EMC storage array. These variables become crucial in a hub environment, since no device (storage array target or host bus adapter) can have the same hard loop ID. The host HBA is conventionally assigned the highest Hard Loop ID, starting from 125 and working down (124, 123, 122, etc.). The EMC storage array is conventionally assigned a lowest Hard Loop ID for each port, starting with 0 and working up (1, 2, 3, etc.).

Example: The following example is a configuration for three QLA2200F HBAs with separate Hard Loop IDs:

```
# Adapter hard loop ID.
# Range: 0 - 125
hba0-adapter-hard-loop-ID=125;
hba1-adapter-hard-loop-ID=124;
hba2-adapter-hard-loop-ID=123;
```

hba0-enable-LIP-reset — Enables/disables the adapter to issue a LIP reset during Fibre Channel reset.

Note: Only one of variables `hba0-enable-LIP-reset`, `hba0-enable-LIP-full-login`, and `hba0-enable-target-reset` should be enabled at the same time.

hba0-enable-LIP-full-login — Enables/disables the adapter to issue a LIP full login reset during Fibre Channel reset. (See the note below `hba0-enable-LIP-reset`.)

hba0-enable-target-reset — Enables/disables the adapter to issue a LIP target reset during Fibre Channel reset. (See the note below `hba0-enable-LIP-reset`.)

hba0-reset-delay — Delay after a reset before sending commands to the devices on the Fibre Channel bus.

hba0-port-down-retry-count — Number of command retries to be done when devices are not responding on the Fibre Channel bus. Large values might cause long delays for fail over software to detect a failing device.

hba0-port-down-retry-delay — Amount of time to delay between port down retries.

hba0-maximum-luns-per-target — Maximum number of LUNs to scan for if the device does not report SCSI Report LUNS command.

hba0-connection-options — Specify the type of connection mode, FC-AL or FC-SW.

hba0-fc-tape — Enable/Disable the Fibre Channel tape support.

hba0-fc-data-rate — Specify the Fibre Channel data rate.

hba0-pci-latency-timer — Latency timer, 0 to 0xF8.

hba0-pci-x-max-memory-read-byte-count — PCI-X maximum memory read byte count: **0** (system default), **512**, **1024**, **2048**, or **4096**.

hba0-link-down-error — Disables all link_down time out values. The sd driver will not be notified of any error conditions if the QLogic driver detects a link_down condition. If the EMC storage array goes off line or the link with the host is broken for any reason, the QLogic driver holds all pending I/Os indefinitely until the link is restored or the storage array rejoins the loop. In a PowerPath® or VERITAS DMP environment, this variable should be enabled (1) so the PowerPath or VERITAS DMP driver will be notified of any error conditions.

hba0-link-down-timeout — Time the driver waits for a Fibre Channel loop to come up before reporting the failure.

hba0-persistent-binding-configuration:

0 = Report to OS discovery of both bound and non-bound devices
1 = Report to OS discovery of bound devices only

hba0-persistent-binding-by port ID — Persistent binding by port ID.

hba0-fast-error-reporting — Fast error reporting to Solaris.

hba0-extended-logging — Disable/Enable logging of driver detected events occurring either in the driver or Fibre Channel bus.

hba0-queue-full-retry-count — Number of times to retry a SCSI `queue full` error.

hba0-queue-full-retry-delay — Time to wait after a SCSI `queue full` error before starting any new I/O commands.

hba0-security-protocols — Disable/Enable Fibre Channel security protocol DH-CHAP.

hba0-FDMI-support — Disable/Enable the Fabric-Device Management Interface support.

hba0-VDP-support — Target/LUN VDP data for failover configuration support.

What next?   Proceed to "Editing /kernel/drv/sd.conf" on page 25.

Editing /kernel/drv/sd.conf

Note: There is no need to edit the sd.conf file if you installed driver 4.15.03 or later.

The matching between the target ID and the LUNs happens inside /kernel/drv/sd.conf. Each of the entries represent a LUN *Z*, as in the device address: /dev/rdsk/c0t0dZs0. Because of the class="scsi" entries, the sd target driver will probe multiple adapters, even multiple adapters across multiple drivers (for example: isp, glm, fas).

Example:

```
#
# Copyright (c) 1992, by Sun Microsystems, Inc.
#
#ident   "@(#)sd.conf    1.8     93/05/03 SMI"

name="sd" class="scsi" target=0 lun=0;
name="sd" class="scsi" target=0 lun=1;
name="sd" class="scsi" target=0 lun=2;
name="sd" class="scsi" target=0 lun=3;
name="sd" class="scsi" target=0 lun=4;
name="sd" class="scsi" target=0 lun=5;
name="sd" class="scsi" target=0 lun=6;
name="sd" class="scsi" target=0 lun=7;
name="sd" class="scsi" target=0 lun=8;
name="sd" class="scsi" target=0 lun=9;
```

The default sd.conf file contains entries for LUN 0 only. Therefore, you must edit the file to add entries for any LUNs with numbers greater than 0 that you will bind in the storage systems connected to the server.

Before editing the current sd.conf file, make a copy of it just in case the file is lost or errors are made. When editing the file, follow these precautions:

◆ Do not delete any original data from this file; the Solaris operating system might not boot properly.

◆ Do not insert hidden format characters. The file is very sensitive to hidden format characters, and a misplaced tab or other formatting character can make all subsequent entries unreadable.

◆ Enter all target and LUN values as decimal numbers.

Note: Changes to `sd.conf` will not take effect until the host is rebooted.

Devices accessed via Fibre Channel using the QLogic driver are addressed behind a single target ID with up to 256 LUNs. (This differs from existing SCSI device addressing, which might have multiple targets and LUNs.) In the standard EMC storage array device definition file, target 0 should have 256 LUNs, and all other targets (1 through 125) have a LUN 0 only.

Edit `sd.conf` to list all targets and all LUNs that might be addressed. The Target ID needed to address a device is determined by the Fibre Channel Arbitrated Loop Physical Address (AL_PA). A Loop_ID of 00 (AL_PA of EF) will have LUNs behind Target ID 0, Loop_ID 01 has LUNs on target ID 1, and so on.

Since each Fibre Channel port can have only one loop ID (or AL_PA), all devices accessed through a port will have the same target ID. If you need to access existing devices that previously had multiple target IDs, be aware of changes required for raw device addressing.

Note: Your actual target/LUN assignment will vary depending on unique system configuration requirements. Be sure that existing and new configurations are well documented before upgrading to Fibre Channel directors.

Make sure that only the `target=x lun=0` line is specified for any target ID that does not need LUN support. This decreases the time needed to reboot the system.

Sample sd.conf file   Here is an example of `sd.conf`:

```
name="sd" class="scsi"
   target=0 lun=0;
name="sd" class="scsi"
   target=0 lun=1;
.
.
name="sd" class="scsi"
   target=0 lun=255;
name="sd" class="scsi"
   target=1 lun=0;
name="sd" class="scsi"
   target=2 lun=0;
.
.
name="sd" class="scsi"
   target=125 lun=0;
```

Device definition files are available on EMC's FTP server, ftp.emc.com, in /pub/elab/solaris. The file sd.conf.fibre is a device definition file for Fibre Channel devices. Change the filename to sd.conf and copy it to the /kernel/drv directory.

What Next?
◆ If you need to edit /etc/system, proceed to "Editing /etc/system" on page 30.

◆ If you are finished editing configuration files, reboot the host with the reconfigure option (**reboot -- -r**) to rebuild the kernel and implement the changes.

Editing driver configuration parameters using the SANblade Control FX utility

The SANblade Control FX application is a graphical user interface (GUI) utility used to configure the HBA's parameters and the target attached to the HBA. EMC requires SANblade Control FX version 1.26 or later to work with QLogic driver version 4.09 and 4.13.

⚠ **CAUTION**

The SANblade Control FX utility only supports QLogic driver 4.13 or earlier.

Editing the driver variables

To edit the QLogic driver varaiables using the GUI:

1. Obtain the SANblade GUI (sanbcfx_vnnn, where vnnn is the version number) from the QLogic CD-ROM or the QLogic website:

   • From the QLogic CD-ROM:

      a. Log on to the system as a *superuser*.

      b. Insert the QLogic CD-ROM.

      c. Copy the sanbcfx_vnnn.Z package from the CD-ROM to the host root directory.

   • From the QLogic website:

      a. Use a web browser to access the link:

         http://www.qlogic.com/support/drivers_software.asp

      b. Under **OEM-Approved Drivers/Firmware**, select **EMC**.

      c. Download the SANblade GUI package.

2. Install the SANblade GUI:

   pkgadd -d sanbcfx_vnnn

   A list of available packages appears.

   Example:

```
The following packages are available:
1  scfx2-6   QLogic SANblade Control FX (HBA Configuration Utility)
             (sparc) Solaris 2.6, 7 Rev=1.26
2  scfx2-8   QLogic SANblade Control FX (HBA Configuration Utility)
             (sparc) Solaris 8-9 Rev=1.26

Select package(s) you wish to process (or 'all' to process all packages).
(default: all) [?,??,q]:
```

   Select a package associated with the host Solaris version and press **ENTER**.

3. Open the SANblade GUI:

   cd /opt/QLogic_Corporation/SANblade_Control_FX
   ./scfx

4. Double-click the hostname pin located at the upper left of the GUI to display all QLogic HBAs installed in the host.

5. Click an adapter for which you want to set the variables.

   Example: Adapter 2200 (Instance #0)

6. At the Tab dialog, click **HBA Options**.

7. Under **Select Parameter Section**:

   a. Select **Adapter Settings**, and set the variables according to Table 4 on page 21.

      When finished, click **Save**.

   b. Select **Advanced Adapter Settings**, and set the variables according to Table 4 on page 21.

      When finished, click **Save**.

8. If you *are not* planning to do the persistent binding for this adapter, go to step 9.

   If you *are* planning to do the persistent binding for this adapter:

   a. Note the following — Persistent binding information added with the SANblade Control FX utility is placed in a different part of /kernel/drv/qla2x00.conf than information added

by editing the actual file `/kernel/drv/qla2x00.conf`. When the host is rebooted, the software looks only at the information added through the SANblade utility, if such information exists. This means that if you use the SANblade utility to add an HBA, any HBAs that were added by editing `/kernel/drv/qla2x00.conf` will be ignored when the host is rebooted.

If you use the SANblade utility, be sure to add any HBAs that are already configured in `/kernel/drv/qla2x00.conf`.

    b. At the **Tab** dialog, click **Target Persistent Binding**.

    c. Check the **Bind** column.

    d. In the **Target ID** field, bind the target device by any ID in the range 0 through 255.

    e. When finished, click **Save**.

9. Repeat steps 5 through 8 to set the variables and/or do the persistent binding for any other QLogic adapters.

10. On the SANblade Control FX main window File menu, select **Exit** to exit the GUI.

⚠️ **CAUTION**

If you want the QLogic driver to report OS discovery of persistent binded devices only, change the setting in /kernel/drv/qla2x00.conf as follows:
    from: qla-mp-config-required=0;
    to: qla-mp-config-required=1;

All parameters saved from the SANblade GUI are stored in the driver configuration file `/kernel/drv/qla2x00.conf` and in the HBA's NVRAM.

What next?
◆ If you need to edit `/etc/system`, proceed to "Editing /etc/system" on page 30.

◆ If you are finished editing configuration files, reboot the host with the reconfigure option (`reboot -- -r`) to rebuild the kernel and implement the changes.

Editing /etc/system

Operation in a Solaris environment requires that some parameters in the file /etc/system must be modified, as described in this section.

Note: Changes to /etc/system will not take effect until the host is rebooted.

Note: The modification to the parameter **sd_max_throttle** is required specifically for Fibre Channel. Other settings apply to both standard SCSI and Fibre Channel.

1. Type **set sd:sd_max_throttle=20** and press **ENTER**.

2. Add a line to set the I/O timeout. This setting prevents the host from issuing warning messages when non-disruptive operations are performed on the EMC storage array:

   ```
   set sd:sd_io_time = 0x3C
   ```

What next? Reboot the host with the reconfigure option (**reboot -- -r**) to rebuild the kernel and implement the changes.

Dynamically configured Targets/LUNs and driver parameters

The dynamic configuration of Targets/LUNs and/or driver parameters without rebooting is supported on driver 4.15.03 or later. The following restrictions must be considered prior to the start of dynamically configuring Targets/LUNs or driver parameters:

◆ Logged on as root, or have an effective user ID of root.

◆ Ensure that the /kernel/drv/sd.conf file contains an entry:

   ```
   name="sd" parent="qla2x00" target=0;
   ```

◆ If any persistent binding changes are made to currently mounted partitions, unmount those partitions.

◆ Stop any application that is using the sdmapi interface (for example, SNIA).

◆ The system utilities (for example, devfsadm, update_drv, pkill, drvconfig, disks, and so forth, must be present on the host and executable by root.

◆ If the system was booted from the SAN using a QLogic adapter, ensure that no change is made to the persistent binding of the boot device (that is, Target and LUN). Failure to do so will result in a hung system, or a panic, as the system will no longer be able to find its root partition.

Dynamically configuring Targets/LUNs

1. To modifying the `/kernel/drv/qla2x00.conf` file:

   • If FC-SW:

     – Make persistent binding entry for each target device as described under: "QLogic persistent binding implementation" on page 19.

     – Set parameter `hba0-connection-options=1;`

     – Set parameter
       `hba0-persistent-binding-configuration=1;`

   • If FC-AL:

     – Set parameter `hba0-connection-options=0;`

     – Set parameter
       `hba0-persistent-binding-configuration=0;`

2. Run the `qlreconfig` utility:

   ```
   cd /opt/QLogic_Corporation/drvutil/qla2x00
   ./qlreconfig -d qla2x00
   ```

⚠ **CAUTION**

After the `qlreconfig` utility is run, the host still adds new devices in the background. Thus, the more new devices added to the host, the longer the time it takes to complete buildup.

Dynamically configuring driver parameters

1. Enter the desired values of parameters in the `/kernel/drv/qla2x00.conf` file.

2. Run the `qlreconfig` utility:

   ```
   cd /opt/QLogic_Corporation/drvutil/qla2x00
   ./qlreconfig -d qla2x00
   ```

Partitioning and labeling devices

Use the **format** command to partition and label new Fibre Channel devices. The devices will appear under /dev/dsk and /dev/rdsk.

To partition and label new devices:

1. At the **root** prompt, type **format** and press **ENTER**.

   The host searches for all disks and displays a list, placing all unlabeled disks at the beginning of the list.

2. At the **Specify Disk** prompt, **ENTER** the number of the first EMC drive.

3. The Format menu appears. At the **format** prompt, type **label** and press **ENTER**.

4. At the **Disk not labeled. Label it now?** prompt, type **y** and press **ENTER**.

5. Type **disk** and press **ENTER** at the prompt to display a list of the disks.

6. Repeat Step 2 through Step 5 for each EMC storage array disk.

Updating the HBA FCode

You can use either of two utilities to update the FCode for an HBA:

- qla2x00flash utility
- SANblade Control FX utility (only supported for driver 4.13 or earlier)

Note: Ensure that the QLogic driver has been installed into the system before updating the HBA FCode.

Both procedures start the same:

1. From the root of your system, create a directory from this list:

HBA model	Directory name
QLA2200F-EMC QCP2202F-E	QLA2200_FCode
QLA2202FS-E	QLA2202FS_FCode
QLA2300F-E-SP	QLA2300_FCode
QLA2340-E-SP QLA2342-E-SP	QLA234x_FCode

2. Copy the appropriate FCode from the QLogic CD or the QLogic website (as described under "From the QLogic website:" on page 11), as shown in the following table:

Note: *yyy* is the FCode version.

If HBA is:	Copy this FCode file:	To this directory:
QLA2200F-EMC QCP2202F-E	2200FCode*yyy*.tar.Z	/QLA2200_FCode
QLA2202FS-E	2202sbusFCode*yyy*.tar.Z	/QLA2202FS_FCode
QLA2300F-E-SP	2300FCode*yyy*.tar.Z	/QLA2300_FCode
QLA2340-E-SP QLA2342-E-SP	2312FCode*yyy*.tar.Z	/QLA234x_FCode

3. Go into the appropriate HBA directory; then uncompress and untar the FCode file.

4. Use the **format** utility to list all of your EMC storage array devices. Write down all storage array device paths in your system.

   Example: At the **%** prompt, type **format** and press **ENTER**. The display is similar to this:

```
Searching for disks... done

AVAILABLE DISK SELECTIONS:
0. c1t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
/pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w21000004cf72febf,0
1. c2t1d0 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,700000/scsi@1/sd@1,0
2. c2t1d1 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,700000/scsi@1/sd@1,1
3. c3t2d0 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,700000/fibre-channel@2/sd@2,0
4. c3t2d1 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,700000/fibre-channel@2/sd@2,1
5. c4t3d0 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,600000/QLGC,qla@1/sd@3,0
6. c4t3d1 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,600000/QLGC,qla@1/sd@3,1
...
```

The device path of QLogic adapters in your system will be:

```
/devices/pci@8,700000/scsi@1
/devices/pci@8,700000/fibre-channel@2
/devices/pci@8,600000/QLGC,qla@1
```

The device paths containing the word scsi and fibre-channel belong to the HBA that has the x86 BIOS installed. The device path containing word QLGC,qla belonging to the HBA that has the FCode installed.

⚠️ **CAUTION**

If the system has an HBA containing the x86 BIOS, upgrading the HBA to FCode will change the device path word "scsi" or "fibre-channel" to "QLGC,qla," which means it will change the adapter device pathname. Therefore, on reboot of the system, Solaris will:

- **Assign a new device path for the HBA (affecting any mount points already created).**
- **Create a new driver instance number (affecting driver configuration file parameters).**

To resolve these issues, please contact EMC local support for assistance.

Note: If the x86 BIOS-to-FCode change is made on a new installation prior to creating mount points and configuring the system, the previous caution does not apply, since the mount points, driver persistent binding entries, etc., will be created based on the new device paths.

At this point, the next step (Step 5) depends on which of the two utilities you use to update the FCode:

◆ If you are using the qla2x00flash utility, continue with "Using the qla2x00flash utility," next.

◆ If you are using the SANblade Control FX utility (only supported for driver 4.13 or earlier), go to "Using the SANblade Control FX utility" on page 36.

Using the qla2x00flash utility

If you are using the `qla2x00flash` utility, proceed from step 4 as follows:

5. Download the FCode for each HBA by entering the appropriate path on the command line.

   Examples:

   - For the QLA2200F-EMC or QCP2202F-E:
     `./qla2x00flash -l`
     `/devices/pci@8,700000/scsi@1:devctl ifp2200.prom`

- For the QLA2202FS-E:

  ```
  ./qla2x00fcode -l -p
  /devices/sbus@1f,0/QLGC,qla@1,3000:devctl -f
  2202fs.prom
  ```

- For the QLA2342E-SP:

  ```
  ./qla2x00flash -l
  /devices/pci@8,700000/fibre-channel@2:devctl
  ifp2312.prom
  ```

6. Repeat step 5 for other adapters.

7. Reboot the host with the reconfigure option:

   ```
   reboot -- -r
   ```

8. After the system has rebooted, issue the **format** command to verify that the device pathname changed to QLGC,qla when the FCode was installed.

   The display is similar to this:

```
Searching for disks... done

AVAILABLE DISK SELECTIONS:
0. c1t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
/pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w21000004cf72febf,0
1. c2t1d0 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,700000/QLGC,qla@1/sd@1,0
2. c2t1d1 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,700000/QLGC,qla@1/sd@1,1
3. c3t2d0 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,700000/QLGC,qla@2/sd@2,0
4. c3t2d1 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,700000/QLGC,qla@2/sd@2,1
5. c4t3d0 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,600000/QLGC,qla@1/sd@3,0
6. c4t3d1 <EMC-SYMMETRIX-5669 cyl 2148 alt 2 hd 15 sec 64>
/pci@8,600000/QLGC,qla@1/sd@3,1
...
```

Using the SANblade Control FX utility

If you are using the SANblade Control FX utility, proceed from step 4 on page 34 as follows:

5. Open the SANblade GUI:

   ```
   cd  /opt/QLogic_Corporation/SANblade_Control_FX
   ./scfx
   ```

6. Double-click the hostname pin located at the upper left of the GUI to display all QLogic HBAs installed in the host.

7. Click the adapter on which you want to update the FCode.

8. At the Tab dialog, click **Utilities**.

9. Enable **Update FCode**.

10. Click **Select Input File**.

11. Select the appropriate filename:

HBA Model	Look in:	Filename
QLA2200F-EMC QCP2202F-E	/QLA2200_Fcode	ifp2200.prom
QLA2202FS-E	/QLA2202FS_Fcode	2202fs.prom
QLA2300F-E-SP	/QLA2300_Fcode	ifp2300.prom
QLA2340-E-SP QLA2342-E-SP	/QLA234x_Fcode	ifp2312.prom

12. Click **Open**.

    The SANblade GUI displays **Last Input File Selected:** and an entry similar to the following:

    `/QLA234x_Fcode/ifp2312.prom`

13. Click **Update** to update the FCode.

14. Repeat steps 7 through 13 for any other HBA that needs the FCode updated.

15. On the SANblade GUI main window's File menu, select **Exit** to exit the GUI.

16. Reboot the host with the reconfigure option:

    reboot -- -r

Symmetrix/Fabric case study

This case study incorporates all of the information for the persistent binding setup and the host configuration files.

The study consists of an environment that includes four Sun servers connected through an EMC Connectrix® Enterprise Director to six Symmetrix Fibre Channel director ports, as shown in the following figure and table.
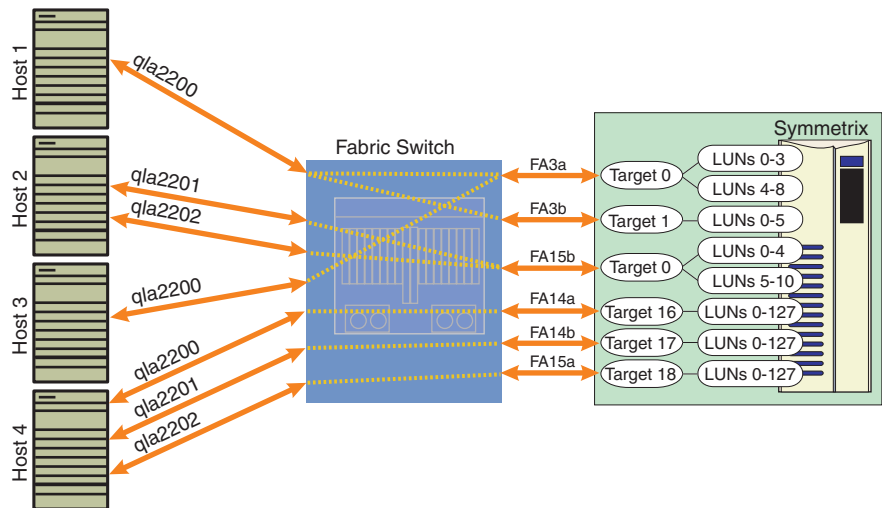
Configuration example	Host	HBA	FA	Target	LUNs	Zone	Volume Logix Device
Fan-in	Host 1	QLA2200	3a	0	0–3	0	0x80–0x83
			3b	1	0–5		0x90–0x95
Fan-out	Host 2	QLA2201	1a	0	0–4	1	0x34–0x38
		QLA2202			5–10	2	0x39–0x45
Multiple host fan-in	Host 3	QLA2200	3a	0	4–8	3	0x84–0x88
PowerPath	Host 4	QLA2200	14a	16	0–127	4	0x100–0x17f
		QLA2201	14b	17	0–127	5	
		QLA2201	15a	18	0–127	6	

As shown in the previous figure and table, the recommended zoning is HBA-based zoning using the WWPN of the HBA and the Symmetrix. HBA-based zoning includes only one HBA port and single/multiple target ports per zone.

Note: For further information on zoning, refer to the *EMC Connectrix Enterprise Network System Planning Guide.*

Volume Logix requires an available Symmetrix device as the gatekeeper for administration on a particular host. Any of the hosts in the example may contain a gatekeeper, which must be assigned in /kernel/drv/sd.conf. Any of the devices defined in the gatekeeper must be mapped to the certain LUN number associated with the Symmetrix port; for example, device 0x80 LUN 0 of FA 3A.

Note: For further information on Volume Logix, refer to the *Volume Logix Product Guide.*

The switch zoning must coincide with Volume Logix mapping to allow probing any Symmetrix devices. Such planning as that shown in the table can help present a complete picture before setting up the persistent binding.

Configuration file entries

Following are the configuration file entries for each server in the case study.

Host 1   In `/kernel/drv/qla2200.conf`:

```
hba0-SCSI-target-id-0-fibre-channel-node-name="50060482bbff7a82";
hba0-SCSI-target-id-0-fibre-channel-port-name="50060482bbff7a82";
hba0-SCSI-target-id-1-fibre-channel-node-name="50060482bbff7a92";
hba0-SCSI-target-id-1-fibre-channel-port-name="50060482bbff7a92";
```

In `/kernel/drv/sd.conf`:

```
name="sd" class="scsi" target=0 lun=0;
name="sd" class="scsi" target=0 lun=1;
name="sd" class="scsi" target=0 lun=2;
name="sd" class="scsi" target=0 lun=3;
name="sd" class="scsi" target=1 lun=0;
name="sd" class="scsi" target=1 lun=1;
name="sd" class="scsi" target=1 lun=2;
name="sd" class="scsi" target=1 lun=3;
name="sd" class="scsi" target=1 lun=4;
name="sd" class="scsi" target=1 lun=5;
```

Host 2   In `/kernel/drv/qla2200.conf`:

```
hba1-SCSI-target-id-0-fibre-channel-node-name="50060482bbff7a9e";
hba1-SCSI-target-id-0-fibre-channel-port-name="50060482bbff7a9e";
hba2-SCSI-target-id-0-fibre-channel-node-name="50060482bbff7a9e";
hba2-SCSI-target-id-0-fibre-channel-port-name="50060482bbff7a9e";
```

In `/kernel/drv/sd.conf`:

```
name="sd" class="scsi" target=0 lun=0;
name="sd" class="scsi" target=0 lun=1;
name="sd" class="scsi" target=0 lun=2;
name="sd" class="scsi" target=0 lun=3;
name="sd" class="scsi" target=0 lun=4;
name="sd" class="scsi" target=0 lun=5;
name="sd" class="scsi" target=0 lun=6;
name="sd" class="scsi" target=0 lun=7;
name="sd" class="scsi" target=0 lun=8;
name="sd" class="scsi" target=0 lun=9;
name="sd" class="scsi" target=0 lun=10;
```

Host 3   In `/kernel/drv/qla2200.conf`:

```
hba1-SCSI-target-id-0-fibre-channel-node-name="50060482bbff7a82";
hba1-SCSI-target-id-0-fibre-channel-port-name="50060482bbff7a82";
```

In `/kernel/drv/sd.conf`:

```
name="sd" class="scsi" target=0 lun=4;
name="sd" class="scsi" target=0 lun=5;
name="sd" class="scsi" target=0 lun=6;
name="sd" class="scsi" target=0 lun=7;
name="sd" class="scsi" target=0 lun=8;
```

Host 4   In `/kernel/drv/qla2200.conf`:

```
hba0-SCSI-target-id-16-fibre-channel-node-name="50060482bbff7a8d";
hba0-SCSI-target-id-16-fibre-channel-port-name="50060482bbff7a8d";
hba1-SCSI-target-id-17-fibre-channel-node-name="50060482bbff7a9d";
hba1-SCSI-target-id-17-fibre-channel-port-name="50060482bbff7a9d";
hba2-SCSI-target-id-18-fibre-channel-node-name="50060482bbff7a8e";
hba2-SCSI-target-id-18-fibre-channel-port-name="50060482bbff7a8e";
```

In `/kernel/drv/sd.conf`:

```
name="sd" class="scsi" target=16 lun=0;
name="sd" class="scsi" target=16 lun=1;
…
name="sd" class="scsi" target=16 lun=127;

name="sd" class="scsi" target=17 lun=0;
name="sd" class="scsi" target=17 lun=1;
…
name="sd" class="scsi" target=17 lun=127;

name="sd" class="scsi" target=18 lun=0;
name="sd" class="scsi" target=18 lun=1;
…
name="sd" class="scsi" target=18 lun=127;
```

Tips for retrieving entries in qla2200.conf

You can retrieve the **hbaX-adapter-** information by issuing the following commands:

cat /var/adm/messages | /usr/bin/grep qla2200-hba | /usr/bin/sed -e \ 's/.*qla2200-//' >> /var/adm/qla2200.entries

Information similar to the following will be appended to /var/adm/qla2200.entries:

```
hba0-adapter-node-name="200000e08b0004c5";
hba0-adapter-port-name="200000e08b0004c5";
hba0-SCSI-target-id-12-fibre-channel-node-name="50060482bbff7a82";
hba0-SCSI-target-id-12-fibre-channel-port-name="50060482bbff7a82";
```

2

Configuring a Boot Device on the EMC Storage Array

EMC supports booting Solaris from the storage array through an EMC-qualified QLogic Fibre Channel HBA. (Refer to the *EMC Support Matrix* for specific HBAs, drivers, and FCode.)

Configuring a Symmetrix boot device

This section contains the following information for configuring a Symmetrix boot device:

- "HBA FCode requirement," next
- "Partitioning the boot device" on page 44
- "Creating file systems" on page 46
- "Installing a bootblk" on page 46
- "Copying required files" on page 47
- "Modifying OpenBoot" on page 48
- "Useful monitor commands" on page 51
- "Troubleshooting" on page 52

HBA FCode requirement

The FCode must be installed before configuring a Symmetrix boot device. If it has not been installed, follow the steps under "Updating the HBA FCode" on page 33.

Partitioning the boot device

1. Use the **format** command to verify that the sizes of the partitions on the Symmetrix device chosen for the Solaris installation are large enough to copy the current OS partitions. Examine the partitions of the host source drive where the current OS resides:

    a. At the %> prompt, select the host source drive and press **ENTER**.

    b. When prompted choose disk **0**, press **ENTER**.

    c. At the **fomat>** prompt, type **partition** and press **ENTER**.

    d. At the **partition>** prompt, type **print** and press **ENTER**.

Sample output:

```
Part       Tag    Flag Cylinders    Size
0          root   wm     0-335    124.69 MB
1          swap   wm   336-792    169.59 MB
2        backup   um    0-5846      2.12GB
3   unassigned    wm        0           0
4   unassigned    wm        0           0
5   unassigned    wm        0           0
6           usr   wm   739-2305   561.40 MB
7          home   wm   2306-5846    1.28GB
```

2. Select the Symmetrix device on which to install the Solaris operating system as follows:

   a. At the **partition** prompt, type **quit** and press **ENTER** to return to the **format** menu.

   b. At the **format** prompt, type **disk** and press **ENTER**.

   c. Information similar to the following appears:

```
AVAILABLE SELECTIONS
...
1. c0t0d0 <SUN4,2G cyl 3880 alt 2 hd 16 sec 135>
/pci@1f,4000/scsi@3/sd@0,0
2. c3t0d0 <EMC-SYMMETRIX-5265 cyl 4088 alt 2 hd 15 sec
64> /pci@1f,4000/QLGC,qla@4/sd@0,0
 ...
specify disk (enter its number):
```

   Select the Symmetrix device (for example, c3t0d0) and press **ENTER**.

3. Repartition the Symmetrix device (if necessary) to model the partition information from the host source drive in order to match the drive configuration:

   a. At the **format** prompt, type **partition** and press **ENTER**.

   b. At the **partition** prompt, type **modify** and press **ENTER**.

   c. After the partition in the Symmetrix device has been created, type **modify** and press **ENTER** at the **format** prompt.

Creating file systems

Create file systems on the required partitions in the designated Symmetrix Boot device.

Below is an example in which the OS is being copied to a Symmetrix device of Target 0 LUN 0 on controller 3:

```
newfs /dev/rdsk/c3t0d0s0
newfs /dev/rdsk/c3t0d0s6
newfs /dev/rdsk/c3t0d0s7
```

To use a different Symmetrix Device, change `t0` to `t<Symmetrix Device target number>`. To use a different controller, change `c3` to `c<controller number>`. You must create both the root partition (slice 0) and the /usr partition (slice 6). You should also create other partitions (/export/home, /var, /opt) to mirror the current layout. Use the **newfs** command to create the file systems.

Installing a bootblk

Install a *bootblk* (the information required by the host to boot the operating system) on the root partition of the Symmetrix boot device.

1. Use the **'uname -a'** command to determine the architecture of the workstation. This determines the directory in /usr/platform where the bootblk will be found. The example below gives sun4u as the architecture, and subdirectory for /usr/platform.

   Example: At the %> prompt, type **uname -a** and press **ENTER** to display a line similar to the following:

```
SunOS patriot 5.8 Generic_108528-15 sun4u Sparc
SUNW,Ultra-60
```

2. At the %> prompt, enter the following to install a bootblk onto the Symmetrix boot device:

```
/usr/sbin/installboot /usr/platform/sun4u/lib/fs/ufs/bootblk /dev/rdsk/
   c<controller number>t<Symmetrix device target number>d0s0
```

For example, entering the following installs a bootblk onto a boot device of Target 0 LUN 0 on controller 3:

```
/usr/sbin/installboot /usr/platform/sun4u/lib/fs/ufs/bootblk /dev/rdsk/c3t0d0s0
```

Note: The information about the boot device's path. This information will be useful later, in the procedure for modifying OpenBoot. In the previous example, your boot device's path is **/pci@1f,4000/QLGC,qla@4/sd@0,0**.

Copying required files

Use **ufsdump** and **ufsrestore** to copy the required files and directories from the host source drive to the Symmetrix boot device.

1. At the %> prompt, type **mount /dev/dsk/c3t0d0s0 /mnt** and press **ENTER** to mounts the root directory of the Symmetrix device to **/mnt**.

2. Use the **ufsdump** command to create the required directory structure on the new Symmetrix device and copy the files.

   Below is an example where the current operating system is located on /dev/dsk/c0t0d0.

   Example: At the %> prompt, type the following and press **ENTER**:

   ufsdump 0f - /dev/dsk/c0t0d0s0 | (cd /mnt; ufsrestore rf -)

   When the above command completes, the Symmetrix device (**c3t0d0s0**) will have the complete image of the root partition.

3. In the /mnt/etc directory update the vfstab file to indicate the Symmetrix boot device address to be mounted during boot. Modify all partitions that will be located on the Symmetrix boot device.

   a. At the %> prompt, type **cd /mnt/etc** and press **ENTER**.

   b. At the %> prompt, type **vi vfstab** and press **ENTER**.

   Example — Before modification:

```
#device               device                mount  FS    fsck   mount    mount
#to mount to          fsck                  point  type  pass   at boot  options
#
/dev/dsk/c0t0d0s1     -                     -      swap  -      no       -
/dev/dsk/c0t0d0s0     /dev/rdsk/c0t0d0s0    /      ufs   1      no       -
/dev/dsk/c0t0d0s6     /dev/rdsk/c0t0d0s6    /usr   ufs   1      no       -
swap -  /tmp tmpfs  - yes -
```

Example — After modification:

```
#device             device                  mount  FS    fsck   mount    mount
#to mount to        fsck                    point  type  pass   at boot  options
#
/dev/dsk/c3t0d0s1   -                       -      swap  -      no       -
/dev/dsk/c3t0d0s0   /dev/rdsk/c3t0d0s0      /      ufs   1      no       -
/dev/dsk/c3t0d0s6   /dev/rdsk/c3t0d0s6      /usr   ufs   1      no       -
swap -  /tmp tmpfs  - yes -
```

Note: To increase system performance, you can leave the swap partition on the internal boot drive by leaving the fourth line (`/dev/dsk/c3t0d0s1 - - swap - no -`) unchanged.

4. At the **%>** prompt, type **umount /mnt** and press **ENTER** to unmount the root partition.

5. Repeat steps 1, 2, and 4 for the **/usr** partition. In the current root directory:

   a. At the **%>** prompt, type **mount /dev/dsk/c3t0d0s6 /mnt** and press **ENTER**.

   At the **%>** prompt, type the following and press **ENTER**: **ufsdump 0f - /dev/dsk/c0t0d0s6 | (cd /mnt; ufsrestore rf -)**

   b. At the **%>** prompt, type **umount /mnt** and press **ENTER**.

6. Repeat steps 1, 2, and 4 for any other partitions to be mounted from the Symmetrix boot device.

Modifying OpenBoot

Follow this procedure to modify OpenBoot:

1. Halt the system and issue a reset to get to the OpenBoot environment:

   a. At the **%>** prompt, type **halt** and press **ENTER**.

   b. At the **OK>** prompt, type **setenv auto-boot? false** and press **ENTER**, so the system will display the **OK>** prompt after reset.

   c. At the **OK>** prompt, type **reset-all** and press **ENTER**.

2. For the intended (target) Fibre Channel boot HBA, set the topology for arbitrated loop:

a. At the **OK>** prompt, type **"<HBA-path>" select-dev** and press **ENTER** to select the HBA.

   Example: Suppose the path to your boot disk is
   `/pci@1f,4000/QLGC,qla@1/sd@0,0`

   Type **" /pci@1f,4000/QLGC,qla@1" select-dev** and press **ENTER**

b. At the **OK>** prompt, type **0 set-connection-mode** and press **ENTER** to set the HBA's topology to *Loop Only.*

   The result is similar to this:

   ```
   Calculating NVRAM checksum, please wait… done
   Current HBA connection mode:0 - Loop Only.

   Possible connection mode choices:
   0 - Loop Only
   1 - Point-to-point only.
   2 - Loop preferred, otherwise point-to-point
   3 - Point-to-point preferred, otherwise loop
   ```

3. Set the **adapter-loopID** of your HBA to be different from the **adapter-loopid**s of all other Symmetrix Fibre Channel directors in the loop. EMC recommends setting your **adapter-loopid** to the same value as the **Hard Loop ID** parameter that you defined when setting the driver configuration variables. (Refer to "Editing /kernel/drv/sd.conf" on page 25.)

   Example: To set your adapter-loopid to 125 (0x7d), at the **OK>** prompt type **7d set-adapter-loopid** and press **ENTER**. The result is similar to this:

   ```
   Calculating NVRAM checksum, please wait ... done
   Adapter loopId -7d
   ```

4. Reset the system for the new HBA topology and adapter-loopId setting to take effect:

   reset-all

5. Set up the boot-id for your boot HBA.

   a. At the **OK>** prompt, type **"<HBA-path>" select-dev** and press **ENTER** to select the HBA.

Example: **" /pci@1f,4000/QLGC,qla@1" select-dev**

The result is similar to this:

```
QLogic QLA2200 Fibre Channel Host Adapter FCode
version 1.15 01/03/01
Loading QLA2200 firmware - version 2.01.26
Waiting for Fibre Channel link up. - link is up
```

b. At the **OK>** prompt, type **show-children** and press **ENTER** to display the Symmetrix WWN and loop ID of the boot disk.

The result is similar to this:

```
******************* Local Loop Devices ***********************
pter loopId - 7d
evice AL-PA  loopId 0  Hard-addr 0   Port WWN 50060482c3a0d833
un  0  DISK  EMC      SYMMETRIX        5567
un  1  DISK  EMC      SYMMETRIX        5567
un  2  DISK  EMC      SYMMETRIX        5567
---
```

Write down the WWN, loopId, and Lun of the boot device.

c. At the **OK>** prompt, set up the boot ID, by typing:
<WWN> <TargetId> <Lun> set-boot-id and pressing **ENTER**

Example: **50060482c3a0d833 0 0 set-boot-id**

The result is similar to this:

```
Calculating NVRAM checksum, please wait... done
Boot device login successful
Boot WWN - 50060482 c3a0d833 WWPN - 50060482 c3a0d833 Id - 0 Lun -
0
```

d. At the **OK>** prompt, type **unselect-dev** and press **ENTER**.

6. Set up a new alias for your new boot disk:

a. At the **OK>** prompt, type **nvalias your_alias** *<your device>* and press **ENTER**.

Example:
nvalias symmdisk /pci@1f,4000/QLGC,qla@4/sd@0,0

b. At the **OK>** prompt, type **nvstore** and press **ENTER** to store your new boot name.

c. At the **OK>** prompt, type **setenv auto-boot? true** and press **ENTER**, so the system will not stop at the **OK>** prompt after reset.

d. **reset-all**

Useful monitor commands

To display various information about the boot HBA:

1. At the **OK>** system monitor prompt, type **select-dev <*controller-path*>** and press **ENTER** to select the HBA.

    Example: **" /pci@1f,4000/QLGC,qla@1" select-dev**

2. You can issue any of these commands:

    show-boot-id — Prints current boot device ID
    version — Prints current version of FCode and firmware
    show-connection-mode — Prints current topology
    show-adapter-loopid — Prints current adapter-loopId
    clear-boot-id — Clears boot-id from the HBA

3. At the **OK>** prompt, type **unselect-dev** and press **ENTER**.

⚠️ **IMPORTANT**

If you do not want to boot from this HBA again, you must issue the clear-boot-id command to remove the boot-id from the HBA.

Troubleshooting

This section describes some problems that could occur, as well as actions to be taken.

Problem	Cause	Solution
During boot process, cannot mount or fsck.	/etc/vfstab file on the Symmetrix boot device did not update correctly.	At the **OK>** prompt, type **boot disk** and press **ENTER** to boot the system using the internal disk. Correct the file /etc/vfstab on the Symmetrix boot device.
After entering **'boot Symmdisk'**, a message states that the loaded file is not executable.	There is probably not a boot disk on the target disk, or the copy from local to Symmetrix device was not successful.	At the **OK>** prompt, type **boot disk** and press **ENTER** to boot the system using the internal disk. Recreate the Symmetrix boot disk again.

Configuring a CLARiiON boot device

You can use either a native-named device or *emcpower* device as a boot device. If using an emcpower device, the host adapter on the emcpower device must support booting in its FCode.

Using a PowerPath device as the boot device provides load balancing and path failover for the boot device. Native-named devices, however, do not provide boot time boot path failover.

Note: This procedure assumes that PowerPath is already installed.

> ⚠️ **IMPORTANT**
>
> **If setting the boot disk with Solaris 10, the target/LUN of the boot device must be defined in the `/kernel/drv/sd.conf` file.**

Booting from a native Solaris device

Follow these steps to use a native device:

1. Select the LUN that will be used for booting by running the **format** command.

2. On the target LUN selected in step 1, create /, /usr, /var, /export/home, /var, /opt, swap, and any other required partitions that match the current boot disk's partitions.

   You must make all of the partitions greater than that of the current boot disk's partitions.

3. Label the disk to save the updated partitions by issuing the **label** command while still in the format utility.

4. Create a new file system for each partition, excluding swap and backup.

   Root partition example: **newfs /dev/rdsk/c2t0d0s0**

5. Create a directory and mount each partition as in the following example:

   ```
   mkdir /bootarray
   mount /dev/dsk/c2t0d0s0 /bootarray
   mkdir /bootarray/usr
   mount /dev/dsk/c2t0d0s6 /bootarray/usr
   ```

6. For each partition you created, change to the root directory of the LUN you set up and dump the OS:

   Example:

   ```
   cd /bootarray
   ufsdump 0f - /dev/dsk/c0t0d0s0 | ufsrestore rf -
   ```

7. Record the complete path of the boot LUN by running the **format** command and taking note of the path listed directly below the device.

   Example: **/ssm@0,0/pci@18,600000/pci@1/QLGC,qla@5/sd@0,0**

8. Once the dump is done, edit /bootarray/etc/vfstab to change the original partitions to reflect the partitions on the new boot disk.

   Example: **vi /bootarray/etc/vfstab**

   Change the lines shown in bold below as follows:

   Before:

   ```
   #device    device    mount     FS        fsck    mount     mount
   #to mount  to fsck   point     type      pass    at boot   options
   #
   #/dev/dsk/c1d0s2 /dev/rdsk/c1d0s2 /usr  ufs      1        yes      -
   fd    -    /dev/fd fd    -    no    -
   /proc  -   /proc proc    -    no    -
   /dev/dsk/c0t0d0s1    -     -     swap - no     -
   /dev/dsk/c0t0d0s0   /dev/rdsk/c0t0d0s0  /      ufs    1    no    -
   /dev/dsk/c0t0d0s6   /dev/rdsk/c0t0d0s6  /usr   ufs    1    no    -
   swap   -    /tmp tmpfs -    yes   -
   ```

   After:

   ```
   #device    device    mount     FS        fsck    mount     mount
   #to mount  to fsck   point     type      pass    at boot   options
   #
   #/dev/dsk/c1d0s2 /dev/rdsk/c1d0s2 /usr  ufs      1        yes      -
   fd    -    /dev/fd fd    -    no    -
   /proc  -   /proc proc    -    no    -
   /dev/dsk/c2t0d0s1    -     -     swap - no     -
   /dev/dsk/c2t0d0s0   /dev/rdsk/c2t0d0s0  /      ufs    1    no    -
   /dev/dsk/c2t0d0s6   /dev/rdsk/c2t0d0s6  /usr   ufs    1    no    -
   swap   -    /tmp tmpfs -    yes   -
   ```

9. Add the following lines to /bootarray/etc/system:

```
rootfs:ufs
rootdev:/ssm@0,0/pci@18,600000/pci@1/QLGC,qla@5/sd@0,b:a
```

where in **sd@0,b:a**:
0 is the target number.
b is the LUN number (in hex format).
a is slice 0.

Note: If a CLARiiON LUN is under the control of the ATF driver, replace the **sd@0,b:a** with **atf@0,b:a**.

10. Edit /bootarray/etc/dumpadm.conf and change the original swap device to the new swap device.

Note: You do not have to edit dumpadm.conf for Solaris 2.6 or earlier.

11. Install the boot block on the new boot device by running the following:

```
installboot  /usr/platform/`uname -i`/lib/fs/ufs/bootblk /dev/rdsk/c2t0d0s0
```

12. Bring the host down to the OBP by issuing the **halt** command.

13. While in OBP, issue the **reset-all** command.

14. Issue the **show-devs** command, and select the correct path to the device to be used as the new boot device.

    Example:
    " /ssm@0,0/pci@18,600000/pci@1/QLGC,qla@5" select-dev

15. To set the correct topology, type the following and press **ENTER**:

    • Fabric: **1 set-connection-mode**

    • Loop: **2 set-connection-mode**

16. To display all Fibre Channel devices along with WWPN of the target SP from which you are booting, issue the **show-children** command.

17. Set the boot ID of the new boot device:

    a. Make note of the actual WWPN, DID, or ALPA returned from the **show-children** comand, and copy down the corresponding boot entry.

    b. Set the boot ID:

```
<WWPN> <TargetID> <LUN #> set-boot-id
```

Example: If the WWN is **500601684004c2f7**, the LoopID is **82** and the LUN is **b**, you would enter:

```
500601684004c2f7 82 b set-boot-id
```

    c. Check the loop ID of the adapter:

```
show-adapter-loopid
```

    d. Set the loop ID:

```
7c set-adapter-loopid
```

    e. Issue an **unselect-dev**.

18. Create an alias for the new boot device:

```
nvalias emcboot /ssm@0,0/pci@18,600000/pci@1/QLGC,qla@5/sd@0,0:a
nvstore
```

19. You are now ready to boot:

    unselect-dev
    reset-all
    boot emcboot

Booting from an emcpower device

Follow these steps to use an emcpower device:

1. Select the LUN that will be used for booting by running the **powermt display** command.

Example:

powermt display dev=0

Output from example:

```
Pseudo name=emcpower0a
CLARiiON ID=WRE00021500561
Logical device ID=6006016AF9080000D6577E33A769D611
state=alive; policy=CLAROpt; priority=0; queued-IOs=0
==============================================================================
---------------- Host ---------------   - Stor -   -- I/O Path -  -- Stats ---
### HW Path                I/O Paths    Interf.   Mode    State Q-IOs Errors
==============================================================================
  0 ssm@0,0/pci@18,600000/pci@1/QLGC,qla@4 c1t0d0s0  SP A0   active  alive  0   0
  0 ssm@0,0/pci@18,600000/pci@1/QLGC,qla@4 c1t1d0s0  SP B0   active  alive  0   0
  0 ssm@0,0/pci@18,600000/pci@1/QLGC,qla@4 c1t2d0s0  SP A1   active  alive  0   0
  0 ssm@0,0/pci@18,600000/pci@1/QLGC,qla@4 c1t3d0s0  SP B1   active  alive  0   0
  1 ssm@0,0/pci@18,600000/pci@1/QLGC,qla@5 c2t0d0s0  SP A0   active  alive  0   0
  1 ssm@0,0/pci@18,600000/pci@1/QLGC,qla@5 c2t1d0s0  SP B0   active  alive  0   0
  1 ssm@0,0/pci@18,600000/pci@1/QLGC,qla@5 c2t2d0s0  SP A1   active  alive  0   0
  1 ssm@0,0/pci@18,600000/pci@1/QLGC,qla@5 c2t3d0s0  SP B1   active  alive  0   0
  2 ssm@0,0/pci@19,600000/pci@1/QLGC,qla@4 c3t0d0s0  SP A0   active  alive  0   0
  2 ssm@0,0/pci@19,600000/pci@1/QLGC,qla@4 c3t1d0s0  SP B0   active  alive  0   0
  2 ssm@0,0/pci@19,600000/pci@1/QLGC,qla@4 c3t2d0s0  SP A1   active  alive  0   0
  2 ssm@0,0/pci@19,600000/pci@1/QLGC,qla@4 c3t3d0s0  SP B1   active  alive  0   0
  3 ssm@0,0/pci@19,600000/pci@1/QLGC,qla@5 c4t0d0s0  SP A0   active  alive  0   0
  3 ssm@0,0/pci@19,600000/pci@1/QLGC,qla@5 c4t1d0s0  SP B0   active  alive  0   0
  3 ssm@0,0/pci@19,600000/pci@1/QLGC,qla@5 c4t2d0s0  SP A1   active  alive  0   0
  3 ssm@0,0/pci@19,600000/pci@1/QLGC,qla@5 c4t3d0s0  SP B1   active  alive  0   0
```

Now run the **format** command.

2. On the target LUN selected in step 1, create /, /usr, /var, /export/home, /var, /opt, swap, and any other required partitions that match the current boot disk's partitions. You must make all of the partitions greater than that of the current boot disk's partitions.

3. Label the disk to save the updated partitions by issuing the **label** command while still in the **format** utility.

4. Create a new file system for each partition, excluding swap and backup.

   Root partition example: **newfs /dev/rdsk/emcpower0a**

5. Create a directory and mount each partition as in the following example:

   mkdir /bootarray
   mount /dev/dsk/emcpower0a /bootarray
   mkdir /bootarray/usr
   mount /dev/dsk/emcpower0g /bootarray/usr

6. Change to the root directory of the LUN you have set up and dump the O/S:

Example:

```
cd /bootarray
ufsdump 0f - /dev/dsk/c0t0d0s0 | ufsrestore rf -
```

Repeat this for each partition you created.

7. Record the complete path of the boot LUN by running the following command:

ls -l /dev/dsk/emcpower0a

Output from command:

```
lrwxrwxrwx  1 root    other    33 Jun  4 09:06 /dev/dsk/emcpower0a ->
../../devices/pseudo/emcp@0:a,blk
```

Record the /pseudo/emcp@0:a,blk.

8. Once the dump is done, edit /bootarray/etc/vfstab to change the original partitions to reflect the partitions on the new boot disk.

Example: **vi /bootarray/etc/vfstab**

Change the lines shown in bold below as follows:

Before:

```
#device    device    mount    FS       fsck    mount    mount
#to mount  to fsck   point    type     pass    at boot  options
#
#/dev/dsk/c1d0s2 /dev/rdsk/c1d0s2 /usr  ufs     1       yes      -
fd     -    /dev/fd fd    -    no    -
/proc  -    /proc proc    -    no    -
/dev/dsk/c0t0d0s1    -    -    swap - no    -
/dev/dsk/c0t0d0s0    /dev/rdsk/c0t0d0s0   /      ufs    1    no   -
/dev/dsk/c0t0d0s6    /dev/rdsk/c0t0d0s6   /usr   ufs    1    no   -
swap   -    /tmp tmpfs   -    yes   -
```

After:

```
#device    device    mount    FS         fsck    mount    mount
#to mount  to fsck   point    type       pass    at boot  options
#
#/dev/dsk/c1d0s2 /dev/rdsk/c1d0s2 /usr  ufs      1         yes      -
fd     -    /dev/fd fd   -    no    -
/proc  -    /proc proc    -    no    -
/dev/dsk/emcpower0b -    -    swap - no    -
/dev/dsk/emcpower0a /dev/rdsk/emcpower0a /   ufs    1    no    -
/dev/dsk/emcpower0g /dev/rdsk/emcpower0g /usr ufs     1    no    -
swap   -    /tmp tmpfs  -    yes    -
```

9. Add the following lines to the end of /bootarray/etc/system:

    forceload: drv/sd
    forceload: drv/emcp
    rootfs:ufs
    rootdev:/pseudo/emcp@0:a,blk

10. Edit /bootarray/etc/dumpadm.conf and change the original swap device to the new swap device.

    Note: You do not have to edit dumpadm.conf for Solaris 2.6 or earlier.

11. Install the boot block on the new boot device by running the following:

installboot /usr/platform/`uname -i`/lib/fs/ufs/bootblk /dev/rdsk/emcpower0a

12. To find the boot device information to reconfigure the boot disk EEPROM setting, issue the **powermt display** command as you did in step 1, and issue **ls -l** on any one of the devices that appears in the output of **powermt display.**

    Example: **ls -l c1t0d0s0**

    Output from command:

```
lrwxrwxrwx  1 root   other    33 Jun  4 09:06 /dev/dsk/c1t0d0s0 ->../
/devices/ssm@0,0/pci@18,600000/pci@1/QLGC,qla@4/sd@0,0:a
```

    Record the /ssm@0,0/pci@18,600000/pci@1/QLGC,qla@4.

13. Bring the host down to the OBP by issuing the **halt** command.

14. While in OBP, issue the **reset-all** command.

15. Issue the **show-devs** command, and select the correct path to the device to be used as the new boot device (recorded in step 11).

Example:

```
"  /ssm@0,0/pci@18,600000/pci@1/QLGC,qla@4" select-dev
```

16. To set the correct topology, type the following and press **ENTER**:

   • Fabric: **1 set-connection-mode**

   • Loop: **2 set-connection-mode**

17. To display all Fibre Channel devices along with WWPN of the target SP from which you are booting, issue the **show-children** command.

18. Set the boot ID of the new boot device:

   a. Make note of the actual WWPN, DID, or ALPA returned from the **show-children** comand, and copy down the corresponding boot entry.

   b. Set the boot ID:

      <WWPN> <TargetID> <LUN #> set-boot-id

      Example:

      ```
      50060160006001b7 82 0 set-boot-id
      ```

   c. Check the Loop ID of the adapter:

      ```
      show-adapter-loopid
      ```

   d. Set the Loop ID:

      ```
      7c set-adapter-loopid
      ```

   e. Issue an **unselect-dev**.

19. Create an alias for the new boot device:

```
nvalias emcpower0a /ssm@0,0/pci@18,600000/pci@1/QLGC,qla@4/sd@0,0:a
nvstore
```

20. You are now ready to boot:

   unselect-dev
   reset-all
   boot emcpower0a

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EMC Fibre Channel with QLogic Host Bus Adapters in the Solaris Environment