EMC Host Connectivity with Emulex Fibre Channel Host Bus Adapters (HBAs) and Converged Network Adapters (CNAs) in the Windows Environment

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EMC Host Connecivity with Emulex Fibre Channel HBAs and CNAs in the Windows Environment

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.

Audience   This guide is intended for customers who need to install an EMC-approved Emulex host bus adapter (HBA) or converged network adapter (CNA) into a Windows host environment or to configure the Windows host for connection to an EMC storage array.

Related documentation   Related documents, which can be found on EMC Online Support at https://support.emc.com, include:

◆ *EMC Host Connectivity Guide for Windows*

◆ EMC Unisphere documentation

◆ EMC Navisphere documentation

◆ *EMC ControlCenter Navisphere Host Agent and CLI for Windows 2000 and NT Version 6.X Installation Guide*

◆ *Storage-System Host Utilities for Windows 2000 and NT Administrator's Guide*

◆ *PowerPath for Windows Installation And Administration Guide*

IMPORTANT

Always consult the *EMC Support Matrix*, available through E-Lab Interoperability Navigator at: http://elabnavigator.EMC.com, under the **PDFs and Guides** tab, for the most up-to-date information.

Conventions used in this guide

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

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

IMPORTANT

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

Typographical conventions

EMC uses the following type style conventions in this document:

Normal	Used in running (nonprocedural) text for: • Names of interface elements (such as names of windows, dialog boxes, buttons, fields, and menus) • Names of resources, attributes, pools, Boolean expressions, buttons, DQL statements, keywords, clauses, environment variables, filenames, functions, utilities • URLs, pathnames, filenames, directory names, computer names, links, groups, service keys, file systems, notifications
Bold	Used in running (nonprocedural) text for: • Names of commands, daemons, options, programs, processes, services, applications, utilities, kernels, notifications, system call, man pages Used in procedures for: • Names of interface elements (such as names of windows, dialog boxes, buttons, fields, and menus) • What user specifically selects, clicks, presses, or types
Italic	Used in all text (including procedures) for: • Full titles of publications referenced in text • Emphasis (for example a new term) • Variables
`Courier`	Used for: • System output, such as an error message or script • URLs, complete paths, filenames, prompts, and syntax when shown outside of running text

Courier bold	Used for:
	• Specific user input (such as commands)
Courier italic	Used in procedures for:
	• Variables on command line
	• User input variables
< >	Angle brackets enclose parameter or variable values supplied by the user
[ ]	Square brackets enclose optional values
		Vertical bar indicates alternate selections - the bar means "or"
{ }	Braces indicate content that you must specify (that is, x or y or z)
...	Ellipses indicate nonessential information omitted from the example

Where to get help EMC support, product, and licensing information can be obtained on the EMC Online Support site as described next.

Note: To open a service request through the EMC Online Support site, you must have a valid support agreement. Contact your EMC sales representative for details about obtaining a valid support agreement or to answer any questions about your account.

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

https://support.EMC.com

Technical support
EMC offers a variety of support options.

Support by Product — EMC offers consolidated, product-specific information on the Web at:

https://support.EMC.com/products

The Support by Product web pages offer quick links to Documentation, White Papers, Advisories (such as frequently used Knowledgebase articles), and Downloads, as well as more dynamic content, such as presentations, discussion, relevant Customer Support Forum entries, and a link to EMC Live Chat.

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◆ EMEA: +353 (0) 21 4879862 and follow the voice prompts.

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techpubcomments@emc.com

Installation and Configuration

This chapter describes the procedures for installing an EMC-approved Emulex adapter into a Microsoft Windows host environment and configuring the Windows host for connection to an EMC storage array over Fibre Channel.

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

How this guide works

In an effort to simplify the installation and configuration of Emulex Fibre Channel adapters, this guide follows a simple flow chart, as shown in Figure 1 on page 21, that guides you through the necessary procedures to connect your Windows server to EMC® storage arrays. Tips on planning, miscellaneous procedures, and troubleshooting information are located in Chapter 2, "Miscellaneous Planning and Procedures," and Chapter 3, "Troubleshooting."

This chapter will guide you through the following steps:

1. "Installing the adapter" on page 22

2. "Booting from the external storage array" on page 30:

    a. If *not* installing an IA-64 or EFI-based server:

        – "Updating the flash firmware/BIOS" on page 30.
        – "Emulex LightPulse-based Fibre Channel adapter BIOS/boot LUN settings" on page 38.

    b. If installing an IA-64 or EFI-based server:

        – "Installing a RAMDISK under the EFI shell" on page 78

3. "Installing Windows on an external SAN disk using an EFI RAMDISK" on page 79.

4. "Installing adapter driver and software utilities" on page 99.

5. "Establishing connectivity to the storage array" on page 163.

6. "Installing additional Unisphere/Navisphere Host Agent software" on page 177

Downloading latest Emulex drivers/firmware/BIOS files

Throughout this document, there are references to updated files from Emulex. All versions included on the Emulex CD packaged with your adapter are current as of this document's release. However, there may be updates to these files that may be necessary to download. For these, use the Emulex website, http://www.emulex.com. From the main page on Emulex website, click the **Downloads** button at the top of the page. On the resulting support page, click the **EMC** link. From the **EMC OEM** section, it is possible to download all of the most recent EMC-approved drivers,

firmware, and boot BIOS files organized by adapter model, as well as documentation and helpful software tools.
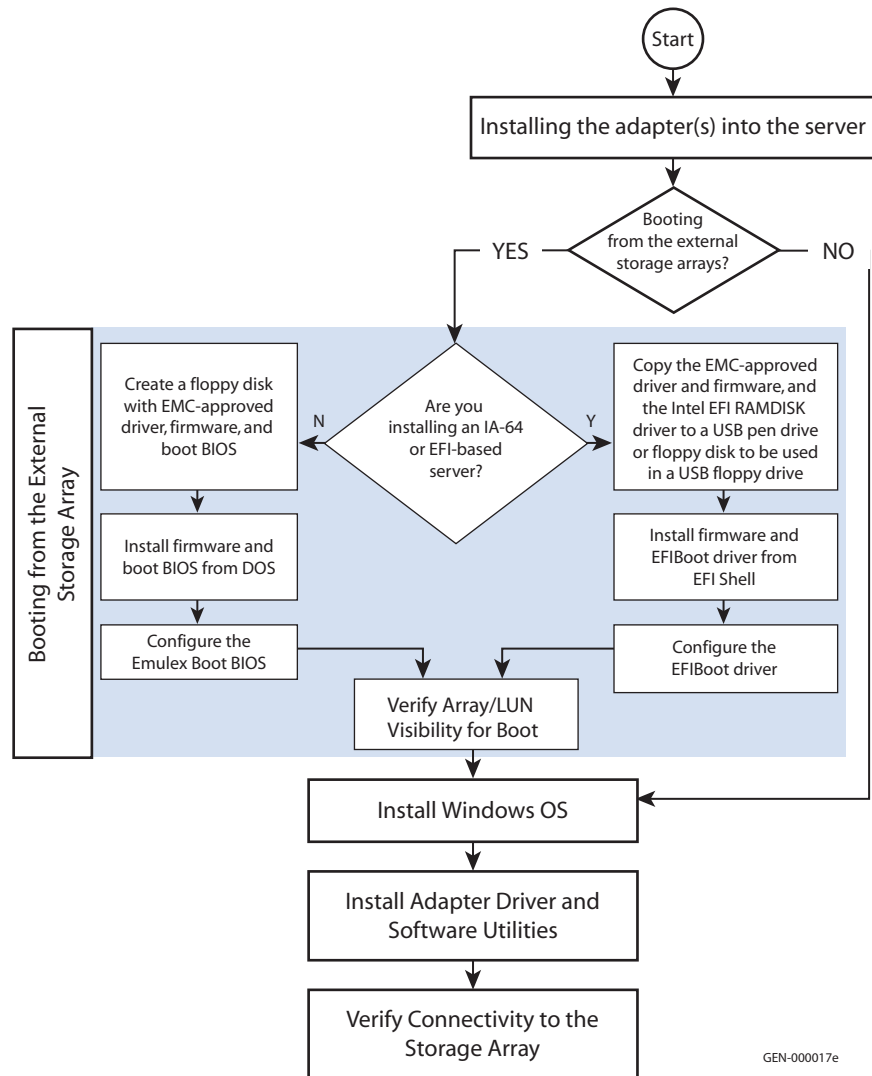
Figure 1   Installation and configuration overview

Installing the adapter

Follow this procedure to install an Emulex adapter in your server.

Note: Newer adapters do not require this first jumper step. Proceed to step 2.

1. For older adapter models, set the adapter jumpers as shown in the following figure to enable it for use with the Windows host.

   Note: The LP850-EMC has no user-configurable jumpers.
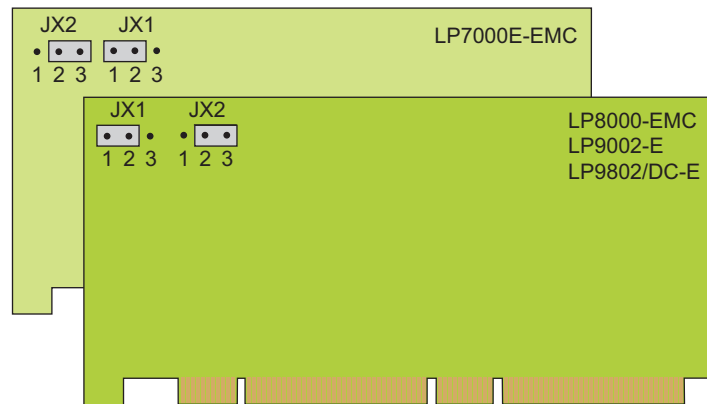
Figure 2   **Jumpers on Emulex adapters**

2. With host system power removed, install the adapter card and cables as instructed in the server documentation. The card installs into a single slot.

3. (Optical cable only) Remove the protective covers on each fiber-optic cable.

4. Plug one end of the cable into the connector on the adapter as shown in the appropriate figure under this step. (The hardware might be rotated 90 degrees clockwise from the orientation shown.)

   • Fibre Channel adapter connectivity options include copper cable with DB9 connector, SC optical, and LC optical cable, as shown next.

– Copper cable with DB9 connector:
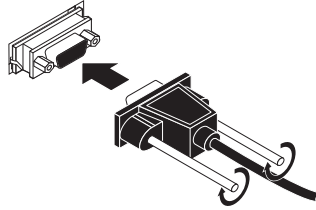
– SC optical cable:
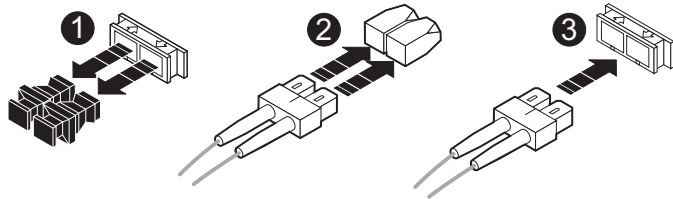
– LC optical cable:
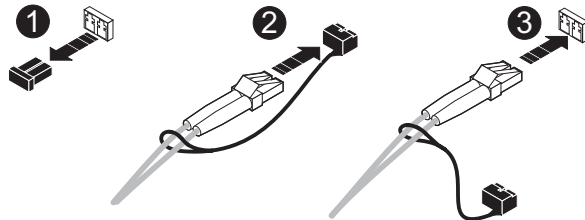
• Fibre Channel over Ethernet converged network adapter (CNA) connectivity options include LC optical and SFP+, shown next.

– LC optical cable:
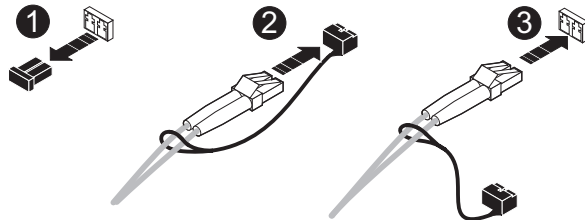
– SFP+ (Twinax cable)

5. Plug the other end of the cable into a connector on the storage system or a hub/switch port. For FCoE switch connections, do not connect cables to the switch port until the switch has been properly configured.

6. Label each cable to identify the adapter and the storage/switch/hub port to which it connects.

7. Reapply power and allow the system to boot normally.

Matching the adapter with the correct PCI slot

When choosing an adapter for your server, it is important to know which adapter is compatible with your server's PCI/PCI-X/PCI Express slots. Certain adapter models have specific voltage requirements or physical limitations that allow them to work only in specific slots.

Servers have several different bus slot types for accepting adapters:

- ◆ PCI
- ◆ PCI-X
- ◆ PCI-X 2.0
- ◆ PCI-Express

PCI slots can be 32-bit and 64-bit (denoted by their 124-pin or 188-pin connectors.) These slots have plastic "keys" that prevent certain adapters from fitting into them. These keys work with the cutout notches in the adapter edge connector so only compatible adapters will fit into them. This is done because of the voltage characteristics

of the adapter. (For example, inserting a 3.3 V adapter into a 5 V slot will cause severe damage to both the adapter and the server.)

Figure 3 shows how PCI slots will appear with their keys and what type of voltage is provided for each slot type.

1) 32-bit Slot, 3.3 V keyed

2) 32-bit Slot, 5 V keyed

3) 64-bit Slot, 3.3 V keyed

4) 64-bit Slot, 5 V keyed
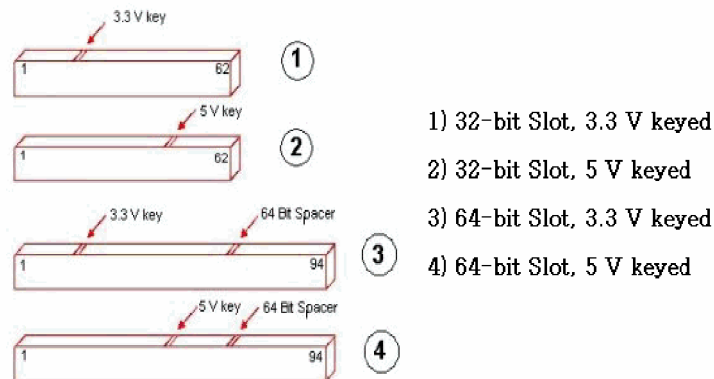
Figure 3   PCI slot types and voltage key locations

Figure 4 on page 25 shows the adapter edge connectors compatible with the PCI slots shown in Figure 3.

1) 32-bit connector, 3.3 V keyed

2) 32-bit connector, 5 V keyed

3) 64-bit connector, 3.3 V keyed

4) 64-bit connector, 5 V keyed

5) 64-bit universal connector (3.3V, 5V)
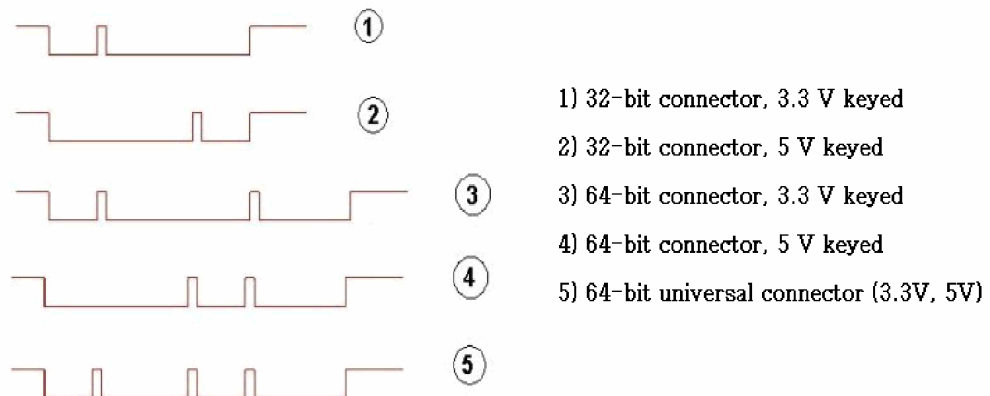
Figure 4   Adapter edge connectors

Note adapter 5, which shows a universal adapter edge connector. Universal adapters are compatible with both 3.3 V and 5 V PCI slots.

PCI-X (or PCI Extended) slots increase the speed with which data travels over the bus. PCI-X slots appear identical to a 64-bit PCI slot keyed for 3.3 V. (Refer to number 3 in Figure 3 on page 25 and Figure 4.) PCI-X slots are backwards compatible with 3.3 V PCI adapters and universal adapters. Inserting standard PCI adapters into PCI-X slots will lower the bus speed as they cannot take advantage of the improved performance.

PCI-X 2.0 is the next generation of PCI-X buses. PCI-X 2.0 increases the bus speed again, providing more performance for adapters. PCI-X 2.0 slots also appear identical to a 64-bit PCI slot keyed for 3.3 V. (Refer to number 3 in Figure 3 on page 25 and Figure 4.) PCI-X 2.0 is also fully backward compatible with 3.3 V PCI and PCI-X.

PCI Express (sometimes noted as PCIe) is a new bus type that uses the existing PCI model, but implements it in a faster, serial protocol. Because of the serial way it transmits data, the PCI Express bus slot can be different sizes depending on the throughput it supports. PCI Express slot speeds are expressed in "lanes" and are normally shown as x1, x4, x8, and x16. Each type of slot is a different length (as shown in Figure 5 on page 26) and adapter edge connectors will also be of varying lengths depending on how many lanes they require for throughput. Because of how PCI Express slots are keyed, an x1 adapter can be inserted in all four slot types, as the adapter will negotiate with the slot to determine the highest mutually supported number of lanes. However, an adapter requiring x16 lanes will not fit into a smaller slot.
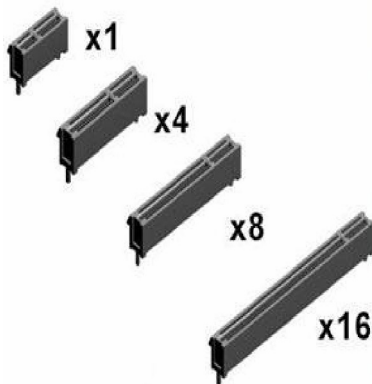
Figure 5   PCI Express slots

Figure 6 shows x1, x4, and x16 lane slots aligned on a mainboard. You can see how the slots are keyed so that low-lane adapters can fit into larger slots.
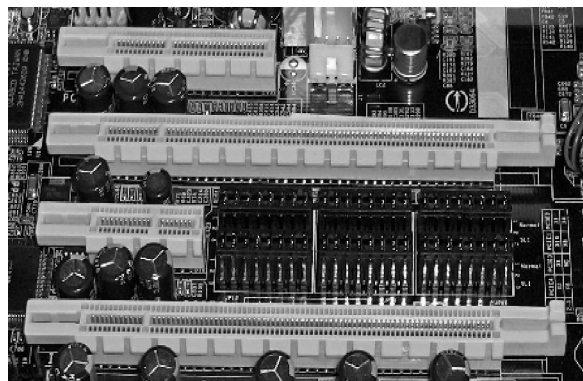
PCI Express x4 lanes

PCI Express x16 lanes

PCI Express x1 lane

PCI Express x16 lanes

Figure 6   PCI Express slots aligned

Emulex offers adapters for each bus/slot type available. Table 1 shows each of the EMC-supported Emulex adapters, and their respective slot requirements. Be sure to consult both your server user guide and Emulex to ensure that the adapter you want to use is compatible with your server's bus.

Table 1   Slot requirements of EMC-supported Emulex adapters (page 1 of 2)

Adapter model	Protocol	PCI spec	BUS length	Power	Slot key
LP7000	FC	PCI 2.2	32-bit	5V	Universal
LP8000	FC	PCI 2.2 (2.1 listed?)	64-bit	5V	Universal
LP850	FC	PCI 2.2	64-bit	5V	Universal
LP9002L	FC	PCI 2.2	64-bit	3.3V	Universal
LP9002DC	FC	PCI 2.2	64-bit	3.3V	Universal
LP982	FC	PCI-X 1.0a & PCI 2.2	64-bit	3.3V	Universal
LP9802	FC	PCI-X 1.0a & PCI 2.2	64-bit	3.3V	Universal
LP9802DC	FC	PCI-X 1.0a & PCI 2.2	64-bit	3.3V, 5V	3.3V
LP1050/LP1050DC	FC	PCI-X 1.0a & PCI 2.3	64-bit	3.3V, 5V	Universal
LP10000/LP10000DC	FC	PCI-X 1.0a & PCI 2.3	64-bit	3.3V, 5V	Universal
LP1050Ex/LP10000ExDC	FC	PCI Express	x4 lane	3.3v	n/a

| Table 1 | | Slot requirements of EMC-supported Emulex adapters (page 2 of 2) | | | |

Adapter model	Protocol	PCI spec	BUS length	Power	Slot key
LP1150/LP11000/LP11002	FC	PCI-X 2.0 & PCI 3.0	64-bit	3.3v	3.3v
LPe1150/LPe11000/LPe11002	FC	PCI Express	x4 lane	3.3v	n/a
LPe1250	FC	PCI Express	x4 lane	3.3v	n/a
LPe12000	FC	PCI Express	x4 lane	3.3v	n/a
LPe12002	FC	PCI Express	x4 lane	3.3v	n/a
LPe16000B / LPe16002B	FC	PCI Express	x8 lane	3.3v	n/a
LP21000	FCoE	PCI Express	x8 lane	3.3v	n/a
LP21002	FCoE	PCI Express	x8 lane	3.3v	n/a

Note that a few adapters are keyed universally, but require 5 V power (LP7000, LP8000, LP850.) They will fit into a 3.3 V PCI/PCI-X slot, but will not work unless the slot is capable of universal (3.3 V and 5 V) signaling. Consult your server user guide or manufacturer.

The LP9802DC, while capable of 3.3 V or 5 V signaling operation, fits only into a 3.3 V PCI/PCI-X slot. Remember, some of the older adapters are tall (also referred to as full-height) and may not fit into a server with a low-profile chassis. These factors must be considered before implementing your configuration to avoid unnecessary delays and possible equipment swaps or returns.

Note: The Emulex LP2100x FCoE CNAs require servers that can accommodate full-height, full-length PCI Express adapters. Always refer to the *EMC Support Matrix* for the most up-to-date information on which servers support these adapters.

Fibre Channel over Ethernet (FCoE)

EMC supports Emulex Fibre Channel over Ethernet (FCoE) Converged Network Adapter (CNA). FCoE adapters represent a method to converge both Fibre Channel and Ethernet traffic over a single physical link to a switch infrastructure that manages both storage (SAN) and network (IP) connectivity within a single unit.

The benefits of FCoE technology become apparent in large data centers:

◆ Where dense, rack-mounted and blade server chassis exist.

◆ Where physical cable topology simplification is a priority.

◆ In virtualization environments, where several physical storage and network links are commonly required.

The installation of the Emulex FCoE CNA provides the host with an Intel-based 10 Gb Ethernet interface (using the existing in-box drivers), and an Emulex Fibre Channel adapter interface.

Upon installation of the proper driver for the FCoE CNA, the Fibre Channel interface will function identically to that of a standard Emulex Fibre Channel HBA. The FCoE CNA simply encapsulates Fibre Channel traffic within Ethernet frames. As such, FC-based content within this guide also applies directly to Emulex FCoE CNAs.

In-depth information about FCoE and its supported features and topologies can be found in the "Fibre Channel over Ethernet (FCoE)" chapter of the *EMC Networked Storage Topology Guide,* available through E-Lab Interoperability Navigator at: http://elabnavigator.EMC.com.

For CNA configuration procedures, refer to

Booting from the external storage array

This section contains the following information on booting from the external storage array:

Updating the flash firmware/BIOS

Each Emulex Fibre Channel controller has flash-upgradeable firmware and BIOS. In most instances, it is necessary to keep only the firmware current, since the BIOS is applied only when using connected storage as a boot device.

The CD-ROM contains the EMC-approved firmware files at the time of this document's release. If updated firmware is available, download it as described under "Downloading latest Emulex drivers/firmware/BIOS files" on page 20.

The firmware and BIOS files are typically in a .zip file that contains different combinations of firmware and BIOS images. Extract the downloaded file, and refer to the included readme.txt to determine which filename image to use. For older adapter models, you should always use the *.awc files; typically there are two from which to choose. One includes the boot BIOS with the firmware, and the other does not. The *.awc file that includes the boot BIOS is named with and additional **c** (i.e., CDC392a2.awc).

Most recent adapter families provide a single firmware file with an .all extension. These firmware images do not have BIOS combined with the firmware, so a separate load for the Boot BIOS is required.

Firmware filenames

Table 2 lists the filenames associated with each supported adapter.

Table 2   Firmware filenames

Adapter model	Firmware file	BIOS file
LP8000	DDCxxxxx.AWC	DBxxxxx.PRG
LP9000	CDCxxxxx.AWC	CBxxxxx.PRG
LP9802	HDxxxxx.ALL	HBxxxxx.PRG
LP9802DC	HFxxxxx.ALL	HBxxxxx.PRG
LP982	LFxxxxx.ALL	LBxxxxx.PRG
LP10000/DC and LP10000/DCEx	TDxxxxx.ALL	TBxxxxx.PRG
LP1050/DC and LP1050Ex	MFxxxxx.ALL	MBxxxxx.PRG
LP1150	JFxxxxx.ALL	JBxxxxx.PRG
LP11000	BDxxxxx.ALL	BDxxxxx.PRG
LP11002	BFxxxxx.ALL	BBxxxxx.PRG
LPe1150	WFxxxxx.ALL	WBxxxxx.PRG
LPe11000	ZDxxxxx.ALL	ZBxxxxx.PRG
LPe11002	ZFxxxxx.ALL	ZBxxxxx.PRG
LPe1250	OFxxxxx.ALL	OBxxxxx.PRG
LPe12000 and LPe12002	UDxxxxx.ALL	UBxxxxx.PRG
LP21000	ADxxxxxALL	AUxxxxxPRG
LP21002	AFxxxxxALL	AUxxxxxPRG

If you are upgrading the firmware and BIOS, update the firmware first, because it may contain an older BIOS, which you can update separately after. Copy the selected firmware and boot BIOS file(s) to a diskette and follow the appropriate upgrade procedures detailed in this chapter:

- ◆ "Upgrading using a DOS boot diskette" on page 32
- ◆ "Upgrading adapter firmware/BIOS on IA-64 class servers" on page 37

- ◆ "Updating the adapter firmware using the HBAnyware utility" on page 109

- ◆ "Installing Fibre Channel firmware on an Emulex CNA" on page 120

ELXCFG and LPUTIL can be used as well, but are not covered in this guide. For general use instructions of these utilities, refer to Emulex documentation or "ELXCFG.EXE" on page 195.

Upgrading using a DOS boot diskette

This section deals exclusively with Emulex' former DOS utility, LP6DUTIL.EXE. This utility was formerly packaged with firmware and BIOS packages to allow users to perform HBA maintenance and code loads from DOS.

This LP6DUTIL.EXE utility is no longer packaged with code from Emulex, but there is currently a DOS Offline Utility kit and manual available to do wnload from the Emulex website:

http://www.emulex.com/downloads/emulex/cnas-and-hbas/utilities/offline-utilities

If you are in need of a DOS utility to load Boot BIOS code to an HBA, EMC recommends downloading and using this new DOS Offline Utility. The user manual for this utility is also available at the above Emulex website address. If possible, EMC recommends using the Emulex HBAnyware utility to load HBA/CNA firmware and BIOS code.

The Emulex CD-ROM contains the latest EMC-approved firmware and BIOS files at the time of creation of the CD-ROM. If more recent files exist, you can locate them on the Emulex website. Refer to "Downloading latest Emulex drivers/firmware/BIOS files" on page 20.

Follow these steps to upgrade the flash firmware from a DOS-bootable diskette:

1. Format a 3.5-inch diskette to be system bootable and extract the firmware and flash utility files from the archive file (.zip or self-extracting .exe) onto the diskette. Ensure lp6dutil.exe and the source files are in the same directory. (Refer to Table 2 on page 31 to ensure the correct .ALL, .AWC, and/or *.PRG file is used.)

Note that each adapter model uses a specific letter designation for its firmware and BIOS filenames. Be sure check the readme included with the upgrade package to ensure you have all of appropriate files before proceeding to the next step.

2. Reboot your Windows host system using a DOS diskette.

3. At the A:\> prompt, insert the diskette that contains the Emulex BIOS files (created in step 1).

   Note: For users upgrading LP7000, LP8000, and LP900X adapters, follow steps 4 through 13. For LP98XX and later families (including PCI-Express adapters), refer to "Lp6dutil for LP98XX and later adapter families" on page 33.

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4. At the A:\> prompt, type **lp6dutil** and press **Enter**.

   The utility performs diagnostic tests on the installed adapter(s). You may be required to press **Enter** after each test so the program can move on to the next. Once the diagnostics are complete, the main menu appears.

5. Type **5** and press **Enter**, to select **Maintenance**.

6. Type **1** and press **Enter**, to select **Upgrade Firmware**.

7. Enter the range of adapters to flash; for example: 1-4 (for four adapters).

8. Enter the Firmware Image filename, including the path. The firmware image file should be on the same disk as LP6DUTIL.EXE.

   Refer to Table 2 on page 31 for the firmware file to use.

9. When prompted, type **1** and press **Enter** to proceed with the upgrade for the first controller.

10. When prompted, type **1** and press **Enter** to reset the adapter after loading is complete.

11. Repeat steps 8 and 9 for each adapter in the range entered in step 6.

12. When all adapters are loaded, type **0** and press **Enter** at the Maintenance menu to return to the main menu.

13. Type **7** and press **Enter** at the main menu to exit the flash utility.
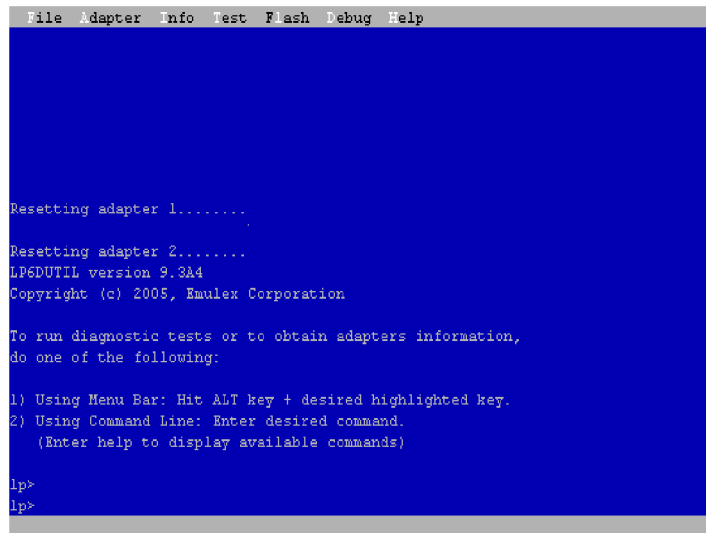
Lp6dutil for LP98XX and later adapter families

Emulex has released an updated lp6dutil.exe application for loading adapter firmware and other adapter maintenance tasks. The new version is included in all recent firmware packages and works differently than the version described in the previous section.

The following procedure assumes you have booted your server with a DOS-bootable diskette, and have inserted the diskette with the firmware, BIOS, and lp6dutil.exe files on it.

1. At the A:\> prompt, type **lp6dutil** and press **Enter**.

   The utility performs diagnostic tests on the installed adapter(s) and displays a text menu at the top of the screen.


```
 File  Adapter  Info  Test  Flash  Debug  Help




Resetting adapter 1........

Resetting adapter 2.......
LP6DUTIL version 9.3A4
Copyright (c) 2005, Emulex Corporation

To run diagnostic tests or to obtain adapters information,
do one of the following:

1) Using Menu Bar: Hit ALT key + desired highlighted key.
2) Using Command Line: Enter desired command.
   (Enter help to display available commands)

lp>
lp>
```

Figure 7   **LP6DUTIL main screen**

2. Press **Alt-L** to open the Flash menu. From this menu, press **D** to select **Download** (or use the arrow keys and press **Enter**).
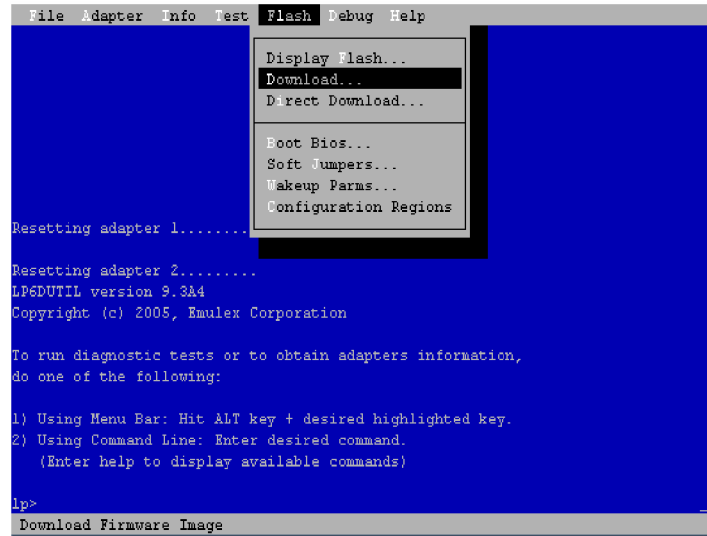
Figure 8   LP6DUTIL flash menu

3. Type in the filename of the firmware file you wish to load. Or, using the tab key, highlight the file under the **Files** box (use up and down arrow keys to select your file).

When you have highlighted the correct file, press **Enter,** and use the tab key to highlight **Adapters**.

Use the up and down arrow keys to select the adapter you wish to load and press **Enter**. Then use the tab key to select **OK** and press **Enter**.
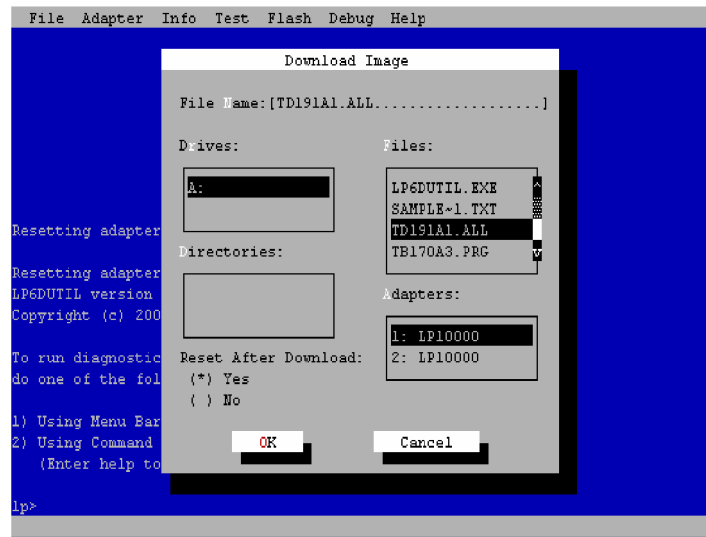
Figure 9   **Selecting the adapter to load**

The utility verifies the file and performs the firmware upgrade. Once complete, the menu at the top of the screen might have disappeared. If so, press **Alt-L** again to retrieve the menu.

4. Repeat steps 2 and 3 to load firmware to any other adapters.

5. Once your adapters are upgraded, press **Alt-F** to open the **File** menu, and select **Exit** to quit the LP6DUTIL.EXE tool.

If you are also loading a boot BIOS to your adapter(s), steps 2 and 3 apply. Using the download technique, ensure that the correct boot BIOS file is selected for your adapter.

Enabling/disabling the boot BIOS

Once the boot BIOS is loaded to the adapters, it is enabled by default. If it is not enabled, the adapter is unconfigurable for external boot.

To enable or disable the boot BIOS on your adapter:

1. Press **Alt-L** to open the **Flash** menu.

2. Select **Display Flash**.

3. Verify the adapter has a valid boot BIOS image loaded. Then press **Esc** to close the **Flash Load List** window.

4. Press **Alt-L** to open the **Flash** menu.

5. Select **Boot BIOS**.

   This displays the **Change Boot BIOS State** window (Figure 10).

File Adapter Info Test Flash Debug Help
Opening File...
Reading Header...
Download PRG image for adapter fa00 PrgType 03 ID 81
Validating   Change Boot BIOS State
Erasing Sec
Loading Ima   Adapters: BIOS Images:
100% comple
Updating Wa   1: LP10000   Boot BIOS disabled: TB1.70A3
Image Succe   2: LP10000   EROM not empty: TB1.70A3

                                    > Change <

                              Help   OK

     Going to Reset Adapter
Reset completed

lp>

Figure 10   Change Boot BIOS State window

6. Use the up/down arrow keys to select the adapter in the **Adapters** box.

7. Use the tab key to highlight the **BIOS Image** box.

   Use the up/down arrow keys to select the **Boot BIOS** image. Be sure to choose the item called **Boot BIOS enabled** (or **disabled**).

8. Use the tab key to highlight the **Change** button, and then press the spacebar. This toggles the boot BIOS image between enabled and disabled.

9. Use the tab key to highlight **OK**, and press **Enter**.

10. Press **Alt-F** and select **Exit** to exit the **lp6dutil.exe** utility.

Upgrading adapter firmware/BIOS on IA-64 class servers

adapter firmware/BIOS can be updated from the Windows operating system using the utilities listed under "Updating the adapter firmware using the HBAnyware utility" on page 109. Firmware/BIOS for the adapter can also be updating using the procedure beginning on page 47.

Emulex LightPulse-based Fibre Channel adapter BIOS/boot LUN settings

This section describes the steps required to configure an Emulex adapter boot BIOS for allowing an array-attached LUN to be used as a boot disk for the server and includes information for the following:

◆ "Legacy (x86 and most x64-based sServers) boot BIOS configuration" on page 39

◆ "Updating adapter firmware from Emulex EFI-BIOS utility" on page 47

◆ "Booting from SAN with HP Itanium servers with EMC storage" on page 63

This section assumes that the following steps are already completed:

◆ In direct-attach configurations, an adapter has a physical connection to the array port.

◆ In fabric-attach configurations, an adapter has a physical connection to the switch/fabric, and is zoned to the array, such that a single adapter to be used for boot has one logical I/O path to the array. Refer to your switch documentation for details.

◆ The Emulex adapter is configured to allow boot BIOS functionality. Refer to "Updating the flash firmware/BIOS" on page 30, which references the LP6DUTIL utility used to enable boot BIOS functionality.

Before configuring adapter settings to boot from an array-based LUN, your server's settings should be adjusted to disable booting from an internal system drive. The procedure for disabling boot from an internal system drive is largely dependent upon the server platform:

◆ In some instances, internal boot can be disabled via entering the onboard SCSI/RAID controller's BIOS utility. For example, an Adaptec-based controller can be configured by pressing **Ctrl-A**, when the Adaptec banner is displayed during power-on self test.

◆ Some servers require entering the system BIOS utility to either disable boot from an internal drive, or to change the controller boot order, such that the boot adapter is enumerated before the internal disk controller. This allows the array-attached LUN to be the first disk visible to the server. Refer to your server documentation for details.

◆ In some server instances, boot from an internal drive cannot be explicitly disabled. In this case, the internal drive(s) must be physically disconnected or removed from the server. Refer to your server documentation for details.

IMPORTANT

In some cases, re-adding an internal drive (after having previously removed it and configured an adapter for boot) may result in the internal drive being re-enumerated as the first drive. This may modify the boot order so the server will attempt to boot from the internal drive rather than the intended array-based LUN, and fail to boot. Make sure that appropriate precautions are taken to ensure that the server will properly boot from an array-based LUN before re-adding an internal system drive.

Legacy (x86 and most x64-based sServers) boot BIOS configuration

1. When the Emulex banner (Figure 11) appears during power-on self test (POST), press **Alt-E** to enter the Emulex Configuration utility.


```
!!! LP11002-M4 BIOS, Copyright (c) 2005 Emulex !!!  Version 1.70a3
Press <Alt E> to go to Emulex BIOS Utility
Press <s> to skip Emulex BIOS
```

Figure 11   Emulex banner

Note: If no Emulex banner is displayed during POST, verify that a bootable BIOS image has been loaded on the adapter and that the image has been explicitly enabled. (Refer to "Updating the adapter firmware using the HBAnyware utility" on page 109 for details on loading a bootable BIOS image on the adapter, and "Updating the flash firmware/BIOS" on page 30.)

The utility opens to the main **Emulex LightPulse BIOS Utility** page (Figure 12).

```
         Emulex Light Pulse BIOS Utility, BB1.70A3
         Copyright (c) 2005 Emulex Design & Manufacturing Corp

         Emulex Adapters in the System:

 1.  LP11002-M4   PCI Bus #:04 PCI Device #:01




  Enter a Selection: 1

Enter <x> to Exit
```

Figure 12   Emulex LightPulse BIOS utility

In this example, only a single adapter is installed. If multiple adapters are installed, there will be multiple adapter entries. The order of the adapter instances listed is the order they will be scanned for a boot device; note that this does not necessarily correspond to PCI slot numbering.

2. Select the row number of the adapter instance that corresponds to the adapter that will be used for boot and press **Enter**.

This displays a screen similar to Figure 13.


```
    Adapter 01:      PCI Bus #:04 PCI Device #:01

    LP11002-MI/0 Base: 4000   Firmware Version: BS2.10A7
    Port Name: 10000000 C94AE020   Node Name: 20000000 C94AE020
    Topology: Auto Topology: Loop first (Default)

1. Configure Boot Devices
2. Configure This Adapter's Parameters


  Enter a Selection: 2

Enter <x> to Exit       <d> to Default Values      <Esc> to Previous Menu
```

Figure 13   Adapter configuration selection

Note: For boot-from-SAN configurations, EMC recommends setting the default BIOS settings before configuring boot settings. This will clear the board of any settings that may be left over from a previous install if the adapter was previously used in another system. Press <d> at the adapter Configuration Selection screen to set the adapter default settings.

3. Type **2** (**Configure This Adapter's Parameters**) and press **Enter**.

Various configuration options are presented, as shown in Figure 14 on page 41.

```
    Adapter 01:      PCI Bus #:04 PCI Device #:01

    LP11002-MI/0 Base: 4000   Firmware Version: BS2.10A7
    Port Name: 10000000 C94AE020   Node Name: 20000000 C94AE020
    Topology: Auto Topology: Loop first (Default)

1. Enable or Disable BIOS
2. Change Default ALPA of this adapter
3. Change PLOGI Retry Timer (+Advanced Option+)
4. Topology Selection (+Advanced Option+)
5. Enable or Disable Spinup delay (+Advanced Option+)
6. Auto Scan Setting (+Advanced Option+)
7. Enable or Disable EDD 3.0 (+Advanced Option+)
8. Enable or Disable Start Unit Command (+Advanced Option+)
9. Enable or Disable Environment Variable (+Advanced Option+)
A. Auto Sector Format Select (+Advanced Option+)

  Enter a Selection:

Enter <x> to Exit          <Esc> to Previous Menu
```

Figure 14   Adapter configuration options

4. Type **1** (**Enable or Disable BIOS**) and press **Enter**.

   As Figure 15 shows, the adapter's boot BIOS is disabled by default.

```
    Adapter 01:      PCI Bus #:04 PCI Device #:01



    The BIOS is Disabled!!



    Enable Press 1, Disable Press 2: 1

Enter <x> to Exit          <Esc> to Previous Menu
```

Figure 15   Enabling/disabling an adapter

5. Type **1** (**Enable**) and press **Enter**.

   The screen (as shown in Figure 15) is refreshed, showing a BIOS status of **Enabled**. This allows the server to use an array-attached LUN to be used as a boot device.

6. Press **Esc** to return to the previous configuration screen (Refer to Figure 14).

7. Type **4** (**Topology Selection**) and press **Enter**.

   This displays a screen similar to Figure 16 on page 42.

Figure 16   **Topology selection**

8. Select the topology based on your attach environment:

   • In FC-AL/direct attach environments, press **Enter** to accept the default of option **1** (**Auto Topology: Loop first**).

   • In FC-SW environments, type **2** (**Auto Topology: Pt to Pt first**) and press **Enter**.

   The **Topology** information near the top of the screen reflects your selection.

9. Press **Esc** to return to the previous configuration screen (Figure 15 on page 41).

10. Type **3** (**Change PLOGI Retry Timer**) and press **Enter**.

   This displays a screen similar to Figure 17.

Figure 17   **Setting the PLOGI retry timer**

   The PLOGI Retry Timer specifies the amount of time following a port reset the adapter will wait to log in again and rescan the bus for devices.

11. Type **2** (**Change PLOGI Retry Timer to 50 msec**) and press **Enter**.

    Setting a value of 50 msec allows more time for the login and rescan functions to complete. A setting of 50 msec takes five to six seconds per device found on the bus.

12. Press **Esc** twice to return to the main **Emulex LightPulse BIOS Utility** screen (Figure 12 on page 40).

    Note: If you have changed the topology or if **BIOS not ready** appears, reboot the host and re-enter the BIOS to this point to continue.
    ---

13. Type **1** (**Configure Boot Devices**) and press **Enter**.

    This displays a list of saved boot devices (Figure 18).


```
      Adapter 01: S_ID:2D3C00 PCI Bus #:04 PCI Device #:01


      List of Saved Boot Devices:

1. Unused    DID:000000 WWPN:00000000 00000000 LUN:00   Primary Boot
2. Unused    DID:000000 WWPN:00000000 00000000 LUN:00
3. Unused    DID:000000 WWPN:00000000 00000000 LUN:00
4. Unused    DID:000000 WWPN:00000000 00000000 LUN:00
5. Unused    DID:000000 WWPN:00000000 00000000 LUN:00
6. Unused    DID:000000 WWPN:00000000 00000000 LUN:00
7. Unused    DID:000000 WWPN:00000000 00000000 LUN:00
8. Unused    DID:000000 WWPN:00000000 00000000 LUN:00


      Select a Boot Entry: 1


Enter <x> to Exit          <Esc> to Previous Menu
```

Figure 18   Saved boot devices

A list of up to eight boot devices, in order of preference, can be saved in the adapter's BIOS utility. Initially, all entries should be listed as **Unused**.

14. Type **1** to set the primary boot LUN, and press **Enter**.

    This displays a screen similar to Figure 19 on page 44.

```
    Adapter 01: S_ID:2C2000 PCI Bus #:04 PCI Device #:01

00. Clear selected boot entry!!
01. DID:2C1900 WWPN:5006048A CD201641 LUN:00    EMC     SYMMETRIX     5671



 Select The Two Digit Number of The Desired Boot Device:

Enter <x> to Exit       <Esc> to Previous Menu       <PageDn> to Next Page
```

Figure 19   **Setting the primary boot LUN**

A list representing all array targets visible to the adapter is presented. In this example, a single array is zoned to the adapter.

15. Select the two-digit row number corresponding to the array to be used for boot (**01** in this example) and press **Enter**.

This displays a screen similar to Figure 20 on page 45.

Note: If no entries (other than **00**) appear, verify the following:

- If multiple adapters are present, verify the adapter selected in the BIOS utility is the same adapter that currently provides the I/O path to the storage. (At this point, only one I/O path should be configured to the boot LUN.)
- For VNX™ series or CLARiiON® systems, verify the single I/O path points to the SP that owns the boot LUN.
- For FC-SW environments, verify fabric-zoning parameters, such that a single I/O path exists to the boot LUN. (Refer to your array software documentation for details.)
- Check the physical Fibre Channel connectivity between the adapter and array (direct-attach environment) or switch (FC-SW environment).

```
    Adapter 01: S_ID:2C2000 PCI Bus #:04 PCI Device #:01

00. Clear selected boot entry!!
01. DID:2C1900 WWPN:5006048A CD201641 LUN:00    EMC     SYMMETRIX      5671


                    DID:2C1900 WWPN:5006048A CD201641

                    Enter two digits of starting LUN (Hex):00

                            <Esc> to Previous Menu



  Select The Two Digit Number of The Desired Boot Device:01

Enter <x> to Exit          <Esc> to Previous Menu     <PageDn> to Next Page
```

Figure 20   Scanning for available boot LUNs

16. Enter the two digits of the starting LUN address, and press **Enter**.

    This setting specifies the LUN address where the utility will begin
    scanning for available boot LUNs. For example, entering **0B** will
    result in the utility scanning from LUN address 0B for available
    LUNs, skipping addresses 00 through 0A. In this example,
    entering **00** instructs the utility to scan from 00, which is the first
    LUN address. This will scan all LUNs visible to the adapter.

    After the scan, a list of available LUNs appears, similar to
    Figure 21.

```
    Adapter 01: S_ID:2C2000 PCI Bus #:04 PCI Device #:01

    DID:2C1900 WWPN:5006048A CD201641

01.       LUN:00           EMC      SYMMETRIX      5671
02.       LUN:04           EMC      SYMMETRIX      5671
03.       LUN:05           EMC      SYMMETRIX      5671
04.       LUN:06           EMC      SYMMETRIX      5671


   Enter a Selection: 02
   B#W: Boot number via WWPN. B#D: Boot number via DID
Enter <x> to Exit          <Esc> to Previous Menu
```

Figure 21   LUNs available for use as boot LUN

In this example, entry **01** references LUN 00, which holds the
Symmetrix® Volume Logix VCM (LUN masking) database. This
LUN cannot be used by the host. Entry **02** references LUN 04,
which will be used for boot.

> **Note:** If no numbered entries appear in the above figure, verify the following:
>
> • For VNX series or CLARiiON systems, verify that the single I/O path points to the SP that owns the boot LUN.
> • Verify that array LUN masking settings are configured such that this adapter has visibility to the appropriate LUN. Refer to your array software documentation for details.

17. Select the number that corresponds to the LUN to be used for boot, and press **Enter**.

    This displays a screen similar to .


```
DID:2C1900 WWPN:5006048A CD201641 LUN:04

      1. Boot this device via WWPN
      2. Boot this device via DID

      <Esc> to Previous Menu
        Enter a Selection:  1_
```
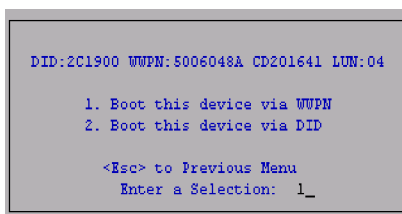
Figure 22   **Selecting the boot method**

18. Type the number that corresponds to your selection and press **Enter**:

    • In FC-SW environments, type **1** (**Boot this device via WWPN**).
    • In FC-AL/direct-attach environments, type **2** (**Boot this device via DID**).

    This re-displays the list of saved boot devices. The first (Primary Boot) entry identifies the WWN/DID of the array port and the selected boot LUN, as shown in .

```
    Adapter 01: S_ID:2C2000 PCI Bus #:04 PCI Device #:01

    List of Saved Boot Devices:

1. Used     DID:000000 WWPN:5006048A CD201641 LUN:04   Primary Boot
2. Unused   DID:000000 WWPN:00000000 00000000 LUN:00
3. Unused   DID:000000 WWPN:00000000 00000000 LUN:00
4. Unused   DID:000000 WWPN:00000000 00000000 LUN:00
5. Unused   DID:000000 WWPN:00000000 00000000 LUN:00
6. Unused   DID:000000 WWPN:00000000 00000000 LUN:00
7. Unused   DID:000000 WWPN:00000000 00000000 LUN:00
8. Unused   DID:000000 WWPN:00000000 00000000 LUN:00


    Select a Boot Entry: _



Enter <x> to Exit          <Esc> to Previous Menu
```

Figure 23   Saved boot devices with WWN of array port

19. Press **X** to exit the BIOS utility.

    When prompted to reboot the system, press **Y**.

    During the subsequent reboot, the Emulex BIOS banner screen
    shows the array and LUN that has been specified as a
    boot-capable LUN.

    At this point, the OS Installation can begin using this LUN as the boot
    volume.

Updating adapter firmware from Emulex EFI-BIOS utility

1. Prior to booting the server, ensure that media (USB memory
   drive, CD-ROM, or diskette) that contains the Emulex EFI boot
   code/utility you downloaded earlier is physically present in the
   system.

2. Following POST of the server, the **Firmware Boot Manager** menu
   (Figure 24 on page 48) appears. Using the arrow keys, select **EFI
   Shell** and press **Enter**.

```
                          Firmware Boot Manager

Boot options: Enter number or ↑/↓ to select, 'Enter' to execute


  1 EFI Shell [Built-in]
  2 Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)
  3 Acpi(PNP0A03,1)/Pci(4|0)/Mac(0002551F80E0)
  4 Acpi(PNP0A03,1)/Pci(4|1)/Mac(0002559F80E0)
  5 CDROM
  6 Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)


System options: Enter letter or ↑/↓ to select, 'Enter' to execute


    Boot Option Maintenance        Diagnostics          EFI Shell
    Configuration/Setup            Driver Setup          Flash
```

Figure 24   Firmware boot manager menu

> The EFI shell will open and the Device Mapping Table (Figure 25 on page 49) may be listed by default. If the Device Mapping Table is not listed, type **map** and press **Enter**.

```
Device Mapping Table
  fs0  : MemMap(15:FF000000-FFFFFFFF)
  fs1  : MemMap(8:FF800200-FFBFFFFF)
  fs2  : MemMap(16:1B846000-1B9ADFFF)
  fs3  : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)/CDROM(Entry0)
  fs4  : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)/CDROM(Entry1)
  fs5  : Acpi(PNP0A03,0)/Pci(5|3)/Usb(0, 0)/HD(Part1,Sig19EEC514)
  fs6  : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)/HD(Part1,SigFA5B03C0-EA5E-01C3
-507B-9E5F8078F531)
  blk0 : MemMap(15:FF000000-FFFFFFFF)
  blk1 : MemMap(8:FF800200-FFBFFFFF)
  blk2 : MemMap(16:1B846000-1B9ADFFF)
  blk3 : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)
  blk4 : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)/CDROM(Entry0)
  blk5 : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)/CDROM(Entry1)
  blk6 : Acpi(PNP0A03,0)/Pci(5|3)/Usb(0, 0)
  blk7 : Acpi(PNP0A03,0)/Pci(5|3)/Usb(0, 0)/HD(Part1,Sig19EEC514)
  blk8 : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)
  blk9 : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)/HD(Part1,SigFA5B03C0-EA5E-01C3
-507B-9E5F8078F531)
  blkA : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)/HD(Part2,SigFA9CA0A0-EA5E-01C3
-F1B3-12714F758821)
  blkB : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)/HD(Part3,Sig5CE668E0-7CC6-01C5
-A1F4-04622FD5EC6D)
fs5:\>
```

Figure 25   Device mapping table

The file systems available to the server are listed in the Device Mapping Table, referenced by **fs**N (where N is a different number for each available file system). The description next to the **fs**N entry references the type of media on which the file system resides.

In the example shown in Figure 25:

- **fs0**, **fs1**, and **fs2** refer to memory RAMdisks.
- **fs3** and **fs4** refer to file systems on a CD inserted into the CD-ROM drive.
- **fs5** refers to a file system on a USB memory-FLASH drive.

Booting from the external storage array

- **fs6** refers to an existing file system on an internal hard drive.

3. The file system you select depends upon what media contains the Emulex EFI boot code/utility. In this example, the Emulex EFI boot code/utility resides on the USB memory drive.

   Point the EFI shell to the proper file system by typing **fs**N**:** (where N is the number which references the proper file system) and press **Enter**.

4. Type **dir** and press **Enter** to list the contents of the directory (Figure 26).

```
fs5:\emulex> dir
Directory of: fs5:\emulex

  11/28/05  10:16a <DIR>            4,096  .
  11/28/05  10:16a <DIR>                0  ..
  09/09/05  10:45p           63,032  JE311A4.PRG
  09/09/05  10:45p          174,080  Elxcli311a4.efi
  10/19/05  03:03p           23,810  rel_notes.txt
            3 File(s)     260,922 bytes
            2 Dir(s)

fs5:\emulex>
```

Figure 26   Directory listing

The directory listing should contain the Emulex EFI boot code/utility downloaded to the media.

The directory should contain the following files:

- **elxcli**nnnn**.efi** — Emulex EFI boot configuration support utility, where NNNN refers to the utility version number.

- xxxxxxx**.prg** — Emulex EFI boot code, where xxxxxxx refers to the version boot code version for the specified adapter model.

If the directory contents are inconsistent with what you expect, and do not appear to contain the Emulex boot code/utility, the file system select may not be correct. Verify the proper file system is selected. If the Emulex boot code/utility resides in a subdirectory, type **cd** subdirectory and press **Enter**.

5. The **elxcli***nnnn***.efi** configuration support utility file must be loaded in the EFI shell to configure the Emulex adapter. Type **load elxcli***nnnn***.efi** (where *nnnn* refers to the specific version number present on your media) and press **Enter**.

    In the example in Figure 27, the configuration support utility file is named elxcli311a4.efi.

```
fs5:\emulex> load Elxcli311a4.efi
EfiInitializeDriverLib: Started
load: Image fs5:\emulex\Elxcli311a4.efi loaded at 0x1BD74000 - Success
```

Figure 27   EFI boot configuration support utility

6. Emulex adapters can now be configured via the EFI shell. Type **drivers** and press **Enter** to obtain a list of loaded drivers in the EFI shell.

7. Make note of the first hexadecimal value listed on the line with **Emulex SCSI pass Thru Driver**. In the example in Figure 28, the driver handle is 8C.

```
3F 00070000 B X X  2  2 Broadcom Gigabit Ethernet Driver    B57UNDI
40 00000010 D - -  2  - Simple Network Protocol Driver       Snp3264
41 00000010 ? - -  -  - PXE Base Code Driver                 PxeDhcp4
42 00000010 D - -  2  - PXE Base Code Driver                 PxeDhcp4
43 00000010 D - -  1  - CD File System Driver                CdFs
4F 01020B00 D X -  2  - LSI Logic Ultra320 SCSI Driver       PciRom Seg=00000000

8C 00031114 D X X  2  - Emulex SCSI Pass Thru Driver         Elxcli311a4

fs5:\emulex>
```

Figure 28   Loaded drivers in the EFI shell

8. The EFI shell includes a driver configuration utility, accessed via **drvcfg**, which configures supported drivers. To configure the Emulex-specific driver, type **drvcfg -s** *driverhandle* (where *driverhandle* refers to the driver handle listed for the Emulex driver in the output of the **drivers** command, described above) and press **Enter**. (In Figure 28 on page 51, the driver handle is 8C, so the command entered is **drvcfg -s 8C**.)

The Emulex EFI BIOS configuration utility (Figure 29) appears.

```
          Emulex FC EFI-Bios Utility, Ver: 3.11a4


       Emulex Adapters in this System: 001 thru 002


001: LP1150          PCI-X   133MHz        Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
002: LP1150          PCI-X   133MHz        Seg#: 00 Bus#: 07 Dev#: 03 Func#: 00




             <</>> to Display Prev/Next Page.
    <↑/↓> to Change Options. <Enter> to Select Option. <ESC> to Exit.


       Copyright (c) 2003-2005 Emulex, All rights reserved.
```
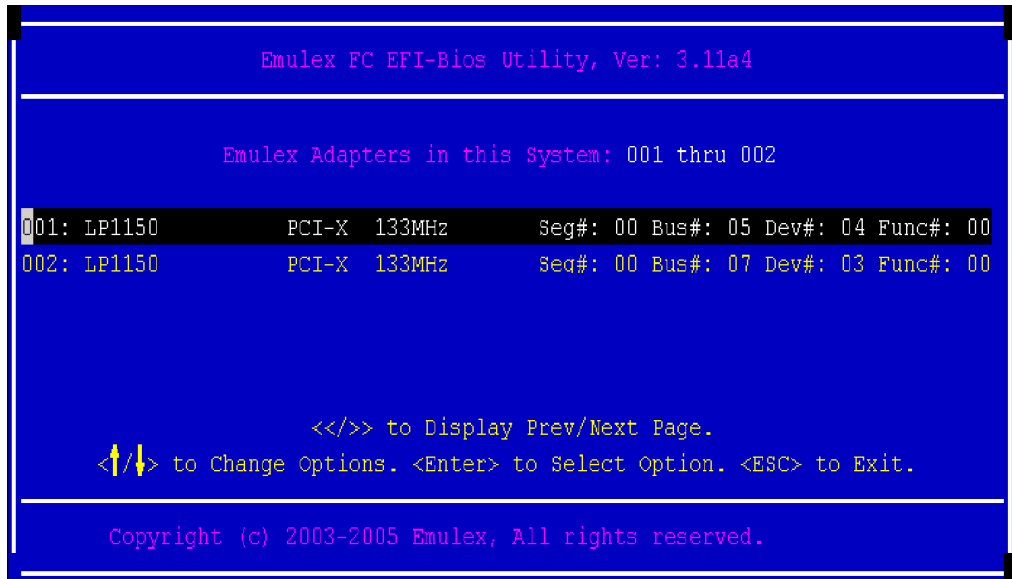
Figure 29   **EFI BIOS configuration utility**

9. Select the number of the adapter instance that corresponds to the adapter to be used for boot and press **Enter**.

    Note: If multiple adapters are installed, there will be multiple adapter entries. The order of the adapter instances listed is the order they will be scanned for a boot device; this does not necessarily correspond to PCI slot numbering. In Figure 29, adapter entry 001 is used for boot.

    A window similar to Figure 30 on page 53 appears.

```
                    Emulex FC EFI-Bios Utility, Ver: 3.11a4

001: LP1150            PCI-X  133MHz        Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
                 HBA Status: Ready               Boot Bios : Disabled
                 EXP ROM   : Disabled            Firmware  : JS2.10A5



                             1. Setup Utility
                             2. Firmware Update



            <↑/↓> to Change Options. <Enter> to Select Option. <ESC> to Prev Menu.


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```
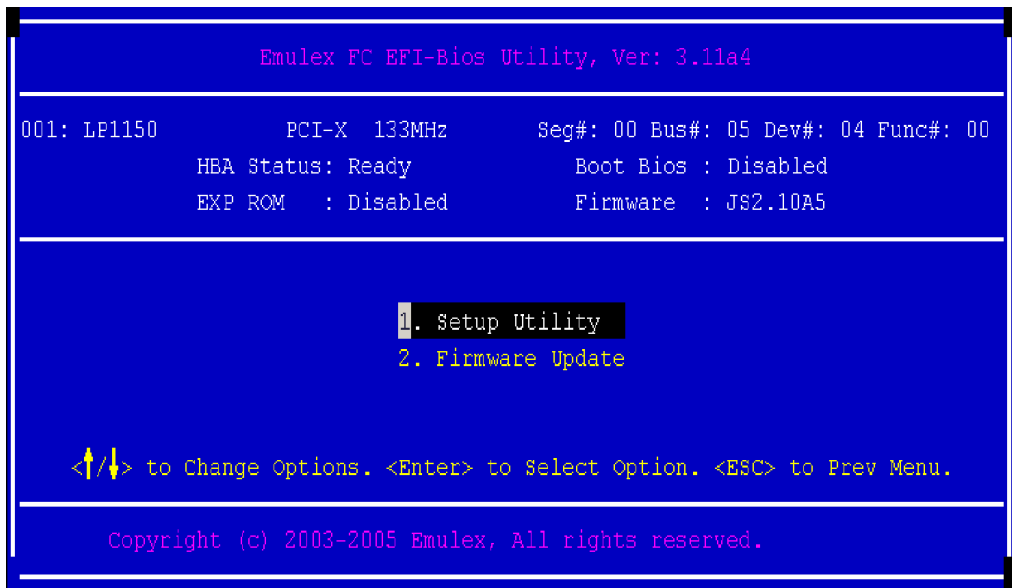
Figure 30   EFI BIOS configuration utility option menu

10. Select **2** (**Firmware Update**) and press **Enter**.

    This displays a window similar to .

```
        Emulex FC EFI-Bios Firmware Update Utility, Ver: 3.11a4

001: LP1150          PCI-X  133MHz        Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
              EXP ROM   : Disabled        SLI - 1   : J1F2.10A5
              Firmware  : JS2.10A5        SLI - 2   : J2F2.10A5
              Port Name : 10000000C94AC3DF Kernel   : 1.11A5


       Directory Path     : \emulex
       Filename           : JE311A4.PRG





       Copyright (c) 2003-2005 Emulex, All rights reserved.
```

Figure 31   EFI BIOS firmware update utility

11. The utility prompts for a directory path. Type the directory path relative to the root directory and press **Enter**.

In Figure 31, the directory path (as shown in the EFI prompt in Figure 26 on page 50) without the file system is **\emulex**.

12. The utility prompts for the EFI boot code/firmware filename. Type the filename (*xxxxxxx*.**prg** as it is found in the media containing the Emulex EFI boot/code utility, and press **Enter**. In Figure 31, the EFI boot code is shown (in the Figure 26 directory listing) as **je311a4.prf**.

13. The utility reports various steps of the boot code/firmware update as **Done** and **Updated**.

When prompted, press any key to return to the previous menu (Figure 30 on page 53).

14. Select **1** (**Setup Utility**) and press **Enter**.

This displays a window similar to Figure 32 on page 55.
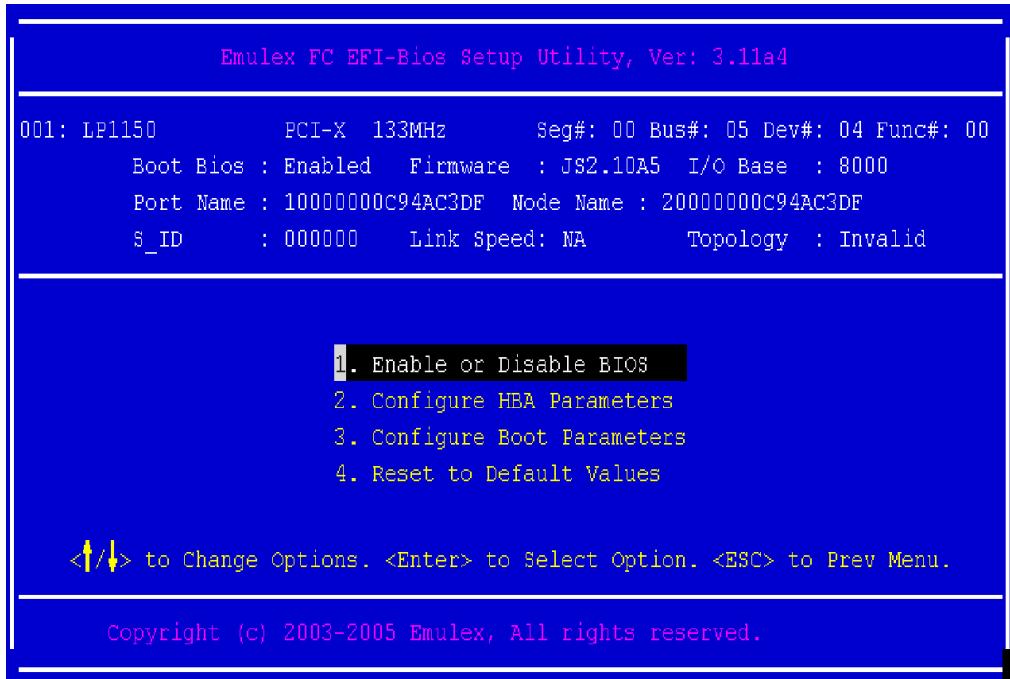
Figure 32   EFI BIOS firmware update utility: Enabling/disabling the BIOS

15. Select **1** (**Enable or Disable BIOS**) and press **Enter**.

    This displays a window similar to Figure 33 on page 56.

```
            Emulex FC EFI-Bios Setup Utility, Ver: 3.11a4

001: LP1150        PCI-X  133MHz      Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
        Boot Bios : Disabled  Firmware : JS2.10A5  I/O Base  : 8000
        Port Name : 10000000C94AC3DF  Node Name : 20000000C94AC3DF
        S_ID      : 000000    Link Speed: NA        Topology  : Invalid


            EFI-Bios Boot Option is Currently DISABLED.


                    Disabled - default
                    Enabled

   < / > to Change Options. <Enter> to Select Option. <ESC> to Prev Menu.

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```

Figure 33   **EFI BIOS firmware update utility: Enabling the BIOS**

16. Boot BIOS is disabled by default. Select **Enabled** and press **Enter**.

17. The utility reports **EFI-Boot BIOS Option is Currently ENABLED**. Press **Esc** to return to the prior configuration screen (Figure 32 on page 55).

18. Select **2** (**Configure HBA Parameters**) and press **Enter**.

    This displays a window similar to Figure 34 on page 57.

```
          Emulex FC EFI-Bios Setup Utility, Ver: 3.11a4

001: LP1150         PCI-X  133MHz       Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
        Boot Bios : Enabled   Firmware  : JS2.10A5  I/O Base  : 8000
        Port Name : 10000000C94AC3DF  Node Name : 20000000C94AC3DF
        S_ID      : 000000    Link Speed: NA        Topology  : Invalid


                    1. Default ALPA of this adapter
                    2. Topology Selection
                    3. PLOGI Retry Timer

      <↑/↓> to Change Options. <Enter> to Select Option. <ESC> to Prev Menu.

         Copyright (c) 2003-2005 Emulex, All rights reserved.
```

Figure 34   **Configure HBA parameters window**

19. Select **2** (**Topology Selection**) and press **Enter**.

    This displays a window similar to Figure 35.

```
Current Topology is: AUTO (start FCAL) - default.


              AUTO (start FCAL) - default.
              AUTO (start Point to Point).
              Point to Point.
              FCAL.
```

Figure 35   **Current topology setting**
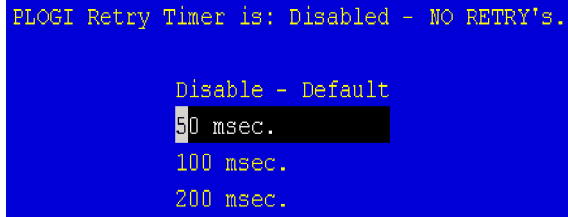
20. Select the appropriate setting and press **Enter**:

    • In FC-SW environments, select **AUTO (start Point to Point)**.

    • In FC-AL/direct-attach environments, leave the setting at the default of **AUTO (start FCAL)**.

21. Press **Esc** to return to the configuration screen shown in Figure 34.

22. Select **3** (**PLOGI Retry Timer**) and press **Enter**.

    This displays a window similar to Figure 36, which shows the default setting of **NO RETRYs**.

```
PLOGI Retry Timer is: Disabled - NO RETRY's.


            Disable - Default
            50 msec.
            100 msec.
            200 msec.
```

Figure 36   Setting the PLOGI retry timer

23. The PLOGI retry timer specifies the amount of time following a port reset the adapter will wait to log in again and rescan the bus for devices. Setting a value of 50 msec allows a retry interval of 50 milliseconds for login and rescan functions to complete. A setting of 50 msec will take five to six seconds per device found on the bus.

    Select **50 msec** and press **Enter**.

24. Press **Esc** to return to the configuration screen shown in Figure 32 on page 55.

25. Select **3** (**Configure Boot Parameters**) and press **Enter**.

    This displays a window similar to Figure 37 on page 59.
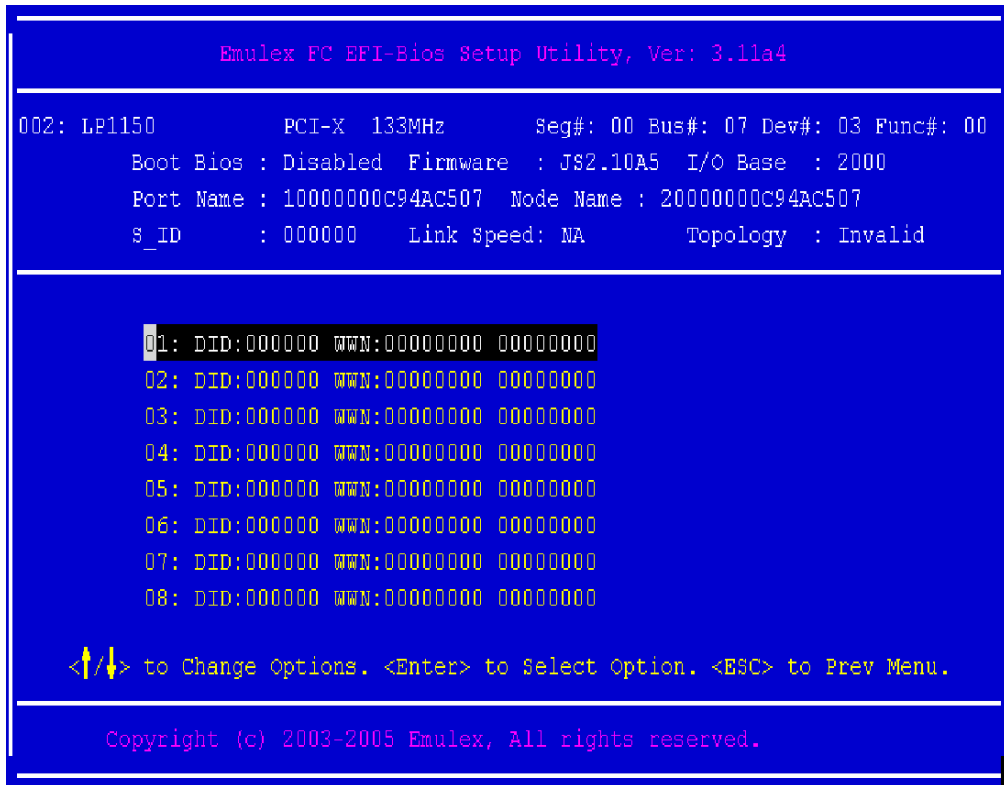
Figure 37   Configure boot parameters window

> A list of up to eight boot devices, in order of preference, can be saved in the adapter's BIOS utility. Initially, all entries should be listed with empty WWN values.

26. Select **1** to set the primary boot LUN, and press **Enter**.
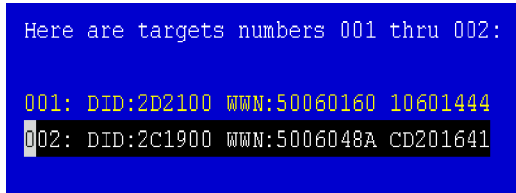
   This displays a window similar to Figure 38.
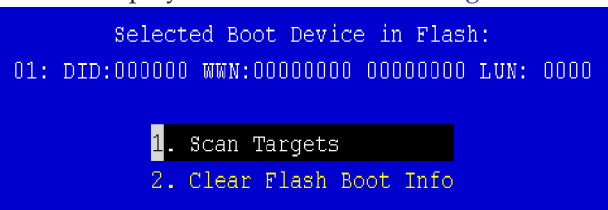
Figure 38   Instructing the adapter to scan for targets

27. Select **1** (**Scan Targets**) to instruct the adapter to scan for attached targets, and press **Enter**.

    This displays a window similar to Figure 39.

```
Here are targets numbers 001 thru 002:


001: DID:2D2100 WWN:50060160 10601444
002: DID:2C1900 WWN:5006048A CD201641
```

Figure 39   Targets

28. Select the number that corresponds to the array target port from which the boot will be configured, and press **Enter**.

    This displays a window similar to Figure 40 on page 61.

    In Figure 39, the array designated by 002: DID:2C1900 WWN:5006048A CD201641 is the array from which the boot will be configured.

    _____

    Note: If no target numbers appear, and the utility simply returns to the prior screen, verify the following:

    •   If multiple adapters are present, verify that the adapter selected in the BIOS utility is the one that currently provides the I/O path to the storage. (At this point, only one I/O path should be configured to the boot LUN.)
    •   For VNX series or CLARiiON systems, verify that the single I/O path points to the SP that owns the boot LUN.
    •   For FC-SW environments, verify fabric zoning parameters, such that a single I/O path exists to the boot LUN. Refer to your array software documentation for details.
    •   Check the physical Fibre Channel connectivity between the adapter and array (direct-attach environment) or switch (FC-SW environment).

    _____

```
Here are Luns numbers 0001 thru 0004:

0001: Mode: Peripheral dev LUN: 0000
0002: Mode: Peripheral dev LUN: 0010
0003: Mode: Peripheral dev LUN: 0011
0004: Mode: Peripheral dev LUN: 0012
```

Figure 40   LUNs for target array port

29. Select the number that corresponds to the LUN to be used for boot, and press **Enter**.

    This displays a window similar to Figure 41.

    In the Figure 40 example:

    • Entry **01** references LUN 00, which holds the Symmetrix Volume Logix VCM (LUN masking) database, cannot be used by the host.

    • Entry **02** references LUN 10 (this is a decimal representation; which corresponds to a hexadecimal value of 0A), which will be used for boot.

    Note: If no numbered entries appear in the above figure, verify the following:

    • For VNX series or CLARiiON systems, verify that the single I/O path points to the SP that owns the boot LUN.

    • Verify that array LUN masking settings are configured so that this adapter has visibility to the appropriate LUN. Refer to your array software documentation for details.

```
                 Selected Boot Device:
002: DID:2C1900 WWN:5006048A CD201641 Mode: Per LUN: 0010


            1. Boot this device via WWN.
            2. Boot this device via DID.
```

Figure 41   Selected boot device

30. In the **Selected Boot Device** window (Figure 41 on page 61), select the appropriate item and press **Enter**:

   • In FC-SW environments, select **1** (**Boot this device via WWPN**).

   • In FC-AL/direct-attach environments, select **2** (**Boot this device via DID**).

   A window similar to Figure 42 appears.

Figure 42   Boot device identification

The utility reports the array port WWN and the LUN address (in decimal) specified as the boot device.

31. The boot from array configuration is now complete. Press **Esc** to exit from each menu screen until the utility is closed and you are prompted: **Action Required is Press [ENTER] to continue**.

32. Press **Enter** twice to return to the EFI shell. The EFI shell can now be exited, and the OS Installation can begin using the specified array-based LUN as the boot volume.

Booting from SAN with HP Itanium servers with EMC storage

Setting up the server

Before booting from a SAN, set up the server as follows:

1. Download and install the latest system firmware.

2. Remove the internal hard disks.

3. Record the WWN of each adapter port (each adapter should be tagged).

4. Install all adapters and connect one port to be targeted for booting.

Preparing the USB drive

Files required for the installation can be downloaded onto a USB drive. Download the following files using the links below and copy to the USB drive.

◆ **ramdisk.efi** — Intel provides this tool in their EFI toolkit. The toolkit in available for download at http://www.intel.com/technology/efi in Tools\Application Toolkit.

◆ **diskpart.efi** — This Intel provided disk utility can be found at http://www.intel.com/technology/efi in the EFI Disk Utilities link.

◆ **EFI Boot code/utility for your adapter** — This can be downloaded from the EMC section at www.emulex.com.

◆ **Adapter driver**

a. Download the AutoPilot Install Kit from the EMC section at www.emulex.com to a temporary directory on a computer, not the USB drive. This file contains the Base driver and HBAnyware utility.

b. After downloading the AutoPilot executable, select **open** to start the installation.

c. Select **Next** and then **Install** to start the installation.

d. Uncheck the **Start AutoPilot Installer** checkbox and select **finish**.

e. The driver files are located at C:\Program
Files\Emulex\AutoPilot Installer\Drivers\Storport\IA64\.
Copy the contents of this directory to the USB drive.

Preparing the adapter   Before booting from a SAN, the EFI Boot BIOS must be installed and
the adapter Boot BIOS enabled.

Adapter EFI firmware configuration

1. Prior to booting the server, ensure that media (USB memory drive
   or CD-ROM that contains the Emulex EFI boot code/utility you
   downloaded earlier is physically present in the system.

2. Following POST of the server, a **Boot Menu** the same or similar to
   (Figure 43) appears. Using the arrow keys, select **EFI Shell** and
   press **Enter**.

```
                         Firmware Boot Manager

Boot options: Enter number or ↑/↓ to select, 'Enter' to execute

  1 EFI Shell [Built-in]
  2 Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)
  3 Acpi(PNP0A03,1)/Pci(4|0)/Mac(0002551F80E0)
  4 Acpi(PNP0A03,1)/Pci(4|1)/Mac(0002559F80E0)
  5 CDROM
  6 Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)


System options: Enter letter or ↑/↓ to select, 'Enter' to execute

    Boot Option Maintenance        Diagnostics             EFI Shell
    Configuration/Setup            Driver Setup            Flash
```

Figure 43   Firmware boot manager menu

The EFI shell will open and the Device Mapping Table (Figure 44
on page 65) may be listed by default. If the Device Mapping Table
is not listed, type **map** and press **Enter**.

```
Device Mapping Table
  fs0  : MemMap(15:FF000000-FFFFFFFF)
  fs1  : MemMap(8:FF800200-FFBFFFFF)
  fs2  : MemMap(16:1B846000-1B9ADFFF)
  fs3  : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)/CDROM(Entry0)
  fs4  : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)/CDROM(Entry1)
  fs5  : Acpi(PNP0A03,0)/Pci(5|3)/Usb(0, 0)/HD(Part1,Sig19EEC514)
  fs6  : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)/HD(Part1,SigFA5B03C0-EA5E-01C3
-507B-9E5F8078F531)
  blk0 : MemMap(15:FF000000-FFFFFFFF)
  blk1 : MemMap(8:FF800200-FFBFFFFF)
  blk2 : MemMap(16:1B846000-1B9ADFFF)
  blk3 : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)
  blk4 : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)/CDROM(Entry0)
  blk5 : Acpi(PNP0A03,0)/Pci(5|1)/Ata(Primary,Master)/CDROM(Entry1)
  blk6 : Acpi(PNP0A03,0)/Pci(5|3)/Usb(0, 0)
  blk7 : Acpi(PNP0A03,0)/Pci(5|3)/Usb(0, 0)/HD(Part1,Sig19EEC514)
  blk8 : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)
  blk9 : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)/HD(Part1,SigFA5B03C0-EA5E-01C3
-507B-9E5F8078F531)
  blkA : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)/HD(Part2,SigFA9CA0A0-EA5E-01C3
-F1B3-12714F758821)
  blkB : Acpi(PNP0A03,1)/Pci(3|0)/Scsi(Pun0,Lun0)/HD(Part3,Sig5CE668E0-7CC6-01C5
-A1F4-04622FD5EC6D)
fs5:\>
```

Figure 44   Device mapping table

The file systems available to the server are listed in the Device Mapping Table, referenced by **fs***N* (where *N* is a different number for each available file system). The description next to the **fs***N* entry references the type of media on which the file system resides.

In the example shown in Figure 44:

- **fs0**, **fs1**, and **fs2** refer to memory RAMdisks.
- **fs3** and **fs4** refer to file systems on a CD inserted into the CD-ROM drive.
- **fs5** refers to a file system on a USB memory-FLASH drive.
- **fs6** refers to an existing file system on an internal hard drive.

3. The file system you select depends upon what media contains the Emulex EFI boot code/utility. In this example, the Emulex EFI boot code/utility resides on the USB memory drive.

   Point the EFI shell to the proper file system by typing **fs**N**:** (where *N* is the number which references the proper file system) and press **Enter**.

4. Type **dir** and press **Enter** to list the contents of the directory (Figure 45).

```
fs5:\emulex> dir
Directory of: fs5:\emulex

  11/28/05  10:16a <DIR>           4,096  .
  11/28/05  10:16a <DIR>               0  ..
  09/09/05  10:45p              63,032  JE311A4.PRG
  09/09/05  10:45p             174,080  Elxcli311a4.efi
  10/19/05  03:03p              23,810  rel_notes.txt
          3 File(s)     260,922 bytes
          2 Dir(s)



fs5:\emulex>
```

Figure 45   Directory listing

The directory listing should contain the Emulex EFI boot code/utility downloaded to the media.

The directory should contain the following files:

- **elxcli**nnnn**.efi** — Emulex EFI boot configuration support utility, where *NNNN* refers to the utility version number.
- *xxxxxxx***.prg** — Emulex EFI boot code, where *xxxxxx* refers to the version boot code version for the specified adapter model.

If the directory contents are inconsistent with what you expect, and do not appear to contain the Emulex boot code/utility, the file system select may not be correct. Verify the proper file system is selected. If the Emulex boot code/utility resides in a subdirectory, type **cd** *subdirectory* and press **Enter**.

5. The **elxcli***nnnn***.efi** configuration support utility file must be loaded in the EFI shell to configure the Emulex adapter. Type **load elxcli***nnnn***.efi** (where *nnnn* refers to the specific version number present on your media) and press **Enter**.

    In the example in Figure 46, the configuration support utility file is named elxcli311a4.efi.

```
fs5:\emulex> load Elxcli311a4.efi
EfiInitializeDriverLib: Started
load: Image fs5:\emulex\Elxcli311a4.efi loaded at 0x1BD74000 - Success
```

Figure 46   EFI boot configuration support utility

6. Emulex adapters can now be configured via the EFI shell. Type **drivers** and press **Enter** to obtain a list of loaded drivers in the EFI shell. The Emulex driver should be listed toward the bottom of the output.

7. Make note of the first hexadecimal value listed on the line with **Emulex SCSI Pass Thru Driver**. In the example in Figure 47, the driver handle is 8C.

```
3F 00070000 B X X  2  2 Broadcom Gigabit Ethernet Driver    B57UNDI
40 00000010 D - -  2  - Simple Network Protocol Driver       Snp3264
41 00000010 ? - -  -  - PXE Base Code Driver                 PxeDhcp4
42 00000010 D - -  2  - PXE Base Code Driver                 PxeDhcp4
43 00000010 D - -  1  - CD File System Driver                CdFs
4F 01020B00 D X -  2  - LSI Logic Ultra320 SCSI Driver       PciRom Seg=00000000

8C 00031114 D X X  2  - Emulex SCSI Pass Thru Driver         Elxcli311a4

fs5:\emulex>
```

Figure 47   Loaded drivers in the EFI shell

8. The EFI shell includes a driver configuration utility, accessed via **drvcfg**, which configures supported drivers. To configure the Emulex-specific driver, type **drvcfg -s** *driverhandle* (where driverhandle refers to the driver handle listed for the Emulex driver in the output of the drivers command, described above) and press **Enter.** (In Figure 47 on page 67, the driver handle is 8C, so the command entered is **drvcfg -s 8C**.)

The Emulex EFI BIOS configuration utility (Figure 48) appears.

Figure 48   EFI BIOS configuration utility

9. Select the number of the adapter instance that corresponds to the adapter to be used for boot and press **Enter**.

> **Note:** If multiple adapters are installed, there will be multiple adapter entries. The order of the adapter instances listed is the order they will be scanned for a boot device; this does not necessarily correspond to PCI slot numbering. In Figure 48, adapter entry 001 is used for boot.

A window similar to on page 69 appears.

```
            Emulex FC EFI-Bios Utility, Ver: 3.11a4

001: LP1150          PCI-X  133MHz        Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
              HBA Status: Ready              Boot Bios : Disabled
              EXP ROM   : Disabled          Firmware  : JS2.10A5


                          1. Setup Utility
                          2. Firmware Update


       <↑/↓> to Change Options. <Enter> to Select Option. <ESC> to Prev Menu.

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```

Figure 49   EFI BIOS configuration utility option menu

10. Select **2** (Firmware Update) and press **Enter**.

This displays a window similar to Figure 50.

```
        Emulex FC EFI-Bios Firmware Update Utility, Ver: 3.11a4

001: LP1150          PCI-X  133MHz        Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
             EXP ROM   : Disabled         SLI - 1   : J1F2.10A5
             Firmware  : JS2.10A5         SLI - 2   : J2F2.10A5
             Port Name : 10000000C94AC3DF Kernel    : 1.11A5


       Directory Path      : \emulex
       Filename            : JE311A4.PRG







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```

Figure 50   EFI BIOS firmware update utility

11. The utility prompts for a directory path. Type the directory path relative to the root directory and press **Enter**.

In Figure 50 on page 69, the directory path (as shown in the EFI prompt in Figure 45 on page 66) without the file system is **\emulex**.

12. The utility prompts for the EFI boot code/firmware filename.

Type the filename (*xxxxxxx*.**prg** as it is found in the media containing the Emulex EFI boot/code utility, and press **Enter**. In Figure 50 on page 69, the EFI boot code is shown (in the Figure 45 on page 66 directory listing) as **je311a4.prf**.

13. The utility reports various steps of the boot code/firmware update as **Done** and **Updated**.

When prompted, press any key to return to the previous menu (Figure 49 on page 69).

14. Select **1** (**Setup Utility**) and press **Enter**.

This displays a window similar to Figure 51.

```
            Emulex FC EFI-Bios Setup Utility, Ver: 3.11a4

001: LP1150          PCI-X  133MHz        Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
        Boot Bios : Enabled    Firmware  : JS2.10A5  I/O Base  : 8000
        Port Name : 10000000C94AC3DF  Node Name : 20000000C94AC3DF
        S_ID      : 000000    Link Speed: NA        Topology  : Invalid


                    1. Enable or Disable BIOS
                    2. Configure HBA Parameters
                    3. Configure Boot Parameters
                    4. Reset to Default Values


     <↑/↓> to Change Options. <Enter> to Select Option. <ESC> to Prev Menu.

        Copyright (c) 2003-2005 Emulex, All rights reserved.
```

Figure 51 EFI BIOS firmware update utility: Enabling/disabling the BIOS

15. Select **1** (**Enable or Disable BIOS**) and press **Enter**.

This displays a window similar to Figure 52.

```
        Emulex FC EFI-Bios Setup Utility, Ver: 3.11a4

001: LP1150          PCI-X  133MHz        Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
        Boot Bios : Disabled  Firmware  : JS2.10A5  I/O Base  : 8000
        Port Name : 10000000C94AC3DF  Node Name : 20000000C94AC3DF
        S_ID      : 000000   Link Speed: NA        Topology  : Invalid


            EFI-Bios Boot Option is Currently DISABLED.


                    Disabled - default
                    Enabled

    <↑/↓> to Change Options. <Enter> to Select Option. <ESC> to Prev Menu.


      Copyright (c) 2003-2005 Emulex, All rights reserved.
```

Figure 52   EFI BIOS firmware update utility: Enabling the BIOS

16. Boot BIOS is disabled by default. Select **Enabled** and press **Enter**.

17. The utility reports **EFI-Boot BIOS Option is Currently ENABLED**. Press **Esc** to return to the prior configuration screen (Figure 51 on page 70).

18. Select **2** (**Configure HBA Parameters**) and press **Enter**.

This displays a window similar to Figure 53.

```
        Emulex FC EFI-Bios Setup Utility, Ver: 3.11a4

001: LP1150          PCI-X  133MHz        Seg#: 00 Bus#: 05 Dev#: 04 Func#: 00
        Boot Bios : Enabled   Firmware  : JS2.10A5  I/O Base  : 8000
        Port Name : 10000000C94AC3DF  Node Name : 20000000C94AC3DF
        S_ID      : 000000   Link Speed: NA          Topology  : Invalid


                1. Default ALPA of this adapter
                2. Topology Selection
                3. PLOGI Retry Timer

      <↑/↓> to Change Options. <Enter> to Select Option. <ESC> to Prev Menu.

        Copyright (c) 2003-2005 Emulex, All rights reserved.
```

Figure 53   Configure adapter parameters window

19. Select **2** (**Topology Selection**) and press **Enter**.

This displays a window similar to Figure 54.

```
Current Topology is: AUTO (start FCAL) - default.


            AUTO (start FCAL) - default.
            AUTO (start Point to Point).
            Point to Point.
            FCAL.
```

Figure 54   Current topology setting
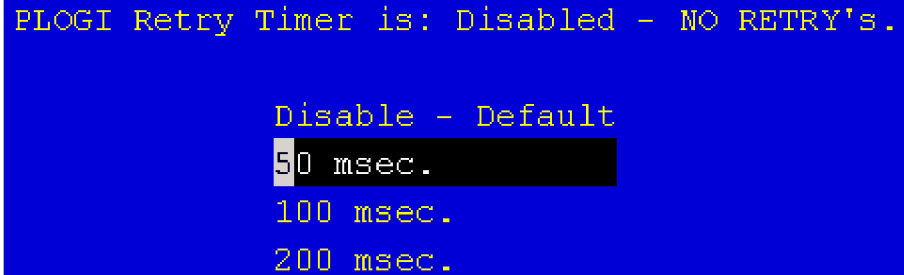
20. Select the appropriate setting and press **Enter**:

- In FC-SW environments, select **AUTO (start Point to Point)**.
- In FC-AL/direct-attach environments, leave the setting at the default of **AUTO (start FCAL)**.

21. Press **Esc** to return to the configuration screen shown in Figure 53 on page 72.

22. Select **3** (**PLOGI Retry Timer**) and press **Enter**.

    This displays a window similar to Figure 55, which shows the default setting of **NO RETRYs**.

```
PLOGI Retry Timer is: Disabled - NO RETRY's.


            Disable - Default
            50 msec.
            100 msec.
            200 msec.
```

Figure 55   Setting the PLOGI retry timer

23. The PLOGI retry timer specifies the amount of time following port reset the adapter will wait to log in again and rescan the bus devices. Setting a value of 50 msec allows a retry interval of 50 milliseconds for login and rescan functions to complete. A setting of 50 msec will take five to six seconds per device found on the bus.

    Select **50 msec** and press **Enter**.

24. Press **Esc** to return to the configuration screen shown in Figure 51 on page 70.

25. Select **3** (**Configure Boot Parameters**) and press **Enter**.

    This displays a window similar to Figure 56 on page 74.

Figure 56   Configure boot parameters window

A list of up to eight boot device, in order of preference, can be saved in the adapter's BIOS utility. Initially, all entries should be listed with empty WWN values.

26. Select **1** to set the primary boot LUN, and press **Enter**.

This displays a window similar to .

Figure 57   Instructing the adapter to scan for targets

27. Select **1** (Scan Targets) to instruct the adapter to scan for attached targets, and press **Enter**.

This displays a window similar to Figure 58.

```
Here are targets numbers 001 thru 002:


001: DID:2D2100 WWN:50060160 10601444
002: DID:2C1900 WWN:5006048A CD201641
```

Figure 58   Targets

IMPORTANT

If booting from Symmetrix with volume logix enabled, do not select LUN 0, as this LUN is reserved for internal Symmetrix use.

28. Select the number that corresponds to the array target port from which the boot will be configured, and press **Enter**.

This displays a window similar to

In Figure 58, the array designated by 002: DID:2C1900 WWN:5006048A CD201641 is the array from which the boot will be configured.

Note: If no target numbers appear, and the utility simply returns to the prior screen, verify the following:

- If multiple adapters are present, verify the adapter selected in the BIOS utility is the same adapter that currently provides the I/O path to the storage. (At this point, only one I/O path should be configured to the boot LUN.)

- For VNX series or CLARiiON systems, verify the single I/O path points to the SP that owns the boot LUN.

- For FC-SW environments, verify fabric-zoning parameters, such that a single I/O path exists to the boot LUN. (Refer to your array software documentation for details.)

- Check the physical Fibre Channel connectivity between the adapter and array (direct-attach environment) or switch (FC-SW environment).

```
Here are Luns numbers 0001 thru 0004:

0001: Mode: Peripheral dev LUN: 0000
0002: Mode: Peripheral dev LUN: 0010
0003: Mode: Peripheral dev LUN: 0011
0004: Mode: Peripheral dev LUN: 0012
```

Figure 59   **LUNs for target array port**

29. Select the number that corresponds to the LUN to be used for boot, and press **Enter**.

This displays a window similar to Figure 60.

In the Figure 59 example:

- Entry **01** references LUN 00, which holds the Symmetrix Volume Logix VCM (LUN masking) database, cannot be used by the host.
- Entry **02** references LUN 10 (this is a decimal representation; which corresponds to a hexadecimal value of 0A), which will be used for boot.

Note: If no numbered entries appear in the above figure, verify the following:

- For VNX series or CLARiiON systems, verify that the single I/O path points to the SP that owns the boot LUN.
- Verify that array LUN masking settings are configured so that this adapter has visibility to the appropriate LUN. Refer to your array software documentation for details.

```
          Selected Boot Device:
002: DID:2C1900 WWN:5006048A CD201641 Mode: Per LUN: 0010

          1. Boot this device via WWN.
          2. Boot this device via DID.
```

Figure 60   **Selected boot device**

30. In the **Selected Boot Device** window (Figure 60 on page 76), select the appropriate item and press **Enter**:

    - In FC-SW environments, select **1** (**Boot this device via WWPN**).
    - In FC-AL/direct-attach environments, select **2** (**Boot this device via DID**).

    A window similar to Figure 61 appears.

```
         Emulex FC EFI-Bios Setup Utility, Ver: 3.11a4

002: LP1150          PCI-X   133MHz       Seg#: 00 Bus#: 07 Dev#: 03 Func#: 00
       Boot Bios : Enabled   Firmware : JS2.10A5  I/O Base  : 2000
       Port Name : 10000000C94AC507  Node Name : 20000000C94AC507
       S_ID      : 2D0800    Link Speed:  2Gb/s    Topology  : PtPt


       01: DID:000000 WWN:5006048A CD201641 Mode: Per LUN: 0010
       02: DID:000000 WWN:00000000 00000000
       03: DID:000000 WWN:00000000 00000000
       04: DID:000000 WWN:00000000 00000000
       05: DID:000000 WWN:00000000 00000000
       06: DID:000000 WWN:00000000 00000000
       07: DID:000000 WWN:00000000 00000000
       08: DID:000000 WWN:00000000 00000000

    <↑/↓> to Change Options. <Enter> to Select Option. <ESC> to Prev Menu.

     Copyright (c) 2003-2005 Emulex, All rights reserved.
```

Figure 61   Boot device identification

The utility reports the array port WWN and the LUN address (in decimal) specified as the boot device.

31. The boot from array configuration is now complete. Press **Esc** to exit from each menu screen until the utility is closed and you are prompted: **Action Required is Press [ENTER] to continue**.

32. Press **Enter** twice to return to the EFI shell. The EFI shell can now be exited, and the OS Installation can begin using the specified array-based LUN as the boot volume.

Installing a RAMDISK under the EFI shell

Intel provides an EFI toolkit on the Intel website http://www.intel.com/technology/efi. Included in the EFI toolkit is the RAMDISK driver. To install the RAMDISK driver on your system, copy the RAMDISK.EFI file to your USB flash drive.

Insert the USB flash drive in your EFI-based server's USB port and boot the server to the EFI shell. At the shell prompt, locate your USB flash drive in the device mapping table. A line similar to the following should be listed in the mapping table:

```
Fs0: Acpi (PNPOA03,0)/Pci (1D|1)Usb(1,0)/HD(Part1,Sig0D0C0B0A)
```

Switch to the USB flash drive by typing in the corresponding FS number, followed by a colon (i.e., FS0:) and press **Enter**.

At the FS prompt, type **Load RAMDISK.EFI** and press **Enter**. You should see the message noting the driver has loaded successfully.

To locate the new RAMDISK, type **Exit** and press **Enter**. From the system Boot Manager menu, select **EFI Shell** to return to the EFI Shell. The device map should now show a new FS device and the previous USB device.

Note: The order of devices may have shifted with the discovery of the RAMDISK.

```
Fs0: VenMsg(06ED4DD0-FF78-11D3-BDC4-00A0C94053D1)
Fs1: Acpi (PNP0A03,0)/Pci (1D|1)/Usb(1,0)/HD(Part1,Sig0D0C0B0A)
```

In the above example, the RAMDISK is now Fs0. Now you can copy your driver files for your adapter to the RAMDISK. Switch to your USB flash drive with the driver files and copy the files to the RAMDISK by using the **copy** command. As with DOS, the **copy** command can use an asterisk to grab multiple files, (i.e., Copy *.* fs0:). Once the files are copied to the RAMDISK, proceed to install Windows.

Note: If the server is rebooted at any time, this procedure will need to be repeated because the RAMDISK is deleted during a reboot.

Installing Windows on an external SAN disk using an EFI RAMDISK

This section provides procedures for installing Windows 2000/2003 and Windows 2008 operating systems.

◆ "Windows 2000/2003 external boot disk installation," next

◆ "Windows 2008 internal/external boot disk installation" on page 86

Windows 2000/2003 external boot disk installation

This section is a step-by-step procedure for installing Windows 2000/2003 operating system on an external boot device.

After you have your adapter(s) installed in your server and configured for external boot the next step is to install the Windows operating system. If you intend to boot to an external device, refer to ""Updating the flash firmware/BIOS" on page 30 and "Emulex LightPulse-based Fibre Channel adapter BIOS/boot LUN settings" on page 38 for setting the boot BIOS for external boot and selecting the external boot LUN. If your system is EFI based, refer to the section on creating an EFI RAMDISK: "Installing a RAMDISK under the EFI shell" on page 78. Also refer to your server's documentation for preparing your server for external boot.

Note: If you intend to boot to an external disk, present only the LUN from which you intend to boot. All additional LUNs can be added after the installation. This will eliminate confusion on selecting the correct partition for installation and eliminates any problems that the operating system could encounter on reboot during the installation. Also confirm there is only one path to the storage array. Having more that one path can cause the operating system to fail during the installation.

To install Windows, you need the following materials:

◆ A Windows CD-ROM for the Windows version you wish to install.

◆ A USB drive with the files required for installation. Refer to "Preparing the USB drive" on page 63 for more information.

◆ A floppy disk containing your EMC-approved adapter.

Note: If you are using Emulex STORPort driver 2.01a4 or later on Windows 2003, and are booting externally to an EMC array, you will need to install using driver version 1.30a9. Driver version 2.10a7 and later require a minimum of Windows 2003 with Service Pack 2 and STORPort hotfix Q950903. Since these required patches/QFEs do not come preinstalled on the Windows 2003 installation CD-ROM, you must install using the older driver version and then upgrade to 2.01a4 or later after installing the correct service pack and QFE.

To install Windows:

1. Insert a bootable Windows CD-ROM into the drive and reboot the system. If your system has a bootable disk already configured from a previous installation, the software will prompt you to press any key to boot from CD-ROM.

2. If you are installing Windows to boot from an external array disk, you will need to supply setup with the adapter driver. To do this, immediately after the Windows installation begins, press **F6** when directed or when the blue screen appears. Otherwise, proceed to Step 6.

   Pressing **F6** tells the Windows installer that you want to load a third-party driver before proceeding with the installation.

   If you do not press **F6** in time to add the drivers, restart the server and try again. You will know if you missed the **F6** function to install third-party drivers when the setup returns with a warning that it cannot find a partition to load the operating system.

Figure 62   Windows setup screen with F6 prompt

Note: Windows 2000 does not display the F6 prompt.

3. When prompted for additional drivers, select **S** (**Specify Additional Device**).

```
Windows Setup


Setup could not determine the type of one or more mass storage devices
installed in your system, or you have chosen to manually specify an adapter.
Currently, Setup will load support for the following mass storage devices(s):

   <none>

 * To specify additional SCSI adapters, CD-ROM drives, or special
   disk controllers for use with Windows, including those for
   which you have a device support disk from a mass storage device
   manufacturer, press S.

 * If you do not have any device support disks from a mass storage
   device manufacturer, or do not want to specify additional
   mass storage devices for use with Windows, press ENTER.




 S=Specify Additional Device    ENTER=Continue    F3=Exit
```

Figure 63   Specifying a driver for your adapter

4. Insert the Windows CD-ROM into the drive

5. Insert the prepared USB drive into the USB port.

6. Boot the server to the EFI shell

7. Install the Ramdisk using the following procedure

   At the shell prompt, locate your USB flash drive in the device mapping table. A line similar to the following should be listed in the mapping table:

```
Fs0: Acpi (PNPOA03,0)/Pci (1D|1)Usb(1,0)/HD(Part1,Sig0D0C0B0A)
```

   Switch to the USB flash drive by typing in the corresponding FS number, followed by a colon (i.e., FS0:) and press **Enter**.

   At the FS prompt, type **Load RAMDISK.EFI** and press **Enter**.

You should see the message noting the driver has loaded successfully. To locate the new RAMDISK, type **Exit** and press **Enter**. From the system Boot Manager menu, select **EFI Shell** to return to the EFI Shell. The device map should now show a new FS device and the previous USB device.

Note: The order of devices may have shifted with the discovery of the RAMDISK.

```
Fs0: VenMsg(06ED4DD0-FF78-11D3-BDC4-00A0C94053D1)
Fs1: Acpi (PNP0A03,0)/Pci (1D|1)/Usb(1,0)/HD(Part1,Sig0D0C0B0A)
```

In the above example, the RAMDISK is now Fs0. Now you can copy your driver files for your adapter to the RAMDISK. Switch to your USB flash drive with the driver files and copy the files to the RAMDISK by using the **copy** command. As with DOS, the **copy** command can use an asterisk to grab multiple files, (i.e., Copy *.* fs0:). Once the files are copied to the RAMDISK, proceed to install Windows. The ramdisk will automatically install the adapter driver files necessary for booting for SAN.

Note: If the server is rebooted at any time, this procedure will need to be repeated because the RAMDISK is deleted during a reboot.

---

8. Start the Windows installation by changing to the CD or DVD drive by typing in the corresponding FS number, followed by a colon (i.e., FS0:). It will be an fsx entry similar to the following:

```
fs1:Acpi(HWP0002,0)/Pci(3|0)/Ata(Primary,Master)/CDROM(Entry0)
```

9. At this screen type **setupldr.efi**. The Windows Installation will start. Do *not* hit F6 when prompted. The **Welcome Setup** screen opens prompting you to select **Enter**. Select **Enter**.

10. Depending on the version of Windows that is being installed, a screen with the following text may appear:

Windows Setup can automatically configure most aspects of your installation, requiring little or no input from you. If you are configuring a computer with no local monitor or keyboard, you must use this feature or setup will not complete.

If you would like to use this feature, please press **ENTER** *now.*

If you would like to proceed with a manual installation, please press the C key now.

Select **C** to proceed with the manual installation.

11. A **Windows Licensing Agreement** appears.

    Read the license agreement. (Press **Pg Dn** as necessary to scroll through the text.) To accept the agreement, press **F8**.

    Setup inspects your computer's hardware configuration. The setup screen displays disk partition information (if your system already contains partitions), or lets you create a new hard disk partition. (Refer to Figure 64.)

12. Figure 64 presents the partitions available. Note the EFI partition (EFIPART). Select the desired partition to install the OS.

```
Windows Server 2003, Enterprise Edition Setup

   The following list shows the existing partitions and
   unpartitioned space on this computer.

   Use the UP and DOWN ARROW keys to select an item in the list.

      *   To set up Windows on the selected item, press ENTER.

      *   To create a partition in the unpartitioned space, press C.

      *   To delete the selected partition, press D.

   34728 MB Disk 0 at Id 0 on bus 4 on cpqcissm [MBR]

           Unpartitioned space                 34724 MB ( 32611 MB free)




   ENTER=Install  C=Create Partition  F3=Quit
```

Figure 64   **Existing partitions**

13. If you are installing an operating system for the first time, highlight **Unpartitioned Space** on the adapter. Then:

    • Press **Enter** to use the entire disk as one partition

      or

    • Press **C** to create a custom partition, and then specify the partition size

    If the new disk is displayed as **Unformatted** or **Damaged** you must delete the partition before continuing. To do this, press **D**, and follow the onscreen delete instructions. After you delete the partition, the space will then appear as **Unpartitioned Space**.

    If you are reinstalling Windows, the setup software prompts you to overwrite or upgrade:

    • To overwrite, press **Esc** and follow instructions.

    • To upgrade, press **Enter**.

    • To create a new hard-disk partition, you must first delete the existing partition, and then create a new one. To do so, select the partition you want to delete, press **D**, and then follow the onscreen instructions to complete the deletion of the partition. Once the system deletes the partition, you can press **C** to create a new partition.)

14. The setup software prompts you to specify the file system format for the partition. Select **NTFS file system** format (suitable for most sites) and press **Enter**, unless you have other specific requirements.

    Note: For background information on the choice of the NTFS file system, refer to Microsoft Knowledge Base Article 184006.

    Setup formats the partition, copies the Windows system files to the partition, and starts rebooting the server.

15. When prompted, remove the diskette and CD-ROM.

16. If your system prompts you to press any key to boot from CD-ROM, do not press a key. Instead, allow the system to boot from the array (if external) or the local disk (if internal). After booting, the system continues installation, displays the Windows banner, and begins auto detection of mass-storage devices and adapters.

17. Follow the onscreen instructions to complete the installation. When the **Completing the Windows Setup Wizard** screen appears, click **Finish**.

18. Install the latest EMC-approved Windows Service Pack and/or OS patches or updates. Follow the procedures in the Microsoft documentation that accompanies the updates.

Windows 2008 internal/external boot disk installation

This section is a step-by-step procedure for installing a Windows operating system to either an internal or external boot device.

After you have your adapter(s) installed in your server, and configured for external boot if necessary, the next step is to install the Windows operating system. If you intend to boot to an external device, refer to "Booting from the external storage array" on page 30 for setting the boot BIOS for external boot and selecting the external boot LUN.

Note: If you intend to boot to an external disk, present only the LUN from which you intend to boot. All additional LUNs can be added after the installation. This will eliminate confusion on selecting the correct partition for installation and eliminates any problems that the operating system could encounter on reboot during the installation. Also confirm there is only **one** path to the storage array. Having more that one path can cause the operating system to fail during the installation.

To install Windows, you need the following materials:

◆ A Windows DVD-ROM for the Windows 2008 you wish to install

◆ An EMC-approved adapter driver jump-drive (USB) for Windows

To install Windows:

1. Insert a bootable Windows DVD-ROM into the drive and reboot the system. If your system has a bootable disk already configured from a previous installation, the software will prompt you to press any key to boot from DVD-ROM.

2. If you are installing Windows to boot from an external array disk, you will need to supply setup with the adapter driver in a USB jump-drive and insert it in your server prior to the Windows installation.

The **Windows Boot Manager** screen displays (Figure 65).


```
                          Windows Boot Manager

Choose an operating system to start, or press TAB to select a tool:
(Use the arrow keys to highlight your choice, then press ENTER.)

    Windows Setup [EMS Enabled]
```
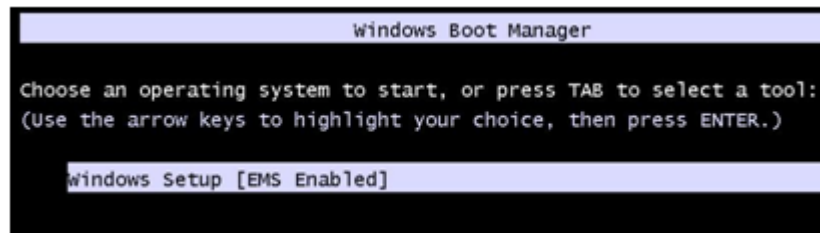
Figure 65   Windows Boot Manager

3. Press **Enter** to continue the installation.

The **Windows Setup** screen displays (Figure 66).
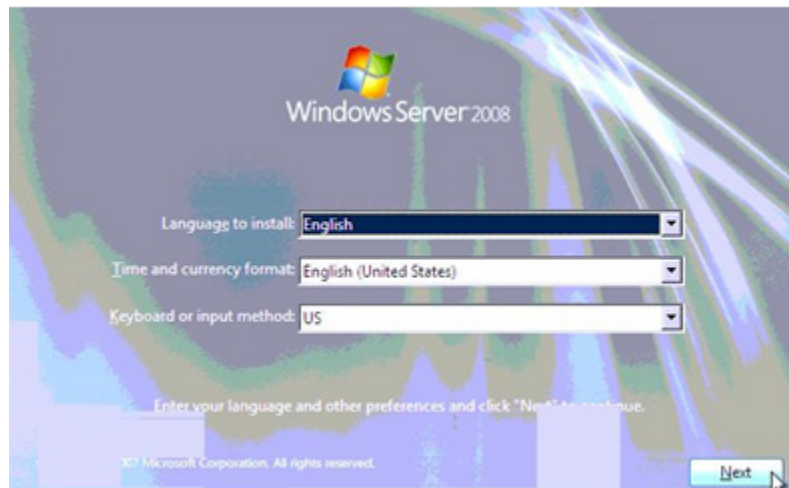
Figure 66   Windows Setup screen

4. Click **Next** to continue to the **Windows Install** screen (Figure 67).
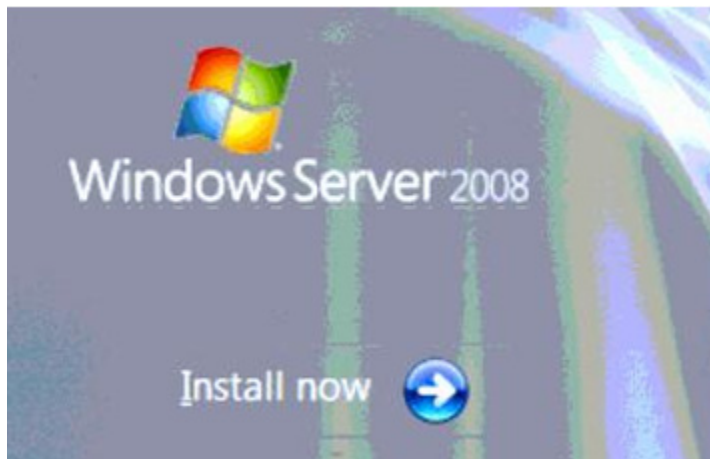
Figure 67   Windows Install screen

5. Click **Install now** to continue to the **Windows operating system selection** screen (Figure 68).

Figure 68   Windows operating system selection screen

6. Choose your operating system type and click **Next** to continue to the **Microsoft Software License Terms** screen (Figure 69).

MICROSOFT SOFTWARE LICENSE TERMS

MICROSOFT WINDOWS SERVER 2008, ENTERPRISE

These license terms are an agreement between Microsoft Corporation (or based on where you live, one of its affiliates) and you. Please read them. They apply to the software named above, which includes the media on which you received it, if any. The terms also apply to any Microsoft

    ☐   updates,

    ☐   supplements,

    ☐   Internet-based services, and

    ☐   support services

☑ I accept the license terms

Figure 69   Microsoft Software License Terms screen

7. Check the **I accept the license terms** checkbox and click **Next** to continue to the **Windows setup** screen (Figure 70 on page 90).

Which type of installation do you want?

Upgrade
Keep your files, settings, and programs and upgrade Windows.
Be sure to back up your files before upgrading.

Custom (advanced)
Install a clean copy of Windows, select where you want to install it, or make changes
to disks and partitions.
This option does not keep your files, settings, and programs.

Help me decide

Upgrade has been disabled

- To upgrade, start the installation from Windows.

Figure 70   Windows setup screen

> 8. Click **Custom (advance)** if you want to install a clean copy of
>   Windows.
>
>   The **Load driver** screen displays (Figure 71).

Where do you want to install Windows?

Name	Total Size	Free Space	Type
Disk 0 Unallocated Space	11.9 GB	11.9 GB	

Refresh   Drive options (advanced)
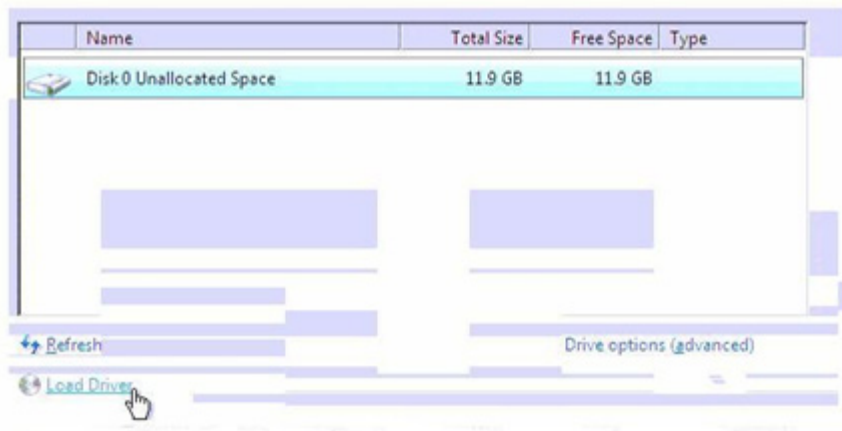
Load Driver

Figure 71   Load driver screen

9. Select **Load Driver** (Figure 71 on page 90) if booting from the external device and then click **Next** to continue.

The **Loading driver** screen displays (Figure 72).
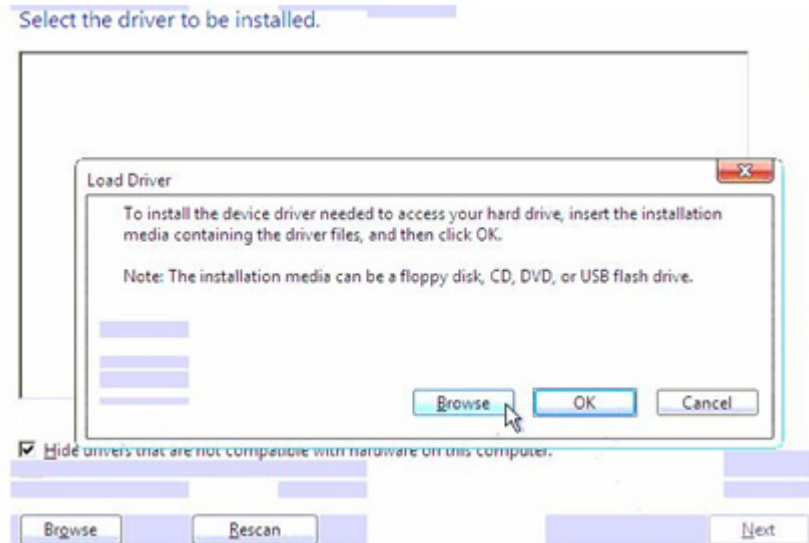
Figure 72   Loading driver screen

10. Click **Browse** to load your adapter driver.

The **Browse for Folder** screen displays (Figure 73).
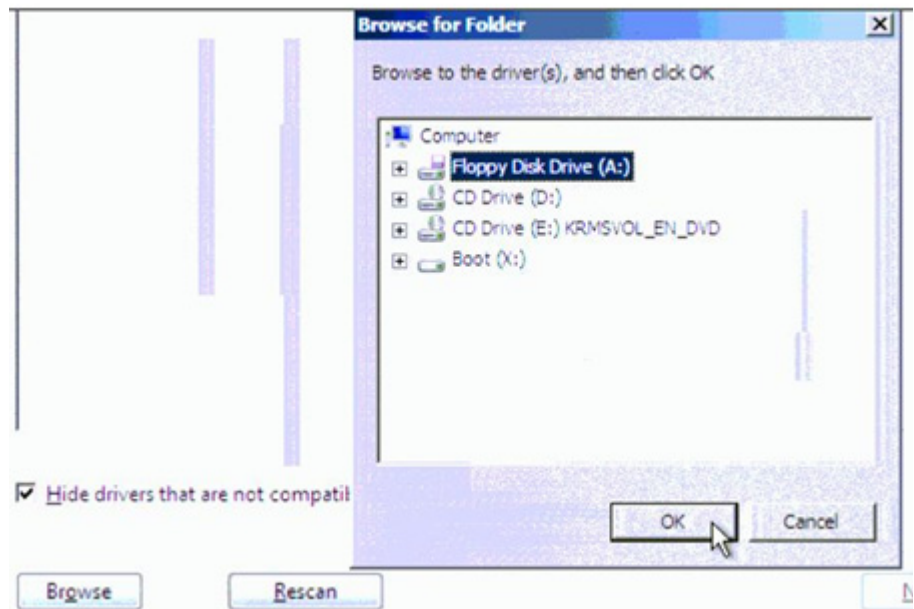
Figure 73   Browse for Folder screen

Note: You would see your USB jump-drive rather than the Floppy Drive A as shown in Figure 73.

11. Select your USB jump-drive (Figure 74).
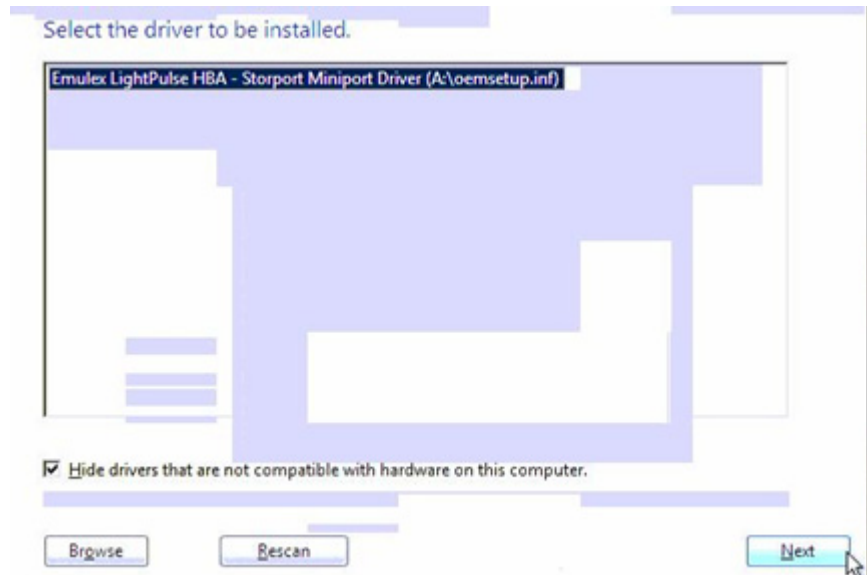
Figure 74   Specifying a driver for your adapter

12. Click **Next** to load your adapter driver.

You will be asked where you want to install Windows (Figure 75).
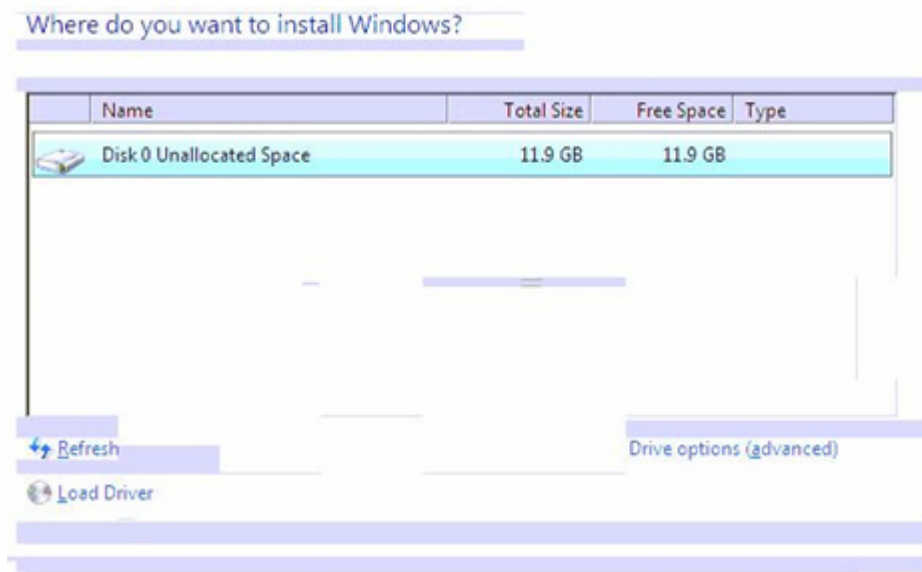
Figure 75   Windows installation prompt screen

Note: Select **Drive Options (advance)** to format your file system.

After the adapter driver is loaded, the **Install Windows** screen displays (Figure 76).
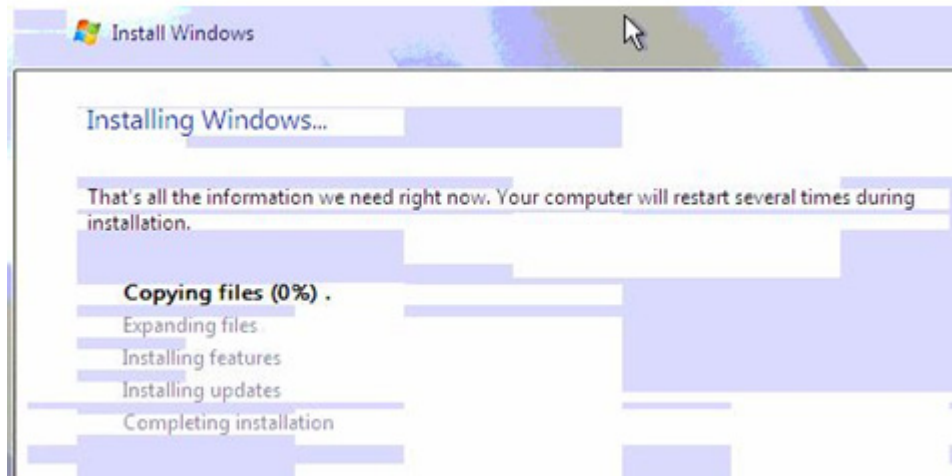
Figure 76   Install Windows screen

13. Click **Next** to begin the Windows installation.

    Setup will copy the Windows system files to the partition and start rebooting the server.

14. Do *not* press a key if your system prompts you to "press any key to boot from DVD-ROM." Instead, allow the system to boot from the array (if external) or the local disk (if internal). After booting, the system continues installation, displays the Windows banner, and begins auto detection of mass-storage devices and adapters.

15. Follow the on-screen instructions to complete the installation.

Windows 2008 Server Core operating system option

Windows Server 2008 includes a variation of an installation called a *Server Core*. Server Core is a "scaled-back" installation where no Windows Explorer shell is installed. All configuration and maintenance is done either through the command line interface windows or by connecting to the machine remotely using Microsoft Management Console.
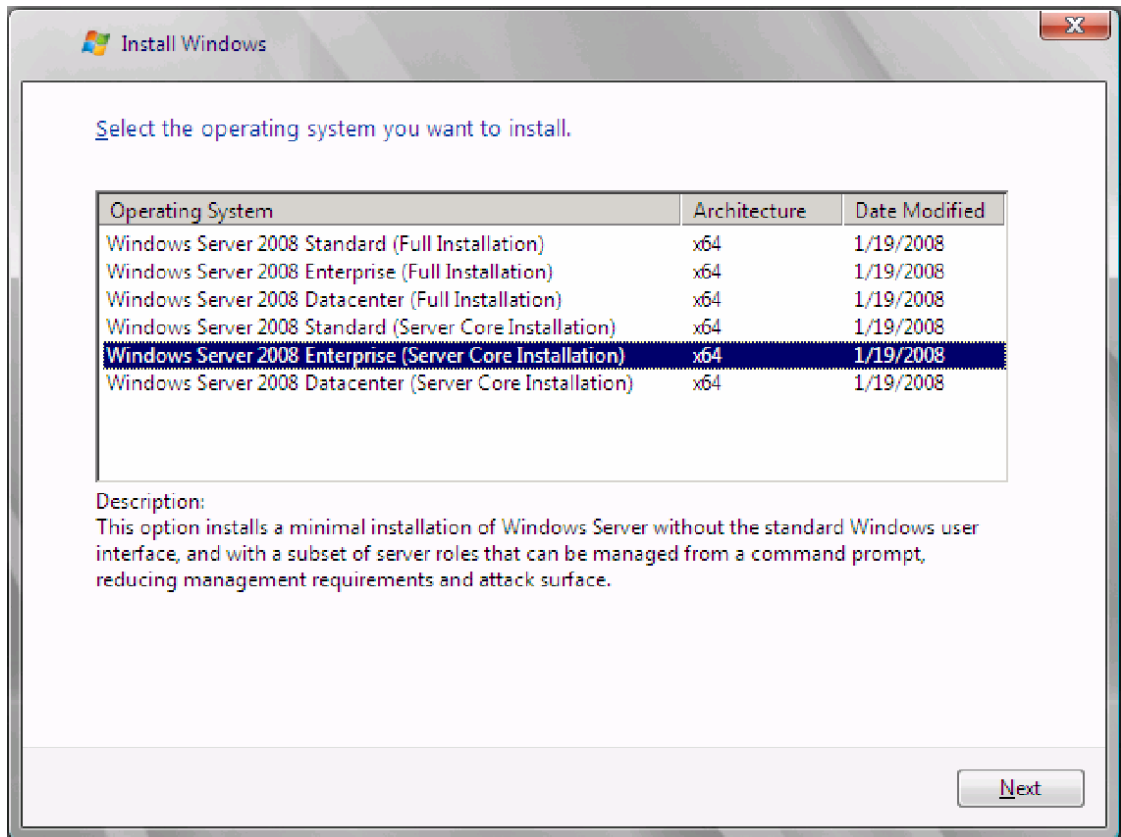
Figure 77   Server Core installation example

Limitations

Since Server Core is a special installation of Windows Server 2008, the following limitations exist:

◆ You cannot upgrade from a previous version of the Windows Server operating system to a Server Core installation. Only a clean installation is supported.

◆ You cannot upgrade from a full installation of Windows Server 2008 to a Server Core installation. Only a clean installation is supported.

◆ You cannot upgrade from a Server Core installation to a full installation of Windows Server 2008. If you need the Windows user interface or a server role that is not supported in a Server Core installation, you must install a full installation of Windows Server 2008.

EMC support

EMC supports the use of Server Core for attach to EMC storage arrays. The currently supported adapter drivers/firmware/BIOS and adapter driver utilities are approved for use with this version of Windows 2008. Use of the Emulex Autopilot driver install wizard (executable driver package), as shown in Figure 78, works exactly as it will on a standard Windows 2008 installation, but the wizard must be started from the command prompt.
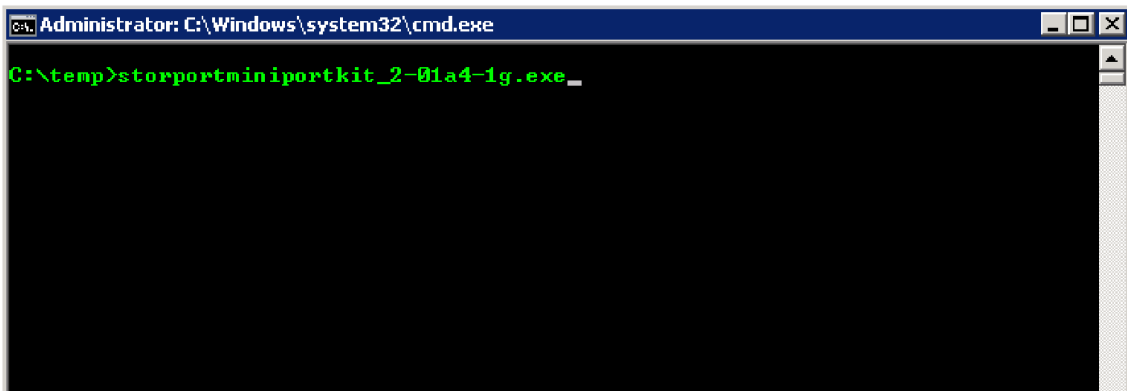
Figure 78   Emulex Autopilot driver install wizard

Likewise, the Emulex HBAnyware utility must be started from the command line.


```
C:\Program Files (x86)\Emulex\Util\HBAnyware>HBAnyware.exe_
```
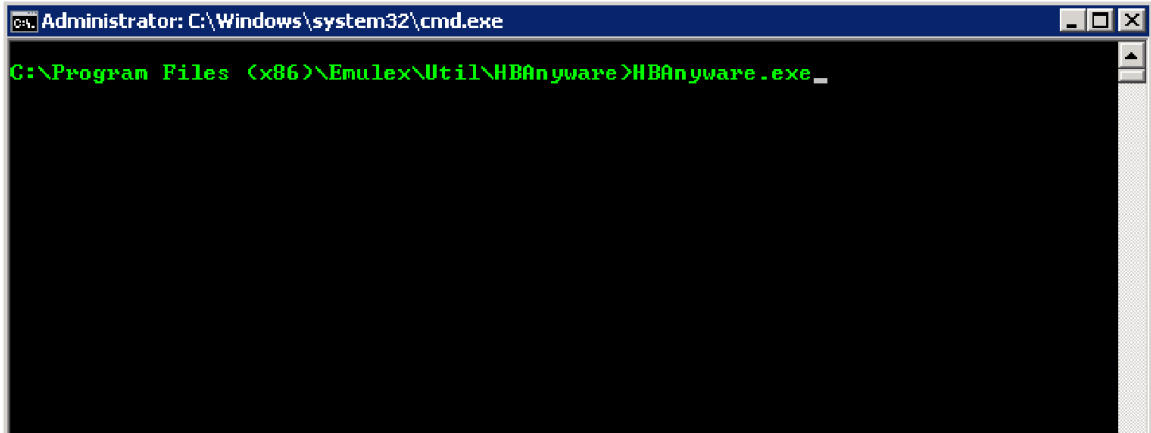
Figure 79   Emulex HBAnyware utility

Once the command has been issued, the installation wizard for the driver/utility will run with a normal installation GUI interface as it would on a standard Windows 2008 installation.

Installing adapter driver and software utilities

Emulex adapters must be installed in the server prior to installing the drivers and utilities. (Refer to "Installing the adapter" on page 22.)

To use EMC storage array disks with a Windows 2000, 2003, or 2008 host, you need a Fibre Channel host adapter driver. The driver and related utilities must be installed and configured before Windows can access the EMC disks. This is done with ease during the Windows setup (if booting from SAN) or by using the Emulex AutoPilot Installer Kit. AutoPilot Installer helps you install and configure drivers for your Emulex Fibre Channel adapters by walking you through the following steps:

- ◆ Adapter selection
- ◆ Driver installation (SCSI or STOR)
- ◆ Utility installation
- ◆ Installation verification

Three sections are outlined on the following pages to help with installation and configuration of your adapter drivers and utilities using the AutoPilot Install Kit:

- ◆ "Pre-installation guidelines", next
- ◆ "Installing or upgrading the driver and utilities" on page 100

Pre-installation guidelines

For Windows 2003, EMC supports both the STORPort driver class and the SCSIPort driver class. EMC recommends STORport in most cases. SCSIPort drivers for Windows 2003 have been frozen and no new versions are planned for this model. Windows 2000 uses only the SCSIPort driver class.

Note: Refer to the *EMC Support Matrix* for the latest required adapter revisions.

Required Windows STORPort updates

Currently, the shipping versions of Windows require post-RTM hot fixes to resolve some known issues. For all Windows STORPort installations, you must obtain the current Microsoft QFE hotfix listed in the *EMC Support Matrix* with the adapter driver revisions.

IMPORTANT

Install this QFE before installing the adapter driver.

Users planning to upgrade to the latest service pack for Windows should upgrade their adapter drivers to the latest supported version prior to installing the service pack. The Windows Service Packs do not contain the latest EMC-approved adapter revisions. Refer to the *EMC Support Matrix*.

Obtaining the Emulex AutoPilot Install Kit

The Emulex AutoPilot Install Kit is available on CD-ROM or downloadable from the Emulex website. Refer to "Installation and configuration overview" on page 21.

Installing or upgrading the driver and utilities

To install or upgrade the driver and utilities:

Note: This example of the Ease of Use installation involves the STORPort driver. SCSI full port driver may appear different, but the wizard works the same.

1. Install the Ease of Use Install Kit CD-ROM to start the Autopilot Install Wizard. If you have downloaded the kit to your hard drive, locate and double-click the file.

The window shown in Figure 80 on page 101 appears.

Figure 80   Storport Miniport Driver Kit installation window

2. Select **Next** to start the installation.

This displays a window similar to Figure 81 on page 102, identifying the default installation folder.
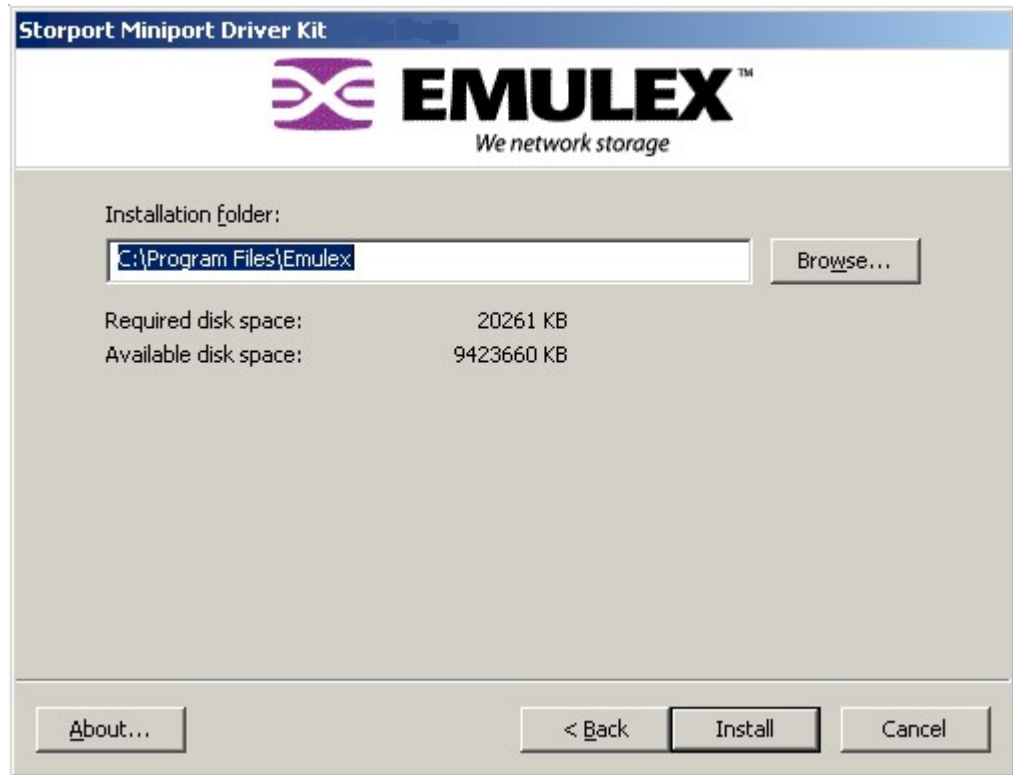
Figure 81   Specifying the installation folder

3. Select **Install** to accept the default installation folder, or type an alternative folder name. Then click **Install**.

The installation process begins, and displays status until complete. Accept all installation defaults on each page of the installation wizard. When installation is complete, the window in Figure 82 on page 103 appears.

Figure 82   Installation complete

4. Select the **Start AutoPilot Installer** checkbox (if not already checked) and click **Finish**.

This opens the AutoPilot Installer program, and displays a window similar to Figure 83 on page 104. The AutoPilot Installer will help you install the driver, as well as the HBAnyware utility.
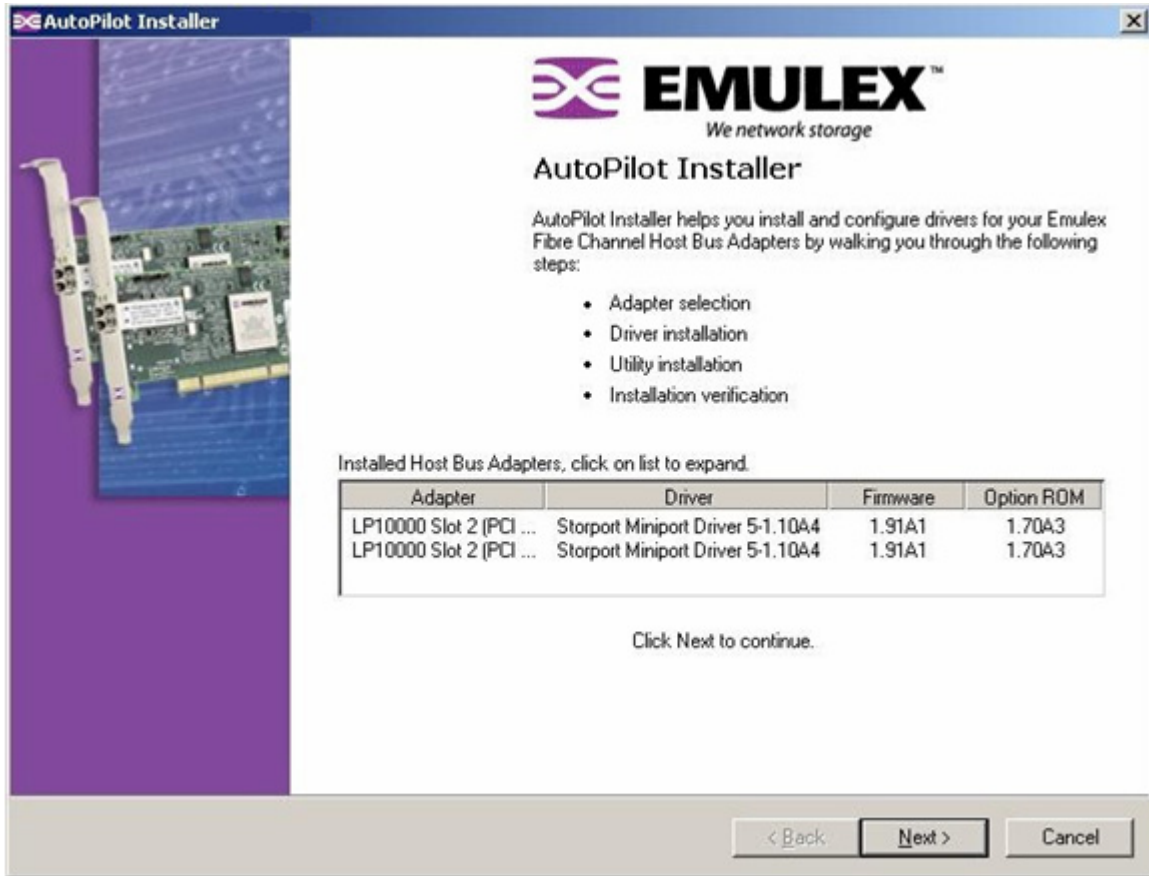
Figure 83   AutoPilot installer program

> **Note:** First time driver installations may display "not available" in the driver and firmware columns. This is normal and does not indicate an issue.

The Autopilot program automatically discovers the adapters in the system.

Note: If no adapters are discovered:

- Verify the adapter is properly seated into the bus and powered on. The LEDs should be lit.
- Verify the adapters are visible in Computer Management/Device Manager/SCSI and RAID controllers. For more troubleshooting information refer to "Starting device manager for Windows" on page 166.

5. Select **Next** to continue.

This displays a window similar to Figure 84.
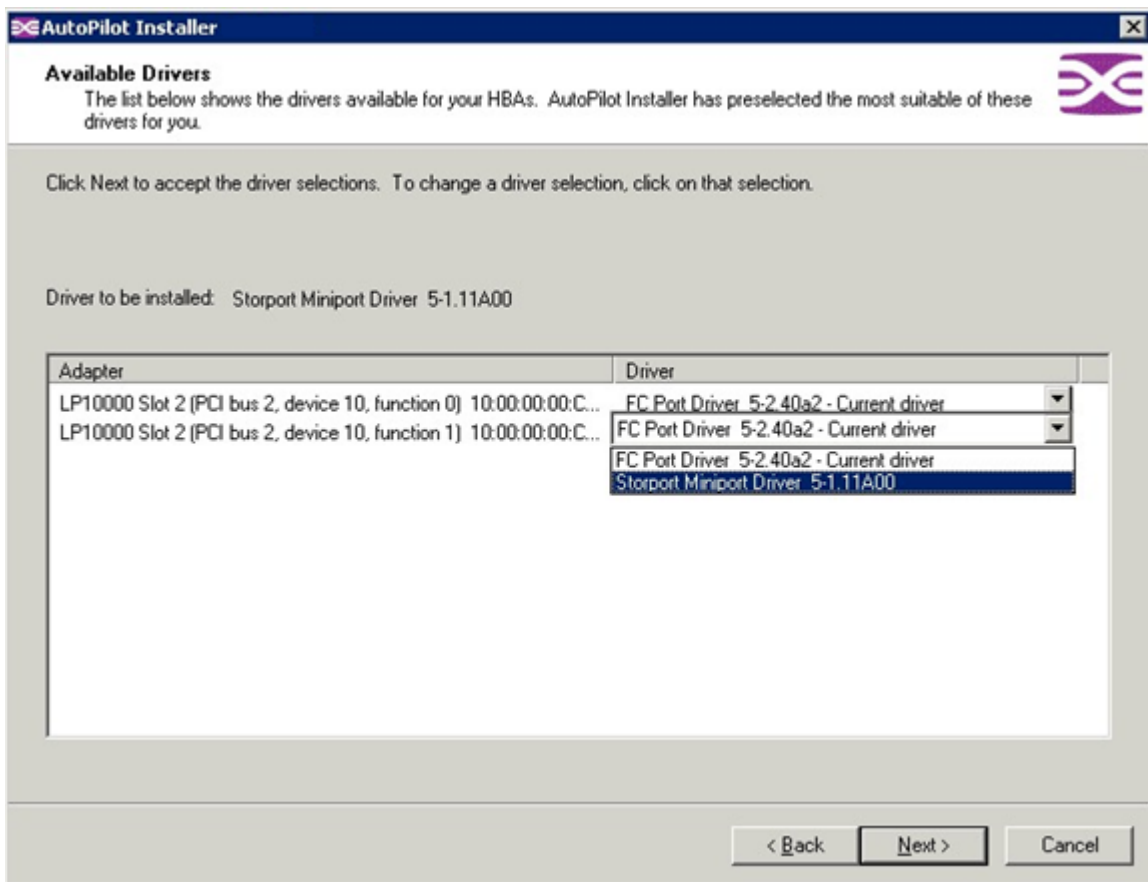
Figure 84   Available drivers

6. For each adapter, use the drop-down menu to select the new driver to be installed.

    Then select **Next** to continue.

    This displays a window similar to Figure 85 on page 106.
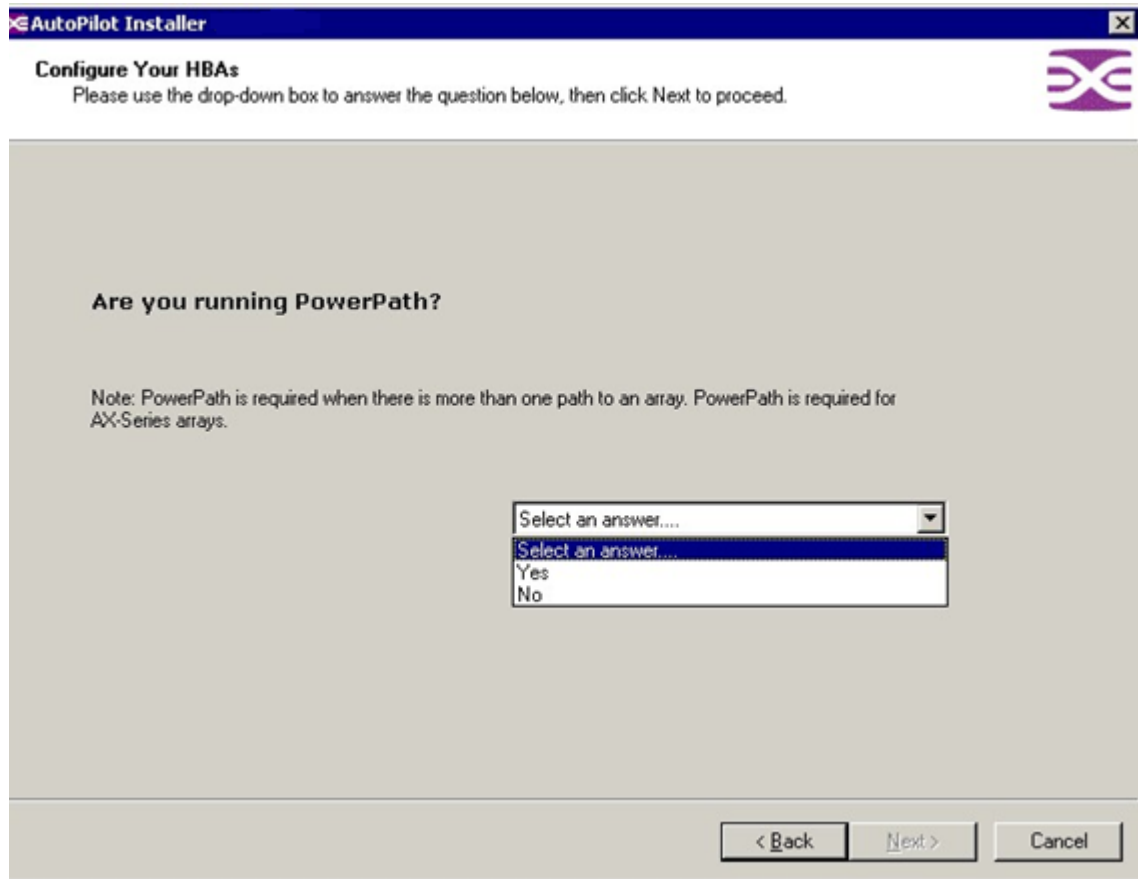
Figure 85   Adapter configuration: PowerPath selection

7. Select the appropriate answer regarding PowerPath® software, and click **Next** to display the next window (Figure 86 on page 107).

    PowerPath is required when there are multiple paths to an array. Powerpath is always required for AX-series arrays.

Note: This question will only appear if you are installing the SCSIPort driver.
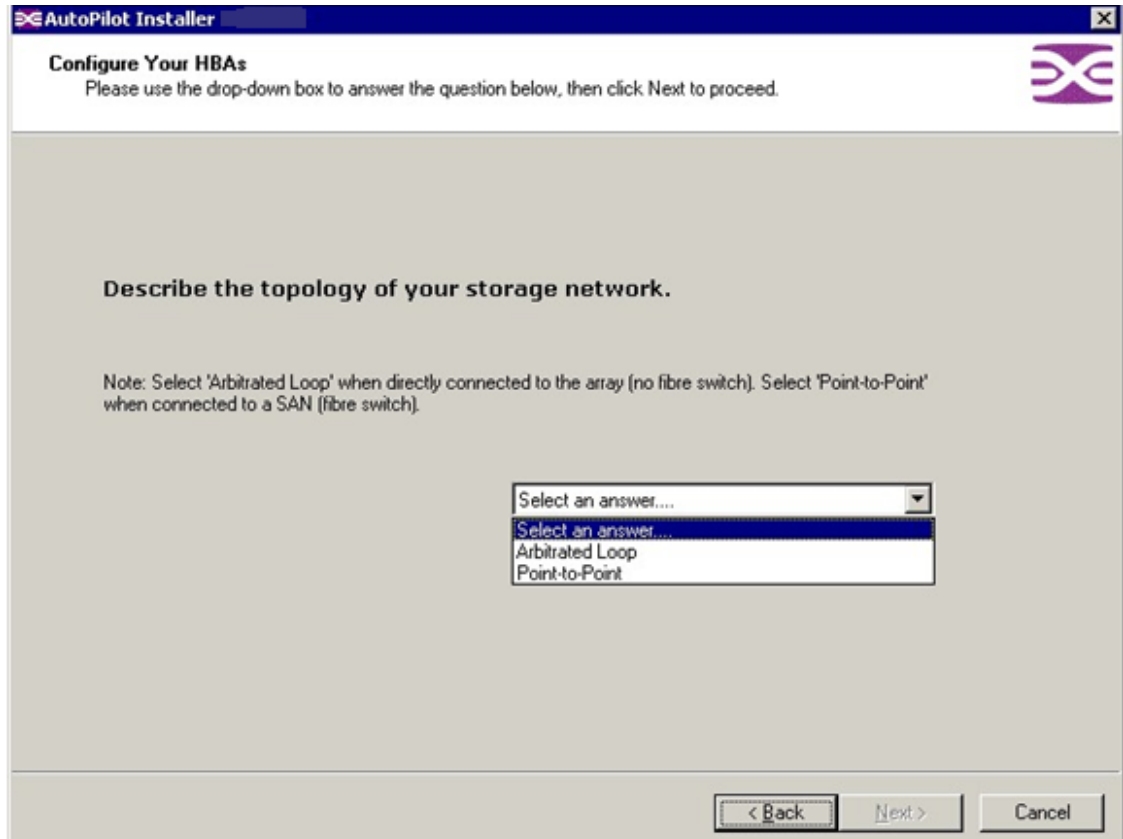
Figure 86   Topology selection

8. Select the topology of your storage network:

   - Select **Arbitrated Loop** when directly connected to the array (no Fibre Channel switch).

   - Select **Point-to-Point** when connected to a SAN (using a Fibre Channel switch).

   Click **Next**. The drivers and utilities are installed.

9. After installation is complete, the message shown in Figure 87 on page 108 appears.

Installing adapter driver and software utilities

Note: This question will only appear if you are installing the SCSIPort driver.
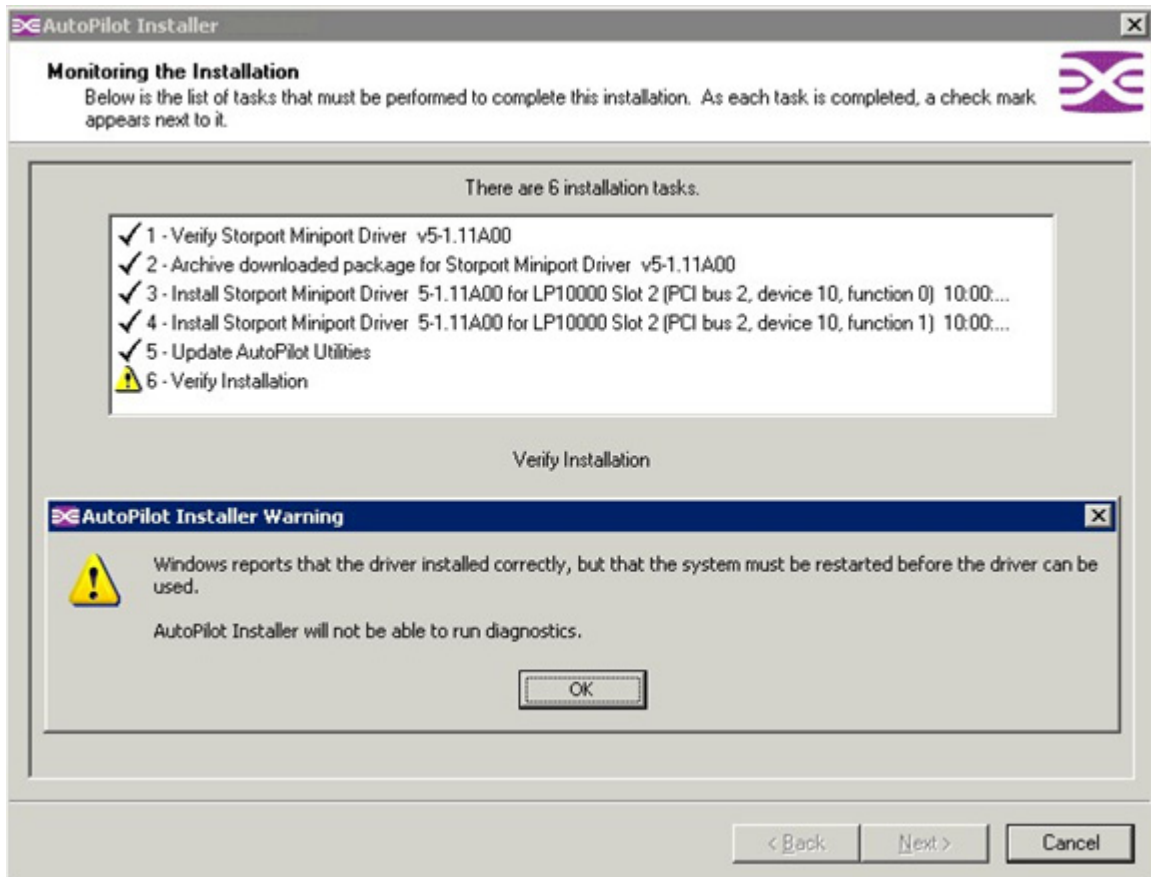
Figure 87   Completing the installation

Click **OK**, and then click **Next** on the **AutoPilot Installer** window.

This displays the window in Figure 88 on page 109.

Figure 88   Installation complete

10. You can print or view the installation report. Note the report is saved in the C:\Program Files\Emulex\AutoPilot Installer\reports.

    Click **Finish** to close the AutoPilot Installer program.

11. When prompted to restart your computer, click **Yes**.

Updating the adapter firmware using the HBAnyware utility

Note: Close all applications prior to this upgrade. It is not recommended to open any other applications during this upgrade. Refer to for more information.

Note: For FCoE CNAs, refer to "Installing Fibre Channel firmware on an Emulex CNA" on page 120 for installation procedures.

1. Ensure that critical files on your local boot disk are backed up as a measure of protection.

2. From the Windows desktop, select **Start > Programs > Emulex > HBAnyware.**

   Select your adapter in the left pane. This will open the **General** tab in the right pane, as shown in Figure 89 on page 110.
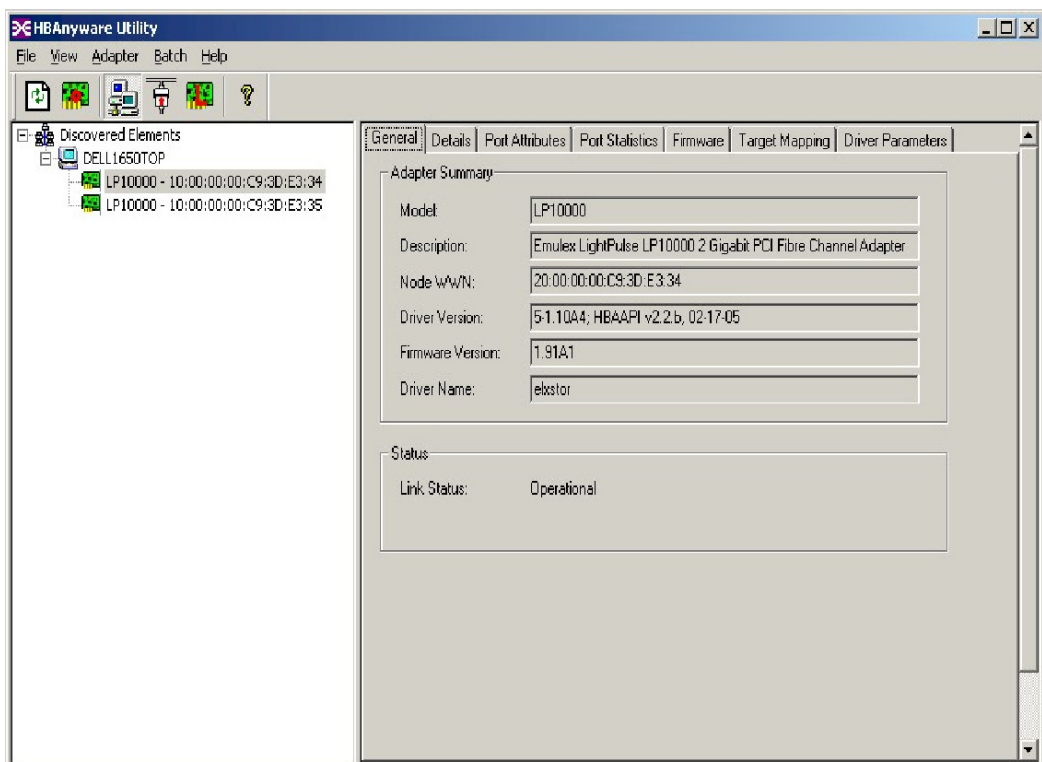
Figure 89   HBAnyware: General tab

3. Select your adapter in the left pane, and then click the **Firmware** tab in the right pane (Figure 90 on page 111).
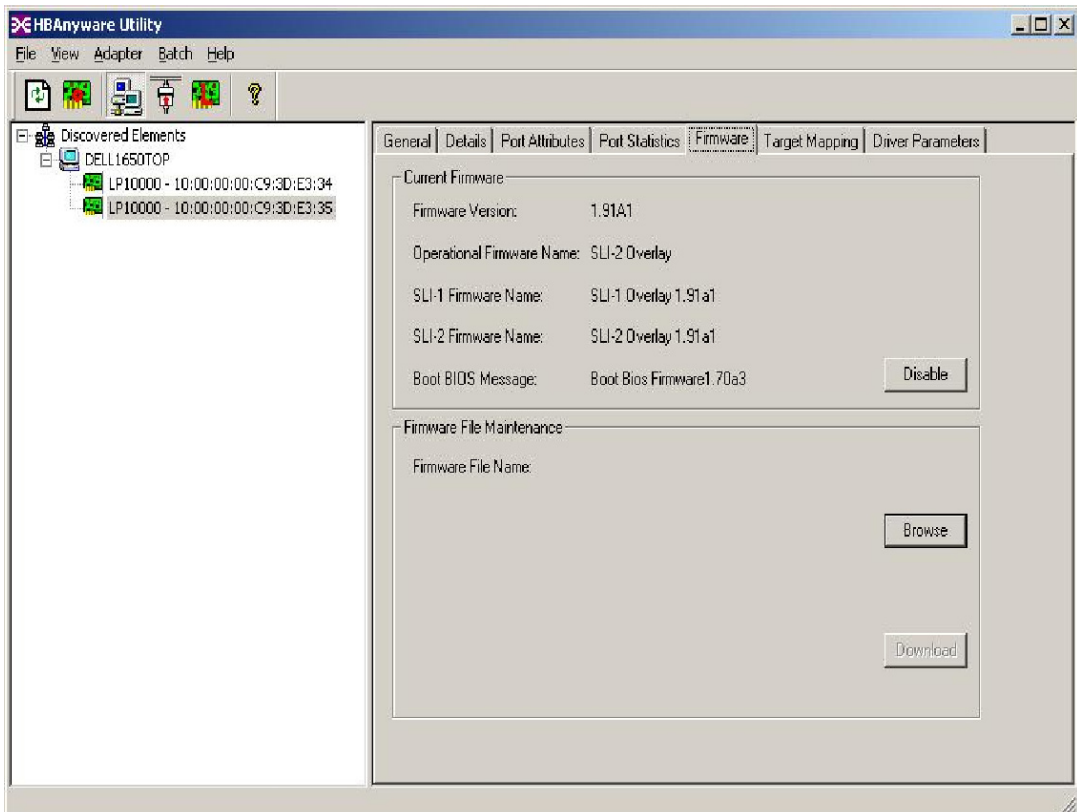
Figure 90   HBAnyware: Firmware tab

4. Use the **Browse** button to locate the firmware file downloaded previously.

5. On the **Select Firmware File** dialog box (Figure 91 on page 112), select the firmware file and click **Open**.
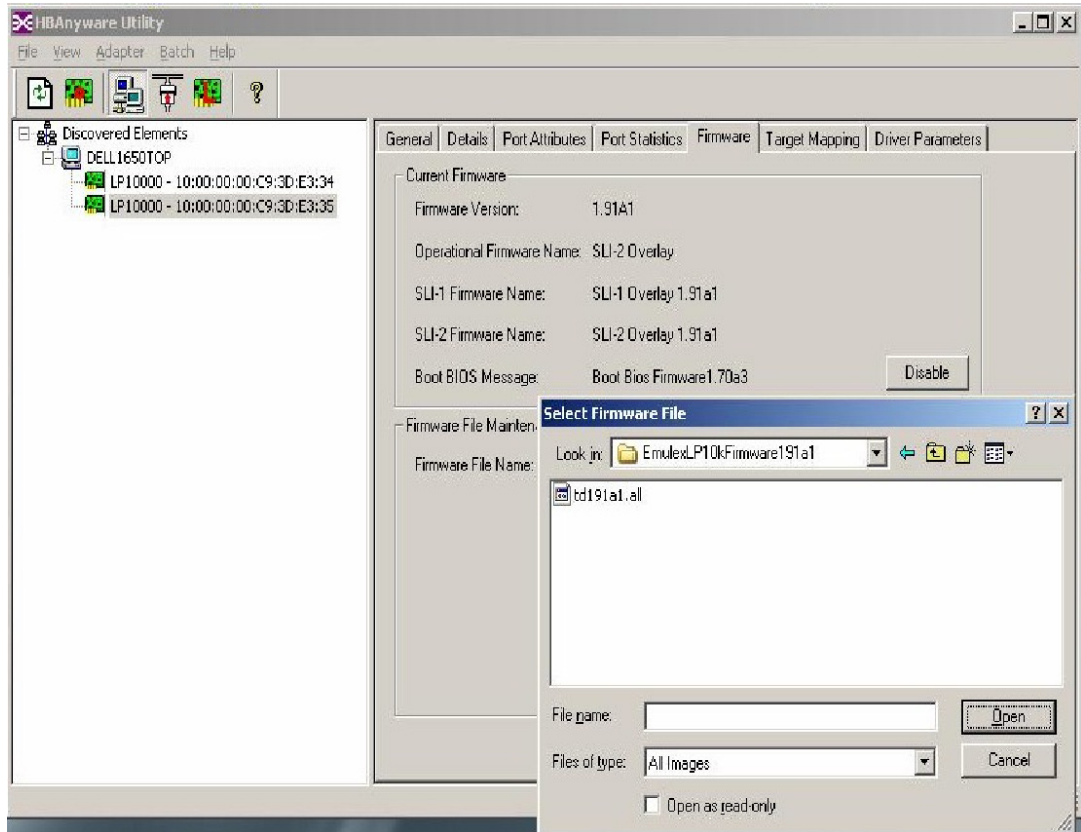
Figure 91   Select Firmware File dialog box

6. On the Firmware tab, click **Download** to initialize the firmware update.

    When the update is complete, a **Download complete** message will appear. If there is a dual-channel adapter or multiple adapters in the system, select the next adapter and repeat steps 5 through 6 for each adapter.

Adapter BIOS upgrade

This section contains the following information:

- ◆ "Obtaining the adapter BIOS" on page 113
- ◆ "Installing the adapter BIOS" on page 113

Obtaining the adapter BIOS

Refer to "Installation and configuration overview" on page 21 for downloading instructions.

Installing the adapter BIOS

Note: Close all applications prior to this upgrade. It is not recommended to open any other applications during this upgrade.

1. From the Windows desktop, select **Start > Programs > Emulex > HBAnyware**.

Select your adapter in the left pane. This will open the **General** tab in the right pane, as shown .

Figure 92   **HBAnyware: General tab**
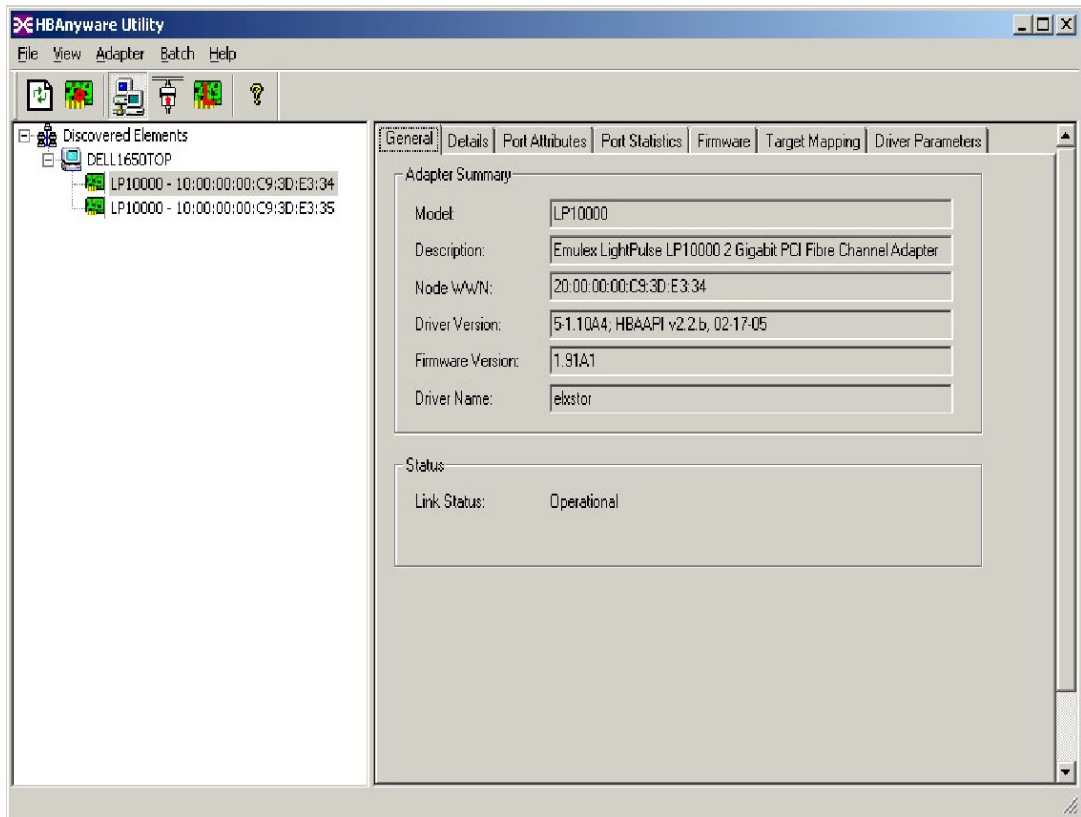
2. Using Windows Explorer, navigate to the folder containing the BIOS. Open Readme.txt file included in the BIOS kit to find which.PRG file corresponds to your adapter.

3. On the **Firmware** tab (Figure 93 on page 115), use the **Browse** button to locate the .PRG BIOS file for your adapter.
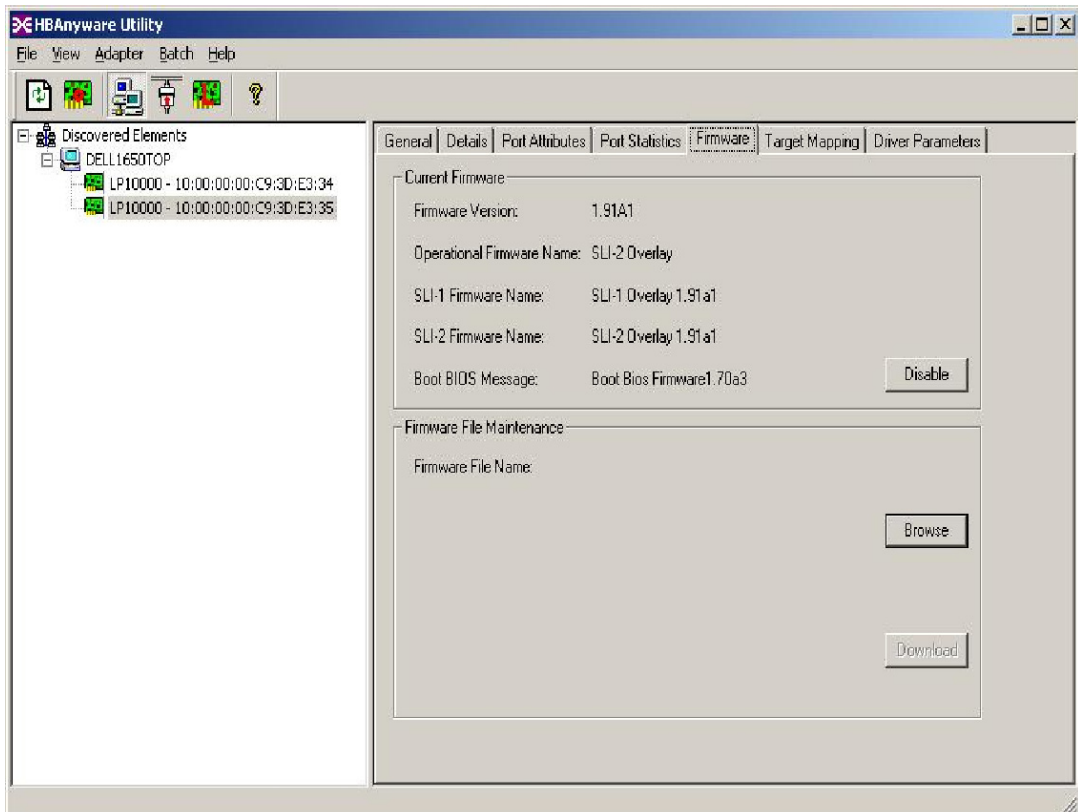
Figure 93   HBAnyware: Firmware tab

4. On the **Select Firmware File** dialog box (Figure 94 on page 116), select the firmware file and click **Open**.
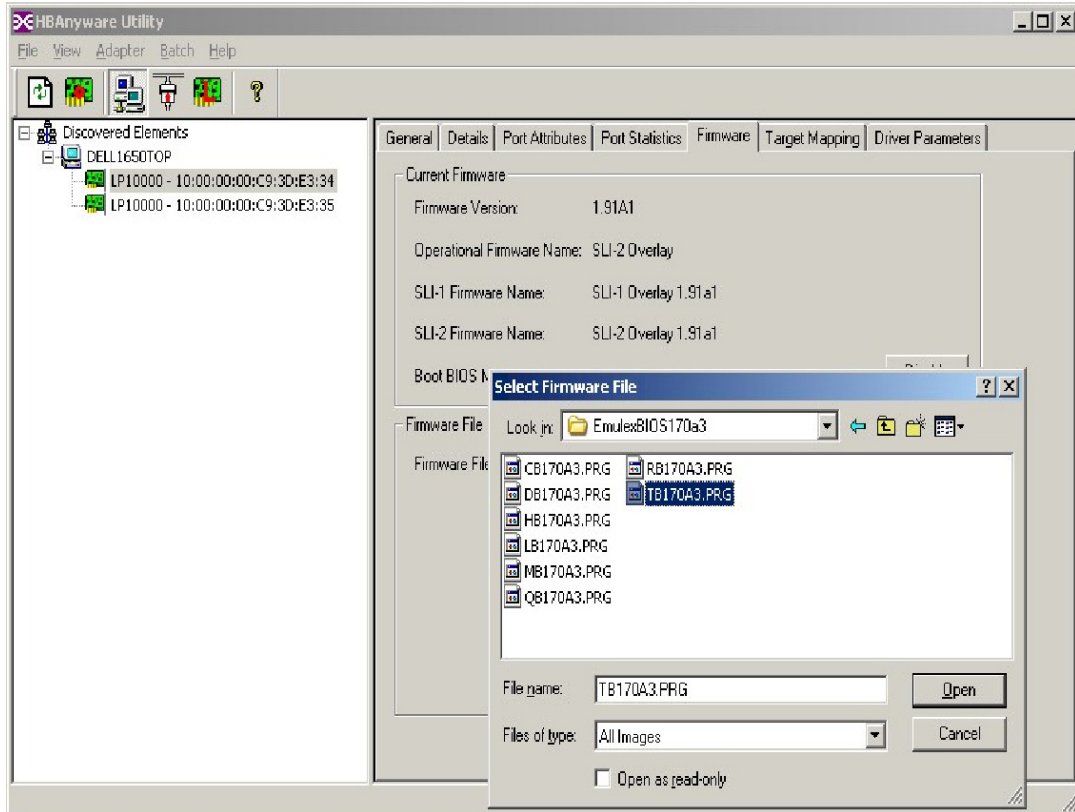
Figure 94   Select Firmware File dialog box

5. On the Firmware tab, click **Download** to start the upgrade.

When the upgrade is complete, a **Download complete** message will appears. If there is a dual-channel adapter, or multiple adapters are in the system, select the next adapter and repeat steps 3 through 5 for each adapter.

Fibre Channel over Ethernet (FCoE) Converged Network Adapter (CNA) procedures

This section provides the following information on Fibre Channel over Ethernet (FCoE) Converged Network Adapters (CNAs):

Overview

FCoE CNAs are similar to Fibre Channel adapters in that they require drivers in order to function in a Windows server. However, because of its ability to converge both Fibre Channel and Ethernet traffic over a single physical link, the adapter will appear to the Windows server as two different pieces of hardware. When viewing the Windows Device Manager, you will see both an Emulex Fibre Channel adapter as well as an Intel 10 Gigabit network adapter available in the system, as shown in Figure 95 on page 118.
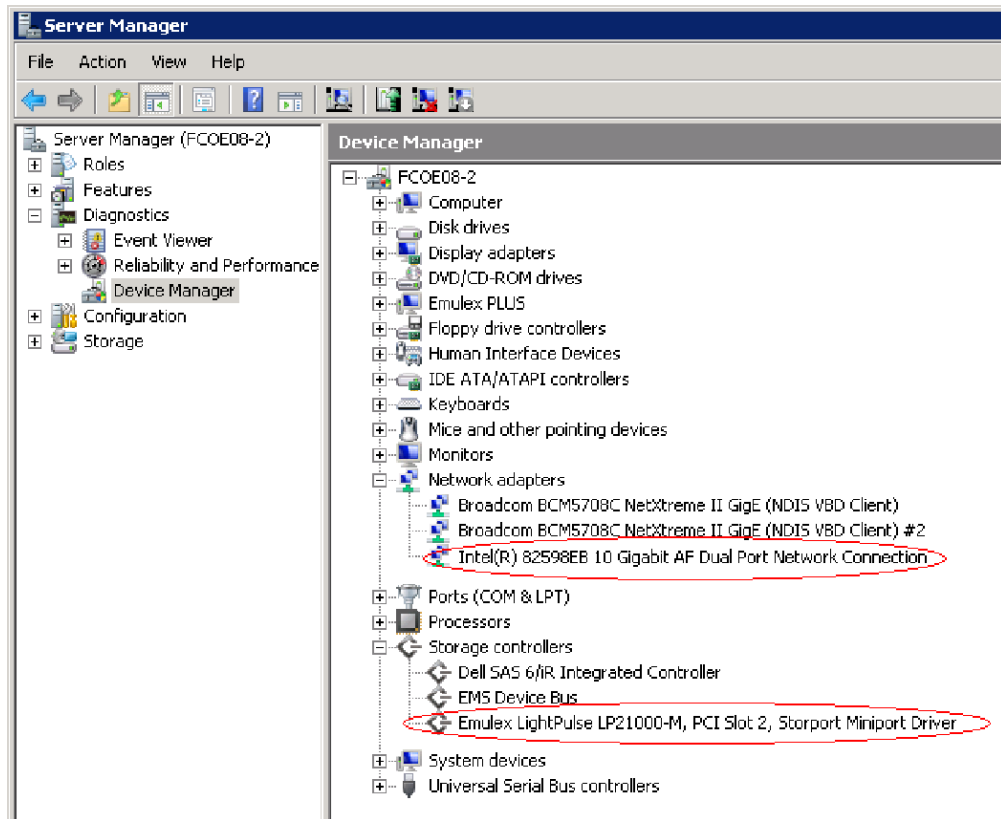
Figure 95   Device Manager

Both of these hardware devices require a driver in order to function. For the Fibre Channel adapter, the same procedure that is used to install drivers on standard Fibre Channel adapters, described in "Installing adapter driver and software utilities" on page 99, can be used.

Note: The procedures in this section require that the adapter driver and HBAnyware utility be installed first.

For the Intel 82598 10 Gigabit Ethernet Controller, visit http://www.intel.com for drivers and information on driver installation for this network adapter. The procedures that follow require that the adapter driver and HBAnyware utility be installed first.

FCoE adapters also require firmware code for the Fibre Channel adapter, as well as for the encapsulation ASIC known as the Menlo chip. To update these firmware versions, the Emulex HBAnyware utility, shown in Figure 96 on page 119 must be used. The minimum HBAnyware version for use with FCoE adapters is v4.0a32 and is packaged with the EMC-approved driver for the FCoE adapter.
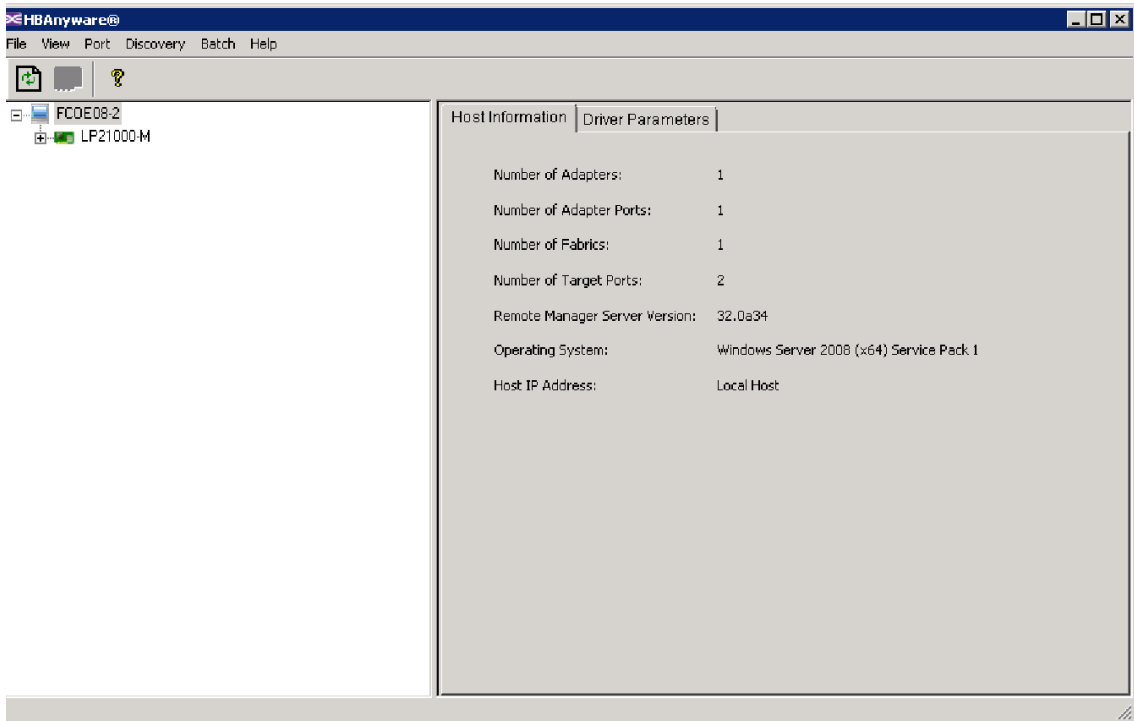
Figure 96   HBAnyware utility

Installing Fibre Channel firmware on an Emulex CNA

To install the Fibre Channel firmware on your FCoE converged network adapter, complete the following steps.

Note: The procedures in this section require that the adapter driver and HBAnyware utility be installed first.

1. Start the **HBAnyware** utility, shown in Figure 97.

   In the left pane of the utility, you will see the CNA listed under your server name.
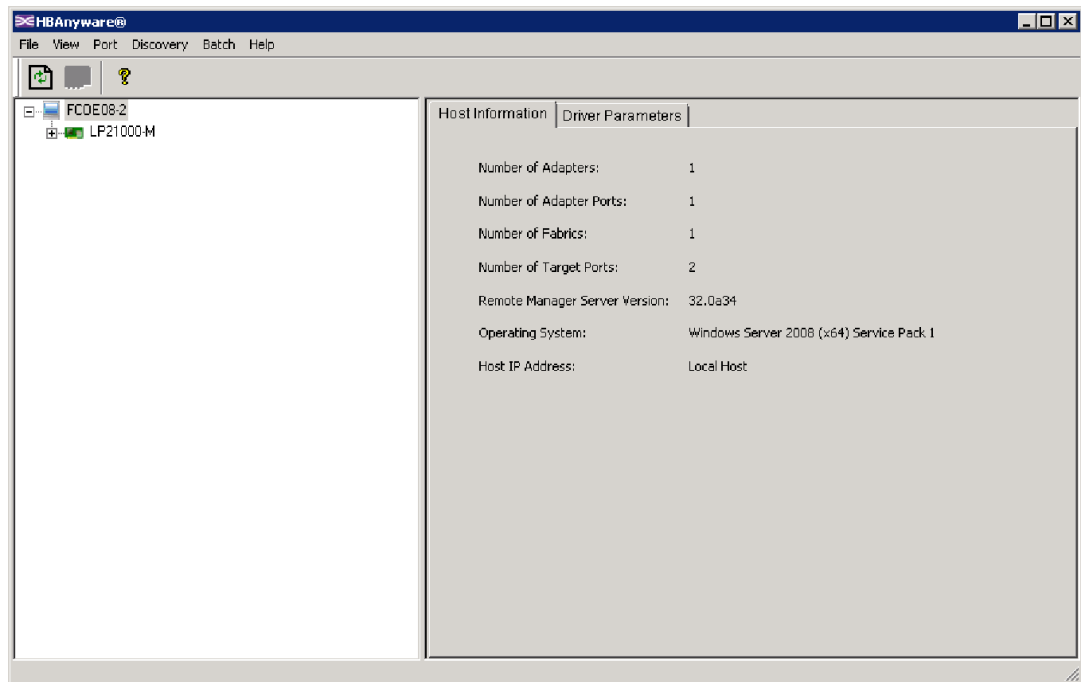
Figure 97   HBAnyware utility

2. Click open the CNA and click on the WWPN in order to view all of the possible options in the right pane of the utility, as shown in Figure 98.
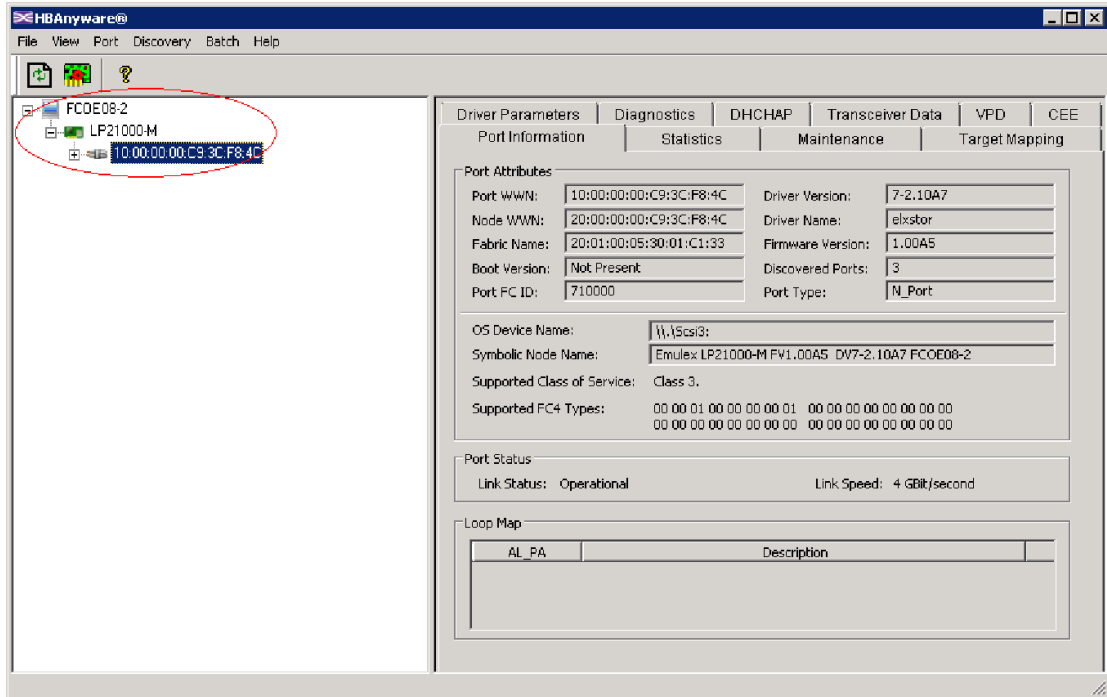
Figure 98   Options

3. In the right pane of the HBAnyware utility, click the **Maintenance** tab, as shown in Figure 99.
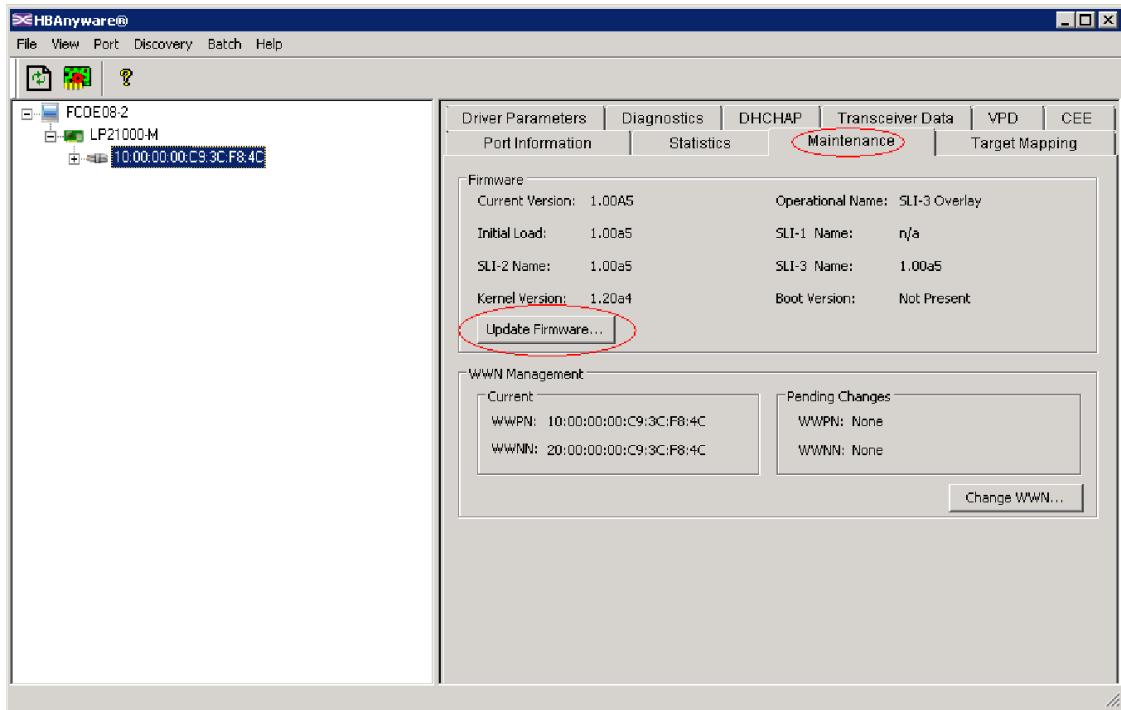
Figure 99   Maintenance tab

4. Under the **Maintenance** tab, you will see information about the currently loaded firmware, kernel version, and boot BIOS versions on the CNA. To update the Fibre Channel firmware of the adapter, click **Update Firmware**, as shown in Figure 99.

5. A confirmation dialog box, shown in Figure 100, will appear to explain the potential time it will take to perform the firmware update. To continue with the firmware update, click **Yes**.
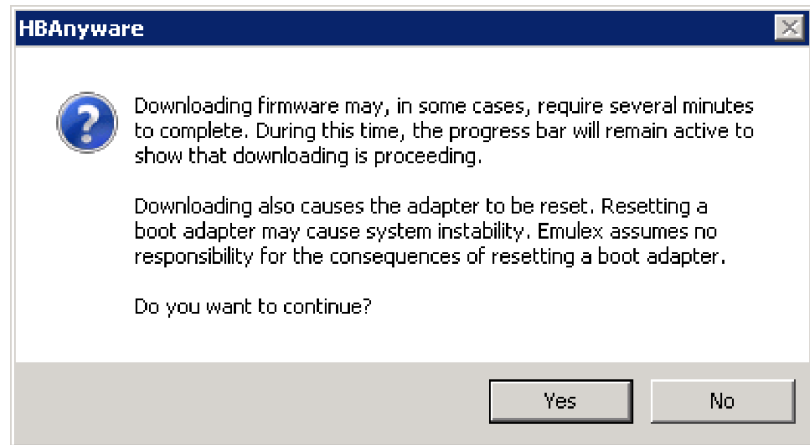
Figure 100   Confirmation dialog box

6. A new window appears, as shown in Figure 101 on page 124. In this window, browse to the location of your firmware file that you wish to load. This file could be included on EMC-approved installation media, or downloaded from the Emulex website, as described in "Downloading latest Emulex drivers/firmware/BIOS files" on page 20.

7. After locating your firmware file, click **Start Download** to flash the firmware file to the CNA, as shown in Figure 101.

HBAnyware - Firmware Download

Host Name: FCOE08-2
Adapter Model: LP21000-M
Current Version: 1.00A5

Select or enter a firmware file and click Start Download to download.

Look in: firmware_zephyr_1.00a5

Name ▲	Date modified	Type	Size
ad100a5.all	7/8/2008 12:52 AM	ALL File	422 K

File name: ad100a5   Open

Start Download   Cancel
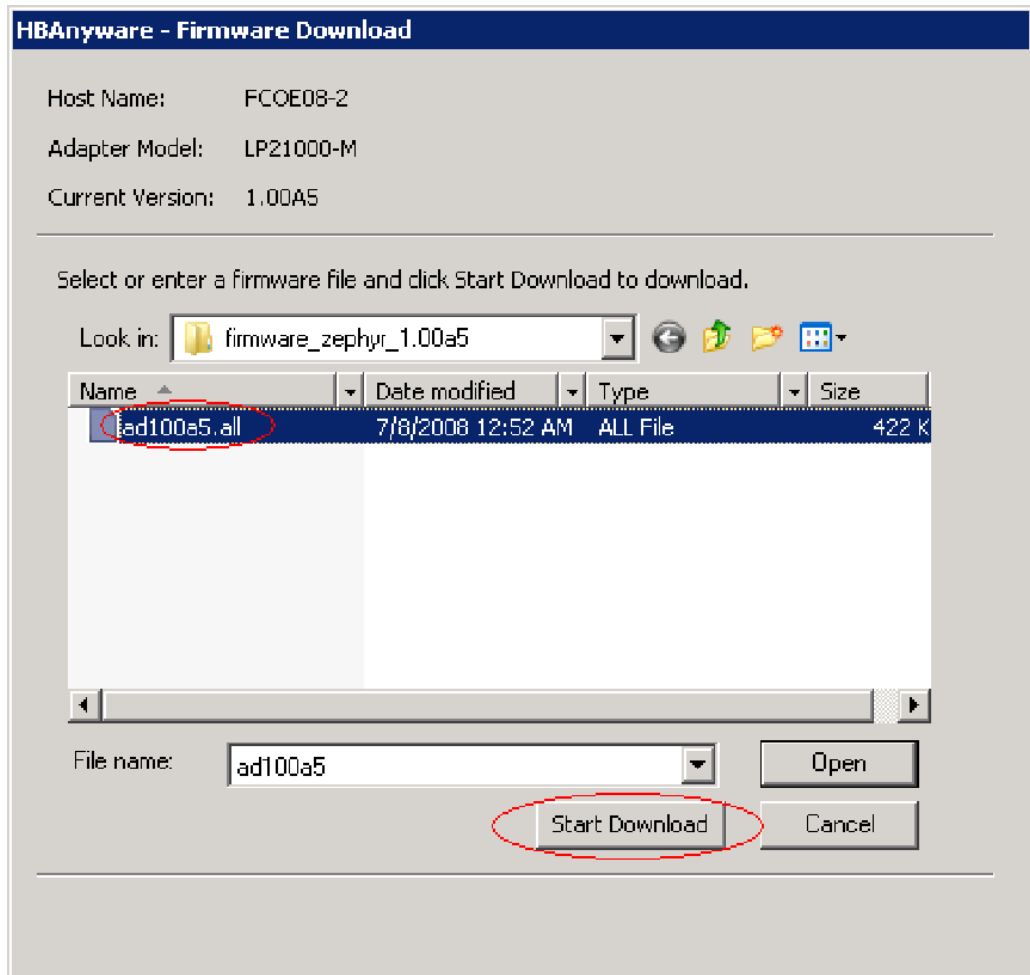
Figure 101   Firmware Download window

A progress bar appears, as shown in Figure 102, as the firmware is downloaded to the CNA. A message will appear when the process is complete.

8. Click **Close** to complete the firmware update procedure.
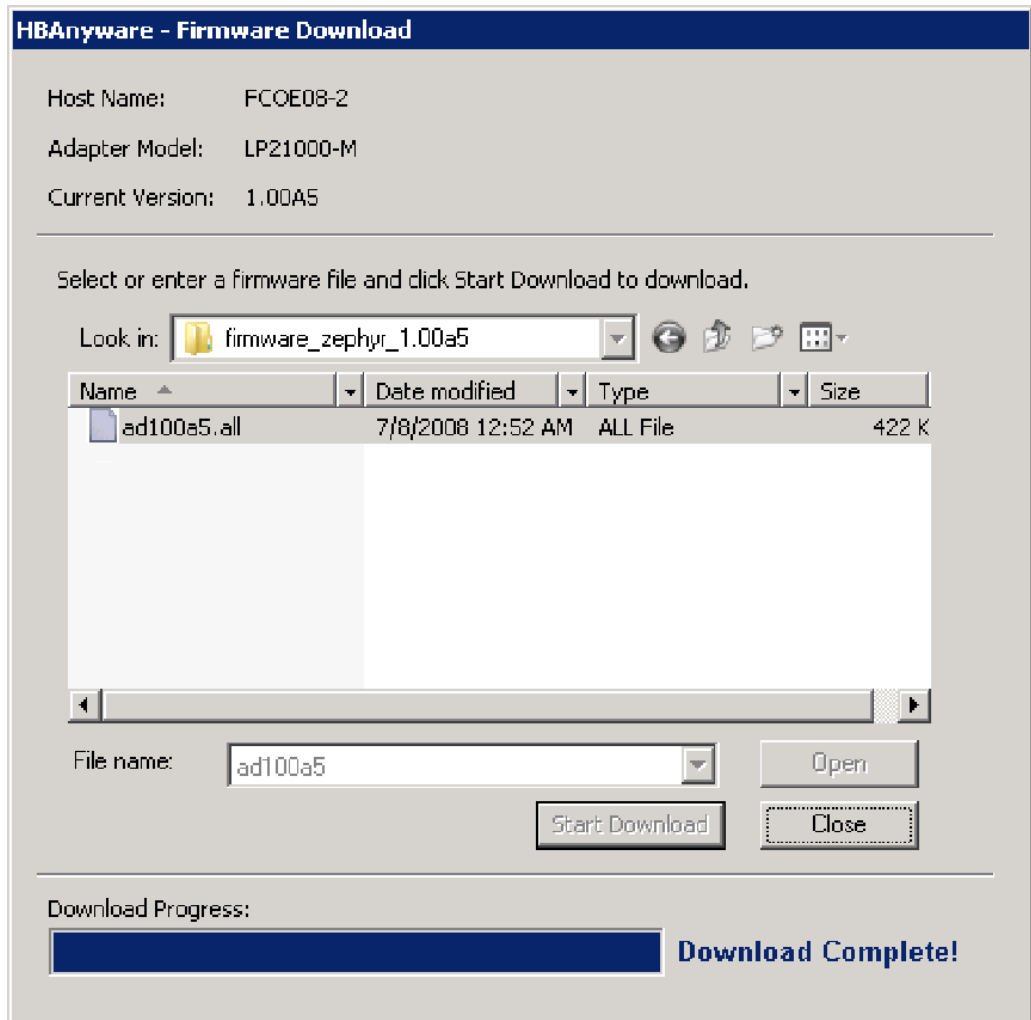
Figure 102   Firmware Download progress bar

.

If you have other CNAs installed in your server, select them in the left pane of the utility and follow this procedure for each CNA you need to update.

Installing Menlo firmware on an Emulex CNA

To install the Menlo encapsulation ASIC firmware on your FCoE converged network adapter, complete the following steps.

Note: The procedures in this section require that the adapter driver and HBAnyware utility be installed first.

1. Start the **HBAnyware** utility, shown in Figure 103.

   In the left pane of the utility, you will see the CNA listed under your server name.
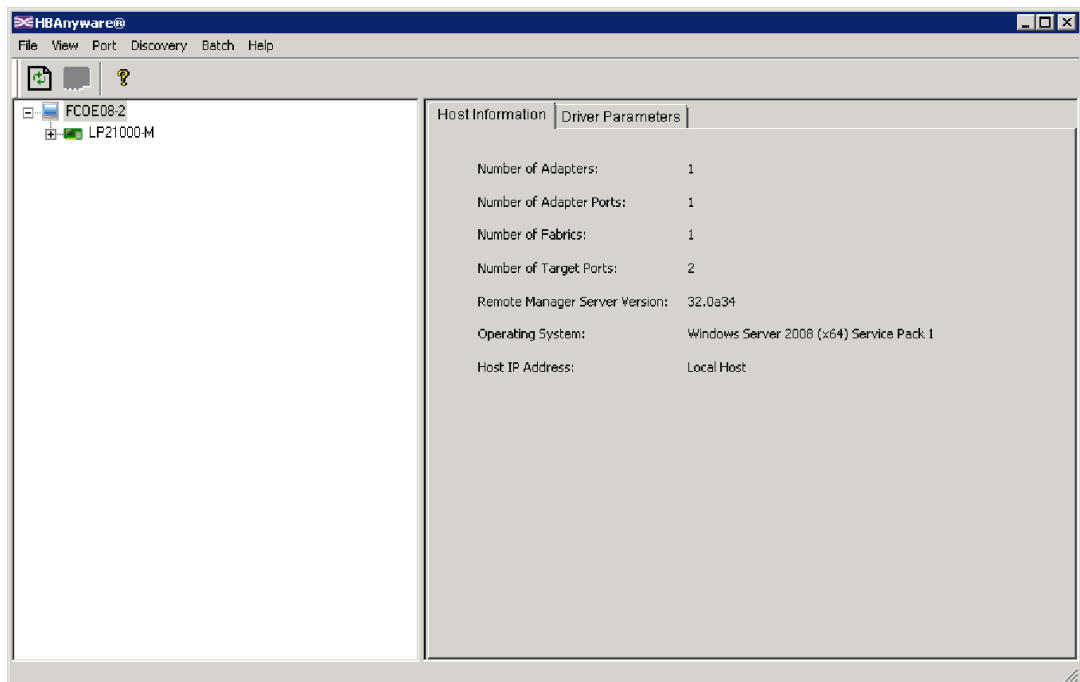
Figure 103   HBAnyware utility

2. Click open the CNA in order to view all of the possible options in the right pane of the utility, as shown in Figure 104.
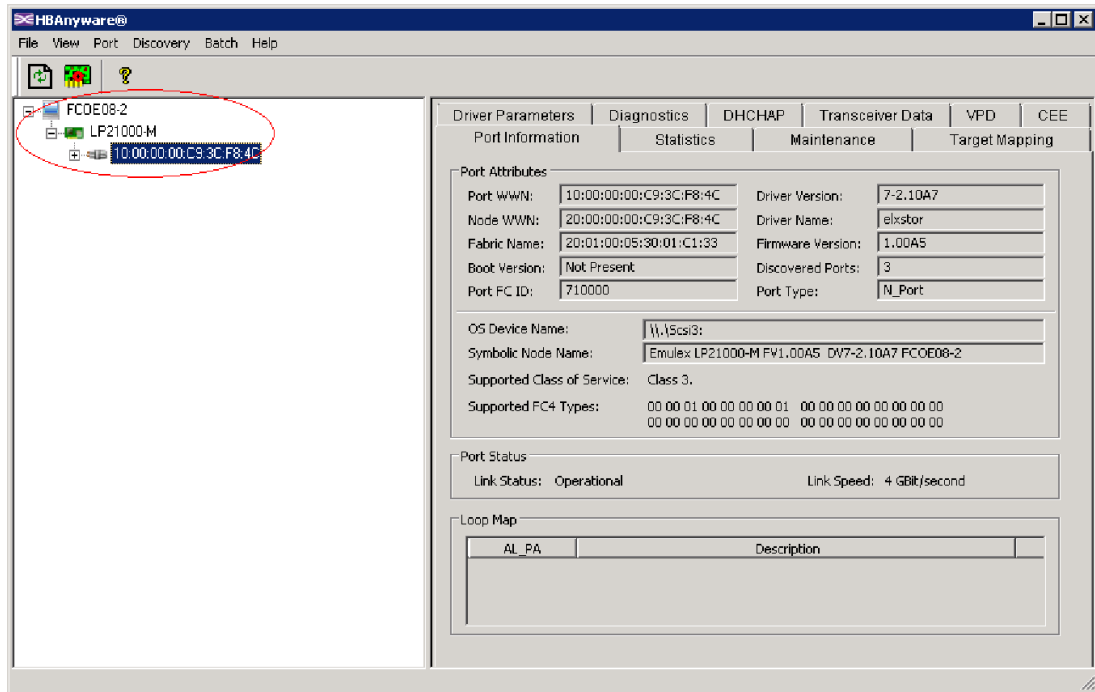
Figure 104   Options

3. In the right pane of the **HBAnyware** utility, click the **CEE** tab.

4. Under the **CEE** tab, you will see information about the currently loaded Menlo firmware version on the CNA, as shown in Figure 105. To update the Menlo firmware of the adapter, click **Update Firmware.**

   Note: The CNA must be connected to either a properly configured switch port, FCoE-capable Ethernet switch, or have a loopback connector attached before upgrading the Menlo firmware.
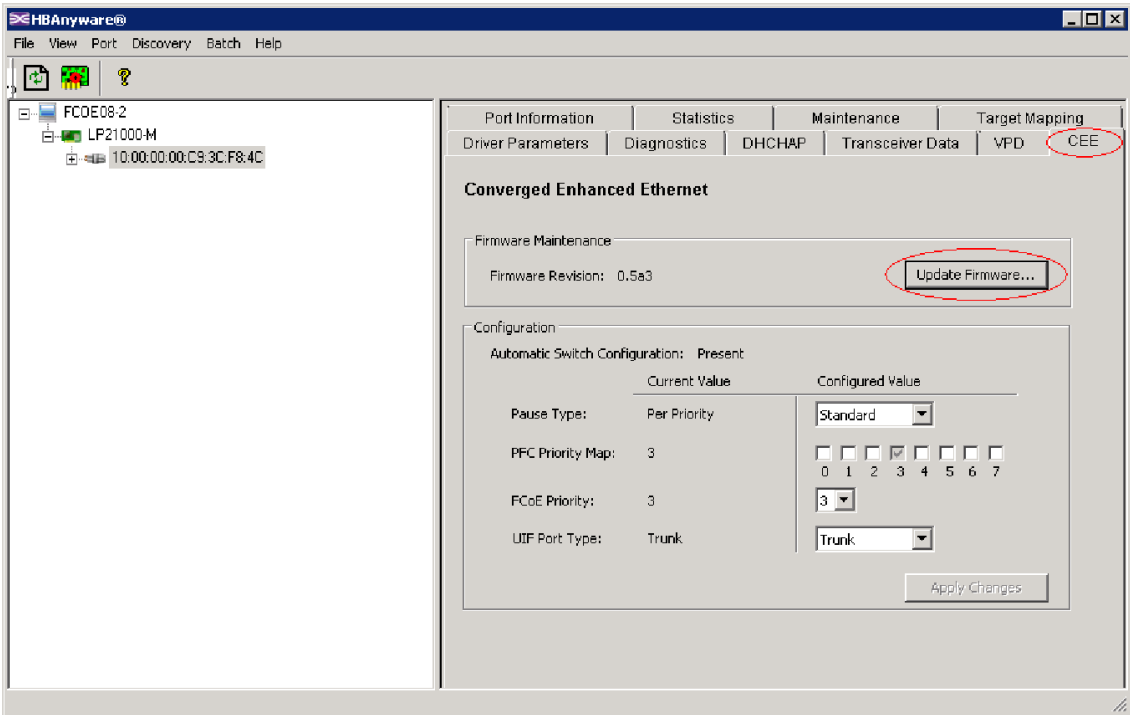
Figure 105   CEE tab

5. A warning dialog box appears, as shown in Figure 106, providing information about CEE firmware. To continue with the firmware update, click **Yes**.
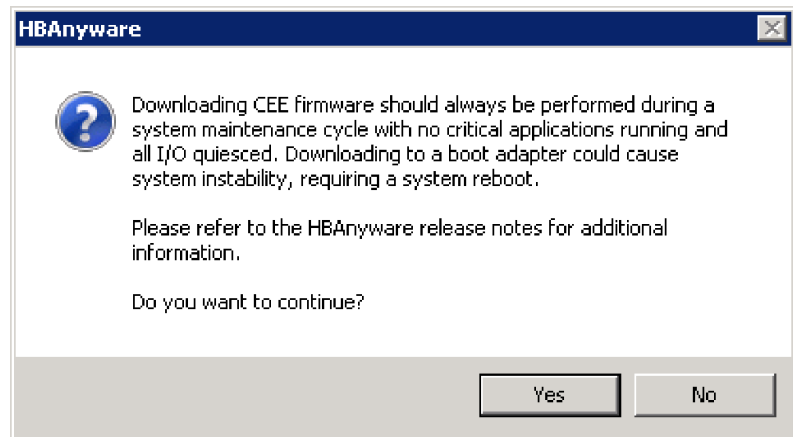
Figure 106   Warning dialog box

6. A new window appears, as shown in Figure 107 on page 130. In this window, browse to the location of your firmware file that you wish to load. This file could be included on EMC-Approved installation media or downloaded from the Emulex website as described in "Downloading latest Emulex drivers/firmware/BIOS files" on page 20.

7. After locating your firmware file, click **Start Download** to flash the firmware file to the CNA, as shown in Figure 107.

HBAnyware - Update FCoE Firmware

Host Name: FCOE08-2

Adapter Model: LP21000-M

Current Version: 0.5n6

Select or enter a firmware file and click Start Download to download.

Look in: Menlo_Firmware

Name ▲	Date modified	Type	Size
cee-0.5n6.bin	9/24/2008 4:38 PM	BIN File	128 K

File name: cee-0.5n6

Open   Start Download   Cancel
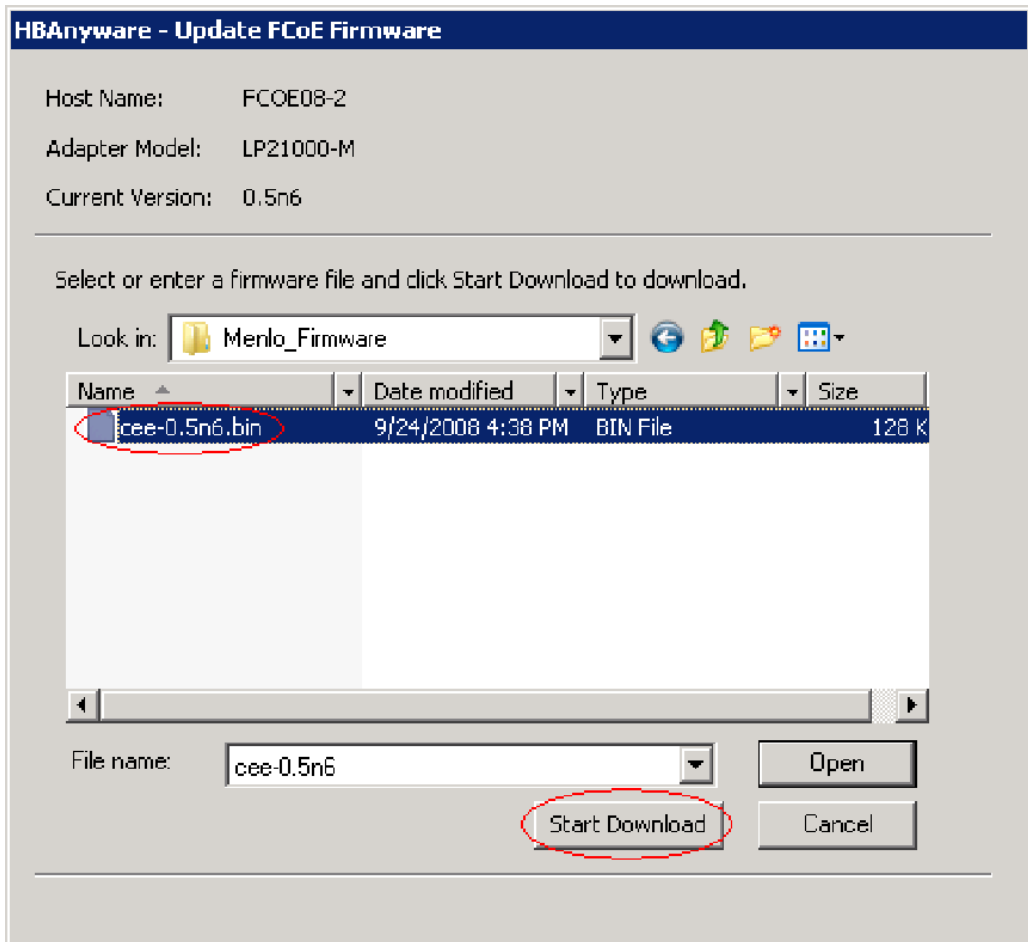
Figure 107   Start Download

A progress bar appears, as shown in Figure 108 on page 131, as the firmware is downloaded to the CNA. A message appears when the process is complete.

8. Click **Close** to complete the firmware update procedure.

HBAnyware - Update FCoE Firmware

Host Name: FCOE08-2

Adapter Model: LP21000-M

Current Version: n/a

Select or enter a firmware file and click Start Download to download.

Look in: [ ] Menlo_Firmware

Name ▲	Date modified	Type	Size
cee-0.5n6.bin	9/24/2008 4:38 PM	BIN File	128 K

File name: cee-0.5n6   Open

Start Download   Close

Download Progress:

Download Complete!

Figure 108   Progress bar

If you have other CNAs installed in your server, select them in the left pane of the utility and follow this procedure for each CNA you need to update.

Note: EMC recommends rebooting your server after completing firmware updates to your adapter.

Installing or upgrading the driver and utilities on an Emulex OCe10102-FM CNA

To install or upgrade the driver and utilities on an Emulex OCe10102-FM CNA, complete the following steps.

1. Download the driver kit installer from the Emulex website in the EMC section and install it on your system. If you have downloaded the kit to your hard drive, locate then double-click the file.

   Note: The Full Installation Driver kit (full driver kit) includes the Emulex protocol drivers for Fibre Channel (FC), Fibre Channel over Ethernet (FCoE), iSCSI, and Ethernet along with the complete OneCommand Manager application, including a Graphical User Interface (GUI) and a Command Line Interface (CLI).

   The full driver kit also provides an option to create AutoPilot Installer kits that you can customize and distribute on your network. Although the full driver kit will not install on the Server Core installation option of Windows Server 2008 (Server Core), it can be used to create kits for those platforms.

   Note: AutoPilot Installer will not let you perform an installation if the minimum Windows service pack is not installed.

   The **OneCommand Manager** installation window displays, as shown in .

Figure 109   OneCommand Manager installation window

> 2. Click **Next** to start the installation.
>
>   This displays an **Installation Options** window, similar to
>   , identifying the default installation folder.

Fibre Channel over Ethernet (FCoE) Converged Network Adapter (CNA) procedures
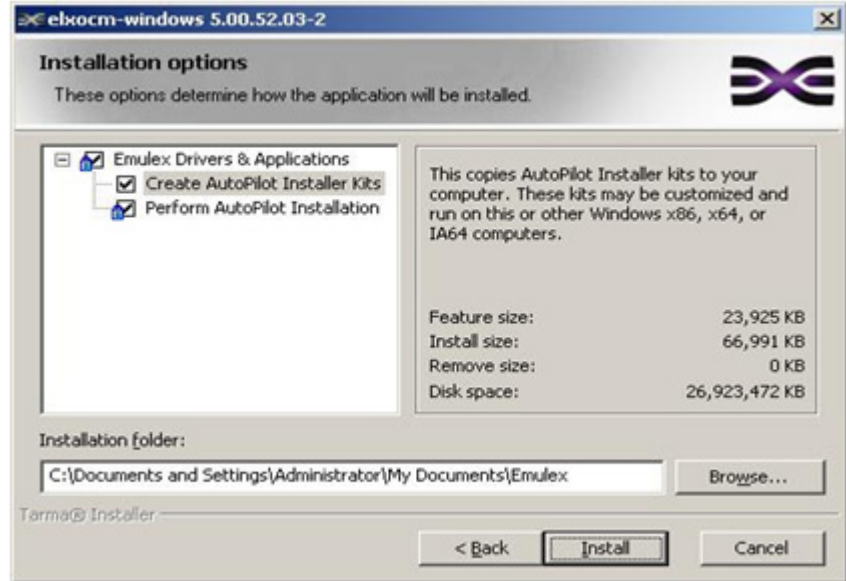
Figure 110   Specify the installation folder

3. Click **Install** to accept the default installation folder or type an alternative folder name, then click **Install**.

    The installation process begins and displays the status until it is complete. Accept all installation defaults on each page of the installation wizard. When the installation is complete, an **Installation completed** window, similar to Figure 111 on page 135, displays.

Figure 111   Installation completed window

> 4. Select the **Start AutoPilot Installer** checkbox (if not already checked) and click **Finish**.
>
> The **AutoPilot Installer** programopens and displays a window similar to Figure 112 on page 136. The **AutoPilot Installer** will help you install the driver and the OneCommand Manager utility.
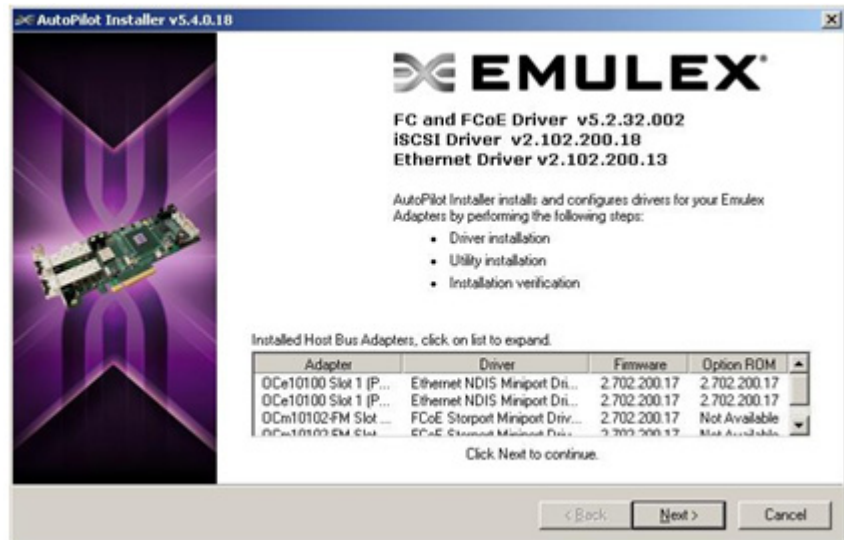
Figure 112   AutoPilot Installer window

Note: First time driver installations may display "not available" in the driver and firmware columns. This is normal and does not indicate an issue.

The AutoPilot program automatically discovers the adapters in the system. If no adapters are discovered:

- Verify the adapter is properly seated into the bus and powered on. The LEDs should be lit.
- Verify the adapters are visible in Computer Management/Device Manager/SCSI and RAID controllers. For more troubleshooting information refer to "Starting device manager for Windows" on page 166.

5. Select **Next** to continue.

A **Driver installation** window displays, similar to Figure 113 on page 137.
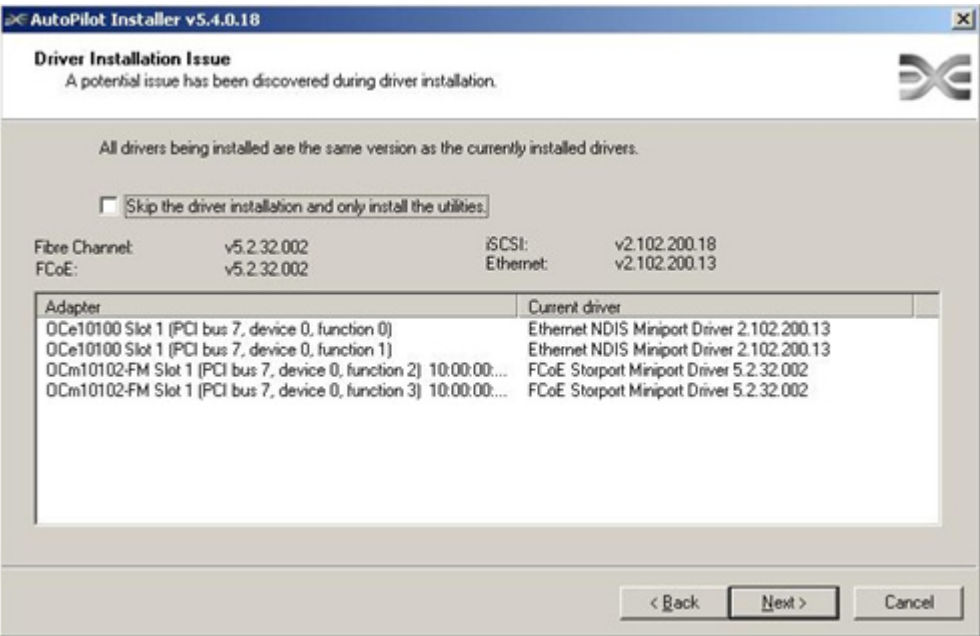
Figure 113   Driver installation window

> After the installation is complete, an **AutoPilot Installer Warning** message displays, as shown in Figure 114 on page 138.
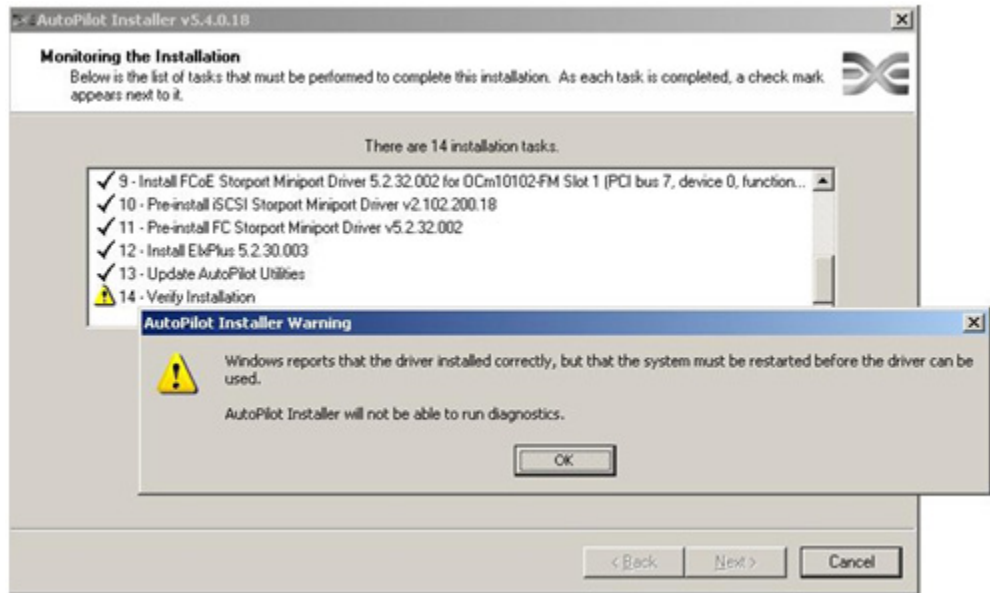
Figure 114   AutoPilog Installer Warning dialog box

6. Click **OK** and then click **Next** on the **AutoPilot Installer** window.

    A confirmation window displays, as shown in Figure 115 on page 139.

Figure 115   Installation complete confirmation window

You can print or view the installation report. Note the report is saved in the
C:\ProgramFiles\Emulex\AutoPilotInstaller\reports.

7. Click **Finish** to close the **AutoPilot Installer** program.

8. When prompted to restart your computer, click **Yes**.

Updating adapter firmware on an Emulex OCe10102-FM CNA

The OneCommand Manager application enables you to update firmware for a single adapter or simultaneously for multiple adapters. Each is further described in this section:

◆ "Updating firmware for a single adapter" on page 140

◆ "Updating firmware for multiple adapters" on page 144

Before updating adapter firmware, note the following:

◆ The Emulex driver must be installed.

◆ The OneCommand Manager application must be installed.

◆ Before you can perform a firmware update, the firmware file must be downloaded from the Emulex website and extracted to a folder on a local drive. This file could be included on EMC-approved installation media, or downloaded from the Emulex website, as described in "Downloading latest Emulex drivers/firmware/BIOS files" on page 20.
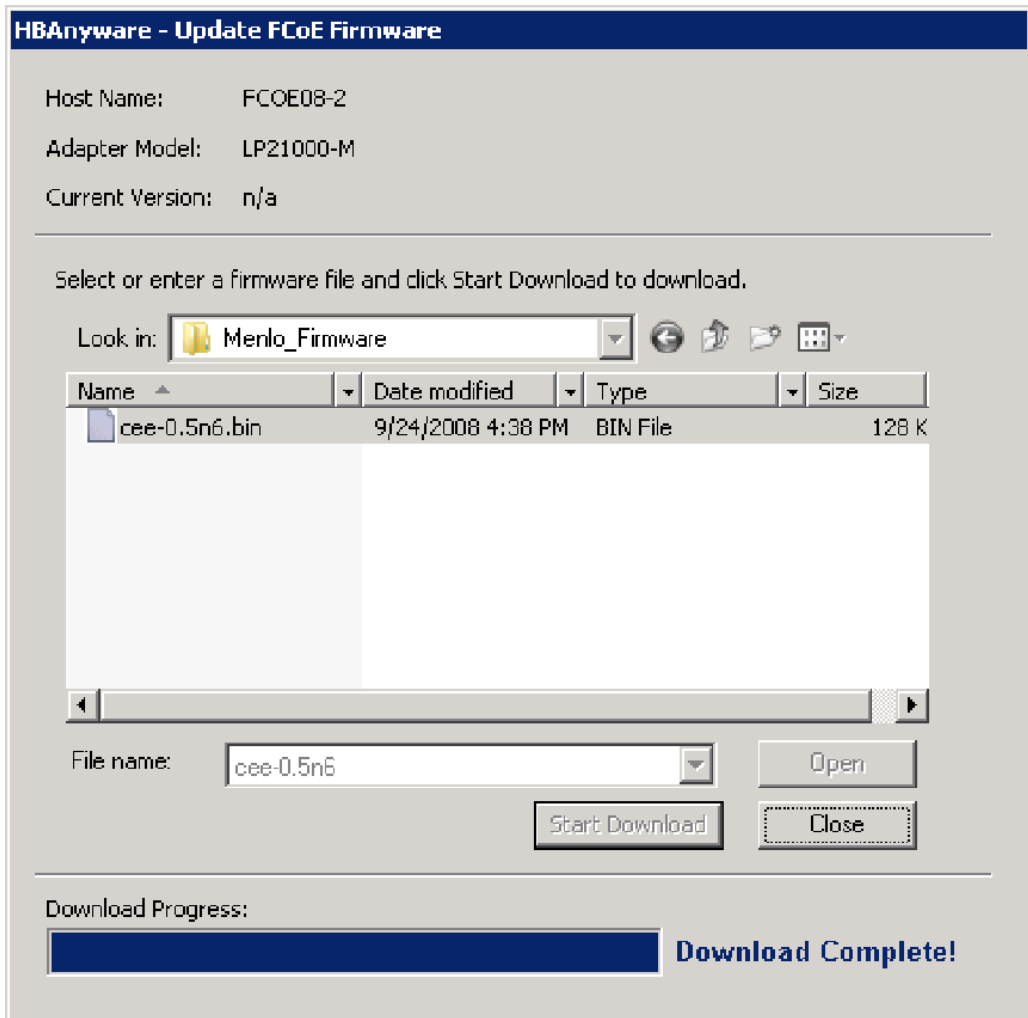
◆ If the adapter is already connected to a boot device, the system must be in a state in which this type of maintenance can be performed:

  • I/O activity on the bus has been stopped.
  • Cluster software, or any other software that relies on the adapter to be available, is stopped or paused.

Updating firmware for a single adapter

To update the Fibre Channel firmware on your FCoE converged network adapter, complete the following steps.

Note: The procedures in this section require that the adapter driver and the **OneCommand Manager** utility be installed first.

1. Start the **OneCommand Manager** utility, as shown in Figure 116.

   In the left pane of the utility, you will see the CNA listed under your server name.
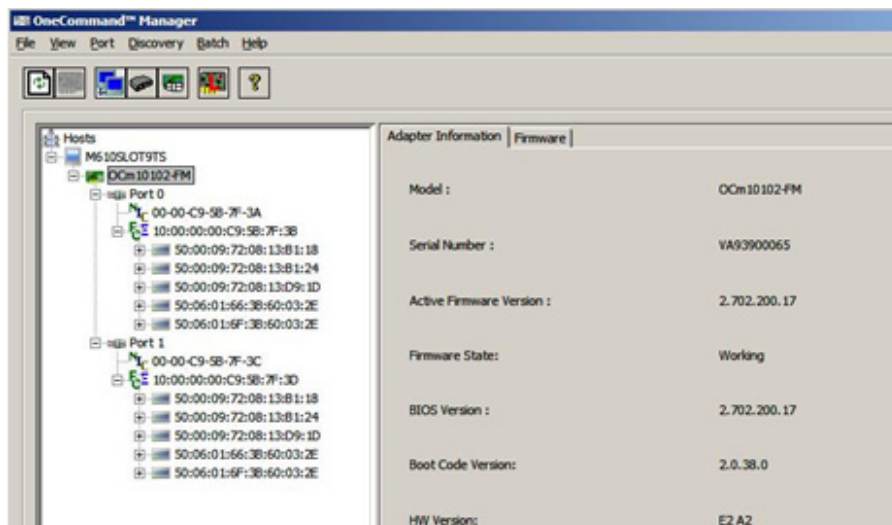
Figure 116   OneCommand Manager window

2. Click on the CNA to view the **Firmware** tab, as shown in Figure 117.
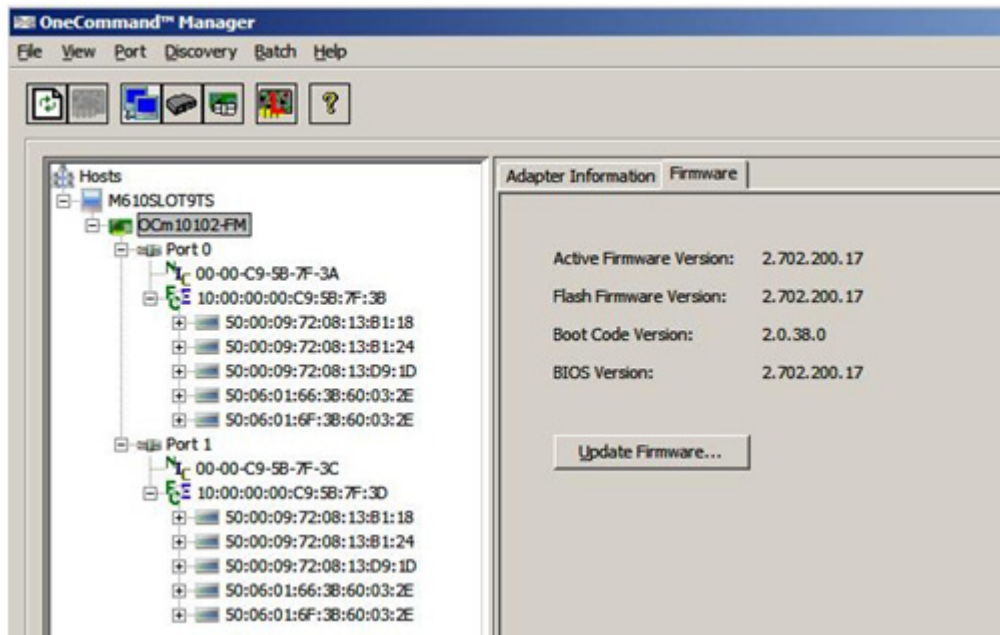
Figure 117   Firmware tab

3. Click on the **Firmware** tab. The **Update Firmware** tab displays information about the currently loaded firmware, Boot BIOS versions on the CNA.

4. Click **Update Firmware**, as shown in Figure 117.

   An **Adapter Firmware Download** dialog box displays, as shown in Figure 118 on page 142.
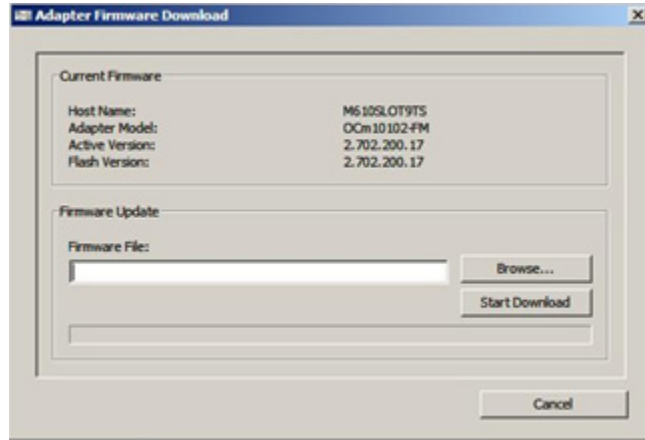
Figure 118   Adapter Firmware Download dialog box

5. Browse to the location of your firmware file that you wish to load as shown in Figure 119.
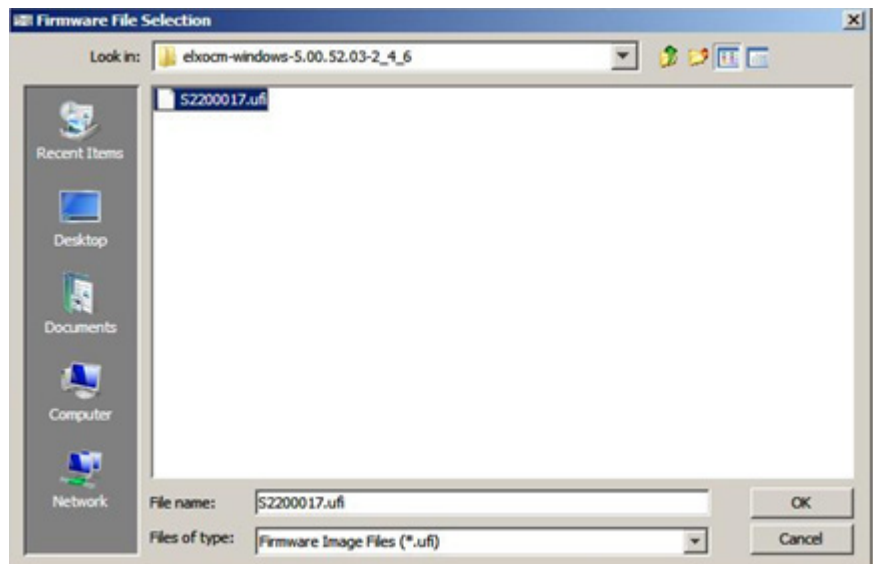
Figure 119   Firmware file location

This file could be included on EMC-approved installation media, or downloaded from the Emulex website, as described in "Downloading latest Emulex drivers/firmware/BIOS files" on page 20.

6. Click **OK** to start loading the firmware.

    A confirmation dialog box displays, explaining the potential time it will take to perform the firmware update, as shown in Figure 120.

Figure 120   Download Firmware confirmation box

7. Click **Yes** to continue with the firmware update.

    A progress dialog box displays as the firmware is downloaded to the CNA, as shown in Figure 121. A message appears when the process is complete.
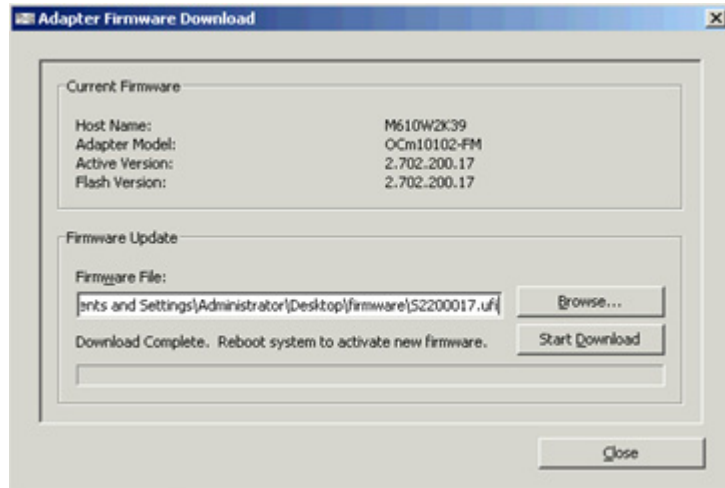
Figure 121   Adaptr Firmware Download progress dialog box

8. Click **Close** and reboot the system to activate the new firmware.

Updating firmware for multiple adapters

Use batch mode to install firmware on multiple adapters in a single step. Batch firmware loading is restricted to a single firmware file and to all accessible adapters for which that file is compatible.

Note: This is not available in read-only mode.

Before you can perform a firmware update, the firmware file must be downloaded from the Emulex website and extracted to a folder on a local drive. This file could be included on EMC-approved installation media, or downloaded from the Emulex website, as described in "Downloading latest Emulex drivers/firmware/BIOS files" on page 20.

To update the Fibre Channel firmware on multiple FCoE converged network adapters, complete the following steps.

1. From the **Batch** menu, select **Download Firmware** as shown in .
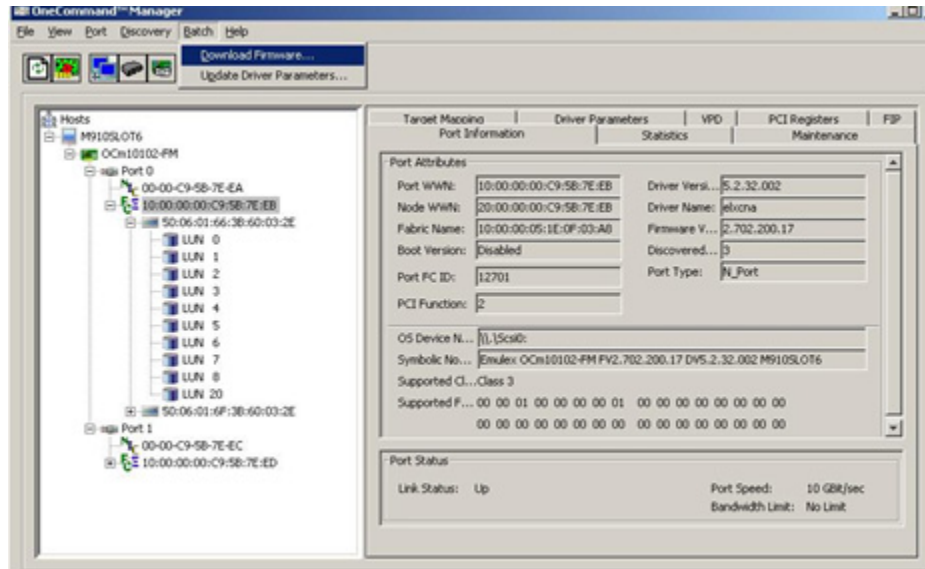
Figure 122   Download Firmware dialog box

> 2. When the **Batch Firmware Download** dialog box displays, click **Browse**, as shown in Figure 123.
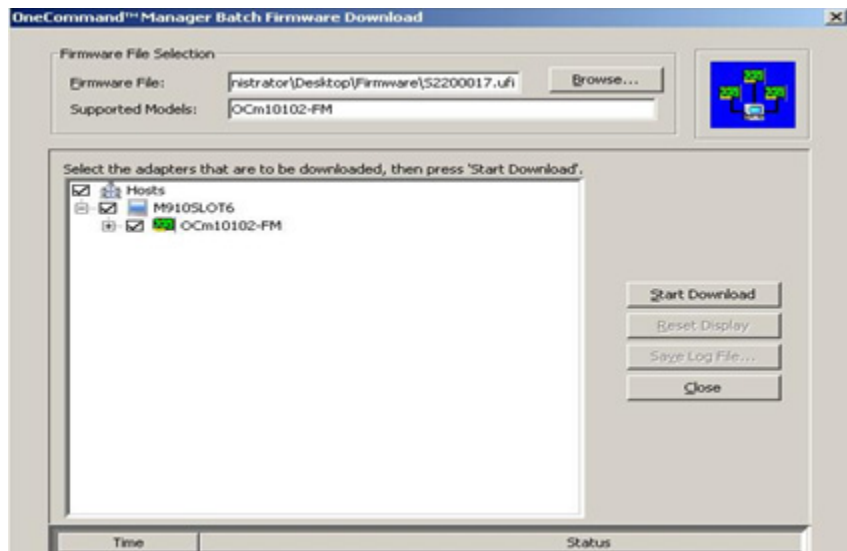
Figure 123   Batch Firmware Download dialog box

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The **Firmware File Selection** dialog box displays

3. Navigate to the firmware file you want to use and click **OK**.

   A dialog box appears notifying you that the **OneCommand Manager** application is searching for compatible adapters.

   Once compatible adapters are found:

   • The "Firmware File" text area of the main **Batch Download** dialog displays the selected image file's path.

   • The "Supported Models" text field displays a list of all adapter models that are compatible with the selected image file.

   • The set of compatible adapters appears in the dialog box's discovery-tree.

4. Make your selection and click **Start Download**.

5. When the download is complete, click **Save Log File** to save a copy of the activity log.

6. Click **Close** to exit the batch procedure.

Configuring Emulex OneConnect FCoE BIOS/boot LUN settings for OCe10102-FM CNA adapters

This section describes the steps required to configure an Emulex OneConnect CNA boot BIOS to allow an array-attached LUN to be used as a boot disk for the server.

To configure an Emulex OneConnect CNA boot BIOS, complete the following steps.

1. When the **Emulex OneConnect FCoE BIOS** banner displays during power-on self test (POST), as shown in Figure 124, press **Alt-E** or **Ctrl-E** to enter the **Emulex OneConnect FCoE BIOS Configuration** utility.

Figure 124   Emulex OneConnect FCoE BIOS banner

Note: If no **Emulex OneConnect FCoE BIOS** banner is displayed during POST, verify that a bootable BIOS image has been loaded on the adapter and that the image has been explicitly enabled.

The utility opens to the main **Emulex OneConnect FCoE BIOS Utility** page, as shown in Figure 125.
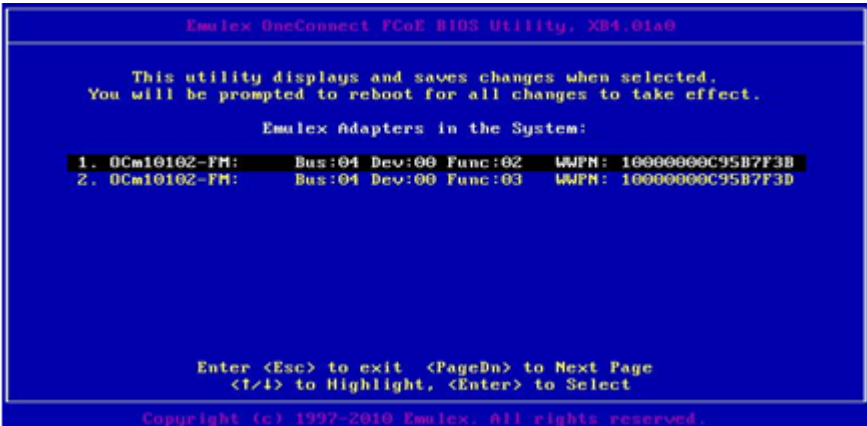
Figure 125   Emulex OneConnect FCoE BIOS Utility page

In this example, there are multiple adapters installed. The order of the adapter instances are listed in the order they will be scanned for a boot device. Note that this does not necessarily correspond to PCI slot numbering.

2. Select the row number of the adapter instance that corresponds to the adapter that will be used for boot and press **Enter**..

   A screen displays similar to Figure 126.

   Emulex OneConnect FCoE BIOS Utility, XB4.01a0

   ```
   01: OCm10102-FM:                          Bus#: 04 Dev#: 00 Func#: 02
   Mem Base: DF280000  Firmware Version: 2.702.200.17    BIOS: Enabled!
   Port Name:  10000000C95B7F3B             Node Name:  20000000C95B7F3B
   Vlan ID:  1002  DCBX mode:  CEE mode
   ```

   ```
                    Enable/Disable Boot from SAN
                    Scan for Target Devices
                    Reset Adapter Defaults
                    Configure Boot Devices
                    Configure DCBX mode
                    Configure FCF CEE Parameters
                    Configure FCF CIN Parameters
                    Configure Advanced Adapter Parameters

                    Enter <Esc> to Previous Menu
                 <↑/↓> to Highlight, <Enter> to Select
   ```

   Copyright (c) 1997-2010 Emulex. All rights reserved.

Figure 126   Emulex OneConnect FCoE BIOS configuration options

3. Select **Enable/Disable Boot from SAN** and press **Enter**.

   A message displays showing the Boot BIOS is enabled, as shown in Figure 127.

4. Select **Enable** to enable the adapter and press **Enter** to accept the setting.

Figure 127   Enable the adapter

5. Press **Esc** to return to the previous configuration screen, as shown in Figure 128.
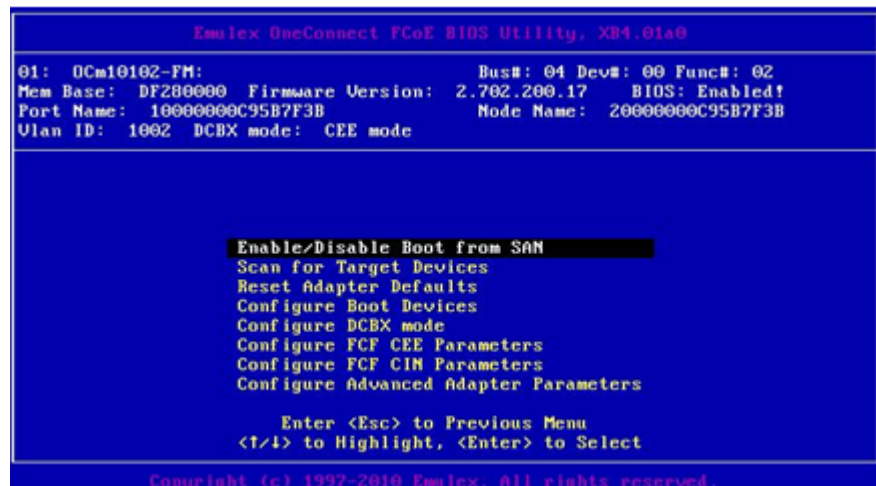
Figure 128   Emulex OneConnect FCoE BIOS configuration option

6. Scroll down and select **Configure Boot Devices** and press **Enter**.

This displays a list of saved boot devices, as shown in Figure 129.
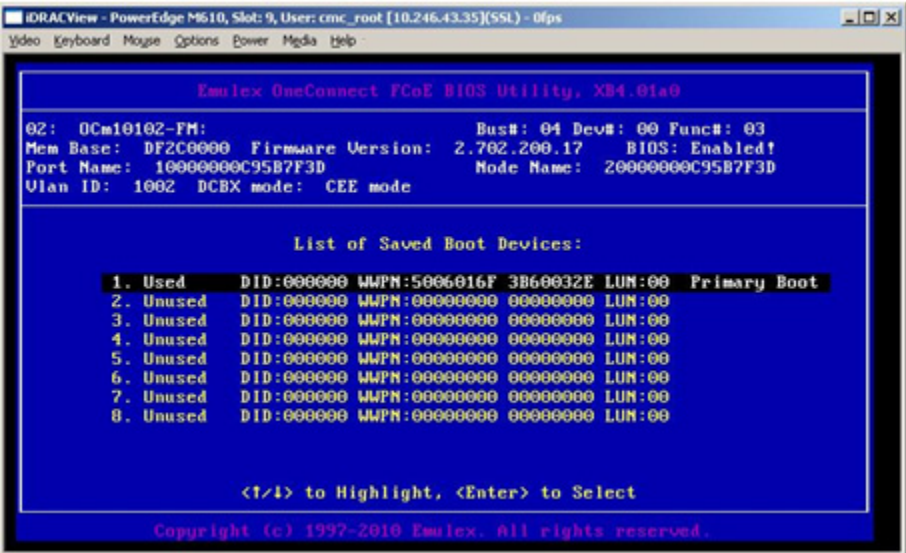
Figure 129   List of Saved Boot Devices

A list of up to eight boot devices, in order of preference, can be saved in the adapter's BIOS utility. Initially, all entries should be listed as "Unused."

7. Type **1** to set the primary boot LUN and press **Enter**. This displays a screen similar to Figure 130.
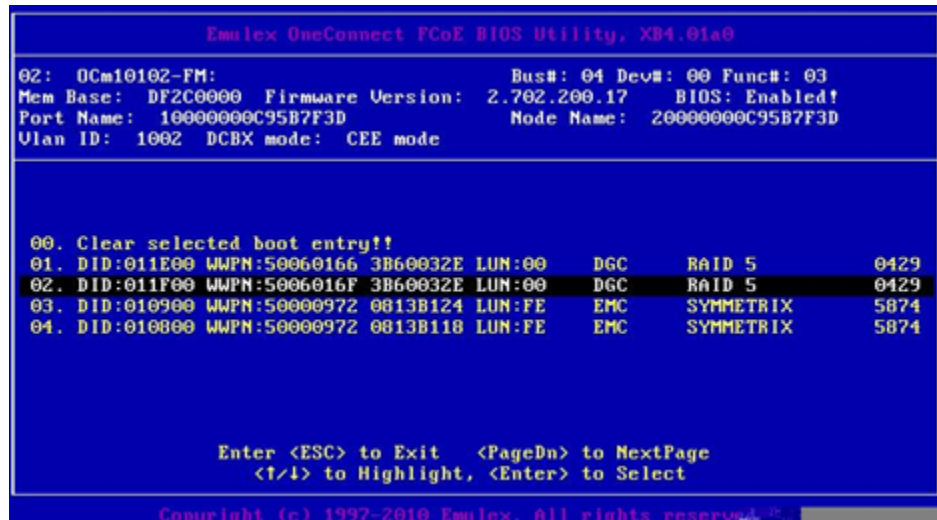
Figure 130   Setting the primary boot LUN

A list representing all array targets visible to the adapter is presented. In this example, a multiple arrays are zoned to the adapter.

8. Select the two-digit row number corresponding to the array to be used for boot (02 in this example) and press **Enter**.

This displays a screen similar to
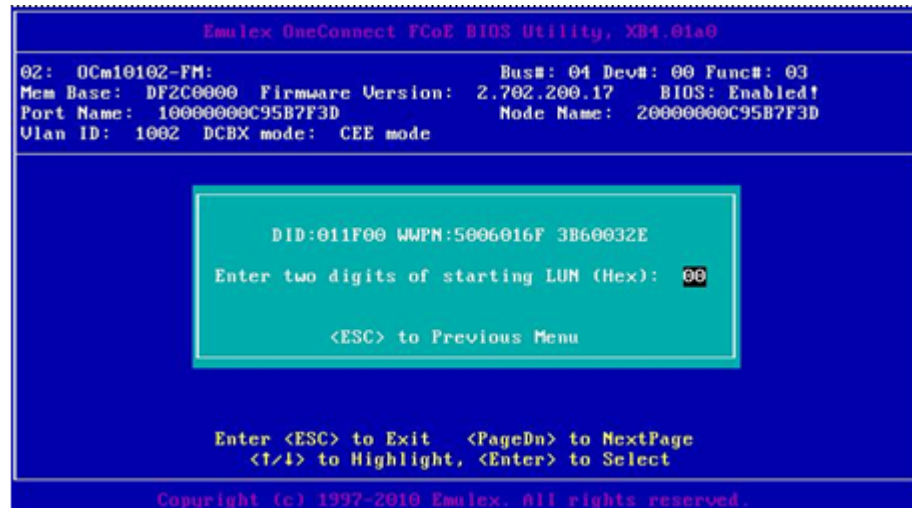
Figure 131   Scanning for available boot LUNs

If no entries (other than 00) appear, verify the following:

- If multiple adapters are present, verify the adapter selected in the BIOS utility is the same adapter that currently provides the I/O path to the storage. (At this point, only one I/O path should be configured to the boot LUN.)

- For VNX series or CLARiiON systems, verify the single I/O path points to the SP that owns the boot LUN.

- For FC-SW environments, verify fabric-zoning parameters, such that a single I/O path exists to the boot LUN. (Refer to your array software documentation for details.)

- Check the physical Fibre Channel connectivity between the adapter and array switch (FC-SW environment).

9. Enter the two digits of the starting LUN address, and press **Enter**.

   This setting specifies the LUN address where the utility will begin scanning for available boot LUNs. For example, entering 0B will result in the utility scanning from LUN address 0B for available LUNs, skipping addresses 00 through 0A. In this example, entering 00 instructs the utility to scan from 00, which is the first LUN address. This will scan all LUNs visible to the adapter.

After the scan, a list of available LUNs appears, similar to Figure 132.
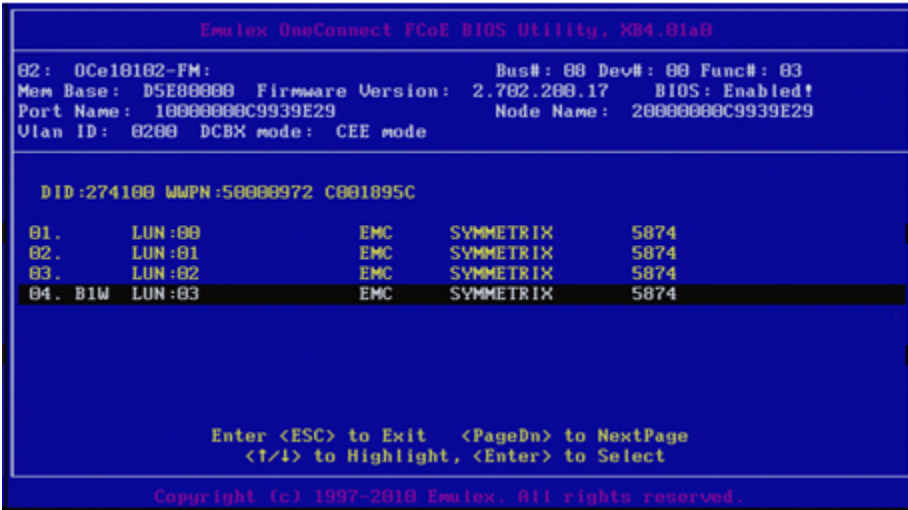
Figure 132   LUNs available for use as boot LUN

In this example, entry 01 references LUN 00, which holds the Symmetrix Volume Logix VCM (LUN masking) database. This LUN cannot be used by the host. Entry 04 references LUN 03, which will be used for boot.

If no numbered entries appear in the above figure, verify the following:

- For VNX series or CLARiiON systems, verify that the single I/O path points to the SP that owns the boot LUN.

- Verify that array LUN masking settings are configured such that this adapter has visibility to the appropriate LUN. Refer to your array software documentation for details.

10. Select the number that corresponds to the LUN to be used for boot and press **Enter**.

A screen similar to Figure 133 on page 154 displays.
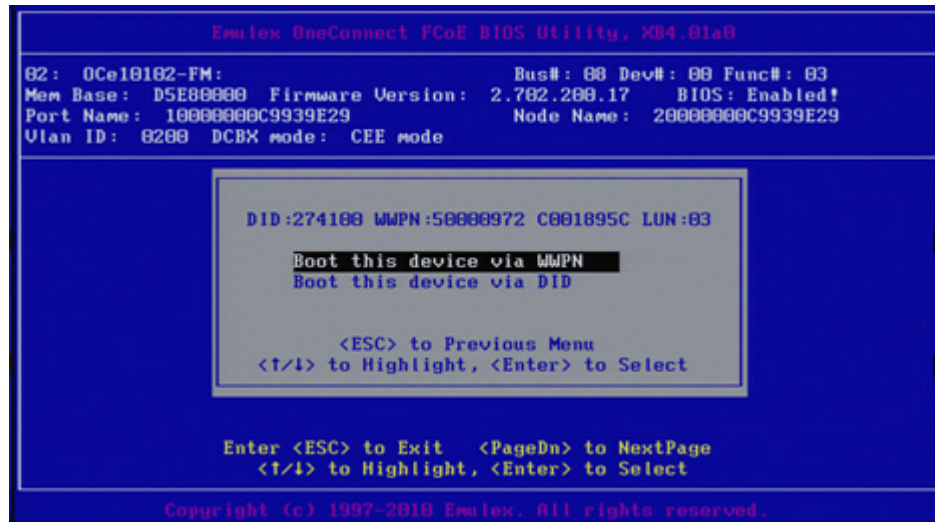
Figure 133   Selecting the boot method

11. Select the type of your environment and press **Enter**:

   • In FC-SW environments, select **Boot this device via WWPN**.

   You will receive a confirmation box asking you to reboot the system, as shown in Figure 134.
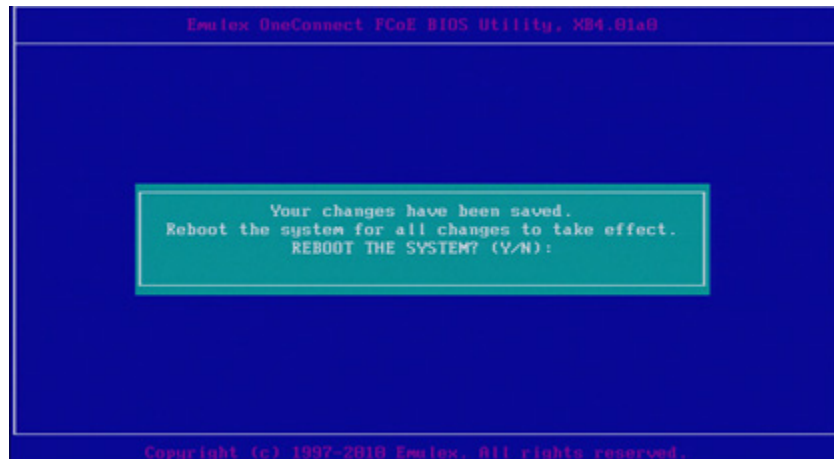
Figure 134   Reboot message

12. Press **Y** to reboot the system.

During the subsequent reboot, the **Emulex OneConnect FCoE BIOS** banner screen shows the array and LUN that has been specified as a boot-capable LUN, as shown in Figure 135. At this point, the OS installation can begin using this LUN as the boot volume.


```
Bringing the Link up, Please wait...
Link Up  : Physical Link Established.
--Adapter 2 OCm10102-FM:     S_ID:012702  PCI Bus, Device, Function (04,00,03)

DID:011F00  WWPN:5006016F3B60032E  LUN:00

Emulex BIOS is installed successfully!!!

ServerEngines 10Gb UNDI, PXE-2.0 BIOS v2.102.200.17
Copyright (C) 2006-2010  ServerEngines Corporation

◀◀◀ Press <Ctrl><P> for PXESelect(TM) Utility ▶▶▶

Controller#0 Port#0 Base 0xDF220000 at Bus:04 Dev:00 Fun:00
Controller#0 Port#1 Base 0xDF260000 at Bus:04 Dev:00 Fun:01
```

Figure 135   Emulex OneConnect FCoE BIOS banner

Configuring Emulex OneConnect 10 GbE iSCSI BIOS/boot LUN settings for OCe10102-IM iSCSI adapters

This section describes the steps required to configure an Emulex OneConnect 10 GbE iSCSI boot BIOS to allow an array-attached LUN to be used as a boot disk for the server.

To configure an Emulex OneConnect 10 GbE iSCSI adapter boot BIOS, complete the following steps.

1. When the Emulex OneConnect 10 GbE iSCSI BIOS banner displays during power-on self test (POST), as shown in Figure 136, press **Ctrl S** to enter the **Emulex OneConnect 10 GbE iSCSI BIOS Configuration** utility.
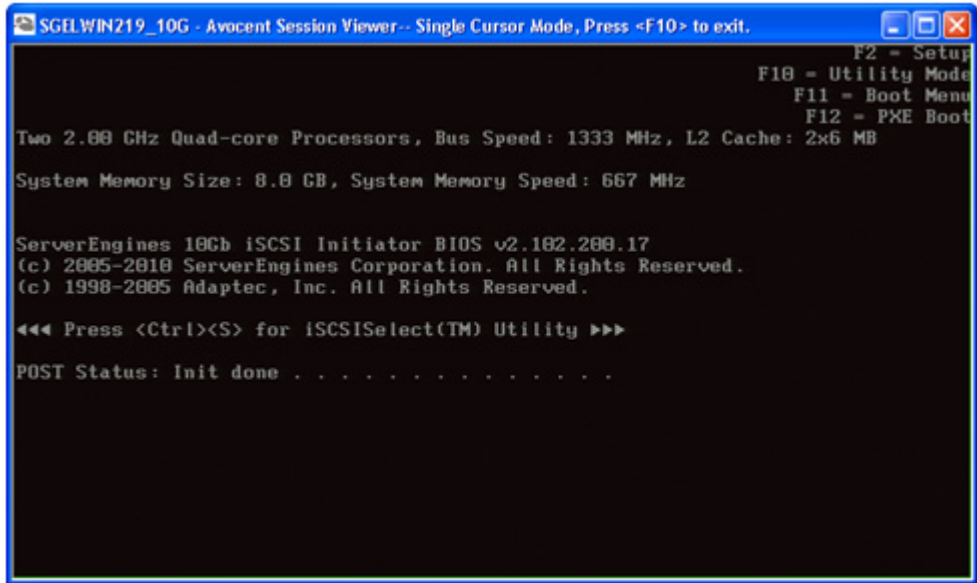
Figure 136   Emulex OneConnect 10 GbE iSCSI BIOS banner

2. The utility opens to the main **Emulex OneConnect iSCSI Select Utility** page, as shown in Figure 137.
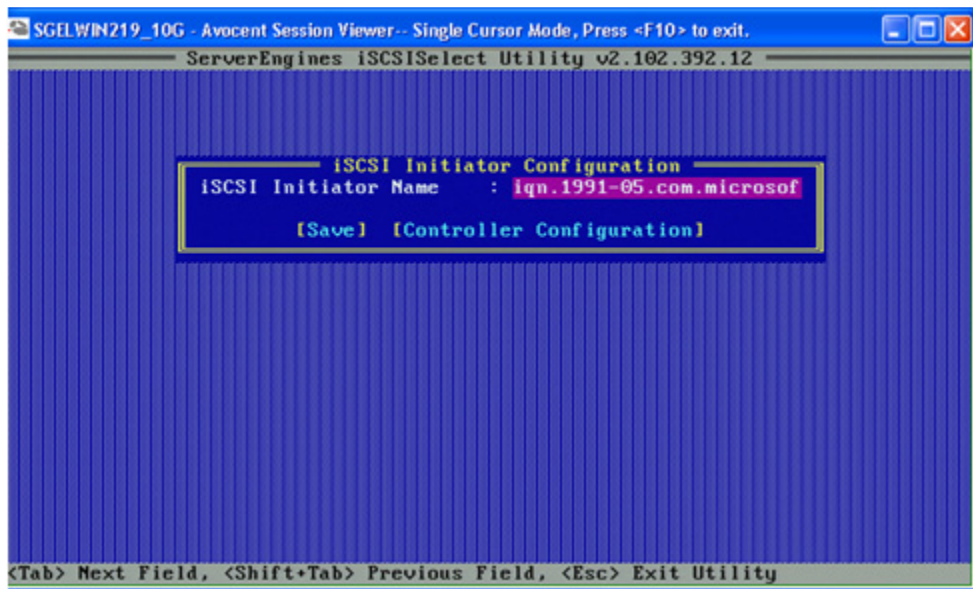
Figure 137   Emulex OneConnect iSCSI Select Utility page

There is one **iSCSI Initiator Name** displayed, the host's IQN name. Use the **Tab** key to select the **Controller Configuration**.

3. The next screen displays the number of controllers under the **Controller Selection Menu**, as shown in Figure 138.
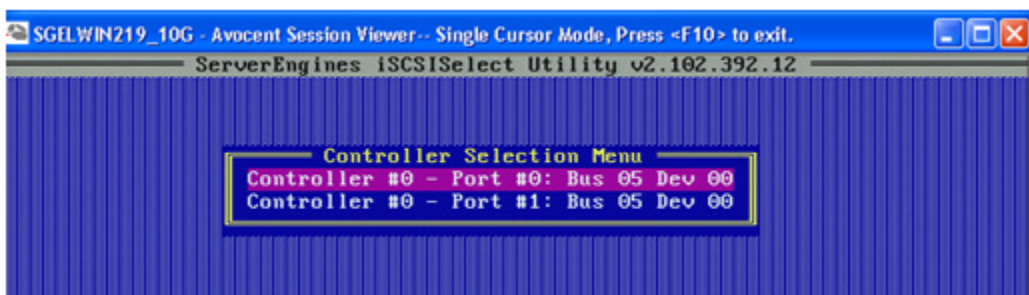
Figure 138   Emulex OneConnect iSCSI BIOS Controller Configuration Selection Menu

Details of the individual controller configuration display, as shown in Figure 139.
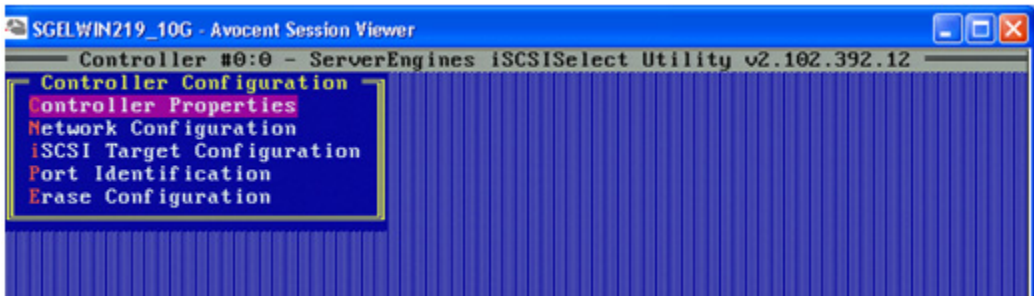
Figure 139   Individual controller configuration details

4. Select **Controller Properties** and press **Enter**.

   A message displays showing the Controller Model Number, BIOS and Firmware Version, and Boot Support, as shown in Figure 140.
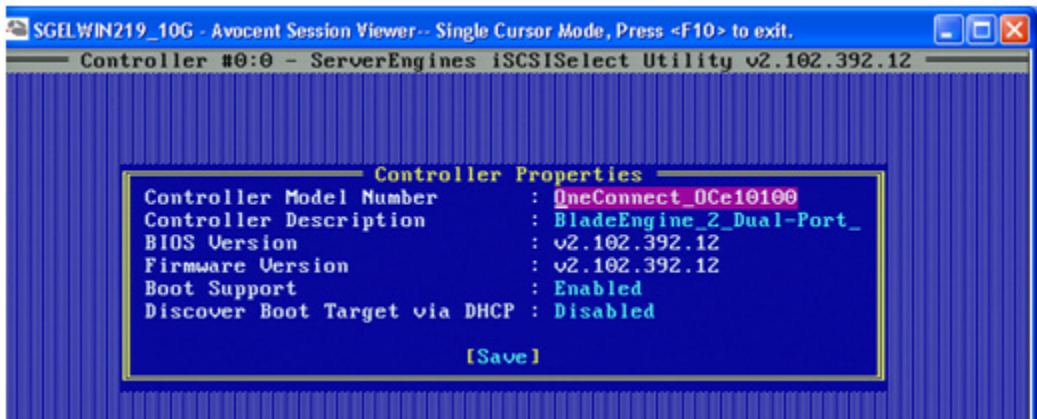
Figure 140   Enable Boot Support

5. Use the **Tab** key to highlight **Boot Support**. A drop-down menu displays.

   a. Choose **Enable** to enable the adapter Boot Support for the specific controller and press **Enter**.

   b. Use the **Tab** key to highlight **Save** and press **Enter**.

6. Press **Esc** to return to the previous **Controller Configuration** screen, as shown in Figure 139 on page 158.

7. From this screen, scroll down and select **Network Configuration** and press **Enter**.

   This will display the Controller MAC Address, Port Speed, Link Status, and other information, as shown in Figure 141.
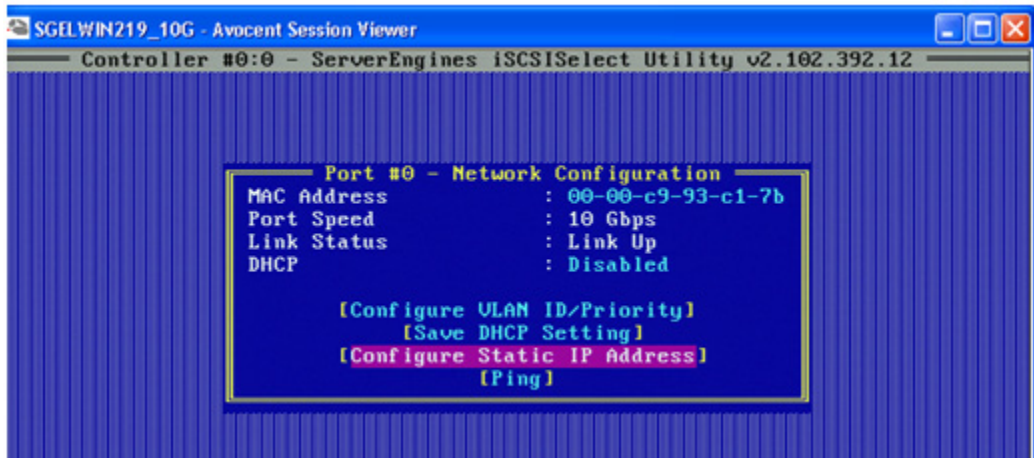
Figure 141   Controller Network Configuration screen

8. Press the **Tab** key to select **Configure Static IP Address** and press **Enter.** The **Controller Static IP Address** screen displays.
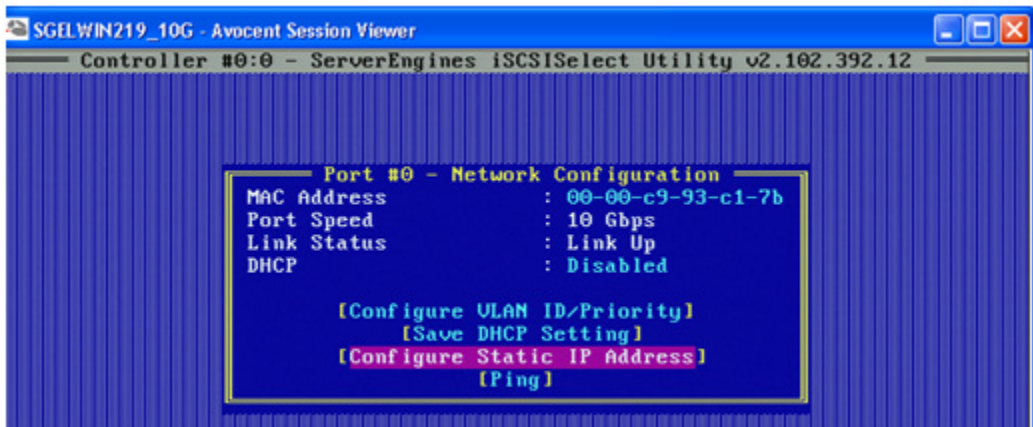
Figure 142   Controller Static IP Address

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9. As shown in Figure 142, you can key in the IP address, Subnet Mask, and Default Gateway. To save the IP address, use the **Tab** key to highlight **Save** and press **Enter**.
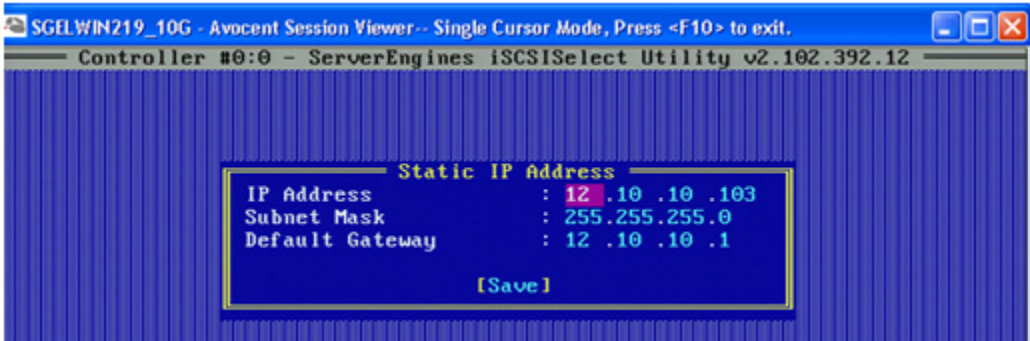
Figure 143   Controller Static IP Address

10. Press **Esc** to return to the **Controller Configuration** screen as shown in Figure 139 on page 158. Scroll down and select **iSCSI Target Configuration** and press **Enter**.

Figure 144 shows the list of Targets which are already connected to the host.
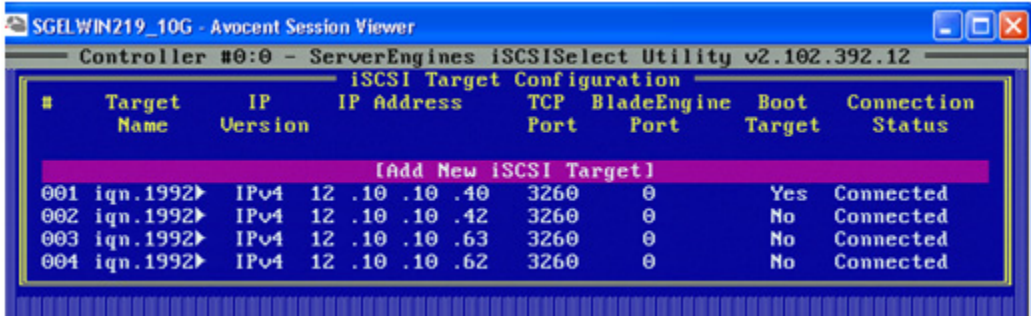
Figure 144   Controller iSCSI Target Configuration

11. Select **Add New iSCSI Target** if you need to add more devices.

You need to key in the **iSCSI Target Name,** which is the desired array's IQN name and iSCSI Target IP address as shown in Figure 145.
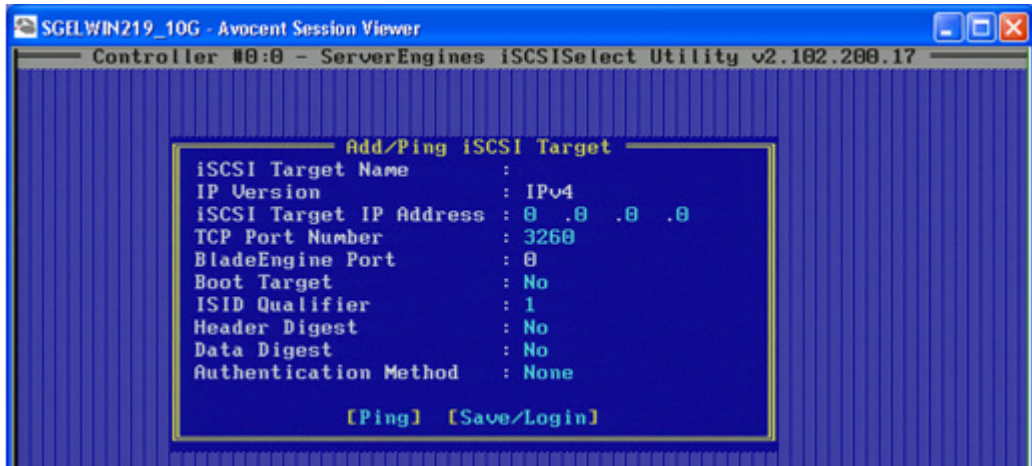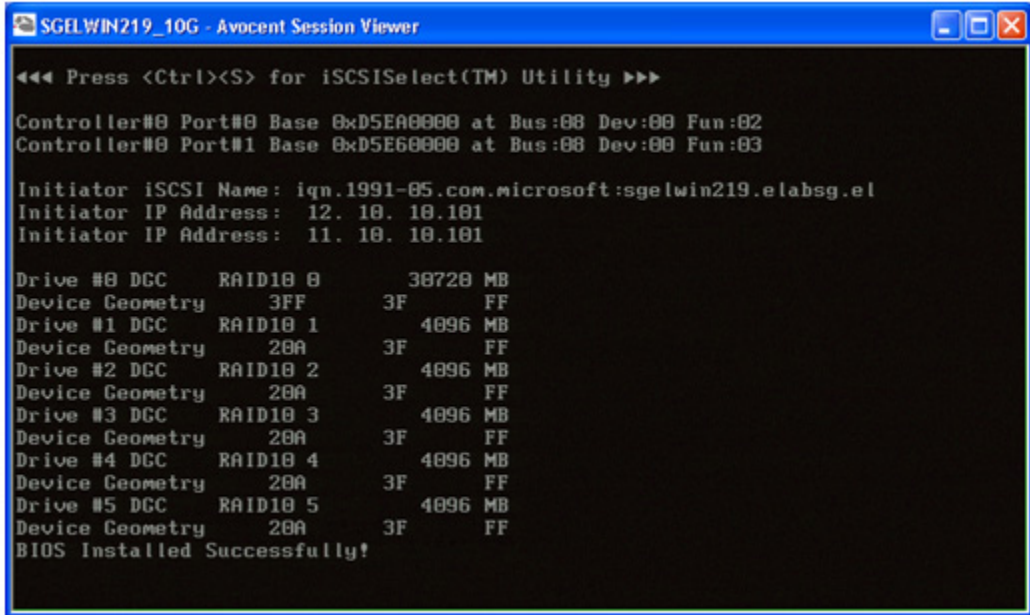
Figure 145   Adding iSCSI Target

12. After you have completed all the setup and boot selections, press **Esc** key to return to the **Emulex OneConnect iSCSI Select Utility page**, as shown in Figure 137 on page 157.

13. To save all the configurations, use the **Tab** key to select **Save** and then press **Esc**.

14. You will be asked if you want to exit from the utility by pressing **Y** or **N**. After you press **Y**, the system will reboot.

15. During the subsequent reboot, the **Emulex OneConnect 10 GbE iSCSI BIOS banner** screen shows the array and LUN that has been specified as a boot-capable LUN, as shown in Figure 146. At this point, the OS installation can begin using this LUN as the boot volume.


```
SGELWIN219_10G - Avocent Session Viewer

◄◄◄ Press <Ctrl><S> for iSCSISelect(TM) Utility ►►►

Controller#0 Port#0 Base 0xD5EA0000 at Bus:08 Dev:00 Fun:02
Controller#0 Port#1 Base 0xD5E60000 at Bus:08 Dev:00 Fun:03

Initiator iSCSI Name: iqn.1991-05.com.microsoft:sgelwin219.elabsg.el
Initiator IP Address:  12. 10. 10.101
Initiator IP Address:  11. 10. 10.101

Drive #0 DGC      RAID10 0        30720 MB
Device Geometry    3FF       3F      FF
Drive #1 DGC      RAID10 1         4096 MB
Device Geometry    20A       3F      FF
Drive #2 DGC      RAID10 2         4096 MB
Device Geometry    20A       3F      FF
Drive #3 DGC      RAID10 3         4096 MB
Device Geometry    20A       3F      FF
Drive #4 DGC      RAID10 4         4096 MB
Device Geometry    20A       3F      FF
Drive #5 DGC      RAID10 5         4096 MB
Device Geometry    20A       3F      FF
BIOS Installed Successfully!
```

Figure 146   Emulex OneConnect 10 GbE iSCSI BIOS banner

Establishing connectivity to the storage array

Once the adapter has been properly configured, connectivity will need to be established between the adapter and the storage array. In the case, where the adapter will be directly connected to the storage array, the cable can just be attached. However, when attaching to an FC or FCoE switch, several additional configuration steps are needed. These include zoning the port on the adapter to the correct port on the storage array, as well as configuring LUN Masking on the array. For additional information on how to perform these additional installation steps, refer to the *EMC Networked Storage Topology Guide,* located at: http://elabnavigator.EMC.com.

Verifying connectivity to the storage array

This section describes various ways to verify successful connectivity between adapter and the attached storage device.

- ◆ "Starting HBAnyware for Windows", next
- ◆ "Starting device manager for Windows" on page 166
- ◆ "Starting disk management for Windows" on page 166
- ◆ "Starting PowerPath GUI for Windows" on page 167

Starting HBAnyware for Windows

After the HBAnyware application is installed, access this utility from the desktop **Start** menu.

To start HBAnyware:

1. From the Windows desktop, select **Start > Programs > Emulex > HBAnyware**.

    The opening screen displays the **General** tab, as shown in Figure 147 on page 165.
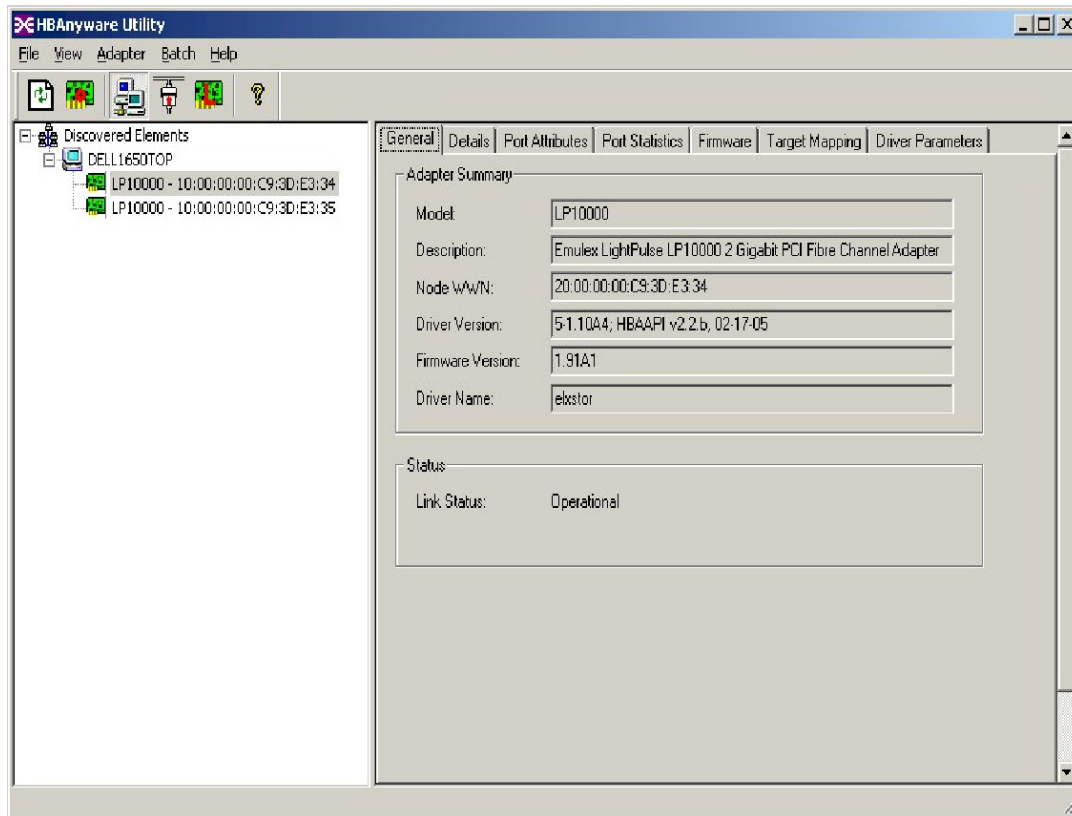
Figure 147   HBAnyware: General tab

> The discovery tree (left pane) displays icons representing
> discovered network (SAN) elements (local hostname, system
> hostnames, and all adapters active on each host). Targets and
> LUNs, when present, are also displayed.

2. Click the plus sign (+) to expand the list below an adapter and
   display all LUNs that attached to a target.

> **Note:** The display in Figure 147 assumes the driver and cable were
> properly installed. For more details, refer to "Installing adapter driver
> and software utilities" on page 99.

Starting device manager for Windows

To verify an adapter is connected to a storage device:

1. Right-click **My Computer** on the desktop and select **Manage** to bring up the **Computer Management** dialog box (Figure 148).
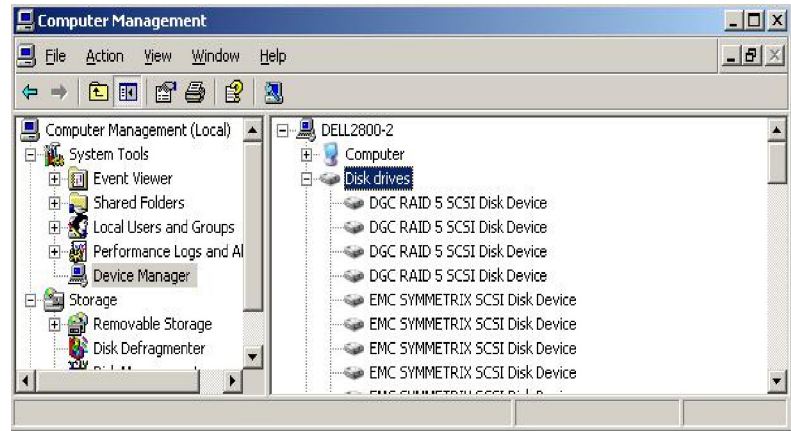
Figure 148   Computer Management dialog box

2. Select **Device Manager > Disk drives** to list all target LUNs attached to the entire system.

3. Double-click the SCSI and RAID controller icon to verify that adapters are detected and installed.

Starting disk management for Windows

To start Disk Management:

1. Right-click **My Computer** on the desktop and select **Manage** to bring up the **Computer Management** dialog box (Figure 149 on page 167). (On Windows 2008, the **Device Manager** is located under the **Diagnostics** item.)

   Note: The display assumes the driver and cable were properly installed. For more detail, refer to "Installing adapter driver and software utilities" on page 99.

2. In the console tree under **Storage**, select **Disk Management**.

The right pane (Figure 149) displays all target LUNs attached to the entire system.
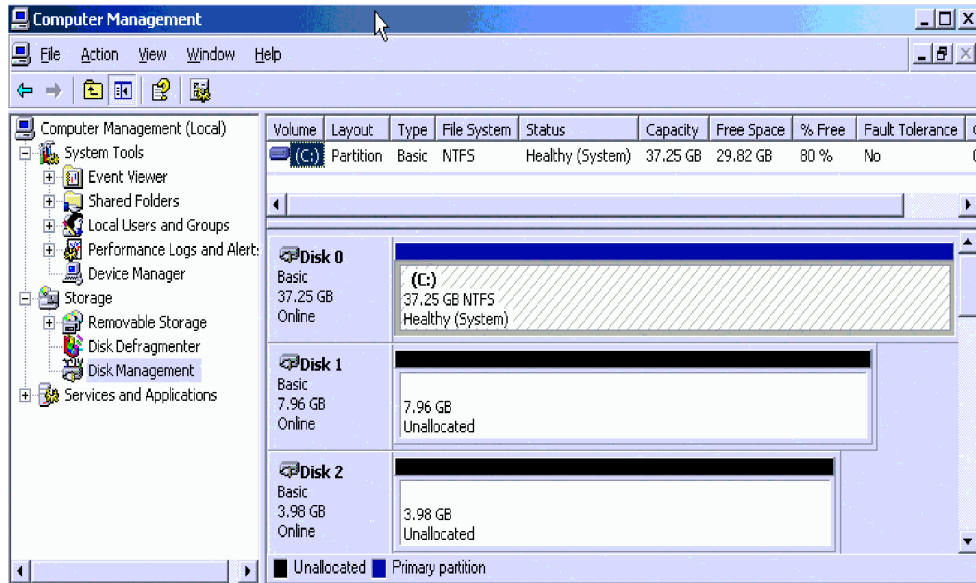
Figure 149   Computer management window: Disk management pane

Starting PowerPath GUI for Windows

1. Start EMC PowerPath for Windows. (Refer to the *Windows Host Connectivity Guide*.)

2. From the Windows desktop, select **Start > Programs > EMC > PowerPath > PowerPath Administrator**.

This displays the **PowerPath Administrator** window (Figure 150 on page 168).

Hardware Path	Path Status	Path State	Path Mode	IOs/sec	Q-IOs	Errors	Description
2 port2\path0	Optimal	Alive	Active	1	0	0	Emulex LightPulse HBA
3 port3\path0	Optimal	Alive	Active	0	0	0	Emulex LightPulse HBA
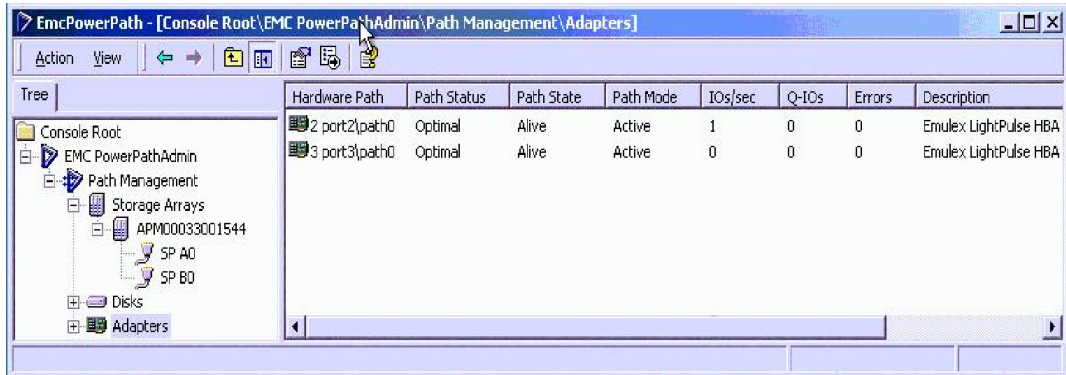
Figure 150   PowerPath Administrator window

> **Note:** The display assumes the driver and cable were properly installed.
> For more detail, refer to "Installing adapter driver and software utilities"
> on page 99.

3. Click the plus sign (**+**) to expand EMC PowerPathAdmin to
    display **Path Management, Storage Arrays, Disks,** and **Adapters**.
    All target LUNs and the total number of adapters managed by
    PowerPath are displayed. For example, **adapters found by
    PowerPath: 2**.

Now that you have a working server with Windows installed and
have verified that the operating system has connectivity to LUNs on
the storage array, you can install any additional host software.

Installing Emulex LPSe12002 8 Gb PCIe EmulexSecure Fibre Channel adapter

This section includes the following information needed to install an Emulex LPSe12002 8 Gb PCIe EmulexSecure Fibre Channel adapter:

Setting up an Emulex encrypted HBA

Complete the following steps to set up an Emulex encrypted HBA.

1. Install the latest version of the Emulex One Command Manager (OCM) software.

   OCM is required to manage the encryption HBA and will also manage all other Emulex HBAs in the system, replacing HBAnywhere as the Emulex adapter management tool.

   The Emulex One Command Manager software installation window is shown in Figure 151 on page 170.

Figure 151   Emulex One Command Manager software installation window

2. Click **Next** until the installation is complete.

3.   Install the EHAPI software. Figure 152 shows the status of the eHBA in the Device Manager before installing EHAPI.
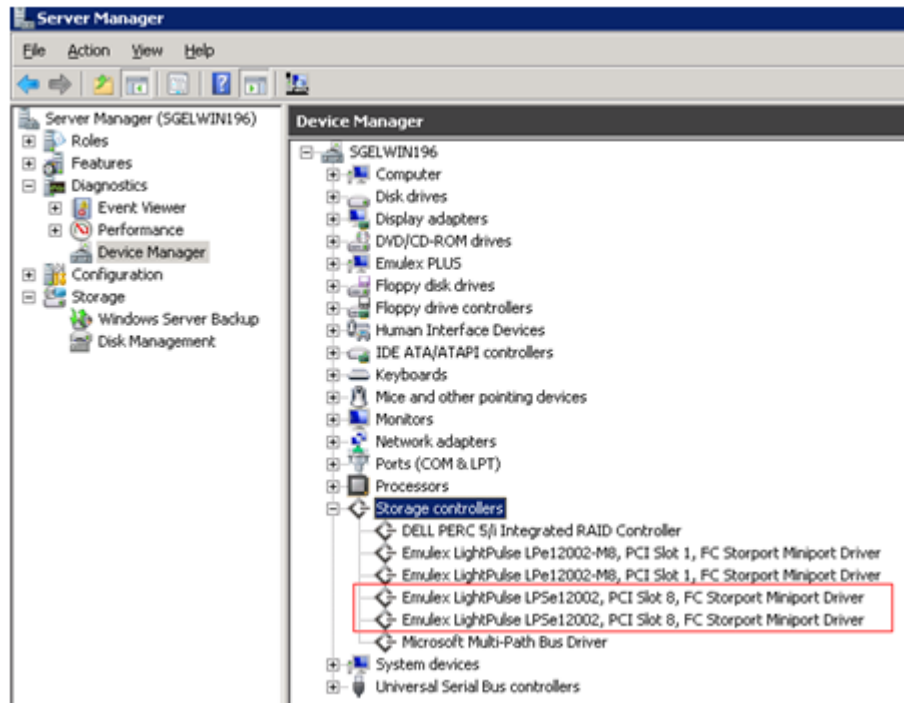
Figure 152   eHBA Status before installing EHAPI

Note: An internet connection is needed to install the EHAPI software. Be sure to configure the gateway connection correctly.

If there is a problem running the EHAPI setup, install .NET Framework 3.5. After installing .NET, run the EHAPI setup again.

The **ElxSec Setup Wizard** displays, as shown in Figure 153.
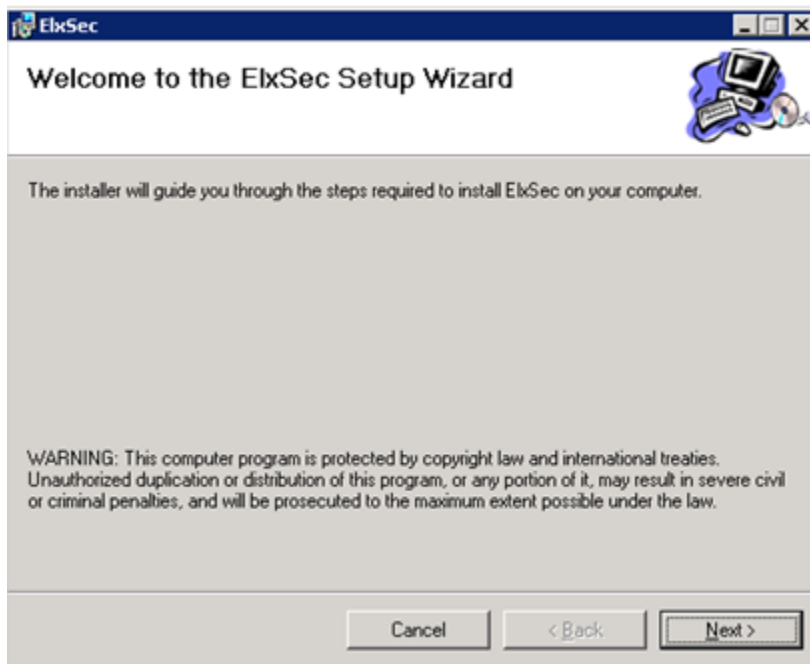
Figure 153   ElxSec Setup Wizard

Figure 154 shows the status of your eHBAs in the Device Manager after installing EHAPI.
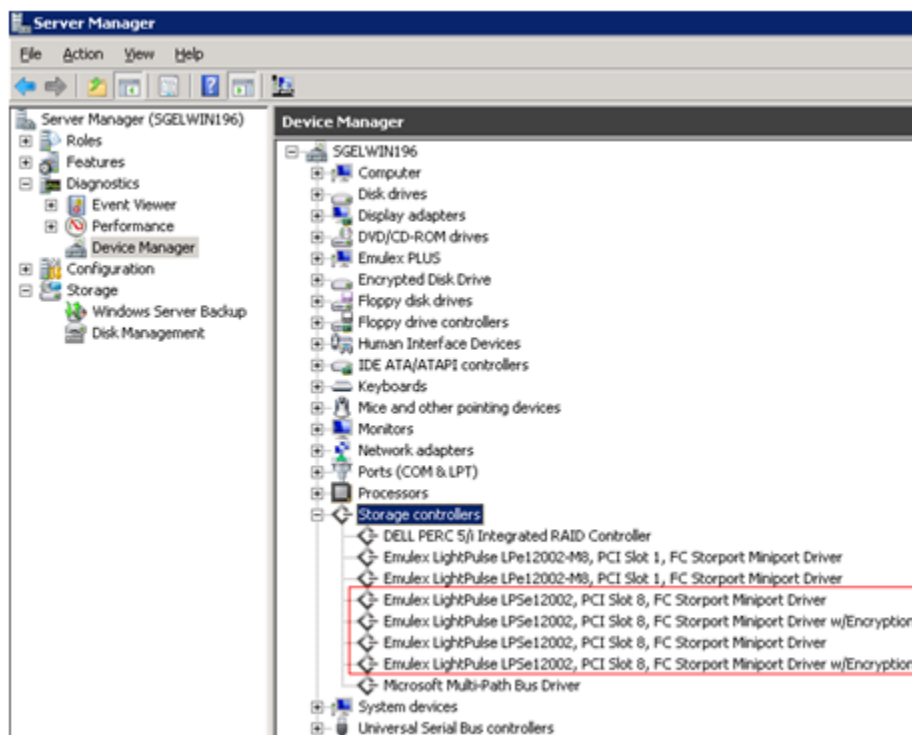
Figure 154   eHBA Status after installing EHAPI

Installing PowerPath with encryption with RSA enabled

1. Follow the instructions in the *PowerPath and PowerPath/VE for Windows Installation and Administration Guide*, located on EMC Online Support at https://support.EMC.com, for general installation steps and registration.

2. Complete this additional step to register the PowerPath license key, which is specifically for encryption, as shown in Figure 155.
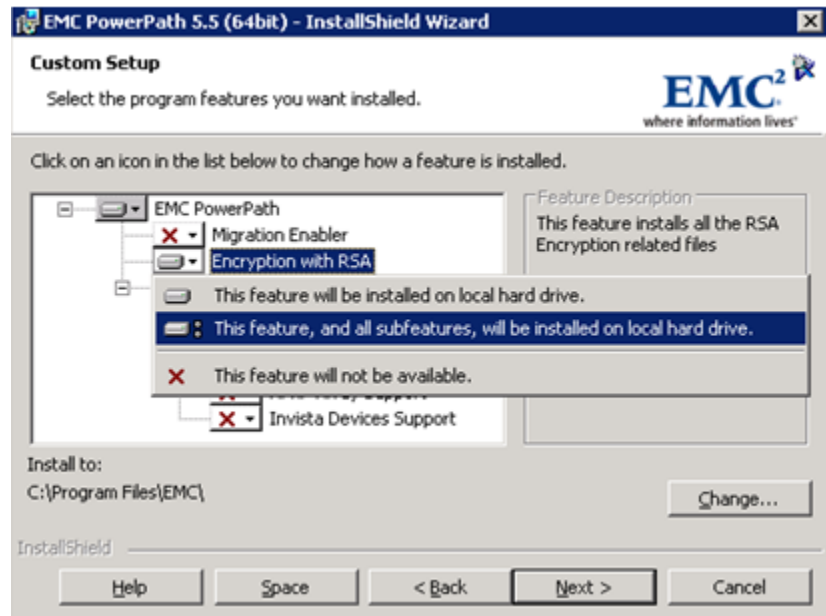
Figure 155   Register PowerPath license key for encryption

Installing an existing encryption HBA and EHAPI software

1. Remove the existing EHAPI software using the Add/Remove Programs of ElxSec.

2. Install the new EHAPI software by running setup.exe in the EHAPI kit and reboot the system.

3. Install the new OCM driver kit if it is not yet installed.

Configuring PowerPath encryption with RKM server

1. Copy the credentials to the host.

   Once PowerPath is installed and registered, copy the .cer and .pfx client credentials files generated by RKM server to the PowerPath encryption configuration directory C:\Program Files\EMC\RSA\Rkm_Client\config.

   This directory should also contain four client configuration file templates (.tmpl files) by default.

2. Edit the Key Manager Client Configuration files.

   Check the content of the following files:

   a. Rkm_init.conf

   b. Rkm_keyclass.conf

   c. Rkm_registration.conf

   d. Rkm_svc.conf

   IMPORTANT

   Accurate information about the RKM server IP address, client credentials file path, keyclass, etc., are needed for successful configuration. Any misconfiguration here may result in failure starting encryption daemon or turning on device encryption in a later step.

3. Run the following batch file to kick start the xcrypt configuration procedure. An example output is shown in :

   a. C:\Program Files\EMC\RSA\CST\lib\RKM_Config.bat

   b. Lockbox passphrase – Teleph0ne#   Require certain password requirements

   c. Client Credential ID and Password needed

```
C:\Program Files\EMC\RSA\CST\lib>RKM_Config.bat
*===============================================================================*
*                                                                               *
*      Initialize and configure PowerPath Data at Rest Encryption.              *
*                                                                               *
*===============================================================================*
**** CONFIGURING CST ****
36 File(s) copied
Enter lockbox passphrase: ************
Confirm passphrase: **********
Strings do not match.
Enter lockbox passphrase: **********
Confirm passphrase: **********
cstadmin: Lockbox C:\Program Files\EMC\RSA\cst\config\csp.clb initialized.
**** CONFIGURING CKM ****
Enter the Client Credential Password:
Verify Password:
RKM Client configured successfully....
Press any key to continue . . .
    EMC PowerPath RSA Encryption Service 5.5.0
Press any key to continue . . .

C:\Program Files\EMC\RSA\CST\lib>_
```

Figure 156   Config.bat

4. Use the following commands to check the query on PowerPath CLI:

```
#powervt xcrypt -info -dev all >> Status Enquiry on all disks
#powervt xcrypt -on -dev harddisk1 -no >> Encryption
#powervt xcrypt -off -dev harddisk1 -no >> De-Cryption
#powervt xcrypt -info -dev harddisk1 >> Enquiry Encryption Status
```

Installing additional Unisphere/Navisphere Host Agent software

The Unisphere™/Navisphere® Host Agent should be used to automatically register host connections with the array. PowerPath and ATF require different registration types and the Unisphere/Navisphere Host Agent is the preferred method over manual registrations.

You should install the Unisphere/Navisphere Host Agent software to ensure the adapter connections are all registered correctly. For instructions on how to perform this operation refer to the EMC ControlCenter® Unisphere/Navisphere Host Agent software documentation for your array type.

After the host agent has started and registered the new adapter paths, you should refresh the host connections in the storage group to ensure all available paths are assigned. To do this, you have two options, depending on whether you want to disrupt the connectivity of the host, as described next.

Option 1: Without disrupting host connectivity (more complex procedure using Navisphere CLI):

Note: You must have Navisphere CLI installed. Refer to product notes for complete usage instructions.

1. Using a command prompt, browse to the Navisphere CLI directory (typically C:\Program Files\EMC\Navisphere CLI>).

2. Enter command **navicli -h** *<sp_IP>* **storagegroup -connecthost -host** *<hostname>* **-gname** *<storagegroupname>*

   where *<sp_IP>* is the IP address of either array SP; *<hostname>* is the hostname of the host connection to update and *<storagegroupname>* is the name of the storage group of the host connection to update.

3. When prompted, verify the *<hostname>* and *<storagegroupname>* are correct as follows:

   ```
   Connect host <hostname> to storage group
      <storagegroupname> (y/n)?"
   ```

   Enter **y** to proceed.

4. Perform a device rescan on your host, and verify the additional device paths are present.

Option 2: With brief disruption of host connectivity (simpler procedure using Unisphere/Navisphere GUI):

1. Shut down the host.

2. Remove the host from the storage group.

3. Apply the change.

4. Add the host back into the storage group.

5. Restart the host.

6. Check the array connectivity status to ensure all connections you require are active.

Emulex NPIV solution

N_Port ID Virtualization (NPIV) allows end users to effectively "virtualize" the Fibre Channel adapter functionality such that each virtual machine running on a server can share in a pool of adapters, yet have independent access to its own protected storage. This enables administrators to leverage standard SAN management tools and best practices, such as fabric zoning and LUN mapping/masking, and enables the full use of fabric-based quality-of-service and accounting capabilities. It also provides the most efficient utilization of the adapters in the server while ensuring the highest level of data protection available in the industry.

Figure 157   NPIV example

For Emulex, NPIV features are accessed through the HBAnyware utility that is packaged with the Windows STORPort driver.

For in-depth information about setting up and configuring NPIV with your Emulex adapter, please refer to Emulex's user manual for the Emulex HBAnyware utility. This manual is available for download from the Emulex website (http://www.emulex.com) in the downloads area.

2

Miscellaneous Planning and Procedures

This chapter contains information on planning and troubleshooting.

Zoning and connection planning in a fabric environment

In a fabric environment, the user should plan for the switch topology, target-to-hosts mapping, and the zone. Here is an overview of the recommended procedure:

1. Draw the connectivity among the hosts, switch, and storage array to verify the correct fabric configuration.

2. Configure the zone capability in the switch. If connecting to EMC® Connectrix®, refer to the *Connectrix v7.01 Enterprise Storage Network System Planning Guide* for information on the zone configuration.

Manually installing the adapter driver — Advanced users

This procedure is only necessary if you are not using the auto-pilot installation. For more information, refer to "Obtaining the Emulex AutoPilot Install Kit" on page 100.

Downloading the driver

Refer to the Figure 1 on page 21 to obtain the latest advanced driver (legacy install) kit.

Installing the adapter driver

To use EMC storage array disks with a Windows 2000 or Windows 2003 host, you need a Fibre Channel or iSCSI host adapter driver. The driver must be installed and configured before Windows can access the EMC disks.

For Windows 2003, EMC supports both the STORPort driver class and the SCSIPort driver class. For Windows 2003 STORPort installation instructions, refer to "Required Windows STORPort updates" on page 183.

The following installation procedure is used for the 2.30a2 Legacy Install Kit and newer drivers. Starting with the 2.20a12 driver revision, the driver configuration tool and HBAnyware application have been moved to a separate .zip file and must be installed separately from the driver, following the installation procedure listed in "Installing the driver on a Windows host" on page 186.

Required Windows STORPort updates

Currently, the shipping version of Windows requires post-RTM hot fixes to resolve some known issues. For all Windows STORPort installations, you must obtain the current Microsoft QFE hotfix listed in the *EMC Support Matrix* with the adapter driver revisions.

IMPORTANT

Install this QFE before installing the adapter driver.

Users planning to upgrade to the latest service pack for Windows should upgrade their adapter drivers to the latest supported version prior to installing the service pack. The Windows Service Packs do

not contain the latest EMC-approved adapter revisions. Refer to the *EMC Support Matrix*.

Migrating Windows 2003 drivers from SCSI to STOR

As of April 2006, STORPort has been fully adopted by third-party software and tape vendors and EMC is proceeding towards sole STORPort support under Windows 2003. Adding to the technical benefits of STORPort, phasing-out SCSI miniport on Windows 2003 will provide better coordination of driver version support from OEMs. STORPort will be the common driver platform for all server and storage vendors to provide the customer with compatible solutions.

In the April 2006 *EMC Support Matrix* (ESM), EMC will make SCSI driver releases for Windows 2003 x86 from Emulex frozen as the last supported Windows 2003 SCSI versions. Once this end-of-life (EOL) is in effect, new installs will still be permitted with the SCSI drivers for three months, but EMC encourages customers to use STORPort instead. Three months after the EOL (after the June ESM) EMC will make these Windows 2003 SCSI versions EOL. Upon EOL, starting with the July *ESM*, the Windows 2003 SCSI versions will no longer be listed and will not be supported for new installations. Existing customers who have Windows 2003 SCSI already installed will be supported, and any fix or MS HCL support will likely require an upgrade to STORPort. Windows 2000 will continue to use SCSI drivers as the only option.

What to expect when moving from SCSI miniport/full port drivers to STORPort drivers

In STORPort drivers, functions or settings that users may have set may no longer be available or may be accessed differently than in the past. In particular, the Emulex full port driver had many settings available in the ELXCFG.EXE configuration utility which are not available in miniport drivers. These are now controlled by the OS. EMC has always provided standard settings which were accessible via driver configuration utilities. For STORPort drivers, EMC will require that the default settings for STORPort drivers be used unless otherwise instructed. Configuration utilities for STORPort that run under Windows (HBAnyware as well as the Emulex Autopilot installation kit) will allow access to settings for the driver that may be changed via the utility if necessary.

If persistent target bindings were in use with the Emulex full port driver, and wish to be carried over to the STORPort driver, a special migration tool available from Emulex is required to transfer those settings. Once the migration tool has been run, the STORPort driver

can be installed and previous target binding settings will be carried over to the STORPort driver.

Installing the driver on a Windows host

Note: Refer to release notes provided with the driver for information that might be unique to new driver revisions. Be sure to perform adapter firmware upgrades before installing adapter drivers. Failure to maintain minimum required adapter firmware revisions can cause errors when installing drivers. Refer to the *EMC Support Matrix* for the latest required adapter revisions.

To install the driver into a Windows 2000, 2003, or 2008 host:

1. Boot the host (if necessary) with Windows 2000, 2003, or 2008.

2. From the Windows taskbar, click **Start, Programs, Administrative Tools, Computer Management**.

3. In the left pane of the **Computer Management** window, click the **Device Manager** icon.

4. If Windows Plug-n-Play does not detect your adapter(s), it will be listed as **Unknown** or as a **Fibre Channel Controller** under the **Other Devices** icon in the right pane. If the Windows Plug and Play service has detected your adapter, the adapter will already be listed under **SCSI and RAID Controllers**. (On Windows 2008, they will appear under **Storage Controllers**.) If your adapters have already been detected, follow the instructions under ""Updating the adapter driver in a Windows host" on page 188. Otherwise, double-click the first instance of controller under **Other Devices**.

5. In the next window, click **Update Driver**, then **Next**.

6. Perform one of the following:

   • For Windows 2000, click the **Next** button on the welcome screen. On the next screen, you will be asked what you want the wizard to do, click **Display a list of known drivers for this device so that I can choose a specific driver**, and click **Next** then Jump to Step 7.

   • For Windows 2000 & 2003, you will be asked if you wish to connect to Windows Update to search for software, click **No, not at this time**, and click **Next**. On the next screen, you will be asked to install software automatically, or install from a list

or generic location. Choose **Install from a list or generic location [Advanced]**, and click **Next**. On the next screen, you are asked to choose your search and installation options, click **Don't search. I will choose the driver to install**, and click **Next**. Select **SCSI & RAID Controllers** from the list, and click **Next** then Jump to Step 7.

- For Windows 2008, you will be asked how you want to search for the driver. Click **Browse my computer for driver software.** On the next screen, you are given options on how to browse for driver software on your computer, click the option to **Let me pick from a list of device drivers on my computer.** Continue to Step 7.

7. In the next window, click the **Have Disk** button.

8. Enter the path to the diskette containing the driver (**A:**, for example), or use the browse function to locate the driver; then click **OK**.

9. Select the appropriate driver for your adapter from the displayed list and click **Next**.

   Note: If you select the wrong driver, you will receive an **Incompatible Hardware** warming message. Select **No** to cancel the update and return to the selection windows, and then select the correct driver.

10. If prompted, in the next window, click **Next**.

11. If prompted, click **Yes** to continue the installation. (Windows 2008 may not display this.)

12. Click **Finish** to complete the installation. Windows 2008 has a **Close** button.

13. If the system requests that you reboot the system, select **No**; then click **Close.**

14. If the system again requests that you reboot the system, select **No**; then click **Close**.

15. If you have other adapters to update, select the next adapter in the device manager and repeat steps Step 6 through Step 14.

16. When all adapters have their drivers updated, select **Yes** to the reboot prompt.

   If you are not promoted to reboot, reboot your server anyway.

IMPORTANT

Failure to reboot before installing the Application Kit can result in a host blue screen error. Uninstall any previous Application Kits before attempting to install the Application Kit.

Note: Step 17 and Step 18 are only necessary for users using SCSIPort drivers. STORPort users can skip these steps.

17. After the reboot completes, install the EMLXApps Application kit included with the driver. To do this, expand the setupapps.exe contained in the EMLXApps.zip file, and run the setupapps.exe program.

    This install updates the Windows installer to v2.0 and then installs three Emulex applications: the Port driver configuration tool (ELXCFG.EXE), the mini-port driver configuration tool (LPUTILNT.EXE), and the HBAnyware Application. Follow the instructions during the Application Kit installation and complete the installation.

18. For Windows 2000/ Windows 2003 SCSIPort installations only, run the elxcfg.exe tool and follow these procedures:

    a. "Updating the shortcut" on page 203.

    b. "Changing the configuration" on page 205.

Updating the adapter driver in a Windows host

On systems where the Emulex adapter is detected automatically or a driver is already installed, it might be necessary to upgrade to the latest EMC-approved driver. The following procedure describes how to upgrade to the latest EMC-approved driver. The procedure assumes that you have copied the latest driver from the Emulex CD-ROM or downloaded it from the Emulex website and put it onto a diskette.

To install the driver:

Refer to release notes provided with the driver for information unique to new driver revisions. Be sure to perform adapter firmware upgrades before installing adapter drivers. Failure to maintain minimum required adapter firmware revisions can cause errors when

installing drivers. Refer to the *EMC Support Matrix* for the latest required adapter revisions.

If you have installed a previous version of the Emulex HBAnyware Application Kit, and are upgrading the adapter driver, uninstall the previous Emulex HBAnyware Application Kit from the Windows Control Panel using the **Add/Remove Programs** applet before proceeding.

1. Boot the host (if necessary) with Windows 2000 or Windows 2003.

2. From the Windows taskbar, click **Start> Programs> Administrative Tools> Computer Management.**

3. In the left pane of the Computer Management window, click the **Device Manager** icon.

4. For Windows 2000 and 2003, double-click the **SCSI & RAID Controllers** icon. For Windows 2008, double-click the **Storage Controllers** icon.

5. Under **SCSI & RAID Controllers** or **Storage Controllers**, double-click the adapter you want to upgrade.

6. In the next window, click the **Driver** tab; then click **Update Driver**.

7. Perform one of the following:

   • For Windows 2000, click the **Next** button on the welcome screen. On the next screen, you will be asked what you want the wizard to do. Click **Display a list of known drivers for this device so that I can choose a specific driver** and then click **Next**. Continue to Step 8.

   • For Windows 2000 and 2003, you will be asked if you wish to connect to Windows Update to search for software. Click **No, not at this time** and then click **Next**. On the next screen, you will be asked to whether you want to install software automatically or to install software from a list or generic location. Choose **Install from a list or generic location [Advanced]** and click **Next**. On the next screen, you are asked to choose your search and installation options. Click **Don't search. I will choose the driver to install** and then click **Next**. Select **SCSI & RAID Controllers** from the list and then click **Next.** Continue to Step 8.

   • For Windows 2008, you will be asked how you want to search for the driver. Click **Browse my computer for driver software**. On the next screen, you are given options on how to browse

for driver software on your computer. Click the option **Let me pick from a list of device drivers on my computer**. Continue to Step 8.

8. In the next window, click **Have Disk**.

9. Enter the path to the diskette containing the driver (**A:**, for example), or use the browse function to locate the driver; then click **OK**.

10. Select the appropriate driver for your adapter from the displayed list and click **Next.**

   Note: If you select the wrong driver, you will receive an **Incompatible Hardware** warming message. Select **No** to cancel the update and return to the selection windows, and then select the correct driver.

11. If prompted in the next window, click **Next**. (Windows 2008 may not display this.)

12. If prompted, click **Yes** to continue the installation. (Windows 2008 may not display this.)

13. Click **Finish** to complete the installation.Windows 2008 will have a **Close** button.

14. If the system requests that you reboot the system and you have other adapters to update, select **No** and then click **Close**.

15. If the system again requests that you reboot the system and you have other adapters to update, select **No** and then click **Close**.

16. If you have other adapters to update, select the next adapter under **SCSI & RAID Controllers** and repeat Step 6 through Step 15.

17. When all adapters have their drivers updated, select **Yes** to the **reboot** prompt.

   If you are not promoted to reboot, reboot your server anyway.

   IMPORTANT

   Failure to reboot before installing the Application Kit can result in host blue screen error. You should also uninstall any previous Application Kits before attempting to install the Application Kit.

Note: Step 18 and Step 19 are only necessary for users using SCSIPort drivers. STORPort users can skip these steps.

18. After the reboot is completed, install the EMLXApps Application Kit included with the driver. To do this, expand the setupapps.exe contained in the EMLXApps .zip file, and run the setupapps.exe program. This install updates the Windows installer to v2.0 and then installs three Emulex applications: the Port driver configuration tool (ELXCFG.EXE), the mini-port driver configuration tool (LPUTILNT.EXE), and the HBAnyware Application. Follow the instructions during the Application Kit installation and complete the installation.

19. For Windows 2000/Windows 2003 SCSIPort installations only, run the ELXCFG.EXE tool and follow these procedures:

    a. "Updating the shortcut" on page 203

    b. "Changing the configuration" on page 205

Upgrading to Windows 2003 from Windows 2000

Note the following if upgrading to Windows 2003:

◆ Upgrading from Windows 2000 — The Windows 2000 drivers may be preserved while upgrading to Windows 2003. These SCSIPort drivers (including the native Windows 2003 SCSIPort drivers) are not supported by EMC for Windows 2003. You should obtain the correct Windows 2003 drivers (refer to "Installation and configuration overview" on page 21) and reinstall the drivers after the upgrade is complete.

◆ Currently, to upgrade from Windows 2000 to Windows 2003, you must first uninstall PowerPath. After upgrading the host, you can reinstall an approved Windows 2003 version. Please refer to the EMC PowerPath documentation for further details.

You may wish to disconnect your storage during the Windows upgrade, and reconnect it after the approved Windows 2003 drivers are installed.

Note: Currently, EMC does not support upgrading Windows 2000 to Windows 2008.

Editing the Windows time-out value

Note: This section applies only to driver version 2.11a2 and below; driver versions above 2.11a2 include a version of the Emulex Configuration Tool that automatically updates the Windows I/O time-out value.

Connecting a Windows 2000 host to an EMC storage array over Fibre Channel requires editing the Windows registry as follows:

1. Open the registry:

    a. On the Windows taskbar, click **Start**.

    b. Click **Run**.

    c. Type **regedt32.exe** in the **Open** field and click **OK**.

2. Follow this path:

    ```
    HKEY_LOCAL_MACHINE\System\CurrentControlSet\
    Services\Disk
    ```

3. Look for the **TimeOutValue** entry in the right pane of the registry editor window:

    - If the **TimeOutValue** exists, double-click it, then go to step 4.
    - If the **TimeOutValue** does *not* exist:

        a. Select **Add Value** from the **Edit** menu.

        b. In the **Value Name** box, type **TimeOutValue** (exactly as shown).

        c. For the data type, select **REG_DWORD** from the pull-down menu.

        d. Click **OK**, then go to step 4.

4. In the **DWORD Editor** window:

    a. Click **decimal** in the **radix** box.

    b. Change the value in the **data** box to **60**.

5. Click **OK**.

6. Close the registry editor.

7. Reboot the host.

Blade server restrictions

Table 3 describes Emulex software support for Blade servers.

Table 3 **Blade server/Emulex support matrix**

Blade server manufacturer	AutoPilot Installer for Windows	HBAnyware Utility for Windows
Dell	Yes	No
HP	Yes	Yes
IBM	Yes	Yes

Using the Emulex configuration tool

The Emulex configuration tool allows you to enable adapter settings to connect to a Symmetrix, VNX series, or CLARiiON storage system.

For Windows 2003, EMC supports both the STORPort driver class and the SCSIPort driver class. This section contains information for the SCSIPort Configuration Tool (ELXCFG.EXE) for Windows 2000 and Windows 2003.

The Emulex STORPort configuration tool (lpUtilNT.EXE/lpUtil64.EXE) for Windows 2003 is described under "lpUtilNT.EXE and lpUtil64.EXE versions" on page 210.

For driver versions 2.11a2 and earlier, edit the Windows 2000 registry as described under "Editing the Windows time-out value" on page 192 before performing the procedures described in this section.

After the Emulex driver is installed, a new Programs Menu shortcut appears for the Emulex Configuration Tool (elxcfg.exe), which is a small graphical user interface (GUI) that allows the user to make setup changes to installed Emulex adapters.

Currently, multiple versions of the Emulex Configuration Tool are available, providing different choices to auto-configure the driver with EMC-approved settings. Each version configures optimal settings for all EMC-supported PowerPath and ATF/CDE configurations. Configurations without PowerPath or ATF/CDE should use only the latest configuration tool. The EMC auto-configure options and the settings of each configuration tool are described under "ELXCFG.EXE": "Versions" on page 195.

EMC recommends using the latest configuration tool, which offers seamless connectivity to both Symmetrix, VNX series, and CLARiiON storage systems.

IMPORTANT

Failure to apply the correct EMC settings described in this section can result in unexpected device behavior, and can inhibit failover software from working correctly.

ELXCFG.EXE

Versions   This section describes the supported versions of ELXCFG.EXE.

ELXCFG.EXE v1.41a2 of the configuration tool allows you to enable adapter settings to connect to a Symmetrix, VNX series and CLARiiON from the same host while using separate adapters. The EMC configuration options for this version are shown in Figure 159 on page 207 and Figure 160 on page 207.

Version 1.41a2 is included with the VNX series and CLARiiON and EMC/Emulex distributions of the LPX 2.11a2 driver. If it detects a VNX series, CLARiiON, or Symmetrix array, it will automatically mask some of the checkbox selections, and will present a six-choice dialog box under the Configuration-Set menu.

As the settings below are in the Bus/Slot configuration, each adapter can be used to connect to either a Symmetrix, VNX series, or CLARiiON with the EMC-recommended settings. A single adapter cannot connect to both arrays simultaneously.

All adapter global settings are Emulex defaults, with the exception of the following:

◆ All Symmetrix choices are set in Bus/Slot and use Emulex default of MaximumQueueDepth=8, and set MaximumLun=255.

◆ All CLARiiON choices are set in Bus/Slot and use WaitReady=10, LinkDown=10, MaximumQueueDepth=32, UniqueNodeWwns=1, ShowUnknowns=1, MultipleScsiClaims=1, BrokenRscn=1, MaximumLun=32.

◆ Symmetrix arbitrated loop (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed), WaitReady=60, LinkDown=10)

◆ Symmetrix arbitrated loop w/PowerPath (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed), WaitReady=10, LinkDown=10)

◆ Symmetrix fabric (InitLinkFlags=0x00000002 (fabric, auto-link speed), WaitReady=60, LinkDown=10)

◆ Symmetrix fabric w/PowerPath (InitLinkFlags=0x00000002 (fabric, auto-link speed), WaitReady=10, LinkDown=10)

- CLARiiON arbitrated loop
  (InitLinkFlags=0x01000000 (arbitrated loop, 1 Gb/s))

- CLARiiON fabric
  (InitLinkFlags=0x01000002 (fabric, 1 Gb/s))

ELXCFG.EXE v1.41a3 of the configuration tool allows you to enable adapter settings to connect to a Symmetrix, VNX series, and CLARiiON from the same host while using the same adapter.

The EMC configuration options for this version are shown in the figure under Figure 160 on page 207.

Version 1.41a3 is distributed separately, and is labeled **EMC universal configuration tool for Symmetrix and VNX series, and CLARiiON**. To enable custom EMC array configuration settings, a user must start the utility with a command line option of -**- emc**. Refer to "Updating the shortcut" on page 203.

The EMC array auto-configuration settings are no longer presented automatically as the configuration tool will no longer auto-detect if an EMC array is present on the fabric. If the **-- emc** option is enabled, the configuration tool will automatically mask some of the checkbox selections, and will present a four-choice EMC array auto-configuration dialog box under the **Configuration-Set** menu.

The settings noted below are modified for the global driver defaults and apply to all adapters in the system. This enables the same adapter to connect to a Symmetrix, VNX series, or CLARiiON from the same host while using the same adapter. All adapter global settings are Emulex defaults, with the exception of the following:

- MaximumQueueDepth=32, MaximumLun=255, UniqueNodeWwns=1,
  ShowUnknowns=1, MultipleScsiClaims=1, BrokenRscn=1

- EMC arbitrated loop without EMC PowerPath/ATF
  (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed),
  WaitReady=60, LinkDown=45)

- EMC arbitrated loop with EMC PowerPath/ATF
  (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed),
  WaitReady=10, LinkDown=10)

- EMC fabric without EMC PowerPath/ATF
  (InitLinkFlags=0x00000002 (fabric, auto-link speed),
  WaitReady=60, LinkDown=45)

◆ EMC fabric with EMC PowerPath/ATF
  (InitLinkFlags=0x00000002 (fabric, auto-link speed),
  WaitReady=10, LinkDown=10)

ELXCFG.EXE v1.41a4 enables adapter settings to connect to a Symmetrix, VNX series, or CLARiiON from the same host while using the same adapter. This version is distributed separately, and is labeled **EMC universal configuration tool for Symmetrix, VNX series, or CLARiiON**. To enable custom EMC array configuration settings, a user must start the utility with a command line option of **--emc**. Refer to .

The EMC array auto-configuration settings are no longer presented automatically as the configuration tool will no longer auto-detect if an EMC array is present on the fabric. If the **-- emc** option is enabled, the configuration tool will automatically mask some of the checkbox selections, and will present a four-choice EMC array auto-configuration dialog box under the **Configuration-Set** menu.

These settings noted below are modified for the global driver defaults and apply to all adapters in the system. This enables the same adapter to connect to a Symmetrix, VNX serie, or CLARiiON from the same host while using the same adapter.

The EMC choices will reset the link-speed to **Auto**. Manually modifying the link-speed later will no longer remove the checkbox from the EMC auto-configuration choices.

All adapter global settings are Emulex defaults, with the exception of the following:

◆ MaximumQueueDepth=32, MaximumLun=255,
  UniqueNodeWwns=1,
  ShowUnknowns=1, MultipleScsiClaims=1, BrokenRscn=1,
  NameServerDelay=800ms, Windows Disk Class Driver
  Timeout=60s

◆ EMC arbitrated loop without EMC PowerPath/ATF
  (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed),
  WaitReady=45, LinkDown=45)

◆ EMC arbitrated loop with EMC PowerPath/ATF
  (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed),
  WaitReady=10, LinkDown=10)

◆ EMC fabric without EMC PowerPath/ATF
  (InitLinkFlags=0x00000002 (fabric, auto-link speed)
  WaitReady=45, LinkDown=45)

◆ EMC fabric with EMC PowerPath/ATF
(InitLinkFlags=0x00000002 (fabric, auto-link speed),
WaitReady=10, LinkDown=10)

ELXCFG.EXE v1.41a5 ELXCFG.EXE has the same settings as v1.41a4,
and is packaged with the 2.13a4 driver.

ELXCFG.EXE v1.41a6 enables adapter settings to connect to a
Symmetrix, VNX series, or CLARiiON from the same host while
using the same adapter. This version is distributed separately, and is
labeled **EMC universal configuration tool for Symmetrix, VNX
series, or CLARiiON**. To enable custom EMC array configuration
settings, a user must start the utility with a command line option of **--
emc**. Refer to "Updating the shortcut" on page 203.

The EMC array auto-configuration settings are no longer presented
automatically as the configuration tool will no longer auto-detect if
an EMC array is present on the fabric. If the **-- emc** option is enabled,
the configuration tool will automatically mask some of the checkbox
selections, and will present a four-choice EMC array
auto-configuration dialog box under the **Configuration-Set** menu.

These settings noted below are modified for the global driver defaults
and apply to all adapters in the system. This enables the same
adapter to connect to a Symmetrix, VNX series, or CLARiiON from
the same host while using the same adapter.

The EMC choices will reset the link-speed to **Auto**. Manually
modifying the link-speed later will no longer remove the checkbox
from the EMC auto-configuration choices.

All adapter global settings are Emulex defaults, with the exception of
the following:

◆ MaximumQueueDepth=32, MaximumLun=255,
UniqueNodeWwns=1,
ShowUnknowns=1, MultipleScsiClaims=1, BrokenRscn=1,
NameServerDelay=1500ms, Windows Disk Class Driver
Timeout=60s

◆ EMC arbitrated loop without EMC PowerPath/ATF
(InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed),
WaitReady=45, LinkDown=45)

◆ EMC arbitrated loop with EMC PowerPath/ATF
(InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed),
WaitReady=10, LinkDown=10)

- EMC fabric without EMC PowerPath/ATF
  (InitLinkFlags=0x00000002 (fabric, auto-link speed),
  WaitReady=45, LinkDown=45)

- EMC fabric with EMC PowerPath/ATF
  (InitLinkFlags=0x00000002 (fabric, auto-link speed),
  WaitReady=10, LinkDown=10)

ELXCFG.EXE v1.41a10 enables adapter settings to connect to a
Symmetrix, VNX series, or CLARiiON from the same host while
using the same adapter. This version is distributed with the 2.20a12
and 2.21a0 drivers and is installed from the included Application Kit.
Starting with this version of the configuration tool, as part of a visual
change only, the EMC settings will no longer mask out the
reconfigured generic checkbox options.

To enable custom EMC array configuration settings, a user must start
the utility with a command line option of **-- emc**. Refer to "Updating
the shortcut" on page 203.

The EMC array auto-configuration settings are no longer presented
automatically as the configuration tool will no longer auto-detect if
an EMC array is present on the fabric. If the **-- emc** option is enabled,
the configuration tool will automatically mask some of the checkbox
selections, and will present a four-choice EMC array
auto-configuration dialog box under the **Configuration-Set** menu.

These settings noted below are modified for the global driver defaults
and apply to all adapters in the system. This enables the same
adapter to connect to a Symmetrix, VNX series, or CLARiiON from
the same host while using the same adapter.

The EMC choices will reset the link-speed to **Auto**. Manually
modifying the link-speed later will no longer remove the checkbox
from the EMC auto-configuration choices.

All adapter global settings are Emulex defaults, with the exception of
the following:

- MaximumQueueDepth=32, MaximumLun=255,
  UniqueNodeWwns=1,
  ShowUnknowns=1, MultipleScsiClaims=1, BrokenRscn=1,
  Windows Disk Class Driver Timeout=60s

- EMC arbitrated loop without EMC PowerPath/ATF
  (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed),
  WaitReady=45, LinkDown=45, TranslateQueueFull=1)

- EMC arbitrated loop with EMC PowerPath/ATF
  (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed),
  WaitReady=10, LinkDown=10)

- EMC fabric without EMC PowerPath/ATF
  (InitLinkFlags=0x00000002 (fabric, auto-link speed),
  WaitReady=45, LinkDown=45, TranslateQueueFull=1)

- EMC fabric with EMC PowerPath/ATF
  (InitLinkFlags=0x00000002 (fabric, auto-link speed),
  WaitReady=10, LinkDown=10)

ELXCFG.EXE v1.41a13 `ELXCFG.EXE` v1.41a13 has the same settings
as v1.41a10, and is packaged with the 2.21a7 driver kit.

ELXCFG.EXE v1.41a14 enables adapter settings to connect to a
Symmetrix, VNX series, or CLARiiON from the same host while
using the same adapter. This version is distributed with the 2.22a8
driver and is installed from the included Application Kit.

To enable custom EMC array configuration settings, a user must start
the utility with a command line option of **-- emc**. Refer to "Updating
the shortcut" on page 203.

The EMC array auto-configuration settings are no longer presented
automatically as the configuration tool will no longer auto-detect if
an EMC array is present on the fabric. If the **-- emc** option is enabled,
the configuration tool will automatically mask some of the checkbox
selections, and will present a four-choice EMC array
auto-configuration dialog box under the **Configuration-Set** menu.

These settings noted below are modified for the global driver defaults
and apply to all adapters in the system. This enables the same
adapter to connect to a Symmetrix, VNX series, or CLARiiON from
the same host while using the same adapter. The EMC choices will
reset the link-speed to **Auto**. Manually modifying the link-speed later
will no longer remove the checkbox from the EMC
auto-configuration choices.

All adapter global settings are Emulex defaults, with the exception of
the following:

- MaximumQueueDepth=32, MaximumLun=255,
  UniqueNodeWwns=1,
  ShowUnknowns=1, MultipleScsiClaims=1,BrokenRscn=1,
  Windows Disk
  Class Driver Timeout=60s

- EMC arbitrated loop without EMC PowerPath/ATF

- (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed), WaitReady=45, LinkDown=45, TranslateQueueFull=1)

- EMC arbitrated loop with EMC PowerPath/ATF (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed), WaitReady=10, LinkDown=10, TranslateQueueFull=1)

- EMC fabric without EMC PowerPath/ATF

- (InitLinkFlags=0x00000002 (fabric, auto-link speed), WaitReady=45, LinkDown=45, TranslateQueueFull=1)

- EMC fabric with EMC PowerPath/ATF (InitLinkFlags=0x00000002 (fabric, auto-link speed), WaitReady=10, LinkDown=10, TranslateQueueFull=1)

ELXCFG.EXE v1.41a15 enables adapter settings to connect to a Symmetrix, VNX series, or CLARiiON from the same host while using the same adapter. This version is distributed with the 2.22a8 driver and is installed from the included Application Kit.

To enable custom EMC array configuration settings, a user must start the utility with a command line option of **-- emc**. Refer to .

The EMC array auto-configuration settings are no longer presented automatically as the configuration tool will no longer auto-detect if an EMC array is present on the fabric. If the **-- emc** option is enabled, the configuration tool will automatically mask some of the checkbox selections, and will present a four-choice EMC array auto-configuration dialog box under the **Configuration-Set** menu.

These settings noted below are modified for the global driver defaults and apply to all adapters in the system. This enables the same adapter to connect to a Symmetrix, VNX series, or CLARiiON from the same host while using the same adapter.

The EMC choices will reset the link-speed to **Auto**. Manually modifying the link-speed later will no longer remove the checkbox from the EMC auto-configuration choices.

All adapter global settings are Emulex defaults, with the exception of the following:

- MaximumQueueDepth=32, MaximumLun=255, UniqueNodeWwns=1, ShowUnknowns=0, MultipleScsiClaims=1, BrokenRscn=1, Windows Disk Class Driver Timeout=60s

> **Note:** ShowUnknowns has been set to 0 to match the Emulex default for non-EMC drivers.

- ◆ EMC arbitrated loop without EMC PowerPath/ATF (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed), WaitReady=45, LinkDown=45, TranslateQueueFull=1

- ◆ EMC arbitrated loop with EMC PowerPath/ATF (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed), WaitReady=10, LinkDown=10, TranslateQueueFull=1)

- ◆ EMC fabric without EMC PowerPath/ATF (InitLinkFlags=0x00000002 (fabric, auto-link speed), WaitReady=45, LinkDown=45, TranslateQueueFull=1)

- ◆ EMC fabric with EMC PowerPath/ATF (InitLinkFlags=0x00000002 (fabric, auto-link speed), WaitReady=10, LinkDown=10, TranslateQueueFull=1)

Beginning with STORPort driver version 1.10a4, EMC has changed the default value of the CoalesceMsCnt parameter to '0'. This change was implemented to improve driver performance.

ELXCFG.EXE v1.41a16 enables adapter settings to connect to a Symmetrix, VNX series, or CLARiiON from the same host while using the same adapter. This version is distributed with the 2.30a2 driver and is installed from the included Application Kit.

To enable custom EMC array configuration settings, a user must start the utility with a command line option of **-- emc**. Refer to .

The EMC array auto-configuration settings are no longer presented automatically as the configuration tool will no longer auto-detect if an EMC array is present on the fabric. If the **-- emc** option is enabled, the configuration tool will automatically mask some of the checkbox selections, and will present a four-choice EMC array auto-configuration dialog box under the **Configuration-Set** menu.

These settings noted below are modified for the global driver defaults and apply to all adapters in the system. This enables the same adapter to connect to a Symmetrix, VNX series, or CLARiiON from the same host while using the same adapter.

The EMC choices will reset the link-speed to **Auto**. Manually modifying the link-speed later will no longer remove the checkbox from the EMC auto-configuration choices.

All adapter global settings are Emulex defaults, with the exception of the following:

◆ MaximumQueueDepth=32, MaximumLun=255, UniqueNodeWwns=1, ShowUnknowns=0, MultipleScsiClaims=1,BrokenRscn=1, Windows Disk Class Driver Timeout=60s

Note: ShowUnknowns has been set to 0 to match the Emulex default for non-EMC drivers.

◆ EMC arbitrated loop without EMC PowerPath/ATF (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed), WaitReady=45, LinkDown=45, TranslateQueueFull=1

◆ EMC arbitrated loop with EMC PowerPath/ATF (InitLinkFlags=0x00000000 (arbitrated loop, auto-link speed), WaitReady=10, LinkDown=10, TranslateQueueFull=1)

◆ EMC fabric without EMC PowerPath/ATF (InitLinkFlags=0x00000002 (fabric, auto-link speed), WaitReady=45, LinkDown=45, TranslateQueueFull=1)

◆ EMC fabric with EMC PowerPath/ATF (InitLinkFlags=0x00000002 (fabric, auto-link speed), WaitReady=10, LinkDown=10, TranslateQueueFull=1)

Beginning with STORPort driver version 1.10a4, EMC has changed the default value of the CoalesceMsCnt parameter to '0'. This change was implemented to improve driver performance.

ELXCFG.EXE v1.41a17 `ELXCFG.EXE` v1.41a17 has the same settings as v1.41a16 and is packaged with the 2.40a2, 2.40a3, 2.41a1, and 2.42a0 driver kits.

Updating the shortcut   Depending on the driver version, you might have to manually update the utility menu shortcut to make the EMC settings available.

To do this, edit the Windows shortcut that was created by the utility. Change the target path and add **--emc** after `elxcfg.exe`, as follows:

If the full line is in quotation marks, make sure the **--emc** is not within the quotation marks.

Example: `"<path>...\elxcfg.exe" --emc`

◆ Driver versions 2.13a4 and earlier:

a. From the Windows desktop, follow this path:

     – Windows 2000, Windows 2003:

     Start> Programs> Emulex Configuration Tool

     Right-click **Emulex Configuration Tool** and select

     Properties from the pop-up menu.

b. Modify the shortcut as follows:

```
c:\winnt\system32\elxcfg.exe --emc
```

(where -- is two dashes).

◆ Driver versions 2.20a12 and 2.21a0:

a. From the Windows desktop, follow this path:

     – – Windows 2000, Windows 2003:

     Start > Programs > ELXCFG

     Right-click **ELXCFG** and select **Properties** from the
     pop-up menu.

b. Modify the shortcut as follows:

```
"c:\Program Files\HBAnyware\elxcfg.exe" --emc
```

(where -- is two dashes).

◆ Driver version 2.21a7 — The shortcut created with the 2.21a7
application kit does not allow direct editing, as it is not a shortcut
but rather a Microsoft token reference.

To create the necessary EMC shortcut:

a. Browse to c:\Program Files\HBAnyware\ and right-click the
ELXCFG.EXE icon. Select **Create shortcut** from the popup
menu.

b. Once the shortcut is created, right-click it and select **Properties**
from the pop-up menu.

c. Modify the shortcut target as follows:

```
"c:\Program Files\HBAnyware\elxcfg.exe" --emc
```

where -- is two dashes

d. Select **OK** to apply the changes.

e. Copy this shortcut to the programs menu or to the desktop.
You must use this shortcut when starting the ELXCFG.EXE
configuration tool.

Removing old versions
With the 2.20a12 driver and Application Kit, the location of the configuration tools have changed, and you will need to manually remove any previous configuration tool versions. For drivers prior to 2.20a12, delete the old configuration tool, %systemroot%\system32\elxcfg.exe.

Launch the new configuration tool using the **ELXCFG** menu shortcut created by the Application Kit install. Refer to "Updating the shortcut" on page 203.

Changing the configuration

To change your configuration:

1. From the Windows taskbar, click **Start> Programs> Emulex Configuration Tool**.

   The tool opens to a window similar to the following figure displaying the available adapters in the upper-left corner.

   Some versions of the configuration tool might have cosmetic differences, such as masking out the generic checkbox options on the right-hand side. These changes do not modify the behavior of the configuration tool. Refer to *"ELXCFG.EXE"*, "Versions" on page 195 for a complete list of the settings for each version of the configuration tool.
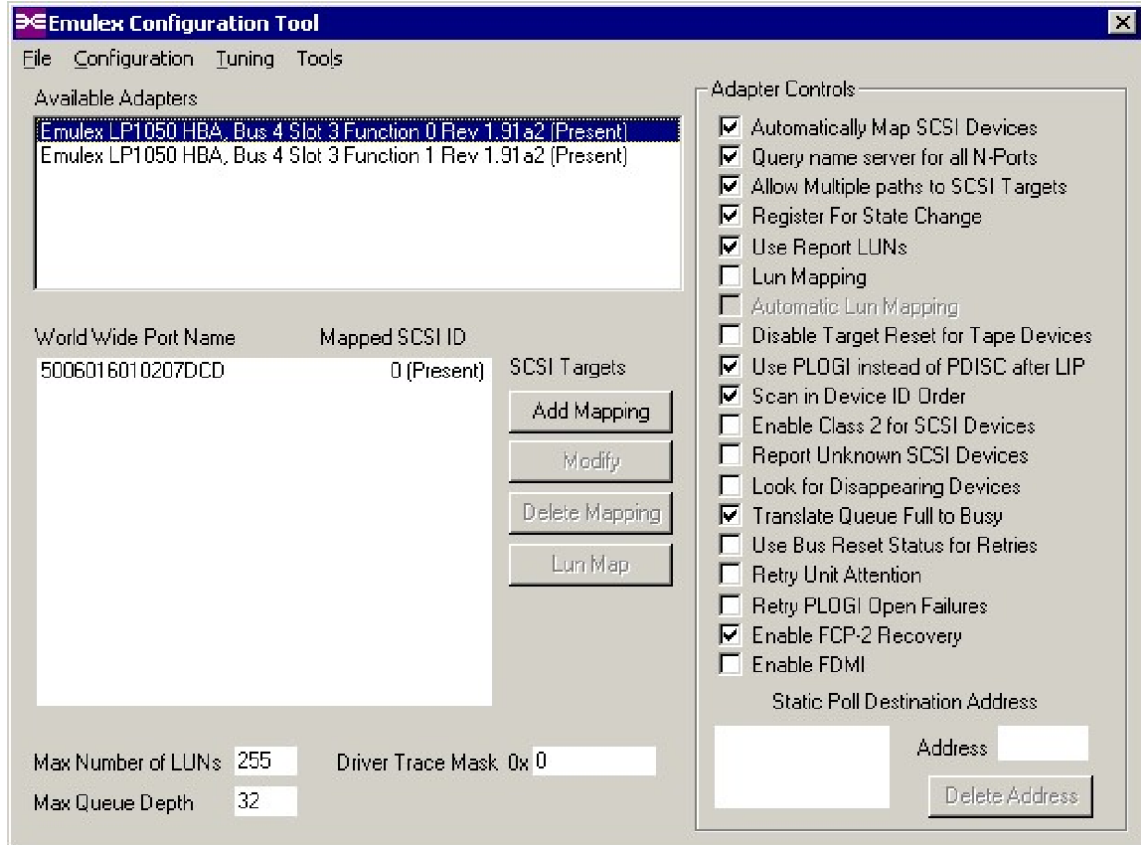
Figure 158   Emulex Configuration Tool window

Note: EMC recommends not changing the settings of any of the checkboxes located in the right pane of the configuration tool window.

2. Click the adapter you wish to modify.

To configure the EMC array settings automatically, click **Configuration** at the top of the configuration tool window; then select the **Set** option. A window similar to one of the following appears:
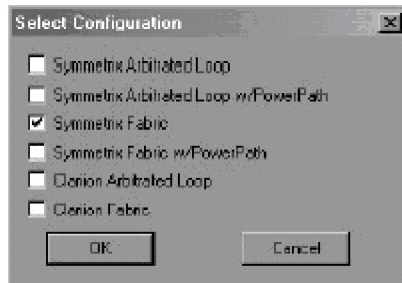
Figure 159   Version 1.41a2 options
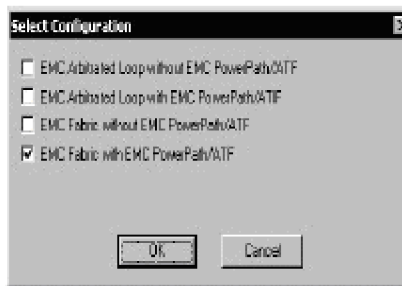
Figure 160   Version 1.41a3 and later options

3. Check the box associated with the configuration you intend to use, and click **OK**.

   With ELXCFG v1.41a3 or later, if you are using a VNX series or CLARiiON CDE configuration, select the equivalent ATF configuration from the list.

Table 4 shows the preconfigured settings. EMC recommends not changing the values of these parameters from their default settings unless it is necessary.

Table 4　　　Preconfigured settings

Adapter Controls	
Automatically Map SCSI Devices	Enabled (checked)
Allow Multiple paths to SCSI Targets	Enabled (checked)
Use Report LUNs	Enabled (checked)
Other Parameters	
Maximum Number of LUNs [a]	Refer to *"ELXCFG.EXE"*, *"Versions"* on page 195
Maximum Queue Depth	Refer to *"ELXCFG.EXE"*, *"Versions"* on page 195
Wait Ready Timer	Refer to *"ELXCFG.EXE"*, *"Versions"* on page 195
Link Down Timer	Refer to *"ELXCFG.EXE"*, *"Versions"* on page 195
E_D_TOV	2000 ms
R_A_TOV	2 sec
AL_TOV	15 ms
ARB_TOV	1000 ms

a. Driver version 2.01a0 and later requires this value to be set to 255 in order to see 256 LUNs (LUN 0 through LUN 255).

Timer values that can be changed are located under the Tuning menu at the top of the configuration tool window. By highlighting an adapter from the Available Adapters list and selecting the Timers option from the Tuning menu, the following window appears.

Note: EMC recommends using the configuration menu to set these values.

Figure 161   Timer settings

Repeat steps 2 and 3 for any other installed adapters you need to configure.

4. Close the configuration tool by selecting Exit on the File menu at the top of the configuration tool window.

5. Reboot the server for configuration changes to take effect.

    For VNX series or CLARiiON configurations in which the array is running in legacy mode, if the array commonpath parameter is disabled (set to '0') then you must use the Emulex configuration tool (ELXCFG.EXE) to re-enable the **Report Unknown SCSI Devices** option. Apply the settings if you need to use Unisphere/Navisphere Agent before and valid LUNs are assigned to the host. This procedure is unnecessary if valid LUNs are assigned to the host, or if the array commonpath parameter is set to '1' (default setting).

MSCS with tape devices

If using MSCS cluttering on the same host to which you have connected a tape device, EMC recommends enabling Disable reset for tape devices by selecting the checkbox in the config tool. This will prevent bus resets from MSCS intended for disk devices to also be applied to tape devices.

lpUtilNT.EXE and lpUtil64.EXE versions

This section describes the supported versions of lpUtilNT.EXE and lpUtil64.EXE.

The complete STORPort driver settings are contained in the default install, and you do not need to run the Emulex STORPort configuration tool to apply any additional settings. The tools below can be used to apply manual configuration changes and view host target bindings, and other useful adapter information.

v1.6a9

This version is included with the 1.00a15 Emulex STORPort driver.

v1.7a4

This version is included with the 1.01a8 and 1.01X1 Emulex STORPort drivers.

v1.7a16

This version is included with the 1.02a3 Emulex STORPort driver.

v1.8a1

This version is included with the 1.03a7 Emulex STORPort driver.

v1.8a2

This version is included with the 1.03a9 Emulex STORPort driver.

v1.8a11

This version is included with the 1.10a4 Emulex STORPort driver.

v1.8a18

This version is included with the 1.11a0, 1.11a3, 1.20a3, and 1.30a6 Emulex STORPort drivers.

v. 1.8a19

This version is included with the 1.30a9 Emulex STORPort driver.

Configuring multiple Fibre Channel topologies on a host

EMC supports configurations where different Fibre Channel topologies exist on a single host, so when installing an adapter it might be necessary to change the Fibre Channel topology setting. This can be accomplished using the Emulex Configuration Tool.

Refer to the *EMC Support Matrix* for EMC-approved mixed topology configurations.

Windows 2000 and Windows 2003 with SCSIPort

On Windows 2000 and Windows 2003 SCSIPort systems, the adapter topology is configured via the ELXCFG.EXE Configuration Tool.

Note: For Windows 2003 with STORPort, refer to "Required Windows STORPort updates" on page 183.

The following steps describe how to configure different topologies for adapters installed in a single server.

To change the default topology:

1. From the Windows taskbar, click **Start > Programs > Emulex Configuration Tool**. The tool opens to a window similar to "Emulex configuration tool" on page 212.
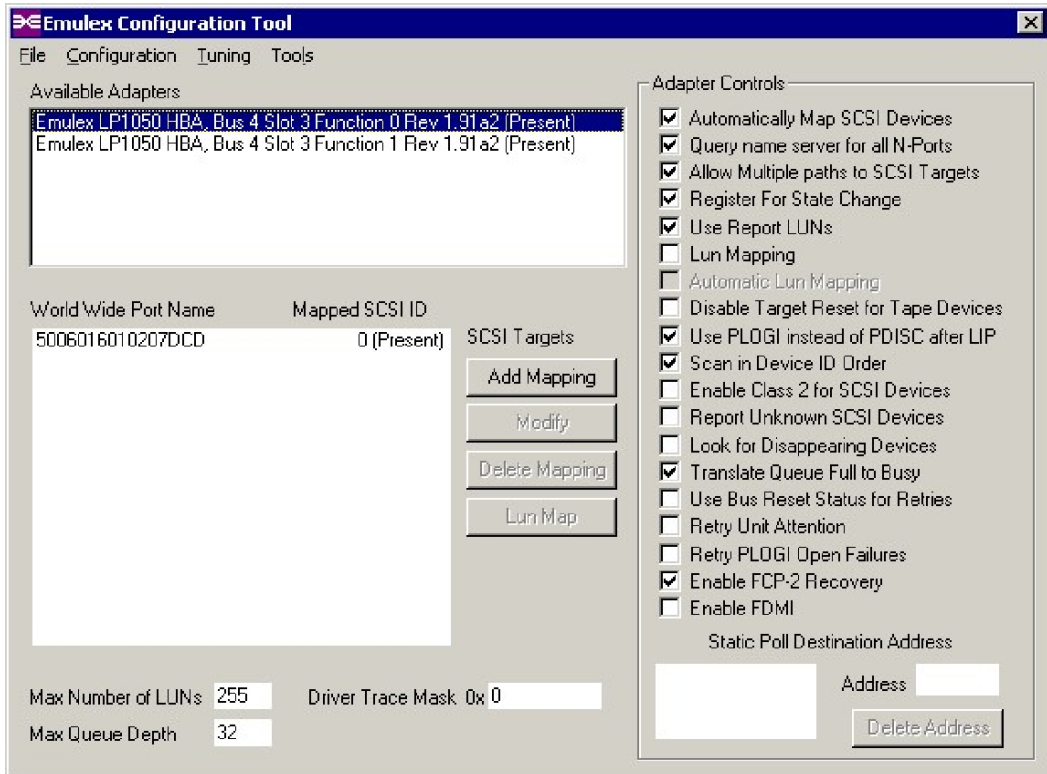
Figure 162   Emulex configuration tool

2. From the Available Adapters list, click the adapter you wish to change.

   You can use the automatic settings (described under "Using the Emulex configuration tool" on page 194), which set the topology and resets all settings to the EMC defaults. If you want to change the topology, follow the remaining steps below.

3. From the **Tuning** menu at the top of the configuration tool, select the **Link Control** option.

4. Select the appropriate topology for the adapter and click **OK**.

5. Select the **Apply** option from the **File** menu at the top of the configuration tool.

6. Select the **Exit** option from the **File** menu.

7. Reboot the host.

8. After the system has rebooted, make sure the adapter is set properly and is able to see the disk drives in the EMC storage array.

Boot-from-SAN configuration restrictions

Refer to the *EMC Support Matrix* for any specific boot-from-SAN restrictions. This guide no longer contains restriction information, and the information in the *EMC Support Matrix* supersedes any restriction references found in previous adapter installation guides.

Further information on booting Microsoft Windows from external storage can be found in the *Windows Host Connectivity Guide*.

Benefits of booting from the storage array

Benefits of storage-based booting include:

◆ Faster replacement/addition of server capacity, enabled by separation of the boot image from the server.

◆ Lower investment in internal server-based RAID cards with limited capability.

◆ Leveraged investment in the storage network through the high availability, data integrity, and storage management of an external RAID storage system.

◆ Leveraged commodity high-density server technology and centralized storage offered by diskless servers using SAN-attached storage systems.

Booting from the EMC storage array works effectively with certain SAN-based environments, including multiserver redundant applications, Web farms, and terminal server applications where an *n+1* server environment protects customers against different types of failures.

Some applications may not be optimized for storage array-based booting. EMC strongly recommends that customers fully investigate their application and data availability requirements and consult with an EMC account team to determine the configuration that best meets their needs.

Preparing the boot disk partitions

Definitions

The definitions of the GPT-type partitions are:

◆ **Msres**: The Microsoft reserved partition for feature support that is used to convert a basic disk to dynamic.

◆ **fisys**: The EFI system partition that is required for boot operations.

◆ **Msdata**: The user data partition that is used by Microsoft Windows.

An EFI System Partition (ESP) is required prior to installing the OS. If you are installing on a raw disk that was not used prior it may not have an ESP partition. Using the EFI "vol" command will show this partition label as "EFIPART".

The EFI System Partition (ESP) is required to boot the OS. It is the first partition, uses 100 MB of disk space, and should only be used for EFI drivers and OS system files.

The Microsoft Reserved Partition (MSR) is required by Windows on the boot drive and all the data drives. The MSR uses 32 MB on hard disk drives less than 16 GB in size and uses 128 MB on hard disk drives 16 GB or greater in size. This partition is hidden from the EFI "vol" command. This partition will be created by the Windows installer if it is not manually configured.

Msdata is the user data partition that is used by Microsoft Windows. This partition will also be created by the Windows installer if not manually created as described below.

To create the GUID partition table partition on a raw disk:

1. Insert the prepared USB drive into the USB port.

2. Boot the server to the EFI shell

3. Navigate to the directory containing diskpart.efi.

To create a GPT partition from a raw disk by using the Diskpart utility:

1. At a command prompt, type **diskpart** to start the Diskpart utility. "Diskpart version 0.0" is displayed as well as a Diskpart prompt.

2. At the prompt, type: **list** to list the mounted hard drive volumes.

3. At the prompt, type: select x (where x is the number of the hard disk drive that you want to convert to GPT). The following information is displayed: **"Selected Disk = x"**.

4. At the prompt, type **new gpt** to add the GPT information into the non-volatile RAM (NVRAM).

   Note: This step does not create the GPT partition information.

5. At the prompt, type **create name="efi system partition" type=efisys Size=102** to create the Extensible Firmware Interface (EFI) partition.

   Note: The name can be anything you want, but if the name has spaces in it, the name must have quotes around it. The type must equal either Efisys, Msres, or Msdata. If a size is not specified, the partition uses the remaining unpartitioned space. To install Windows, the Msdata partition must contain at least 2 gigabytes (GB) of free space.

6. At the prompt, type **create name="microsoft reserved" type=msres Size=3**1 to create the MSR partition.

7. At the prompt, type **create name="basic data" type=msdata** to create a partition for the remaining unpartitioned space.

8. At the prompt, type **inspect** to display the partition information.

9. At the prompt, type **exit** to quit the Diskpart utility.

To install Windows on an external SAN disk using an EFI RAMDISK, refer to

Emulex HBA API library information

SP1 or later for Windows 2003 is not required for the 1.20xx driver, but is recommended.

There are two installation scenarios with respect to STORPort 1.20a3/HBAnyware 3.0 and the Emulex HBA API:

◆ If the Microsoft HBA API has been installed (typically with SP1 or SP2), Emulex does not install the Emulex HBAAPI (emulexhbaapi.dll). In this case, the Microsoft HBA API (hbaapi.dll) is used.

◆ If the Microsoft HBA API has not been installed (typically pre-SP1), Emulex will install the Emulex HBA API in the system folder. If the server is later upgraded to SP1or later, the Microsoft HBA API will replace the Emulex HBA API.

The plan behind these scenarios is that Emulex is moving to using the Microsoft HBA API with HBAnyware and would like customers and software developers to move in that direction rather than depend on the Emulex HBA API. The Microsoft HBA API is expected to become the Windows standard. Emulex is moving away from distributing and supporting the Emulex HBA API.

EMC ControlCenter Host Agent for Windows 5.2 SP4/SP5 (possibly older versions as well) may require that users obtain the Emulex HBAAPI Mini kit which will provide the Emulex HBA API. Use the following link to obtain the API tool:

`http://www.emulex.com/support/windows/tools/windows_tools.html`

Special instructions for CLARiiON CX200-Series

This section contains special instructions to set the adapter FC-AL Loop ID for the CLARiiON CX200-Series.

Set the adapter FC-AL Loop ID

While configuring an Emulex LPx adapter for Windows and connection to EMC CLARiiON CX200-Series for direct-connect cluster configurations, you must manually set the adapter AL_PA (FC-AL Loop ID). Once set, this value will be honored by the adapter and driver throughout the boot process.

In the following steps, you do not need to enable the Boot BIOS or change the default topology settings, since the adapter will not be used as a boot device.

To manually set the AL_PA on each adapter:

Note: This procedure requires a minimum adapter BIOS revision of 1.60a7. If you are not at this minimum revision, update to the latest supported adapter BIOS revision as described under "Updating the flash firmware/BIOS" on page 30.

Note: Perform this procedure on all nodes in the cluster connected to the CX200-Series array.

Note: Future firmware upgrades will *not* overwrite changes made using this procedure.

1. Reboot the server; when the Emulex BIOS banner (shown below) appears, press **Alt–E** to start the BIOS utility:

   ```
   !!! EMULEX LP8000 BIOS, Copyright xxxx !!! xB1.60A7
   Press <Alt E> To Go To EMULEX BIOS Utility
   Press <s> To Skip EMULEX BIOS
   ```

   If you miss the banner, reboot and try again.

2. To query an adapter, select the adapter number from the BIOS utility's main menu (shown in the following example). When you are querying all adapters, start with the first adapter:

```
Emulex Light Pulse BIOS Utility, xB 1.60A7
Copyright  xxxx

Emulex Adapters in this system

1. LP8000: ALPA: 01(NVRAM ALPA: 01)  PCI Bus #:02 PCI Device #:04
2. LP8000: ALPA: 01(NVRAM ALPA: 01)  PCI Bus #:01 PCI Device #:03

Enter a Selection:
```

3. A banner similar to the following appears, displaying the port and node name for this adapter:

```
LPx000: I/O Base: 3400 Firmware Version: xS 3.20X4
Port Name: 10000000 C8B0D022  Node Name: 20000000 C8B0D022
Topology: FC-AL

1. Configure Boot Devices
2. Configure This Adapter's Parameters
```

Type **2** and press **Enter** to configure the parameters for the adapter you selected.

4. The following adapter configuration menu appears:

```
1. Enable or Disable BIOS
2. Change Default ALPA of this Adapter
3. Change PLOGI Retry Timer <+Advanced Option+>
4. Topology Selection <+Advanced Option+>
5. Enable or Disable Spinup Delay <+Advanced Option+>
6. Auto Scan Setting <+Advanced Option+>
7. Enable or Disable EDD 3.0 <+Advanced Option+>
```

Type **2** and press **Enter** to select **Change Default ALPA of this Adapter**.

5. Enter a new AL_PA and press **Enter**.

Note: Adapters connected to the same SP should all have unique AL_PAs. Select **01** for all adapters on one node, select **02** for all adapters on the next node, and so on.

> **Note:** Only valid FC-AL AL_PAs in hex are accepted. If you receive an `Invalid ALPA` error message, retry with a valid AL_PA (for example: 01, 02, 04, 08, 10, and so on).

6. Press PAGE UP three times to return the adapter selection menu.

7. Repeat steps 2 through 6 for each adapter.

8. When you have completed setting the AL_PA for each adapter, press X to reboot the host.

9. Repeat this procedure on all nodes in the cluster connected to the CX200-Series array.

> **Note:** To restore the default EMC value (**01**) for the AL_PA, repeat step 5 and select an AL_PA of **01** for each adapter.

> **Note:** Pressing D in step 3 resets the AL_PA to the last set value, but will not reset the value to the EMC default if it was previously changed.

3

Troubleshooting

This chapter contains the following information for troubleshooting, problems, and issues.

Basic troubleshooting steps

You can follow this sample procedure for some basic troubleshooting steps if your configuration is not working as expected. The procedure below starts at the lowest layer in the host LUN detection sequence and should be followed in order, moving to the next step only when the current step appears correct.

1. Check that adapter has initialized, adapter driver is loaded, array targets were discovered, and LUNs were discovered by the adapter. This can be done in HBAnyware as follows:

   • Verify adapter properties for driver loaded: Link Status should be Operational or show a specific error to correct. Adapter summary section should be complete and driver version information correct.

   • Adapters are shown in the left-hand window. Under each adapter will be discovered targets as well as LUNs on each target. This should match what is expected and should show duplicate LUNs if multiple paths are enabled. If targets or LUNs are missing, verify adapter zoning and array access permissions/ LUN assignments.

2. If all items in step 1 above are as expected, verify that device drivers are assigned correctly by Windows, and that all expected devices are available. This can be done in the Windows Device Manager as follows:

   • Open the Device Manger as noted in . Under disk drives there should be one DGC or EMC disk listed for each device path available. If disks are missing, recheck adapter zoning and access permissions and ensure that LUNs are online from the array. If LUNs appear in HBAnyware, but not in the device manager, it is likely the LUNs are reported as offline by the array (or are unavailable to Windows as inactive BCVs, etc.), or did not have the correct drivers loaded by Windows. If the incorrect disk drivers were loaded, the device may have a "!" beside the icon, and viewing the device properties screen should indicate the actual error.

3. If all items in step 2 appear as expected, verify that PowerPath can access all devices and device paths. This can be done in the PowerPath GUI or **powermt** commands. Refer to "Starting PowerPath GUI for Windows" on page 167 for more information.

   • In the PowerPath GUI or **powermt**, verify that each expected adapter is listed with the expected targets, LUNs, and number of paths per LUN. If paths/LUNs are missing, verify adapter zoning and access permissions, and ensure that correct PowerPath licenses have been installed.

   • If PowerPath is not able to detect all EMC devices listed in the device manager, it is usually due to the devices being offline or not able to be claimed by PowerPath.

   • Devices may also appear in the Device Manager with an "!" and not correctly list some PowerPath drivers as loaded. In these cases it usually means that an incorrect PowerPath license key was used, an unsigned PowerPath beta product was used, or there were errors when installing PowerPath.

   Note: Refer to PowerPath documentation for supported configurations and procedures to correct these conditions.

4. If all items in step 3 (or step 2 if no PowerPath is installed) appear as expected, verify in the Disk Management (previously called disk manager) that all LUNs are available to be accessed and used. To do this, start the Disk Management similar to "Starting disk management for Windows" on page 166 and review as follows:

   • Each array LUN should be represented as a single disk number entry. There should be no duplicate LUN path entries here. If there are, either PowerPath is not functioning correctly or you have not installed PowerPath or multipath software correctly and are using an unsupported multipath configuration.

   • All LUNS should be listed as Online and list the Windows usable raw capacity. Disks may be basic or dynamic if previously used by Windows. Disks that are offline or listed as no capacity are likely system or inactive BCV LUNs, and may appear depending on the state of the LUN. If LUNs that are expected to be usable are offline or do not display the capacity correctly, ensure the LUN is correctly assigned to the host, has not been trespassed to an unavailable path (VNX series or

CLARiiON only), or is marked read-only or offline by the array. LUNs previously assigned to Windows may also appear as foreign disks and can be reactivated if available to the system. If LUNs show errors in this display, refer to the Windows event log to help determine why they are unavailable.

- Here you may also assign partitions, volumes, drive letters, etc., to LUNs available to the system. Once drive letters or mount points are assigned, Windows will have access to use the LUNs. Some applications can use "raw" devices and do not require this step. Refer to your application documentation for how you need to configure LUNs.

Operating system/driver capabilities and limitations

The following capabilities and limitations should be noted for Windows operating systems with Emulex adapters.

LUNs

Theoretically, Windows supports up to 261,120 total LUNs. This figure is based on the listed support limitations for Windows Server from Microsoft: 8 buses per adapter, 128 targets per bus, and 255 LUNs per target. However, due to registry hive limitations, a Windows server is most likely to run out of registry space to keep track of these large LUN counts well before reaching this limit. Windows 2000 has this registry size issue. See Microsoft knowledge-base articles 292726 and 269075 for information. Windows 2003 does not have this issue.

Microsoft Windows limits the number of LUNs per adapter to 255 (LUNs 00-FE) even though the adapters are capable of presenting 256 (LUNs 00-FF). It is a function of the operating system that prevents that last LUN from being presented to the user, and not the adapter or driver. This limitation should be taken into consideration when planning your host configuration.

Based on E-Lab testing, it has been determined that for EMC configurations, Windows servers should be limited to a maximum of 500 LUNs. In most cases, this number will be more than sufficient. In others, it may be deemed too small. For configurations where a large amount of storage is necessary, but not necessarily a large number of disks, EMC storage can be configured to present LUNs of large sizes to the host.
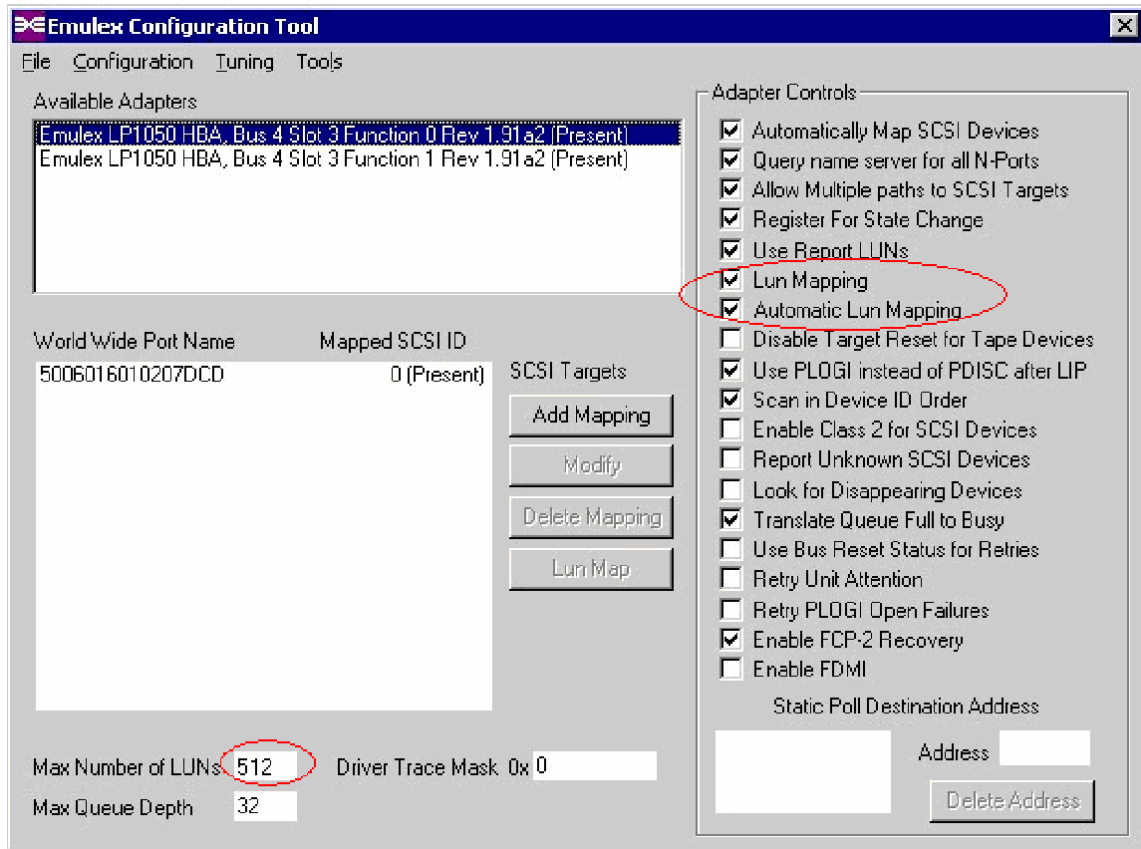
Figure 163   Lun mapping and automatic Lun mapping

Refer to the "Manually installing the adapter driver — Advanced users" on page 183 and your Emulex user guide for more information on using the ELXCFG configuration tool.

STORPort drivers under Windows 2003 are not capable of addressing LUNs above FE as this is a limitation of the operating system.

Volume sizes

Windows 2000 supports a maximum file system size of 2 TB (terabytes.)

Windows 2003 supports a maximum file system size of 2 TB unless Service Pack 1 or later is installed. With SP1 or later, the maximum supported physical disk size is 256 TB. Note that volumes larger than 2 TB must use GPT partitions to support them. Refer to your Windows users guide for information on GPT partitions.

Note: Windows 2003 for x64 servers does not require SP1 or later to create GPT partitions.

EMC storage arrays provide the ability to expand the size of a LUN presented to the host server. Refer to your EMC arrays documentation for procedures on expanding LUN sizes. Windows has the ability to recognize the extra space on these expanded LUNs by performing a rescan via the Disk Administrator window.

Understanding persistent binding

Persistent binding is the mechanism to create a continuous logical route from a storage device object in the Windows host to a volume in the EMC storage array across the fabric.

Without a persistent binding mechanism, the host cannot maintain persistent logical routing of the communication from a storage device object across the fabric to an EMC storage array volume. If the physical configuration of the switch is changed (for example, the cable is swapped or the host is rebooted), the logical route becomes inconsistent, causing possible data corruption if the user application is modifying data through inconsistent logical routing of the communication from the driver entry point to a volume in an EMC storage array across the fabric.

The Windows operating system (OS) does not provide a satisfactory means to allow persistent binding. Most software applications access storage using file systems managed by the Windows OS. (File systems are represented as <drive letter><colon>, that is, **C:**, **D:**, and so forth) For storage devices containing file systems, Windows writes a disk signature to the disk device. The operating system can then identify, and associate with, a particular drive letter and file system.

Since the signature resides on the disk device, changes can occur on the storage end (a cable swap, for example) that can cause a disk device to be visible to the host server in a new location. However, the OS looks for the disk signature and, providing that nothing on the disk changed, associate the signature with the correct drive letter and file system. This mechanism is strictly an operating system feature and is not influenced by the Fibre Channel device driver.

Some software applications, however, do not use the Windows file systems or drive letters for their storage requirements. Instead they access storage drives directly, using their own built-in "file systems." Devices accessed in this way are referred to as *raw devices* and are known as *physical drives* in Windows terminology.

The naming convention for physical drives is simple and is always the same for software applications using them. A raw device under Windows is accessed by the name **\\.\PHYSICALDRIVEXXX**, where **XXX** is the drive number.

For example, a system with three hard disks attached using an Emulex Fibre Channel controller assigns the disks the names **\\.\PHYSICALDRIVE0**, **\\.\PHYSICALDRIVE1**, and **\\.\PHYSICALDRIVE2**. The number is assigned during the disk discovery part of the Windows boot process.

During boot-up, the Windows OS loads the driver for the storage adapters. Once loaded, the OS performs a SCSI **Inquiry** command to obtain information about all the attached storage devices. Each disk drive that it discovers is assigned a number in a *semi-biased* first come, first serve fashion based on adapter. *Semi-biased* means the Windows system always begins with the controller in the lowest-numbered PCI slot where a storage controller resides. Once the driver for the storage controller is loaded, the OS selects the adapter in the lowest-numbered PCI slot to begin the drive discovery process.

It is this naming convention and the process by which drives are discovered that makes persistent binding (by definition) impossible for Windows. Persistent binding requires a continuous logical route from a storage device object in the Windows host to a volume in an EMC storage array across the fabric. As mentioned above, each disk drive is assigned a number in a first-come, first-serve basis. This is where faults can occur.

Example   Imagine this scenario: A host system contains controllers in slots 0, 1, and 2. Someone removes a cable from the Emulex controller in host PCI slot 0, then reboots the host.

During reboot, the Windows OS loads the Emulex driver during reboot and begins disk discovery. Under the scenario presented above, there are no devices discovered on controller 0, so the OS moves to the controller in slot 1 and begins naming the disks it finds, starting with **\\.\PHYSICALDRIVE0**. Any software applications accessing **\\.\PHSYICALDRIVE0** before the reboot will be unable to locate their data on the device, because it changed.

Figure 164 on page 230 shows the original configuration before the reboot. Adapter 0 is in PCI slot 0 of the Windows host. Each adapter has four disk devices connected to it, so Windows has assigned the name **\\.\PHYSICALDRIVE0** to the first disk on Adapter 0. Each disk after that is assigned a number in sequence as shown in Figure 164.
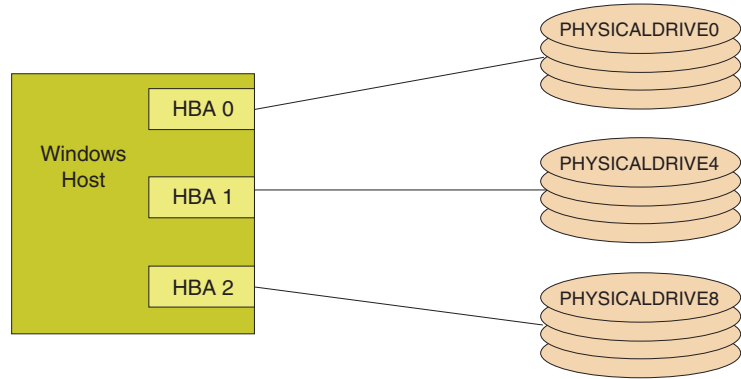
Figure 164   Original configuration before the reboot

Figure 165 shows the same host after the cable attached to adapter0 has been removed and the host rebooted. Since Windows was unable to do a discovery on Adapter 0, it assigned **\\.\PHYSICALDRIVE0** to the first device it discovered. In this case, that first device is connected to Adapter 1. Due to the shift, any software application accessing **\\.\PHYSICALDRIVE0** will not find data previously written on the original **\\.\PHYSICALDRIVE0**.

Figure 165   Host after the rebooted

Note: Tape devices are treated the same as disk devices in Windows with respect to persistent binding. Refer to your tape device documentation for more information.

Understanding queue depth

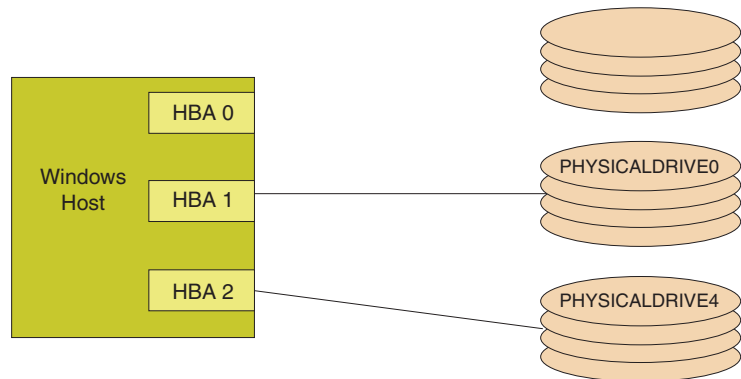Each port on EMC storage arrays has a maximum queue depth. The performance implications in a large fabric environment with many HBAs (initiators) generating I/Os is that a storage port's queue can quickly fill up to the maximum. When this happens, the HBA will be notified by the array with queue full (QFULL) messages and result in very poor response times. Various operating systems deal with queue full differently.

Windows operating systems with STORPort drivers will throttle I/Os down to a minimum in an attempt to prevent filling the queue. When the queue full messages subside, STORPort will increase the queue depth again. This could take up to around a minute in some instances, depending on the load. The performance of the server's applications will be impacted, sometimes to the point of hanging or crashing if it happens repeatedly or for a prolonged amount of time.

In order to avoid overloading the storage array's ports, you can calculate the maximum queue depth using a combination of the number of initiators per storage port and the number of LUNs ESX uses. Other initiators are likely to be sharing the same SP ports, so these will also need to have their queue depths limited. The math to calculate the maximum queue depth is:

QD = Maximum Port Queue Length / (Initiators * LUNs)

For example, there are 4 servers with single HBA ports connected to a single port on the storage array, with 5 LUNs masked to each server. The storage port's maximum queue length is 1600 outstanding commands. This leads to the following queue depth calculation:

HBA Queue Depth = 1600 / (4 * 20)

In this example, the calculated HBA queue depth would be 20. A certain amount of over-subscription can be tolerated because all LUNs assigned to the servers are unlikely to be busy at the same time, especially if additional HBA ports and load balancing software is used. So in the example above, a queue depth of 32 should not cause queue full. However, a queue depth value of 256 or higher could cause performance issues.

Using this example, it is easy to extrapolate the potential performance implications of large server environments with large numbers of servers and initiators. This includes virtualized environments like Hyper-V that use synthetic/virtual Fibre Channel adapters and NPIV

environments, where there are a number of virtual initiators connecting through the same physical HBA port. EMC's approved settings ("ELXCFG.EXE" on page 195) are meant to be guidelines based on qualification test work performed by EMC engineering. Each environment is different, however, so it is important to review and pre-plan your environment, possibly adjusting your queue depth setting to allow for better performance in your environment.

Known issues

Be aware of these issues:

◆ NTOSKNL BSOD (blue screen) during a link down event can cause file system corruption to mounted file systems.

◆ Adapter boot BIOS does not support high availability. A boot attempt during a simultaneous path failure will fail. On VNX series or CLARiiON systems, it also will fail after failure of a path that requires a trespass of the boot LUN. Manual intervention is required to trespass the LUN to the other SP and boot from it.

◆ Degraded response time as the I/O load approaches storage system capacity can make the OS appear hung or result in a NTOSKNL BSOD.

◆ Boot files, Windows system files, and swap space should all be on the boot LUN. With certain server models, you can use an internal disk for the page file for stability; however, this may not increase fault tolerance and might reduce system recovery options.

◆ Swap space must be available on **%SYSTEMROOT%** or core dump will fail.

◆ You can configure any supported adapter for the boot LUN. Higher model-number adapters will appear first in the boot BIOS displays.

◆ Windows 2000 hosts running less than SP4 could be susceptible to data loss during LUN expansion operations. This issue is corrected by Microsoft in SP4, or by applying hotfix 327020. Refer to EMC Solution IS emc73538 and Microsoft Knowledge Base article 327020 for more information.

◆ For Windows 2003 on 64-bit IA64-2 servers, the system no longer uses an x86-compatible BIOS; therefore, enabling boot-from-array support with the adapter requires a separate firmware EFI download.

◆ If using STORPort drivers, you are required to use minimum Microsoft QFE 891793 if you wish to move the page file from the default boot disk to a local disk. You must install the QFE and reboot prior to moving the page file or the server will potentially generate a NTOSKNL BSOD crash. (This is not required on Windows 2003 for X64.)

◆ In configurations where the Emulex LP8000 is connected to storage using Cisco MDS switches, the switch port for the LP8000 is required to be hard-set to 1Gb speed.

◆ For servers booting from the array, a Symmetrix out-of-family microcode load, or a VNX series for block or CLARiiON FLARE® NDU between versions will cause the server to require a reboot. This occurs because Windows requires a reboot when characteristics of the boot LUN change. During the NDU process on EMC storage arrays, the serial number and inquiry VPD data will change to reflect the new code version. When Windows performs a rescan and recognizes this change, it assumes a change has occurred on the boot LUN and will require a reboot.

◆ STORPort 1.20a3 and HBAnyware 3.0 after the FC Port installation or update.

Although not recommended, running multiple Emulex drivers on the same server may be supported by your OEM vendor. The Emulex adapter applications installed with a new driver will supersede previously installed Emulex adapter applications. In some cases, the local management utility (lputilnt or elxcfg) for a previously installed driver will be removed and not superseded. In this case, HBAnyware can be used to manage the previously installed driver on the local server.

Installing or updating FC Port on a server with STORPort Miniport 1.20a3 installed will cause management problems with adapters that use STORPort Miniport. In this case, it will be necessary to reinstall STORPort Miniport 1.20a3 and HBAnyware 3.0 after the FC Port installation or update.

Problems and solutions

This section contains known problems and solutions.

Problem 1
Problem 85340 — Disk manager Rescan Disks does not find MetaLUNs. Windows 2000 requires an OS reboot to size (discover) MetaLUNs. A conventional LUN is sized successfully with a Rescan Disks.

Solution
Upgrade to the latest adapter driver. This was corrected in 2.20a12 and later drivers.

Problem 2
EMC Knowledge base solution emc67559 — Fibre Channel tape devices disappearing under Windows 2000.

Solution
Upgrade to the latest adapter driver. This was corrected in 2.21a0 and later drivers.

Problem 3
EMC Knowledge base solution emc69097 — If using adapters connected to both VNX series or CLARiiON SPs, without PowerPath installed, duplicate LUNs will be visible in the Device Manager and Disk Manager. Only one instance of the LUN will be accessible, and all other matching mappings will be listed as Unknown, Unreadable, and Unallocated.

Solution
This is normal behavior when multiple paths are available, PowerPath is not installed, and the initiator type is registered in PowerPath mode (array default depending on core code revision).

Problem 4
EMC Knowledge base solution emc70952 — While attempting to install the Emulex HBAnyware Application Kit without removing a previously installed Emulex HBAnyware Application Kit, the host may generate the following error:

```
STOP  50 (PAGE FAULT IN NON PAGED AREA).
```

Solution
Uninstall any existing HBAnyware Application Kit before installing an updated HBAnyware Application Kit. This problem was corrected in the application kit contained in the driver package for 2.21a7 and later drivers.

Problem 5

EMC Knowledge base solution emc71483 — Emulex SCSIPort driver 2.21a7 and earlier versions do not support VSS (Microsoft Volume Shadow Copy Service) on Windows 2003.

Solution This is corrected in SCSIPort 2.22a8 and later drivers. You should also use minimum Microsoft VSS QFE 833167.

Problem 6

HP SuperDome Integrity servers running STORPort drivers may BSOD on reboot with more than 4 GB of Physical RAM.

Solution This issue was corrected in minimum Microsoft STORPort QFE hot fix 837413.

Problem 7

If using STORPort drivers, you are required to use minimum Microsoft QFE 837413 if you want to move the page file from the default boot disk to a local disk, or the server will potentially generate a blue screen error.

Solution This was first corrected in Microsoft 837413QFE. This patch or later must be installed prior to moving the page file.

Problem 8

If attempting to downgrade STORPort driver 1.20a3 to previous STORPort versions, you will receive an error message "The installation of HBAnyware failed because its Service Manager could not be started. Error code 113."

Solution This issue is a result of Emulex Autopilot installed being unable to force the removal of the previous HBAnyware installation. In this case, it is necessary to uninstall the previous installation of HBAnyware (via the Add/Remove Programs dialog in the Windows control panel) prior to running the 1.20a3 driver installation. Refer to Emulex case number 74773 for more information.

Event codes from the Emulex STORPort driver

Emulex STORPort drivers often place driver event codes in the Windows event viewer. These codes may be driver or hardware errors that have been detected, or in many instances are simply warning or informational messages for the user. The *Emulex STORPort Miniport Driver User Manual* contains information on the various event codes and their severity.

This guide can be found on the Emulex website under the standard adapter driver downloads. The EMC downloads section on the Emulex website does not have this particular guide. The Emulex site also provides several troubleshooting guides for their adapter models including basic and advanced troubleshooting guides. Please see the Emulex website for these guides for your particular adapter model.

A

Third-Party Software

This appendix contains additional information about third-party software used with Windows hosts.

Emulex HBAnyware

EMC has approved the use of the Emulex HBAnyware application for use with attached EMC Symmetrix and VNX series or CLARiiON storage systems. Only versions packaged with EMC-approved drivers should be used; these versions are posted in the EMC section on the Emulex website (www.emulex.com) with the drivers.

This Windows utility provides information on the installed Emulex adapters, driver versions, mapped targets, statistics, and configuration settings. It can be used in conjunction with the current Emulex Configuration Tool (ELXCFG.EXE). Refer to "Downloading latest Emulex drivers/firmware/BIOS files" on page 20 for instructions.

Before using the HBAnyware application, the Emulex HBAnyware service must be started. Depending on the version of HBAnyware you have installed, the Emulex HBAnyware service may have a default startup type of *manual* or *automatic*. If it is set to *manual*, you can start the service to use it immediately, or configure it for automatic startup on the next reboot.

For information on the use and features of the Emulex HBAnyware Application, refer to the documentation that accompanies the software.