User's Guide

Converged Network Adapter

8100 Series

FE0254601-00 A

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Preface

This guide provides detailed instructions on the installation, configuration, and troubleshooting of QLogic 8100 Series Converged Network Adapter for Windows®, Linux®, and VMware®. It also provides details on the use of QLogic adapter features to enhance the value of server virtualization using VMware ESX™/ESXi 4.0. Such features include virtual adapter configuration using N_Port ID virtualization (NPIV) and boot-from-SAN configuration.

What's in This Guide

This preface covers the intended audience, related materials, document conventions used, license agreements, technical support, and legal notices. The remainder of the guide is organized into the following sections and appendices:

- Quick Start describes how to install and configure your new QLogic Converged Network Adapter in four simple steps.
- Section 1 provides an overview of the QLogic 8100 Series Converged Network Adapter, including hardware components, software components, and adapter specifications.
- Section 2 describes the QLogic 8100 Series Converged Network Adapter management tools, including the QConvergeConsole web management interface, the server agent, QConvergeConsole Command Line Interface (CLI), and CNA Networking CLI.
- Section 3 describes how to install a QLogic 8100 Series Converged Network Adapter in a Windows environment, including system requirements, hardware installation, driver installation, and software installation.
- Section 4 describes how to install a QLogic 8100 Series Converged Network Adapter in a Linux environment, including system requirements, hardware installation, driver installation, and software installation.
- Section 5 describes how to install a QLogic 8100 Series Converged Network Adapter in VMware, including hardware installation, driver installation, and software installation.
- Section 6 describes the NIC parameters, management tools, and configuration options for the QLogic 8100 Series Converged Network Adapter for a Windows environment and a Linux environment.

- Section 7 describes the characteristics, configurations, and features of the QLogic 8100 Series Converged Network Adapter FCoE function for Windows.
- Section 8 describes the characteristics, configurations, and features of the QLogic 8100 Series Converged Network Adapter FCoE function for Linux.
- Section 9 describes offline adapter configuration and Flash programming utilities with the adapter multi-boot code for advanced users.
- Appendix A describes the QLogic 8100 Series Converged Network Adapter Storage Traffic and Link/Ethernet Traffic port LEDs.
- Appendix B describes the use of the Cisco® Nexus™ FCoE switch CLI to configure the switch port as a virtual Fibre Channel port.
- Appendix C describes the use of the Brocade® FCoE switch CLI to configure the switch port as a virtual Fibre Channel port.

Intended Audience

This guide is intended for those responsible for deploying QLogic Fibre Channel and Converged Network Adapters on Windows, Linux, and VMware: users ranging from end users, such as data center managers and system administrators, to the test and development community.

Related Materials

For additional information, refer to the QLogic 8100 Series Converged Network Adapter Read Me and release notes files, available on the QLogic Web site: http://driverdownloads.qlogic.com.

Documentation Conventions

This guide uses the following documentation conventions:

- **NOTE:** provides additional information.
- ***CAUTION!*** indicates the presence of a hazard that has the potential of causing damage to data or equipment.
- ***WARNING!!*** indicates the presence of a hazard that has the potential of causing personal injury.

- Text in blue font indicates a hyperlink (jump) to a figure, table, or section in this guide, and links to Web sites are shown in underlined blue. For example:
  - Table 9-2 lists problems related to the user interface and remote agent.
  - See “Installation Checklist” on page 3-6.
  - For more information, visit www.qlogic.com.
- Text in **bold** font indicates user interface elements such as a menu items, buttons, check boxes, or column headings. For example:
  - Click **Start**, point to **Programs**, point to **Accessories**, and then click **Command Prompt**.
  - Under **Notification Options**, select the **Warning Alarms** check box.
- Text in `Courier` font indicates a file name, directory path, or command line text. For example:
  - To return to the root directory from anywhere in the file structure: Type `cd /root` and press ENTER.
  - Enter the following command: `sh ./install.bin`
- Key names and key strokes are indicated with UPPERCASE:
  - Press CTRL+P.
  - Press the UP ARROW key.
- Text in *italics* indicates terms, emphasis, variables, or document titles. For example:
  - For a complete listing of license agreements, refer to the *QLogic Software End User License Agreement*.
  - What are *shortcut keys*?
  - To enter the date type *mm/dd/yyyy* (where *mm* is the month, *dd* is the day, and *yyyy* is the year).
- Topic titles between quotation marks identify related topics either within this manual or in the online help, which is also referred to as *the help system* throughout this document.

License Agreements

Refer to the *QLogic Software End User License Agreement* for a complete listing of all license agreements affecting this product.

Technical Support

Customers should contact their authorized maintenance provider for technical support of their QLogic products. QLogic-direct customers may contact QLogic Technical Support; others will be redirected to their authorized maintenance provider.

Visit the QLogic support Web site listed in Contact Information for the latest firmware and software updates.

QLogic Technical Support for products under warranty is available during local standard working hours excluding QLogic Observed Holidays. For customers with extended service, consult your plan for available hours.

For details about available service plans, or for information about renewing and extending your service, visit the Service Program web page at http://www.qlogic.com/services.

Training

QLogic offers training for technical professionals for all iSCSI, Converged Network, InfiniBand, and Fibre Channel products. From the main QLogic web page at www.qlogic.com, click the **Support** tab at the top, then click the **Training and Certification** on the left. The QLogic Global Training Portal offers online courses, certification exams, and scheduling of in-person training.

Technical Certification courses include installation, maintenance, and troubleshooting QLogic products. Upon demonstrating knowledge using live equipment, QLogic awards a certificate identifying the student as a certified professional. You can reach the training professionals at QLogic by e-mail at training@qlogic.com.

Contact Information

Support Headquarters	QLogic Corporation 4601 Dean Lakes Blvd. Shakopee, MN 55379 USA
QLogic Web Site	www.qlogic.com
Technical Support Web Site	http://support.qlogic.com
Technical Support E-mail	support@qlogic.com
Technical Training E-mail	training@qlogic.com

For Support phone numbers, see the Contact Support link at support.qlogic.com.

Knowledge Database

The QLogic knowledge database is an extensive collection of QLogic product information that you can search for specific solutions. We are constantly adding to the collection of information in our database to provide answers to your most urgent questions. Access the database from the QLogic Support Center: http://support.qlogic.com.

Legal Notices

Warranty

For warranty details, please check the QLogic Web site at http://www.qlogic.com/Support/warranty.aspx.

Laser Safety

FDA Notice

This product complies with DHHS Rules 21CFR Chapter I, Subchapter J. This product has been designed and manufactured according to IEC60825-1 on the safety label of laser product.

CLASS I LASER

Class 1 Laser Product
Appareil laser de classe 1
Produkt der Laser Klasse 1
Luokan 1 Laserlaite

Caution—Class 1 laser radiation when open
Do not view directly with optical instruments

Attention—Radiation laser de classe 1
Ne pas regarder directement avec des instruments optiques Vorsicht—Laserstrahlung der Klasse 1 bei geöffneter Abdeckung
Direktes Ansehen mit optischen Instrumenten vermeiden

Varoitus—Luokan 1 lasersäteilyä, kun laite on auki
Älä katso suoraan laitteeseen käyttämällä optisia instrumenttej

Agency Certification
QLogic Adapters

The following sections contain a summary of EMC/EMI test specifications performed on the QLogic adapters to comply with radiated emission, radiated immunity, and product safety standards.

EMI and EMC Requirements

FCC Part 15 compliance: Class A (QLE8*xxx*) **FCC compliance information statement:** This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

ICES-003 compliance: Class A (QLE8*xxx*) This Class A digital apparatus complies with Canadian ICES-003.Cet appareil numériqué de la classe A est conformé à la norme NMB-003 du Canada.

CE Mark 2004/108/EC EMC Directive compliance:
EN55022:2006+A1:2007/CISPR22:2006: Class A (QLE8*xxx)*

EN55024:1998
EN61000-3-2: Harmonic Current Emission
EN61000-3-3: Voltage Fluctuation and Flicker

Immunity Standards
EN61000-4-2: ESD
EN61000-4-3: RF Electro Magnetic Field
EN61000-4-4: Fast Transient/Burst
EN61000-4-5: Fast Surge Common/ Differential
EN61000-4-6: RF Conducted Susceptibility
EN61000-4-8: Power Frequency Magnetic Field
EN61000-4-11: Voltage Dips and Interrupt

VCCI: 2009-04 Class A (QLE8*xxx*)

AS/NZS CISPR22: Class A (QLE8*xxx*)

CNS 13438: Class A (QLE8*xxx*)

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

警告使用者:
這是甲類的資訊產品， 在居住的環境中使用時 ，
可能會造成射頻干擾， 在這種情況下，
使用者會被要求採取某些適當的對策。

MIC: Class A (QLE81*xx*)

Korea MIC Class

Korean KCC: KN22 KN24(08.05.19) Class A (QLE81*xx)*

Korea Class A Certified

Product Name/Model Fibre Channel Adapter
Certification holder—QLogic Corporation
Manufactured date—Refer to date code listed on product
Manufacturer/Country of origin QLogic Corporation/USA

A class equipment (Business purpose info/telecommunications equipment)	As this equipment has undergone EMC registration for business purpose, the seller and/or the buyer is asked to beware of this point and in case a wrongful sale or purchase has been made, it is asked that a change to household use be made.

Korean Language Format— Class A

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니
판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약
잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기
바랍니다.

Product Safety Compliance

UL, cUL product safety: QLogic 8100 Series Converged Network Adapter

UL60950-1 (2nd Edition), 2007-03-3-27
UL CSA C22.2 60950-1-07 (2nd Edition)

Use only with listed ITE or equivalent.

Complies with 21 CFR 1040.10 and 1040.11.

2006/95/EC low voltage directive: QLogic 8100 Series Converged Network Adapter

TUV:
EN60950-1:2006+A11 2nd Edition
EN60825-1:1994+A1+A2
EN60825-2:2004+A1
IEC60950-1 2nd Edition (2005) CB

CB Certified to IEC 60950-1 2nd Edition

Quick Start

Installation Instructions

This Quick Start section describes how to install and configure your new QLogic Converged Network Adapter in four simple steps:

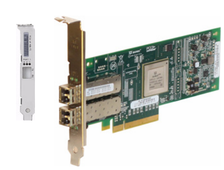
- Step 1. Verify the Package Contents.
- Step 2. Install the Adapter Hardware.
- Step 3. Install the Adapter Drivers.
- Step 4. Install QConvergeConsole Management Tools.

CAUTION!

Keep the adapter in the antistatic bag until installation. The adapter contains parts that can be damaged by electrostatic discharge (ESD). Before handling the adapter, use standard methods to discharge static electricity. Place the adapter on the bag when examining it. Retain the bag for future use.

Step 1. Verify the Package Contents

The QLogic adapter is shipped with the following items:



- Low-profile bracket.

Step 2. Install the Adapter Hardware

To install the adapter hardware, you need to open the computer and locate the appropriate bus slot. If necessary, consult your computer system manual for instructions to remove the computer cover.

Follow these steps to install the adapter hardware:

1. Power off the computer and all attached devices such as monitors, printers, and external components.
2. Disconnect the power cable.
3. Remove the computer cover and find an empty PCIe x8 or larger bus slot.

4. Pull out the slot cover (if any) by removing the screw or releasing the lever.
5. Install the low-profile bracket (if required).
6. Grasp the adapter by the top edge and seat it firmly into the appropriate slot (see the illustration below).
7. Refasten the adapter's retaining bracket using the existing screw or lever.
8. Close the computer cover.
9. Plug the appropriate Ethernet cable (either copper or optical) into the adapter.
   - Optical models ship with optical transceivers already installed. 8100 Series Adapters will only operate with optical transceivers sold by QLogic.
   - For copper connectivity, see the list of approved copper cables on QLogic's Web site: http://www.qlogic.com/Resources/Documents/LineCards/Copper_Cables_Support_Matrix_Line_Card.pdf
10. Plug in the power cable and turn on the computer.

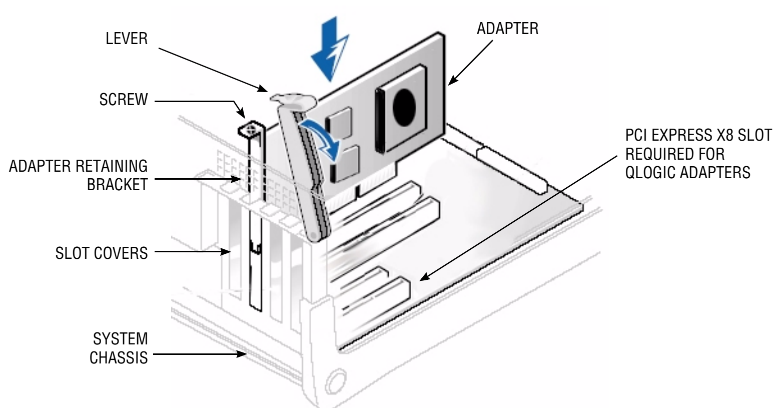


Figure i Illustration of Sample Motherboard and Slots

Step 3. Install the Adapter Drivers

To install the FCoE and Ethernet drivers:

1. Go to the QLogic Driver Downloads/Documentation page at http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. From the table at the bottom of the page, select **Converged Network Adapters**, the appropriate adapter model, and your operating system, and then click **Go**. The product download page opens.

4. On the download page under **Drivers**, select the appropriate driver and download it to your system.
5. Follow the instructions provided in the driver read me file for installing the downloaded driver.

Step 4. Install QConvergeConsole Management Tools

To install the QConvergeConsole web management interface:

1. Go to the QLogic Driver Downloads/Documentation page at http://driverdownloads.qlogic.com.
2. From the table at the bottom of the page, select **Converged Network Adapters**, the appropriate adapter model, and your operating system, and then click **Go**. The product download page opens.
3. On the download page under **Management Tools**, select **QConvergeConsole** and download it to your system.
4. Follow the instructions in the QConvergeConsole read me file for installing the downloaded software.

Additional Resources

- To obtain the most current drivers, management tools, user instructions, and documentation, please visit the QLogic Web site at http://driverdownloads.qlogic.com and download the latest versions.
- See What's in This Guide for descriptions of user instructions provided in this manual.
- For descriptions and procedures related to QConvergeConsole, use the built-in help system.

The following sections contain additional information about the QLogic adapter, the warranty, and laser safety information.

1 Product Overview

- What is a Converged Network Adapter?
- What is Enhanced Ethernet?
- What is Fibre Channel over Ethernet (FCoE)?
- QLogic Converged Network Adapter
- Hardware Components
- Software Components
- Adapter Specifications

What is a Converged Network Adapter?

A Converged Network Adapter is a multifunction adapter that combines the capabilities of a Fibre Channel adapter and an Ethernet NIC. A Converged Network Adapter provides simultaneous Fibre Channel and Ethernet traffic over a shared 10Gb Ethernet link. Deploying Converged Network Adapters lowers costs through reduced adapter, switch, cabling, power, cooling, and management requirements.

The following table identifies the adapters that apply to content in this user's guide.

Table 1-1. QLogic 8100 Series Converged Network Adapters

Product	Part Number
QLE8140	FE0210402
QLE8142	FE0210402
QLE8150	FE0210401
QLE8152	FE0210401

What is Enhanced Ethernet?

Standard Ethernet is a best-effort network that may drop packets or deliver packets out of order when the network is busy or congested, resulting in retransmissions and time-outs. The SCSI payload carried by the Fibre Channel protocol does not react well to dropped or out-of-order packets. Therefore, standard Ethernet is not an acceptable choice to carry Fibre Channel payloads.

To enable the transport of Fibre Channel frames over Ethernet, several enhancements were added to standard Ethernet. These enhancements have been ratified in the following IEEE and IETF standards:

- Priority flow control (IEEE 802.1Qbb)
- Congestion notification (IEEE 802.1Qau)
- Link layer routing protocol (IETF–TRILL)
- Enhanced transmission selection (802.1Qaz)

Standard Ethernet with these enhancements is known as enhanced Ethernet (EE), converged enhanced Ethernet (CEE), lossless Ethernet, or data center Ethernet (DCE).

What is Fibre Channel over Ethernet (FCoE)?

FCoE provides a way to transport Fibre Channel frames on top of an Ethernet infrastructure. In summary, unaltered Fibre Channel frames are encapsulated in an Ethernet header, sent over a lossless Ethernet fabric, and unencapsulated when they reach the target (Figure 1-1). Because protocol conversion tables and state tables are not required, FCoE is considered to be a gateway-less technology.

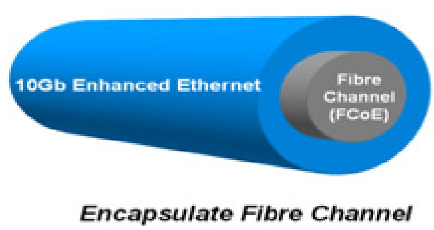


Figure 1-1. Encapsulated Fibre Channel

The FCoE architecture is based on the Fibre Channel protocol, and provides the same host-to-switch and switch-to-switch connectivity as Fibre Channel fabrics. FCoE also provides the same level of management and security found in Fibre Channel through the use of zoning and port worldwide name-based port security.

Because the transmitting Fibre Channel frames require a lossless transport, an Ethernet network that transports FCoE frames must also provide the same lossless characteristics. Priority flow control (PFC) provides these lossless characteristics. PFC is a revised implementation of the IEEE 802.3X Ethernet standard, known as Pause, and is defined by the IEEE 802.1Qbb standard.

QLogic Converged Network Adapter

The second-generation QLogic 8100 Series Converged Network Adapters feature a fully integrated, single ASIC with significant enhancements in performance, power efficiency, and server-platform compatibility. The 8100 Series Adapter combines the functions of a Fibre Channel adapter and a NIC on one PCIe® Gen2 card (Figure 1-2). The 8100 Series Adapter appears to the operating system as two separate adapters.

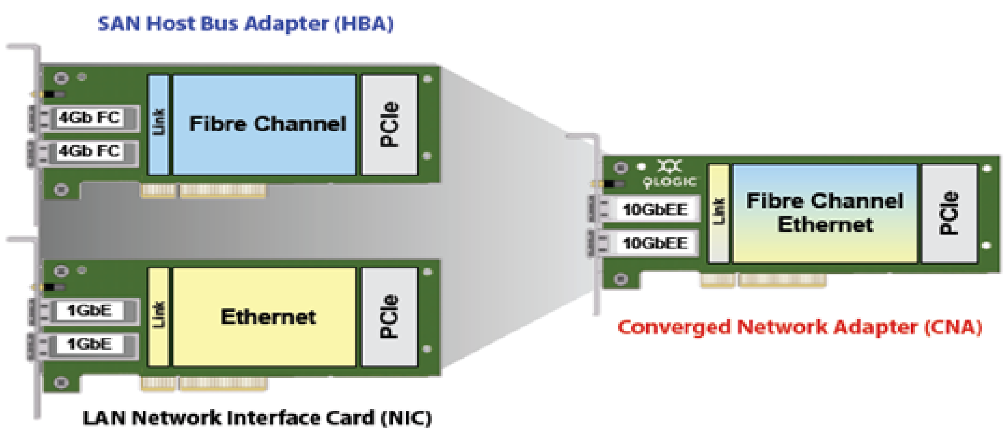


Figure 1-2. Combined SAN and LAN Function on One Converged Network Adapter

The 8100 Series Adapter boosts system performance with 10Gbps speed and full-hardware offload for FCoE protocol processing. 10Gbps bandwidth eliminates performance bottlenecks in the I/O path with a tenfold data rate improvement over existing 1Gbps Ethernet solutions. Additionally, full-hardware offload for FCoE protocol processing reduces system CPU load for I/O operations, which leads to faster application performance and greater consolidation in virtualized systems.

QLogic Converged Network Adapters can connect a server to a Fibre Channel storage area network through a compatible converged network switch (FCoE switch). QLogic Converged Network Adapters can also connect to a network switch, and perform the functions of a 10Gb NIC.

QLogic offers four 8100 Series models for standard servers. For information about custom adapters for blade servers, see the product documentation.

Table 1-2 describes the QLogic 8100 series Converged Network Adapters for standard servers.

Table 1-2. 8100 Series Converged Network Adapters

Model	Ports	Media	Bus Speed		Bus Width		Bus Type	I/O Rate
			PCIe Gen2	PCIe Gen1	PCIe Gen2	PCIe Gen1		
QLE8150	Single	Copper	5.0GHz	2.5GHz	x4	x8	PCIe	10Gb
QLE8152	Dual	Copper	5.0GHz	2.5GHz	x4	x8	PCIe	10Gb
QLE8140	Single	Optical	5.0GHz	2.5GHz	x4	x8	PCIe	10Gb
QLE8142	Dual	Optical	5.0GHz	2.5GHz	x4	x8	PCIe	10Gb

FCoE Network Deployment

The FCoE network consists of several hardware components in addition to the Converged Network Adapters. FCoE switches (converged networking switches) are an important component that provide switching for both standard data networking (LAN) and storage networking (SAN) traffic. Figure 1-3 shows that the Converged Network Adapter passes both data networking traffic, typically as TCP/IP, and storage networking traffic, in this case FCoE, to the switch. The FCoE switch routes data networking traffic to the existing Ethernet networking cloud of switches and routers. The FCoE switch can also connect the FCoE adapter to existing native Fibre Channel infrastructure because the FCoE switches are capable of translating between FCoE and native Fibre Channel interfaces.

In Figure 1-3, the FCoE adapter communicates to existing native Fibre Channel storage because of the translation capability of the switch.

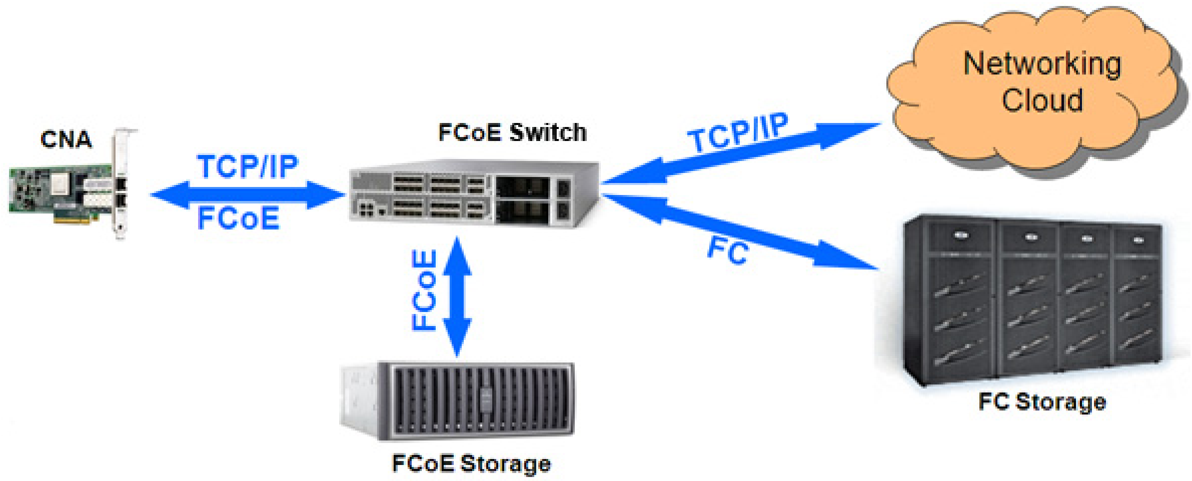


Figure 1-3. FCoE Deployment

Hardware Components

A typical 8100 Series Adapter has the following major components[1]:

- ASIC (reduced instruction set computer (RISC) processor)
- Nonvolatile memory (Flash)
- NVRAM
- Transceivers (SFP+)
- LEDs

[1] Some adapters may have additional components not shown in this list.

Figure 1-4 shows the hardware components of a QLogic 8100 Series Adapter. Table 1-3 describes the 8100 Series Adapter components.

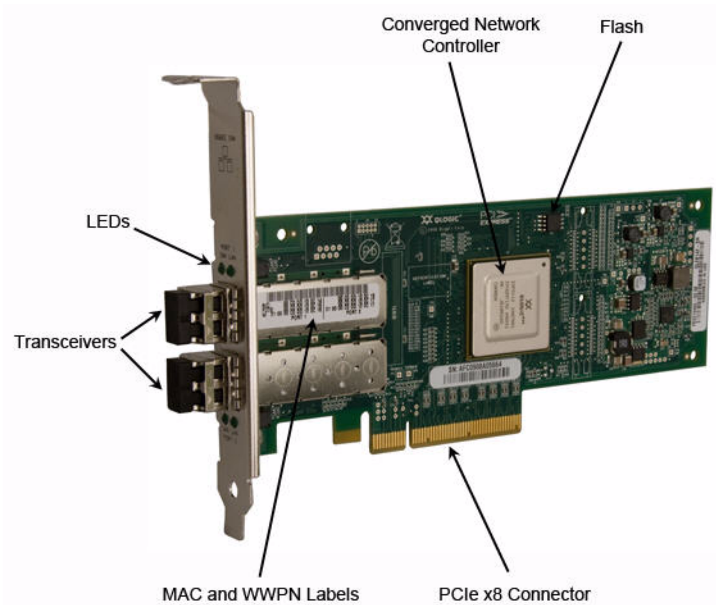


Figure 1-4. 8100 Series Adapter Components

Table 1-3. 8100 Series Adapter Components

Hardware Component	Function
ASIC	The Converged Network Controller, also known as the intelligent storage peripheral (ISP) controller, is the heart of the adapter. The Converged Network Controller is a single integrated ASIC that provides the processing power that runs the FCoE and NIC protocols. The Converged Network Controller also interfaces with the PCIe host bus and controls the I/O operations of the adapter.
Flash	4MB nonvolatile memory, or Flash memory. It contains the boot code run by the converged network controller when the adapter is powered up. It contains multiple boot images [the FCode, x86 BIOS, extensible firmware interface (EFI)] to support a multi-boot capability on different platforms. It also contains the NVRAM that stores the per-port adapter configuration parameters, which configure the adapter during initialization. Adapter configuration parameters include boot device selection, Fibre Channel connection type (topology), frame size, Fibre Channel tape support, and so on.

Table 1-3. 8100 Series Adapter Components (Continued)

Hardware Component	Function
Transceivers	Each transceiver is a removable device that functions both as transmitter and as a receiver. A transceiver and cable connect the adapter to other devices. A transceiver can be a QLogic-branded SR (short range), optical transceiver, or copper cables. For a list of QLogic approved copper cables, visit http://www.qlogic.com/Resources/Pages/Resources.aspx and select **Cable Support**.
LEDs	Light emitting diodes indicate the real-time status of the adapter. Each port has two LEDs indicating the status of SAN and LAN traffic originating from or terminating at the adapter. For more information about determining adapter status from the LED indications, see Appendix A.
Mounting Bracket	A full-height or low-profile bracket that secures the adapter to the server chassis.
PCIe x8 Connector	Adapter bus interface to the server computing resources. The bus physical interface must be x8 in width and either PCIe Gen1 x8 or PCIe Gen2 x4.

Software Components

This section describes the following QLogic Converged Network Adapter software components (Figure 1-5):

- Boot Code
- Operating System Driver
- Firmware
- Management Tools and Utilities

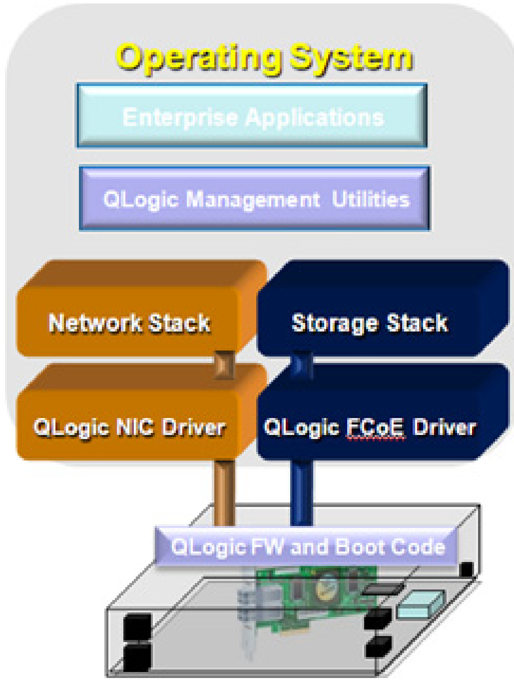


Figure 1-5. Driver Model

Boot Code

Boot code resides in the Flash memory on the adapter. The primary function of the boot code is to communicate with an external boot device before the operating system takes control when booting from a storage device or a pre-eXecution environment (PXE) boot server attached to the QLogic Converged Network Adapter. This type of configuration is called PXE boot (LAN) or boot from SAN. QLogic Converged Network Adapters support PXE boot for servers with BIOS and unified extensible firmware interface (UEFI) capabilities, and boot from SAN for servers with BIOS, UEFI, and FCode capabilities.

Operating System Driver

The driver allows the operating system to interface with the adapter. QLogic provides operating system drivers for most enterprise-class operating systems. Most operating system vendors (OSVs) bundle QLogic adapter drivers with the operating system, in which case, no separate driver installation is required.

Drivers for all supported operating systems are available in the following ways:

- Bundled with the operating system (inbox drivers)
- QLogic Web site http://driverdownloads.qlogic.com/

Firmware

The firmware module performs most of the FCoE and Ethernet protocol-related functions, thus freeing the system CPU and memory resources from protocol processing. This efficiency saves runtime system resources, such as CPU and memory. For the QLogic 8100 Series Adapter, the firmware comes as part of the multi-boot image, which comprises the boot code, FCoE firmware, message passing interface (MPI) firmware, and various offline utilities.

The firmware is preloaded into the QLogic adapter, not bundled with the driver. The QLogic 8100 Series Adapter also contains an additional minimal copy of the firmware called the *golden firmware*. This copy of the firmware performs maintenance tasks on the adapter if the original firmware becomes corrupt.

Management Tools and Utilities

Table 1-4 list the comprehensive set of management tools and utilities, including the following:

- **QConvergeConsole**™ Web Management Graphical User Interface (GUI), which is used to configure and manage QLogic Fibre Channel adapters, Intelligent Ethernet Adapters, and Converged Network Adapters within storage area networks (SANs).
- **QConvergeConsole**™ CLI, which is used to configure and manage QLogic Fibre Channel adapters, Intelligent Ethernet Adapters, and Converged Network Adapters within SANs. The QConvergeConsole CLI also includes the networking (NIC) commands, previously supported in a separate networking CLI utility.
- **SuperInstallers**. QLogic provides both Linux and Windows SuperInstaller Utilities, which install the following drivers, tools, and agents used to support QLogic 8100 Series Adapters:
  - FC-FCoE and Ethernet Networking (NDIS) drivers
  - VLAN/Teaming driver (Windows version only)
  - QConvergeConsole Command Line (CLI) management tool
  - FC-FCoE and Ethernet networking management agents
- **Offline utilities** provide adapter maintenance functions for special circumstances. Section 9 describes the offline utilities and their functions.

Table 1-4. Software and Firmware Components

Component (QLogic	Operating System Supported [a]	Comments
Windows FCoE Driver Windows NIC Driver Windows Teaming Driver	Windows	Install the teaming driver only if the teaming function is required. NIC management is provided by Windows Property Pages through Device Manager and QConverge-Console CLI.
Linux FC/FCoE Driver (qla2xxx) Linux NIC Driver (qlgc)	Red Hat RHEL Novell SLES	The teaming function on Linux is provided by the Linux bonding driver. NIC management is fully integrated with Linux tools, such as ethtool, ifconfig, and vconfig.
QConvergeConsole Web Management GUI QConvergeConsole CLI	Windows Red Hat RHEL Novell SLES	Provides data center bridging exchange protocol (DCBX) logs, ETS, port-level statistics, Fibre Channel support quality of service (QoS), N_Port ID virtualization (NPIV), and FCAPS capabilities.
QLogic SuperIn-staller for Windows	Windows	Windows utility that installs: ■ FC-FCoE and Ethernet Network-ing (NDIS) drivers. ■ VLAN and Teaming driver. ■ QConvergeConsole Command Line Interface (CLI) manage-ment utility. ■ FC-FCoE and Networking man-agement agents to enable remote access using the QCon-vergeConsole (GUI) manage-ment utility.

Table 1-4. Software and Firmware Components (Continued)

Component (QLogic	Operating System Supported [a]	Comments
QLogic SuperInstaller for Linux	Red Hat RHEL Novell SLES	Linux Utility that installs: ■ FC-FCoE and Ethernet Networking drivers. ■ QConvergeConsole command line interface (CLI) Management Tool. ■ Fibre Channel/FCoE and Ethernet Networking Management Agents to enable remote access using QConvergeConsole (GUI) Management Tool ■ Linux Tools (scripts) for commonly performed storage networking tasks. ■ SNIA Host Bus Adapter APIs for 2400/2500/8100/8200 (Fibre Channel/FCoE functions).
Multi-boot Flash Image	FCoE boot code ■ BIOS ■ UEFI ■ FCode NIC boot code ■ PXE boot ■ NIC EFI Firmware ■ FCoE firmware ■ MPI firmware ■ EDC PHY firmware (815x series only) Utilities ■ FlasUTIL ■ VPD Util ■ EFI Util	FlasUTIL is a DOS-based utility that updates the Flash image on the adapter. This utility is invoked through the `update.bat` batch file. The EFIUTIL utility accesses and modifies the Flash contents from the EFI shell on EFI-based systems. This utility is Invoked by the `update.nsh` script from the EFI shell to update the Flash image on the adapter. VPD utility updates the version numbers in the vital product data (VPD), and requires valid VPD to be present on the adapter. This utility is invoked by the `update.bat` batch file when updating the Flash content.

[a] Refer to the Read Me file provided with the posted software for Operating System support or updates.

Adapter Specifications

The QLogic 8100 Series Adapters provide high-performance server connectivity to SAN and LAN networks. Table 1-5 lists the adapter physical and electrical specifications.

NOTE:

Some features may not be available for all 8100 Series Converged Network Adapters. Refer to the data sheet for the a list of adapter models and supported features.

Table 1-5. Physical and Electrical Specification

Specification	Description
Ports	Single-port or dual-port 10Gbps Ethernet. Pluggable SFPs (SFP+) for enhanced serviceability.
Transceivers	SFP+ pluggable: ■ QLogic supported active and passive copper cables with transceivers ■ QLogic optical short range (SR)—300 meter maximum cable length Table 1-6 shows the adapter models and supported transceivers.
Form Factor	Low-profile PCIe card. The adapter ships with a full-height bracket for use in a standard PCIe slot, or an optional spare low-profile bracket for use in a low-profile PCIe slot. Low-profile slots are typically found in compact servers.
Power Consumption	Approximately 7-10 Watts (typical) for dual-port QLogic 8100 Series Adapters
Bus Interface	PCIe interface with eight lanes. The adapter operates in one of the following modes ■ PCIe Gen 1 x8 mode, 250MBps per lane ■ PCIe Gen 2 x4 mode, 500MBps per lane QLogic adapters can automatically train a PCIe Gen 2 x8 slot to use the slot as a PCIe Gen 2 x4 slot, where four lanes of the PCIe Gen 2 x8 slot are powered off to save power and maximize performance.

Table 1-5. Physical and Electrical Specification

Specification	Description
BIOS Support	QLogic adapters support the following boot images (boot from SAN and PXE boot): ■ PCI BIOS version 2.1 and 3.0 ■ UEFI specification 1.10 and 2.*x*. ■ FCode for SPARC®-based systems

Table 1-6. Transceiver Requirements

Adapter	Active Copper	Passive Copper	SR Optics Sold by QLogic	Optics Not Sold by QLogic
QLE8150 QLE8152	Supported [a]	Supported [a]	Unsupported [b]	Unsupported [c]
QLE8140-SR QLE8142-SR	Unsupported [b]	Unsupported [c]	Supported	Unsupported [c]
QLogic 8100 Series Adapters are not backward compatible with <10Gbps SFP+ modules or copper cables.				

[a] QLogic-approved active copper cables only. Refer http://www.qlogic.com/Products/CU_Cables.aspx for a list of approved cables from switch vendors.

[b] The adapter port will function; however, QLogic provides no warranty or technical support for this configuration.

[c] The adapter port will not function.

Table 1-7. FCoE Specifications

Feature	Description
Performance	250,000 IOPs per port to handle enterprise class transactional workloads
Throughput	1000MBps per port, half duplex 2000MBps per port, full duplex
Full FCoE hardware offload	Enables all FCoE protocol processing to be offloaded from the host CPU to the adapter saving precious host CPU cycles for application processing.

Table 1-7. FCoE Specifications (Continued)

Feature	Description
N_Port ID Virtualization	Supports 256 virtual ports per physical port, optimized for virtualization
Topology Support	Point-to-point and switched fabric
Logins	Supports 2,048 concurrent logins and 2,048 concurrent exchanges
Boot from SAN	Supports booting the server with an operating system that resides on the SAN instead of on a local hard disk drive
Class of Service	Class 3
Compatibility	Viewed as a Fibre Channel adapter by the operating system. Compatible with existing Fibre Channel driver stack and legacy applications
Features	Overlapping protection domains (OPD) Out-of-order frame re-assembly (OoOFR) Intelligently interleaved direct memory access (iiDMA) Persistent binding Fibre Channel over Ethernet initialization protocol (FIP) version 1.0 Hardware assisted firmware tracing (HAFT) MSI-X with 256 vectors

Table 1-8. Ethernet Specifications

Specification	Description
Throughput	10Gbps
Stateless offload	■ IP, TCP, and user datagram protocol (UDP) checksum offloads ■ Large and giant send offload (LSO, GSO) ■ Receive side scaling (RSS) ■ Header-data split ■ Interrupt coalescing ■ NetQueue
Ethernet Frame	1500 byte or 9000 byte (jumbo frame)

Table 1-8. Ethernet Specifications (Continued)

Specification	Description
Compliance	■ IEEE: 802.3ae (10Gb Ethernet) ■ 802.1q (VLAN) ■ 802.3ad (Link Aggregation) ■ 802.1p (Priority Encoding) ■ 802.3x (Flow Control) ■ IEEE 1149.1 (JTAG) ■ IPv4 Specification (RFC 791) ■ IPv6 Specification (RFC 2460) ■ TCP/UDP Specification (RFC 793/768) ■ ARP Specification (RFC 826)
Enhanced Ethernet	■ Priority-based flow control (802.1Qbb rev. 0) ■ Enhanced transmission selection (802.1Qaz rev. 0) ■ DCBX protocol (802.1Qaz rev. 0)
Active MAC Addresses	128 MAC addresses per port

Table 1-9. Management Specifications

Specification	Description
QLogic Utilities	■ QConvergeConsole Web Management GUI, which is used to configure and manage QLogic Fibre Channel adapters, Intelligent Ethernet Adapters, and Converged Network Adapters within storage area networks (SANs). ■ QConvergeConsole CLI, which is used to configure and manage QLogic Fibre Channel adapters, Intelligent Ethernet Adapters, and Converged Network Adapters within SANs. The QConvergeConsole CLI also includes the networking (NIC) commands, previously supported in a separate networking CLI utility. ■ SuperInstallers—QLogic provides both Linux and Windows SuperInstaller Utilities, which install the drivers, tools, and agents used to support QLogic 8100 Series Adapters. ■ qlremote and netqlremote—Agent software that allows the remote management of QLogic adapters with the QConvergeConsole web management interface. ■ QLogic FC HBA API—SNIA HBA API V2 - Management API for integration with other tools. ■ SNIA Common Adapter API—v1.x/v2.0 compliant. ■ Offline Utilities—Provide maintenance functions for QLogic adapters.
Operating System Utilities	■ Microsoft Device Manager—Operating System snap-in that allows driver installation, driver removal, and device management features for QLogic adapters. ■ WMI Interface—Windows Management Implementation. ■ Windows Property Pages—Operating System snap-in displays and edits various properties for the NIC functions of the QLogic adapters.
Third-Party Libraries and Utilities	■ Microsoft PRO Pack with System Center Operations Manager. ■ SMI-S—CIM providers for use with a SMI-S-based standard management tool. ■ Various other server management suites from leading server vendors.

2 Management Tools

Overview

QLogic provides the following tools with which to manage the QLogic 8100 Series Converged Network Adapter:

- QConvergeConsole Web Management GUI
- QConvergeConsole Management Agents (qlremote/netqlremote)
- QConvergeConsole CLI
- Offline Utilities

QConvergeConsole Web Management GUI

The QConvergeConsole management tool is a Web-based client/server application that allows for centralized management and configuration of QLogic adapters within the entire network (LAN and SAN) via a Graphical User Interface.

On the server side, the QConvergeConsole runs as an Apache Tomcat™ application server. After the application is launched on the application server, you can connect to the QConvergeConsole through a browser, either locally on the server or remotely from another computer. Your browser window becomes the client used to connect to servers that host the QLogic adapters and connected storage devices within the network.

The QConvergeConsole has the following features:

- Unified adapter management – QConvergeConsole provides a browser-based graphical user interface that lets you monitor, configure, and manage QLogic adapters with Fibre Channel, FCoE, and Ethernet (NIC) networking protocols.
- Virtualization – QConvergeConsole provides configuration pages on selected Fibre Channel ports that let the administrator create multiple virtual ports from a single physical adapter.
- Asset management – QConvergeConsole allows you to connect to and disconnect from local and remote hosts. It also provides information about connected hosts and their attached QLogic adapters with connected storage devices.

- Configuration management – QConvergeConsole allows you to configure local and remote systems. With QConvergeConsole you can configure QLogic adapters and connected devices. It also lets you update adapter parameters, firmware, boot code, and drivers.

  NOTE:

  You can install the adapter driver before you install the adapter hardware.

- Statistics – QConvergeConsole provides statistics for each host and adapter port. These statistics can be collected automatically or on request. They can be reset at any time. In addition, you can export the statistics to a comma separated values (CSV) file that can be imported into other applications, for example, Microsoft® Excel.
- Reports – QConvergeConsole provides a report facility that lets you generate reports, which you can use to view lists of all SAN assets: adapters, devices, and LUNs. After generating reports, you can view them and save them to a variety of file formats.
- E-mail notifications – QConvergeConsole can automatically send notifications with a copy of the current host configuration to an e-mail distribution list, thus enabling the information to be opened and analyzed from other locations.
- Wizards – QConvergeConsole provides some easy-to-use wizards that walk you through Flash and driver parameter file updates on Fibre Channel and Converged Network Adapters.

For information about obtaining, installing, configuring, and using the QConvergeConsole, refer to "Installing and Launching the QConvergeConsole" on page 3-40.

QConvergeConsole Management Agents (qlremote/netqlremote)

The QConvergeConsole agents provide remote management for QLogic adapters through the QConvergeConsole web management interface.

The SuperInstaller utilities install the FC-FCoE management agent (qlremote) and the Ethernet networking management agent (netqlremote) that enable you to manage 8100 Series Adapters connected to the QConvergeConsole server where the agents reside.

QConvergeConsole CLI

The QConvergeConsole CLI is a unified CLI that manages Ethernet and Fibre Channel functions on QLogic adapters. The QConvergeConsole CLI non-interactive mode starts, performs the functions defined by the list of parameters provided, and then terminates. Use the noninteractive mode to run the QConvergeConsole CLI from a script file or when you want to perform a single operation.

You can automate management and monitoring tasks using scripts. You must install the CLI on the host in which the QLogic adapter is installed. The CLI manages only the host on which it is installed. The CLI is also available as a menu interface.

The QConvergeConsole CLI lets you manage and monitor both FCoE and Ethernet (NIC) port functions on QLogic 8100 Series Adapters.

For information about obtaining, installing, configuring, and using the QConvergeConsole CLI, refer to the *QConvergeConsole CLI User's Guide* for your adapter model and target operating system version at http://driverdownloads.qlogic.com.

Offline Utilities

The QLogic 8100 Series Converged Network Adapter can be managed with the QConvergeConsole web management GUI or QConvergeConsole CLI, when the adapter is online, and transacting data or control operations. These management tools are operating-system specific and typically require the installation of one or more components on the server.

QLogic offers offline utilities that are bundled with the adapter firmware/boot code. These utilities are recommended only for experienced users who are managing and configuring adapters that are offline.

There are separate offline utilities for BIOS servers and UEFI servers. The offline utilities for BIOS servers are as follows:

- *Fast!*UTIL—This utility is standard on all QLogic Converged Network Adapters as part of the multi-boot image. *Fast!*UTIL configures advanced adapter features, including boot-from-SAN.
- FlasUTIL—This utility installs the multi-boot image (including firmware) on the QLogic Converged Network Adapter.

The offline utilities for UEFI servers are as follows:

- EFICFG—This utility provides a UEFI shell into the server manufacturer's boot-up menu interface, which configures advanced adapter features, including boot-from-SAN.
- EFIUTIL—This utility installs the multi-boot image (including firmware) on the QLogic Converged Network Adapter.

For more information about the offline utilities, refer to Section 9.

3 Installation in a Windows Environment

Overview

This section describes how to install a QLogic Converged Network Adapter, including system requirements, hardware installation, driver installation, and software installation.

System Requirements

Operating Systems Requirements

The QLogic 8100 Series Adapters support the following Microsoft Windows operating systems:

- Windows Server 2003
- Windows Server 2008
- Windows Server 2008 Server Core

Architecture Support: IA-32 (x86), Intel64, AMD64 (x64)

Refer to the Read Me file provided with the QLogic 8100 Series Adapter multi-flash image or Windows driver for a complete list of supported operating systems and required service packs.

Server and Switch Requirements

QLogic products are certified with products from leading converged networking switch and server vendors. For product-level interoperability details, visit http://www.qlogic.com/Interoperability/Pages/default.aspx, and select **Converged Networking**.

A server must satisfy the following requirements to host a QLogic Converged Network Adapter:

- The server motherboard must have a PCIe slot of at least x8 physical length. Both PCIe Gen 1 and Gen 2 slots are supported. QLogic 8100 Series Adapters operate on all eight lanes on a PCIe Gen 1 x8 slot, and automatically train down to use only four lanes on a PCIe Gen 2 x8 slot, thus saving energy by powering off the remaining four lanes of the PCIe Gen 2 x8 slot.
- A supported Microsoft Windows operating system must be installed on the server. This is not required if you are configuring boot from SAN. Refer to Section 7 for details about configuring boot-from-SAN with QLogic adapters.
- There must be a LAN connection or a physical connection to the server console.

Cabling Requirements

QLogic 814x Series Adapters ship with QLogic-branded short range (SR) optics that are compatible with all fibre optic cables for direct connections to a supported FCoE switch. QLogic 814x Series Adapters operate only with optical transceivers sold by QLogic.

QLogic 815*x* Series Adapters ship with empty SFP+ cages that support active and passive copper cables for connecting to an FCoE switch. These cables are not available from QLogic, and must be purchased from the FCoE switch vendor. Visit http://www.qlogic.com/Resources/Pages/Resources.aspx to obtain a list of supported copper cables, their vendors, and part numbers.

Refer to "Adapter Specifications" on page 1-12 for details about connectors, cables, and supported adapters.

Other Requirements

A Phillips #1 screwdriver (or equivalent) is required to fasten the mounting bracket to the adapter.

Downloading QLogic Drivers

QLogic 8100 Series Adapter drivers are not included with most versions of Microsoft Windows operating systems. Microsoft Windows does not recognize the QLogic 8100 Series Adapter until the drivers are installed on the server. If the adapter drivers are installed on the server, go to Section 7 for information about updating drivers.

To download QLogic drivers:

1. Go to the QLogic Web site: http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. Click **QLogic Adapters**.

4. In the selection list, click **Converged Network Adapters** in the first column.
5. In the selection list, click on the adapter model number in the second column.
6. In the third column, click the version of the Microsoft Windows operating system that is installed on the server. For example, in Figure 3-1, **Windows Server 2008 R2 (64-bit)** is selected for a QLE8152 adapter.

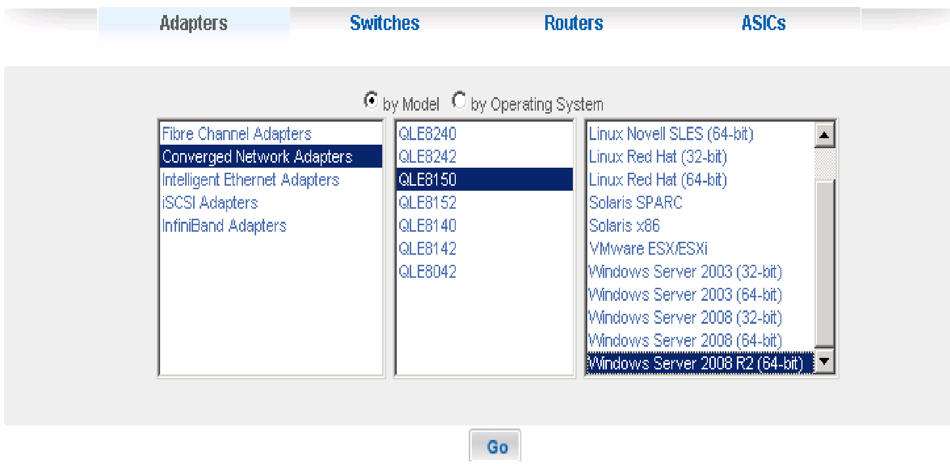


Figure 3-1. Select an Adapter and a Windows Operating System

7. Click **Go**.

8. Under Drivers, click the download link for the QLogic drivers. To enable all adapter capabilities, download both the FCoE (STOR Miniport) and NIC (NDIS Miniport) drivers (Figure 3-2).

Drivers

Name	Version	Description	Support Files
Ethernet Networking Driver (x64)	1.0.1.7	Ethernet Networking (NDIS) Driver. **Note:** VLAN/Teaming driver is included with the Windows SuperInstaller.	Readme Release Notes
FCoE Driver (x64)	9.1.9.15	FCoE Driver	Readme Release Notes
Windows SuperInstaller (x86/x64)	1.00.0005	Utility to install: • FC-FCoE, iSCSI, and Ethernet Networking (NDIS) drivers • VLAN/Teaming driver • QConvergeConsole Command Line (CLI) management Tool • FC-FCoE, iSCSI, and Ethernet Networking Management Agents	Readme Release Notes

Figure 3-2. Download Drivers for Windows Servers

9. Read the QLogic license agreement, and then click **Agree**.
10. When prompted, click **Save** to save the driver file to your workstation.

Installing Hardware

CAUTION!

- To minimize the risk of Electrostatic Discharge (ESD) damage, use a workstation anti-static mat and an ESD wrist strap.
- Leave the adapter in its antistatic bag until you are ready to install it in the server.
- Hold the adapter by the edge of the PCB or mounting bracket, not the connectors.
- Place the adapter on a properly grounded antistatic work surface pad when it is out of its protective anti-static bag.

Install the Adapter

To install the adapter:

1. Record the adapter model number, which can be found on the bar code label on the board.
2. Determine whether the server requires a full-height or a half-height adapter bracket. The QLogic 8100 Series Adapter ships with a full-height bracket installed and a spare half-height (low profile) bracket.

   To install the half-height bracket:

   a. Using the bail handle of the SFP+ transceivers, pull out the SFP+ modules.
   b. Remove the two screws that hold the full-height bracket using a Phillips #1 screw driver.
   c. Carefully remove the full-height bracket by pulling it away from the card.
   d. Fit the half-height bracket while aligning the slots for the SFP+ transceivers and LEDs.
   e. Fasten the half-height bracket using the screws provided.
   f. Reinstall each SFP+ transceiver. Press the transceiver into the port until it clicks in place.
3. Power off the computer and all attached devices such as monitors, printers, and external components.
4. Remove the server cover, and find an empty PCIe x8 or larger bus slot. If necessary, consult the server system manual for information about how to remove the server cover.
5. Pull out the slot cover (if any) by removing the screw or releasing the lever.
6. Grasp the adapter by the top edge, and insert it firmly into the slot (Figure 3-3).
7. Refasten the adapter retaining bracket using the screw or lever.
8. Close the server cover.
9. Plug the appropriate Ethernet cable (either copper or optical) into the adapter.
   - QLE814*x* Series Adapters ship with optical transceivers already installed. 814*x* Series Adapters operate only with optical transceivers sold by QLogic.

- For QLE815*x* Series Adapters, see the list of approved copper cables at http://www.qlogic.com/Resources/Pages/Resources.aspx under Cable Support.

10. Connect the other end of the Ethernet cable to a supported switch.
11. Plug in the power cables and power up the server.

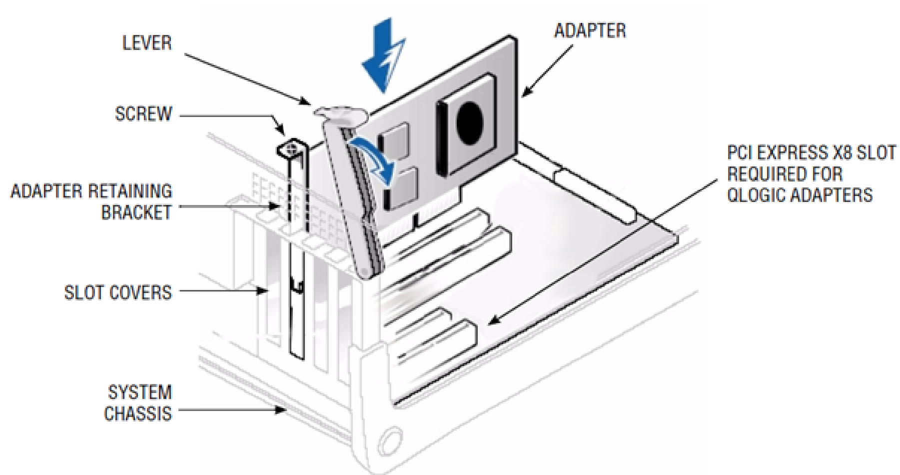


Figure 3-3. Adapter Hardware

Verify the Adapter Installation

To verify that the adapter is properly installed and that it can be recognized as a PCIe device by the server:

1. While the host server is booting, verify that the adapter BIOS banner appears without errors. Some servers may require that you press the ESC key at the motherboard BIOS banner screen to enable the display of diagnostic messages.
2. The QLogic BIOS banner indicates that the adapter has passed its Power-On Self Test (POST), the adapter has been recognized and enumerated as a PCIe device, and it is safe to boot the operating system and install the QLogic driver.
   - The presence or absence of the QLogic banner does not indicate that the QLogic adapter has been connected to a compatible switch.

- If the QLogic BIOS banner does not appear, confirm that the adapter is seated properly. If necessary, install the adapter in another available PCIe x8 slot. If the BIOS banner still does not appear, verify that the adapter is compatible with the server. If the adapter is compatible with the server, contact your authorized maintenance provider for instructions on updating the motherboard BIOS.
- The message `ROM BIOS NOT INSTALLED` may appear at the end of the QLogic BIOS banner. This message does not indicate an error, but that the QLogic ROM BIOS has not been enabled to boot from SAN. No action is required unless the adapter is booting from the SAN. For more information on configuring boot from SAN, refer to "Boot from SAN" on page 7-15.

3. For unified extensible firmware interface (UEFI) servers, boot into the UEFI shell and enter the `drivers` command to verify that the QLogic adapter is in the list of discovered devices. Figure 3-4 shows sample output for a dual-port QLogic 8100 Series Adapter. Each port is listed as both a 10GbE adapter and a Fibre Channel driver.

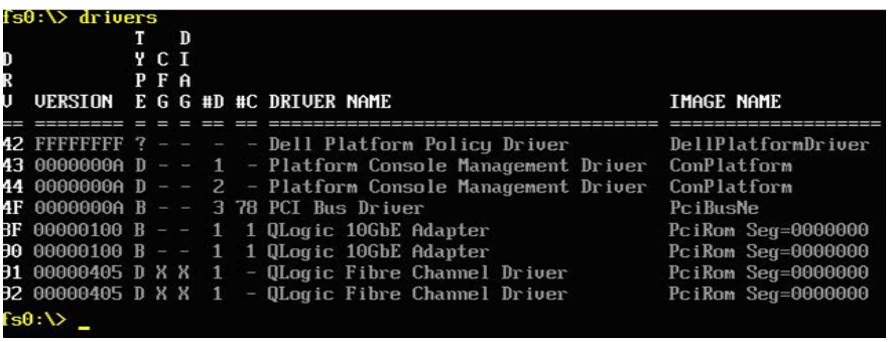


Figure 3-4. Drivers Command Output

Installing Software

The FCoE driver (STOR Miniport) and NIC driver (NDIS Miniport) provide the adapter's Fibre Channel and Ethernet capabilities, respectively. The adapter driver installation process depends on the Microsoft Windows operating system version that is installed on the server and whether the operating system image resides on the server hard drive or on the SAN.

Close any open QConvergeConsole windows before proceeding with the driver installation using the Windows Device Manager interface.

CAUTION!

A reboot may be required to complete the installation of a QLogic driver. If a reboot is required, the driver installation process prompts for a reboot.

NOTE:

For Microsoft Windows 2003 operating systems, a Microsoft STOR miniport update is required before installing the FCoE driver. For boot-from-SAN, you must install the update immediately after installing the operating system.

- For Windows Server 2003 SP2 or later, install Microsoft fixes KB932755 and KB939315.
- For Windows Server 2003 SP1, install Microsoft fixes KB932755 and KB939315.

Creating the Driver Disk or Extracting the Driver File into a Folder

For a boot-from-SAN installation, insert the disk, CD, or other media, and unzip the driver package file. Enter a temporary directory on the corresponding drive. This drive is called the *driver disk*.

NOTE:

Windows Server 2003 does not support the use of USB memory sticks or CD-ROMs; therefore a 3.5-inch floppy disk must be used.

For a server with the operating system already installed, unzip the downloaded driver package(s), and enter a temporary directory on to the local hard drive.

Identifying Unnamed Devices

QLogic 8100 Series Adapters are plugged into PCIe slots on the server motherboard. PCIe provides high-speed communication between the adapter and other components on the server motherboard. Devices that use PCIe have a vendor ID and a device ID. The vendor ID identifies the device vendor. For example, the vendor ID 1077 identifies QLogic as the vendor. The device ID identifies device types within devices for the same vendor. For the QLogic 8100 Series Adapter, the device IDs are 8000 (NIC function) and 8001 (FCoE function).

For Microsoft Windows, unless a valid driver is already installed, the device will appear in the Other Devices section of the Device Manager. To identify a QLogic device in the Other Devices section, match the vendor ID (1077) and device IDs (8000, 8001).

To obtain vendor ID and device ID information:

1. Right-click on the **My Computer** icon on the desktop or in the **Start** menu, and then select **Manage**.
2. Select **Device Manager** in the left pane.
3. In the right pane, under **Other Devices**, right click on any device and click **Properties** (Figure 3-5).

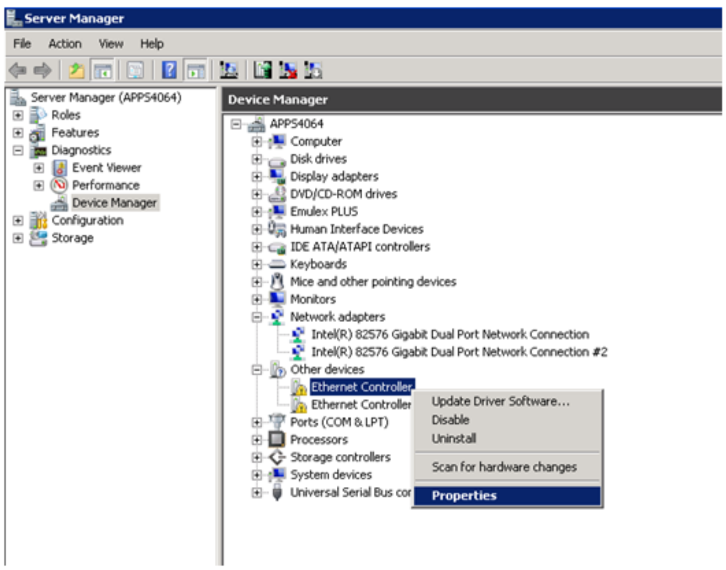


Figure 3-5. Device Properties

4. In the Device Properties window, click the **Details** tab.

5. In the **Property** drop-down list, select **Device Instance Id** (Windows Server 2003) or **Hardware Ids** (Windows 2008). Figure 3-6 shows sample vendor IDs and device IDs for QLogic 8100 NIC adapter (Windows 2003) and QLogic 8100 FCoE adapter (Windows 2008).

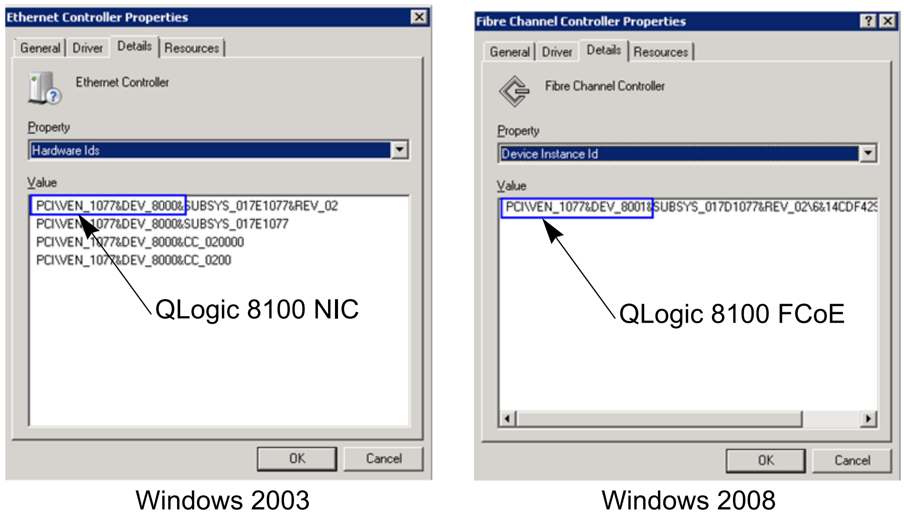


Figure 3-6. Sample QLogic Vendor IDs and Device IDs

6. Click **Cancel** to return to the Device Manager.

Installing and Updating Drivers Using Device Manager

The following sections describe how to install drivers for Windows 2003 and Windows 2008 servers using Device Manager. You can also install drivers using the QConvergeConsole Web Management Interface. For information about installing the QConvergeConsole Web Management Interface, refer to the *QConvergeConsole User's Guide*.

For information about determining the currently installed QLogic driver versions, refer to "Verifying Driver Installation" on page 3-31.

Installing the NIC Driver for Windows Server 2003

This procedure describes how to install the NIC driver for one adapter port on a Windows Server 2003 using Device Manager. For adapters with multiple ports, you must repeat this procedure for each port. To install the NIC driver:

1. Install the adapter as described in "Installing Hardware" on page 3-4.
2. After the Microsoft Windows operating system has booted up, log on to the server as the administrator.
3. Right-click on the **My Computer** icon on the desktop or in the **Start** menu, and then select **Manage**.

4. In the Computer Management window, select **Device Manager** in the left pane.

5. Scroll down the list of hardware types in the right pane. If you are installing the QLogic adapter drivers for the first time on this server, do the following; otherwise, go to Step 6:

   a. Click **Other Devices** to see a list of devices for which a driver is not installed on the server. Find each port of the QLogic adapter NIC function that is listed as Ethernet Controller under this section. Figure 3-7 shows typical entries for a dual-port QLogic 8100 Series Adapter. For information about identifying QLogic devices in the Other Devices section, refer to "Identifying Unnamed Devices" on page 3-8.

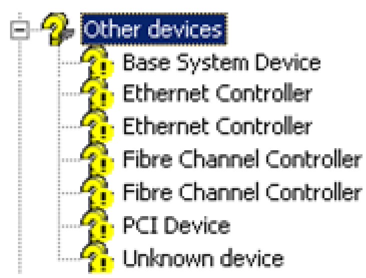


Figure 3-7. QLogic 8100 Series Adapter Device Entries

   b. To install the driver, right click **Ethernet Controller**, and then click **Update Driver** (Figure 3-8).

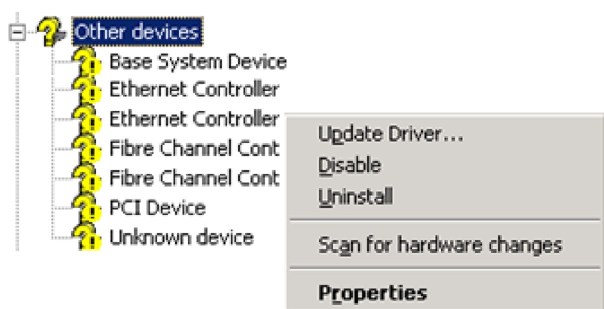


Figure 3-8. Installing an NIC Driver

6. If you are updating QLogic adapter drivers:

   a. Click **Network Adapters** (for NIC Drivers). Find each port of the QLogic adapter NIC function that is listed as QLogic10Gb PCI Ethernet

Adapter under this section. Figure 3-9 shows typical entries for a dual-port QLogic 8100 Series Adapter.

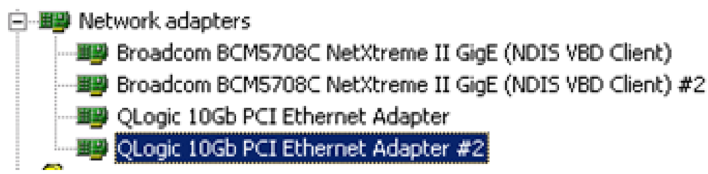


Figure 3-9. Typical QLogic 8100 Series Ethernet Adapter Port Entries

b. To update the driver, right click **Ethernet Controller**, and then click **Update Driver** (Figure 3-10).

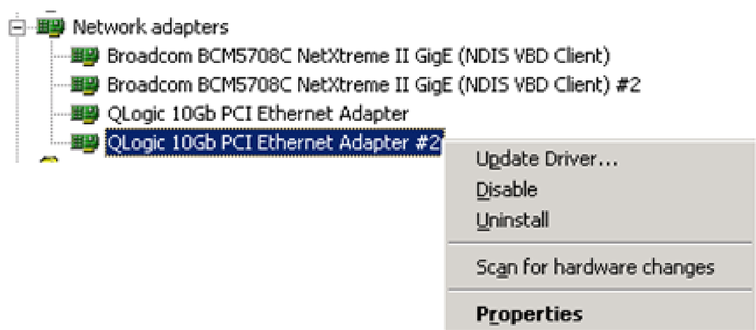


Figure 3-10. Updating an NIC Driver

7. The Hardware Update Wizard starts. Select **No, not this time**, and then click **Next** (Figure 3-11).

Figure 3-11. Starting the Hardware Update Wizard

8. Select **Install from a list or specific location (Advanced)**, and then click **Next**.
9. Click **Have Disk**, and then navigate to the folder containing the extracted QLogic NIC driver that you downloaded in "Downloading QLogic Drivers" on page 3-2.
10. Select the setup information file (`qlge.inf`) from the list of QLogic NIC driver files, and then click **Open**.
11. When the Hardware Update Wizard/Select a Device Driver dialog box opens, click **Next**.

12. Confirm that the QLogic 10Gb network adapter is shown in the list of network adapters (Figure 3-12), and then click **Next**.

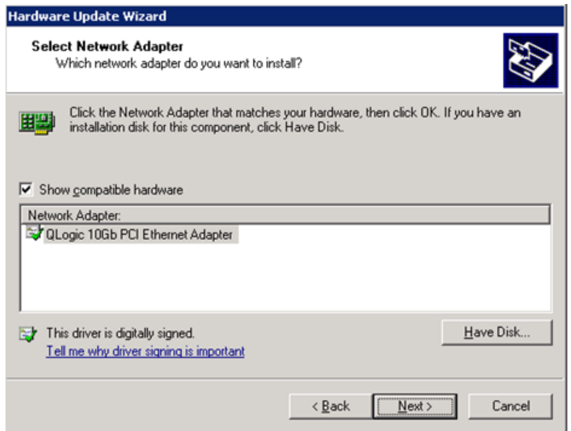


Figure 3-12. Confirming the Ethernet Adapter

13. The Microsoft Windows Hardware Update Wizard installs the NDIS driver for the QLogic adapter NIC function.
14. When the installation is complete, click **Finish** to close the Hardware Update Wizard.

Installing the FCoE Driver for Windows Server 2003

This procedure describes how to install the FCoE driver for one adapter port on a Windows Server 2003 using Device Manager. For adapters with multiple ports, you must repeat this procedure for each port. To install the FCoE driver:

1. Install the adapter as described in "Installing Hardware" on page 3-4.
2. After the Microsoft Windows operating system has completed booting up, log on to the server as the Administrator.
3. Right-click on the **My Computer** icon on the desktop or in the **Start** menu, and then select **Manage**.
4. In the Computer Management window, select **Device Manager** in the left pane.
5. Scroll down the list of hardware types in the right pane. If you are installing the QLogic adapter drivers for the first time on this server, do the following; otherwise, go to Step 6:
   a. Click **Other Devices** to see a list of devices for which a driver is not installed on the server. Find each port of the QLogic adapter FCoE function that is listed as **Fibre Channel Controller** under this section. Figure 3-7 shows typical entries for a dual-port QLogic 8100 Series

Adapter. For information about identifying QLogic devices in the Other Devices section, refer to “Identifying Unnamed Devices” on page 3-8.

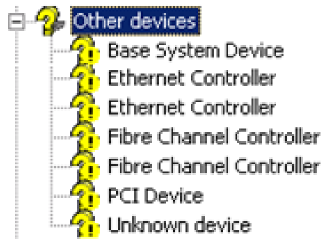


Figure 3-13. QLogic 8100 Series Adapter Device Entries

b. To install the driver, right click **Fibre Channel Controller**, and then click **Update Driver** (Figure 3-14).

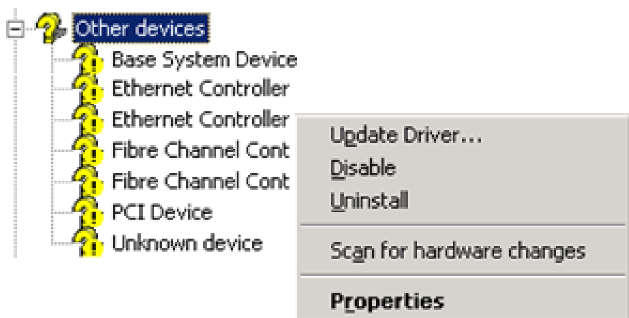


Figure 3-14. Installing an FCoE Driver

6. If you are updating QLogic adapter drivers:

   a. Click **SCSI and RAID Devices** (for FCoE Drivers). Find each port of the QLogic adapter FCoE function that is listed as QLogic FCoE Adapter under this section. Figure 3-15 shows typical entries for a dual-port QLogic 8100 Series Adapter.

Figure 3-15. Typical QLogic 8100 Series Adapter Port Entry

b. To upgrade the driver, right click **QLogic FCoE Adapter**, and then click **Update Driver** (Figure 3-16).

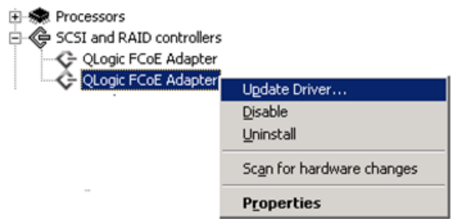


Figure 3-16. Updating an FCoE Driver

7. The Hardware Update Wizard starts. Select **No, not this time**, and then click **Next**.
8. Select **Install from a list or specific location (Advanced)**, and then click **Next**.
9. Click **Have Disk**, and then navigate to the folder containing the extracted QLogic FCoE driver that you downloaded in "Downloading QLogic Drivers" on page 3-2.
10. Select the setup information file (`qlfcoe.inf`) from the list of QLogic FCoE driver files, and then click **Open**.
11. When the Hardware Update Wizard/Select a Device Driver dialog box opens, click **Next**.
12. Confirm that the QLogic FCoE adapter is shown in the list of network adapters (Figure 3-17), and then click **Next**.

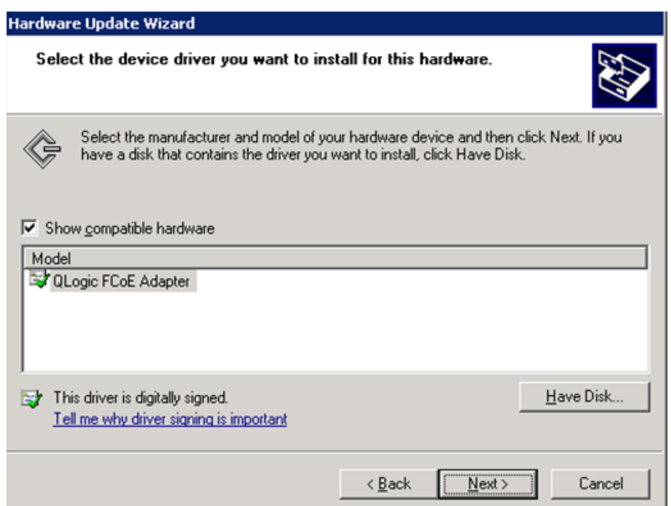


Figure 3-17. Confirming the FCoE Adapter

13. The Microsoft Windows Hardware Update Wizard proceeds to install the STOR Miniport driver for the QLogic adapter FCoE function.
14. When the installation is complete, click **Finish** to close the Hardware Update Wizard.

Installing the NIC Driver for Windows Server 2008

This procedure describes how to install the NIC driver for one adapter port on a Windows Server 2008 using Device Manager. For adapters with multiple ports, you must repeat this procedure for each port.

To install the NIC driver:

1. Install the adapter as described in “Installing Hardware” on page 3-4.
2. After the Microsoft Windows operating system has completed booting up, log on to the server as the Administrator.
3. Right-click on the **My Computer** icon on the desktop or in the Start menu, and then select **Manage**.
4. In the Server Management window, expand the Diagnostics entry in the left pane, and then select **Device Manager**.
5. Scroll down the list of hardware types. If you are installing the QLogic adapter drivers for the first time on this server, do the following; otherwise go to Step 6.
    a. Click **Other Devices** to see a list of devices for which a driver is not installed on the server. Find each port of the QLogic adapter NIC function that is listed as **Ethernet Controller** under this section. Figure 3-18 shows the typical entries for a dual-port QLogic 8100 Series Adapter.

Figure 3-18. QLogic 8100 Series Adapter Device Entries—Windows 2008

b. To install the driver, right click **Ethernet Controller**, and then click **Update Driver Software** (Figure 3-19).

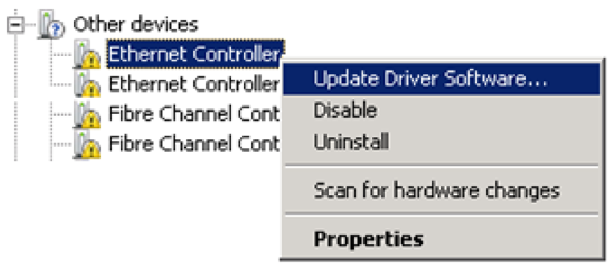


Figure 3-19. Installing an NIC Driver—Windows 2008

6. If you are updating QLogic adapter drivers:

   a. Click **Network Adapters** (for NIC drivers). Find each port of the QLogic adapter NIC function that is listed as QLogic10Gb PCI Ethernet Adapter under this section. Figure 3-20 shows typical entries for a dual-port QLogic 8100 Series Adapter.

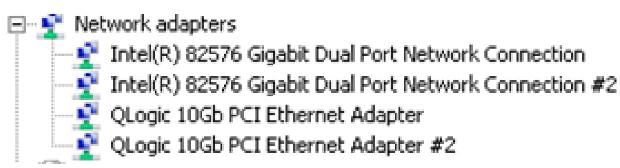


Figure 3-20. Typical Ethernet Adapter Port Entries for Windows 2008

   b. To update the driver, right click **QLogic10Gb PCI Ethernet Adapter**, and then click **Update Driver Software** (Figure 3-21).

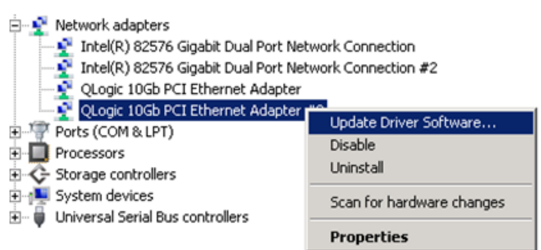


Figure 3-21. Updating an NIC Driver for Windows 2008

7. The Update Driver Software Wizard starts. Click **Browse my computer for driver software** (Figure 3-22).

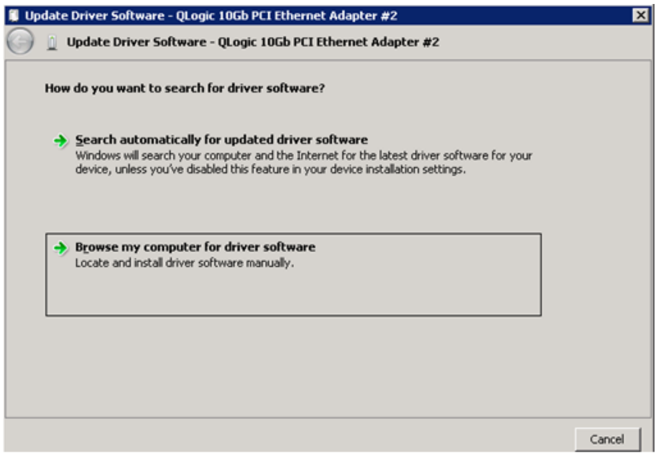


Figure 3-22. Starting the Update Driver Software Wizard

8. In the Update Driver Software–Ethernet Controller dialog box, click **Browse**, and then navigate to the folder containing the QLogic NIC driver that you downloaded earlier. Click **Next**.

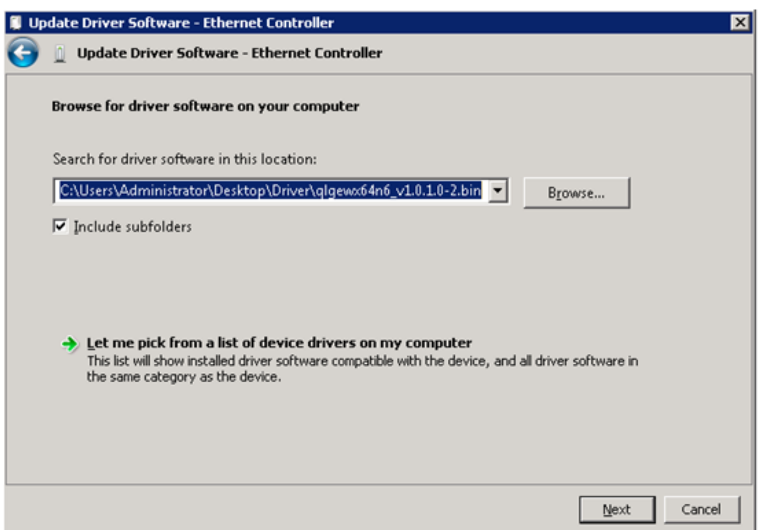


Figure 3-23. Select Driver Software

9. The Microsoft Windows Update Driver Software Wizard installs the NDIS driver for the QLogic adapter NIC function. The progress bar indicates activity during the installation.

10. When the installation is complete, the message `Windows has successfully installed/updated your driver software` appears. Click **Close** to exit.

Installing the FCoE Driver for Windows Server 2008

This procedure describes how to install the FCoE driver for one adapter port on a Windows Server 2008 using Device Manager. For adapters with multiple ports, you must repeat this procedure for each port.

To install the FCoE driver:

1. Install the adapter as described in "Installing Hardware" on page 3-4.
2. After the Microsoft Windows operating system has completed booting up, log on to the server as the Administrator.
3. Right-click on the **My Computer** icon on the desktop or in the Start menu, and select **Manage**.
4. In the Server Management window, expand the Diagnostics entry in the left pane, and then select **Device Manager**.
5. Scroll down the list of hardware types. If you are installing the QLogic adapter drivers for the first time on this server, do the following; otherwise go to Step 6.
   a. Click **Other Devices** to see a list of devices for which a driver is not installed on the server. Find each port of the QLogic adapter FCoE function that is listed as **Fibre Channel Controller** under this section. Figure 3-24 shows the typical entries for a dual-port QLogic 8100 Series Adapter.

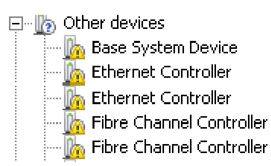


Figure 3-24. QLogic 8100 Series Adapter Device Entries for Windows 2008

b. To install the driver, right click **Fibre Channel Controller**, and then click **Update Driver Software...** (Figure 3-25).

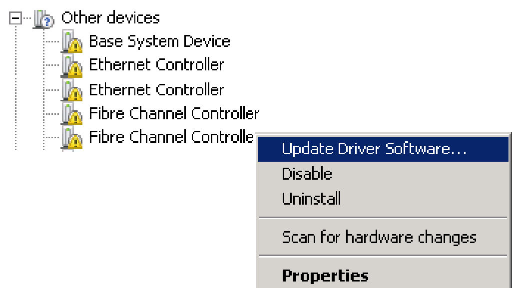


Figure 3-25. Installing an FCoE Driver for Windows 2008

6. If you are updating QLogic adapter drivers:

   a. Click **Storage controllers** (for FCoE drivers). Find each port of the QLogic adapter FCoE function that is listed as QLogic FCoE Adapter under this section. Figure 3-26 shows typical entries for a dual-port QLogic 8100 Series Adapter.

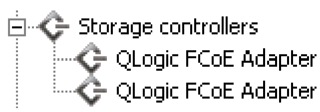


Figure 3-26. Typical QLogic 8100 Series Adapter Port Entry

   b. To update the driver, right click **QLogic FCoE Adapter**, and then click **Update Driver Software…** (Figure 3-27).

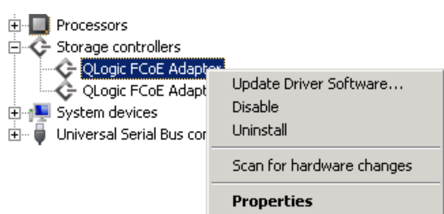


Figure 3-27. Updating an FCoE Driver for Windows 2008

7. The Update Driver Software Wizard starts. Click **Browse my computer for driver software** (Figure 3-28).

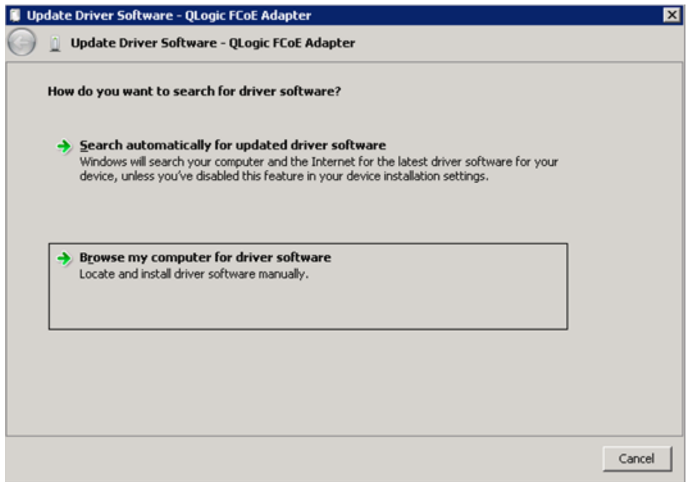


Figure 3-28. Starting the Update Driver Software Wizard

8. In the Update Driver Software–Ethernet Controller dialog box, click **Browse**, and then navigate to the folder containing the QLogic FCoE driver that you downloaded earlier (Figure 3-29). Click **Next**.

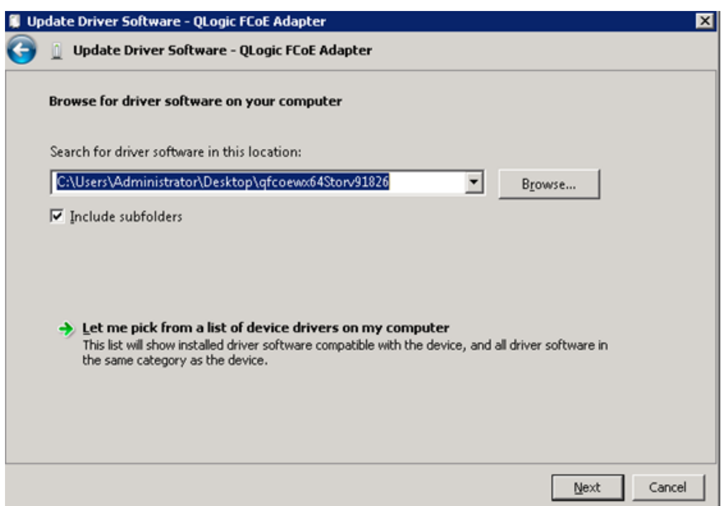


Figure 3-29. Select Driver Software

9. The Microsoft Windows Update Driver Software Wizard proceeds to install the FCoE driver for the QLogic adapter FCoE function. The progress bar indicates activity during the installation.

10. When the installation is complete, the message `Windows has successfully installed/updated your driver software` appears. Click **Close** to exit.

11. If a reboot is required to complete the driver installation or update, Windows will prompt you (Figure 3-30). If you are finished installing drivers for all ports, click **Yes**. Otherwise, click **No** and proceed with the installation.

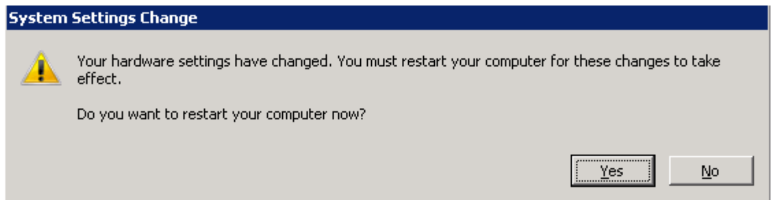


Figure 3-30. Prompt to Reboot

Installing and Updating Drivers Using the Windows SuperInstaller

The Windows SuperInstaller provides the following tasks and functions:

- Driver pre-installation
- Driver installation
- Driver updates
- Multiple installation modes: normal, CLI, silent
- Management agent installation for Ethernet Networking, FC-FCoE, and iSCSI
- QConvergeConsole CLI utility installation

Downloading the Windows SuperInstaller

To download the Windows SuperInstaller:

1. Go to the QLogic Web site: http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. Click **QLogic Adapters**.
4. In the selection list, click **Converged Network Adapters** in the first column.
5. In the selection list, click the adapter model number in the second column.

6. In the third column, click the version of the Microsoft Windows operating system that is installed on the server. For example, in Figure 3-31, **Windows Server 2008 R2 (64-bit)** is selected for a QLE8152 adapter.

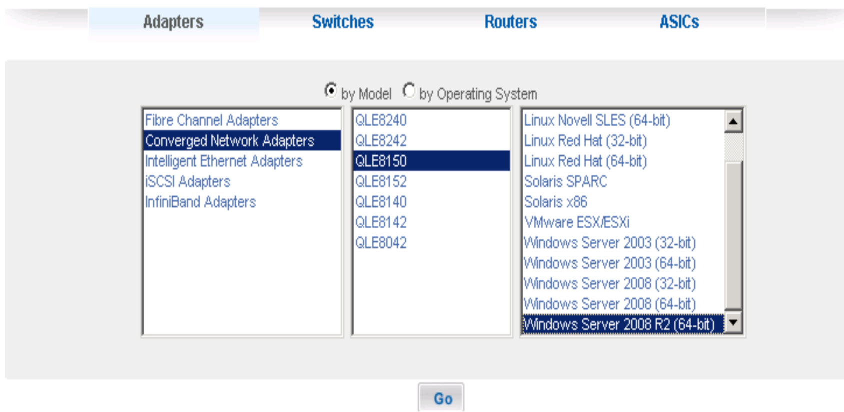
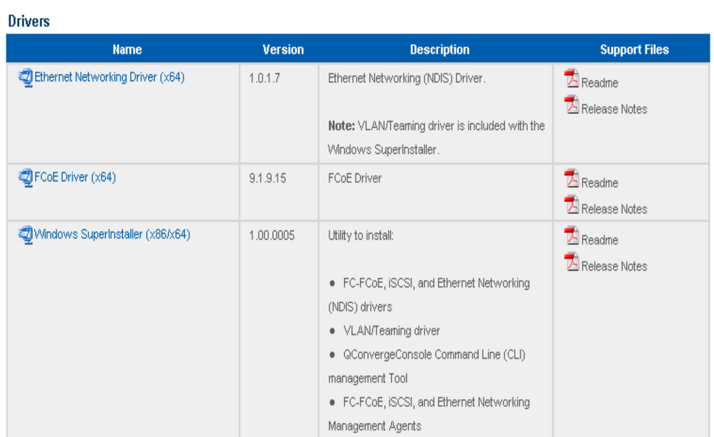


Figure 3-31. Select an Adapter and a Windows Operating System

7. Click **Go**.

8. Under Drivers, click the download link for the Windows SuperInstaller (Figure 3-32). On the same page, review the Readme file, which describes how to install and use the Windows SuperInstaller. The release notes provide the versions of the QLogic adapter drivers that are bundled with the SuperInstaller.


Drivers

Name	Version	Description	Support Files
Ethernet Networking Driver (x64)	1.0.1.7	Ethernet Networking (NDIS) Driver. **Note:** VLAN/Teaming driver is included with the Windows SuperInstaller.	Readme Release Notes
FCoE Driver (x64)	9.1.9.15	FCoE Driver	Readme Release Notes
Windows SuperInstaller (x86/x64)	1.00.0005	Utility to install: • FC-FCoE, iSCSI, and Ethernet Networking (NDIS) drivers • VLAN/Teaming driver • QConvergeConsole Command Line (CLI) management Tool • FC-FCoE, iSCSI, and Ethernet Networking Management Agents	Readme Release Notes

Figure 3-32. Download the Windows SuperInstaller

9. Read the license agreement that opens, then click **I Agree** to accept the terms. A dialog box opens, prompting you to save or open the file.

   The Windows SuperInstaller package is an EXE file (`Setup.exe`).

10. Run the Windows SuperInstaller:

    a. Extract the `setup.exe` from the `.ZIP` file to a temporary location on your system drive.

    b. Use Windows Explorer to navigate to the temporary location.

    c. In Windows Explorer, double-click the following file:

    `Setup.exe`

11. Respond to prompts on the SuperInstaller screens to install the applications, agents, optional components, and drivers.

12. When the installation is complete, click **Finish** to terminate the wizard.

Initial Windows Server 2003 Installation with the Converged Network Adapter as Boot Device (for FCoE Driver Only)

To install Windows Server 2003 on the boot-from-SAN disk attached to the QLogic Converged Network Adapter:

1. Start the Windows installation procedure using the setup CD.

2. Press F6 in response to the following message.

```
Press F6 if you want to install a third party SCSI or RAID
Driver
```

3. Wait for the Windows installation process to load the drivers for all the standard devices.

4. After all drivers have been loaded for the standard devices (Figure 3-33), type `S` to select **Specify Additional Device**.

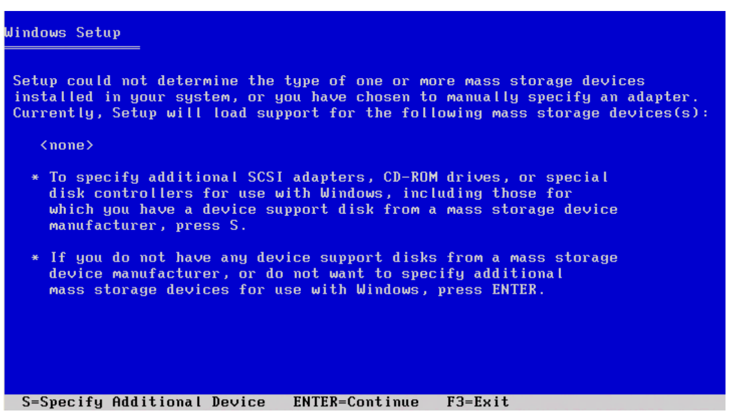


Figure 3-33. Specify Additional Device

5. Insert the QLogic driver disk (3.5-inch floppy) into a floppy disk drive on the server, and then press ENTER (Figure 3-34).

NOTE:

Windows Server 2003 does not support the use of USB memory sticks or CD-ROMs; therefore, a 3.5-inch disk is required.

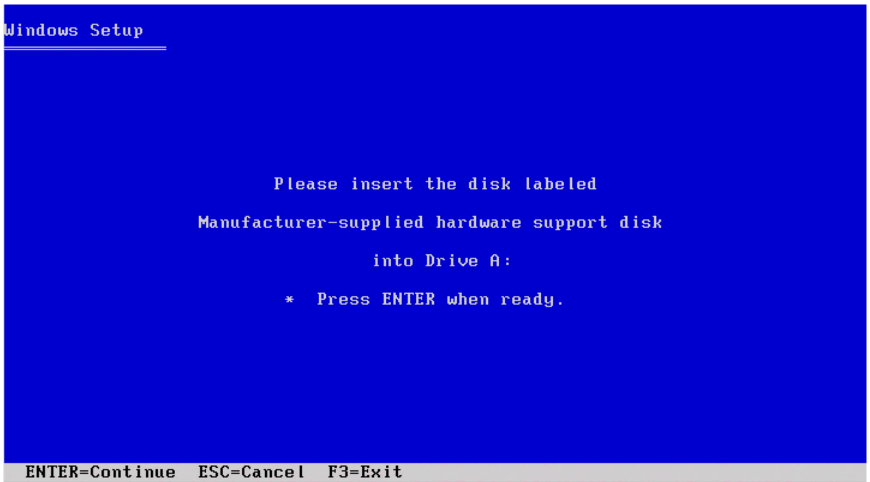


Figure 3-34. Insert Driver Disk

6. Windows displays a list of drivers found on the disk (Figure 3-35). Select **QLogic FCoE Adapter**, and then press ENTER.

Figure 3-35. Select QLogic FCoE Adapter

7. Windows presents a list of mass storage device drivers to load in addition to the standard drivers that have already been installed (Figure 3-36). If required, specify other devices, or press ENTER to continue with the installation.

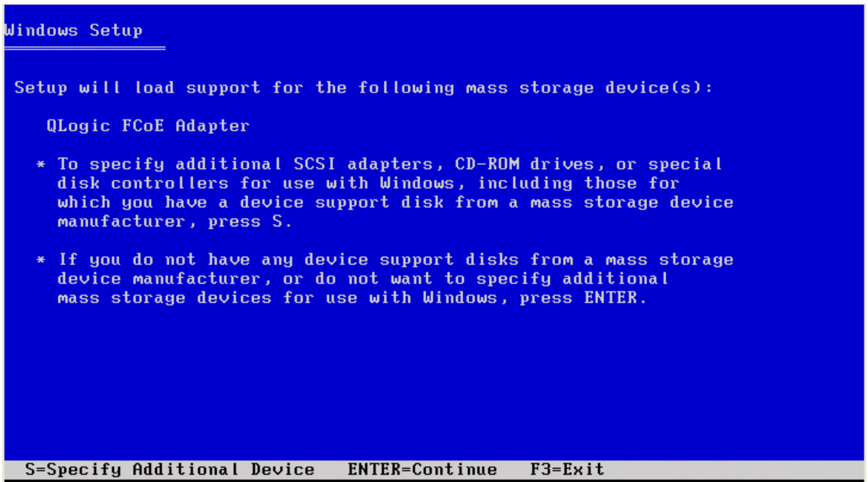


Figure 3-36. Install Additional Drivers

8. Continue with the standard Windows Server 2003 installation procedure. For more information about the other QLogic BIOS configurations required to enable a server to boot from SAN, refer to “Boot from SAN” on page 7-15.

Initial Windows Server 2008 Installation with the Converged Network Adapter as Boot Device (for FCoE Driver Only)

To initially install Windows Server 2008 on the boot-from-SAN disk attached to the QLogic Converged Network Adapter:

1. Start the Windows installation procedure using the setup CD.
2. Read and accept the Windows End User License Agreement.

3. When prompted to indicate the type of installation (Figure 3-37), click **Custom (advanced)**.

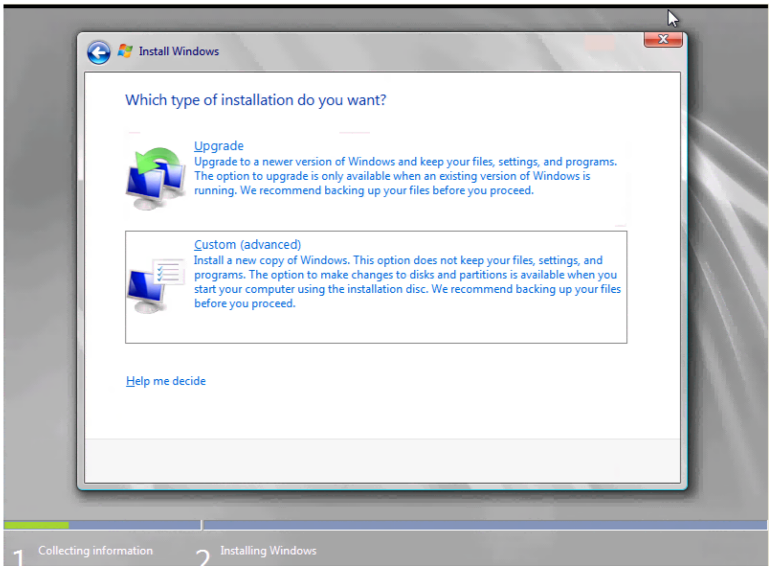


Figure 3-37. Windows Installation Type

4. When prompted to indicate where to install Windows (Figure 3-38), click **Load Driver**.

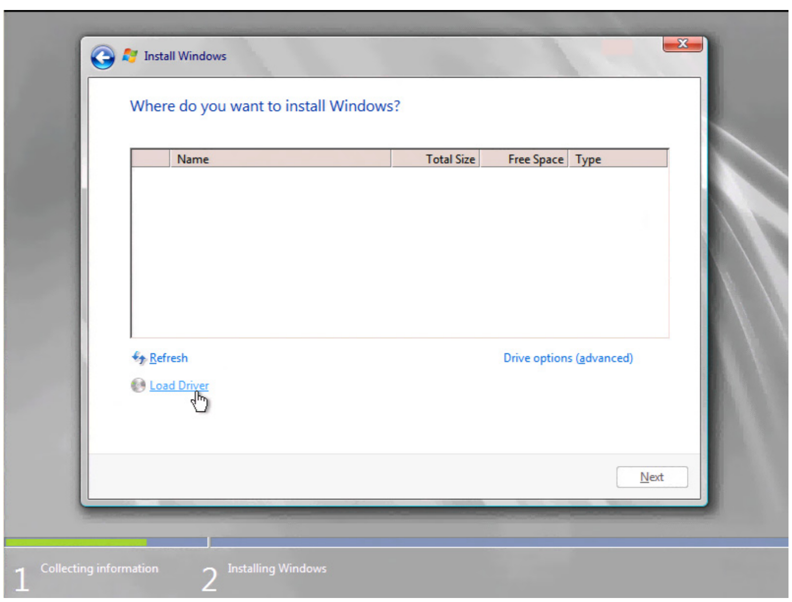


Figure 3-38. Windows Installation Location

5. When prompted to select the driver to be installed (Figure 3-39), insert the QLogic driver disk (3.5-inch disk, USB memory stick, CD/DVD-ROM), click **Browse**, and then select the drive containing the QLogic driver disk.

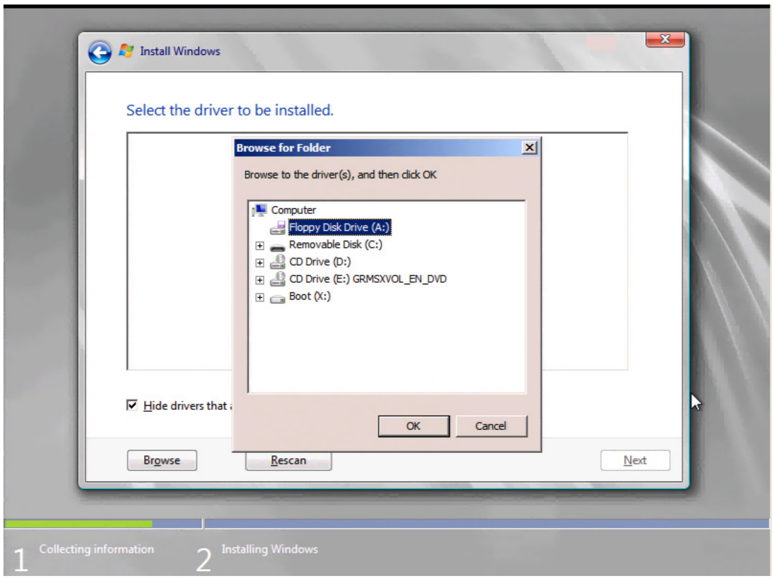


Figure 3-39. Insert the Driver Disk

6. Windows Setup presents a list of all drivers on the driver disk (Figure 3-40). Select **QLogic FCoE Adapter** from the list.

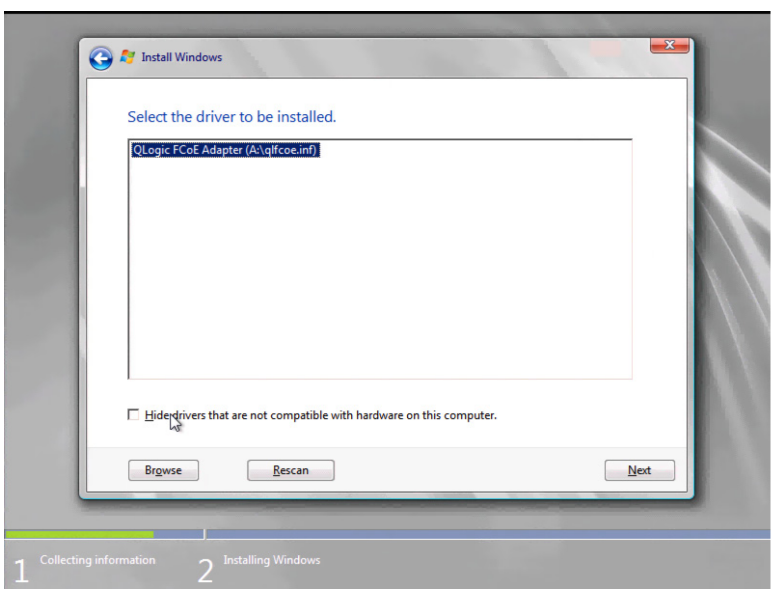


Figure 3-40. Select the Driver to Be Installed

7. Windows loads the QLogic FCoE driver, and displays all LUNs that were presented to the QLogic adapter for a boot-from-SAN installation. If LUNs are found, Windows prompts you to select the disk/LUN on the SAN on which to install Windows Server 2008 (Figure 3-40).

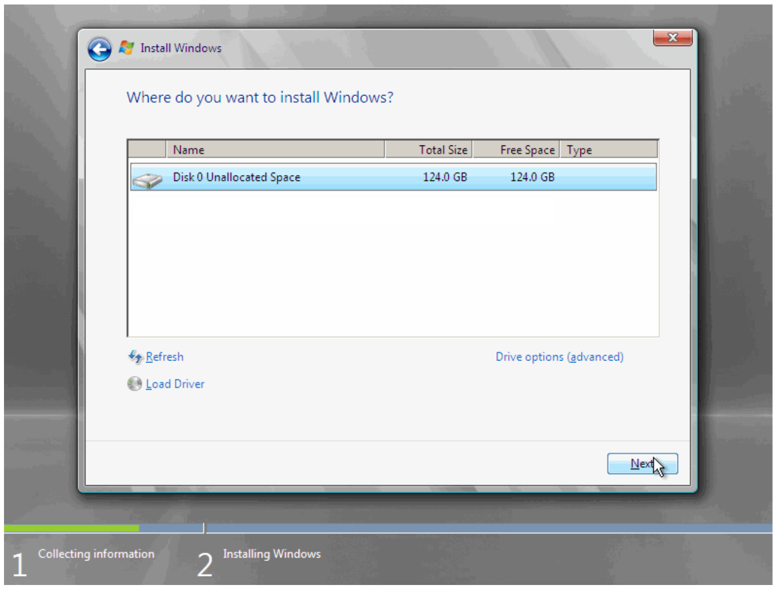


Figure 3-41. Select Disk/LUN on which to Install Windows 2008

8. Click **Next** to continue with the standard Windows Server 2008 installation procedure. For more information about the other QLogic BIOS configurations required to enable a server to boot from SAN, refer to "Boot from SAN" on page 7-15.

Removing the Driver

To remove the driver from the Microsoft Windows server:

1. Power off the server.
2. Remove all QLogic 8100 Series Adapters from the server. For information about adapter handling precautions, see "Installing Hardware" on page 3-4.

NOTE:

Generally, it is not necessary to use the Device Manager or the Hardware wizard to uninstall a plug-and-play device like the QLogic 8100 Series Adapter. After you remove the adapter from the server, and restart the server, Microsoft Windows automatically recognizes that the adapter has been removed and disables the driver.

CAUTION!

Do not attempt to manually remove any QLogic driver files from the operating system directories or remove any registry entries related to the QLogic drivers—this may disable the operating system.

Verifying Driver Installation

Verify every adapter installation to guarantee that the adapter drivers have been installed successfully and are operational. To verify the driver installation:

1. Verify that the server operating system can see the QLogic 8100 Series Adapter and that it is classified under the correct hardware type.

   a. Start the Device Manager, and expand the network adapters and SCSI and RAID controllers/storage controllers entries.

   b. Confirm that each QLogic 8100 Series Adapter port is listed in the Windows Device Manager under its respective categories.

   c. Verify that the port icon indicates a healthy state (a yellow or red mark on the icon indicates an unhealthy state). Figure 3-42 shows a dual-port QLogic 8100 adapter in Device Manager (Windows 2008) when the FCoE and NIC drivers are installed, and the Network Adapters and Storage Controllers sections are expanded.

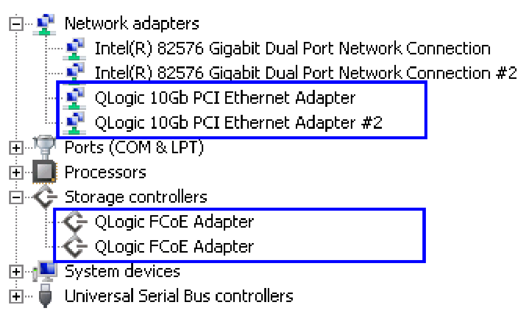


Figure 3-42. Confirming Port Classification and Health

2. Verify that QLogic adapter driver versions are the most recent for the server operating system. Compare the installed driver versions with those on the QLogic Web site. For information about downloading drivers from the QLogic Web site, see “Downloading QLogic Drivers” on page 3-2.

   To obtain version information for QLogic drivers installed on the server:

   a. Right-click on the **My Computer** icon on the desktop or in the Start menu, and then select **Manage**.

   b. Select **Device Manager**.

c. In Device Manager, under **Network Adapters** (for NIC Drivers) and **Storage Controllers** (for FCoE Drivers), right click on a QLogic-labeled entry, and then click **Properties** (Figure 3-43).

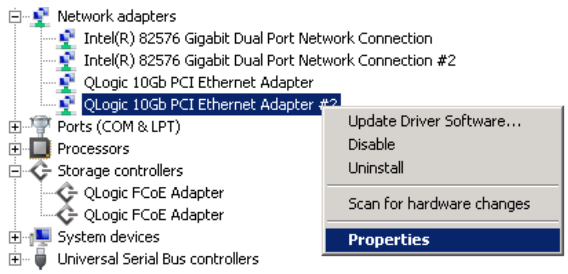


Figure 3-43. Network Adapters and Storage Controllers

d. In the Properties dialog box, click the **Driver** tab and find the field Driver Version field. Figure 3-44 shows an example of a NIC adapter driver (version 1.0.1.0) and an FCoE adapter driver (version 9.1.8.26).

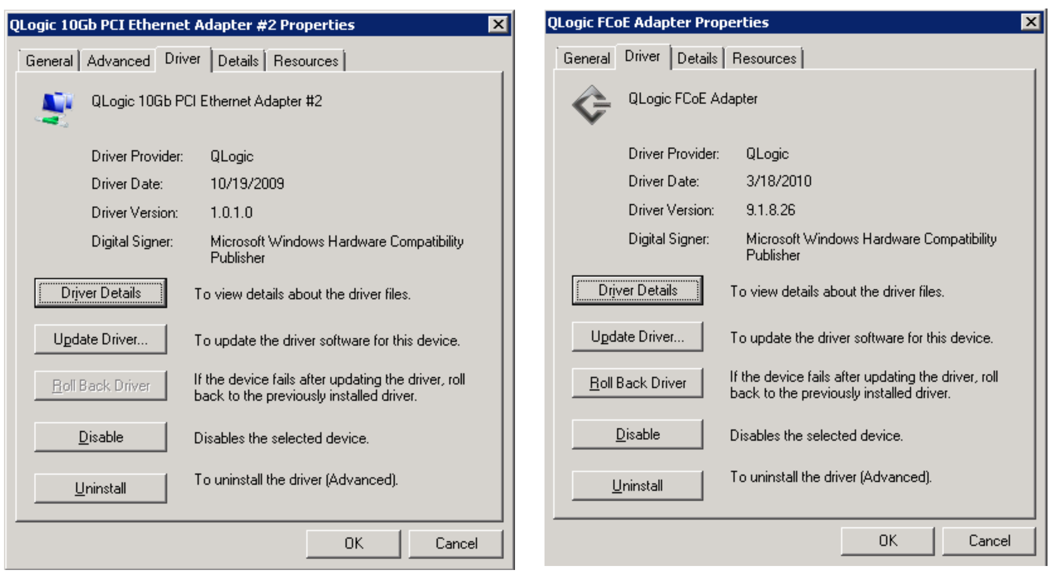


Figure 3-44. NIC and FCoE Adapter Driver Properties

3. Understand the LED scheme for QLogic 8100 Series Adapters. For information about QLogic 8100 Series Adapter LEDs, see Appendix A.

Firmware Upgrades

QLogic 8100 Series Converged Network Adapters ship with the latest firmware version. QLogic periodically releases new firmware versions, which can be downloaded from the QLogic Web site as part of a multi-boot image. Always use the latest firmware versions for enhanced performance and availability.

QLogic does not publish an image that contains just the firmware, but rather publishes a package (known as *boot code* or *multi-boot image*) that contains the firmware, BIOS drivers, UEFI drivers, and offline utilities. To update the firmware, you must update the boot code on the QLogic 8100 Series Adapters. QLogic publishes one boot code for all operating systems and QLogic 8100 Series Adapter models.

Obtaining the QLogic Firmware/Boot Code

To download the QLogic boot code:

1. Go to the QLogic Web site: http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. Click **QLogic Adapters**.
4. In the selection list, click **Converged Network Adapters** in the first column.
5. In the selection list, click on the adapter model number in the second column.
6. In the third column, click the version of the Microsoft Windows operating system that is installed on the server. For example, in Figure 3-45, **Windows Server 2008 R2 (64-bit)** is selected for a QLE8152 adapter.

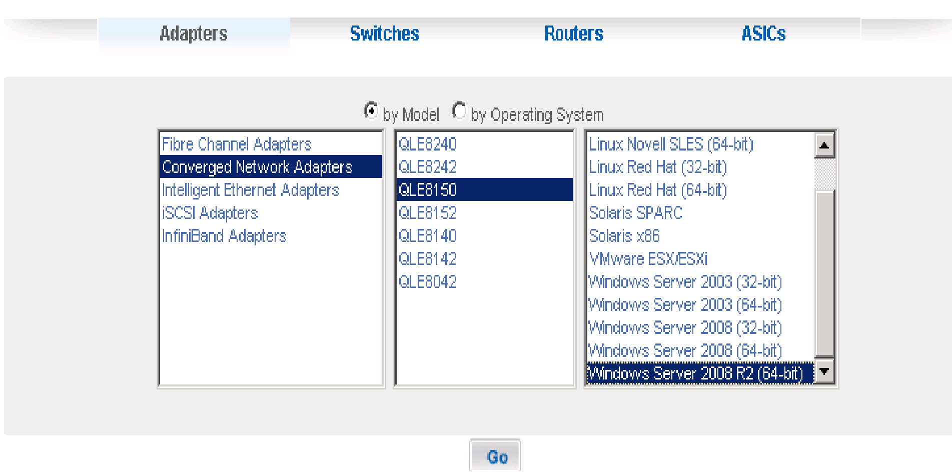


Figure 3-45. Select an Adapter and a Windows Operating System

7. Click **Go**.

8. Under Boot Code, click the download link for the multi-boot image (Figure 3-46). The multi-boot image contains firmware, BIOS and UEFI drivers, and the FlasUTIL and EFIUTIL utilities. Make a note of the FCoE firmware version included in the multi-boot image.

Boot Code

Name	Version	Description	Support Files
Multi-boot Image for QLE8152 Converged Network Adapters	1.01.98		Readme Release Notes
[Previously released versions]			

Figure 3-46. Download the Multi-boot Image

9. Read the license agreement, and then click **Agree**.
10. When prompted, select **Save** to save and extract (unzip) the multi-boot image to a temporary location on your workstation.

CAUTION!

Do not alter any files or the contents of the compressed multi-boot image or the extracted files—this is could corrupt the boot code. Flashing a corrupt boot code, or attempting to update boot code using a different method than what is described in this section, may render the adapter inoperable.

Determining the Installed Firmware Version

Use the QConvergeConsole GUI or QConvergeConsole CLI to determine the firmware version of the QLogic adapter installed in the server. For information about installing and using the QConvergeConsole management tools, refer to Section 2.

To determine the adapter firmware version:

1. In the QConvergeConsole web management GUI, in the left pane, expand the host to view the connected adapters.
2. Select the port QLogic 8100 Series Adapter for which to determine the installed firmware version. The **HBA Info** tabbed page identifies the firmware version (Figure 3-47).

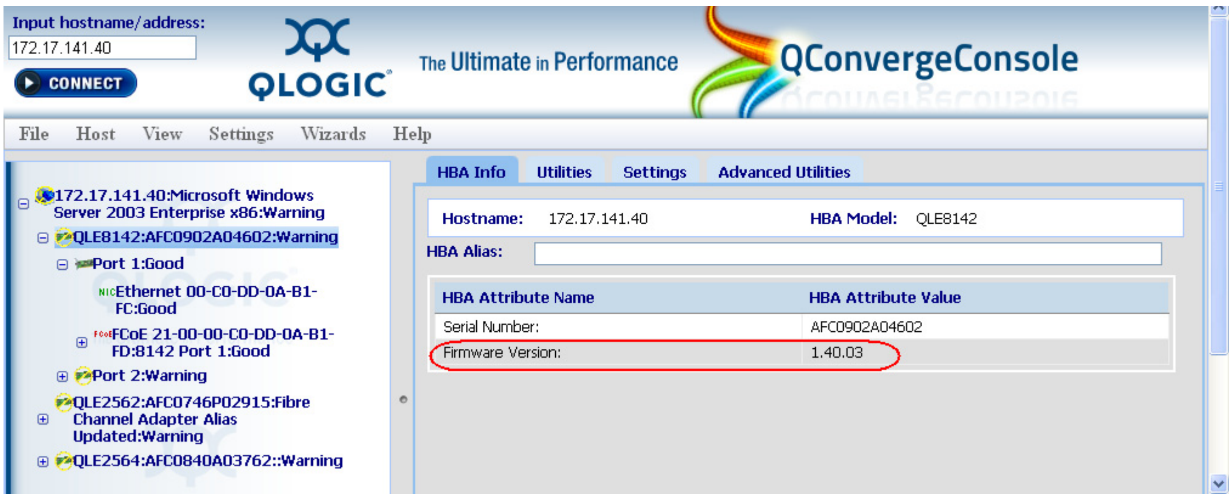


Figure 3-47. Displaying the Adapter Firmware Version

3. Expand the physical Port 1, select the FCoE port, and then select the **VPD** tab (Figure 3-48) in the right pane. The Flash Image Version appears at the bottom of the Port Vital Product Data (VPD) list.

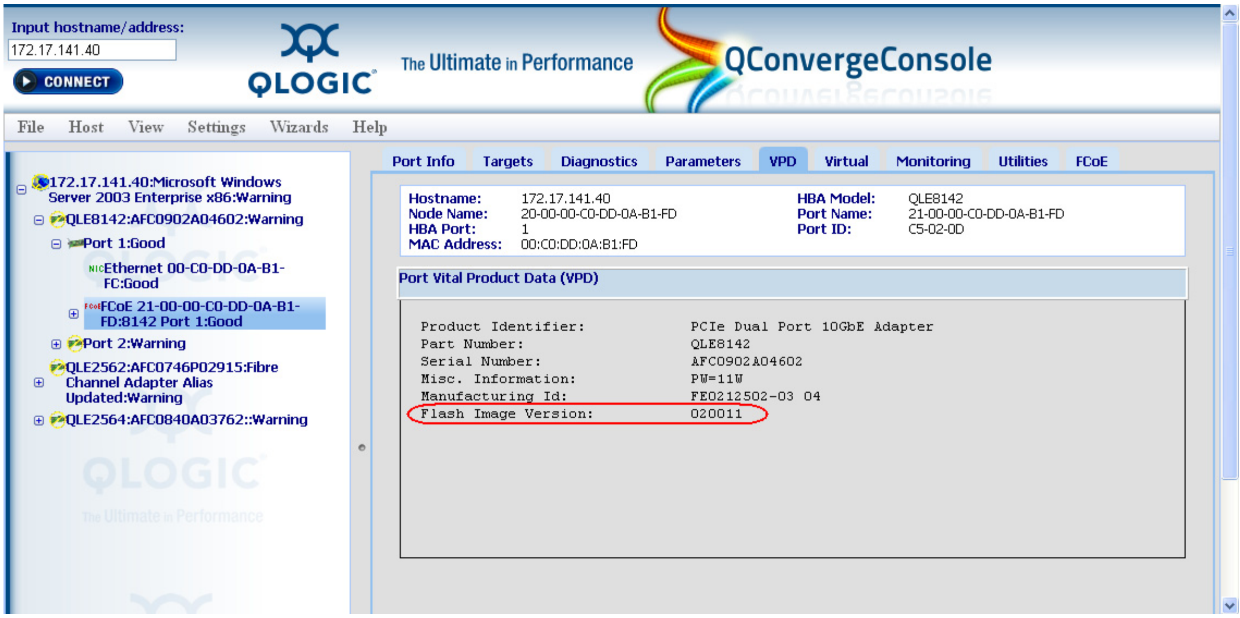


Figure 3-48. Displaying the Multi-boot Image Version

Upgrading the Firmware/Boot Code

Using QConvergeConsole GUI or QConvergeConsole CLI

Firmware is updated for the adapter and not for individual ports. For a multiport adapter, firmware can be updated only through the first port.

To update firmware using the QConvergeConsole:

1. Expand the physical Port 1 and select the FCoE port.
2. In the right pane, click the **Utilities** tab.

3. Under Flash, click **Update Entire Image** (Figure 3-52).

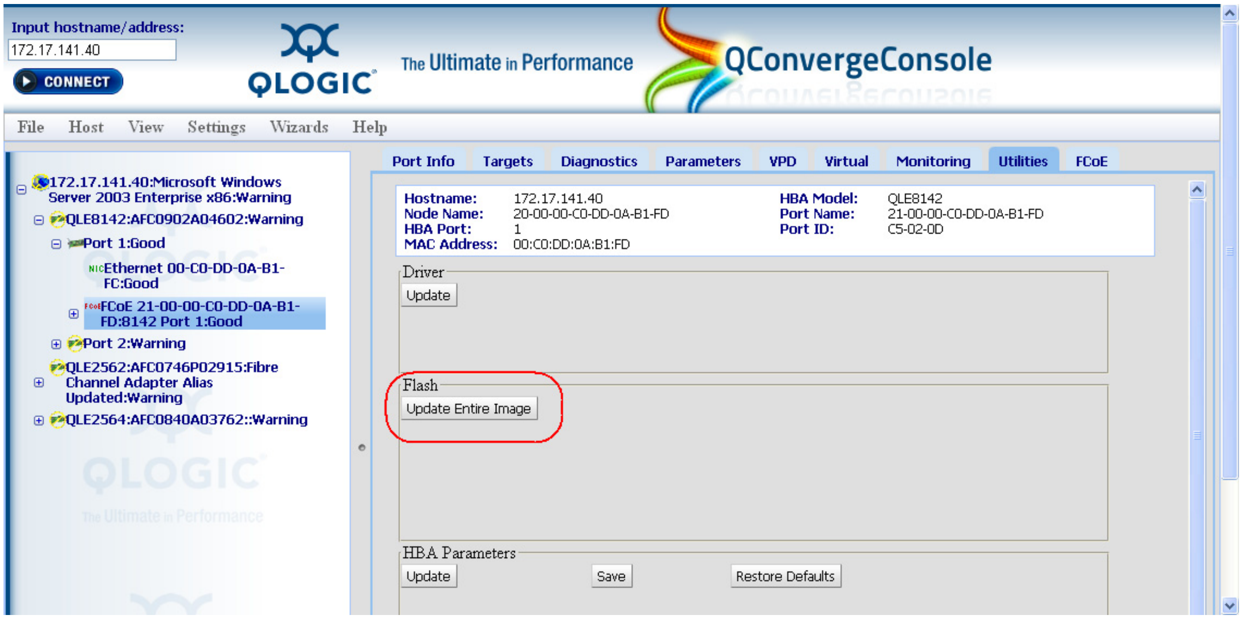


Figure 3-49. QConvergeConsole—Update Entire Image

4. Click the **Choose File** button. The Open dialog box appears.
5. Navigate to and click on the file from which to update, then click **Open**. Make sure you select the correct file.

NOTE:

The Flash file must end with a `.bin` extension. Note that Flash files are unique to each adapter model.

---

6. If you select a file that is an unacceptable Flash file for the adapter, the unacceptable Flash data file message displays. Re-select a valid file and click **OK**. The Security Check dialog box appears.
7. In the **Enter Password** box, type the password, and then click **OK**.The page appears dimmed during the update.
8. When complete, the flash update complete message appears.
9. Select **Refresh** from the **Host** menu to refresh the configuration and version information.
10. Verify the firmware installation as described in "Determining the Installed Firmware Version" on page 3-34.

Updating Firmware Using QLogic BIOS and UEFI Utilities

You can update firmware without a first installing an operating system on the server. Such firmware upgrades are considered offline upgrades.

To update firmware on BIOS-based servers:

1. Boot the server into DOS using either a DOS bootable 3.5-inch disk or a USB memory stick containing the extracted multi-boot image.
2. Run the script `update.bat`.
3. Verify the firmware installation as described in "Determining the Installed Firmware Version" on page 3-34.

To update firmware on UEFI-based servers:

1. Boot the server into the UEFI shell using an in-built shell or a third-party UEFI shell from a USB memory stick containing the adapter multi-boot image.
2. Run the script `update.nsh`.
3. Verify the firmware installation as described in "Determining the Installed Firmware Version" on page 3-34.

For information about using QLogic offline utilities, see Section 9.

Installing Management Tools

QLogic 8100 Series Adapters can be managed with QLogic tools requiring a separate installation, or with built-in Microsoft Windows tools.

The QLogic tools are:

- **QConvergeConsole**™ Web Management GUI, which is used to configure and manage QLogic Fibre Channel adapters, Intelligent Ethernet Adapters, and Converged Network Adapters within storage area networks (SANs).
- **QConvergeConsole**™ CLI, which is used to configure and manage QLogic Intelligent Ethernet, Converged Network, and Fibre Channel Adapters within SANs. The QConvergeConsole CLI also includes the networking (NIC) commands, previously supported in a separate networking CLI utility.
- **SuperInstallers**. QLogic provides a Windows SuperInstaller Utility, which installs the following drivers, tools, and agents used to support QLogic 8100 Series Adapters:
  - FC-FCoE and Ethernet Networking (NDIS) drivers
  - VLAN/Teaming driver (Windows version only)
  - QConvergeConsole Command Line (CLI) management tool
  - FC-FCoE and Ethernet networking management agents

- **Offline utilities** provide adapter maintenance functions for special circumstances. Section 9 describes the offline utilities and their functions.

The Windows operating system tool is the Windows Device Manager/Server Manager. Device Manager enables and disables the adapter port, updates adapter drivers, and provides access to version information of the currently installed drivers.

Obtaining QLogic Adapter Management Utilities

To download the QLogic management utilities and documentation:

1. Go to the QLogic Web site: http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. In the selection box (Figure 3-50), click Converged Network Adapters in the left column, your adapter model number in the middle column, and your operating system in the right column.

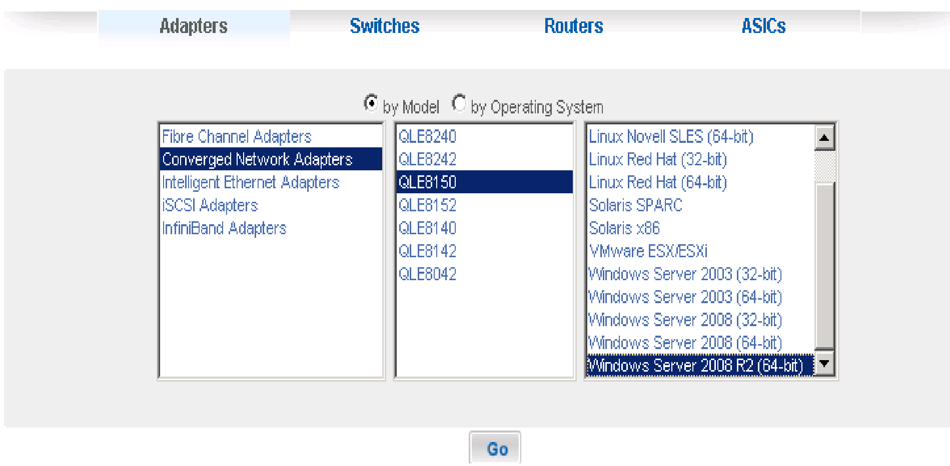


Figure 3-50. QConvergeConsole Download Selections (Example)

4. Click **Go**.
5. Scroll down to the **Management Tools** table and click the QConvergeConsole for your operating system.
6. On the End User Software License Agreement page, read this important information, and then click **I Agree** to continue.
7. On the File Download dialog box, click **Save**. Select a directory on your system and then click **Save As** to download the file.
8. In the **Management Tools** table, select and download the Readme and Release Notes files for your version of the QConvergeConsole.

Installing and Launching the QConvergeConsole

The QConvergeConsole Installer for Windows is a self-extracting utility that installs the QConvergeConsole and related files.

After you install the application on the server, you can start using the QConvergeConsole by opening its main page in your browser window, either locally on the server where the QConvergeConsole is installed or remotely from another computer. From the main window, you can connect to servers that host QLogic adapters and devices you want to manage.

NOTE:

Refer to the *QConvergeConsole User's Guide* and the online help system for more details.

Perform the following steps to install the QConvergeConsole on your system.

To install the QConvergeConsole in a Windows environment:

1. Locate the folder where you downloaded the install file and double-click the file `QConvergConsole_Installer_<version>.exe`.

   The InstallAnywhere® window prepares to install the QConvergeConsole and opens the installation Introduction dialog box (Figure 3-51).

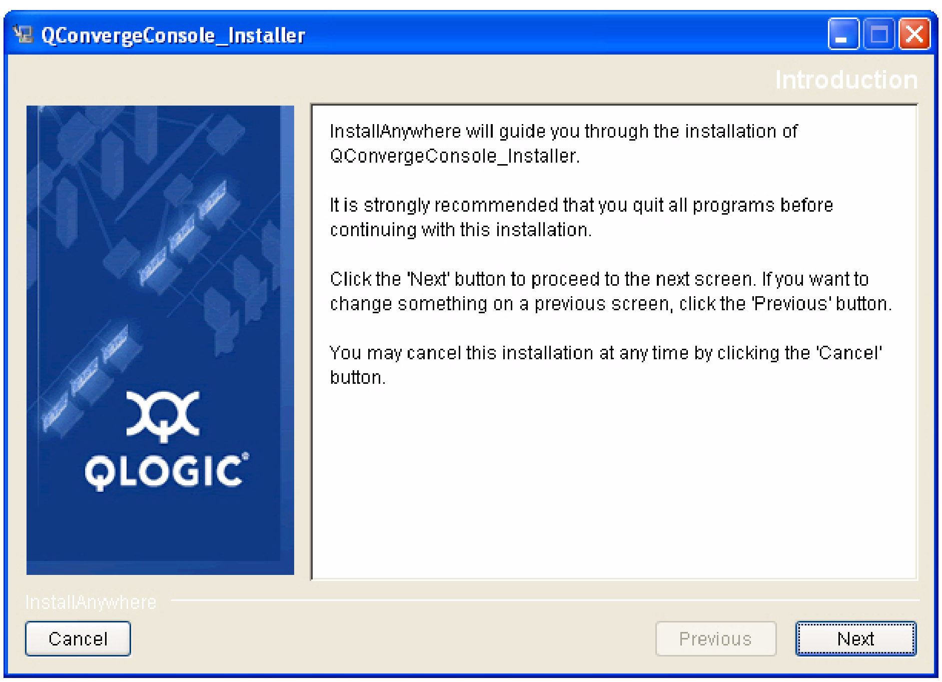


Figure 3-51. Install the QConvergeConsole: Introduction

2. Click **Next**.

   If the Apache Tomcat server is not installed, a message prompts whether you want to install Tomcat on your system (Figure 3-52).

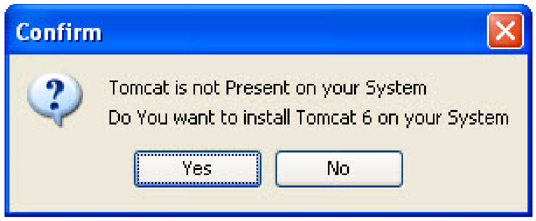


Figure 3-52. Install the QConvergeConsole: Install Tomcat on Your System

3. Click **Yes**.

   The Pre-Installation Summary dialog box (Figure 3-53) opens.

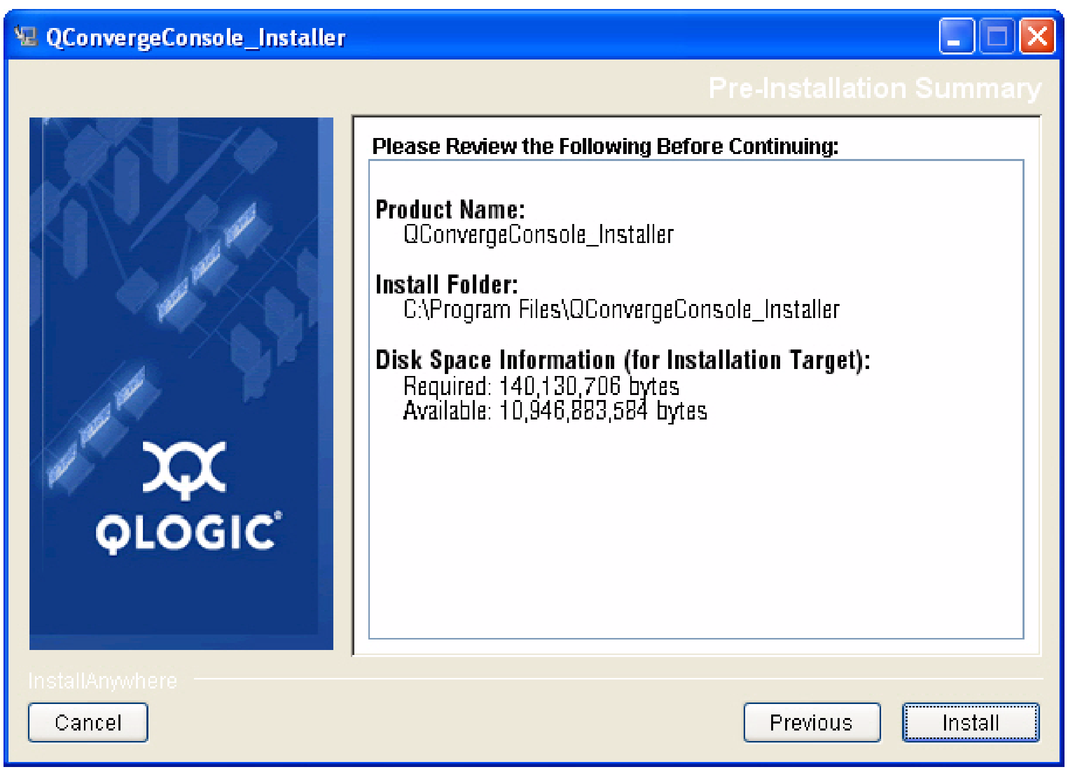


Figure 3-53. Install the QConvergeConsole: Pre-Installation Summary

4. Read the information, and then click **Install**.

During the installation, the installer notifies you of the installation status (Figure 3-54).

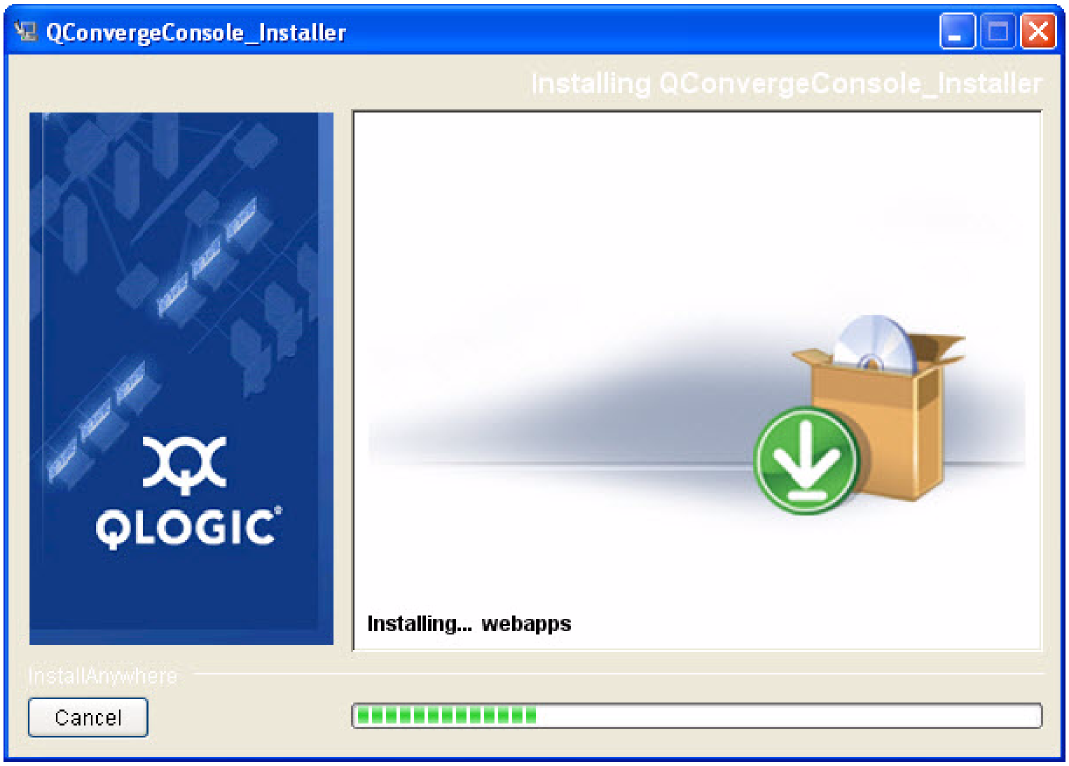


Figure 3-54. Install the QConvergeConsole: Installation Status

A message prompts you to confirm that you want to enable the Secure Socket Layer (SSL) feature, which allows you to run QConvergeConsole in a secured environment (Figure 3-55).

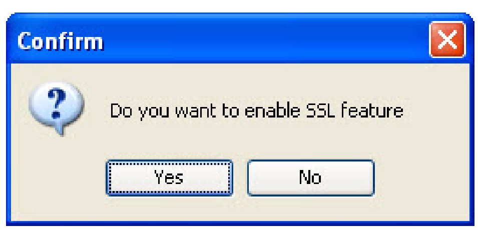


Figure 3-55. Install the QConvergeConsole: Enable SSL Feature

5. Click **Yes** to enable the SSL feature.

The Install Complete dialog box (Figure 3-56) opens.

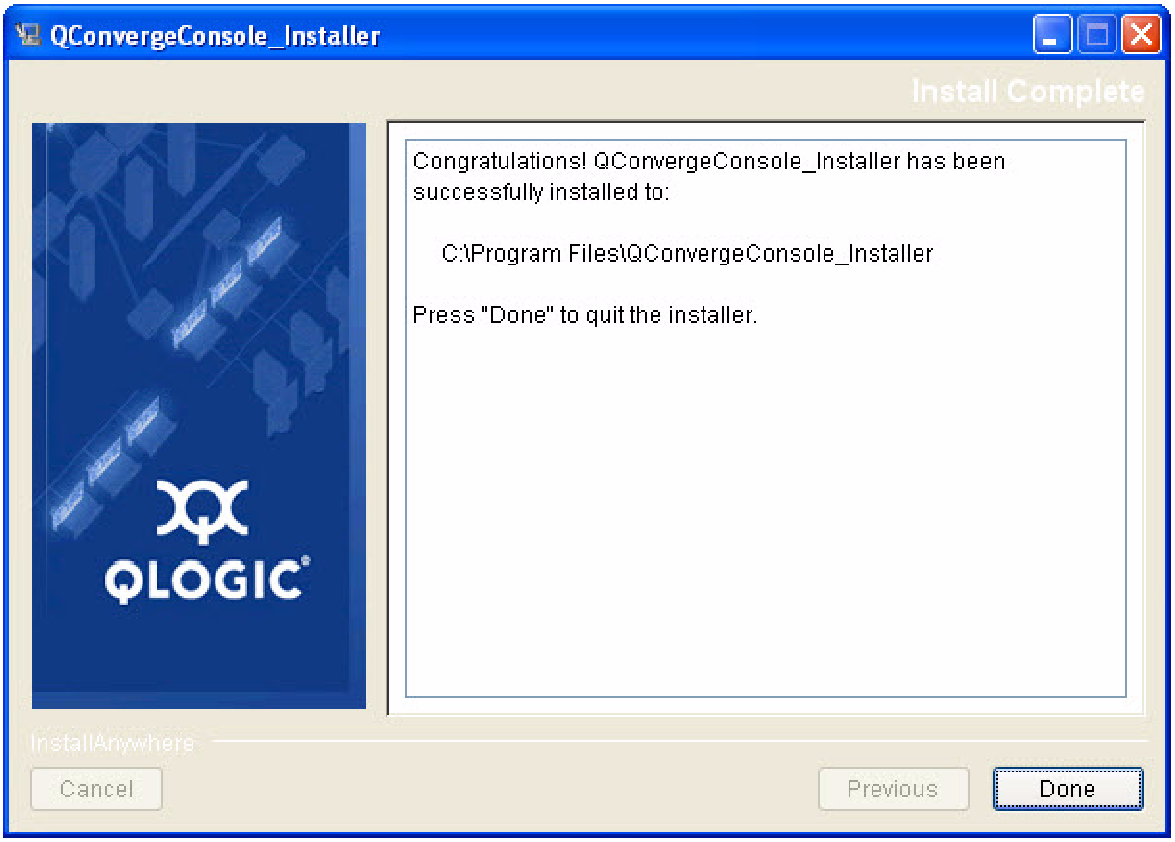


Figure 3-56. Install the QConvergeConsole: Install Complete Notification

6. Click **Done** to exit the installer.

   You have installed the QConvergeConsole on your server.

7. Install the management agents (NIC and FCoE) to remotely manage the server in which your adapter is physically installed. These agents can be installed using the Windows SuperInstaller found on the download sections for your specific adapter at http://driverdownloads.qlogic.com.

8. Open QConvergeConsole locally on the server or from a remote computer.

   To open QConvergeConsole locally on the server:

   Enter the following as the Web address in the browser's address bar:

   `http://localhost:8080/QConvergeConsole`

   The initial main menu of the QConvergeConsole opens (Figure 3-57).

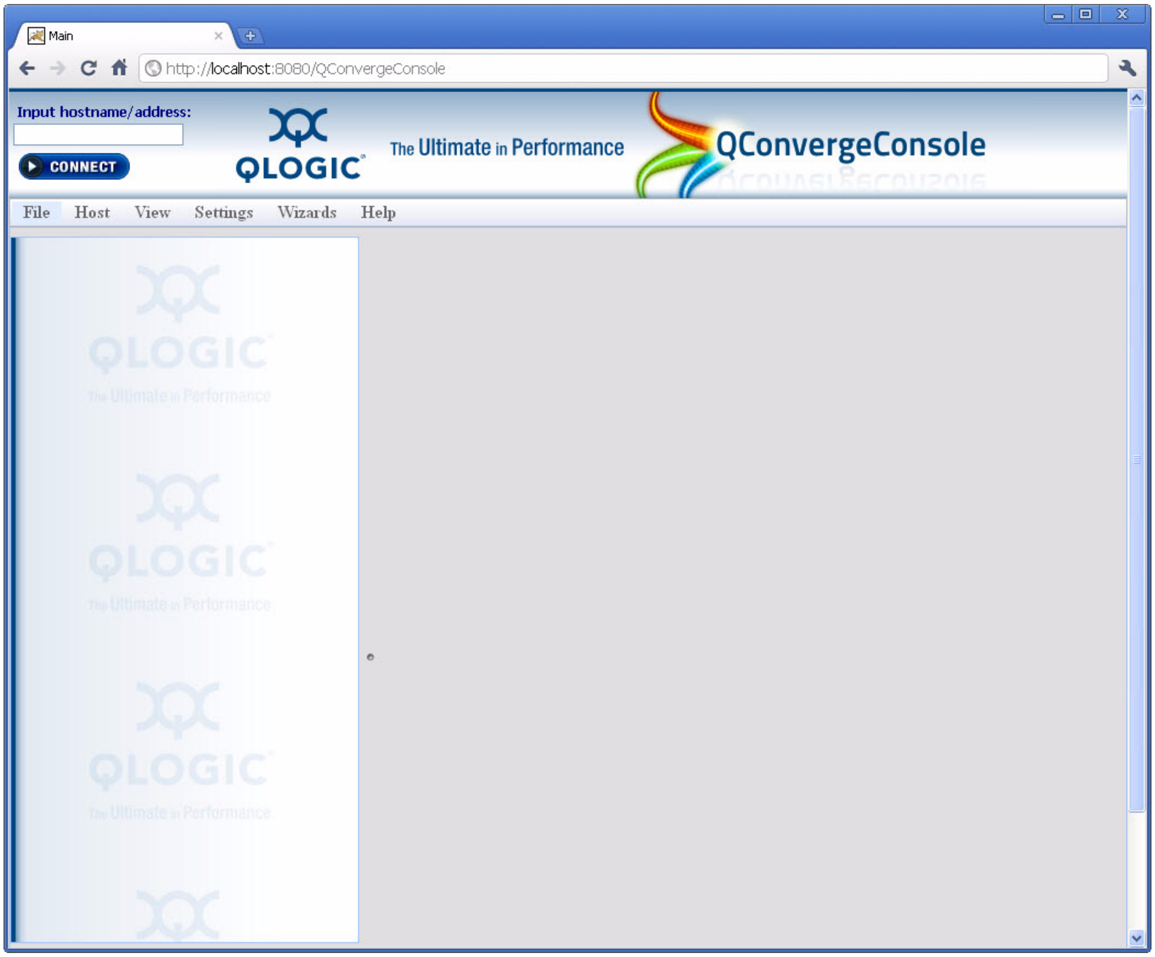


Figure 3-57. QConvergeConsole Main Window on the Server Where QConvergeConsole Resides

To open QConvergeConsole from a remote computer:

Enter the IP address of the QConvergeConsole server, followed by the access port and application name in the browser's address bar using the following format:

`http://`*`xxx.xxx.xxx.xxx`*`:8080/QConvergeConsole/`

In the following example, the Web address of the QConvergeConsole server displays (Figure 3-58).

Figure 3-58. Entering QConvergeConsole Web Address (Example)

The initial main menu of the QConvergeConsole opens, as shown in Figure 3-59.

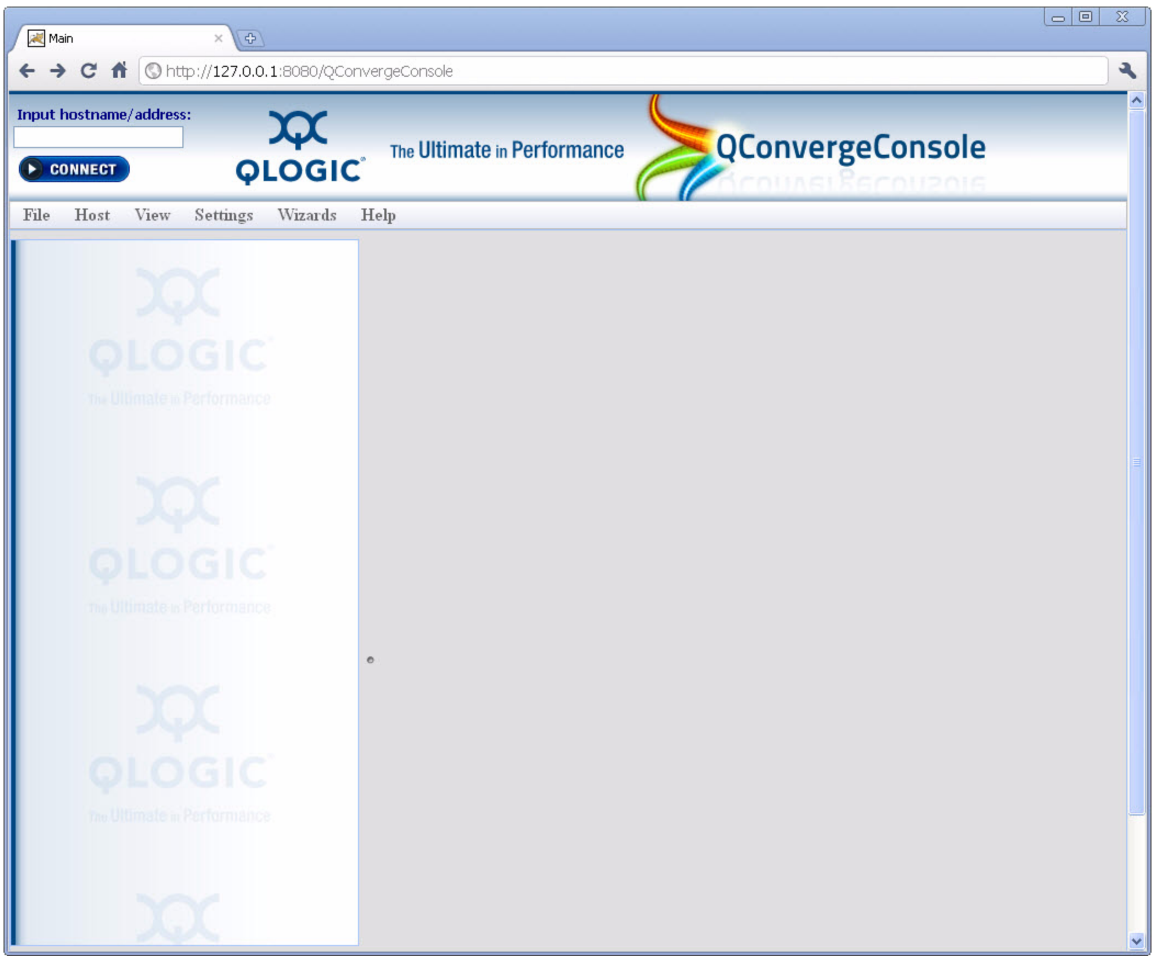


Figure 3-59. QConvergeConsole Main Window from a Remote Computer —Unpopulated View

Installing and Launching the QConvergeConsole CLI

You can install the QConvergeConsole CLI from the command prompt using the Microsoft® Windows Installer (MSI). Use one of the following methods:

- Standard Windows Interactive (CLI) Installation
- Quiet or Unattended Windows Installation
- Passive Windows Installation
- Overwrite Previous Windows Installations

NOTE:

You can also configure the installation using MSI commands. To see a summary of MSI commands, at the command prompt, type: **`msiexec`**.

To obtain more information about MSI, visit the Microsoft Web site.

Standard Windows Interactive (CLI) Installation

To begin a standard installation of the QConvergeConsole CLI on a Microsoft Windows operating system, at a command line type one of the following:

```
QCCCLI.msi
msiexec /i QCCCLI.msi
```

The default directory for the QConvergeConsole CLI application is:

```
Program files\QLogic Corporation\QCCCLI
```

If you want a different directory, type it in the command line. For example:

```
QCCCLI.msi installdir="directory"
```

The preceding command installs the QConvergeConsole CLI in the directory named `directory`. Use full path names.

Quiet or Unattended Windows Installation

Type the following for a quiet (silent) installation using default values. For example, the following command installs silently using defaults and does not show any errors:

```
QCCCLI.msi /q
```

Passive Windows Installation

Type the following for a passive installation using default values. For example:

```
QCCCLI.msi /passive
```

The preceding command installs with minimum interaction, showing only the progress bar and any errors.

Overwrite Previous Windows Installations

Type the following for an installation that overwrites any previous installations *without* asking for confirmation. Type:

```
QCCCLI.msi /i forceinstall=true
```

Starting the QConvergeConsole CLI

You can start the QLogic 8100 Series Converged Network Adapter in Windows in the following ways:

- Double click the QCCCLI icon on the desktop.
- Click **Start** and point to **All Programs**, **QLogic Management Suite**, and then **QConvergeConsole CLI**.
- Open a DOS window, and type the following command:

  ```
  qaucli
  ```

NOTE:

Refer to the *QConvergeConsole CLI User's Guide* for more details.

4 Installation in a Linux Environment

Overview

This section describes how to install a QLogic 8100 Series Adapter in a Linux server, including system requirements, hardware installation, driver installation, and software installation.

System Requirements

Operating System Requirements

The QLogic 8100 Series Adapter supports the following Linux operating systems:

- Red Hat® Enterprise Linux
- SUSE® Linux Enterprise Server

NOTE:

The QLogic 8100 Series Adapter supports both SLES and RHEL distributions. However, this section describes the installation and configuration of the QLogic 8100 Series Adapter on RHEL systems.

Refer to the Read Me file provided with the QLogic 8100 Series Adapter multi-flash image or Linux driver for a complete list of supported operating systems and required service packs.

Architecture support: IA-32 (x86), Intel64, AMD64 (x64)

Server and Switch Requirements

QLogic adapter products are certified with products from leading converged networking switch and server vendors. For product-level interoperability information, visit http://www.qlogic.com/Interoperability/Pages/default.aspx, and select **Converged Networking**.

A server must satisfy the following requirements to host a QLogic Converged Network Adapter:

- The server motherboard must have a PCIe slot of at least x8 physical length. Both PCIe Gen 1 and Gen 2 slots are supported. QLogic adapters operate on all eight lanes on a PCIe Gen 1 x8 slot, and automatically train down to use only four lanes on a PCIe Gen 2 x8 slot, thus saving energy by powering off the remaining four lanes of the PCIe Gen 2 x8 slot.
- A supported Linux operating system must be installed on the server. This is not required if you are configuring boot-from-SAN. Refer to Section 8 for details about configuring boot-from-SAN with QLogic adapters.
- There must be a LAN connection or a physical connection to the server console.

Cabling Requirements

QLogic 814*x* Series Adapters ship with QLogic-branded short-range (SR) optics, which are compatible with all fibre optic cables for direct connections to a supported FCoE switch. QLogic 814*x* Series Adapters operate only with optical transceivers sold by QLogic.

QLogic 815*x* Series Adapters ship with empty SFP+ cages that support active and passive copper cables for connecting to an FCoE switch. These cables are not available from QLogic, and must be purchased from the FCoE switch vendor. Visit http://www.qlogic.com/Resources/Pages/Resources.aspx to obtain a list of supported copper cables, their vendors, and part numbers.

Refer to "Adapter Specifications" on page 1-12 for details about connectors, cables, and supported adapters.

Other Requirements

A Phillips #1 screwdriver (or equivalent) is required to fasten the mounting bracket to the adapter.

Installing Hardware

CAUTION!

- To minimize the risk of ESD damage, use a workstation anti-static mat and an ESD wrist strap.
- Leave the adapter in its anti-static bag until you are ready to install it in the server.
- Hold the adapter by the edge of the printed circuit board (PCB) or mounting bracket, not the connectors.
- Place the adapter on a properly grounded antistatic work surface pad when it is out of its protective anti-static bag.

Install the Adapter

To install the adapter:

1. Record the adapter model number, which can be found on the bar code label on the board.
2. Determine whether the server requires a full-height or a half-height adapter bracket. The QLogic 8100 Series Adapter ships with a full-height bracket installed and a spare half-height (low profile) bracket.

   To install the half-height bracket:

   a. Using the bail handle of the SFP+ transceivers, pull out the SFP+ modules.
   b. Remove the two screws that hold the full-height bracket using a Phillips #1 screw driver.
   c. Carefully remove the full-height bracket by pulling it away from the card.
   d. Fit the half-height bracket while aligning the slots for the SFP+ transceivers and LEDs.
   e. Fasten the half-height bracket using the screws provided.
   f. Reinstall the SFP+ transceivers back by pressing them in until the transceivers clicks.
3. Power off the computer and all attached devices such as monitors, printers,
4. and external components.
5. Remove the server cover, and find an empty PCIe x8 bus slot. If necessary, consult the server system manual for information about how to remove the server cover.
6. Pull out the slot cover (if any) by removing the screw or releasing the lever.
7. Grasp the adapter by the top edge, and insert it firmly into the slot (Figure 4-1).
8. Refasten the adapter retaining bracket using the screw or lever.
9. Close the server cover.
10. Plug the appropriate Ethernet cable (either copper or optical) into the adapter.
    - QLE814*x* adapters ship with optical transceivers already installed. 814*x* adapters operate only with optical transceivers sold by QLogic.
    - For QLE815*x* adapters, see the list of approved copper cables at http://www.qlogic.com/Resources/Pages/Resources.aspx under Cable Support.

11. Connect the other end of the Ethernet cable to a supported switch.
12. Plug in the power cables and power up the server.

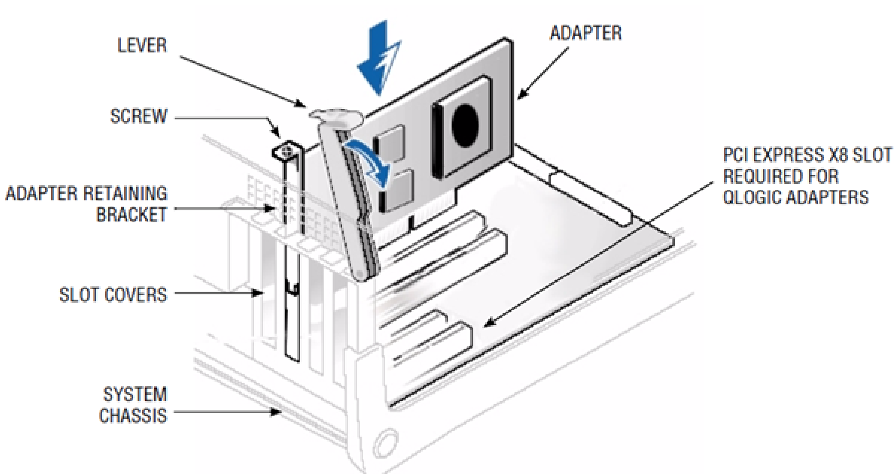


Figure 4-1. Adapter Hardware

Verify the Adapter Installation

To verify that the adapter is properly installed and that it can be recognized as a PCIe device by the server:

1. While the host server is booting, verify that the adapter BIOS banner appears without errors. Some servers may require that you press the ESC key at the motherboard BIOS banner screen to enable the display of diagnostic messages.
2. The QLogic BIOS banner indicates that the adapter has passed its POST, the adapter has been recognized and enumerated as a PCIe device, and it is safe to boot the operating system and install the QLogic driver.
   - The presence or absence of the QLogic banner does not indicate that the QLogic adapter has been connected to a compatible switch.
   - If the QLogic BIOS banner does not appear, confirm that the adapter is seated properly. If necessary, install the adapter in another available PCIe x8 slot. If the BIOS banner still does not appear, verify that the adapter is compatible with the server. If the adapter is compatible, contact your authorized maintenance provider for instructions on updating the motherboard BIOS.
   - The message `ROM BIOS NOT INSTALLED` may appear at the end of the QLogic BIOS banner. This message does not indicate an error, but that the QLogic ROM BIOS has not been enabled to boot from SAN. No action is required unless the adapter is booting from the SAN. For more information on configuring boot from SAN, refer to "Boot-from-SAN" on page 8-29.
3. For unified extensible firmware interface (UEFI) servers, boot into the UEFI shell and enter the `Drivers` command to verify that the QLogic adapter is in the list of discovered devices. Figure 4-2 shows sample output for a dual-port QLogic 8100 Series Adapter. Each port is listed as both a 10GbE adapter and a Fibre Channel driver.

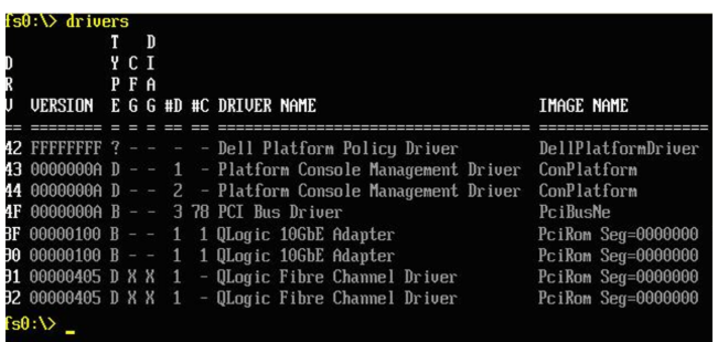


Figure 4-2. Drivers Command Output

Installing Software

The FCoE driver (STOR Miniport) and NIC driver (NDIS Miniport) provide the adapter's Fibre Channel and Ethernet capabilities, respectively. The adapter driver installation process depends on the Linux operating system version that is installed on the server and whether the operating system image resides on the server hard drive or on the SAN. Only one instance of the FCoE driver and networking driver is needed for all QLogic 8100 Series Adapters installed in the server.

Close any open windows of the QConvergeConsole before proceeding with the driver installation.

CAUTION!

A reboot may be required to complete the installation of a QLogic driver. If a reboot is required, the driver installation process prompts for a reboot.

Installing the FCoE Driver (qla2xxx)

The QLogic 8100 Series Adapter FCoE drivers are included (inbox or in kernel) with all supported versions of RHEL 5, except RHEL 5.3. QLogic releases asynchronous updates to inbox drivers periodically. If your operating system version is a recent release (within the past six months), use the drivers that are included with the operating system. Otherwise, proceed with the following instructions to download, compile, and install the most recent QLogic FCoE driver:

1. Go to the QLogic Web site: http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. Click **Adapters**.
4. In the selection list, click **Converged Network Adapters** in the first column.
5. In the selection list, click on the adapter model number in the second column.

6. In the third column, click the version of the Linux operating system that is installed on the server, and then click **Go**. For example, in Figure 4-3, **Linux Red Hat (64-bit)** is selected for a QLE8152 adapter.

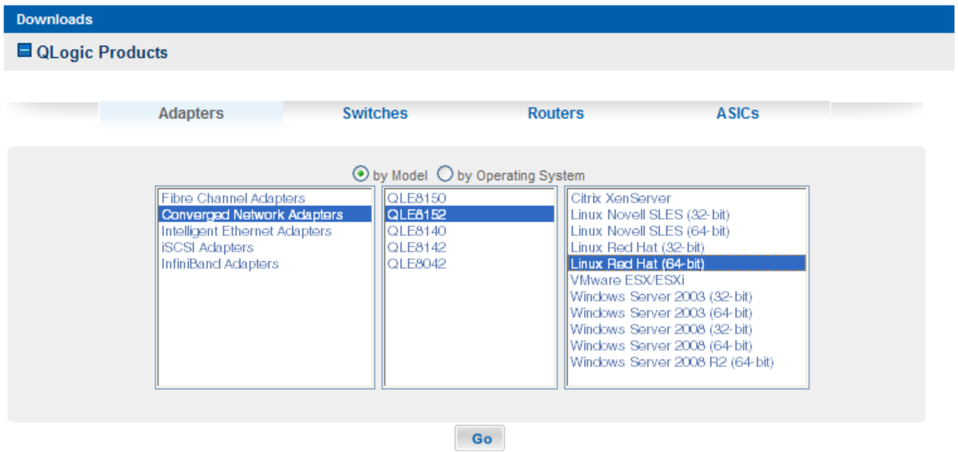


Figure 4-3. Select an Adapter and a Linux Operating System

7. Under Drivers, click the download link **FC-FCoE Adapter Driver for RHEL 5.*x*** (Figure 4-4).

Drivers

Name	Version	Description	Support Files
2.6 Kernel Inbox Driver Updates (Asynchronous Updates to Inbox Drivers)			
FC-FCoE Adapter DD-Kit for RHEL 5.3 (x64)	8.03.00.09		Readme Release Notes
FC-FCoE Adapter Driver for RHEL 5.x (x86/x64)	8.03.01.06	• RHEL 5.3, 5.4, 5.5	Readme Release Notes
Converged Network Adapter Networking Driver for RHEL 5.3 (x86/x64)	1.0.0.23		Readme Release Notes
[Previously released versions]			

Figure 4-4. Download the FCoE Adapter Driver

8. Read the QLogic license agreement, and then click **Agree**.

9. When prompted, click **Save** to save the compressed driver file to a temporary location on the hard drive. The compressed file contains the source for the QLogic FC-FCoE drive. The file name has the following format:

   `qla2xxx-src-`*`x.xx.xx.xx.xx.xx`*`-k.tar.gz`

10. Insert the RHEL 5 installation DVD into the optical drive on the server, or into another drive that contains the following packet files for the RHEL 5 version and architecture installed on the server:

    - `kernel-headers-2.6.18-164.el5.x86_64.rpm`
    - `kernel-devel-2.6.18-164.el5.x86_64.rpm`
    - `glibc-headers-2.5-42.x86_64.rpm`
    - `glibc-devel-2.5-42.x86_64.rpm`
    - `libgomp-4.4.0-6.el5.x86_64.rpm`
    - `gcc-4.1.2-46.el5.x86_64.rpm`

    These packet file names will vary depending on the RHEL version and server architecture.

11. Change to the directory that contains the required packages. In this example, the RHEL 5 installation DVD is mounted and available at `/media/RHEL 5.4 x86_64 DVD/`.

    ```
    #cd /media/RHEL 5.4 x86_64 DVD/Server/
    ```

12. Enter the following commands, in order, to compile each package and preserve dependencies:

    ```
    rpm -ivh kernel-headers-2.6.18-164.el5.x86_64.rpm
    rpm -ivh kernel-devel-2.6.18-164.el5.x86_64.rpm
    rpm -ivh glibc-headers-2.5-42.x86_64.rpm
    rpm -ivh glibc-devel-2.5-42.x86_64.rpm
    rpm -ivh libgomp-4.4.0-6.el5.x86_64.rpm
    rpm -ivh gcc-4.1.2-46.el5.x86_64.rpm
    ```

    Figure 4-5 shows the response to the first two commands.

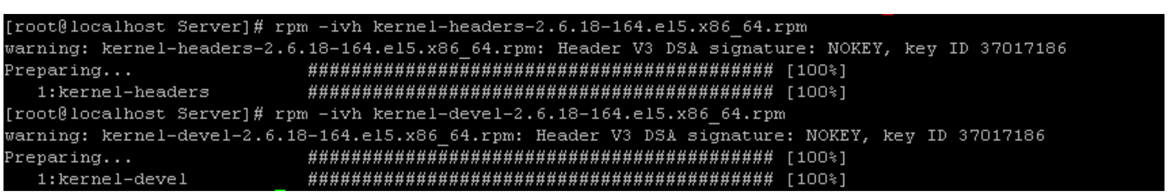


Figure 4-5. Compiling the QLogic Driver

You can also use the `yum` command to compile these packages. For more information about the `yum` command, refer to the manual pages.

13. Log into the server as root, or as a root-privileged user.

14. In the directory that contains the driver source file, `qla2xxx-src-x.xx.xx.xx.xx.xx-k.tar.gz`, type the following commands to expand the compressed file:

    `# tar -xzvf qla2xxx-src-x.xx.xx.xx.xx.xx-k.tar.gz`

    `# cd qla2xxx-src-x.xx.xx.xx.xx.xx-k`

15. Execute the `build.sh` script to compile the driver modules from the source code.

    `# ./extras/build.sh install`

    The build.sh script does the following:

    - Builds the QLogic FCoE driver .ko files.
    - Copies the .ko files to the appropriate `/lib/modules/2.6.<kernel-sub-version>/extra/qlgc-qla2xxx` directory.
    - Adds the appropriate directive in the `/etc/modprobe.conf` (if required)

    Figure 4-6 shows the `build.sh` script execution log.

```
[root@localhost qla2xxx-src-8.03.01.06.05.06-k]# ./extras/build.sh install
QLA2XXX -- Building the qla2xxx driver...
make: Entering directory `/usr/src/kernels/2.6.18-164.el5-x86_64'
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_os.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_init.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_mbx.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_iocb.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_isr.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_gs.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_dbg.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_sup.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_attr.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_mid.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla_nlnk.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/ql2100_fw.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/ql2200_fw.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/ql2300_fw.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/ql2322_fw.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/ql2400_fw.o
  CC [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/ql2500_fw.o
  LD [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla2xxx.o
  Building modules, stage 2.
  MODPOST
  CC      /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla2xxx.mod.o
  LD [M]  /root/Desktop/drivers/qla2xxx-src-8.03.01.06.05.06-k/qla2xxx.ko
make: Leaving directory `/usr/src/kernels/2.6.18-164.el5-x86_64'
QLA2XXX -- Installing the qla2xxx modules to /lib/modules/2.6.18-164.el5/extra/qlgc-qla2xxx/...
QLA2XXX -- Installing udev rule to capture FW dump...
[root@localhost qla2xxx-src-8.03.01.06.05.06-k]#
```

Figure 4-6. Executing the build.sh Script

16. Load the driver into the operating system by creating a new RAMDISK image:

a. Change to the directory that contains the RAMDISK images.

```
# cd /boot
```

b. Create a backup copy of the RAMDISK (initrd) image.

```
# cp initrd-[kernel version].img initrd-[kernel
version].img.bak
```

c. Generate a new RAMDISK image containing the updated QLogic FCoE driver.

```
# mkinitrd -f initrd-[kernel version].img `uname -r`
```

Depending on the server hardware, the RAMDISK file name may be slightly different. The command is successful if there is no output.

d. Reboot the server for the new RAMDISK image to take affect:

```
# shutdown -r now
```

Instead of creating a new RAMDISK (Step 16), it may be possible (though not recommended) to load the new driver without a reboot by unloading and loading the driver using the modprobe utility:

1. To unload the driver using the modprobe utility, type the following command:

```
# modprobe -r qla2xxx
```

The following error message indicates that the unload operation failed because the server is engaged in I/O operations through the QLogic adapter, or another module is dependent on the qla2xxx module.

```
FATAL: Module qla2xxx is in use
```

In this case, stop all I/O, eliminate dependent modules, and unload the module again. Otherwise, you must create a new RAMDISK.

2. To load the driver using the modprobe utility, type the following command:

```
# modprobe -v qla2xxx
```

The modprobe utility loads the `qla2xxx.ko` file in the directory `/lib/modules/2.6.<kernel-sub-version>/extra/qlgc-qla2xxx/`. The following example message indicates that the load operation was successful.

```
insmod/lib/modules/2.6.<kernel-sub-version>/extra/qlgc-ql
a2xxx/qla2xxx.ko
```

Installing the FCoE Driver for RHEL 5.3 Boot-from-SAN

The RHEL 5.3 operating system does not include the QLogic 8100 Series Adapter drivers. Therefore, to boot from SAN, you must load the adapter drivers during the operating system installation. QLogic provides a driver disk kit (DD-Kit) for RHEL 5.3 that contains the driver binaries for RHEL 5.3.

To download, create, and install a DD-Kit for RHEL 5.3 on the SAN:

1. Go to the QLogic Web site: http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. Click **Adapters**.
4. In the selection list, click **Converged Network Adapters** in the first column.
5. In the selection list, click on the adapter model number in the second column.
6. In the third column, click the version of the Linux operating system that is installed on the server, and then click **Go**. For example, in Figure 4-7, **Linux Red Hat (64-bit)** is selected for a QLE8152 adapter.

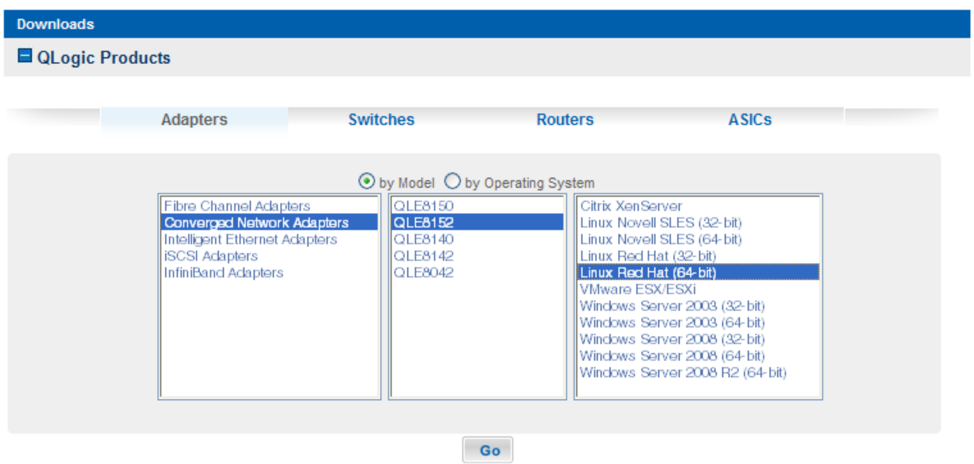
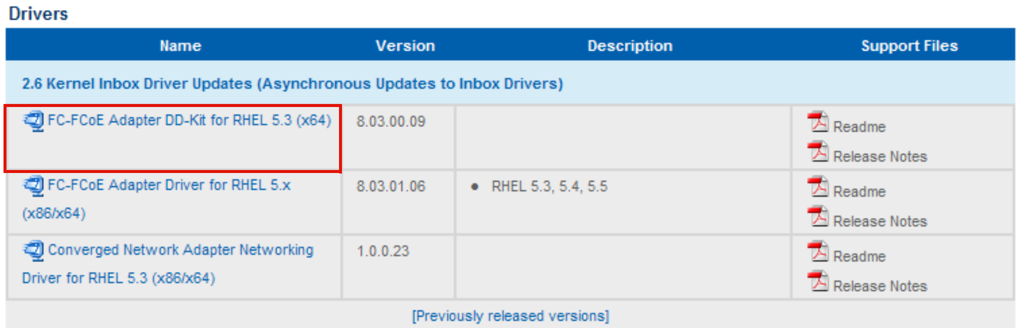


Figure 4-7. Select an Adapter and Linux Operating System

7. Under **Drivers**, click the download link for **FC-FCoE DD-Kit** (Figure 4-8).



Drivers

Name	Version	Description	Support Files
2.6 Kernel Inbox Driver Updates (Asynchronous Updates to Inbox Drivers)			
FC-FCoE Adapter DD-Kit for RHEL 5.3 (x64)	8.03.00.09		Readme Release Notes
FC-FCoE Adapter Driver for RHEL 5.x (x86/x64)	8.03.01.06	• RHEL 5.3, 5.4, 5.5	Readme Release Notes
Converged Network Adapter Networking Driver for RHEL 5.3 (x86/x64)	1.0.0.23		Readme Release Notes
[Previously released versions]			

Figure 4-8. Download the FC-FCoE DD-Kit

8. Read the QLogic license agreement, and then click **Agree**.
9. When prompted, click **Save** to save the driver file to the hard drive. The compressed file contains the source for the QLogic FC-FCoE driver. The file name has the following format:

   ```
   qla2xxx-src-x.xx.xx.xx.xx.xx-k.tar.gz
   ```

10. When prompted, click **Save** to save the DD-Kit file to a temporary location on the hard drive. The compressed file contains the driver binaries in ISO image format. The file name has the following format:

```
qla2xxx- x.xx.xx.xx.xx.xx-k-<architecture>-dd-2.6.18-128.iso.gz
```

11. Unzip the DD-Kit file to obtain the ISO image by typing the following command:

   ```
   # gunzip qla2xxx- x.xx.xx.xx.xx.xx-k-<architecture>-dd-
   2.6.18-128.iso.gz
   ```

12. Transfer the ISO image to a CD-ROM using an ISO CD-burner software, or type the following command:

   ```
   # dd if=/<directory with iso image>/ qla2xxx-
   x.xx.xx.xx.xx.xx-k-<architecture>-dd-2.6.18-128.iso
   of=/dev/fd0
   ```

   The resulting CD-ROM becomes the driver disk.
13. Insert the RHEL 5.3 CD/DVD into the server optical drive.

14. Configure the server to boot from the optical drive, and power up the server. The system boots from the CD and stops at the `boot:` prompt (Figure 4-9).

Figure 4-9. RHEL 5.3 Boot Screen

15. At the `boot:` prompt, press the F2.
16. In the Installer Boot Options screen, type **`linux dd`** at the boot prompt (Figure 4-10).

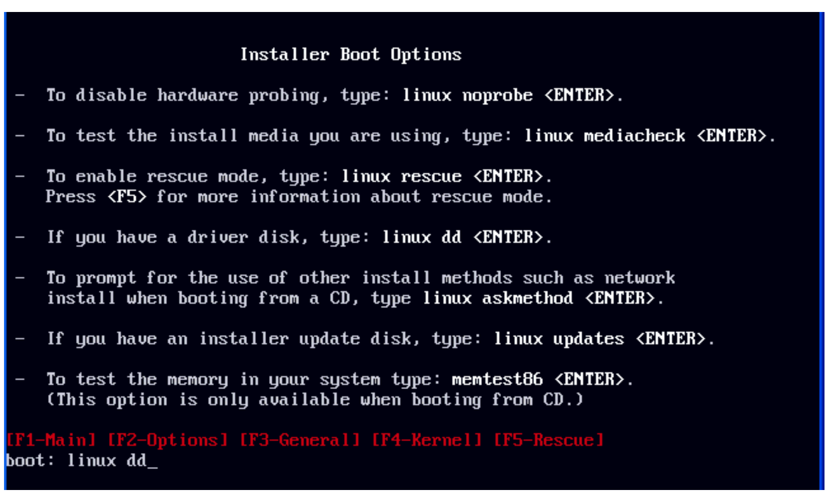


Figure 4-10. RHEL 5.3 Installer Boot Options Screen

17. The Driver Disk message box prompts you for a driver disk: click **YES**, and then press ENTER.
18. From the Driver Disk Source window, select the driver source:
    - If the driver disk is a 3.5-inch floppy disk, select **fd0**, and then press ENTER.
    - If the driver disk is a CD-ROM, select **hd*x*** (where *x* is the drive letter), and then press ENTER.
19. At the **Insert Driver Disk** window, insert the driver disk into the appropriate drive, click **OK**, and then press ENTER. The QLogic driver is loads automatically from the driver disk.
20. The Disk Driver window prompts you to install more drivers. Click **NO**, and then press ENTER.
21. Remove the driver disk, if necessary, and reinsert the RHEL 5.3 CD/DVD into the optical drive. Press ENTER continue.
22. Follow the instructions to complete the operating system installation process. For information about additional configuration that may be required to boot from SAN, refer to "Boot-from-SAN" on page 8-29.

Installing the Networking Driver

The QLogic 8100 Series Adapter networking drivers are included inbox with all supported versions of RHEL 5, except RHEL 5.3. If the networking drivers are included, the operating system automatically recognizes the QLogic 8100 Series Adapter. For RHEL 5.3, the networking driver must be installed before the adapter can operate.

To download and install the QLogic adapter networking drivers:

1. Go to the QLogic Web site: http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. Click **Adapters**.
4. In the selection list, click **Converged Network Adapters** in the first column.
5. In the selection list, click on the adapter model number in the second column.

6. In the third column, select the version of the Linux Operating System that is installed on the server, and then click **Go** (Figure 4-11). For example, in Figure 4-11, **Linux Red Hat (64-bit)** is selected for a QLE8152 adapter.

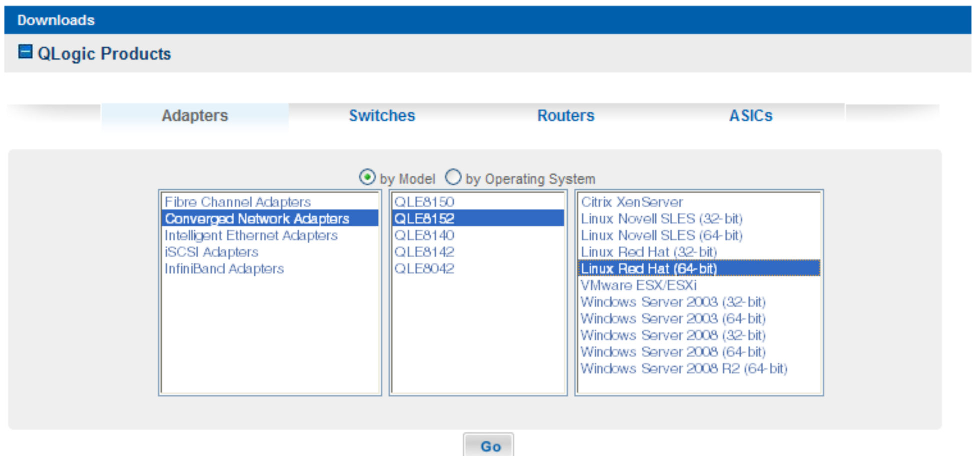


Figure 4-11. Select an Adapter and a Linux Operating System

7. Under **Drivers**, click the download link **Converged Network Adapter Networking Driver** (Figure 4-12).

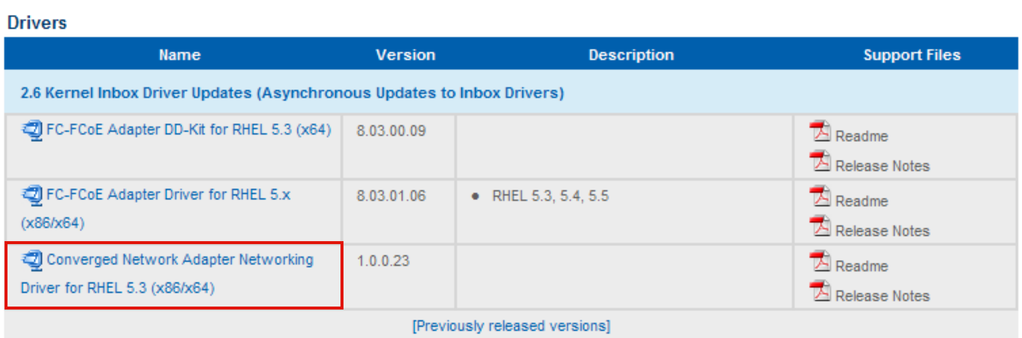


Figure 4-12. Download the Networking Driver

8. Read the QLogic license agreement, and then click **Agree**.

9. When prompted, click **Save** to save the compressed driver file to a temporary location on the hard drive. The compressed file contains the source for the QLogic networking driver. The file name has the following format:

   qlge_*x.x.x.xx-ddmmyy_xx_x.x.xx*.tgz

10. Insert the RHEL 5 installation DVD into the optical drive on the server, or into another drive that contains the following packet files for the RHEL 5 version and architecture installed on the server.
    - kernel-headers-2.6.18-164.el5.x86_64.rpm
    - kernel-devel-2.6.18-164.el5.x86_64.rpm
    - glibc-headers-2.5-42.x86_64.rpm
    - glibc-devel-2.5-42.x86_64.rpm
    - libgomp-4.4.0-6.el5.x86_64.rpm
    - gcc-4.1.2-46.el5.x86_64.rpm

    These packet file names will vary depending on the RHEL version and server architecture.
11. Change to the directory that contains the required packages. In this example, the RHEL 5 installation DVD is mounted and available at `/media/RHEL 5.4 x86_64 DVD/`.

    ```
    # cd /media/RHEL 5.4 x86_64 DVD/Server/
    ```
12. Enter the following commands, in order, to compile each package and preserve dependencies.

    ```
    rpm -ivh kernel-headers-2.6.18-164.el5.x86_64.rpm
    rpm -ivh kernel-devel-2.6.18-164.el5.x86_64.rpm
    rpm -ivh glibc-headers-2.5-42.x86_64.rpm
    rpm -ivh glibc-devel-2.5-42.x86_64.rpm
    rpm -ivh libgomp-4.4.0-6.el5.x86_64.rpm
    rpm -ivh gcc-4.1.2-46.el5.x86_64.rpm
    ```

    You can also use the `yum` command to compile these packages. For more information about the `yum` command, refer to the manual pages.
13. Log into the server as root, or as a root-privileged user.
14. In the directory that contains the driver source file, qla2xxx-src-*x.xx.xx.xx.xx.xx*-k.tar.gz, type the following commands:

    ```
    # tar -xzvf qla2xxx-src-x.xx.xx.xx.xx.xx-k.tar.gz
    # cd qla2xxx-src-x.xx.xx.xx.xx.xx-k
    ```

15. In the directory that contains the source driver file, `qlge_`*`x.x.x.xx-ddmmyy_xx_x.x.xx`*`.tgz`, type the following commands to expand the compressed file:

    ```
    # tar -xzvf qlge_x.x.x.xx-ddmmyy_xx_x.x.xx.tgz
    # cd qlge
    ```

16. Build and install the driver modules from the source code.

    ```
    # make install
    ```

    The GNU executes the `makefile` included in the `qlge/` directory and then does the following:

    - Builds the QLogic networking driver .ko files
    - Copies the .ko file to the appropriate `/lib/modules/`*`[Kernel_version]`*`/kernel/drivers/net/qlge/` directory.

    Figure 4-13 shows the `make install` command execution log.

```
[root@localhost qlge]# ls
kcompat.h  Makefile  qlge_dbg.c  qlge_ethtool.c  qlge.h  qlge_main.c  qlge_mpi.c
[root@localhost qlge]# make install
make -C /lib/modules/2.6.18-164.el5/build SUBDIRS=/root/Desktop/drivers/qlge modules
make[1]: Entering directory `/usr/src/kernels/2.6.18-164.el5-x86_64'
  CC [M]  /root/Desktop/drivers/qlge/qlge_main.o
  CC [M]  /root/Desktop/drivers/qlge/qlge_dbg.o
  CC [M]  /root/Desktop/drivers/qlge/qlge_mpi.o
  CC [M]  /root/Desktop/drivers/qlge/qlge_ethtool.o
  LD [M]  /root/Desktop/drivers/qlge/qlge.o
  Building modules, stage 2.
  MODPOST
  CC      /root/Desktop/drivers/qlge/qlge.mod.o
  LD [M]  /root/Desktop/drivers/qlge/qlge.ko
make[1]: Leaving directory `/usr/src/kernels/2.6.18-164.el5-x86_64'
# remove all old versions of the driver
find /lib/modules/2.6.18-164.el5 -name qlge.ko -exec rm -f {} \; || true
find /lib/modules/2.6.18-164.el5 -name qlge.ko.gz -exec rm -f {} \; || true
install -D -m 644 qlge.ko /lib/modules/2.6.18-164.el5/kernel/drivers/net/qlge/qlge.ko
/sbin/depmod -a || true
[root@localhost qlge]#
```

Figure 4-13. Make Install Command Execution Log

17. Load the driver into the operating system by creating a new RAMDISK image. Loading the driver in this way enables the new driver to load early in the kernel boot sequence and is persistent across reconfigurations.

    a. Change to the directory that contains the RAMDISK images.

    ```
    # cd /boot
    ```

    b. Create a backup copy of the RAMDISK (initrd) image.

    ```
    # cp initrd-[kernel version].img initrd-[kernel version].img.bak
    ```

c. Create a new RAMDISK image containing the updated QLogic networking driver.

```
# mkinitrd -f initrd-[kernel version].img `uname -r`
```

Depending on the server hardware, the RAMDISK file name may be slightly different. The command is successful if there is no output.

d. Reboot the server for the new RAMDISK image to take affect:

```
# shutdown -r now
```

Instead of creating a new RAMDISK (Step 17), it may be possible (though not recommended) to load the new driver without a reboot by unloading and loading the driver using the modprobe utility:

1. To unload the driver using the modprobe utility, type the following command:

```
# modprobe -r qlge
```

The following error message indicates that the unload operation failed because the server is engaged in I/O operations through the QLogic adapter, or another module is dependent on the qlge module.

```
FATAL: Module qlge is in use
```

In this case, stop all I/O, eliminate dependent modules and unload the module again. Otherwise, you must create a new RAMDISK.

2. To load the driver using the modprobe utility, type the following command:

```
# modprobe -v qlge
```

The modprobe command loads the `qlge.ko` file in the directory `/lib/modules/2.6.`*`<kernel-sub-version>`*`/kernel/drivers/net/qlge/`.

The modprobe utility loads the `qla2xxx.ko` file in the directory `/lib/modules/2.6.`*`<kernel-sub-version>`*`/extra/qlgc-qla2xxx/`. The following example message indicates that the load operation was successful.

```
insmod/lib/modules/2.6.18-164.el5/kernel/drivers/net/qlge/qlge.ko
```

Verifying the Driver Installation

Verify every adapter to guarantee that the FCoE and networking adapter drivers have been installed successfully and operational. To verify the driver installation:

1. Use the lsmod command to list the loaded kernel modules, and then locate the QLogic FcoE (qla2*xxx*) and networking (qlgc) driver entries.

   - The following example lists kernel modules for the QLogic FCoE driver.

     ```
     # lsmod | grep  qla2xxx
     qla2xxx           1133797  3
     scsi_transport_fc   73800  1 qla2xxx
     scsi_mod           196697  8 scsi_dh,sr_mod,sg,lbata,
     qla2xxx, scsi_transport_fc,sd_mod
     ```

   - The following example lists the kernel modules for the QLogic networking driver.

     ```
     # lsmod | grep qlgc
     # qlge             129881   0
     #
     ```

2. Verify the QLogic adapter driver versions. You can use sysfs (FCoE) and ethtool (networking), which is usually the most accurate. You can also use the modinfo command.

   - The following example displays the FCoE driver version, where *X* is the sysfs host number for the FCoE driver.

     ```
     # cat /sys/class/scsi_host/hostX/driver_version
     8.03.01.06.05.06-k
     #
     ```

   - The following example displays the networking driver version, where `eth0` specifies the network interface associated with the adapter networking function.

     ```
     # ethtool -i eth0
     driver: qlge
     version: 1.00.00.23
     firmware-version: v1.35.11
     bus-info: 0000:85:00.0
     ```

   The `modinfo` command displays vendor and version information the about Linux kernel modules.

- The following example displays the FCoE driver information:

  ```
  # modinfo  -F version qla2xxx
  8.03.01.06.05.06-k
  ```

- The following example displays the networking driver information:

  ```
  # modinfo -F version qlgc
  1.00.00.23
  ```

3. Observe the adapter Link/Enet Traffic LED and Storage Traffic LED for indications that the adapter is operating correctly. For specific LED indications, refer to Appendix A.

Removing Drivers

Uninstalling the QLogic FCoE or networking driver disables the adapter and terminates communication between the server and connected SAN or LAN devices.

In a boot-from-SAN configuration, the FCoE driver (qla2xxx) cannot be uninstalled because the server accesses the operating system image over the SAN through the adapter. Attempts to remove the FCoE driver could disrupt server access to the operating system.

To remove the QLogic FCoE driver:

1. Unload the qla2xxx FCoE driver module.

   ```
   # modprobe -r qla2xxx
   ```

2. Remove the qla2xxx driver binary kernel module from the install location.

   ```
   # cd qla2xxx-src-x.xx.xx.xx.xx.xx-k
   #./extras/build.sh remove
   ```

To remove the QLogic networking driver:

1. Unload the qlge networking driver module.

   ```
   #modprobe -r qlge
   ```

2. Remove the qlge driver binary kernel module from the install location.

   ```
   # cd qlge_x.x.x.xx-ddmmyy_xx_x.x.xx
   # make uninstall
   ```

3. Remove qlge driver entries that were added to the `/etc/sysconfig/kernel` file
4. Rebuild the RAMDISK image as described in Step 17 on page 4-17.

Firmware Upgrades

QLogic 8100 Series Converged Network adapters ship with the latest available firmware version. QLogic periodically releases new firmware versions, which can be downloaded from the QLogic Web site as part of a multi-boot image. Always use the latest firmware versions for enhanced performance and availability.

QLogic does not publish an image for download that contains just the firmware, but rather publishes a package (known as *boot code* or *multi boot image*) that contains the firmware, BIOS drivers, UEFI drivers, and offline utilities. To update the firmware, you must update the boot code on the QLogic 8100 Series Adapters. QLogic publishes one boot code for all operating systems and 8100 Series Adapter models.

Obtaining the QLogic Firmware/Boot Code

To download the QLogic boot code:

1. Go to the QLogic Web site: http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. Click **Adapters**.
4. In the selection list, click **Converged Network Adapters** in the first column.
5. In the selection list, click on the adapter model number in the second column.
6. Click the Linux operating system that is installed on the server, and then click **Go**. For example, in Figure 4-14, **Linux Red Hat (64-bit)** is selected for a QLE8152 adapter.

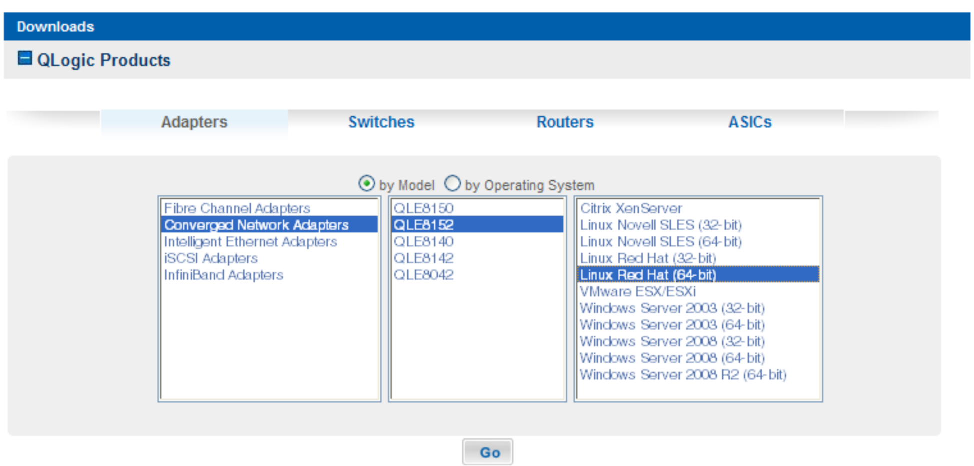


Figure 4-14. Select an Adapter and a Linux Operating System

7. Under Boot Code, click the download link for the multi-boot image (Figure 4-15). The multi-boot image contains firmware, BIOS and UEFI drivers, and the FlasUTIL and EFIUTIL utilities. Make note of the FCoE firmware version included in the multi-boot image.

Figure 4-15. Download the Multi-boot Image

8. Read the license agreement, and then click **Agree**.

9. When prompted, select **Save** to save and extract (unzip) the multi-boot image to a temporary location on your workstation.

CAUTION!

Do not alter any files or the contents of the compressed multi-boot image or the extracted files—this is could corrupt the boot code. Flashing a corrupt boot code, or attempting to update boot code using a different method than what is described in this section, may render the adapter inoperable.

Determining the Installed Firmware Version

You can determine the firmware version the QConvergeConsole, or for advanced users, sysfs.

Displaying the Firmware Version Using the QConvergeConsole

Use QConvergeConsole GUI or QConvergeConsole CLI to determine the firmware version of the QLogic adapter installed in the server. For information about installing and using QConvergeConsole, refer to Installing Software.

To display the adapter firmware version:

1. In the QConvergeConsole main window, locate the QLogic 8100 Series Adapter in the system tree and select the port.

2. In the **General Information** tab (Figure 4-16), the firmware version (FCoE firmware) is listed under Flash Information after the BIOS, FCode, and EFI version information.

NOTE:

Ignore the driver firmware version listed under Information; it is not related to the installed adapter firmware version. QLogic 8100 Series Adapter drivers are not bundled with the firmware, and use the firmware that is resident on the adapter hardware.

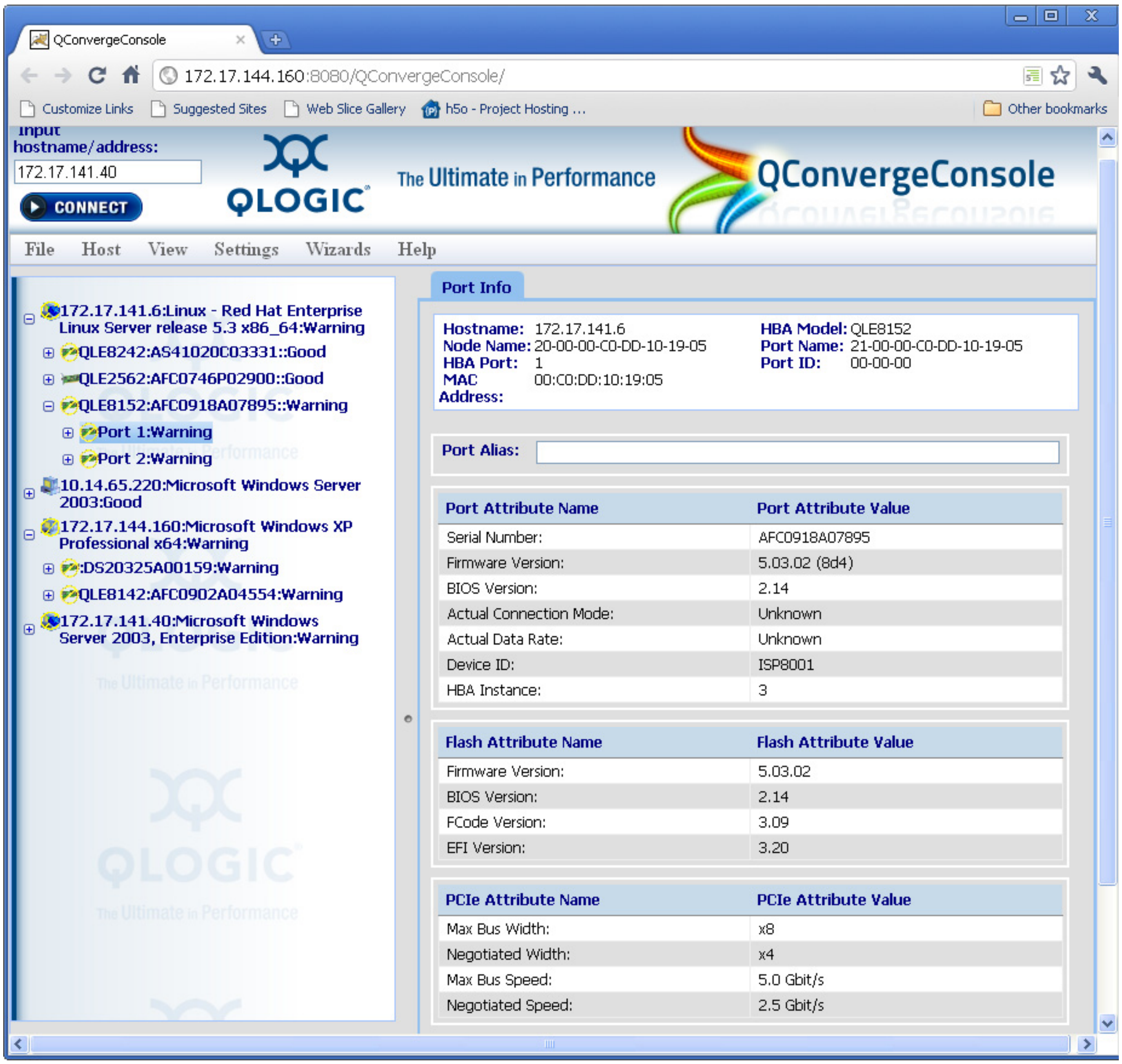


Figure 4-16. Displaying the Adapter Firmware Version

3. Expand the Port node and select the FCoE port.

4. In the right pane, click the **FCoE** tab (Figure 4-17). The MPI firmware version is listed under the Information section.

Figure 4-17. Displaying the Adapter MPI Firmware Version

Displaying the Firmware Version Using sysfs

The sysfs interface is available to advanced users to display the adapter firmware version. To display the FCoE adapter firmware version, log in as root, and type the following command, where *X* is the host number:

```
#cat /sys/class/scsi_host/hostX/fw_version
5.03.02 (8d4)
```

To display the MPI firmware version, log in as root, and type the following command:

```
#cat /sys/class/scsi_host/hostX/mpi_version
1.40.00 (10400)
```

Upgrading the Boot Code (Firmware)

You can upgrade the boot code using the QConvergeConsole or the BIOS and UEFI management utilities.

Upgrading the Boot Code Using the QConvergeConsole GUI

Updating the boot code applies to the adapter and not for individual ports. For a multi-port adapter, you can update the boot code (flash image) only through the first port.

To update boot code using the QConvergeConsole:

1. Expand the adapter port number 1, then select the FCoE port.
2. In the right pane, click the **Utilities** tab.

3. Under Flash, click **Update Entire Image** (Figure 4-18).

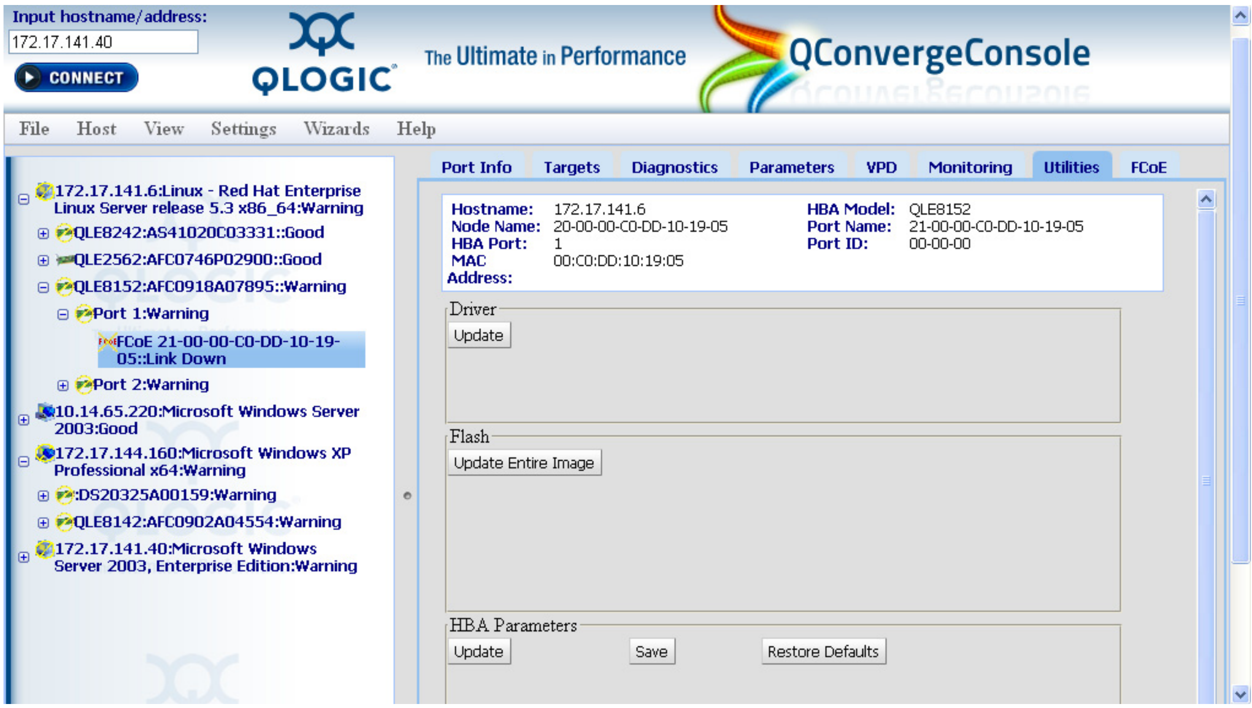


Figure 4-18. QConvergeConsole—Update Entire Image

4. In the Open pop-up window, browse to the temporary folder that contains the extracted multi-boot image, and then select the Flash file (`.BIN`).

5. Click **Open**. The QConvergeConsole reads the multi-boot image to determine the version information of the image file. A dialog box presents the current multi-boot image version and the boot code version. This is not the firmware version; it is the version of the multi-boot image. Verify that the current boot code is an earlier version than the new boot code version. Click **Yes** to proceed with the boot code update; click **No** to cancel the update.

6. Provide the password set by the system administrator, and then click **OK** The default password is *config*.

7. When the update is complete, click **OK**.

Using QLogic BIOS and UEFI Utilities

You can update firmware without a first installing an operating system on the server. Such firmware upgrades are considered offline upgrades.

To update firmware on BIOS servers:

1. Boot the server into DOS using either a DOS-bootable 3.5-inch disk or a USB memory stick containing the extracted multi-boot image.
2. Run the script `update.bat`.
3. Verify the firmware installation as described in "Determining the Installed Firmware Version" on page 4-22.

To update firmware on UEFI servers:

1. Boot the server into the UEFI shell using an in-built shell or a third-party UEFI shell from a USB memory stick containing the adapter multi-boot image.
2. Run the script `update.nsh`.
3. Verify the firmware installation as described in "Determining the Installed Firmware Version" on page 4-22.

For information about using QLogic offline utilities, refer to Section 9.

Management Tool Installation

QLogic 8100 Series Adapters can be managed with QLogic utilities or with Linux utilities. The QLogic utilities are:

- QConvergeConsole web management GUI, which is used to configure and manage QLogic Fibre Channel adapters, Intelligent Ethernet Adapters, and Converged Network Adapters within storage area networks (SANs).
- QConvergeConsole CLI, which is used to configure and manage QLogic Fibre Channel adapters, Intelligent Ethernet Adapters, and Converged Network Adapters within SANs. The QConvergeConsole CLI also includes the networking (NIC) commands, previously supported in a separate networking CLI utility.
- Linux utilities—A set of scripts that perform FCoE-related administrator tasks, including rescanning for LUNs and collecting support information. The Linux utilities are:
  - ethtool—A utility that displays and configures the QLogic adapter networking function. For more information about this utility, refer to the ethtool manual pages.

- Linux Network Interface Configuration Tools—A set of tools, including ifconfig and neat, that configure parameters such as IP address and network interface status. For more information about these tools, refer to the tool manual pages.

Obtaining the QLogic Adapter Management Tools

To download the QLogic management tools and documentation:

1. Go to the QLogic Web site: http://driverdownloads.qlogic.com.
2. Click **QLogic Products**.
3. Click **Adapters**.
4. In the selection list, click **Converged Network Adapters** in the first column.
5. In the selection list, click on the adapter model number in the second column.
6. In the third column, click the Linux operating system that is installed on the server, and then click **Go**.
7. Under Management Tools, click the download link for the QLogic management application that you want, including the Readme and Release Note files (Figure 4-19). Save the files to a temporary location on the hard drive.

Management Tools

Name	Version	Description	Support Files
Configuration and Management (GUI / CLI) Tools for 2.6 Kernel Drivers			
SANsurfer FC-FCoE Manager (x86/x64)	5.0.1 build 78	Graphical user interface (GUI) management tool for Fibre Channel and Converged Network Adapters	Readme Release Notes
QConvergeConsole CLI (x86/x64)	1.0.0 build 46	Command line interface (CLI) management tool for Fibre Channel, Intelligent Ethernet, and Converged Network Adapters	Readme Release Notes
SANsurfer FC-FCoE CLI (x86/x64)	1.7.3 build 37	Command line interface (CLI) management tool for Fibre Channel and Converged Network Adapters.	Readme Release Notes
Linux Tools			
Linux Utilities	20101207-1	Linux Tools for Fibre Channel, iSCSI, and Converged Network Adapters	Readme

Figure 4-19. Download Linux Adapter Management Tools

8. To download the related management tool documentation, click on the corresponding document link under Documentation.

Installing and Launching QConvergeConsole

To install and launch the QConvergeConsole:

QConvergeConsole can be installed on a Linux host by running a Virtual Network Computing (VNC®) program on a Windows host to remotely control the installation. VNC Viewer is a VNC program that can remotely control QConvergeConsole installation on a Linux host.

To install the QConvergeConsole in a Linux environment:

1. Open the directory containing the installer `QConvergeConsole_Installer_<version>.bin` (Figure 4-20).

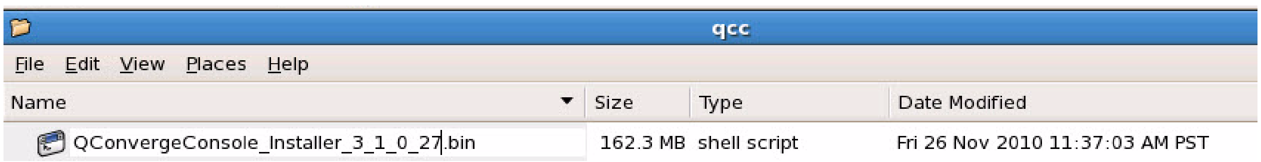


Figure 4-20. Install the QConvergeConsole: Directory Containing Installer

2. From the Terminal window, verify that the installer file has permission to execute. At the prompt, enter `ls -lt` (Figure 4-21).

```
QConvergeConsole_Installer_3_1_0_27.bin
[root@apps53 qcc]# ls -lt
total 166404
-rwxrwxrwx 1 root root 170221184 Nov 26 11:37 QConvergeConsole_Installer_3_1_0_2
7.bin
[root@apps53 qcc]#
```

Figure 4-21. Install the QConvergeConsole: Terminal Window—Verify Permission to Execute

3. To install the QConvergeConsole, double-click the file `QConvergeConsole_Installer_<version>.bin`.

   A message displays asking whether you want to run or display `QConvergeConsole_Installer_<version>.bin` (Figure 4-22).

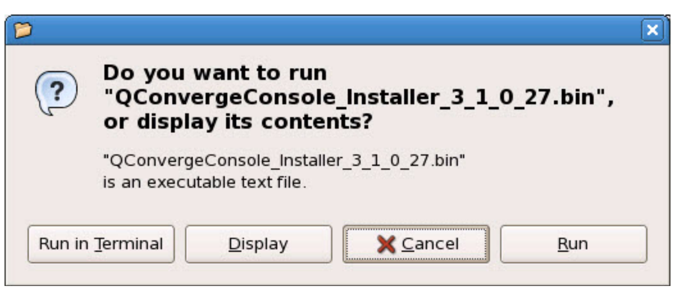


Figure 4-22. Install the QConvergeConsole: Run in Terminal Selection

4. Click **Run in Terminal**.

   The installer extracts the files and installs QConvergeConsole in the directory `/opt/QConvergeConsole_Installer` (Figure 4-23).

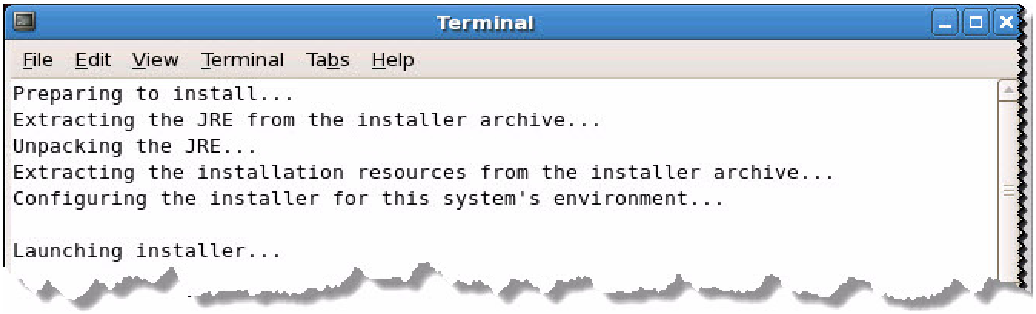


Figure 4-23. Install the QConvergeConsole: Installer Extracts FIles

The InstallAnywhere window prepares to install the QConvergeConsole and opens the installation Introduction dialog box (Figure 4-24).

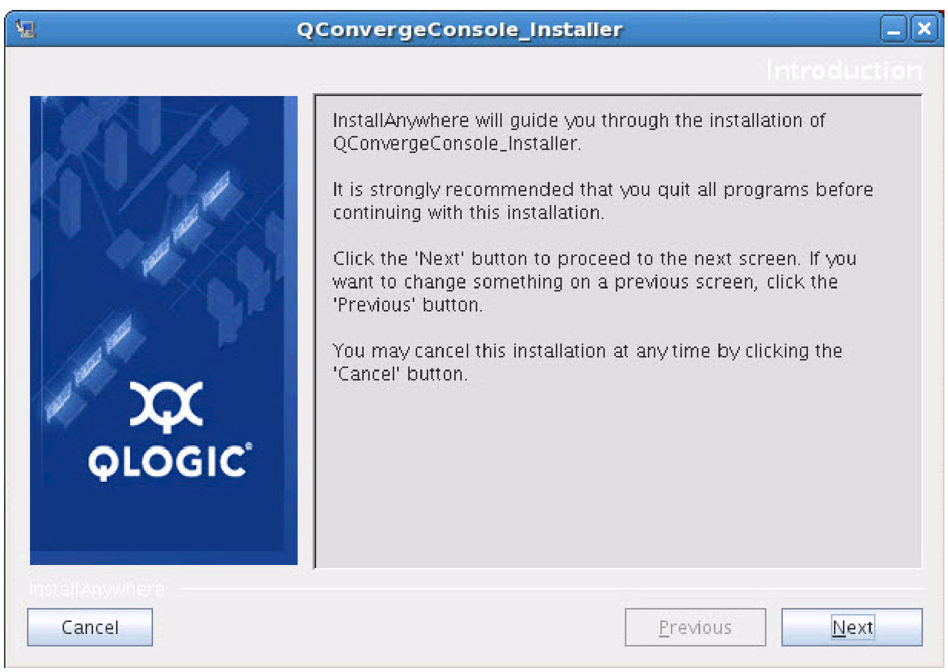


Figure 4-24. Install the QConvergeConsole: Introduction

5. Click **Next**.

The Pre-Installation Summary dialog box (Figure 4-25) opens.

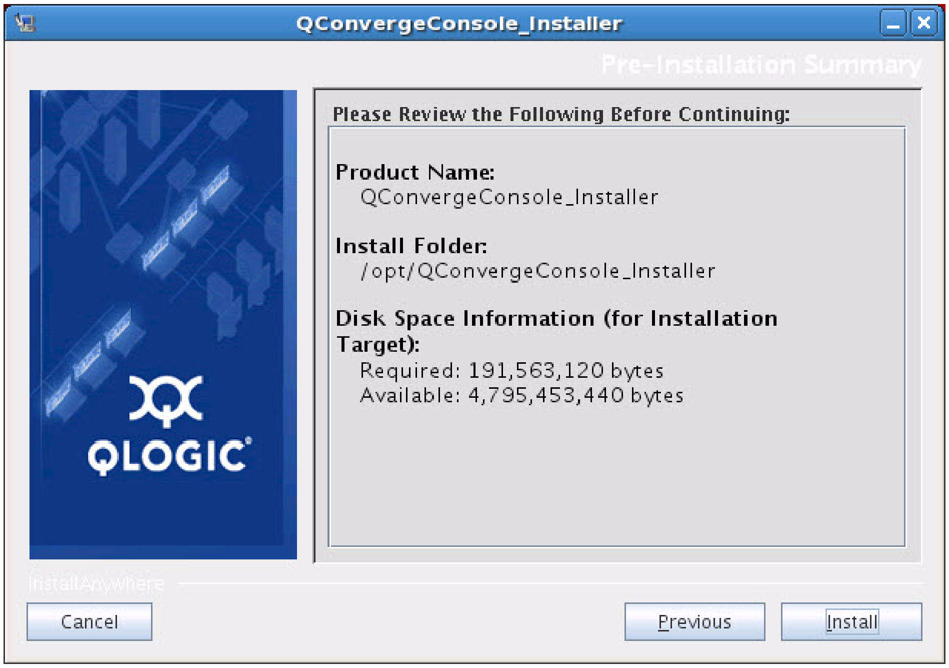


Figure 4-25. Install the QConvergeConsole: Pre-Installation Summary

6. Read the information, and then click **Install**.

During the installation, the installer notifies you of the installation status (Figure 4-26).

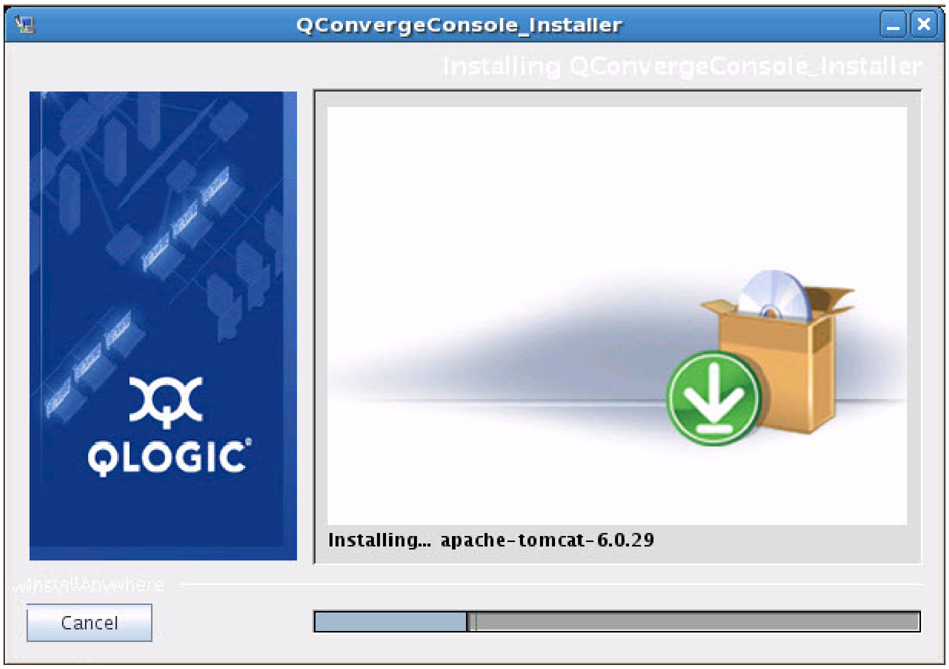


Figure 4-26. Install the QConvergeConsole: Installation Status

The Install Complete dialog box (Figure 4-27) opens.

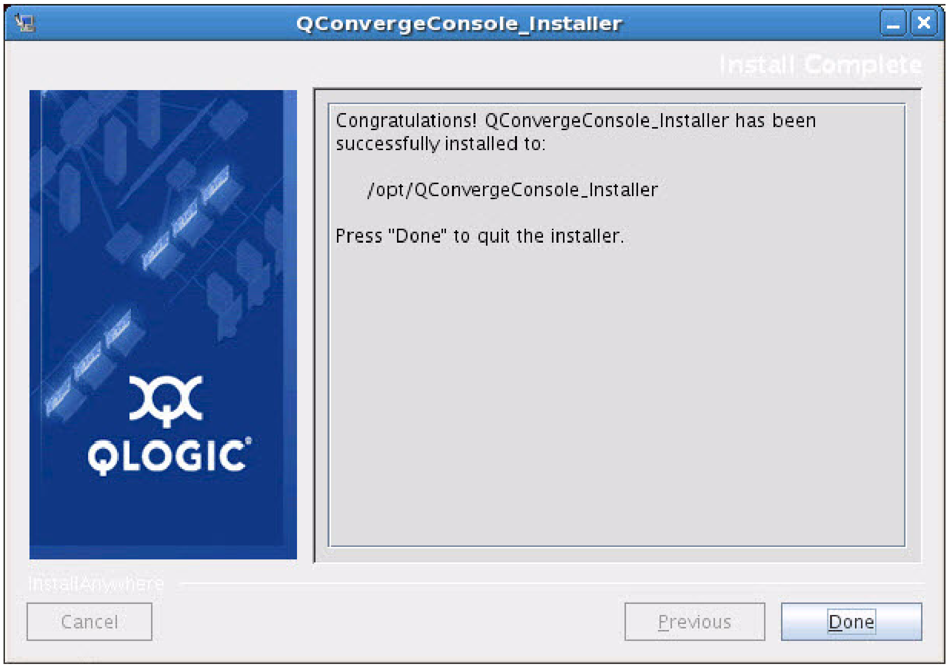


Figure 4-27. Install the QConvergeConsole: Install Complete Notification

7. Click **Done** to exit the installer.

   You have installed the QConvergeConsole on your server.

8. Install the management agents (NIC andFCoE) to remotely manage the server in which your adapter is physically installed. These agents can be installed using the Linux SuperInstaller found on the download sections for your specific adapter at http://driverdownloads.qlogic.com.

9. Open QConvergeConsole locally on the server or from a remote computer.

   To open QConvergeConsole locally on the server:

   Enter the following as the Web address in the browser's address bar:

   `http://localhost:8080/QConvergeConsole`

   The initial main menu of the QConvergeConsole opens (Figure 4-28).

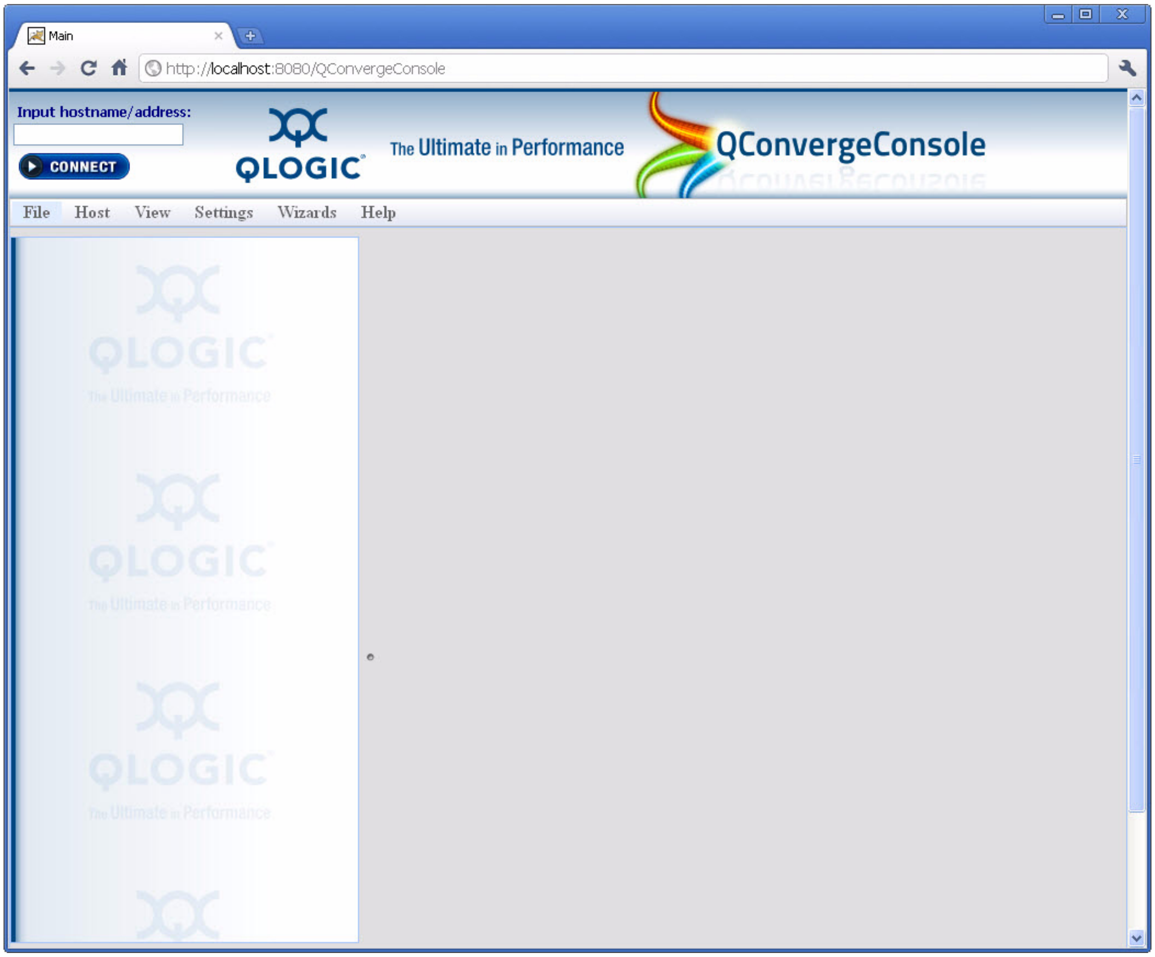


Figure 4-28. QConvergeConsole Main Window on the Server Where QConvergeConsole Resides

To open QConvergeConsole from a remote computer:

Enter the IP address of the QConvergeConsole server, followed by the access port and application name in the browser's address bar using the following format:

`http://`*`xxx.xxx.xxx.xxx`*`:8080/QConvergeConsole/`

In the following example, the Web address of the QConvergeConsole server displays (Figure 4-29).

Figure 4-29. Entering QConvergeConsole Web Address (Example)

The initial main menu of the QConvergeConsole opens, as shown in Figure 4-30.

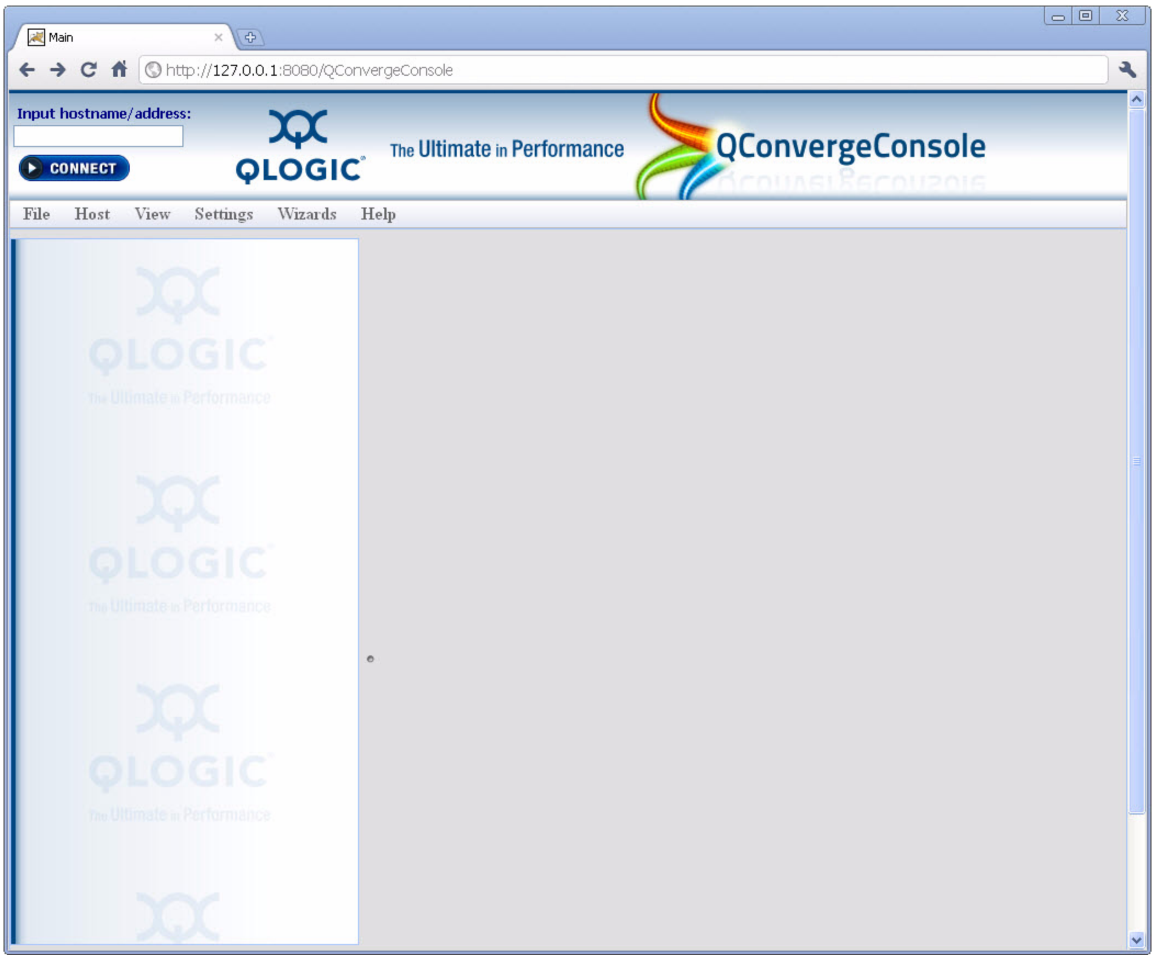


Figure 4-30. QConvergeConsole Main Window from a Remote Computer —Unpopulated View

Installing and Launching the QLogic Linux Tools

The QLogic Linux utilities manage the adapter FCoE function. The QLogic Linux tools package (`Linux-Tools-`*`yyyymmdd-x`*`.tgz`) is a compressed file that contains the utility packages described in Table 4-1.

Table 4-1. QLogic Linux Utilities

Utility File	Description
`ql-dynamic-tgt-lun-disc-`*`x.xx`*`.tgz`	Scans for newly added LUNs
`ql-hba-collect-`*`x.x`*`.tgz`	Gathers troubleshooting information on a variety of Linux hosts
`ql-hba-snapshot-`*`x.xx`*`.tgz`	Uses sysfs to display details about the QLogic Fibre Channel adapter that is installed in the server
`ql-lun-state-online-`*`x.x`*`.tgz`	Changes the state of LUNs connected to a QLogic Fibre Channel adapter from offline to online
`ql-set-cmd-timeout-`*`x.x`*`.tgz`	Sets the timeout on the devices connected to the QLogic Fibre Channel adapter

To install and launch the QLogic Linux utilities on the RHEL 5 host:

1. Extract the component files from the `Linux-Tools-`*`yyyymmdd-x`*`.tgz` file by typing the following command:

```
# tar -xvzf Linux-Tools-yyyymmdd-x.tgz
```

2. Extract the utilities, readme documents, and release notes from the corresponding compressed files by typing the following commands:

```
#tar -xvzf ql-dynamic-tgt-lun-disc-x.xx.tgz
#tar -xvzf ql-hba-collect-x.x.tgz
#tar -xvzf ql-hba-snapshot-x.xx.tgz
#tar -xvzf ql-lun-state-online-x.x.tgz
#tar -xvzf ql-set-cmd-timeout-x.x.tgz
```

3. For each utility, change to the directory listed in Table 4-2, and enter the corresponding command to launch the utility.

Table 4-2. QLogic Linux Utility Directories and Commands

Directory	Command
`ql-dynamic-tgt-lun-disc-`*`x.xx`*`/`	`./ql-dynamic-tgt-lun-disc.sh -i`
`ql-hba-collect-`*`x.x`*`/`	`./ql-hba-collect.sh`

Table 4-2. QLogic Linux Utility Directories and Commands

Directory	Command
`ql-hba-snapshot-x.xx/`	`./ql-hba-snapshot.sh`
`ql-lun-state-online-x.x/`	`./ql-lun-state-online.sh –i`
`ql-set-cmd-timeout-x.x/`	`./ql-set-cmd-timeout.sh -i`

For information about using the Linux utilities, refer to "Using the QLogic Linux Utilities" on page 8-41.

5 Installation in a VMware Environment

Overview

This section describes how to install a QLogic 8100 Series Adapter in VMware® ESX/ESXi environments including, hardware installation, driver installation, and software installation.

Installing Hardware

CAUTION!

- To minimize the risk of ESD damage, use a workstation anti-static mat and an ESD wrist strap.
- Leave the adapter in its anti-static bag until you are ready to install it in the server.
- Hold the adapter by the edge of the PCB or mounting bracket, not the connectors.
- Place the adapter on a properly grounded antistatic work surface pad when it is out of its protective anti-static bag.

To install the adapter:

1. Record the adapter model number, which can be found on the bar code label on the adapter.
2. Determine whether the server requires a full-height or a half-height adapter bracket. The QLogic 8100 Series Adapter ships with a full-height bracket installed and a spare half-height (low profile) bracket.

   To install the half-height bracket:

   a. Using the bail handle of the SFP+ transceivers, pull out the SFP+ modules.

   b. Remove the two screws that hold the full-height bracket using a Phillips #1 screw driver.

   c. Carefully remove the full-height bracket by pulling it away from the card.
   d. Fit the half-height bracket while aligning the slots for the SFP+ transceivers and LEDs.
   e. Fasten the half-height bracket using the screws provided.
   f. Reinstall the SFP+ transceivers by pressing them in until the transceivers clicks.

3. Power off the computer and all attached devices such as monitors, printers, and external components.
4. Remove the server cover, and find an empty PCIe x8 bus slot. If necessary, consult the server system manual for information about how to remove the server cover.
5. Pull out the slot cover (if any) by removing the screw or releasing the lever.
6. Grasp the adapter by the top edge, and insert it firmly into the slot (Figure 5-1).
7. Refasten the adapter retaining bracket using the screw or lever.
8. Close the server cover.
9. Plug the appropriate Ethernet cable (either copper or optical) into the adapter.
   - QLE814*x* adapters ship with optical transceivers already installed. 814*x* adapters operate only with optical transceivers sold by QLogic.
   - For QLE815*x* adapters, see the list of approved copper cables at http://www.qlogic.com/Resources/Pages/Resources.aspx under Cable Support.
10. Connect the other end of the Ethernet cable to a supported switch.
11. Plug in the power cables and power up the server.

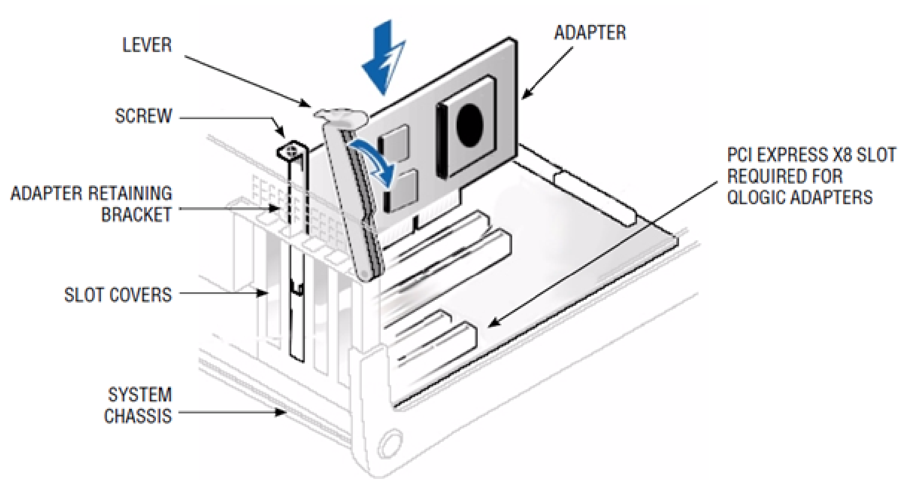


Figure 5-1. Adapter Hardware

12. Verify the LEDs on the adapter to ensure proper operation. For information about LED indications, refer to Appendix A.

Installing the FCoE and Networking Drivers

The QLogic 8100 Series Adapter driver is not included with the VMware ESX™/ESXi4.0 operating system. Therefore, you must download the drivers for VMware ESX/ESXi 4.0 from the QLogic Web site at http://driverdownloads.qlogic.com/.

To download and install the FCoE and networking drivers:

1. Click **QLogic Products**.
2. Click the **by Operating System** radio button above the selection list.
3. Under Adapters, select **Converged Network Adapters** in the first column of the selection list.
4. Select **VMware** in the second column of the selection list.

5. Select **VMware ESX/ESXi** in the third column of the selection list, and then click **Go** (Figure 5-2).

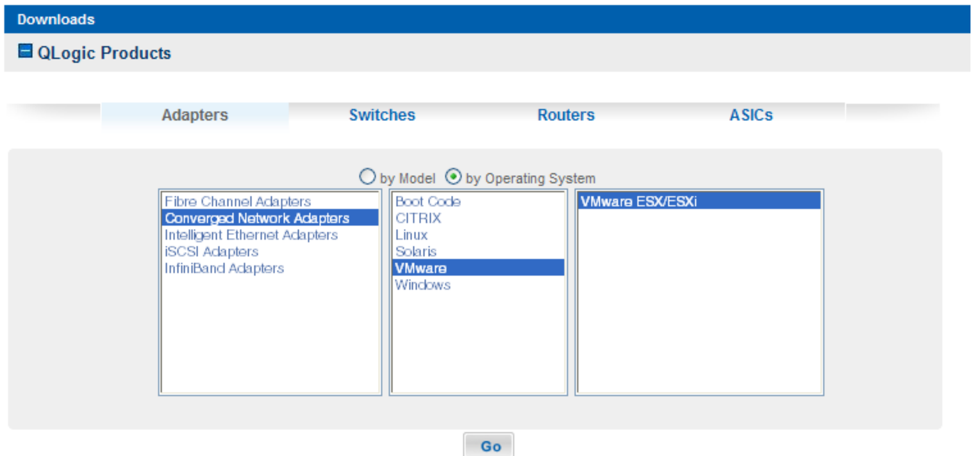


Figure 5-2. Select Adapter Software for VMware by Operating System

6. In the Drivers table, click the links that correspond to the following descriptions to download the drivers:
   - Networking driver for VMware ESX/ESXi 4.0.*x* and 4.1
   - FC-FCoE driver for VMware ESX/ESXi 4.0.*x*, 4.1

7. On the vSphere client, open the vSphere application to place the ESX host server in maintenance mode. Select **Inventory**, **Host**, **Enter Maintenance Mode** (Figure 5-3).

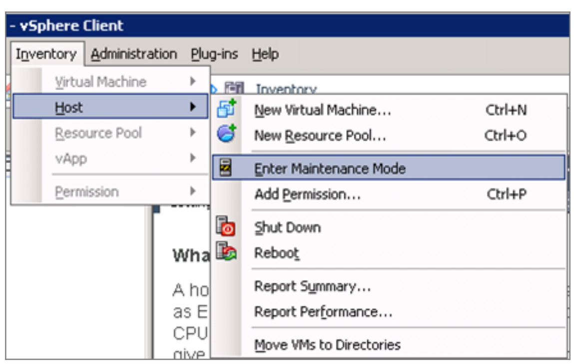


Figure 5-3. Placing the ESX Host Server in Maintenance Mode Using vSphere

8. On the ESX host server, in maintenance mode, select the **Summary** tab (Figure 5-4).

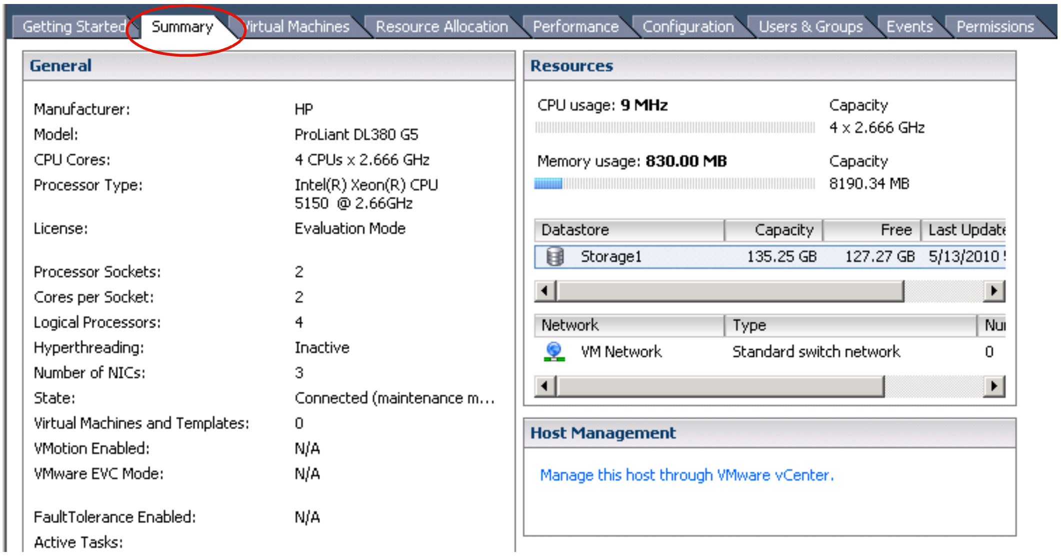


Figure 5-4. Selecting the Summary Tab

9. Right-click the storage icon, and then select **Browse Datastore** (Figure 5-5).

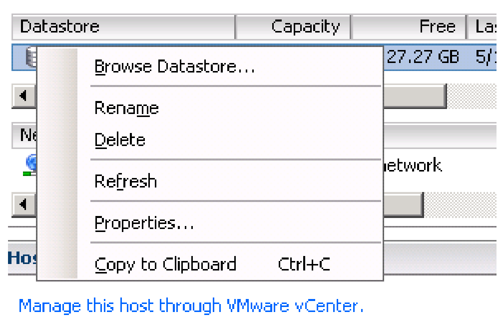


Figure 5-5. Selecting Browse Datastore

10. In the Datastore Browser, create a temporary folder in which to store the driver ISO files (Figure 5-6).

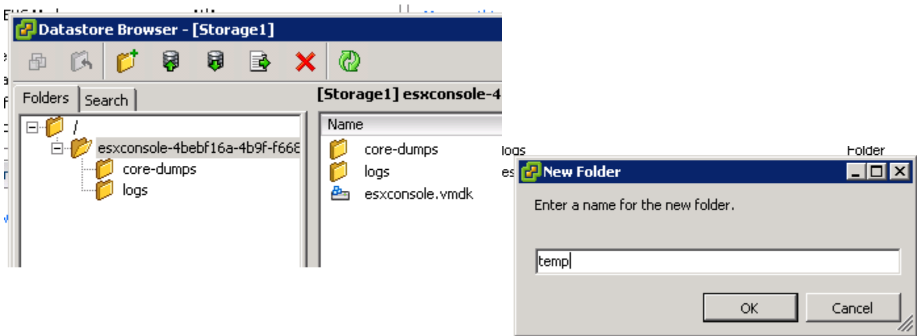


Figure 5-6. Creating a Temporary Folder in Which to Store the Driver ISO Files

11. Click the Upload icon to upload the driver ISO files into the temporary folder (Figure 5-7).

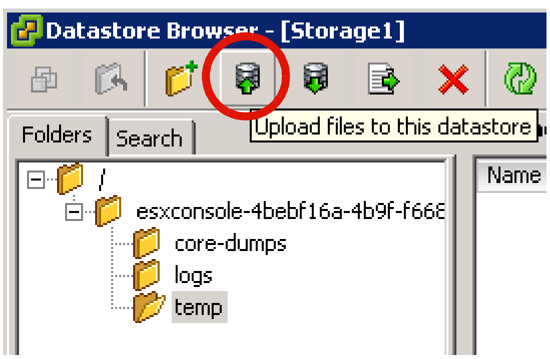


Figure 5-7. Opening the Temporary Driver Folder

12. In the Upload Items window, select a driver, and then click **Open** to upload the driver into the temporary folder.

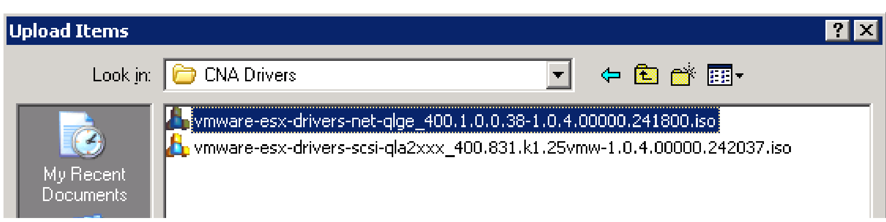


Figure 5-8. Uploading Drivers

13. Change to the directory that contains the driver ISO files by issuing the following command:

```
# cd /vmfs/volumes/Storage1/<esxconsole>/temp
```

14. Mount the first ISO file under the ESX host server by issuing the following command:

```
# mount -o loop -t iso9660 <network driver file>.iso
/mnt/cdrom
```

15. Change to the directory that contains the zip files from the mounted ISO image by issuing the following command:

```
# cd /mnt/cdrom/offline-bundle
```

16. Install the driver by issuing the following command:

```
# esxupdate  --bundle=<network driver file>.zip update
```

17. Go back to the directory that contains the ISO files by issuing the following command:

```
# cd /vmfs/volumes/Storage1/<esxconsole>/temp
```

18. Unmount the first ISO file from the ESX host server by issuing the following command:

```
# umount /mnt/cdrom
```

19. Repeat Steps 12 and 13 for the second driver:
20. Mount the second ISO file under the ESX host server by issuing the following command:

```
# mount -o loop -t iso9660 <fcoe driver file>.iso /mnt/cdrom
```

21. Change to the directory that contains the zip files from the mounted ISO image by issuing the following command:

```
# cd /mnt/cdrom/offline-bundle
```

22. Install the driver by issuing the following command:

```
# esxupdate  --bundle=<fcoe driver file>.zip update
```

23. Go back to the directory that contains the ISO files by issuing the following command:

```
# cd /vmfs/volumes/Storage1/<esxconsole>/temp
```

24. Unmount the first ISO file from the ESX host server by issuing the following command:

    ```
    # umount /mnt/cdrom
    ```

25. Reboot the ESX host server to complete the driver installation and exit maintenance mode.

Verifying Driver Installation

To verify that the Converged Network Adapter drivers are installed on the VMware ESX/ESXi 4.0 host server, log in to the service console as root, and then type the `vmkload_mod` command, as shown in Figure 5-9. The qlge (networking driver) and qla2xxx (FCoE driver) entries should show `Yes` in the last column.

```
[root@localhost ~]# vmkload_mod -l | grep ql
vmw_satp_eql         0x41802b054000   0x1000     0x417febe6d4c0   0x1000      22  Yes
qlge                 0x41802b09a000   0x1d000    0x417fec035580   0x1000      30  Yes
qla2xxx              0x41802b0c9000   0x3e000    0x417fec03ed00   0xdf000     35  Yes
[root@localhost ~]#
```

Figure 5-9. Verifying Adapter Driver Installation

Validating Driver and Firmware Versions

Use the console operating system to identify Converged Network Adapters on a VMware ESX/ESXi 4.0 system.

To validate the Converged Network Adapter driver and firmware versions:

1. Discover the device using `lspci`.

2. List the subdirectories by issuing the following command:

    ```
    # ls /proc/scsi:
    ```

    If the `qla2xxx` directory is present, the QLogic FCoE adapter driver is installed on the VMware ESX/ESXi 4.0 host server.

3. List the QLogic FCoE adapters present on the ESX host server by issuing the following command:

    ```
    # ls /proc/scsi/qla2xxx
    1  2  3  4  5  6
    ```

4. Display additional details for a specific FCoE adapter by issuing the following command:

    ```
    # cat /proc/scsi/qla2xxx/<adapter_number>
    ```

    In this command, *<adapter_number>* is an adapter number.

The example in Figure 5-10 shows the details for FCoE adapter 3, including the current state, the firmware version, the driver version, and the boot code version.

```
[root@localhost ~]# ls /proc/scsi/qla2xxx/
3  4
[root@localhost ~]# cat /proc/scsi/qla2xxx/3
QLogic PCI Express to FCoE Converged Network Adapter for QLE8142:
        FC Firmware version 5.02.01 (8d4), Chip Type: QLE814x
        MPI Firmware Version:  1.35.11 (66048)
Driver version 831.k1.25vmw

Host Device Name vmhba2

BIOS version 2.14
FCODE version 3.09
EFI version 3.20
Flash FW version 5.02.01
ISP: ISP8001
Request Queue = 0xad015000, Response Queue = 0xad096000
Request Queue count = 4096, Response Queue count = 512
Total number of interrupts = 1571
    Device queue depth = 0x20
Number of free request entries = 4096
Number of mailbox timeouts = 0
Number of ISP aborts = 0
Number of loop resyncs = 1
Host adapter:Loop State = <DEAD>, flags = 0x1905a83
Link speed = <Unknown>

Dpc flags = 0x100c0
Link down Timeout =  030
Port down retry =   005
Login retry count =   008
Execution throttle = 2048
ZIO mode = 0x6, ZIO timer = 1
Commands retried with dropped frame(s) = 0
Product ID = 0000 0000 0000 0000


NPIV Supported : Yes
Max Virtual Ports = 254

SCSI Device Information:
scsi-qla0-adapter-node=200000c0dd12ab09:000000:0;
scsi-qla0-adapter-port=210000c0dd12ab09:000000:0;

FC Target-Port List:

[root@localhost ~]#
```

Figure 5-10. Displaying FCoE Adapter Driver Details

5. List details for the QLogic adapter networking driver by issuing the following command:

   `ifconfig -a`

   The example in Figure 5-11 shows all vmnic and vswif interfaces available on the host.

```
[root@localhost ~]# ifconfig -a
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:435019 errors:0 dropped:0 overruns:0 frame:0
          TX packets:435019 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:387832456 (369.8 MiB)  TX bytes:387832456 (369.8 MiB)

vmnic0    Link encap:Ethernet  HWaddr 00:1C:C4:EC:97:B6
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:692248 errors:0 dropped:0 overruns:0 frame:0
          TX packets:35317 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:88308579 (84.2 MiB)  TX bytes:12547124 (11.9 MiB)
          Interrupt:177 Memory:c8000000-c8012100

vmnic1    Link encap:Ethernet  HWaddr 00:1C:C4:EC:97:B4
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:185 Memory:ca000000-ca012100

vmnic2    Link encap:Ethernet  HWaddr 00:0E:1E:01:0C:D8
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:255

vmnic3    Link encap:Ethernet  HWaddr 00:C0:DD:12:AB:08
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:255

vmnic4    Link encap:Ethernet  HWaddr 00:C0:DD:12:AB:0A
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:255

vswif0    Link encap:Ethernet  HWaddr 00:50:56:44:54:97
          inet addr:172.29.40.84  Bcast:172.29.40.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:279553 errors:0 dropped:0 overruns:0 frame:0
          TX packets:35327 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:38637844 (36.8 MiB)  TX bytes:12494424 (11.9 MiB)

[root@localhost ~]#
```

Figure 5-11. Displaying Networking Adapter Driver Details

6. Display adapter networking driver and firmware versions for QLogic `vmnic` interfaces by issuing the following command:

   `# ethtool -i vmnic[N]`

   In this command, *[N]* is the adapter number that corresponds to a QLogic interface from the `ifconfig -a display` (Figure 5-11). A QLogic interface MAC address begins with `00:0C:DD`. The example in Figure 5-12 shows networking driver version and firmware version for adapter 3.

```
[root@localhost ~]# ethtool -i vmnic3
driver: qlge
version: v1.00.00.38-022710
firmware-version: v1.35.11
bus-info: 0000:17:00.0
[root@localhost ~]#
```

Figure 5-12. Displaying Networking Driver and Firmware Versions

Identifying QLogic Adapters Using vSphere Client

You can use the VMware vSphere client to identify Converged Network Adapters on a VMware ESX/ESXi 4.0 host server.

To display Converged Network Adapters using the vSphere client:

1. Start the vSphere client and select the host you want.
2. Click the **Configuration** tab.
3. In the Hardware pane, select **Storage Adapters** to display all storage adapters, including QLogic Fibre Channel and Converged Network Adapters, as shown in Figure 5-13.

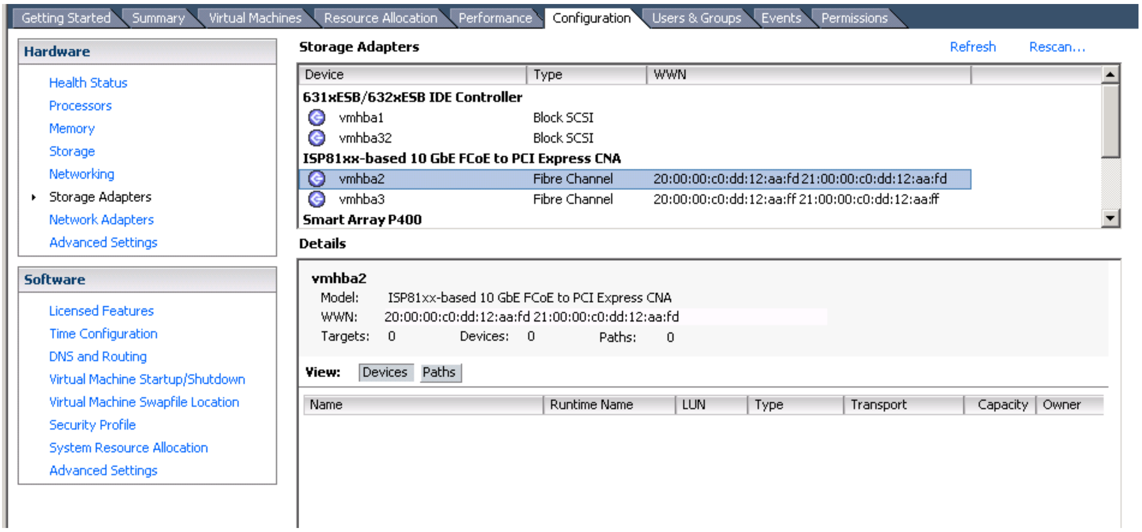


Figure 5-13. Displaying Storage Adapters Using the vSphere Client

4. In the Hardware pane, select Network Adapters to display all network adapters, as shown in Figure 5-14.

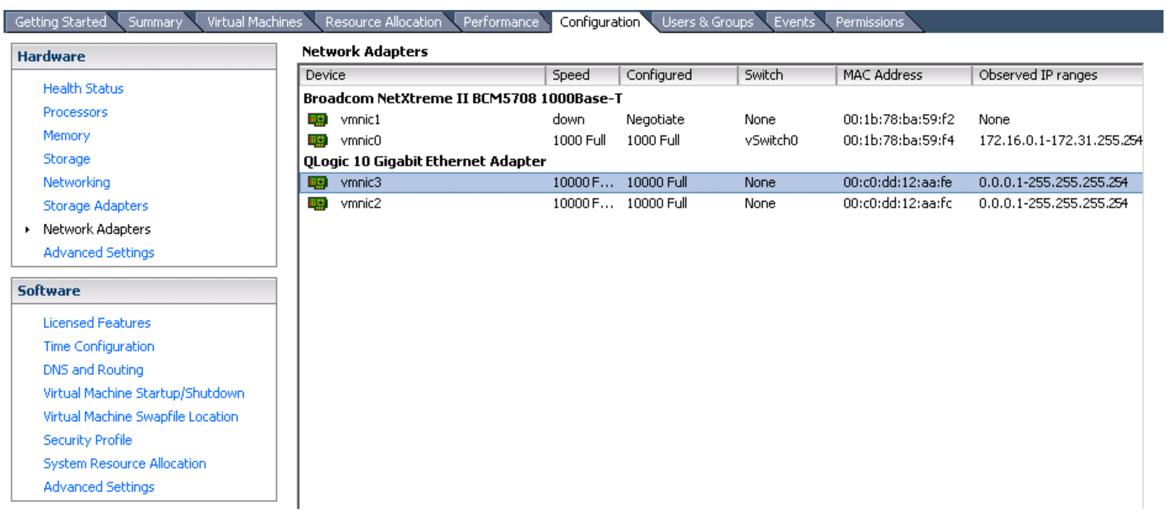


Figure 5-14. Displaying Network Adapters Using the vSphere Client

Configuring NIC Using the vSphere Client

To configure the NIC using the vSphere client:

1. Ensure that the necessary guest operating systems have been installed on the ESX host server.
2. Power off the guest operating systems so that they can be configured.

3. Open the vSphere client, and then click the **Configuration** tab.
4. In the Hardware pane, select **Networking**, as shown in Figure 5-15.

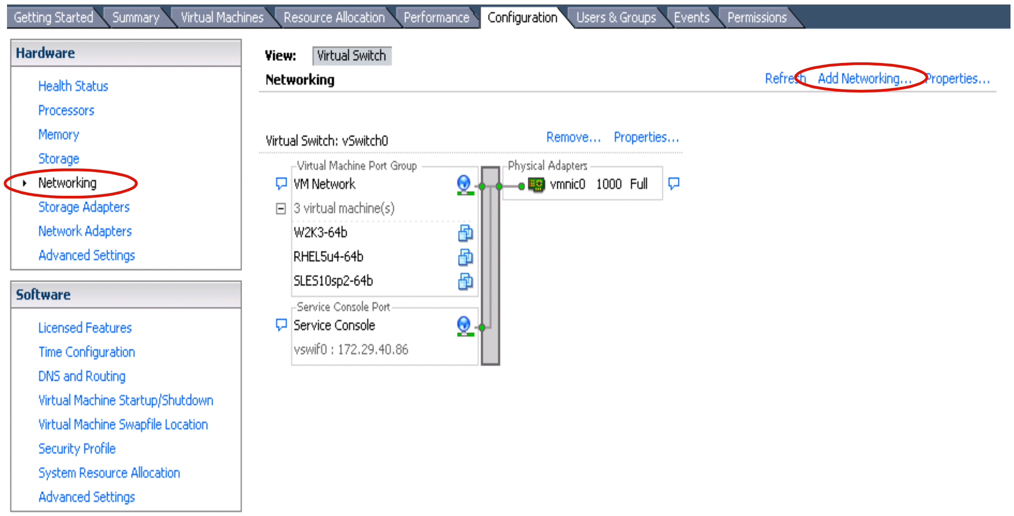


Figure 5-15. Configuring Networking Adapters

5. Select **Add Networking . .** in the upper right portion of the window.
6. In the Add Network Wizard, click **Virtual Machine**, and then click **Next** (Figure 5-16).

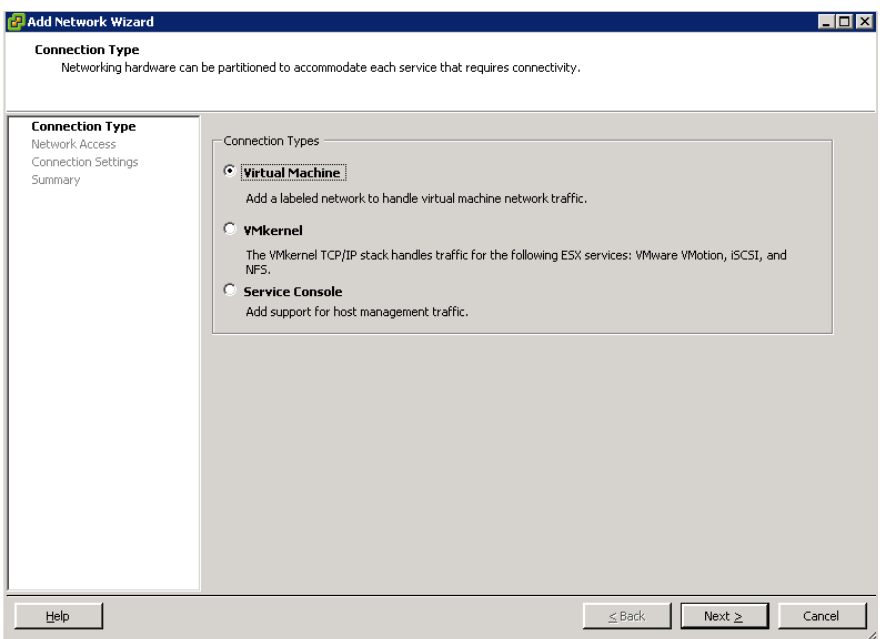


Figure 5-16. Add a Labeled Network

7. Click the `vmnic` associated with the QLogic adapter to be connected to the new virtual switch, and then click **Next**.

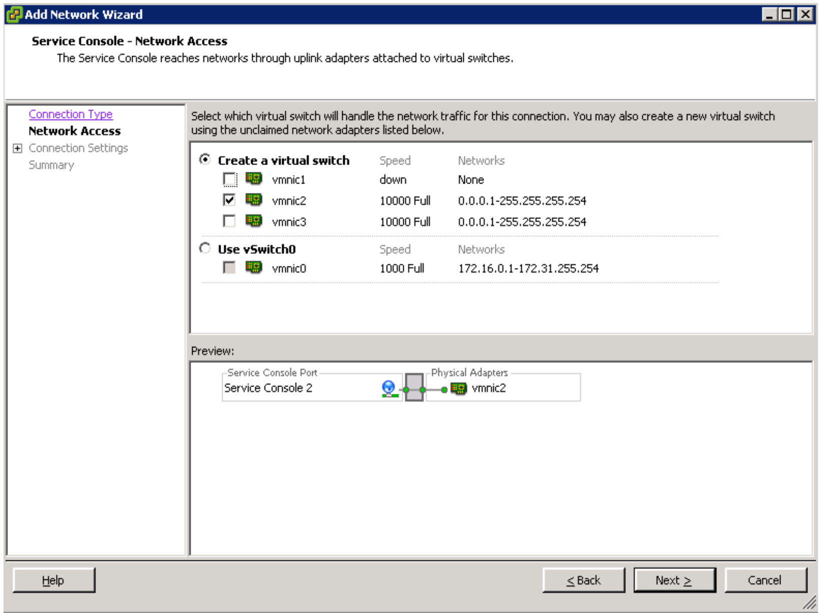


Figure 5-17. Selecting the Virtual Switch

8. Modify the network label and VLAN ID if needed, and then click **Next** (Figure 5-18).

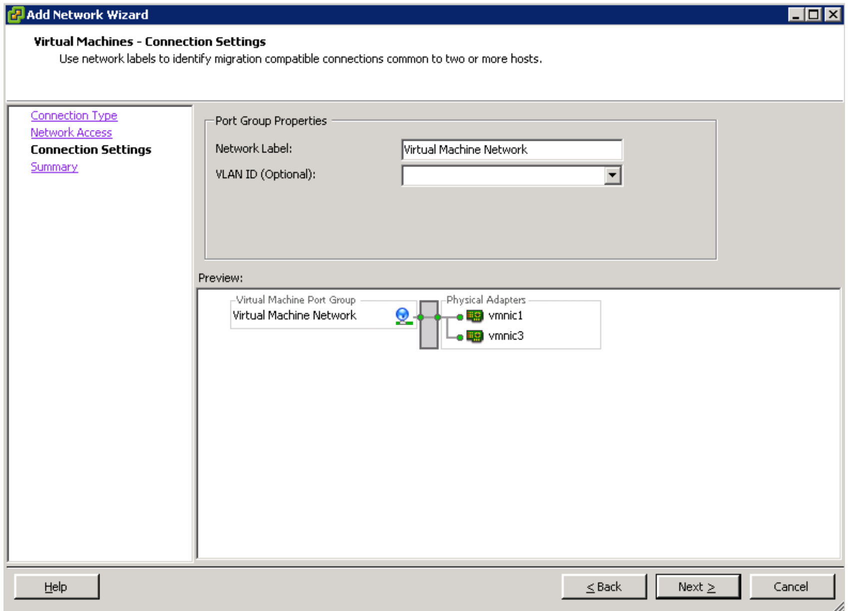


Figure 5-18. Modifying the Network Label and the VLAN ID

9. Click **Finish** to complete the addition of the networking interface.

Configuring the Driver Parameters

Use the `esxcfg-module` command to configure the QLogic Fibre Channel and Converged Network Adapter driver parameters. Configuration changes made using the `esxcfg-module -s` command are preserved across system reboots.

To configure driver parameters:

1. To list the driver parameters, issue the following command:

   `# `**`esxcfg-module -g qla2xxx`**

2. To set the driver parameters, issue the following command:

   `# `**`esxcfg-module -s `*`<options>`*` qla2xxx`**

   In this command, <*options*> is one of the configurable parameters listed in Table 5-1.

   For example, the following command sets the maximum device queue depth, reported by the QLogic, to a value of 32:

   `# `**`esxcfg-module -s ql2xmaxqdepth=32 qla2`*`xxx`***

3. To update the ESX RAMdisk image, issue the following command:

   `# `**`esxcfg-boot -b`**

4. Reboot the server to place the parameter changes into effect.

```
# reboot
```

Table 5-1 describes the configurable QLogic driver parameters.

Table 5-1. esxcfg-module Configurable Driver Parameters

Driver Parameter	Description
ql2xallocfwdump	Enables (1) or disables (0) allocation of memory for a firmware dump during adapter initialization. Memory allocation requirements vary by ISP type. The default is 0.
ql2xcmdtimeout	Timeout value for the scsi command in seconds. Default is 20.
ql2xenablemsi	Enables (1) or disables (0) the MSI-X/MSI interrupt scheme. Default is 0.
ql2xexecution_throttle	I/O control block exchange count for the adapter. The default is 0.
ql2xextended_error_logging	Enables (1) or disables (0) extended error logging. The default is 0.
ql2xiidmaenable	Enables (1) or disables (0) iIDMA settings. The default is 1.
ql2xintrdelaytimer	Number of seconds before the firmware sends an interrupt to the host indicating request completion.
ql2xioctltimeout	Ioctl timeout value for pass-through commands in seconds. Default is 66.
ql2xloginretrycount	Number of login retries allowed.
ql2xlogintimeout	Login timeout value in seconds. Default is 20.
ql2xmaxqdepth	Maximum queue depth to report for target devices. Default is 32.
ql2xmaxsgs	Maximum scatter or gather entries per I/O request. Default is 32.
ql2xoperationmode	Enables or disables operation mode for 2Gb or 4Gb Fibre Channel adapters. For 2Gb Fibre Channel adapters, set to 0x5 to enable zero input-output (ZIO) mode. For 4Gb Fibre Channel adapters, set to 0x5/0x6 to enable ZIO mode.

Table 5-1. esxcfg-module Configurable Driver Parameters (Continued)

Driver Parameter	Description
ql2xplogiabsentdevice	Enables (1) or disables (0) PLOGI (port login) to devices that are not present after a fabric scan. Enabling this parameter is required to work around some Fibre Channel switch defects. The default is 0.
ql2xqfullrampup	Number of seconds to wait before increasing the queue depth for a device after a queue-full condition has been detected. The default is 120 seconds.
ql2xusedefmaxrdreq	PCIe maximum read request size. Adjust the PCIe maximum read request size (0); use system default (1). The default 0.
ql2xusedrivernaming	Enables (1) or disables (0) the consistent device naming feature. The default is 0.
qlport_down_retry	Maximum number of command retries for a port that returns `PORT-DOWN` status. This parameter determines how long the driver internally queues I/O before returning the `DID_NO_CONNECT` status to the SCSI mid layer. Multiply this parameter by two to determine the number of seconds that the driver holds the I/O request. Default is 15.

Configuring a Hard Drive in a Virtual Machine

To configure a hard drive in a virtual machine:

1. Open vSphere and exit maintenance mode on the vSphere client (Figure 5-19).

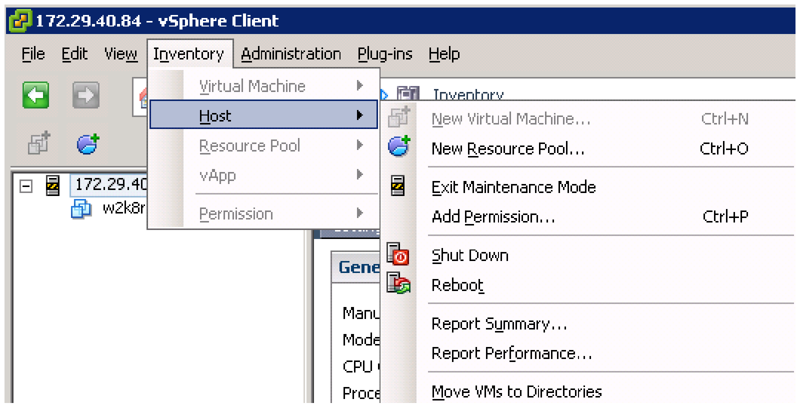


Figure 5-19. Exiting Maintenance Mode

2. Power off the virtual machine that you are configuring.
3. Select the virtual machine in the left pane (Figure 5-20).

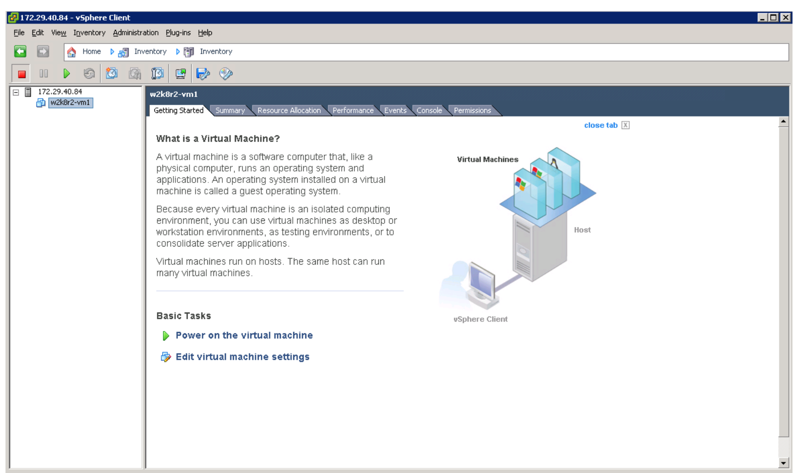


Figure 5-20. Selecting the Virtual Machine

4. Click the **Getting Started** tab.
5. Click **Edit virtual machine settings** under Basic Tasks.

6. Click **Add** in the Virtual Machine Properties window to add a device to the virtual machine (Figure 5-21).

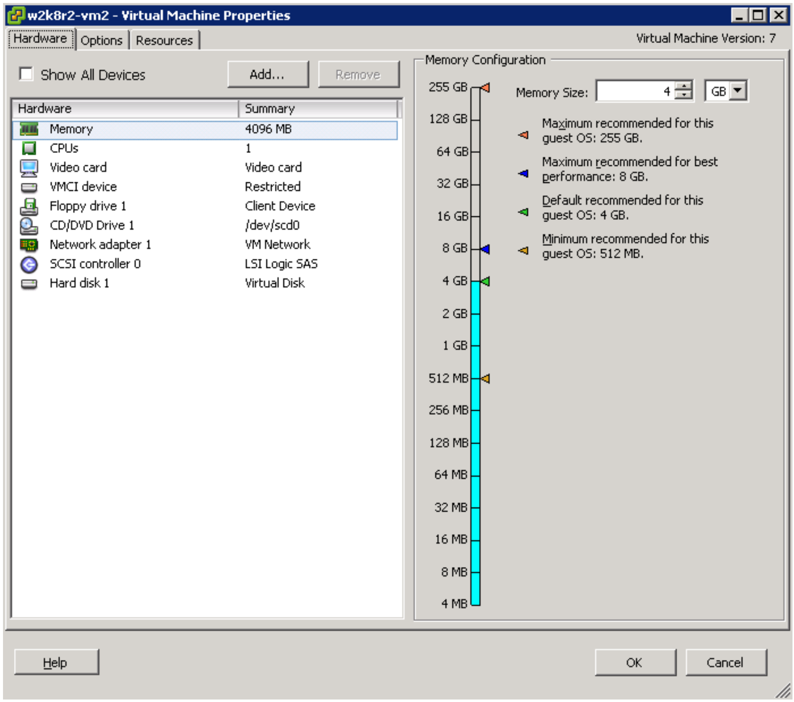


Figure 5-21. Virtual Machine Properties Window

7. Select a device. In this example, select **Hard Drive** to add a storage device to the virtual machine, and then click **Next** (Figure 5-22).

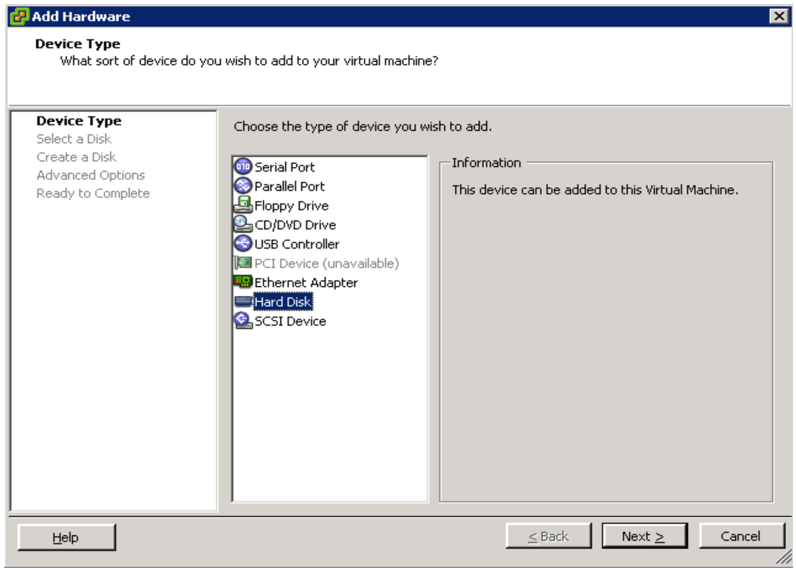


Figure 5-22. Add Hardware—Device Type

8. Select the type of disk. Click **Raw Device Mappings**, and then click **Next**. (Figure 5-23). For an explanation of the virtual disk options, refer to your VMware documentation.

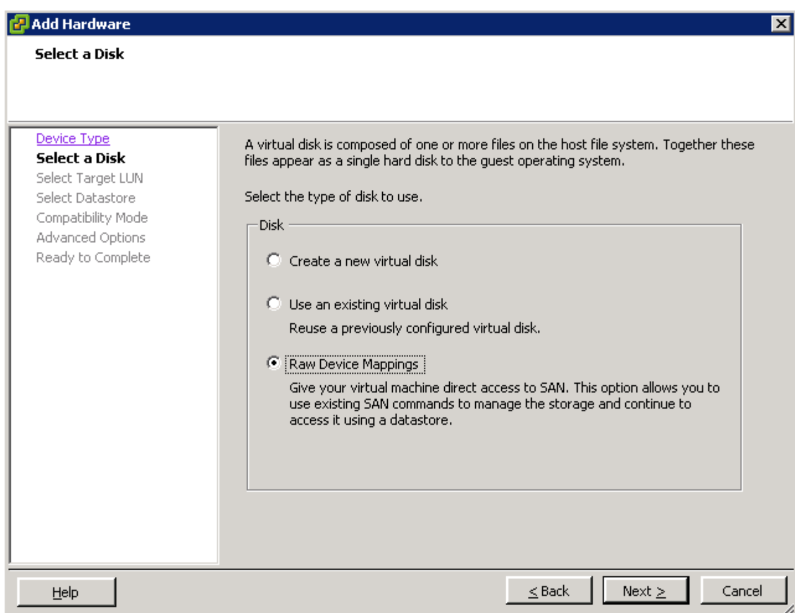


Figure 5-23. Add Hardware—Select a Disk

9. Select a target LUN. In this example, accept the selected LUN, and then click **Next** (Figure 5-24).

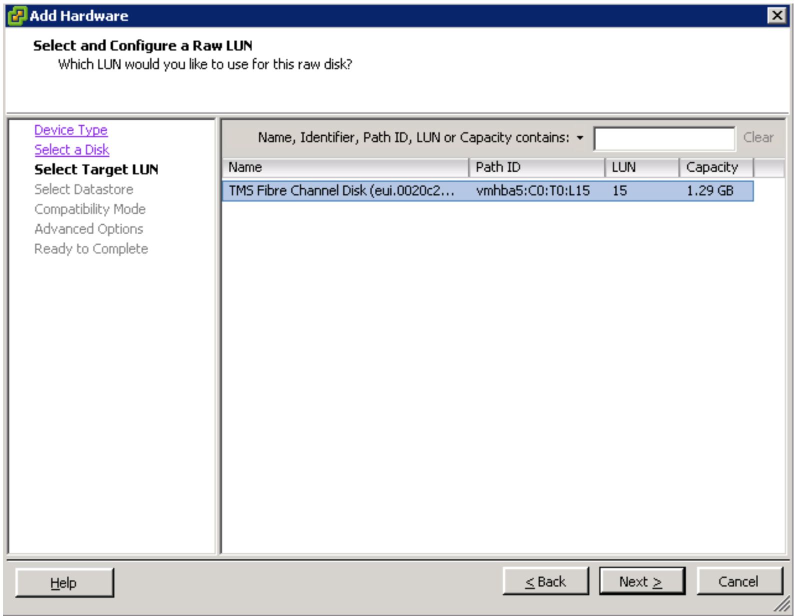


Figure 5-24. Add Hardware—Select Target LUN

10. Select a datastore. In this example, accept the default, **Store with Virtual Machine**, and then click **Next** (Figure 5-25).

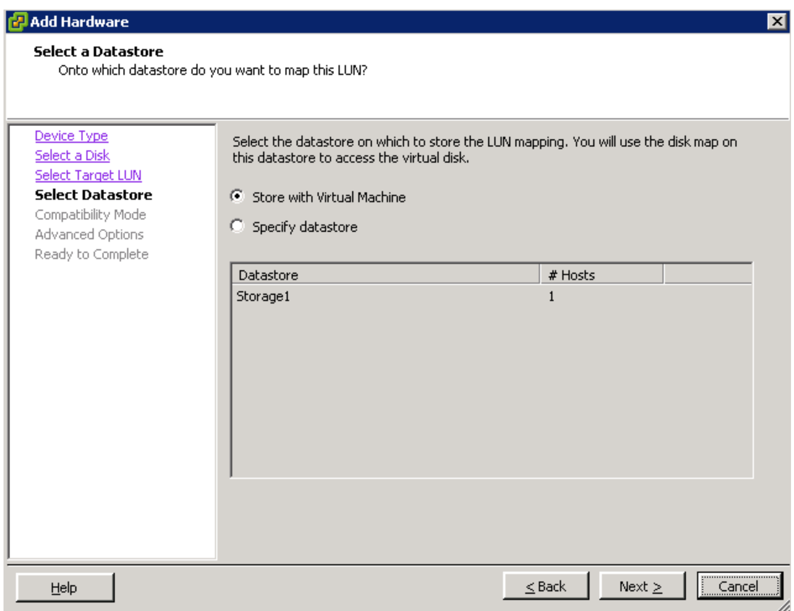


Figure 5-25. Add Hardware—Select Datastore

11. Select a compatibility mode. In this example, accept the default, **Physical**, and then click **Next** (Figure 5-26).

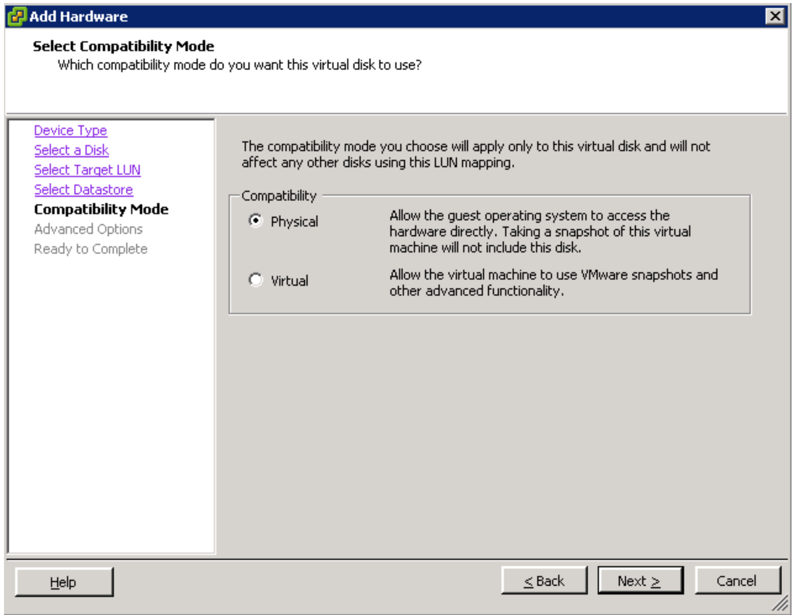


Figure 5-26. Add Hardware—Compatibility Mode

12. Select advanced options. In this example, accept the default, and then click **Next** (Figure 5-27).

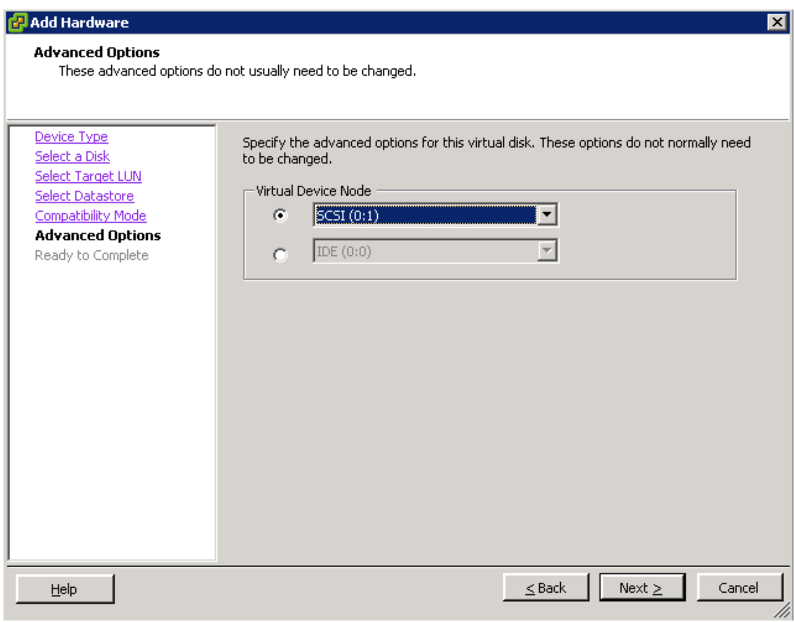


Figure 5-27. Add Hardware—Advanced Options

13. Review the disk settings, and then click **Finish** to complete the configuration (Figure 5-28).

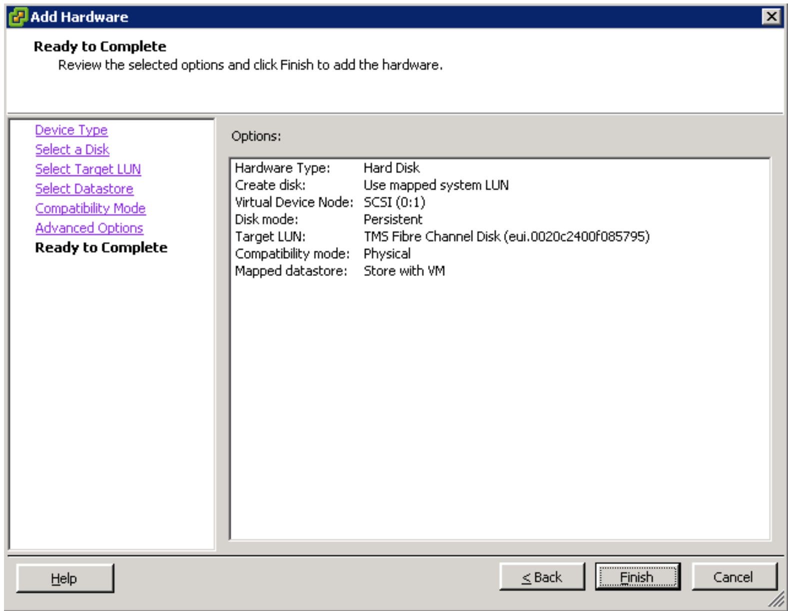


Figure 5-28. Add Hardware—Ready to Complete

14. Observe the New Hard Disk (adding) entry in the Virtual Machine Properties window, and then click **OK** (Figure 5-29).

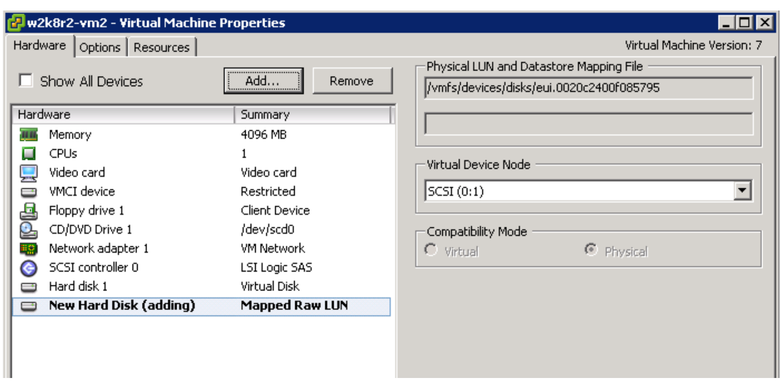


Figure 5-29. Confirming the New Disk

Configuring a Network Adapter in a Virtual Machine

To configure a network adapter in a virtual machine:

1. Open vSphere and exit maintenance mode on the vSphere client (Figure 5-30).

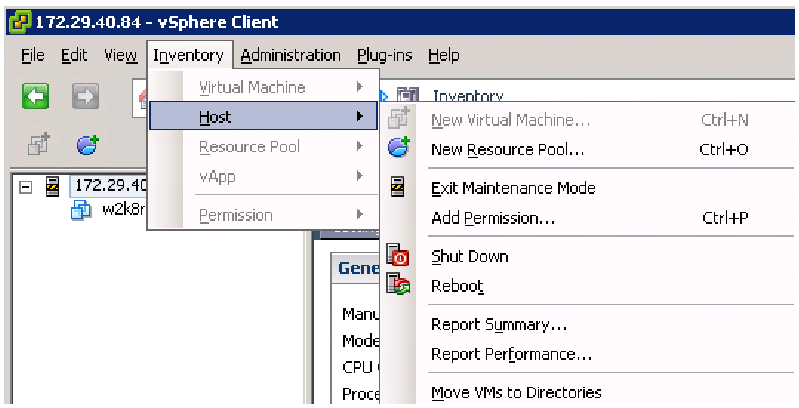


Figure 5-30. Exiting Maintenance Mode

2. Power off the virtual machine that you are configuring.
3. Select the virtual machine in the left pane (Figure 5-31).

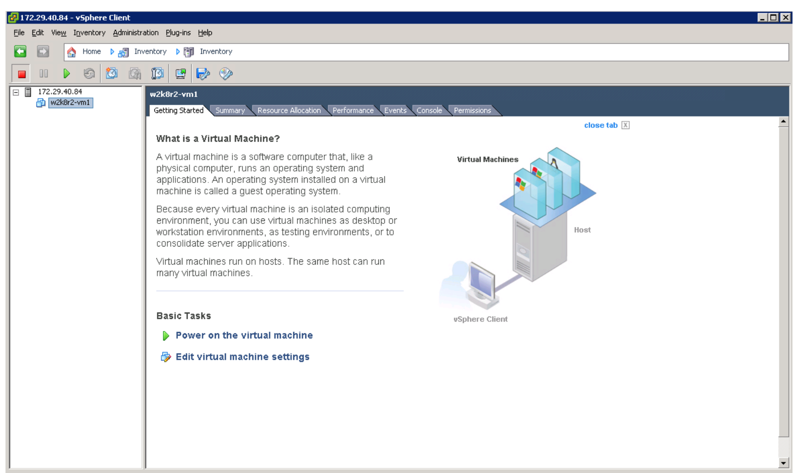


Figure 5-31. Selecting the Virtual Machine

4. Click the **Getting Started** tab.
5. Click **Edit virtual machine settings** under Basic Tasks.

6. Click **Add** in the Virtual Machine Properties window to add a device to the virtual machine (Figure 5-21).

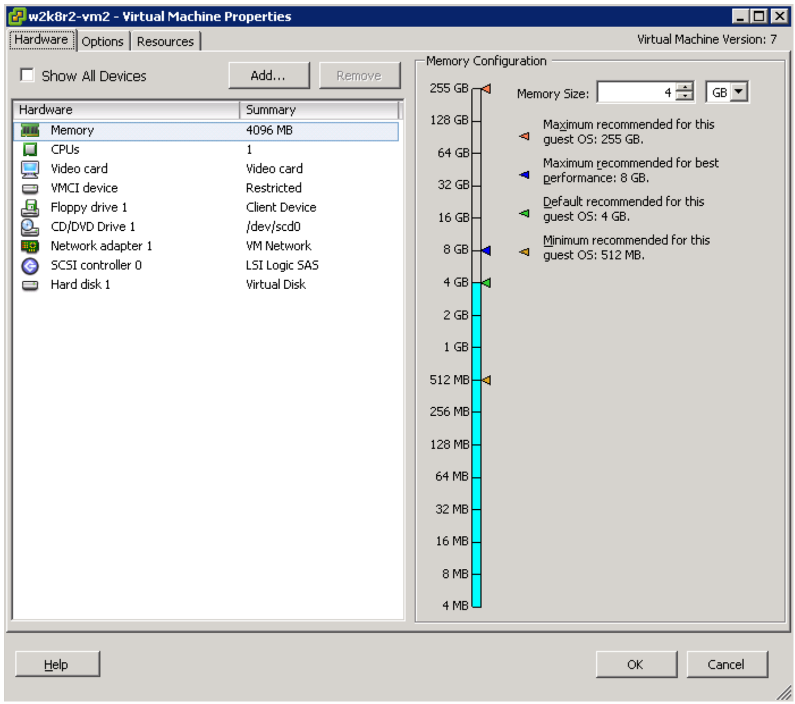


Figure 5-32. Virtual Machine Properties Window

7. Select the Ethernet adapter device, and then click **Next** (Figure 5-33).

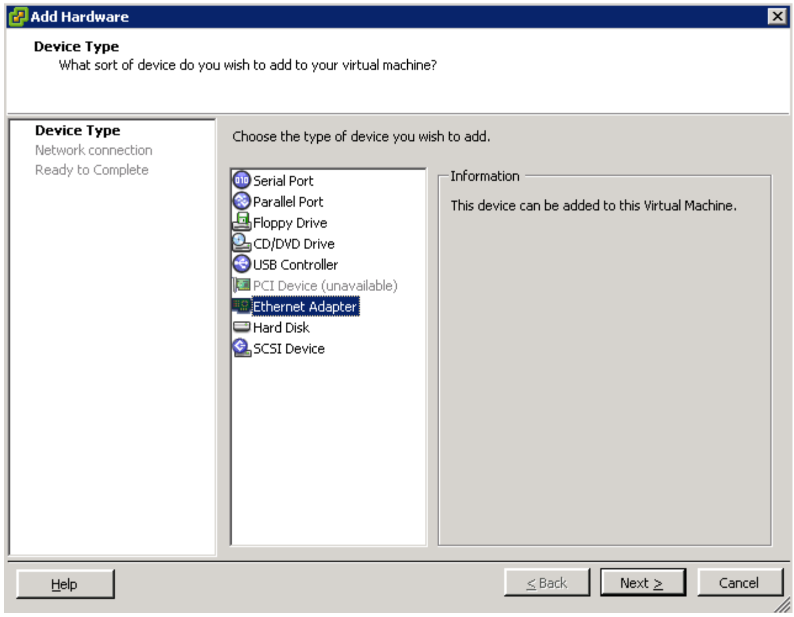


Figure 5-33. Add Hardware—Select Adapter

8. Select the adapter type and network connection. For information about these options, refer to the VMware documentation. In this example, accept the default setting for adapter type, select **Network Label**, **Virtual Machine Network**, and then click **Next** (Figure 5-34).

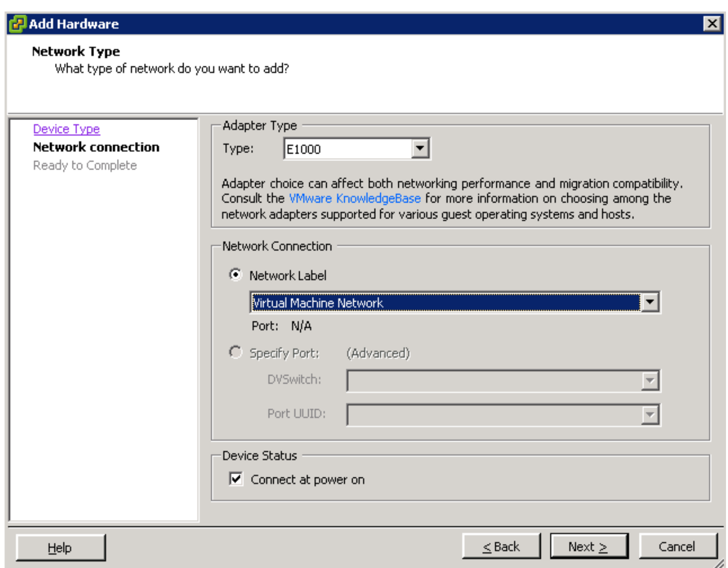


Figure 5-34. Add Hardware—Network Connection

9. Review the adapter settings, and then click **Finish** to complete the adapter configuration (Figure 5-35).

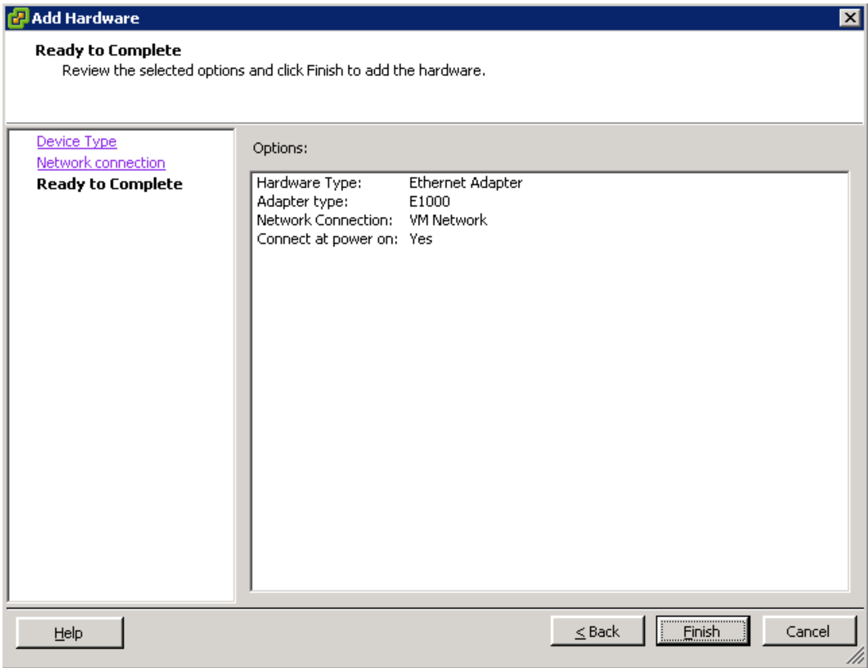


Figure 5-35. Add Hardware—Ready to Complete

10. Observe the New NIC (adding) entry in the Virtual Machine Properties window, and then click **OK** (Figure 5-36).

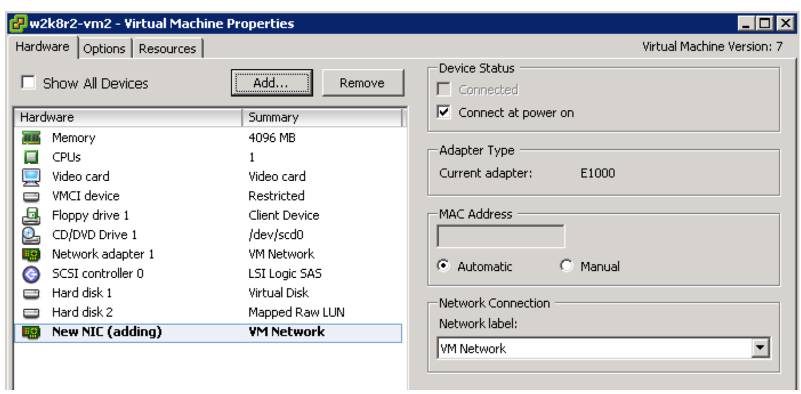


Figure 5-36. Confirm New Adapter

Deploying NPIV for VMware ESX/ESXi 4.0

QLogic Fibre Channel and Converged Network Adapters support N_Port ID virtualization (NPIV) for Fibre Channel and FCoE SANs. NPIV enables each virtual machine to have its own Fibre Channel-FCoE WWPN by creating multiple virtual adapters on a single physical adapter. VMware ESX/ESXi 4.0 enables NPIV support on QLogic 4Gb and 8Gb Fibre Channel adapters and 8100 Series Converged Network Adapters. No additional software or hardware installation is required to support NPIV.

VMware ESX/ESXi 4.0 supports NPIV only on raw device mapping (RDM) devices. To configure NPIV, you must enable NPIV on the Fibre Channel-FCoE switch port. For information about enabling NPIV on the switch port, refer to the Fibre Channel-FCoE switch documentation. For information about NPIV, refer to the following documents:

- *Fibre Channel SAN Configuration Guide*
  http://www.vmware.com/pdf/vsphere4/r40/vsp_40_san_cfg.pdf
- *Configuring and Troubleshooting N-Port ID Virtualization* technical note (also applies to ESX 4.0)
  http://www.vmware.com/pdf/vi3_35_25_npiv_config.pdf

Requirements for Using NPIV

The following are required to implement NPIV:

- NPIV can only be used for virtual machines with RDM disks. Virtual machines with regular virtual disks use the WWNs of the host's physical adapters.
- The physical adapters on an ESX/ESXi host, using their own WWNs, must have access to all LUNs that are to be accessed by virtual machines running on that host.
- Only four WWN pairs are generated per virtual machine.
- The switches must support NPIV.
- The NPIV LUN number and NPIV target ID must match the physical LUN and Target ID when configuring an NPIV LUN for access at the storage level.
- Always use the vSphere client to manage virtual machines with WWNs.
- The virtual machine must be powered off to configure it for NPIV.

Assigning WWNs to Virtual Machines

You can assign a WWN to a new virtual machine with an RDM disk when you create the virtual machine, or to an existing virtual machine that has been powered off.

To create an NPIV-ready virtual machine:

1. Open the vSphere client, and then click **Inventory** in the navigation bar. Expand the inventory as needed.
2. Select the managed host to which you want to add a new virtual machine (Figure 5-37).

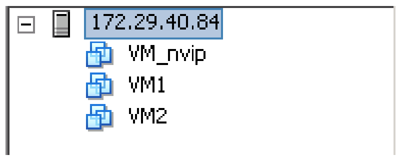


Figure 5-37. Selecting a Managed Host

3. From the **Getting Started** tab, select **Create a new virtual machine**.
4. In the Create New Virtual Machine window, click **Custom**, and then click **Next**.

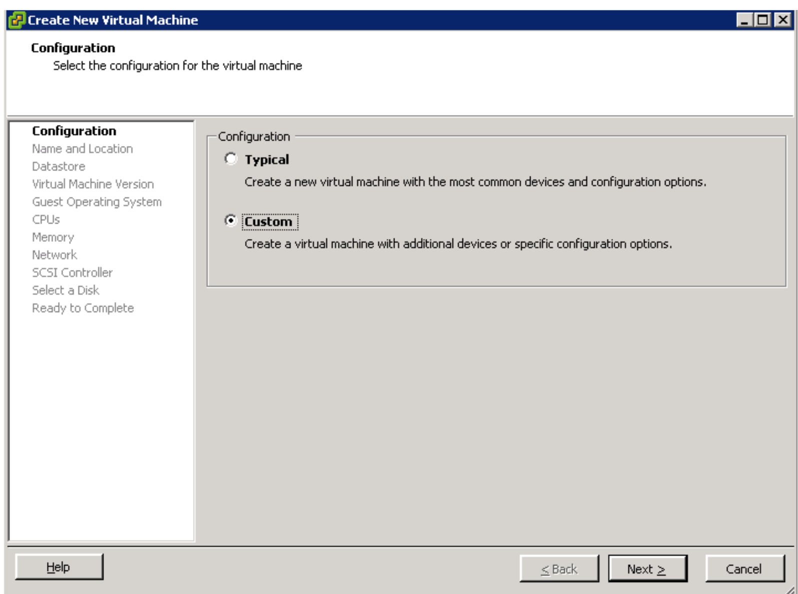


Figure 5-38. Create New Virtual Machine—Configuration

5. Proceed through the configuration procedure (Name and Location, Datastore, Virtual Machine Version, Guest Operating System, CPUs, Memory, Network, SCSI Controller) as you would for any non-NPIV virtual machine.
6. Select a disk. In this example, click **Raw Device Mappings**, and then click **Next** (Figure 5-39).

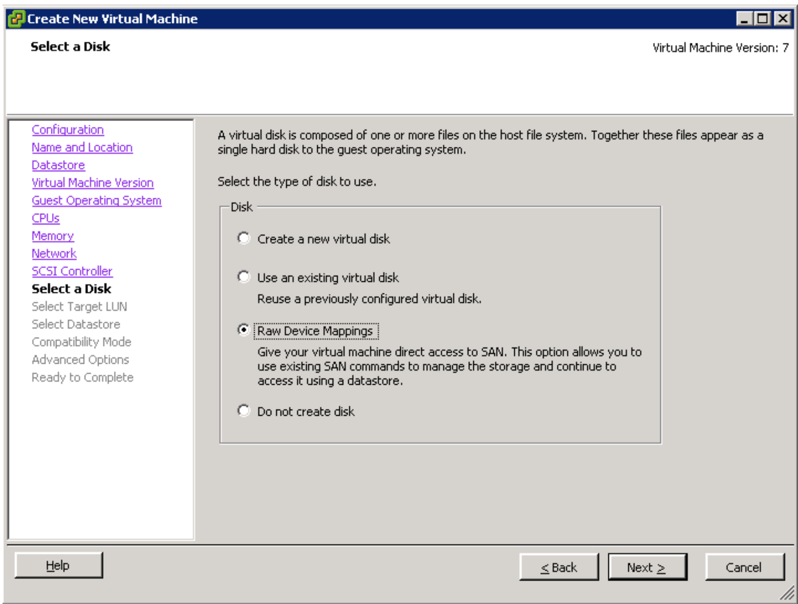


Figure 5-39. Create New Virtual Machine—Select a Disk

7. Select the LUN to attach to the VM, and then click **Next** (Figure 5-40).

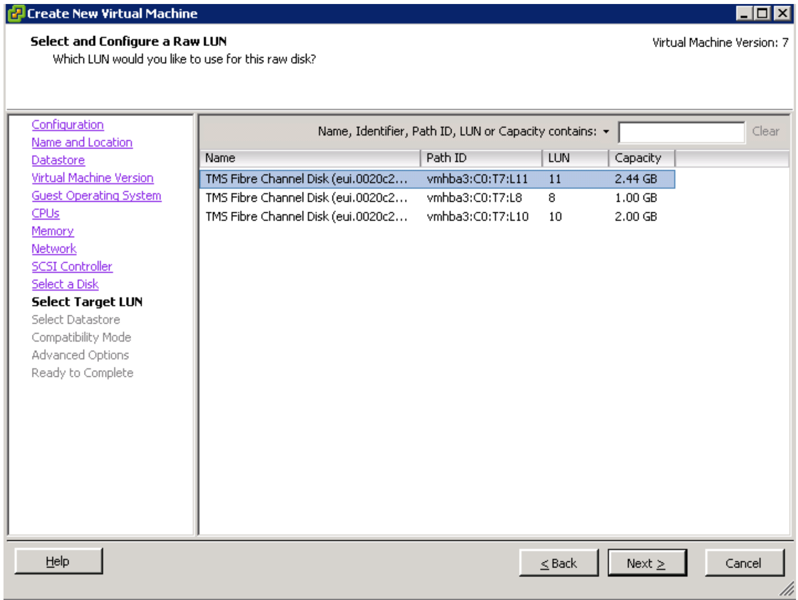


Figure 5-40. Create New Virtual Machine—Select Target LUN

8. Select the datastore on which to store the LUN mapping. In this example, click **Store with Virtual Machine**, and click **Next** (Figure 5-41).

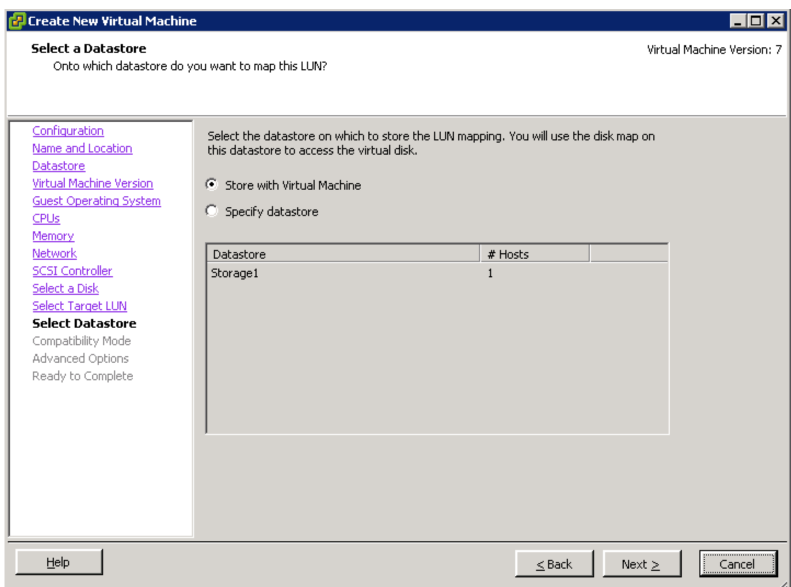


Figure 5-41. Create New Virtual Machine—Select Datastore

9. Select the compatibility mode. In this example, click **Virtual**, and then click **Next** (Figure 5-42).

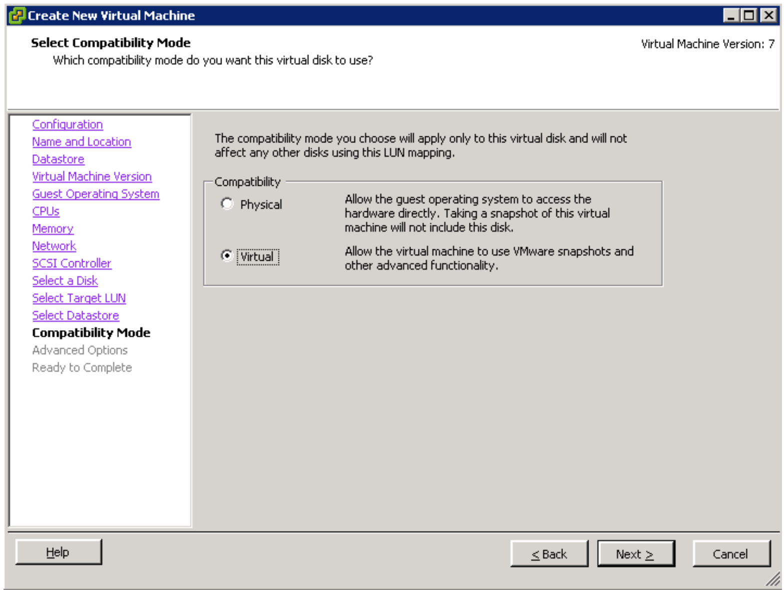


Figure 5-42. Create New Virtual Machine—Compatibility Mode

10. Select advanced options. In this example, accept the default, and then click **Next**.

11. Complete the creation process by clicking **Edit the virtual machine settings**, and then click **Continue** (Figure 5-43).

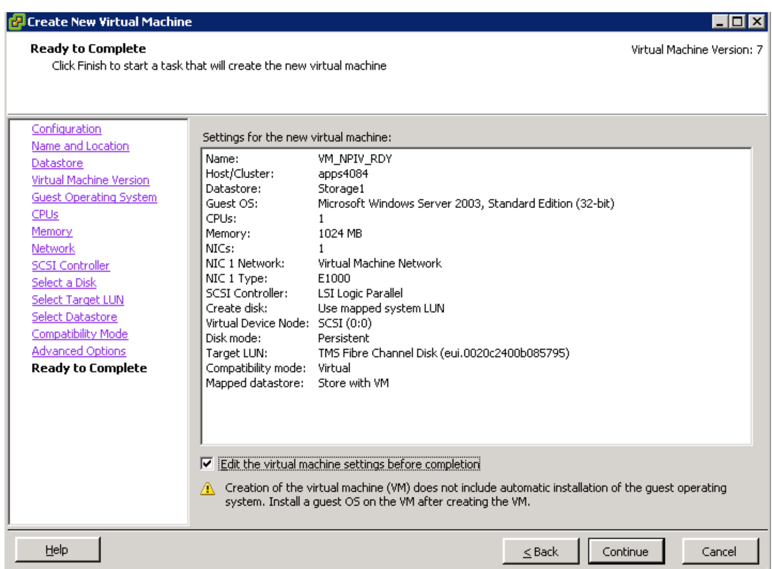


Figure 5-43. Create New Virtual Machine—Ready to Complete

12. Select the **Options** tab in the Virtual Machine Properties window.
13. Select **Fibre Channel NPIV** in the left pane, click Generate new WWNs, and then click **Finish** (Figure 5-44).

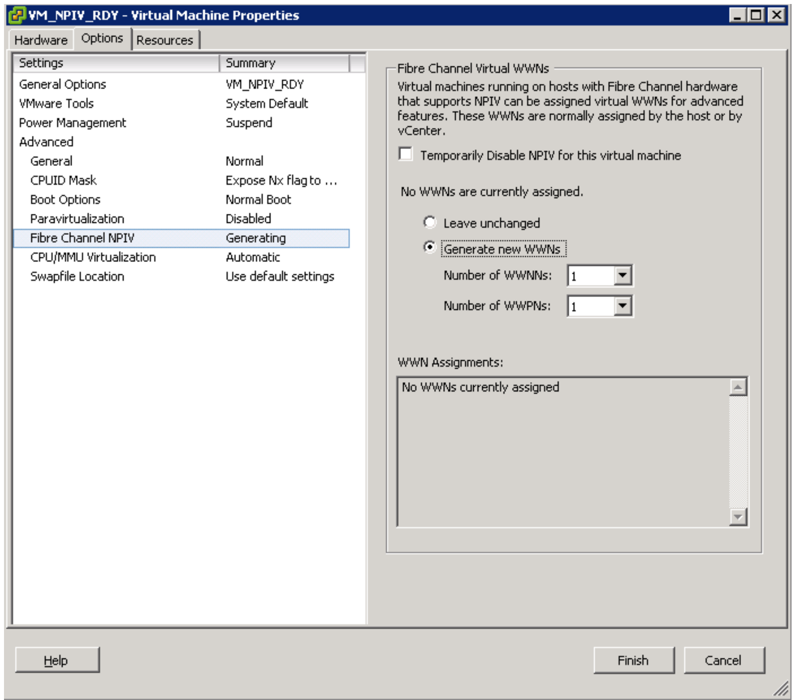


Figure 5-44. Virtual Machine Properties—Generate New WWNs

14. To confirm that the WWNs were generated for the port:
    a. Select the **Getting Started** tab, and then click **Edit virtual machine settings**.
    b. In the Virtual Machine Properties window, select the **Options** tab, and then select **Fibre Channel NPIV**.

c. Confirm the node WWN and port WWN in the WWN Assignment field of the Virtual Machines Properties window (Figure 5-45).

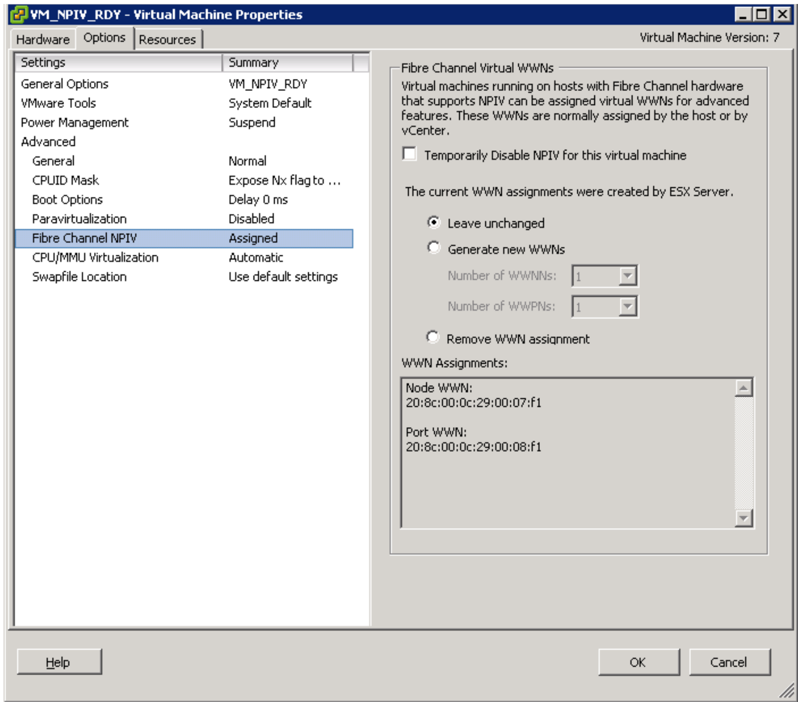


Figure 5-45. Confirm Node and Port WWNs

NOTE:

- Do NOT power on the virtual machine prior to configuring zoning and LUN masking.
- For information on zoning configuration, refer to the FCoE switch documentation.
- For information on LUN masking, refer to the storage array documentation.

---

6 Configuring NIC Functionality in the Converged Network Adapter

Overview

QLogic 8100 series Converged Network Adapter provides both NIC and FCoE server connectivity to hosts. This section describes the NIC parameters, management tools and configuration options for the QLogic 8100 Series Adapter for a Windows environment and a Linux environment.

Configuring the NIC in a Windows Environment

You can configure the QLogic 8100 Series Adapter NIC function with one of the following methods:

- Microsoft Windows property pages—Sets and displays the NIC parameters, updates QLogic drivers and enables or disables the NIC function. Property pages is available with all Microsoft Windows installations by default. However, the Windows Property page does not support advanced features, such as VLANs and teaming.
- QConvergeConsole CLI—In addition to providing FCoE configuration parameters, the QConvergeConsole CLI enables you to configures teaming, VLANs, and other NIC parameters.

Managing the NIC Function with Windows Property pages

The adapter NIC function driver can be configured through the adapter properties in Device Manager.

To access the Device Manager:

1. Click **Start**, right-click **My Computer**, and then click **Device Manager** to display a list of devices, as shown in Figure 6-1.

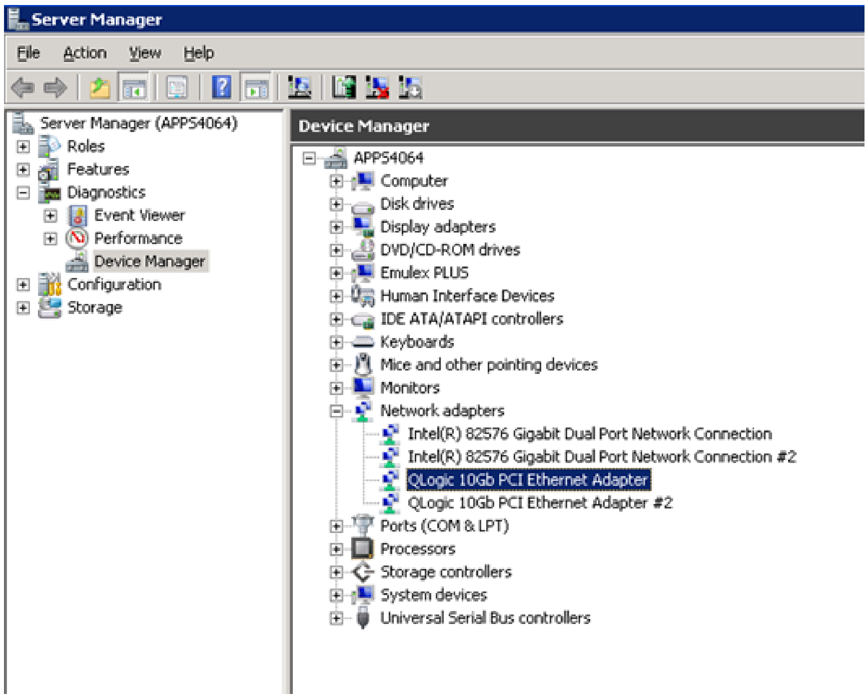


Figure 6-1. Accessing Device Manager

2. Under Network Adapters, right-click the QLogic 10Gb PCI Ethernet Adapter, and then select **Properties** to display the Properties dialog box (Figure 6-2). The properties window (Figure 6-2) has the following tabs:

   - The **General** tab provides the adapter device type, manufacturer, and the location of the adapter on the server PCI bus.
   - The **Advanced** tab queries and sets NIC driver parameters.
   - The **Driver** tab displays the current driver version and updates the driver.

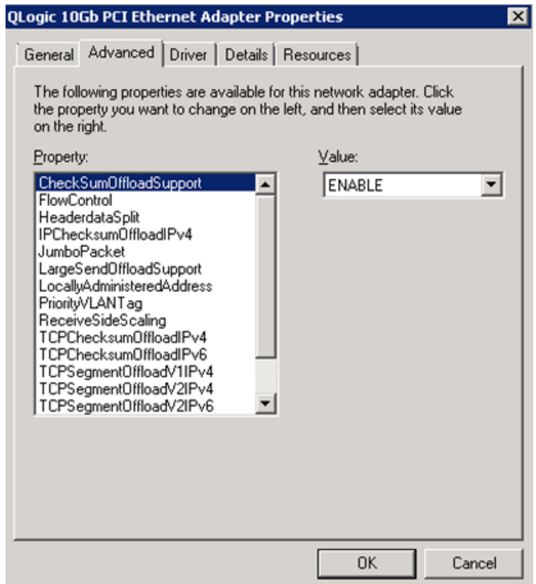


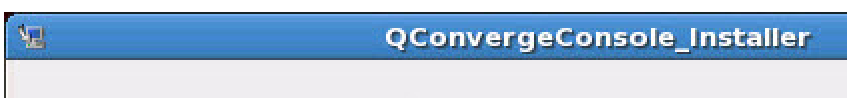
Figure 6-2. Adapters Properties Dialog Box

Managing the NIC Function with the QConvergeConsole CLI

The QConvergeConsole CLI configures the teaming and VLANs for the NIC function driver. The CLI also performs diagnostics, provides link status, and configures offload driver parameters. To access the QLogic QConvergeConsole CLI:

1. Download and install the QLogic the QConvergeConsole CLI from http://driverdownloads.qlogic.com/ by selecting the QLogic adapter model and target operating system.

2. Click the shortcut icon on the desktop to start the QConvergeConsole CLI



3. Navigate through the menu options in the main interactive menu (Figure 6-3) by typing the option number. The CLI detects QLogic adapters in the local server and displays a list of options, including support for advanced features such as VLANs and teaming. For detailed instructions about using the QConvergeConsole CLI, refer to the *QConvergeConsole CLI Users Guide*, which is available at http://driverdownloads.qlogic.com/.

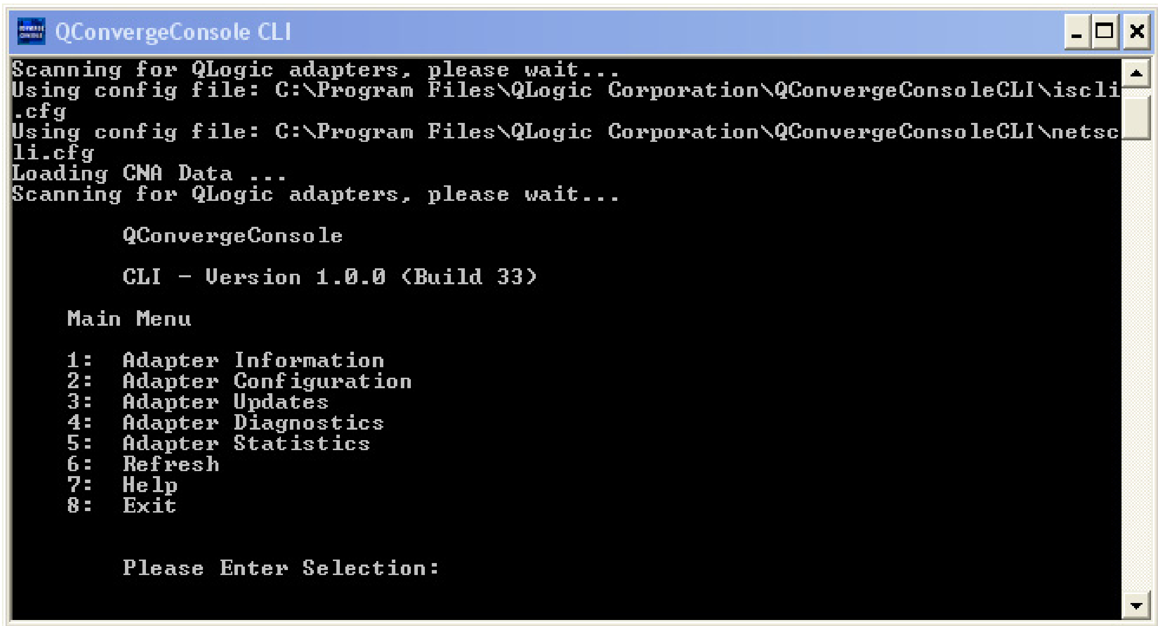


Figure 6-3. Main Interactive Menu

NIC Driver Parameters (Windows)

Table 6-1 lists the QLogic 8100 Series Adapter NIC function driver parameters for Windows, their default values, and allowed values.

Table 6-1. NIC Driver Parameters for Windows

Parameter Name	Function	Default Value	Range	Method to Configure
CheckSumOffloadSupport	Bucket to enable, disable all IP, TCP, UDP checksum offload driver capabilities	Enable	Disable Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
FlowControl	Enable or disable Flow Control. Flow Control enables adapters to generate or respond to flow control frames, which help regulate network traffic	Rx Enable Tx Enable	Disable Rx Enable Tx Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab
HeaderdataSplit	Enable or disable Header Data Split (HDS). HDS splits the header information from an incoming packet so that the CPU does not have to process the whole packet, thus reducing CPU use. Windows Server 2008 only.	Disable	Enable Disable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
IPChecksumOffloadIPv4	IPv4 Checksum Offload verifies the TCP/IP checksum on received packets (Rx) and computes the checksum on transmitted packets (Tx). Enabling this parameter can improve TCP/IP performance and reduce CPU use. With Offloading disabled, the operating system calculates and verifies the TCP/IP checksum.	Rx Enable Tx Enable	Disable Rx Enabled Tx Enabled Rx and Tx Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI

Table 6-1. NIC Driver Parameters for Windows (Continued)

Parameter Name	Function	Default Value	Range	Method to Configure
Jumbo Packet	Enables Jumbo Packet capability for TCP/IP packets. When large packets make up the majority of traffic, and additional latency can be tolerated, jumbo packets can reduce CPU use and improve wire efficiency. FCoE traffic uses 2554-byte Ethernet frames (baby jumbo) whether this parameter is enabled or not.	1514	9014,1514	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
LargeSendOffloadSupport	Enable or disable Large Send Offload support. Enabling offloads the task of segmenting TCP messages into valid Ethernet frames onto the adapter, thereby reducing CPU use. Windows Server 2008 only. Applies to IPv4 and IPv6.	Enable	Disable Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
LocallyAdministeredAddress	Locally Administered Address overrides the virtual, user-assigned adapter MAC address. This parameter does not override the adapter's physical MAC address.	Not present	12-digit hexadecimal MAC	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI

Table 6-1. NIC Driver Parameters for Windows (Continued)

Parameter Name	Function	Default Value	Range	Method to Configure
PriorityVLANTag	Enables the sending and receiving of IEEE 802.3ac tagged frames, which include: ■ 802.1p QoS (Quality of Service) tags for priority-tagged packets ■ 802.1Q tags for VLANs When this feature is enabled, tagged packets use the queue settings defined by the operating system's Priority Level Definition. PriorityVLANTag is automatically enabled when you set up a VLAN using SANsurfer Networking CLI. Tagging is required for VLANs and cannot be disabled.	Enable	Disable Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab
ReceiveSideScaling	Receive Side Scaling (RSS) processes a TCP connection across multiple processors or processor cores.	Enable	Disable Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
TCPChecksumOffloadIPv4	Computes (Tx) or verifies (Rx) the TCP checksum of packets in IPv4. This parameter can improve performance and reduce CPU use. With Offloading enabled, the adapter computes or verifies the checksum for the operating system.	Rx and Tx Enable	Disable Rx Enable Tx Enable Rx and Tx Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI

Table 6-1. NIC Driver Parameters for Windows (Continued)

Parameter Name	Function	Default Value	Range	Method to Configure
TCPChecksumOffloadIPv6	Computes (Tx) or verifies (Rx) the TCP checksum of packets in IPv6. This feature can improve performance and reduce CPU use. With Offloading enabled, the adapter computes or verifies the checksum for the operating system. Windows Server 2008 only.	Rx and Tx Enable	Disable Rx Enable Tx Enable Rx and Tx Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
TCPChecksumOffloadV1IPv4	Computes (Tx) or verifies (Rx) the TCP checksum of packets in IPv4.	Enable	Disable Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
TCPChecksumOffloadV2IPv4	Computes (Tx) or verifies (Rx) the TCP checksum of packets in IPv4 with enhanced v2 offload support.	Enable	Disable Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
TCPChecksumOffloadV2IPv6	Computes (Tx) or verifies (Rx) the TCP checksum of packets in IPv6 with enhanced v2 support. This parameter can improve performance and reduce CPU use. With Offloading enabled, the adapter computes or verifies the checksum for the operating system. Windows Server 2008 only.	Enable	Disable Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI

Table 6-1. NIC Driver Parameters for Windows (Continued)

Parameter Name	Function	Default Value	Range	Method to Configure
UDPChecksumOffloadIPv4	Computes (Tx) or verifies (Rx) the UDP checksum of packets for IPv4. This parameter can improve performance and reduce CPU use. With Offloading enabled, the adapter computes or verifies the checksum for the operating system.	Rx and Tx Enable	Disable Rx Enable Tx Enable Rx and Tx Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
UDPChecksumOffloadIPv6	Computes (Tx) or verifies (Rx) the UDP checksum of packets for IPv6. This parameter can improve performance and reduce CPU use. With Offloading enabled, the adapter computes or verifies the checksum for the operating system. Windows Server 2008 only.	Rx and Tx Enable	Disable Rx Enable Tx Enable Rx and Tx Enable	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab or QConvergeConsole CLI
VlanID	Sets a VLAN ID on the base adapter port so that all frames originating from the port are tagged to this VLAN ID	0	0–4095	Windows Property Pages for QLogic adapter, navigate to **Advanced** tab

Offload Support

The QLogic 8100 Series Adapter offloads the processing of several common protocols onto its hardware; this saves host CPU cycles, increases performance, and reduces CPU use. The QLogic 8100 Series Adapter supports the following offload types:

- Checksum offload—The QLogic adapter supports checksum offloads for IP, TCP (IPv4, IPv6), UDP (IPv4, IPv6) packets, and the IPv4 header. The ChecksumOffloadSupport parameter is enabled by default and can be disabled on the Windows Advanced property pages for the QLogic 10Gb PCI Ethernet adapter using Windows Device Manager. For information about the CheckSumOffload parameter, refer to Table 6-1 Do not turn off checksum offload unless you are debugging a checksum computation problem. TCP checksum offloading significantly reduced reduces host CPU use when using jumbo frames.

- Stateless offload—QLogic 8100 Series Adapters support large send offloading (LSO).LSO enables the Microsoft Windows TCP stack to send one large block of data to the QLogic adapter, which then segments this large block into multiple TCP packets. The LargeSendOffloadSupport parameter is enabled by default and can be disabled on the Windows Advanced property pages for the QLogic 10Gb PCI Ethernet adapter using Windows Device Manager. For information about the LargeSendOffloadSupport parameter, refer to Table 6-1.

Receive Side Scaling

QLogic 8100 Series Adapters supports receive side scaling (RSS) in Microsoft Windows environments for nonoffloaded IP/TCP traffic. When a packet arrives on a network interface, an interrupt is sent to the network driver. The network driver then executes a deferred procedure call (DPC), which runs on the same CPU as the interrupt. With RSS disabled, only one DPC can execute at a time. With RSS enabled, up to four parallel DPCs can run on four different processors or cores, which enables the simultaneous receive processing of incoming packets (Figure 6-4).

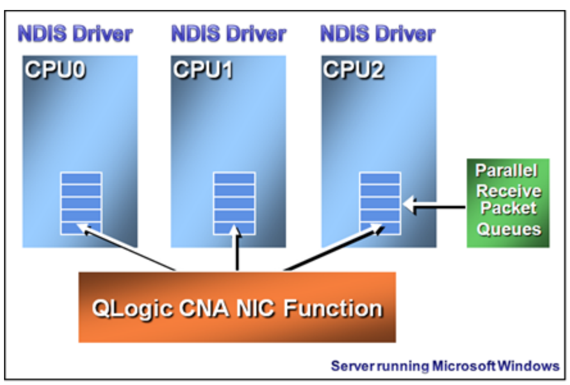


Figure 6-4. Receive Side Scaling Concepts

With RSS enabled, the NIC driver implements a hash function to distribute inbound packets across CPUs. In-order delivery is maintained by identifying the flow. RSS provides the following advantages:

- Parallel processing of inbound packets while maintaining in-order delivery
- Load balancing of network processing across CPUs in an symmetrical multiprocessing (SMP) system
- Cache locality

Network applications that have a large number of short-lived connections, such as Web servers and data base servers, typically benefit from RSS.

The RSS feature must be enabled on both the QLogic adapter and in the Microsoft Windows networking stack. By default, RSS is enabled on both the QLogic the CNA adapter (on a per port basis) and in the Microsoft Windows networking stack (globally).

Enabling RSS in the Microsoft Networking Stack The current state of RSS can be displayed and enabled using the following methods:

- Windows Server 2008—To display the RSS status as shown in Figure 6-5, issue the following Windows command as the administrator:

  `netsh int tcp show global`

Figure 6-5. Displaying RSS Status—Windows 2008

  To enable RSS as shown in Figure 6-6, issue the following command:

  `netsh int tcp set global rss = enabled`

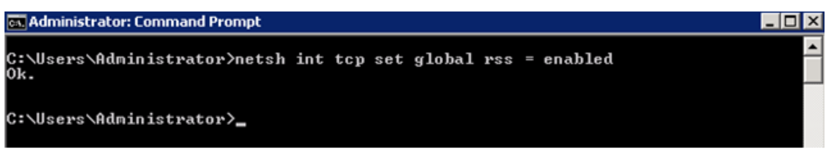


Figure 6-6. Enabling RSS—Windows 2008

- Windows Server 2003—To determine the current RSS status:

  1. Click **Start**, and then select Run.
  2. Type `regedit`, and then click **OK**.
  3. Locate and then click the following registry subkey:

     `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters`

4. Search for a DWORD named EnableRSS.
   - If none exists, RSS is enabled, and no action is required.
   - If a DWORD named EnableRSS exists, double-click **EnableRSS**, type `1`, and then click **OK** to enable RSS.
5. Restart the server on which the EnableRSS value has been modified.

Enabling RSS Using the Windows Advanced Property Pages To enable RSS using the Windows Advanced Property Pages (Figure 6-7):

1. Select **ReceiveSideScaling** under the Property Box in the **Advanced** Tab and set the value to **Enabled**.
2. Click **OK** to save the setting and enable RSS.

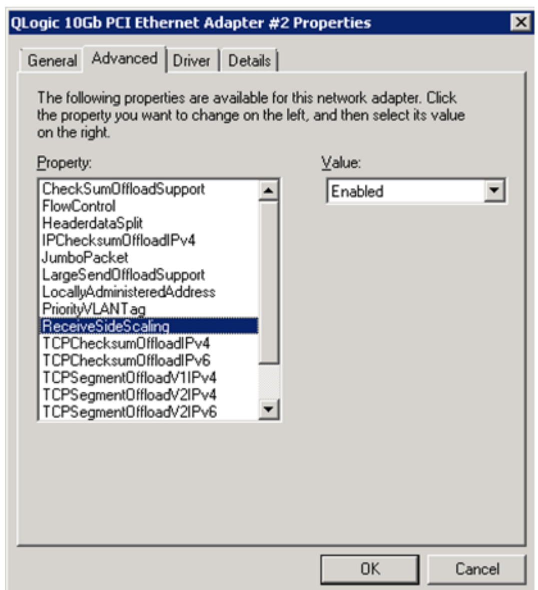


Figure 6-7. Enabling RSS—Windows Advanced Properties

Disabling RSS in the Microsoft Windows Networking Stack RSS can be disabled on the QLogic adapter on a per port basis by accessing the Windows property pages for the QLogic 10Gb PCI Ethernet adapter, or globally in Microsoft Windows.

- Windows Server 2008—To disable RSS using the Windows 2008 networking stack, enter the following Windows command as the administrator, as shown in Figure 6-8:

  ```
  netsh int tcp set global rss = disabled
  ```

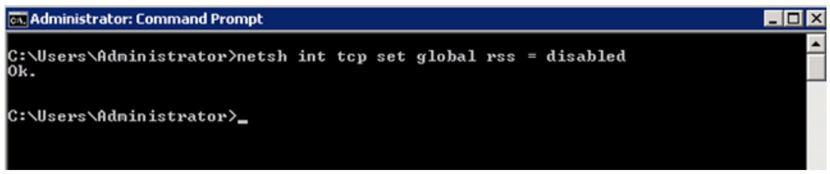


Figure 6-8. Disable RSS—Windows 2008

- Windows Server 2003—To disable RSS using the Windows 2003 networking stack:

  1. Click **Start**, and then click **Run**.
  2. Type `regedit`, and then click **OK**.
  3. Locate and then click the following registry subkey:

     `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters`

  4. On the **Edit** menu, point to **New**, click **DWORD Value**, and then type `EnableRSS`.
  5. Double-click **EnableRSS**, type `0`, and then click **OK**.
  6. Restart the computer on which you changed the EnableRSS value.

Disabling RSS per Port Using the Windows Advanced Property Pages To disable RSS per port using the Windows Advanced Property pages (Figure 6-9):

1. Select **ReceiveSideScaling** under the Property box in the **Advanced** tab and set the value to **Disabled**.
2. Click **OK** to save the setting and deactivate RSS.

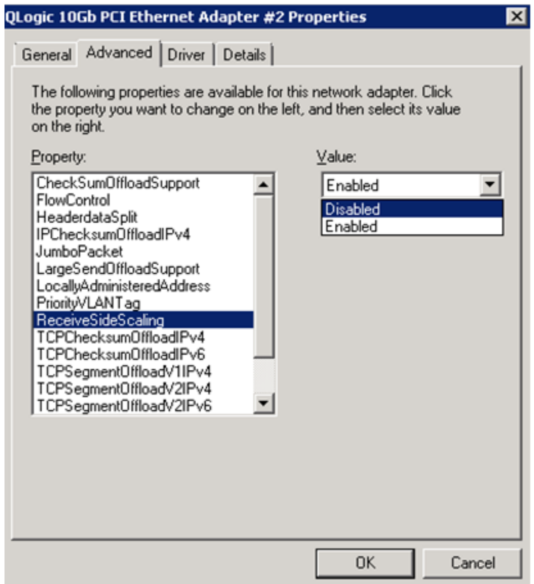


Figure 6-9. Disable RSS Per Port

For more information about Microsoft implementation of RSS and its limitations for Microsoft Windows operating system versions, refer to http://technet.microsoft.com/en-us/network/dd277646.aspx

Header Data Split (HDS)

Header data split (HDS) is a feature of the networking stack in Microsoft Windows Server 2008 and is fully supported by the QLogic 8100 Series Adapter NIC driver. HDS enables the adapter NDIS miniport driver to indicate to the network stack that incoming packets are split: the header portion of the packet and the data payload portion of the packet are mapped into two or more memory descriptor lists. The headers and the remainder of the payload are located in different areas in virtual memory, instead of in one contiguous virtual memory block. This split of the header and the data portions of the packets into multiple memory descriptor lists increases system performance, and reduces CPU use through intelligent cache management.

You should enable HDS in Microsoft Windows virtualized environments like Hyper-V.

HDS is disabled on QLogic 8100 Series Adapters by default and can be enabled using the Windows Advanced Property Pages for the QLogic 10Gb PCI Ethernet adapter port through the Windows Device Manager. To enable or disable HDS (Figure 6-10):

1. Select **HeaderDataSplit** under the Property box in the **Advanced** tab, and set the value to **Enabled** (or **Disabled**).
2. Click **OK** to save the setting and enable or disable HDS.

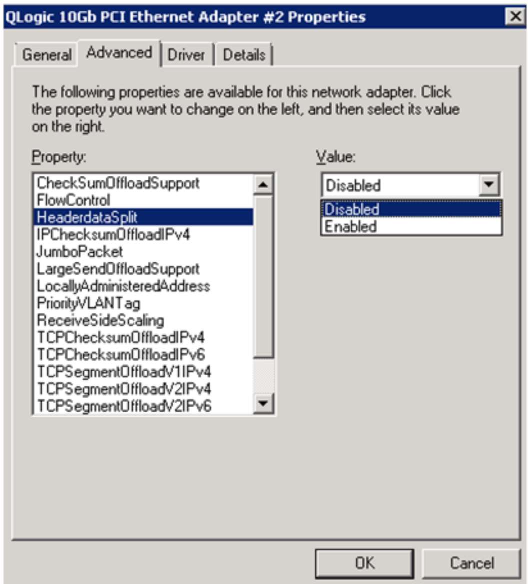


Figure 6-10. Enabling or Disabling HDS

NIC Teaming

Teaming combines two or more interfaces and provides advantages such as increased bandwidthand load balancing.

NIC teaming modes support failover between ports and multiple adapters for high availability server requirements. Link aggregation provides increased bandwidth via throughput aggregation between two ports. Load balancing allows distribution of traffic across ports.

QLogic 8100 Series Adapters support a maximum of 16 teams per server. The maximum number of teamed adapter ports per server is 256.

A protocol address, such as an IP address, is usually assigned to the physical adapter. However, when the QLogic NIC teaming driver and the QConvergeConsole CLI are used to create a team, the protocol address is assigned to the team adapter, and not to the physical adapters that make up the team. For Microsoft Windows environments, the command `ipconfig /all` displays the IP and MAC addresses of the logical/virtual adapter and not of the individual physical adapters

There are two types of NIC teaming: switch independent and switch dependent.

Switch Independent Teaming

Switch independent teaming is implemented entirely at the adapter level. The Ethernet switch that is connected to the adapter is unaware of the team, and no switch involvement is required for team operation. QLogic 8100 Series Adapters support switch-independent teams only by using a specialized QLogic NIC teaming driver and the QConvergeConsole CLI for Microsoft Windows environments.

Switch independent teaming functions in one of the following modes:

- Failover mode allows only one active team member at any time. When the active team member is not available, due to a link down or a hardware fault, the automatic failover mechanism selects another healthy team member to be the active member, and traffic continues uninterrupted.
- Load balanced mode has all the capabilities of failover mode, except all team members remain active and are able to distribute the transmit side of TCP/IP traffic between them.

Switch Dependent Teaming

Switch dependent teaming implements the adapter teaming function with the teaming capabilities of the switch. There are two switch dependent teaming modes:

- Static teaming (or generic trunking) mode is also known as IEEE 802.3ad Link Aggregation static mode and requires configuration at both ends of the link (server adapter port and switch). In this teaming mode, the adapter NIC teaming driver controls load balancing and failover for outgoing traffic only, while incoming traffic is controlled by the switch.
- Dynamic teaming mode using aggregation control protocol (LACP) is similar to static teaming, except IEEE 802.3ad LACP is used between the adapter port and the switch to negotiate with the adapter ports that make up the team. In this mode, LACP controls the addition and removal of physical links for the link aggregation, so that no frames are lost or duplicated in the process.

Creating and Configuring a Team

NOTE:

Creating, modifying, or dissolving network teams resets the network connection. Do not attempt teaming configuration and reconfiguration on production systems.

Two or more QLogic adapter ports must be available in a server to configure teaming; all members of the team must be QLogic adapter ports. To configure switch-independent teaming using the NIC function of the QLogic 8100 Series Adapter:

1. Download and install QConvergeConsole CLI. The installation package and instructions can be downloaded from http://driverdownloads.qlogic.com/.
2. Start QConvergeConsole CLI by clicking on its desktop icon.
3. Type 2 and press ENTER to select **Host Level Info and Operations** from the main Interactive Menu.
4. Type 2 and press ENTER in the Host Level Info and Operations Menu to select **Install/Update VLAN/Teaming Driver, All Adapters** (Figure 6-11).

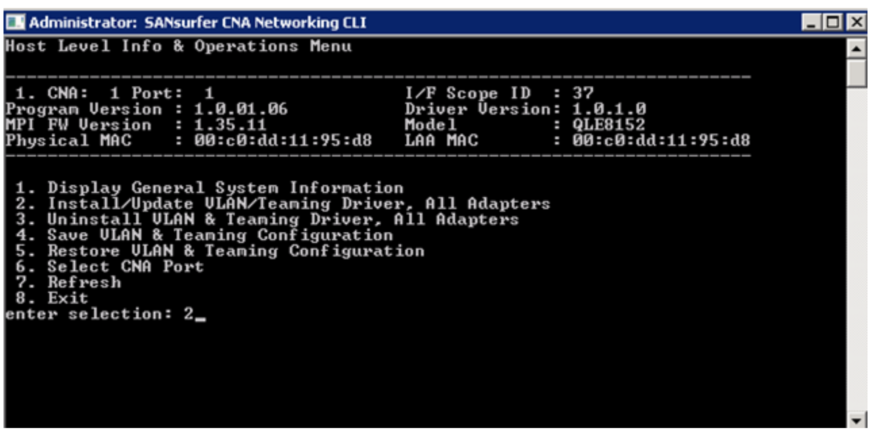


Figure 6-11. Host Level Info and Operations Menu

5. At the prompt, `Do you want to use external source for VLAN/Teaming driver?`, choose one of the following:
   - No—installs the VLAN/teaming driver bundled with QConvergeConsole CLI.
   - Yes—specifies the path to the zip file containing the QLogic VLAN/teaming driver.

6. The current VLAN/teaming driver version and the version to be installed are displayed. If this is correct, type **`Yes`** to proceed with the installation (Figure 6-12).

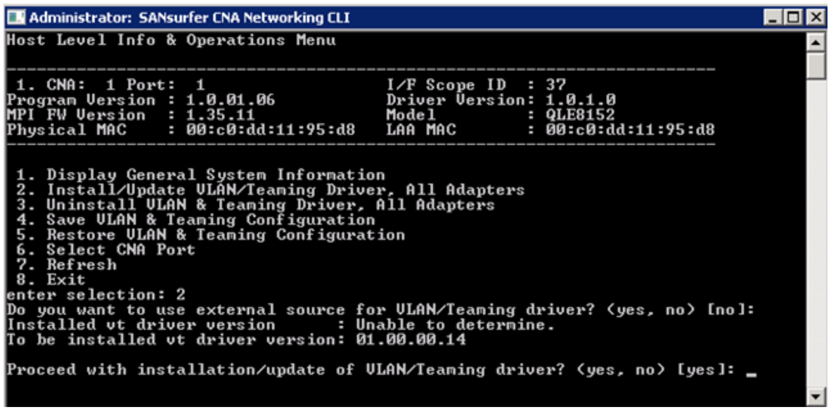


Figure 6-12. Confirm VLAN/Teaming Driver Installation

7. When the VLAN/teaming driver installation is complete, type **`8`** and press ENTER to return to the main interactive menu.
8. In the main interactive menu key, type **`3`**, and then press ENTER to select **Configure Teams Menu**.
9. In the Configure Teams menu, type **`3`**, and then press ENTER to select **Configure New Team** (Figure 6-13).
   a. At the prompt `Select Team Type`, type **`1`** to create a fail over team, or **`2`** to create a load balanced team, and then press ENTER.
   b. A list of available QLogic adapter ports is displayed from which to select ports to be members of the team.
   c. At the prompt, `Select two or more CNA Port Indices`, enter the comma-delimited string of numbers that correspond to the ports that are to be members of this team, or select **`All`** to include all listed QLogic adapter ports, and then press ENTER.
   d. When the team has been created, press ENTER to return to the Configure Teams Menu.

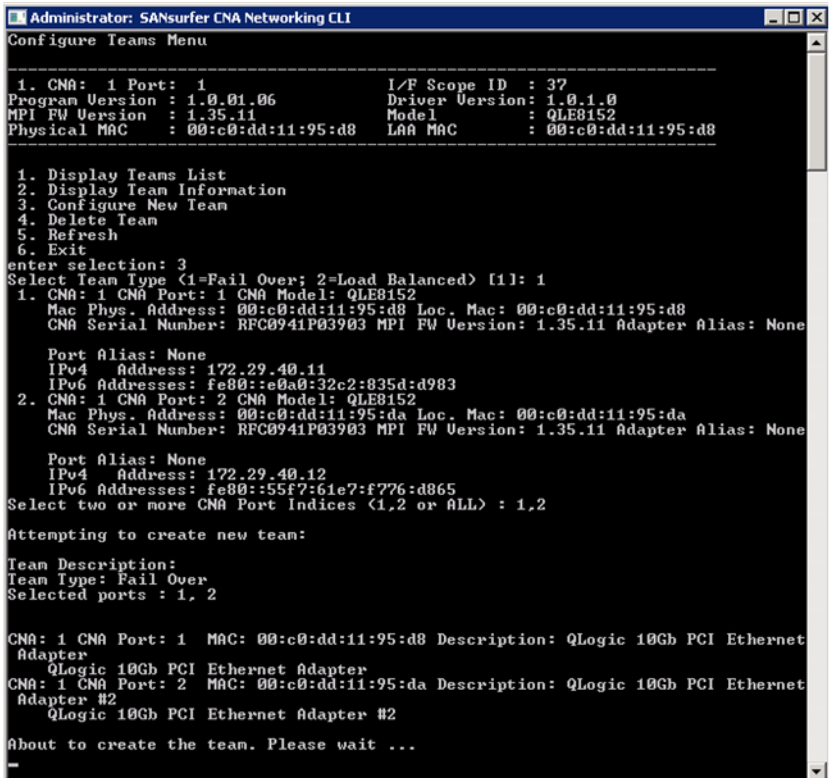


Figure 6-13. Creating a Team

NOTE:

Ports that have a VLAN ID assigned to them are not available to be team members. Remove VLAN IDs from a port to allow membership. For more information, refer to "VLAN Configuration" on page 6-52.

---

10. After successfully creating a team, a new logical interface appears in the Microsoft Windows Network Connections window as shown in Figure 6-14.

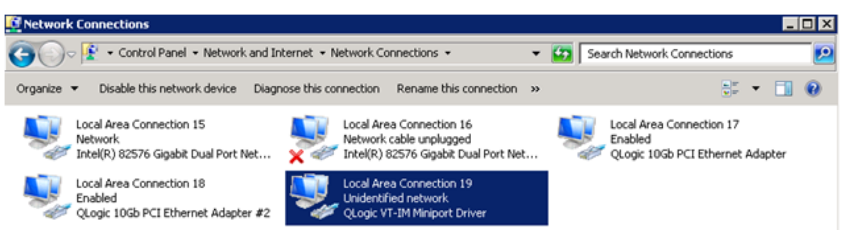


Figure 6-14. Logical Interface—QLogic VT-IM Miniport Driver

11. Configure of the team by assigning a dynamic or static IP address to the QLogic VT-IM Miniport Driver logical interface.

    The windows command, `ipconfig /all`, lists the newly created team but not the physical interfaces in the team. This is because only the logical team interface is visible to the operating system for all operations, while the QLogic teaming driver manages the physical interfaces.

Deleting a Team

NOTE:

Modifying or deleting a network team causes the network connection to be reset. Do not attempt to configure a team configuration on a production system.

To delete a team:

1. Start QConvergeConsole CLI by clicking its desktop icon.
2. In the main interactive menu, type **3**, and then press ENTER to select **Configure Team Menu**.
3. In the Configure Teams Menu, type **4**, and then press ENTER to select **Delete Team** to display a list of teams from which to choose.
4. Locate the team you want to delete in the list of configured teams. Type the corresponding number, and then press ENTER (Figure 6-15).

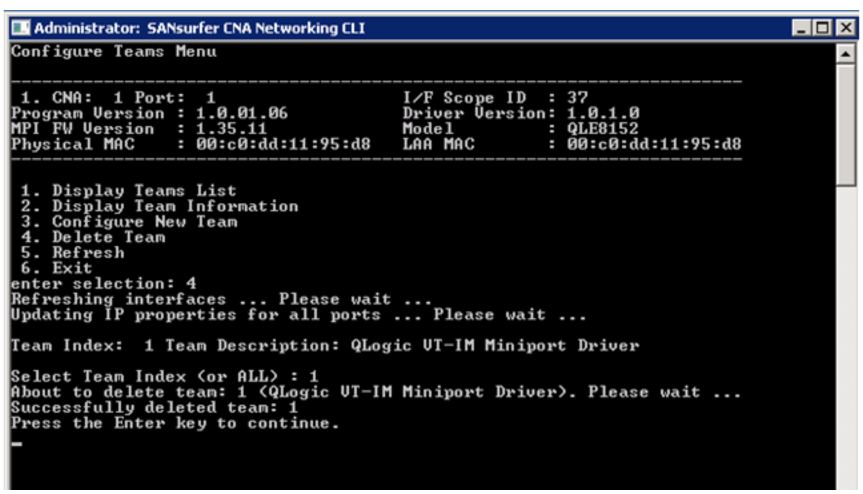


Figure 6-15. Deleting a Team

5. After the system acknowledges that the team has been deleted, press ENTER to return to the Configure Teams Menu.

After a team has been deleted, the corresponding QLogic VT-IM Miniport Driver logical interface is removed from the Microsoft Windows Network Connections window. Enter the Windows command, `ipconfig /all`, to list the physical network interfaces that comprised the team.

VLAN Tagging

VLAN is a logical grouping of network users and resources connected to a switch to segment a physical network. By default, all switches are part of a single broadcast domain in the layer-2 switched network. Creating a VLAN makes it is possible to break up a single broadcast domain into smaller domains within a switch by assigning different ports to different subnets. The benefits of using VLAN include broadcast control, security, flexibility, and scalability.

VLAN tagging assigns a VLAN ID to a NIC interface. The most commonly used protocol for VLAN tagging is the virtual LANs IEEE 802.1Q. Using this protocol, the QLogic 8100 adapter NIC function assigns a VLAN ID to each frame that it transmits. The connected switch understands that the tag and packets are switched only within the VLAN. Communication across VLANs requires a layer-3 router.

The QLogic 8100 Series Adapter supports a maximum of 64 VLANs per port and a maximum of 1,024 VLANs per server.

NOTE:

VLAN ID cannot be set for interfaces that are part of a team. The team VLAN ID is set at the team level.

Configuring VLAN Tagging Using the Adapter NIC Function

NOTE:

Creating, modifying, or dissolving network VLANs can cause loss of connectivity. Do not attempt to configure VLANs on production systems

VLAN tagging can be done for individual physical ports or for a team. You can also configure VLAN tagging using the QConvergeConsole CLI, which requires the QLogic VLAN/teaming driver.

To configure VLAN tagging using the adapter NIC function:

1. Download and install QConvergeConsole CLI. The install package and instructions are available at http://driverdownloads.qlogic.com/.
2. Start the QConvergeConsole CLI by clicking its desktop icon.
3. In the main Interactive Menu, type **2** and press ENTER to select **Host Level Info and Operations.**

4. In the Host Level Info & Operations menu, type **2** and press ENTER to select **Install/Update VLAN/Teaming Driver, All Adapters** (Figure 6-16).

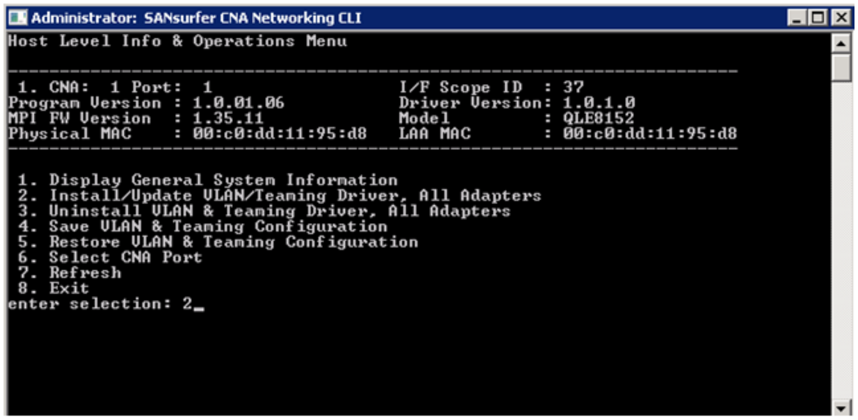


Figure 6-16. Host Level Info & Operations Menu

5. At the prompt, `Do you want to use external source for VLAN/Teaming driver?`, choose one of the following (Figure 6-17):

   - No—Installs the VLAN/teaming driver bundled with the QConvergeConsole CLI.
   - Yes—Specifies the path to the zip file containing the QLogic VLAN/teaming driver.

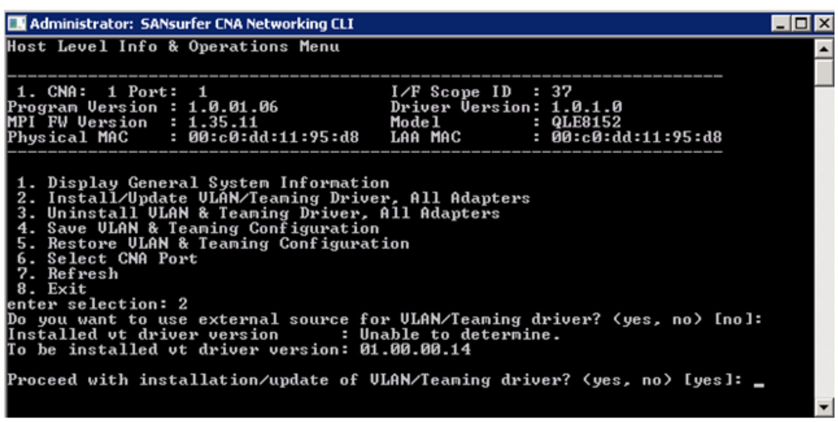


Figure 6-17. Installing VLAN Teaming Driver

6. The current VLAN/teaming driver version and the version to be installed are displayed. If this is correct, enter **`Yes`** to proceed with the installation.

7. When the QLogic VLAN/teaming driver installation is complete, type **8** and press ENTER to return to the main Interactive Menu.

8. In the main Interactive Menu, type **4** and press ENTER to select **Configure VLANs Menu**.

9. In the Configure VLANs menu, type **3**, and then press ENTER to select **Add VLAN to Port or Team** (Figure 6-18).

   a. Choose an entry from the list of available non-teamed physical ports and teams for which to assign a VLAN ID.

   b. At the prompt, `Select ListIndex from the list`, type the number that corresponds to the chosen port or team, and then press ENTER.

   c. At the prompt, `Enter VLAN ID (1..4095)`, type the VLAN ID. Refer to the documentation for the connecting switch to determine if there are reserved VLAN IDs that should not be used.

NOTE:

The VLAN ID set for a team or physical adapter interface must match the port-to-VLAN mapping on the connected switch; or the switch port must be configured to accept untagged frames.

---

   d. After the VLAN ID has been set, press ENTER to return to the Configure VLANs Menu.

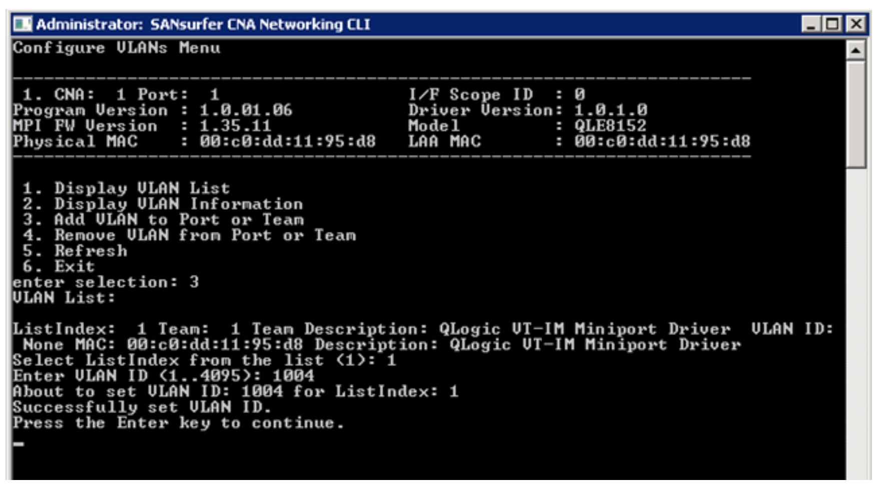


Figure 6-18. Adding a VLAN to a Team

10. To assign multiple VLAN IDs to a physical interface or a team, repeat Step 9.

11. After successfully creating a team, a new logical interface appears in the Microsoft Windows Network Connections window as shown in Figure 6-14.

12. After successfully assigning a VLAN ID to the team or interface, a new logical interface appears in the Microsoft Windows Network Connections window as shown in Figure 6-19, and the local area connection for the teaming logical interface would be disabled.

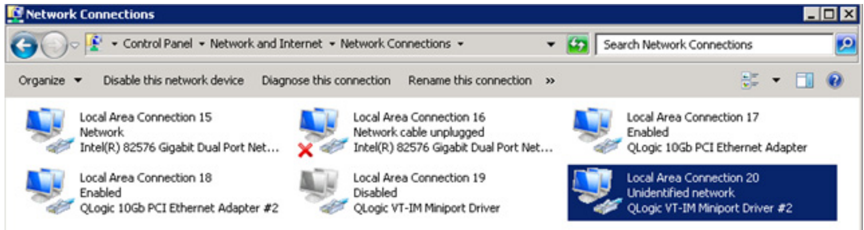


Figure 6-19. VLAN Local Area Connection Entry

13. Complete the configuration of the VLAN ID assignment by assigning a dynamic or static IP address to this enabled logical interface. The Windows command, `ipconfig /all`, lists the newly created logical interface but not the physical interfaces and the teaming logical interface. These interfaces are not listed because the logical team interface is visible to the operating system for all operations, while the QLogic VLAN/teaming driver manages the physical interfaces and teaming.

Removing VLAN ID Assignment

NOTE:

Creating, modifying, or dissolving network VLANs can cause loss of connectivity. Do not attempt to configure VLANs on production systems.

To remove VLAN ID assignments from a physical interface or team:

1. Start QConvergeConsole CLI by clicking its desktop icon.
2. In the Main Interactive Menu, type **`4`**,and then press ENTER to select **Configure VLANs Menu**.
3. In the Configure VLANs menu, type **`4`**,and then press ENTER to select **Remove VLAN from Port or Team** (Figure 6-20).
   a. Choose an entry from the list of physical interfaces and teams from which to remove a VLAN ID assignment.
   b. At the prompt, `Select ListIndex from the list`, type the number that corresponds to the chosen physical interface or team, and then press ENTER.
   c. At the prompt, `Enter VLAN ID (1..4095)`, type the VLAN ID to be removed from the physical interface or team, or type `All` and press ENTER to remove all VLAN ID assignments.

d. After successfully removing the VLAN ID assignment, press ENTER to return to the previous menu.

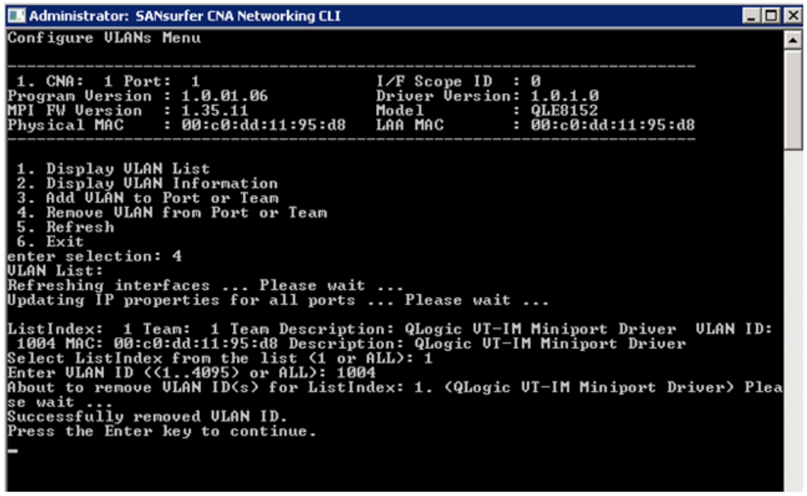


Figure 6-20. Removing VLAN ID Assignments

After a VLAN ID assignment has been removed, the corresponding QLogic VT-IM Miniport Driver logical interface is removed from the Microsoft Windows Network Connections window, and the local area connection for the teaming logical interface will be enabled again.

PXE Boot

PXE boot code is a part of the QLogic 8100 Series Adapter multi-boot image that allows a networked server to boot with the images provided by remote servers.

Prerequisites for PXE Boot

PXE boot requires the following:

- A client server with a PXE-compliant BIOS or UEFI implementation and a QLogic 8100 Series Adapter installed. This server will boot through PXE with Microsoft Windows.
- A DHCP or proxy DHCP server that can provide an IP address and boot server list to the client server.
- A PXE boot server to deliver the PXE execution environment and the operating system images to the client server. It is possible to configure a single physical server as both a DHCP and a boot server.

The following tasks must be completed in sequence to enable a networked server to boot with the images provided by remote servers across the network using PXE boot.

1. Setup PXE boot and DHCP server. To setup a Microsoft Windows server as a DHCP and a OXE boot server, the following Windows services must be configured:
   - DHCP services
   - Remote installation services (RIS)
   - Windows deployment server (WDS)

   For detailed instructions about setting up a PXE boot server and a DHCP server, refer to the Microsoft documentation at http://technet.microsoft.com/.

   The current versions of Microsoft Windows do not include the QLogic 8100 Series Adapter drivers.

2. A successful PXE boot requires that the Microsoft Windows image that resides on the PXE boot server contains the latest QLogic 8100 Series Adapter drivers.
   - If you are installing Microsoft Windows using PXE boot on the client server local hard drive, the PXE boot server operating system image must contain the QLogic adapter NIC driver.
   - If you are installing the PXE boot server operating system image onto the SAN device, operating system image must contain both the QLogic adapter NIC driver and FCoE driver.

   For information about adding QLogic drivers to an operating system image for RIS installations, refer to Microsoft article ID Q246184—*How to Add Third-Party OEM Network Adapters to RIS Installations*.

3. Set up client servers BIOS boot order. Select 8100 Series NIC as the first boot device in the Boot order/Boot Device priority (Figure 6-21). The two `QLogic UNDI v1.11 PXE-2` entries are dual-port QLogic 8100 Series Adapters.

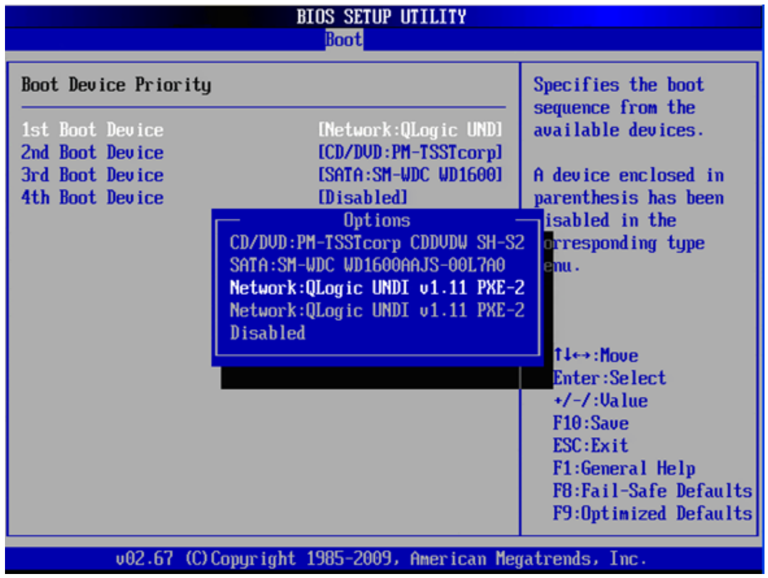


Figure 6-21. Boot Order in BIOS

4. Reboot the client system to boot over the network from the PXE boot server.

PXE Protocol Operation

The PXE protocol, illustrated in Figure 6-22, operates as follows:

1. The client initiates the protocol by broadcasting a DHCPDISCOVER containing an extension that identifies the request as one coming from a client that implements the PXE protocol.
2. Assuming that a DHCP server or a proxy DHCP server is available that is capable of implementing this extended protocol, after several intermediate steps, the server sends a list of appropriate boot servers to the client.
3. The client then discovers a boot server of the selected type and receives the name of an executable file on the chosen boot server.
4. The client uses TFTP to download the executable from the boot server.
5. Finally, the client executes the downloaded image. At this point, the client's state must meet certain requirements to provide a predictable environment for the image. These requirements include the availability of certain areas of the client's main memory and the availability of basic network I/O services.

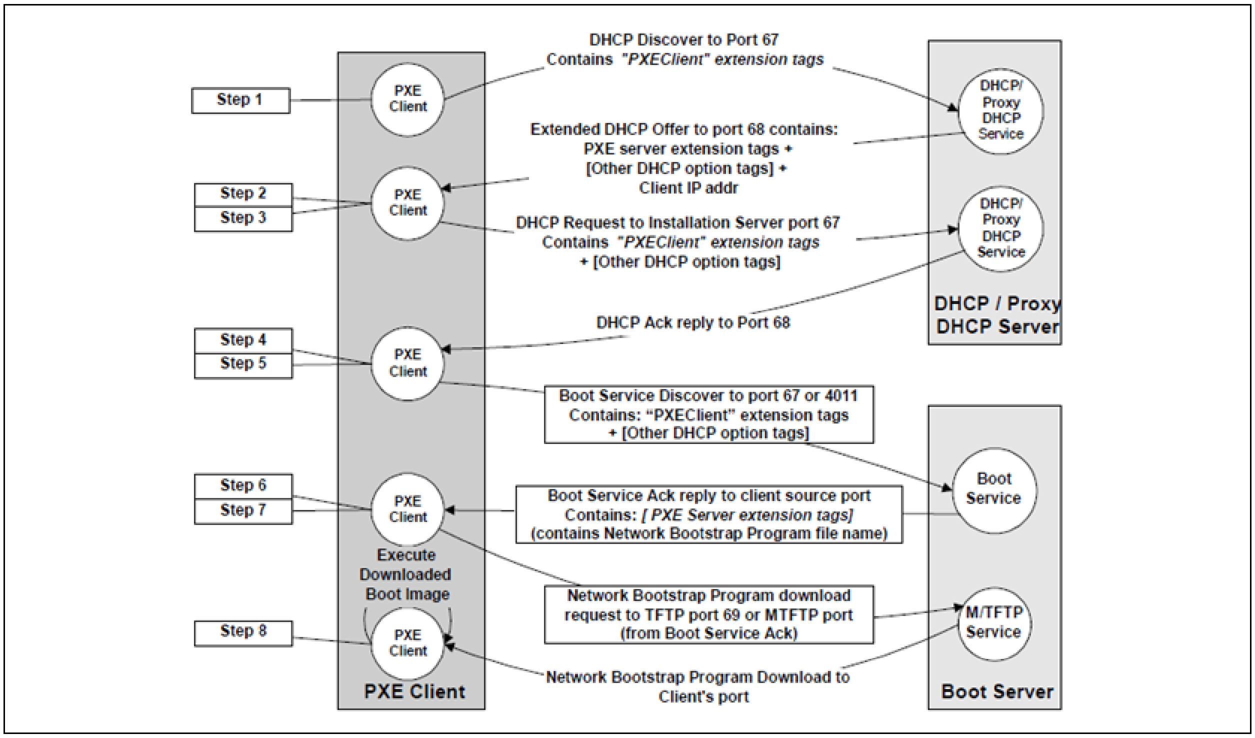


Figure 6-22. PXE Operation

1. As the server boots up, the QLogic adapter PXE boot code starts from the adapter Flash memory. This boot code is part of the multi-boot image that is resident on the QLogic adapter.
2. The PXE boot code broadcasts a `DHCPDISCOVER` message.
3. In the boot server or a separate entity, the DHCP server then responds by sending a `DHCPOFFER` message with an IP address for use by the QLogic adapter during the PXE boot process. The `DHCP OFFER` message also contains the boot-server list.
4. PXE boot code acknowledges the `DHCPOFFER` message and waits for an acknowledgement from the DHCP server.
5. The PXE boot code selects a boot server and proceeds to imitate the boot server with its IP address and system architecture details.
6. The boot server responds to the PXE boot code with the boot file name (an executable file corresponding to the server architecture) and trivial file transfer protocol (TFTP) configuration settings required by the PXE boot code to download the executable boot file.
7. The PXE boot code downloads the executable boot file using TFTP and executes the boot file.

Configuring the NIC in a Linux Environment

Configuring the QLogic 8100 Series Adapter NIC function in RHEL 5 environments can be accomplished using the following built-in utilities and functions:

- ethtool—An interface that displays and configures QLogic 8100 Series Adapter NIC function parameters. Use ethtool to configure offload settings and view network interface statistics. Configuration changes that you make with ethtool are lost if the server reboots. To make persistent configuration changes, edit the file `/etc/sysconfig/network-scripts/ifcfg-ethX`.
- ifconfig—A utility that configures a adapter network interface with certain parameters such as IP address, subnet mask, or jumbo frames. Ifconfig also displays currently active network interfaces. Any configuration changes you make with ifconfig are lost if the server reboots. To make persistent configuration changes, edit the file `/etc/sysconfig/network-scripts/ifcfg-ethX`.
- modprobe—A utility that loads and unloads a kernel module, such as the QLogic NIC driver (qlge). modprobe also changes the values of various driver parameters for the qlge driver. Any configuration changes that you make with modprobe are lost if the server reboots. To make persistent configuration changes, edit the file `/etc/modprobe.conf` and create a new RAMDISK image.
- ifenslave—A user-level control program that manages bonding interfaces.
- vconfig—A user level utility that creates VLAN interfaces.

The following sections describe the use of these utilities and functions.

NIC Driver Parameters (Linux)

Table 6-2 lists the QLogic 8100 Series Adapter networking (NIC) driver parameters, their default values, and allowed values. It also recommends the utility to be used to modify these parameters.

Table 6-2. NIC Driver Parameters for Linux

Parameter Name	Description	Default Value	Allowed Values	Configuration Method
rx-checksumming (rx)	Enables or disables hardware receive TCP/UDP checksum validation	On	Off, On	ethtool

Table 6-2. NIC Driver Parameters for Linux (Continued)

Parameter Name	Description	Default Value	Allowed Values	Configuration Method
tx-checksumming (tx)	Enables or disables hardware transmit TCP/UDP checksum	On	Off, On	ethtool
scatter-gather (sg)	Enables or disables scatter-gather and 64-bit DMA on x86	On	Off, On	ethtool
tcp segmentation offload (tso)	Enables or disables TCP segmentation offload	On	Off, On	ethtool
udp fragmentation offload (ufo)	Enables or disables UDP fragmentation offload	Off	On, Off	ethtool
generic segmentation offload (gso)	Enables or disables generic segmenta-tion offload	Off	On, off	ethtool
generic-receive-offload (gro)	Enables or disables generic receive offload	Off	On, off	ethtool
qlge_irq_type	Type of interrupt for the network device to use	0	0 = MSI-X 1 = MSI 2 = Legacy Interrupts	Modprobe
qlge_mpi_coredump	Enables or disables allocation of memory for an MPI firmware dump	1	0 (disables) 1 (enables)	Modprobe
qlge_spool_coredump	Enables or disables spooling of firmware dump to log.	0	1 (enables) 0 (disables)	Modprobe
debug	Debug level (0=none,...,16=all) (int)	0	0–16	Sysfs (/sys/class/net/eth0)

Table 6-2. NIC Driver Parameters for Linux (Continued)

Parameter Name	Description	Default Value	Allowed Values	Configuration Method
mtu	Jumbo Packet enables jumbo packet capability for TCP/IP packets. In situations where large packets make up the majority of traffic, and additional latency can be tolerated, Jumbo packets can reduce CPU use and improve wire efficiency. FCoE traffic uses an Ethernet frame size of 2554 bytes (baby jumbo).	1500	9000	Sysfs, ifconfig

Modifying NIC Driver Parameters (Linux)

The driver parameters described in Table 6-2 can be modified using various methods. Some of these parameters require a server reboot or a reload of the QLogic NIC driver (qlge). This section describes how to modify the QLogic 8100 Series Adapter NIC function parameters.

NOTE:

Not all parameters can be modified using the same utility or function. Refer to Table 6-2 for information about available configuration methods for each parameter.

Using modprobe

Available by default in RHEL 5, modprobe is a Linux utility that intelligently adds or removes a module from the Linux kernel. The QLogic drivers for the 8100 Series Adapter are compiled and used as a module. Any driver parameter that is modified using this method requires that the QLogic driver be reloaded (for nonpersistent changes) or rebooted (for persistent changes). Therefore, this method disrupts I/O operations on the host.

NOTE:

- Reloading the QLogic NIC driver (qlge) does not interrupt the QLogic adapter FCoE function (qla2xxx). Neither does reloading the QLogic FCoE driver interrupt the NIC function.
- For nonpersistent changes, use modprobe only if the driver parameter cannot be changed using any other method

Making Nonpersistent Changes to the QLogic NIC Driver Parameters To make changes that are not persistent across reboots, use the modprobe command to specify the driver parameters and their values. For example:

1. Unload the QLogic FCoE driver module:

```
# modprobe -r qlge
```

2. Load the QLogic NIC driver module specifying the driver parameters to be changed. One or more parameters can be specified separated by a space. For example, the following command enables MSI interrupts and specifies that memory not be allocated for the MPI firmware dump:

```
# modprobe -v qlge qlge_irq_type =1 qlge_mpi_coredump=0
```

3. Verify that the values for these parameters have changed. For example:

```
# cat /etc/bus/pci/drivers/qlge/module/parameters/
qlge/qlge_irq_type
# cat /etc/bus/pci/drivers/qlge/module/parameters/
qlge/mpi_coredump
```

Making Persistent Changes to the QLogic NIC Driver To make changes that are persistent across reboots, edit the file `/etc/modprobe.conf`, add the QLogic NIC driver parameters with their values, build a new RAMDISK image and reboot. For example:

1. Open the file `/etc/modprobe.conf` in read/write mode using a Linux editor.

```
#vi /etc/modprobe.conf
```

2. Add the options line for the appropriate driver setting (Figure 6-23), save the file, and then exit the editor.

```
options qlge qlge_irq_type =1 qlge_mpi_coredump=0
```

Figure 6-23. Example modprobe.conf

3. Create a new RAMDISK (initrd image):
   a. Change directory to the location containing the RAMDISK images. For example:

      `# `**`cd /boot`**

   b. Create a backup copy of the RAMDISK (initrd) image. For example:

      `# `**`cp initrd-[kernel version].img initrd-[kernel version].img.bak`**

   c. Generate a new RAMDISK image containing the updated QLogic FCoE driver:

      `# `**`mkinitrd -f initrd-[kernel version].img `uname -r``**

      NOTE:

      Depending on the server hardware, the RAMDISK file name may be different. The command is successful if there is no output.

      ---

   d. Reboot the server for the new RAMDISK image to take effect:

      `# `**`shutdown -r now`**

4. After a successful reboot, verify that the values for these parameters, has changed. For example:

```
# cat /etc/bus/pci/drivers/qlge/module/parameters/qlge/qlge_irq_type
# cat /etc/bus/pci/drivers/qlge/module/parameters/qlge/mpi_coredump
```

Using sysfs

The `sysfs` virtual file system, provided by Linux 2.6 kernels, is available in RHEL 5. It exports information about supported devices and drivers from the kernel device model into user space and configures devices and drivers.

NOTE:

Driver parameter changes that you make with `sysfs` are effective immediately, and do not interrupt I/O operations on the adapter.

CAUTION!

Driver parameter changes that you make with `sysfs` are not persistent across reboots or driver reloads.

For the QLogic NIC driver, the following table summarizes the `sysfs` locations and the parameters can be modified by accessing these locations.

Table 6-3. Sysfs Locations and Parameters

Sysfs Location	Modifiable Driver Parameters
/sys/module/qlge/parameters	qlge_irq_type qlge_mpi_coredump qlge_spool_coredump
/sys/class/net/ethX/	mtu flags weight

For example:

1. Change directory into the `sysfs` location where the driver parameter to be modified is represented as a sysfs special file/entry. For example:

   ```
   # cd /sys/module/qlge/parameters
   ```

2. Modify the `sysfs` entry for the corresponding driver parameter. The following command forces the qlge driver to use MSI interrupts. For example:

   ```
   # echo 1 > qlge_irq_type
   ```

3. Verify that the values for the parameter have changed. The output of the following command should be 1 if the command in Step 2 was successful. For example:

   ```
   # cat /sys/module/qlge/parameters/ql2xmaxqdepth
   ```

   or

```
cat /etc/bus/pci/drivers/qlge/module/parameters/qlge/qlge_irq_type
```

Using ethtool

To make temporary changes to the network configuration of a Ethernet device, use ethtool. To make persistent changes, edit the appropriate `/etc/sysconfig/networking-scripts/ifcfg-ethX` file, and then add ETHTOOL options. The following sections describe how to make both persistent and nonpersistent changes.

Making NonPersistent Changes Using ethtool To make changes that are not across reboots, use the ethtool command to specify the driver parameters and their values.

For example:

1. To disable rx-checksumming for network interface eth0, enter the command:

   ```
   # ethtool -K eth0 rx off
   ```

2. To verify that rx0checksummung has been disabled for eth0, enter the following command:

   ```
   # ethtool -k eth0
   ```

   The command output shows that rx-checksumming has been set to off (Figure 6-24).

```
[root@apps4065 eth0]# ethtool -k eth0
Offload parameters for eth0:
Cannot get device udp large send offload settings: Operation not supported
rx-checksumming: off
tx-checksumming: on
scatter-gather: on
tcp segmentation offload: on
udp fragmentation offload: off
generic segmentation offload: off
generic-receive-offload: off
[root@apps4065 eth0]#
```

Figure 6-24. ethtool -k eth0 Command Example

Making Persistent Changes Using ethtool To make changes that are persistent across reboots, choose one of the following:

- Edit the file `/etc/sysconfig/networking-scripts/ifcfg-ethX`, add required ETHTOOL_OPTS, and then restart the network interface. Note that ETHTOOL_OPTS is limited to specifying only those parameters that are configured with the -s flag.

    1. Open the file `/etc/sysconfig/network-scripts/ifcfg-ethX` with an editor in read/write mode. For example:

    ```
    # vi /etc/sysconfig/network-scripts/ifcfg-eth0
    ```

    2. Append the following text to the file:

    ```
    ETHTOOL_OPTS=<any of the ethtool -s parameters>
    ```

    3. Save the file `/etc/sysconfig/network-scripts/ifcfg-eth0`.
    4. Stop the interface eth0. For example:

    ```
    # /etc/sysconfig/network-scripts/ifdown eth0
    ```

    5. Bring up the interface eth0. For example:

    ```
    # /etc/sysconfig/network-scripts/ifup eth0
    ```

- Add a udev rule for ethtool to modify other parameters like offload settings.

    1. Create or open the file `/etc/udev/rules.d/50-ethtool.rules` in read/write mode using an editor. For example:

    ```
    # vi /etc/udev/rules.d/50-ethtool.rules
    ```

    2. Append the following text to the file. For example:

    ```
    ACTION=="add", SUBSYSTEM=="net", NAME=="eth0",
    RUN+="/sbin/ethtool <any ethtool command line parameter"
    ```

    Figure 6-25 shows an example of udev rules usage. For more details on udev rules, refer to the manual page for udev using the `man udev` command.

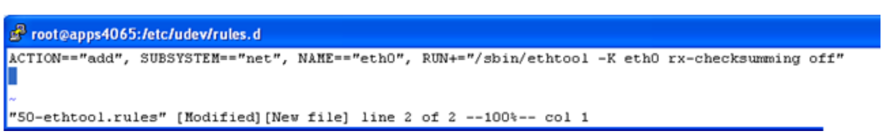


Figure 6-25. udev Rule Example

    3. Save the udev rules file and reboot the server.

Using ifconfig

Use the Linux network interface configuration command `ifconfig` to modify the driver parameters that are listed in Table 6-2 that can be modified with ifconfig.

For example:

1. Set the MTU of network interface eth0 to Jumbo

    `# **ifconfig eth0 mtu 9000**`

2. Verify that the MTU has been changed.

    `# **ifconfig eth0**`

    Figure 6-26 shows the new MTU value

```
[root@apps4065 rules.d]# ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 00:C0:DD:11:95:98
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:9000  Metric:1
          RX packets:31 errors:0 dropped:0 overruns:0 frame:0
          TX packets:161 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1024
          RX bytes:1426 (1.3 KiB)  TX bytes:38381 (37.4 KiB)
          Interrupt:51
```

Figure 6-26. Verify the MTU Value

Identifying the QLogic 8100 Adapter Network ID

To identify the adapter network ID:

1. Identify the QLogic 8100 Series Adapter NIC function as a PCI device. Figure 6-27 shows 85:00.0 and 85:00.1 to be the PCI bus device IDs for the NIC function ports of a dual-port adapter. For example:

    `# **lspci | grep "QLogic Corp"**`

```
root@apps4065:/sys/bus/pci/drivers/qla2xxx
[root@apps4065 qla2xxx]# lspci | grep QLogic
85:00.0 Ethernet controller: QLogic Corp. 10GbE Converged Network Adapter (TCP/IP Networking) (rev 02)
85:00.1 Ethernet controller: QLogic Corp. 10GbE Converged Network Adapter (TCP/IP Networking) (rev 02)
85:00.2 Fibre Channel: QLogic Corp. 10GbE Converged Network Adapter (FCoE) (rev 02)
85:00.3 Fibre Channel: QLogic Corp. 10GbE Converged Network Adapter (FCoE) (rev 02)
[root@apps4065 qla2xxx]#
```

Figure 6-27. Identify NIC Function

2. Verify that QLogic NIC driver qlge is managing the PCI bus device ID as 85:00.0 and 85:00.1. For example:

    `# **ls -l /sys/bus/pci/drivers/qlge**`

```
[root@apps4065 qlge]# ls -l
total 0
lrwxrwxrwx 1 root root    0 Jun 22 03:56 0000:85:00.0 -> ../../../../devices/pci0000:80/0000:80:07.0/0000:85:00.0
lrwxrwxrwx 1 root root    0 Jun 22 03:56 0000:85:00.1 -> ../../../../devices/pci0000:80/0000:80:07.0/0000:85:00.1
--w------- 1 root root 4096 Jun 22 03:56 bind
lrwxrwxrwx 1 root root    0 Jun 22 03:56 module -> ../../../../module/qlge
--w------- 1 root root 4096 Jun 22 03:56 new_id
--w------- 1 root root 4096 Jun 22 03:56 remove_id
--w------- 1 root root 4096 Jun 22 03:56 unbind
[root@apps4065 qlge]# pwd
/sys/bus/pci/drivers/qlge
[root@apps4065 qlge]#
```

Figure 6-28. Verify NIC Driver qlge

Figure 6-28 shows the PCI device IDs 85:00.0 and 85:00.1 are listed under the qlge section in sysfs.

3. List the contents of the soft link for the device ID. In Figure 6-29, find the `net:ethX` entries. The X in each entry represents the network interface ID, which indicates that the QLogic adapter NIC function is located in sysfs under `/sys/class/net/ethX`. For example:

   \# **cd /sys/bus/pci/drivers/qla2xxx**

   \# **ls -l 0000:85:00.0/**

```
[root@apps4065 qlge]# ls -l 0000:85:00.0/
total 0
-rw-r--r-- 1 root root    4096 Jun 21 23:10 broken_parity_status
lrwxrwxrwx 1 root root       0 Jun 21 23:10 bus -> ../../../../bus/pci
-r--r--r-- 1 root root    4096 Jun 21 23:10 class
-rw-r--r-- 1 root root    4096 Jun 21 23:10 config
-r--r--r-- 1 root root    4096 Jun 21 23:10 device
lrwxrwxrwx 1 root root       0 Jun 21 23:10 driver -> ../../../../bus/pci/drivers/qlge
-rw------- 1 root root    4096 Jun 21 23:10 enable
-r--r--r-- 1 root root    4096 Jun 21 23:10 irq
-r--r--r-- 1 root root    4096 Jun 21 23:10 local_cpus
-r--r--r-- 1 root root    4096 Jun 21 23:10 modalias
lrwxrwxrwx 1 root root       0 Jun 21 23:10 net:eth0 -> ../../../../class/net/eth0
drwxr-xr-x 2 root root       0 Jun 21 23:10 power
-r--r--r-- 1 root root    4096 Jun 21 23:10 resource
-rw------- 1 root root     256 Jun 21 23:10 resource0
-rw------- 1 root root   16384 Jun 21 23:10 resource1
-rw------- 1 root root 1048576 Jun 21 23:10 resource3
-r-------- 1 root root  262144 Jun 21 23:10 rom
lrwxrwxrwx 1 root root       0 Jun 21 23:10 subsystem -> ../../../../bus/pci
-r--r--r-- 1 root root    4096 Jun 21 23:10 subsystem_device
-r--r--r-- 1 root root    4096 Jun 21 23:10 subsystem_vendor
--w------- 1 root root    4096 Jun 21 23:10 uevent
-r--r--r-- 1 root root    4096 Jun 21 23:10 vendor
[root@apps4065 qlge]# pwd
/sys/bus/pci/drivers/qlge
[root@apps4065 qlge]#
```

Figure 6-29. Device ID Soft Link Contents

Figure 6-29 shows that the QLogic 8100 Series Adapter NIC function at PCI device ID 85:00.0 maps to eth0. QLogic driver parameters can now be displayed and configured through `/sys/class/net/eth0`. You can set network interface options and parameters using commands such as ifconfig and ethtool by querying with this network id (ethX).

Alternatively, you can create the link between a network interface name *ethX* and the physical hardware using the following ethtool command:

`ethtool -1 eth0`

#ethtool -i ethX

Figure 6-30 shows the sample output for the eth0 interface, associating the driver with the interface and the location of the adapter hardware on the PCI bus.

```
[root@apps4065 qlge]# ethtool -i eth0
driver: qlge
version: 1.00.00.20
firmware-version: v1.35.11
bus-info: 0000:85:00.0
[root@apps4065 qlge]#
```

Figure 6-30. eth0 Interface Sample Output

NOTE:

Rebooting or reloading the QLogic FCoE driver (qlge), or adding other network interface cards may change the value of the network ID.

Interrupt Support

The QLogic 8100 Series Adapter does not support interrupt moderation.

Offload Support

The QLogic 8100 Series Adapter offloads common protocol processing onto its hardware, which reduces host CPU processing, and increases performance. The following types of offload are supported:

- Checksum offload—The QLogic adapter supports checksum offloads for IP, TCP (IPv4, IPv6), UDP (IPv4, IPv6) packets and the IPv4 header. Checksum offload for these protocols is enabled by default and can be disabled using ethtool as described in "NIC Driver Parameters (Linux)" on page 6-29. Do not disable checksum offload unless you are debugging a checksum computation problem. Enabling TCP checksum offload significantly reduces host CPU processing when using jumbo frames.
- Stateless offload—The QLogic 8100 Series Adapter supports large send offloading (LSO), which enables the Linux TCP stack to send one large block of data to the QLogic adapter, which then segments this large block into multiple TCP packets.

NIC Bonding (Linux)

You can configure multiple QLogic 8100 Series Adapters to appear as a single virtual network interface. This type of configuration is called teaming or trunking. Because two or more interfaces are combined, teaming provides advantages such as increased bandwidth, load balancing, and high link availability. There are two types of NIC bonding: switch independent and switch dependent.

Switch Independent Bonding

Switch independent teaming is implemented entirely at the adapter-host level. The Ethernet switch that is connected to the adapter is unaware of the team, and no switch involvement is required for team operation. QLogic 8100 Series Adapters support switch independent teams only by using a specialized QLogic NIC teaming driver and the QConvergeConsole CLI for Microsoft Windows environments.

Switch independent bonding functions in one of the following modes:

- Failover mode allows only one active team member at any time. When the active team member is not available, due to a link down or a hardware fault, the automatic failover mechanism selects another healthy team member to be the active member, and traffic continues uninterrupted.
- Load balanced mode has all the capabilities of failover mode, except all team members remain active and are able to distribute the transmit side of TCP/IP traffic between them.

Switch Dependent Bonding

Switch dependent bonding implements the adapter bonding function with the bonding capabilities of the switch. There are two switch dependent bonding modes:

- Static bonding (or generic trunking) mode is also known as IEEE 802.3ad Link Aggregation static mode and requires configuration at both ends of the link (server adapter port and switch). In this teaming mode, the adapter NIC teaming driver controls only load balancing and failover for outgoing traffic, while incoming traffic is controlled by the switch.
- Dynamic bonding mode using aggregation control protocol (LACP) is similar to static teaming, except IEEE 802.3ad LACP is used between the adapter port and the switch to negotiate with the adapter ports that make up the team. In this mode, LACP controls the addition and removal of physical links for the link aggregation, so that no frames are lost or duplicated in the process.

Bonding Prerequisites

Before you configure the bonding driver, you must download and install the following:

- Ethernet channel bonding driver (bonding driver)
- ifenslave utility

For RHEL 5 based-Linux distributions, both the bonding driver and the `ifenslave` utility are available by default.

Ethernet Channel Bonding Driver

The Linux bonding driver combines multiple network interfaces into a single logical bonded interface. The driver supports bonding modes such as failover and round-robin. The bonding driver also monitors link integrity. For bonding driver documentation, visit http://www.kernel.org/doc/Documentation/networking/bonding.txt.

The bonding driver is a kernel-loadable module (bonding.ko) that resides in the `/lib/modules/`uname -`/kernel/drivers/net/bonding/` directory on RHEL 5-based distributions.

Bonding Driver Parameters

Table 6-4 list the bonding driver parameters. Bonding driver options are supplied as parameters to the bonding module at load time. Though these parameters can be used as arguments in the modprobe command, it is recommended that they be specified in the `/etc/modprobe.conf` configuration file. If any of these parameters is not specified, the default value is used.

NOTE:

Options with text values accept either the text name or, for backward compatibility, the option value. For example, `mode= active-backup o` and `mode=1`, set the same mode.

Table 6-4. Linux Bonding Driver Parameters

Parameter Name	Unit	Description	Default Value	Allowed Values
miimon	milliseconds	Specifies the MII link monitoring frequency in milliseconds. This determines how often the link state of each slave is inspected for link failures. A value of zero disables MII link monitoring. A value of 100 is a good starting point. The `use_carrier` parameter affects how the link state is determined.		0
arp_interval	milliseconds	Specifies the ARP link monitoring frequency. ARP monitoring should not be used with miimon.	0	32767

Table 6-4. Linux Bonding Driver Parameters (Continued)

Parameter Name	Unit	Description	Default Value	Allowed Values
arp_ip_target	IP address	Specifies the IP addresses to use as ARP monitoring peers when arp_interval is > 0. These are the targets of the ARP request that are sent to determine the health of the link to the targets.	None	Up to 16 IP addresses (comma separated)
downdelay	milliseconds	Specifies the time to wait before disabling a slave after a link failure has been detected. This option is valid only for the miimon link monitor. The downdelay value should be a multiple of the miimon value; if not, it will be rounded down to the nearest multiple	0	32767
updelay	milliseconds	Specifies the time to wait before enabling a slave after a link recovery has been detected. This option is valid only for the miimon link monitor. The updelay value should be a multiple of the miimon value; if not, it will be rounded down to the nearest multiple.	0	32767
max_bonds	Integer	Specifies the number of bonding devices to create for this instance of the bonding driver. For example, if `max_bonds` is 3, and the bonding driver is not already loaded, then `bond0`, `bond1` and `bond2` are created.	1	NA

Table 6-4. Linux Bonding Driver Parameters (Continued)

Parameter Name	Unit	Description	Default Value	Allowed Values
mode	Integer or string	Specifies a bonding policy	balance-rr or 0	■ balance-rr or 0—Round-robin policy transmits packets in sequential order from the first available slave through the last. This mode provides load balancing and fault tolerance. ■ active-backup or 1—Active-backup policy specifies that only one slave in the bond is active. A different slave becomes active if and only if the active slave fails. The bond's MAC address is externally visible on only one port (network adapter) to avoid confusing the switch.
primary	String	A string (eth0, eth2, . . .) specifying which slave is the primary device. The specified device is always the active slave while it is available. Alternate devices are used only when the primary device is offline. This parameter is useful when one slave is preferred over another for reasons such as higher throughput. The primary value is valid only for active-backup mode	None	ethX

Table 6-4. Linux Bonding Driver Parameters (Continued)

Parameter Name	Unit	Description	Default Value	Allowed Values
use_carrier		Specifies MII/ETHTOOL ioctls or netif_carrier_ok() for use by miimon to determine the link status. MII/ETHTOOL ioctls is less efficient and uses a deprecated calling sequence within the kernel. The netif_carrier_ok() relies on the device driver to maintain its state with netif_carrier_on/off.	1	1–enables the use of netif_carrier_ok() 0–enables use of MII/ETHTOOL ioctls

Loading the Bonding Driver

In most RHEL 5 environments, the bonding driver is not loaded by default. Unless the bonding driver is loaded, bond interfaces using the QLogic adapter NIC function cannot be created.

To determine whether the bonding driver is loaded, enter the following command:

```
# lsmod | grep bonding
```

If the command produces no output, the bonding driver is not loaded. If the output is similar to Figure 6-31, the bonding driver is already loaded.

```
[root@apps4065 ~]# lsmod | grep bonding
bonding                 126649  0
ipv6                    432161  49 bonding
[root@apps4065 ~]#
```

Figure 6-31. Verifying that the Bonding Driver Is Loaded

To load the bonding driver, enter one of the following commands:

```
# modprobe -v bonding miimon = x
```

or

```
# modprobe -v bonding arp_interval=n arp_ip_target=yy.yy.yy.yy
```

If the command produces no output, the bonding driver is already loaded. If the output is similar to Figure 6-32, the bonding driver has been successfully loaded.

```
[root@apps4065 ~]# modprobe -v bonding miimon=100
insmod /lib/modules/2.6.18-164.el5/kernel/drivers/net/bonding/bonding.ko miimon=100
[root@apps4065 ~]#
```

Figure 6-32. Loading the Bonding Driver

Unloading the Bonding Driver

To unload the bonding driver, enter the following command:

```
# modprobe -r bonding
```

To verify that the bonding driver has been unloaded, enter the `lsmod | grep bonding` command as described in "Loading the Bonding Driver" on page 6-45

To display the bonding driver version and the configurable parameters, enter the following:

```
# modinfo bonding
```

Changing Bonding Driver Parameters

NOTE:

When initially configuring a bond or modifying bonding related parameters, enter the `tail -f /var/log/messages` command in a separate window, and watch for bonding driver status messages.

modprobe is a Linux utility that intelligently adds or removes a module from the Linux kernel. modprobe also has an option to specify a parameter value when loading the driver. You can make nonpersistent changes or persistent changes to the bonding driver.

Making Nonpersistent Changes to the Bonding Driver To make changes to driver parameters that are not persistent across reboots or driver reloads, use the modprobe command. For example:

1. Unload the Linux Bonding driver module by issuing the following command:

   ```
   # modprobe -r bonding
   ```

2. Load the Linux bonding driver module and specify parameters to be changed. One or more parameters can be specified separated by a space. The following command sets MII link monitoring frequency to 100ms and enables the round-robin policy mode:

   ```
   # modprobe -v miimon=100 mode=0
   ```

3. Verify that the values for these parameters have changed by issuing the following command:

   ```
   # cat /sys/class/net/bond0/bonding/miimon
   # cat /sys/class/net/bond0/bonding/mode
   ```

Making Persistent Changes to the Bonding Driver (recommended)

To make changes to driver parameters that persist across reboots, edit the file `/etc/modprobe.conf`, add the QLogic FCoE driver parameters and values, build a new RAMDISK image and reboot. For example:

1. Open the file `/etc/modprobe.conf` with an editor in read/write mode by issuing the following command:

   ```
   # vi /etc/modprobe.conf
   ```

2. Add the driver parameters, save the file, and then exit the editor by issuing the following commands:

   ```
   alias bond0 bonding
   options bonding miimon=100 mode=0
   ```

3. Create a new RAMDISK (initrd image) by issuing the following command:

   a. Change directory to the location containing the RAMDISK images by issuing the following command:

      ```
      # cd /boot
      ```

   b. Create a backup copy of the RAMDISK (initrd) image by issuing the following command:

      ```
      # cp initrd-[kernel version].img initrd-[kernel
      version].img.bak
      ```

   c. Generate a new RAMDISK image containing the updated QLogic FCoE driver by issuing the following command:

      ```
      # mkinitrd -f initrd-[kernel version].img `uname -r`
      ```

NOTE:

Depending on the server hardware, the RAMDISK file name may be different. The command is successful if there is no output.

d. Reboot the server for the new RAMDISK image to take affect by issuing the following command:

```
# shutdown -r now
```

4. After a successful reboot, verify that the parameter values parameters have changed by issuing the following commands:

```
# lsmod | grep bonding
# cat /sys/class/net/bond0/bonding/miimon
# cat /sys/class/net/bond0/bonding/mode
```

Bonding Configuration

NOTE:

Creating, modifying, or dissolving bonding interfaces may cause the network connection to be reset. Do not configure bonding on a production system.

The following nonpersistent and persistent configuration procedures assume that the Linux bonding driver has been loaded and that the parameters have been specified that define the type of bond to be created. For information about loading the bonding driver, refer to "Loading the Bonding Driver" on page 6-45.

Nonpersistent Bonding Configuration

NOTE:

Nonpersistent configuration changes (`ifconfig` and `ifenslave` commands) are lost if the server is rebooted.

1. Create a bondX network interface. For example, issue the following command:

```
# ifconfig bond0 192.168.10.11 netmask 255.255.255.0 broadcast
192.168.10.255 up
```

2. Add slave interfaces to the bonding interfaces by issuing the following command:

```
# ifenslave bond0 eth0 eth1
```

In this command:

- `bond0` is the bonding interface created by the ifconfig command in Step 1.
- `eth0` and `eth1` are the QLogic adapter network interfaces form a part of this bond.

Persistent Bonding Configuration

NOTE:

Persistent configuration changes are preserved across server reboots. To make persistent configuration changes, edit the Linux networking scripts in the `/etc/sysconfig/network-scripts/` directory. For information about dismantling a bonding network interface, refer to “Disabling a Bonding Network Interface” on page 6-51.

---

1. Create a bond0 configuration file. RHEL 5-based Linux distributions persistently store network configurations in the `/etc/sysconfig/network-scripts/` directory. The following demonstrates how to create a network configuration file for a bonding interface:

   a. Create or open the file `/etc/sysconfig/network-scripts/ifcfg-bond0X` with an editor:

      ```
      # vi /etc/sysconfig/network-scripts/ifcfg-bond0
      ```

   b. Append the following commands to the file to modify the network. For example:

      ```
      DEVICE=bond0
      IPADDR=<ip_address>
      NETWORK=<network_address>
      NETMASK=<netmask>
      USERCTL=no
      BOOTPROTO=none
      ONBOOT=yes
      ```

2. Save the file, and then exit the editor.
3. Modify the network interface scripts for the physical interfaces that are to be bonded.

a. Open the file /etc/sysconfig/network-scripts/ifcfg-ethx. For example:

```
# vi /etc/sysconfig/network-scripts/ifcfg-eth0
```

b. Append the following commands to the file to modify the physical interface.

```
MASTER=bond0
SLAVE=yes
```

c. Save the file, and then exit the editor.

4. Repeat Step 3 for each physical network interface that is to be part of the bonding interface.

5. Restart the network service by issuing the following command:

```
# service network restart
```

Verify the Bonding Configuration

To verify if the bonding interface:

1. Enter the cat /proc/net/bonding/bond0 command, and examine the bond0 network interface. Figure 6-33 shows that eth0 and eth1 form the bond0 interface, the bonding mode is round-robin, and eth1 status is down.

```
[root@apps4065 ~]# cat /proc/net/bonding/bond0
Ethernet Channel Bonding Driver: v3.4.0 (October 7, 2008)

Bonding Mode: load balancing (round-robin)
MII Status: up
MII Polling Interval (ms): 100
Up Delay (ms): 0
Down Delay (ms): 0

Slave Interface: eth0
MII Status: up
Link Failure Count: 0
Permanent HW addr: 00:c0:dd:11:95:98

Slave Interface: eth1
MII Status: down
Link Failure Count: 0
Permanent HW addr: 00:c0:dd:11:95:9a
[root@apps4065 ~]#
```

Figure 6-33. Examine the Bond0 Network Interface

2. Enter the `ifconfig` command, and examine the output. Figure 6-34 shows that the bond0 interface status and IP address information. The MAC addresses for the two bonded ports (eth0 and eth1) are the same. After the bond has been brought down and the bonding driver removed, the original MAC addresses are restored.

```
[root@apps4065 network-scripts]# ifconfig
bond0     Link encap:Ethernet  HWaddr 00:C0:DD:11:95:98
          inet addr:192.168.10.11  Bcast:192.168.10.255  Mask:255.255.255.0
          inet6 addr: fe80::2c0:ddff:fe11:9598/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:36 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 b)  TX bytes:8079 (7.8 KiB)

eth0      Link encap:Ethernet  HWaddr 00:C0:DD:11:95:98
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:36 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1024
          RX bytes:0 (0.0 b)  TX bytes:8079 (7.8 KiB)
          Interrupt:51

eth1      Link encap:Ethernet  HWaddr 00:C0:DD:11:95:98
          UP BROADCAST SLAVE MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1024
          RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)
          Interrupt:59
```

Figure 6-34. ifconfig Command Output

Disabling a Bonding Network Interface

To disable a bonding interface, issue the following command:

`# ifconfig bondX down`

In this command, `bond`*`X`* is the bonding interface. For example:

`# ifconfig bond0 down`

To remove a physical network interface from a bond, enter the following command:

`# ifenslave -d bondX ethY`

In this command:

- bond*X* is the bonding interface.
- eth*Y* is the physical network interface to be removed from bond*X*

  For example:

  `# ifenslave -d bond0 eth1`

VLAN Configuration

A virtual LAN (VLAN) is a logical grouping of network hosts connected to a switch to achieve a logical segmentation of a physical network. By default, all switches make up a broadcast domain in the layer-2 switched network. Creating a VLAN breaks up a broadcast domain into smaller domains within a switch by assigning different ports to different subnets. The benefits of using VLANs include broadcast control, security, flexibility, and scalability.

VLAN configuration assigns a VLAN ID to a NIC interface. The protocol most commonly used to configure VLANs is *Virtual LANs IEEE 802.1Q*. Using this protocol, the QLogic adapter NIC function assigns a VLAN ID to each frame that it transmits. The connected switch interprets the tag, and packets are switched only within the VLAN. Communication across VLANs requires a layer-3 router.

NOTE:

The VLAN ID is set for the entire team and not for individual ports in the team.

VLAN Prerequisites

The following software components are required to configure VLANs on Linux systems with network interface bonding.

- VLAN 802.1q kernel module (8021q)—Linux kernel module that provides the VLAN 802.1q support for network interfaces. The Linux 8021q VLAN driver creates VLANs on Linux network interfaces over both physical and bonded interfaces. The VLAN 802.1q driver is a kernel-loadable module (8021q.ko) that resides in the `/lib/modules/2.6.18-164.el5/kernel/net/8021q/` directory on RHEL 5-based distributions.
- vconfig utility—A user-level control program for managing VLANs in Linux. vconfig is a VLAN (802.1q) configuration program that creates and removes VLAN devices on a VLAN-enabled kernel (such asRHEL 5). VLAN devices are virtual Ethernet devices that represent the VLANs on the physical LAN. For information about the vconfig command, enter the `man vconfig` command to display the manual page.

The VLAN 802.1q kernel module and the vconfig utility are available by default in all RHEL 5 installations.

NOTE:

To enable all VLAN capabilities in Linux, you must configure VLANs on the attached Ethernet switch. For information about configuring VLANs on the switch, refer to the Ethernet switch vendor documentation.

Loading the VLAN 802.1q Kernel Module

In most RHEL 5 environments, the VLAN 802.1q kernel module is loaded by default. VLAN interfaces cannot be created over the QLogic adapter NIC function without the VLAN 802.1q kernel module.

To determine whether the VLAN 802.1q kernel module is loaded, issue the following command:

```
# lsmod | grep 8021q
```

If the command produces no output, the VLAN 802.1q Kernel Module is not loaded. If the output is similar to Figure 6-35, the VLAN 802.1q kernel module is already loaded.

```
[root@apps4065 network-scripts]# lsmod | grep 8021q
8021q                  56657  1 igb
[root@apps4065 network-scripts]#
```

Figure 6-35. Verifying that the VLAN 802.1q Kernel Module Is Loaded

To load the VLAN 802.1q kernel module, issue the following command:

```
# modprobe -v 8021q
```

If the command produces no output, the VLAN 802.1q Kernel Module is already loaded. If the output contains the string `insmod /lib/modules/2.6.18-164.el5/kernel/net/8021q/8021q.ko`, the VLAN 802.1q kernel module has already been loaded.

Unloading the VLAN 802.1q Kernel Module

To unload the VLAN 802.1q Kernel Module, issue the following command:

```
# modprobe -r 8021q
```

To verify that the VLAN 802.1q kernel module has been unloaded, refer to "Loading the VLAN 802.1q Kernel Module" on page 6-53.

To display VLAN 802.1q kernel module version information, issue the following command:

```
# modinfo 8021q
```

Configuring a VLAN

NOTE:

Creating, modifying, or dissolving VLAN interfaces can reset the network connection. Do not configure VLAN interfaces on production systems.

This section describes nonpersistent and persistent configuration of VLAN interfaces over the NIC function using VLAN 802.1q Kernel Module and user space utilities. Nonpersistent configuration (`ifconfig` and `vconfig`) changes are lost across server reboots. Before configuring VLANs the physical/bond interface should be in an UP state in Linux.

The following procedures assume that the Linux VLAN 802.1q kernel module has been loaded. For information about loading the kernel module, refer to "Loading the VLAN 802.1q Kernel Module" on page 6-53.

Nonpersistent VLAN Configuration To configure changes to VLAN interfaces that do not persist across server reboots:

1. Create a VLAN network interface using the vconfig command. The following command creates a VLAN interface with VLAN ID 5 over physical network interface eth0:

   ```
   # vconfig add eth0 5
   ```

   The resulting VLAN interface appears as eth0.5 in Linux network configuration utilities.

   NOTE:

   Some VLAN IDs may be reserved.For information about reserved VLAN IDs, refer to the corresponding switch documentation.

   ---

2. Assign an IP address to the VLAN interface. The following command assigns an IP address, netmask address, and broadcast IP address to VLAN interface eth0.5:

   ```
   # ifconfig eth0.5 192.168.10.15 netmask 255.255.255.0
   broadcast 192.168.10.255 up
   ```

Persistent VLAN Configuration To configure changes to VLAN interfaces that persist across server reboots:

1. Create a network configuration file for the VLAN interface. RHEL 5-based Linux distributions persistently store network configurations in the `/etc/sysconfig/network-scripts/` directory.

   a. Copy the contents of physical/bond interfaces `ifcfg-` file into a network configuration file for the VLAN interface. For example, the following commands configure a VLAN interface with VLAN ID 5 on physical interface eth0:

      ```
      # cp /etc/sysconfig/network-scripts/ifcfg-eth0
      /etc/sysconfig/network-scripts/ifcfg-eth0.5
      ```

b. Open the VLAN interface network configuration script with an editor, and make the following changes:

- Replace the string `DEVICE=eth0` with `DEVICE=eth0.5`.
- Append the string `VLAN=yes` to the end of the file.

Figure 6-36 shows the resulting file.

```
# QLogic Corp. 10GbE Converged Network Adapter (TCP/IP Networking)
DEVICE=eth0.5
BOOTPROTO=dhcp
HWADDR=00:C0:DD:11:95:98
ONBOOT=yes
DHCP_HOSTNAME=apps4065
VLAN=yes
~
"ifcfg-eth0.5" [Modified] line 8 of 8 --100%-- col 1
```

Figure 6-36. Creating a Network Configuration File—VLAN Interface

c. Save the file, and then exit the editor.

2. Restart the network services by issuing the following command:

```
# service network restart
```

Verify the VLAN configuration

To verify if the VLAN interface (ethX.VLAN ID or bondX.VLAN ID)

1. Examine the VLAN network interface using the /proc interface. For example:

```
# cat /proc/net/bonding/bond0
```

Figure 6-37 shows that eth0 is the physical interface and the VLAN interface is eth0.5.

```
[root@apps4065 ~]# cat /proc/net/vlan/eth0.5
eth0.5  VID: 5   REORDER_HDR: 1  dev->priv_flags: 81
         total frames received            0
          total bytes received            0
      Broadcast/Multicast Rcvd            0

      total frames transmitted            6
       total bytes transmitted         2052
            total headroom inc            0
           total encap on xmit            0
Device: eth0
INGRESS priority mappings: 0:0  1:0  2:0  3:0  4:0  5:0  6:0 7:0
EGRESSS priority Mappings:
[root@apps4065 ~]#
```

Figure 6-37. Verify the VLAN Interface

2. Enter the ifconfig command, and then examine the output. For example:

   ```
   # ifconfig eth0.5
   ```

   This command shows the eth0.5 VLAN interface status, statistics, and IP address.

Disabling a VLAN interface

To disable a VLAN interface, enter the following command:

```
# ifconfig <ethX.VLAN ID or bondX.VLAN ID> down
```

In this command, `<ethX.VLAN ID or bondX.VLAN ID>` is the VLAN interface name. For example:

```
# ifconfig eth0.5 down
```

To remove the VLAN interface, issue the following command:

```
# vconfig rem <ethX.VLAN ID or bondX.VLAN ID> down
```

In this command: `<ethX.VLAN ID or bondX.VLAN ID>` is the VLAN interface name. For example:

```
# vconfig rem eth0.5
```

If the VLAN interface was created with an entry in the network configuration file, delete that entry from the file `/etc/sysconfig/networking-scripts/ifcfg`.

Creating a VLAN on a Bond Interface

You can configure VLAN devices over a bond interface using the 8021q driver. However, only packets coming from the 8021q driver and passing through bonding are tagged by default.

VLAN interfaces can be added on top of a bonding interface only after enslaving at least one slave. The bonding interface has a hardware address of 00:00:00:00:00:00 until the first slave is added. If the VLAN interface is created prior to the first enslavement, it picks up the all-zeros hardware address. After the first slave is attached to the bond, the bond device picks up the slave's hardware address, which is then available to the VLAN device.

A similar situation can arise if all slaves are released from a bond that still has one or more VLAN interfaces on top of it. When a new slave is added, the bonding interface obtains its hardware address from the first slave, which may not match the hardware address of the VLAN interfaces that were copied from an earlier slave.

To insure that the VLAN device operates with the correct hardware address when all slaves are removed from a bond interface, remove, and then recreate all VLAN interfaces.

Wake On LAN

Wake on LAN is not supported for QLogic 8100 Series Adapters.

PXE Boot

PXE boot code is a part of the QLogic 8100 Series Adapter multi-boot image that enables a networked server to boot with the images provided by remote servers.

The PXE protocol, illustrated in Figure 6-38, operates as follows:

1. The client initiates the protocol by broadcasting a `DHCPDISCOVER` containing an extension that identifies the request as one coming from a client that implements the PXE protocol.
2. Assuming that a DHCP server or a proxy DHCP server is available that is capable of implementing this extended protocol, after several intermediate steps, the server sends a list of appropriate boot servers to the client.
3. The client then discovers a boot server of the selected type and receives the name of an executable file on the chosen boot server.
4. The client uses TFTP to download the executable from the boot server.
5. Finally, the client executes the downloaded image. At this point, the client's state must meet certain requirements to provide a predictable environment for the image. These requirements include the availability of certain areas of the client's main memory and the availability of basic network I/O services.

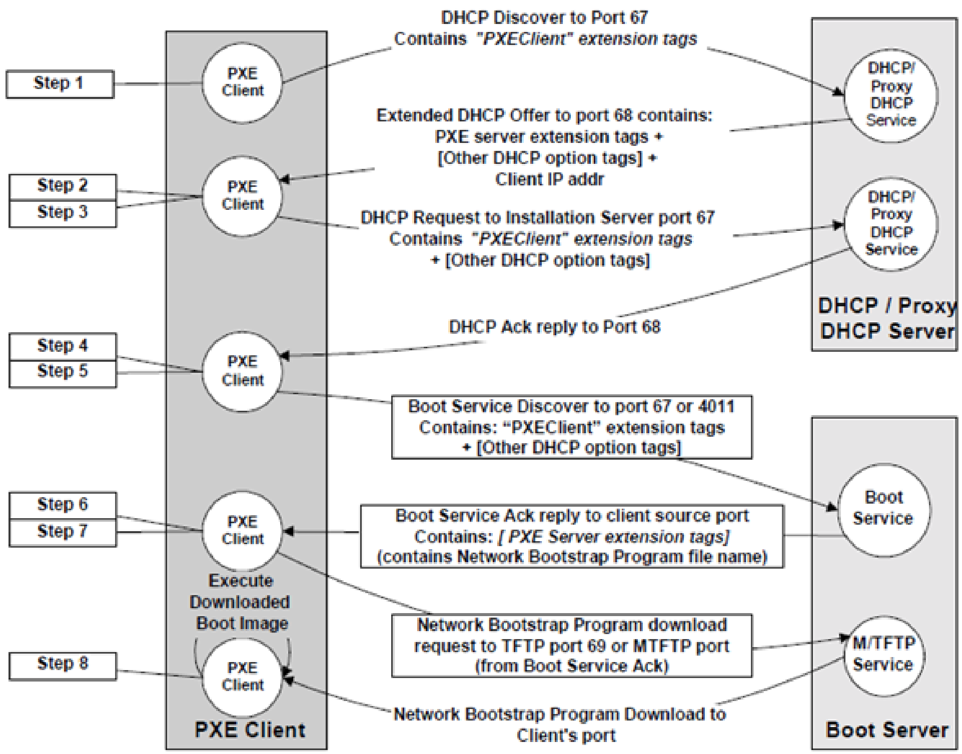


Figure 6-38. PXE Flow Diagram

1. As the server boots up, it starts the QLogic adapter PXE boot code from the adapter Flash memory. This boot code is part of the multi-boot image that is resident on the QLogic adapter.
2. The PXE boot code broadcasts a `DHCPDISCOVER` message.
3. Within the boot server or a separate entity, the DHCP server then responds by sending a `DHCPOFFER` message with an IP address for use by the QLogic adapter during the PXE boot process. The `DHCP OFFER` message also contains the boot server list.
4. PXE boot code acknowledges the `DHCPOFFER` message and waits for an acknowledgement from the DHCP server.
5. The PXE boot code selects a boot server and proceeds to imitate the boot server with its IP address and system architecture details.
6. The boot server responds to the PXE boot code with the boot file name (an executable file corresponding to the server architecture) and trivial file transfer protocol (TFTP) configuration settings required by the PXE boot code to download the executable boot file.

7. The PXE boot code downloads the executable boot file using TFTP and executes the boot file.

Prerequisites for PXE Boot

PXE boot requires the following:

- A client server with a PXE-compliant BIOS or UEFI implementation and a QLogic 8100 Series Adapter. This server boots through PXE with Microsoft Windows.
- A DHCP or proxy DHCP server that can provide an IP address and boot server list to the client server.
- A PXE boot server to deliver the PXE execution environment and the operating system images to the client server. It is possible to configure a single physical server as both a DHCP and a boot server.

  For information about setting up a Linux server as a PXE boot server, refer to the QLogic application note, *Setting Up Linux PXE on Server and Client Systems*, which is available at http://driverdownloads.qlogic.com.

Setting the Client Servers BIOS Boot Order

To set the client servers BIOS boot order:

1. Set up client servers BIOS boot order to select 8100 Series NIC as the first boot device in the Boot order/Boot Device priority. The two QLogic UNDI v1.11 PXE-2 entries are for a dual-port QLogic 8100 Series Adapter (Figure 6-39).

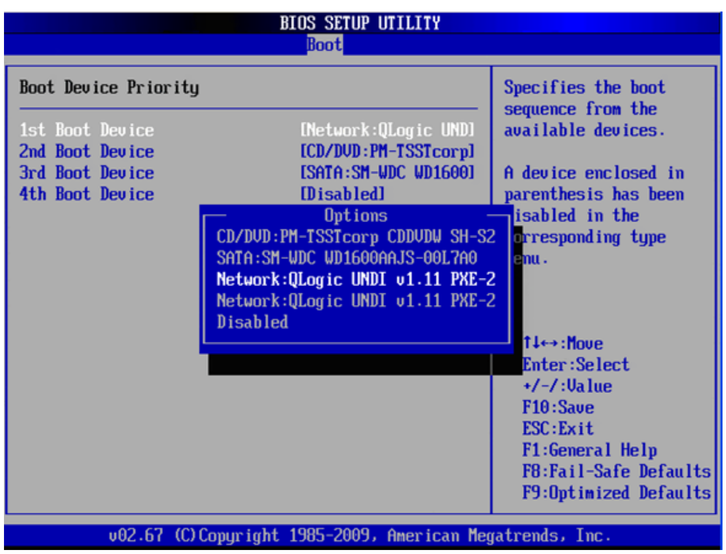


Figure 6-39. Boot Order in BIOS

2. Reboot the client system to boot over the network from the PXE boot server.

7 Configuring FCoE in a Windows Environment

Overview

The QLogic 8100 Series Converged Network Adapter is dual-function adapter comprising FCoE and NIC functions. This section describes the characteristics, configurations, and features of the FCoE function.

Driver Parameters

Table 7-1 lists the FCoE parameters, their default values, allowed values, and how to change values. For information about changing parameter values, refer to the FCoE topics in the QConvergeConsole Help or the *Fast!*UTIL configuration options described in "Fast!UTIL" on page 9-2.

Table 7-1. Driver Parameters

Parameter	Description	Default	Range	Configuration Method
Operation Mode	The reduced interrupt operation (ZIO) modes post multiple command completions in a single interrupt.	0	0, 5, 6	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Interrupt Delay Timer	The wait time in 100-microsecond increments between accessing (DMA) a set of handles and generating an interrupt. Specify a value for this parameter only when the Operation Mode setting is 5 or 6. When the Operation Mode setting is 0, this parameter should be disabled.	Disabled	0–255	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI

Table 7-1. Driver Parameters

Parameter	Description	Default	Range	Configuration Method
Spin-up Delay	Time that the adapter port waits before scanning the channel for devices.	0	0–2 seconds	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Frame Size	Maximum length of a Fibre Channel frame created by the adapter for encapsulation in an Ethernet frame.	2,048	512, 1,024, 2,048	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Enable Hard Loop ID	Enables or disables the adapter hard loop ID on the Fibre Channel bus. Enabling this parameter may be necessary on some bus configurations when devices do not appear.	Disabled	Enabled, Disabled	QConvergeConsole GUI or QConvergeConsole CLI
Enable Extended Logging	Enables or disables the logging of driver-detected events that occur in the driver or the Fibre Channel bus.	0	0—Disabled 1—Enabled	QConvergeConsole GUI or QConvergeConsole CLI
Execution Throttle	Maximum number of commands that a port can execute at one time. When a port reaches its execution throttle, no new commands can execute until the current command execution is complete.	65,535	1–65,535	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Login Retry Count	Number of times that the software tries to log in to a device.	8	0–255	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Port Down Retry Count	Time to wait before reissuing a command to a port that is down.	30	0–255 seconds	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Link Down Timeout	Time to wait for a link to come up.	30	0–240 seconds	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI

Table 7-1. Driver Parameters

Parameter	Description	Default	Range	Configuration Method
LUNs per Target	Number of LUNs per target. Multiple LUN support is typical of RAID boxes that use LUNs to map drives.	128	0, 8, 16, 32, 64, 128, 256	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Enable LIP Full Login	Enables or disables the ISP chip to relog in to all ports after any LIP.	Enabled	Enabled, Disabled	QConvergeConsole GUI or QConvergeConsole CLI
Enable Target Reset	Enables or disables the drivers to issue a Target Reset command to all devices on the loop when a SCSI Bus Reset command is issued.	Enabled	Enabled, Disabled	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Enable OoOFR	Enables or disables out-of-order frame reassembly. Enabling this parameter reassembles out-of-order frames as they are received, minimizing network congestion by eliminating the retransmission of frames and exchanges.	Disabled	Enabled, Disabled	QConvergeConsole GUI or QConvergeConsole CLI
Enable HBA Port Hard Loop ID	The adapter ID to use if the Enable Hard Loop ID parameter is enabled.	0	0–125	QConvergeConsole GUI or QConvergeConsole CLI
Enable HBA Port BIOS	Enables or disables the host bus adapter BIOS. You must enable this parameter if you are starting from a Fibre Channel disk drive that is attached to the PCIe slot. Disabling this parameter disables the ROM BIOS on the adapter, freeing space in upper memory.	Disabled	Enabled, Disabled	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Loop Reset Delay	Time to wait before initiating loop activity after the firmware resets the loop.	5	0–255 seconds	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI

Table 7-1. Driver Parameters

Parameter	Description	Default	Range	Configuration Method
Enable Fibre Channel Tape Support	Enables or disables FCP-2 recovery. Disable this parameter if the Fibre Channel adapter is connected to a storage subsystem. Most storage subsystems do not support sending I/O from the same Fibre Channel adapter to both a storage subsystem and a tape device.	Enabled	Enabled, Disabled	*Fast!*UTIL, QConvergeConsole GUI, or QConvergeConsole CLI
Enable LIP Reset	The type of loop initialization process (LIP) reset to use when the operating system initiates a bus reset routine. Enabling this parameter initiates a global LIP reset to clear the target device reservations. Disabling this parameter initiates a global LIP reset with full login.	Disabled	Enabled	QConvergeConsole GUI or QConvergeConsole CLI

The following parameters affect adapter FCoE performance:

- Operation Mode
- Interrupt Delay Timer
- Execution Throttle
- Frame Size (Fibre Channel)

The Execution Throttle and Frame Size Rate parameters default to their maximum values for optimal FCoE performance. The following subsections describe how to use the Operation Mode and Interrupt Delay Timer parameters to improve adapter FCoE performance.

Operation Mode (ZIO)

The Operation Mode (ZIO) parameter specifies the reduced interrupt operation modes. ZIO modes allow the posting of multiple command completions in a single interrupt. Table 7-2 describes the Operation Mode parameter values in detail.

Table 7-2. Operation Mode Values

Values	Operation
0	Disables ZIO mode.
5	Enables ZIO mode 5. DMA transfers response queue entries into the response queue. No interrupt is generated unless the Interrupt Delay Timer updates the Response Queue-Out Pointer register.
6	Enables ZIO mode 6. DMA transfers response queue entries into the response queue and generates an interrupt when the firmware has no active exchanges (even if the interrupt delay timer has not expired).

Interrupt Delay Timer (IDT)

The Interrupt Delay Timer parameter is available if the Operation Mode (ZIO) parameter is enabled. The Interrupt Delay Timer parameter specifies the time period (in 100-microsecond increments) between updating the response queue and generating an interrupt. The interrupt is not generated if the host updates the Response Queue Out-Pointer register during this time. Specifying a value of 0 disables the timer. In the firmware, the value 0 is equivalent to a time period of two hours.

N_Port ID Virtualization

N_Port ID Virtualization (NPIV) is a Fibre Channel facility that allows multiple N_Port IDs to share a single physical N_Port. N_Port sharing allows multiple Fibre Channel initiators to use a single physical port, easing hardware requirements in SAN design, especially where virtual SANs are used. NPIV is defined by the technical committee T11 within the INCITS standards body by the FC-DA (Fibre Channel Direct Attach) and FC-LS (Fibre Channel Link Services) specifications.

NPIV virtualizes the Fibre Channel adapter function such that each VM running on a server can share a pool of adapters and maintain independent access to its own protected storage. This sharing enables administrators to leverage standard SAN management tools and best practices, such as fabric zoning and LUN mapping/masking, and it enables the full use of fabric-based quality-of-service and accounting capabilities. Adapter sharing also provides the most efficient use of the adapters in the server, while ensuring the highest level of data protection.

NPIV allows a single physical Fibre Channel adapter port to function as multiple logical ports, each with its own WWPN, as shown in Figure 7-1.

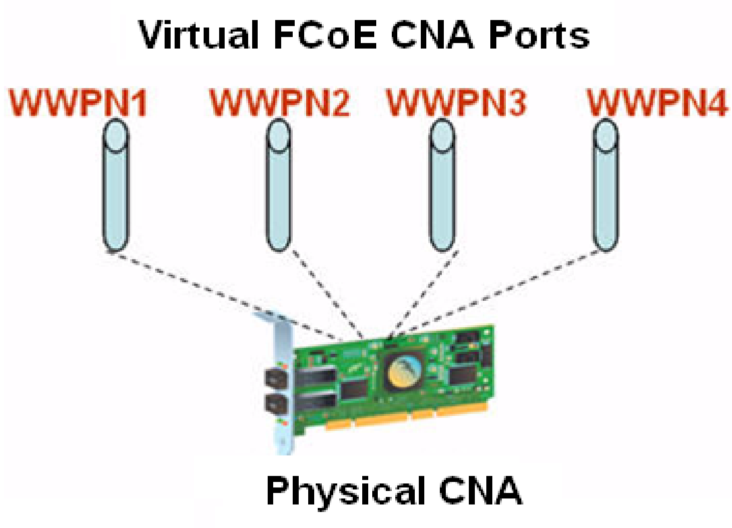


Figure 7-1. N_Port ID Virtualization

QLogic CNA NPIV Solution

To complement Microsoft and other server virtualization software solutions, QLogic has extended virtualization capabilities to the adapter hardware through NPIV. All QLogic 8100 Series Adapters support NPIV. QLogic supports creating, deleting, and managing NPIV ports through the QConvergeConsole web management GUI.

With the combined QLogic and Microsoft solution, storage administrators can create virtual FCoE adapter ports within multiple zones and assign them to VMs for migration without reconfiguring zoning or LUN masking. This solution creates a virtual network that is easier to manage and maintain. In addition, support for Microsoft's virtualization solutions, like Virtual Server 2005 and Microsoft Windows Server 2009 Hyper-V combined with QLogic's 8100 Series Adapter virtualization technologies, increase hardware efficiency and enable rapid configuration and deployment of VMs.

NPIV Deployment Requirements

The following hardware and software requirements must be met before deploying a QLogic NPIV solution on Microsoft Windows environments:

- A compatible Converged Networking Ethernet switch that supports NPIV. For information about compatible switches, refer to "System Requirements" on page 3-1.
- A QLogic 8100 Series Converged Networking Adapter.

- QLogic 8100 Series Adapter driver—QLogic STOR Miniport Driver 9.1.8.17 or later.
- QLogic QConvergeConsole GUI, version 1.0.28, or later; or QConvergeConsole CLI Build, version 1.0.0, build 46, or later.
- Additional Microsoft software components may be required to deploy Microsoft Virtual Server 2005 or Windows Server 2008 Hyper-V. For more information, consult the specific Microsoft documentation.

NOTE:

QLogic 8100 Series Adapters support a maximum of 15 virtual ports per adapter port in Microsoft Windows 2003 and a maximum of 15 virtual ports per adapter port in Microsoft Windows 2008.

Creating Virtual Ports

This subsection describes how to create virtual adapter ports using the QConvergeConsole GUI. For information about creating virtual adapter ports using QConvergeConsole CLI, refer to the *QConvergeConsole CLI User Guide*.

To create a virtual adapter port, connect the QConvergeConsole window to the server that houses the QLogic 8100 Series Adapter, then follow these steps:

1. In the system tree, expand a QLogic 8100 Series Adapter, and then expand the port number to view the FCoE port node.
2. Select the **FCoE** port node.
3. Select the **Virtual** tab in the right pane (Figure 7-2).

Figure 7-2. Select Port to Create a Virtual Port

4. In the **Number of vPort to create** box, select the number of virtual ports you want to create, then click **Update**. The Generated WWNs window displays unique WWNs for the selected number of vPorts.

   The generated WWN for multiple virtual ports supports the following:

   - The driver determines the number of **vPorts** allowed. For example, a Windows driver that supports 16 ports can allow up to 15 virtual ports.
   - To generate a different set of randomly selected WWNs, click Generate to create a different one.
   - To change a particular WWN, type a different hex number (greater than `0x4`) in the second field.

5. Click the **Create** button. The Security Check dialog box opens.

6. Type the administrative password, and then click **OK**. If the default password has not been changed, type `config`. An additional port appears in the list of virtual ports shown in the list box.

NOTE:

To benefit from I/O segregation and NPIV monitoring after creating a virtual port, configure zoning on the FCoE switch, and configure selective LUN presentation on the Fibre Channel or FCoE target array. For information about configuring the FCoE switch and target array, refer to the product documentation

7. Select **Refresh** from the **Host** drop-down menu and click **OK** when prompted to refresh the host.

Verifying the Virtual Ports

Use QConvergeConsole GUI to verify that the vPort has been created:

1. Verify that the vPort is listed in the left pane of the QConvergeConsole window beneath the FCoE port selected when creating the virtual ports, as shown in the following example.

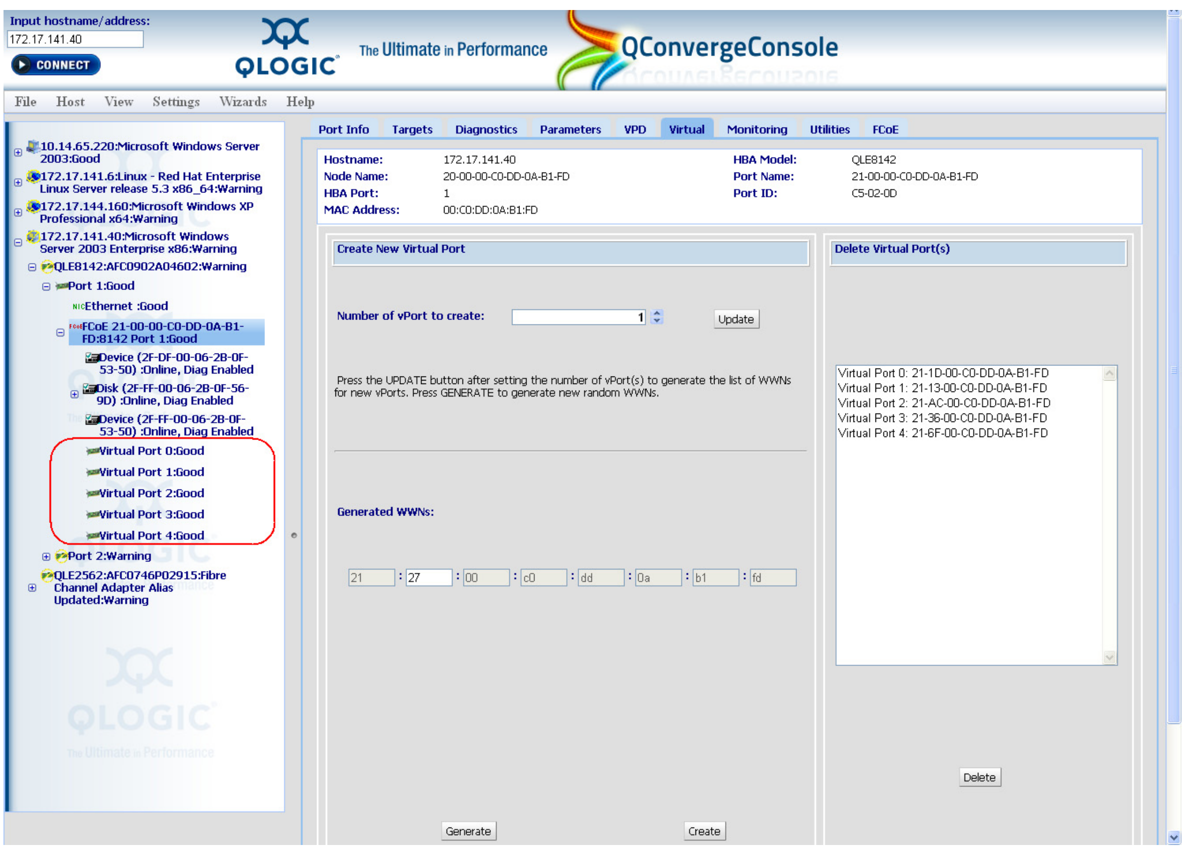


Figure 7-3. Verifying Additional Virtual Ports

2. Inspect the switch Fibre Channel database to verify that the vPort has logged into the connected NPIV-enabled FCoE switch. Refer to the corresponding switch documentation for details.
3. If possible, verify that the vPort has logged in to the storage array through the storage array management interface.
4. Using the Device Manager, inspect the Disk Manager to verify that all LUNs presented to the vPort through the zoned storage array ports are visible to the Microsoft Windows operating system.

Deleting Virtual Ports

CAUTION!

Deleting or removing a virtual port is disruptive and should not be performed on a production system or while I/O operations are in progress on LUNs that are being accessed through the virtual port.

This subsection describes how to delete virtual adapter ports using QConvergeConsole GUI. For information about deleting virtual adapter ports using QConvergeConsole CLI, refer to the QConvergeConsole *CLI User's Guide*.

To delete one or more virtual ports, connect the QConvergeConsole window to the server that houses the QLogic 8100 Series Adapter, then follow these steps:

1. In the system tree, expand a QLogic 8100 Series Adapter, and then expand the port number to view the FCoE port node.
2. Select the **FCoE** port node.
3. Select the **Virtual** tab in the right pane.
4. Select the port you want to delete:
   - To delete an individual port, click the individual port displayed in the list box.
   - To delete more than one port, press and hold the **CTRL** key while selecting the ports.

Figure 7-4. Select Virtual Ports to Delete

5. Click the **Delete** button, located at the bottom of the screen. A dialog box prompts you for a password.
6. Type the administrative password, and then click **OK**. A dialog box appears, asking if you want to refresh the host view.
7. Click **OK** to refresh the host immediately or click **Cancel** if you want to refresh the view at a later time.

Verifying Deletion of Virtual Ports

Use QConvergeConsole GUI to verify that the virtual adapter port has been deleted:

1. Verify that the deleted vPort number no longer appears beneath the FCoE port selected when deleting the virtual ports.
2. Verify that the vPort is no longer logged into the connected NPIV-enabled FCoE switch by checking its Fibre Channel name server database. Refer to the corresponding switch documentation for details.

3. Verify that none of the LUNs presented to the vPort through the zoned storage array ports are visible to the Microsoft Windows operating system. Check for the absence of these LUNs as disks by navigating to the **Disk Manager** through the **Device Manager**.

Virtual Port Features and Limitations

When using a virtual port, the **Settings** and **Utilities** tabs are not available in QConvergeConsole GUI. As a result, the following features are not available:

- Adapter parameter settings
- Adapter parameter restore default
- Flash update from file
- Flash save to file
- Adapter parameter update from file
- Adapter parameter save to file
- Adapter parameter update from templates
- Target link speed (intelligent interleaf factor)
- Boot device settings
- Driver settings
- Adapter beacon function
- Target list (unavailable in Windows only)
- LUN list (unavailable in Windows only)

However, the following tabs are available and reflect the data from the physical adapter:

- Target persistent binding
- Diagnostics
- Information
- VPD
- Target list
- Monitoring (real-time statistics)
- Link status

For more information about setting up and configuring NPIV with your QLogic Fibre Channel adapter, refer to the *QLogic Fibre Channel HBA and VM Migration for Hyper-V & SC VMM2008 Quick Start Guide* at http://www.qlogic.com.

Implementing Adapter-Based Quality of Service

The QLogic 8100 Series Adapter solution provides for standards-based quality of service (QoS), ensuring high-quality performance for applications that require preferential delivery. The QLogic QoS solution is based on assigning QoS levels to virtual ports (NPIV ports). You can configure QoS using the priority method or the bandwidth method, as shown in Figure 7-5. On a single physical port, you can configure QoS using the priority method or the bandwidth method but not both.

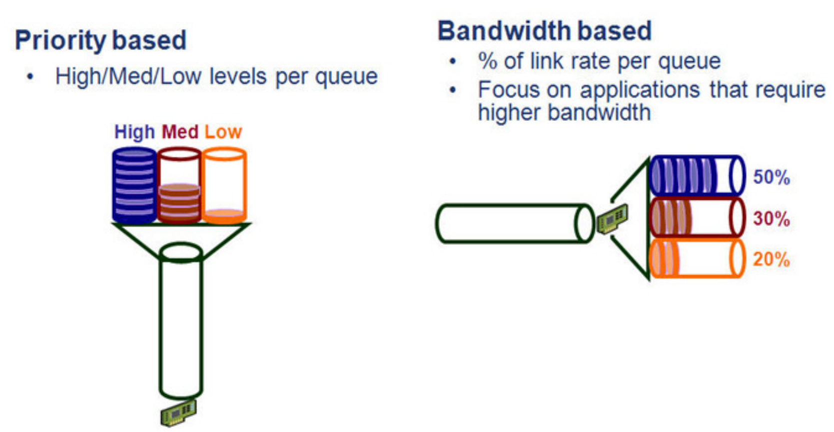


Figure 7-5. Priority and Bandwidth-Based QoS

The priority method assigns priority levels (low, medium, high) to virtual ports based on the quality of service required for the applications or VMs using the virtual port. This method provides for various levels of latency requirements across virtual ports.

The bandwidth method assigns a bandwidth percentage (0–100) or a bandwidth rate (0–10Gb) to applications or VMs that are using a virtual port. This method provides a minimum bandwidth guarantee. Bandwidth-based QoS configuration applies only when the total bandwidth requirement of the applications exceeds the available bandwidth. Bandwidth is not reserved for a particular virtual port, and unused bandwidth is shared among the other virtual ports.

The physical port or WWN always has high priority, independent of the bandwidth or priority scheme chosen for created virtual ports. You need not assign a QoS level to every virtual port that you create. If a QoS level is not assigned to a virtual port, the default is low priority (best effort), independent of the bandwidth or priority scheme. This flexibility allows you to focus on critical applications to ensure that the highest service level is provided. You can modify QoS levels for virtual ports using the QConvergeConsole CLI.

NOTE:

The QoS levels described in this section apply only to SAN and FCoE traffic. These QoS levels do not affect Ethernet traffic QoS levels and NIC traffic bounds.

To modify QoS levels, the configuration must meet the following hardware and software requirements:

- Server operating system: Microsoft Windows 2008
- Server support for message signaled interrupts–extended (MSI-X)
- A QLogic 8100 Series Adapter
- QLogic STOR Miniport Driver 9.1.8.15 or later

Setting QoS by Bandwidth

Setting the QoS by bandwidth allocates up to 80 percent of the physical port's bandwidth to its virtual ports. For the 10Gbps 8100 Series Adapter, this value is 8Gb. The remaining 20 percent (or 2Gb) is reserved to handle non-QoS applications and virtual ports.

Setting QoS by bandwidth guarantees bandwidth for each virtual port and to the application or virtual machine associated with that virtual port. The proper QoS setting can prevent bottlenecks that occur when VMs contend for port bandwidth.

Consider how bandwidth is required to maximize application or virtual machine performance, and set the QoS level to 105 percent of that value. For example, if a mission-critical application on a virtual machine requires 1Gb of bandwidth to transmit its data over the fabric, the recommended bandwidth for the virtual port would be 1.05Gb.

Alternatively, the virtual port QoS values can be set as a percentage of the total available bandwidth.

NOTE:

Setting QoS by bandwidth guarantees a minimum bandwidth to a virtual port but not a maximum limit. If the application/virtual port requires more bandwidth than the QoS bandwidth value allows, and the physical port has available bandwidth, the application will receive the additional bandwidth. The port allocates additional bandwidth on demand up to the port capacity or until there is contention for bandwidth among the virtual ports.

Boot from SAN

For legacy servers, the most common boot method was to boot from a direct-attached disk. When booting from a direct-attached disk, the server BIOS/UEFI locates the SCSI/IDE adapter BIOS, which contains instructions that enable the server to determine which of its internal direct-attach disks is the boot device. This boot method is called *local boot*. Local boot is not fault tolerant, and it does not allow centralized management of operating system images for rapid deployment scenarios and disaster recovery options. While many modern servers provide high-availability local disk configurations through server-based RAID controllers, other issues with local boot are paving the way for alternative boot methods.

The boot-from-SAN method places the boot device on the SAN—not locally on the server, as with direct-attached disks. This boot device is a LUN that resides on a Fibre Channel storage array device. The server communicates with the storage array on the SAN through a Fibre Channel Adapter or a Converged Network Adapter. The adapter boot code (BIOS or UEFI) contains the instructions that enable the server to find the boot disk on the SAN.

Because the boot device resides on the SAN, it simplifies server management. Separating the boot image from each server allows administrators to leverage the advanced capabilities of storage arrays to achieve high availability, improved data integrity, rapid provisioning, and more efficient storage management. Replacing a failed server is as easy as moving the Converged Network Adapter to a new server, pointing it to the SAN boot device, and booting up the new host.

All QLogic 8100 Series Adapters enable a host to boot from any of the supported versions of Microsoft Windows operating on the SAN.

Boot-from-SAN Requirements

Host/Server Requirements

Server requirements depend on the type of server, the SAN installation, and the network environment. Consider the following recommendations:

- If you plan to configure boot-from-SAN on production servers, back up all disks before proceeding.
- Set the boot order in the system BIOS configuration menu: first, the optical drive, then the disk, and then the SAN-boot device. Placing the optical drive at the top of the boot order enables the server to boot from Microsoft Windows installation media and then install the operating system on the SAN boot device. If the boot media is a PXE server (for LAN boot), place the QLogic 8100 Series Adapter at the top of the boot order. For more information about PXE boot, refer to “PXE Boot” on page 6-25.

- If failover capabilities are required during boot-from-SAN, multiple QLogic 8100 Series Adapters are required to create redundant paths to the boot device. Consult the server manufacturer's documentation to determine the maximum number of QLogic 8100 Series Adapters that the server can support.

Converged Network Adapter Requirements

The Converged Network Adapter must meet the following requirements:

- QLogic 8100 Series Adapter with current firmware.
- QLogic 8100 Series Adapter with the boot BIOS is enabled. Typically, the boot BIOS is disabled by default. Disregard this requirement if a UEFI-enabled server is used.
- If failover capabilities are required during boot-from-SAN, multiple QLogic 8100 Series Adapters are required to create redundant paths to the boot device.
- Record the WWPN and WWNN for each adapter prior to installation. The WWPN and WWNN can be found on a label on the adapter.

FCoE Switch Requirements

Ensure that the FCoE switch has the correct zoning configuration according to the following rules:

- Locate the FCoE switch on the SAN that contains the boot LUN so that the FCoE switch is visible to the server through the QLogic adapter.
- The host must have exclusive access to the LUN from which it boots. No other host on the SAN should be able to detect or access the same logical disk.
- Only one instance of the boot LUN can be visible to the server during the initial installation. The installation may fail if multiple instances of the boot LUN are available to the server through different paths or through the same LUN presented through two different storage array controllers. If failover is required, configure boot-from-SAN after the initial installation is complete.
- Limit zones to no more than one adapter port to avoid RSCN interruptions from other hosts in the fabric.

Storage Array Requirements

Some storage arrays cannot support boot-from-SAN for specific environments. Consult the storage array manufacturer's documentation to confirm that the array and the firmware support boot-from-SAN. Consider the storage array and any limitations regarding boot-from-SAN.

Create and present an appropriately sized LUN to the QLogic 8100 Series Adapter port.

Confirm the following:

- The adapter port has exclusive access to this LUN.
- The LUN host type matches the operating system that is to be installed on this LUN.

Each server must have its own dedicated boot LUN. Two servers cannot share the same boot LUN.

Boot-from-SAN Configuration

Boot-from-SAN requires the configuration of the QLogic 8100 Series Adapter, the FCoE switch, and the storage array. How you connect these SAN components is determined by the level of redundancy you require. There are minor differences when configuring the QLogic 8100 Series Adapter for boot-from-SAN between servers that support BIOS and those that support UEFI.

The following subsections describe how to configure the QLogic 8100 Series Adapter and SAN components for boot-from-SAN. The following summarizes the configuration process:

1. Set the boot order to disable boot-from-local-disk, or disconnect the internal hard drives.
2. Configure a single path to the storage array when installing Microsoft Windows. For multiple adapter port configurations (for redundancy), connect only one adapter port to the SAN during installation. The same guidance applies to the storage controller ports.
3. Enable the adapter port BIOS.
4. Specify a boot LUN using the QLogic CNA *Fast!*UTIL BIOS configuration utility.
5. Boot from the optical drive. Install media/PXE boot, and then install the operating system.
6. During the operating system installation process, select the boot LUN as the device on which to install the operating system.
7. Enable multipath (MPIO) configuration on the server after installing the operating system.

Boot-from-SAN Topologies

One of the benefits of SAN adoption, and in turn, boot-from-SAN, is high availability, which is not easily achieved in a local boot scenario. Before configuring boot-from-SAN, you must understand and finalize the level of fault tolerance and high availability required for boot-from-SAN installations. The following sections describe two boot-from-SAN topologies: single-path configuration (least fault tolerant) and multipath configuration (most fault tolerant).

Single-Path Configuration

A single-path configuration is the simplest configuration for boot-from-SAN for QLogic 8100 Series Adapters. The single-path configuration consists of a single adapter port connected to a converged networking switch (FCoE switch), which is then connected to the storage controller (SP) of a storage array. A single-path configuration does not use redundant components, and therefore, is not recommended for mission-critical servers.

However, single-path configuration does offer some degree of fault tolerance because the QLogic 8100 Series Adapter can configure alternate boot LUNs. As shown in Figure 7-6, if the primary boot device (LUN1) fails, or if it is not available at boot time, the QLogic adapter automatically tries to boot from the alternate boot device (LUN2). Up to four alternate boot devices can be configured, which provides failover protection by redirecting the boot device without user intervention.

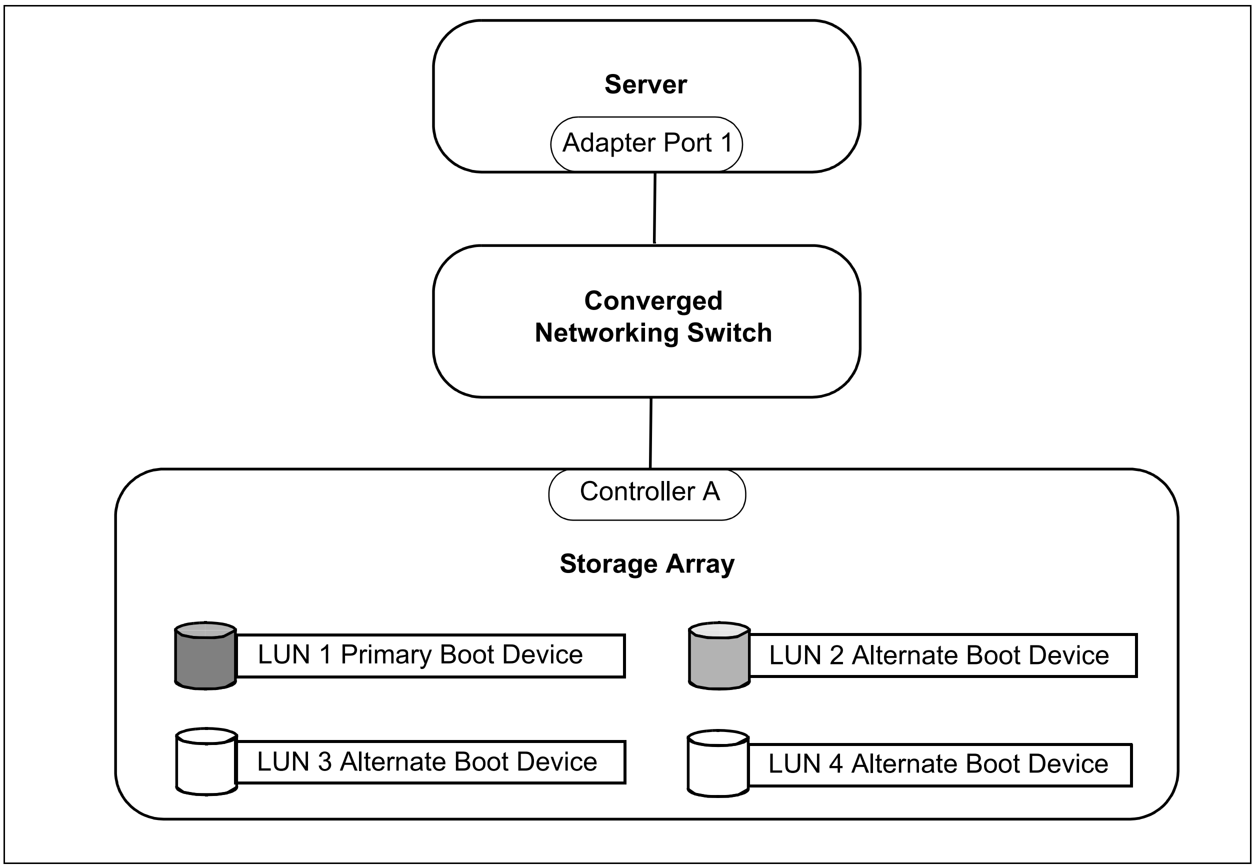


Figure 7-6. Single-Path Topology

Multipath Topology

Multipath topology provides fault tolerance through redundant SAN components: two adapter ports, two converged networking switches, and access to the boot LUNs through two independent storage array controllers. Figure 7-7 shows the SAN components and their connections. The server has access to the primary and alternate boot LUNs through two independent paths. A single point of failure is unlikely to with this configuration. You can enhance this configuration further by adding more adapter ports that connect to the converged networking switches. This added level of redundancy protects against adapter board failures.

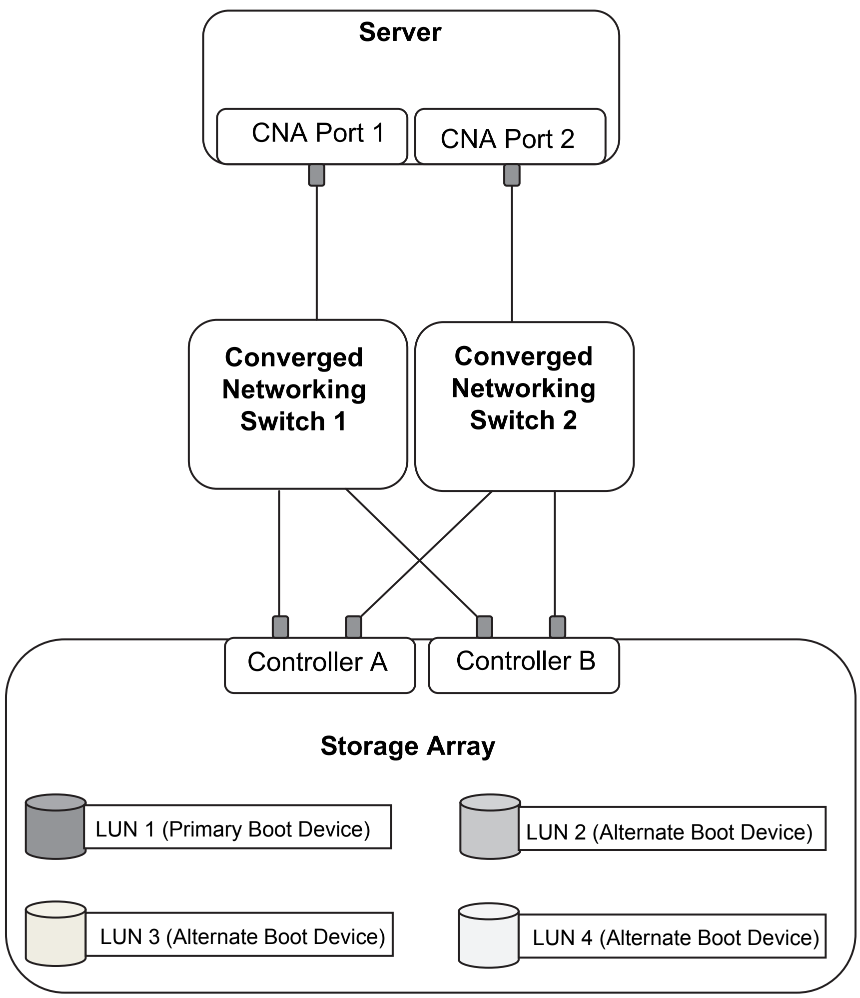


Figure 7-7. Multipath Topology

Configuring an Adapter to Boot-from-SAN

This section describes how to configure a QLogic 8100 Series Adapter to boot the Microsoft Windows operating system from the SAN.

1. Install the QLogic 8100 Series Adapter, and update the firmware, if necessary. For information about updating the firmware, refer to "Firmware Upgrades" on page 3-33.

2. Connect the SAN components in a single-path topology, as shown in Figure 7-6. If a multipath topology is required, make the necessary additions and connections after the initial operating system installation.

3. Power up the server.

   - If this is a BIOS server, press CTRL+Q or ALT+Q while the server is booting to open the QLogic *Fast!*Util BIOS configuration utility. Proceed to Step 4.

   - If this is a UEFI server, select **EFI Shell** from the EFI Boot manager menu while the server is booting. Proceed to Step 5.

4. Configure the BIOS server. For information about configuring an UEFI server, proceed to Step 5.

   a. Configure the switch with a zone that includes the adapter port and one storage array port using either soft zoning (WWPN-based) or hard zoning (port number-based), and enable the zone. Soft zoning is recommended because if a server malfunctions, you can move the adapter to another host without reconfiguration.

   b. Create an appropriately-sized LUN on the storage array. The LUN size depends on the operating system to be installed. Add this LUN to a host group containing the QLogic adapter.

   c. Set the host type/mode for the host group that corresponds to the operating system to be installed.

   d. For Windows XP, the boot LUN must be LUN 0. For specific instructions, refer to the storage array documentation.

   e. In the QLogic *Fast!*UTIL BIOS configuration utility on the server, select the adapter port in the Select Host Adapter menu, and then press ENTER.

   f. Select Configuration Settings from the *Fast!*UTIL Options menu, and then press ENTER.

   g. Select Adapter Settings from the Configuration Settings menu, and then press ENTER.

   h. Change Host Adapter BIOS to `Enabled` in the Adapter Settings menu, and then press Enter.

i. Press ESC to return to the Configuration Settings menu. Select Selectable Boot Settings, and then press Enter.

j. Enable the Selectable Boot option in the Selectable Boot Settings menu. Move the cursor to the Selectable Boot option, and then press ENTER (Figure 7-8).

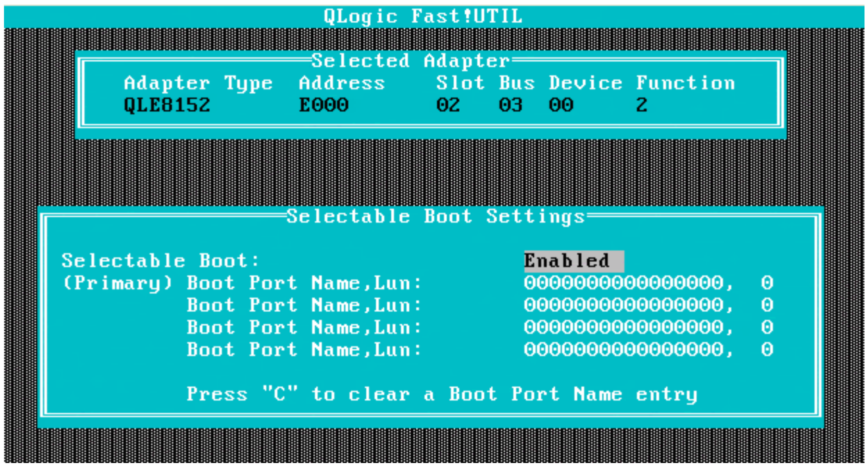


Figure 7-8. Selectable Boot Settings Menu

k. Specify the primary boot LUN. Move the cursor to (Primary) Boot Port Name, Lun option. Type the LUN number, and then press ENTER. The adapter scans the available devices.

l. Specify the alternate boot LUNs. Move the cursor to the Boot Port Name, Lun fields, select the device from which to boot in the Select Fibre Channel Device menu, and then press ENTER. This device is the LUN that you created on the storage array in Step b.

m. Press ESC twice—the utility prompts you to save the settings.

n. Press ESC to exit the *Fast!*UTIL BIOS configuration utility.

o. Select Reboot System from the Exit *Fast!*UTIL menu.

NOTE:

For information about using the QLogic 8100 Series *Fast!*UTIL BIOS configuration utility, refer to “Fast!UTIL” on page 9-2.

---

5. Configure the UEFI server (Windows Server 2008 only). To configure a BIOS server, refer to Step 4. The boot-from-SAN configuration process for UEFI servers depends on the server make and model. The following instructions configure the adapter for boot-from-SAN using the EFI shell. If a UEFI shell is not available on the server being configured, consult the server documentation for information about obtaining a shell or for alternate ways to configure the adapter.

    a. When the server is booting up, select EFI shell from the EFI Boot Manager menu.

    b. In the EFI shell, type the following command to display a list of installed EFI drivers:

    ```
    drivers
    ```

    c. Under the heading DRIVER NAME, find the driver with name *QLogic Fibre Channel Driver*. Locate the DRV column, and make note of the driver handle number.

    d. Display the list of adapters that are managed by this driver by issuing the following command.

    ```
    drvcfg <driverhandle>
    ```

    Locate and note the controller handle number inside the brackets labeled `Ctrl [ ]`.

    e. Configure the switch with a zone that includes the adapter port and one storage array port using either soft zoning (WWPN-based) or hard zoning (port number-based), and enable the zone. Soft zoning is recommended because, if a server malfunctions, you can move the adapter to another host without reconfiguration.

    f. Create an appropriately sized LUN on the storage array. The LUN size depends on the operating system to be installed. Add this LUN to a host group containing the QLogic adapter.

    g. Set the host type/mode for the host group that corresponds to the operating system to be installed. For Windows XP, the boot LUN must be LUN 0. For specific instructions, refer to the storage array documentation.

    h. At the EFI shell, enter the following command to start the EFI driver configuration protocol.

    ```
    drvcfg -s <driverhandle> <controllerhandle>
    ```

i. Select Show Translation, under Information, from the Driver Configuration Main Menu (Figure 7-9). This option displays the target and LUN information.

```
Main Menu
 NVRAM Parameters
  1. Edit Adapter Settings
  2. Edit Advanced Settings
  3. Edit Database
  4. Edit Boot Settings
 Information
  5. Show Database
  6. Show Translation
  7. Show NVRAM Buffer
  8. Info
  9. Help
 Operation
  10. Abandon
  11. Write
  12. Quit
```

Figure 7-9. Driver Configuration Main Menu

j. Confirm that the LUN you created in Step f appears in the list, and make note of the WWPN and LUN number. Press ENTER to return to the Main Menu.

k. Select Edit Database, under NVRAM Parameters, from the Configuration Main Menu.

l. Enter the WWPN and LUN number of the primary and alternate boot device.

m. Return to the Driver Configuration Main Menu, and select Edit Boot Settings under NVRAM Parameters.

n. Enable both Selective Login and Selective LUN Logins (Figure 7-10). Enabling Selective Logins restricts the discovery of targets [WWPNs] to what is specified in the database as a boot device. Enabling Selective LUN Logins restricts the discovery of LUNs to what is specified in the database as a boot device LUN number.

```
Edit Boot Settings

 0. Previous Menu
 1. Enable Alternate Boot Device [n]
 2. Enable Selective Login [n]  Y
 3. Enable Selective LUN Logins [n]  Y
 4. OS Mode [Windows/Linux/Other]
 5. EFI Variable EFIFCSanLevel [1]
 6. Enable World Login [n]
```

Figure 7-10. Edit Boot Settings Menu

o. Return to the Main Menu, and select Write under Operation.

p. Select Quit from the driver configuration Main Menu to return to the EFI shell.

q. At the EFI shell, enter the following command to reboot the server:

```
reset
```

NOTE:

For information about using the QLogic 8100 Series EFI utilities and driver configuration, refer to "Configuration Settings" on page 9-4.

---

4. Insert the Windows installation media in the optical drive on the server; the windows installation process starts automatically.

   The adapter drivers must be installed on the server during the installation of the operating system. For information about installing drivers, refer to "Installing Software" on page 3-7.

5. After the operating system installation is complete and the server reboots, type the appropriate key sequence to open the system BIOS/EFI Boot Manager.

6. Set the SAN boot device (QLogic adapter for BIOS; fibre disk for UEFI) at the top of the boot order.

7. To configure a multipath/load-balanced boot-from-SAN configuration:
   a. Connect the second adapter port, as shown in Figure 7-7.
   b. Modify the storage array configuration to present the primary and alternate boot LUNs to both storage array controllers.
   c. Modify switch zoning to ensure that the second adapter port has access to both storage array controllers.
   d. Install Microsoft MPIO or the storage array vendor's multipath solution onto the Microsoft Windows operating system.
   e. Repeat Steps 4 or 5 to configure the a second adapter port to provide failover for the boot-from-SAN device.

For more information from Microsoft about configuring boot-from-SAN for Windows operating systems, see http://www.microsoft.com/downloads/details.aspx?FamilyID=f4095fae-553d-4700-aafa-1cce38b5618f&displaylang=en.

8 Configuring FCoE in a Linux Environment

Overview

The QLogic 8100 Series Converged Network Adapter is dual-function adapter comprising FCoE and NIC functions. This section describes the characteristics, configurations and features of the QLogic 8100 Series Adapter FCoE function for Linux.

FCoE Driver Parameters for Linux

Table 8-1 lists the FCoE driver parameters for Linux, their default values, allowed values, and configuration methods. For information about changing parameter values, refer to the FCoE topics in the QConvergeConsole Help or the *Fast!*UTIL configuration options described in "Fast!UTIL" on page 9-2.

Table 8-1. FCoE Driver Parameters for Linux

Parameter	Description	Default	Range	Configuration Method
ql2xlogintimeout	Login timeout value in seconds during the initial login.	20	1–120 seconds	modprobe, sysfs
qlport_down_retry	Time to wait for a port that returns a PORT-DOWN status before returning I/O back to the operating system.	30	1–60 seconds	modprobe, sysfs
ql2xplogiabsentdevice	Enables or disables PLOGI to devices that are not present after a fabric scan.	0	0—Disable 1—Enable	modprobe, sysfs
ql2xloginretrycount	Alternate value for the NVRAM login retry count.	8	1–16	modprobe, sysfs
ql2xallocfwdump	Enables or disables memory allocation for a firmware dump during adapter initialization.	1	0—Disable 1—Enable	modprobe, sysfs

Table 8-1. FCoE Driver Parameters for Linux

Parameter	Description	Default	Range	Configuration Method
ql2xextended_error_logging	Enables or disables the driver to print verbose logging information.	0	0—Disable 1—Enable	modprobe, sysfs
ql2xdevdiscgoldfw	Enables or disables device discovery with golden firmware.	0	0—Disable 1—Enable	modprobe, sysfs
ql2xfdmienable	Enables or disables FDMI registration.	0	0—Disable 1—Enable	modprobe, sysfs
ql2xmaxqdepth	Maximum queue depth reported to SCSI mid-level per device. The queue depth specifies the number of outstanding requests per LUN.	32	32	modprobe, sysfs
ql2xqfulltracking	Enables or disables driver tracking of queue full-status returns, and dynamically adjusts a SCSI device's queue depth.	1	0—Disable 1—Enable	modprobe, sysfs
ql2xqfullrampup	Time to wait before increasing the queue depth for a device after a queue-full condition has been detected.	120	120 seconds	modprobe, sysfs
ql2xenablemsix	Enables or disables MSI-X interrupt mechanisms.	1	0—Disable 1—Enable	modprobe, sysfs
ql2xetsenable	Enables or disables firmware ETS burst.	0	0—Disable 1—Enable	modprobe, sysfs
Operation Mode	Number of reduced interrupt operation (ZIO) modes. ZIO modes allow the posting of multiple command completions in a single interrupt.	0	0, 5, 6	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI

Table 8-1. FCoE Driver Parameters for Linux

Parameter	Description	Default	Range	Configuration Method
Interrupt Delay Timer	The time interval, in 100ms increments, between the response queue update and the interrupt generation. This parameter can be specified only if the Operation Mode parameter is enabled. Otherwise, this parameter is set to zero. This parameter should be set to zero unless the Operation Mode parameter is set to 5 or 6. The interrupt is not generated if the host updates the Response Queue Out-Pointer Register during this interval. The default is zero, which corresponds to an interval of two hours.	0	0–255	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI
Spin-up delay	Time that the adapter port waits before scanning the channel for devices.	0	0–2 seconds	*Fast!*UTIL
Frame Size	Maximum frame length of a Fibre Channel frame created by that adapter for encapsulation in an Ethernet frame.	2,048	512, 1,024, 2,048	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI
Enable hard loop ID	Enables or disables the adapter hard loop ID on the Fibre Channel bus. This parameter may be necessary on some bus configurations when devices do not appear.	0	0—Disabled 1—Enabled	QConverge-Console CLI
Enable extended error logging	Enables or disables the logging of driver-detected events that occur in the driver or the Fibre Channel bus.	0	0—Disabled 1—Enabled	modprobe

Table 8-1. FCoE Driver Parameters for Linux

Parameter	Description	Default	Range	Configuration Method
Execution throttle	Maximum number of commands that a port can execute at one time. When a port reaches its execution throttle, the port can execute no new commands until the current command execution is complete.	65,535	1–65,535	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI
Login Retry Count	Number of times that the software tries to log in to a device.	8	0–255	*Fast!*UTIL, modprobe, QConverge-Console GUI, or QConverge-Console CLI
Port Down Retry Count	Time to wait before reissuing a command to a port that is down.	30	0–255 seconds	*Fast!*UTIL, modprobe. QConverge-Console GUI, or QConverge-Console CLI
Link Down Timeout	Time to wait for a link to come up.	30	0–240 seconds	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI
LUNs per Target	Number of LUNs per target. Multiple LUN support is typically of RAID boxes that use LUNs to map drives.	128	0, 8, 16, 32, 64, 128, 256	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI
Enable LIP Full Login	Enables or disables the ISP chip to log in to all ports after a LIP.	1	0—Disabled 1—Enabled	QConverge-Console GUI or QConverge-Console CLI
Enable Target Reset	Enables or disables drivers to issue a Target Reset command to all devices on the loop when a SCSI Bus Reset command is issued.	1	0—Disabled 1—Enabled	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI

Table 8-1. FCoE Driver Parameters for Linux

Parameter	Description	Default	Range	Configuration Method
Enable OoOFR	Enables or disables out-of-order frame reassembly. This parameter reassembles out-of-order frames as they are received, minimizing network congestion by eliminating the re-transmission of frames and exchanges.	0	0—Disabled 1—Enabled	QConverge-Console GUI or QConverge-Console CLI
Enable HBA Port Hard Loop ID	This setting forces the adapter to attempt to use the ID that is specified in the Hard Loop ID setting. If the host bus adapter hard loop ID is enabled, the adapter attempts to use the ID that is specified in this setting. The default ID is 0. Set this ID to a unique value from 0 through 125, if more than one adapter is connected to a FC-AL loop and the host bus adapter hard loop ID is enabled.	0	0–125	QConverge-Console GUI or QConverge-Console CLI
Enable HBA Port BIOS	Enables or disables the host bus adapter BIOS. You must enable this parameter if you are starting from a Fibre Channel disk drive that is attached to the PCIe slot. Disabling this parameter disables the ROM BIOS on the adapter, freeing space in upper memory.	0	0—Disabled 1—Enabled	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI
Loop Reset Delay	Time to wait before initiating loop activity after the firmware resets the loop.	5	0–255 seconds	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI

Table 8-1. FCoE Driver Parameters for Linux

Parameter	Description	Default	Range	Configuration Method
Enable Fibre Channel Tape Support	Enables or disables FCP-2 recovery. Disable this parameter if the Fibre Channel adapter is connected to a storage subsystem. Most storage subsystems do not support sending I/O from the same Fibre Channel adapter to both a storage subsystem and a tape device.	1	0—Disabled 1—Enabled	*Fast!*UTIL, QConverge-Console GUI, or QConverge-Console CLI
Enable LIP Reset	Type of loop initialization process (LIP) reset to use when the operating system initiates a bus reset routine. Enabling this parameter initiates a global LIP reset to clear the target device reservations. Disabling this parameter initiates a global LIP reset with full log in.	0	0—Disabled 1—Enabled	QConverge-Console GUI or QConverge-Console CLI

Configuring Driver Parameters Using modprobe

The `modprobe` Linux utility intelligently adds or removes a module from the Linux kernel, and is available with RHEL 5. Adapter driver parameter modifications that you make with modprobe require that you either reload the driver (nonpersistent change), or reboot the server (persistent change).

Reloading the QLogic FCoE driver (qla2xxx) for nonpersistent changes does not interrupt the adapter's NIC function (qlge). Neither does reloading the QLogic NIC driver interrupt the FCoE function. Use modprobe to make nonpersistent changes only if the driver parameter cannot be changed using any other method.

Making Nonpersistent Changes Using modprobe

Nonpersistent changes are not preserved across server reboots. To make nonpersistent changes to adapter driver parameters using `modprobe`:

1. Unload the QLogic FCoE driver module. For example:

```
#modprobe -r qla2xxx
```

2. Load the QLogic FCoE driver module, and specify one or more parameters separated by a space. The following example enables MSI-X and Extended Error Logging:

   ```
   #modprobe -v qla2xxx ql2xenablemsix =1
   ql2xextended_error_logging=1
   ```

3. Verify the parameter changes by issuing the following commands:

```
#cat /etc/bus/pci/drivers/qla2xxx/module/parameters/ql2xenablemsix
#cat /etc/bus/pci/drivers/qla2xxx/module/parameters
/ql2xextended_error_logging
```

Making Persistent Changes Using modprobe

Persistent changes are preserved across server reboots. To make persistent changes to adapter driver parameters:

1. Open the file `/etc/modprobe.conf` in read/write mode using a Linux editor by issuing the following command:

   ```
   #vi /etc/modprobe.conf
   ```

2. Add the options line for the appropriate driver parameter by issuing the following command:

   ```
   options qla2xxx ql2xenablemsix=1 ql2xextended_error_logging=1
   ```

   Figure 8-1 shows the result.

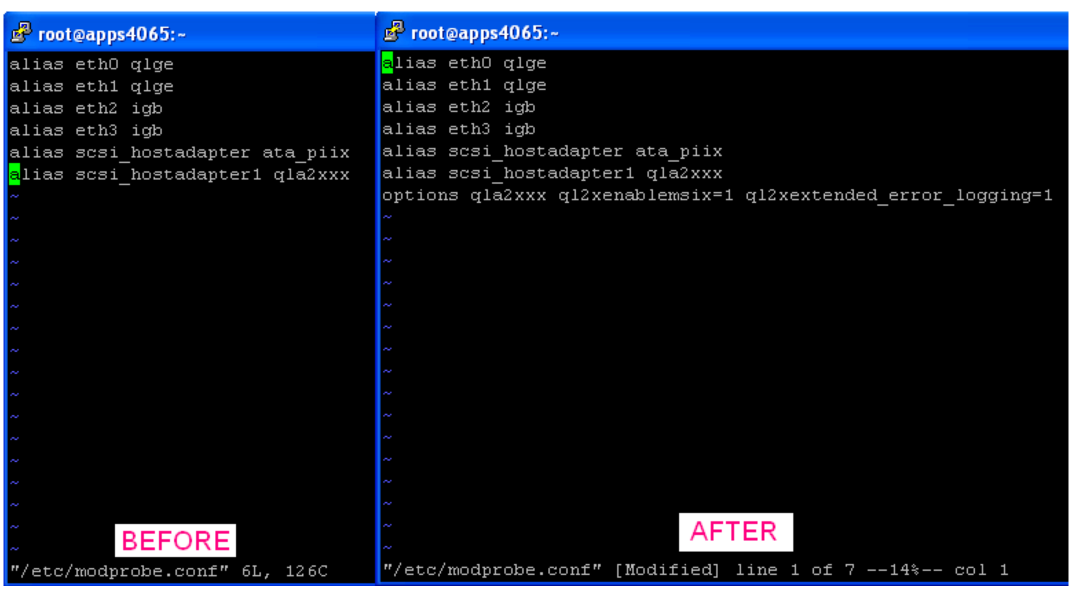


Figure 8-1. Adding the Options Line to modprobe.conf

3. Save and exit the file `etc/modprobe.conf`.
4. Create a new RAMDISK (`initrd` image):
   a. Change to the directory that contains the RAMDISK images by issuing the following command:

      ```
      # cd /boot
      ```

   b. Create a backup copy of the RAMDISK (`initrd`) image by issuing the following command:

      ```
      # cp initrd-[kernel version].img initrd-[kernel
      version].img.bak
      ```

   c. Generate a new RAMDISK image containing the updated FCoE driver by issuing the following command:

      ```
      # mkinitrd -f initrd-[kernel version].img `uname -r`
      ```

      Depending on the server hardware, the RAMDISK file name may be different. The command is successful, if there is no output.

   d. Reboot the server to activate the new RAMDISK image by issuing the following command:

      ```
      # shutdown -r now
      ```

5. After a successful reboot, verify the changes by issuing the following commands:

```
#cat /etc/bus/pci/drivers/qla2xxx/module/parameters/ql2xenablemsix
#cat /etc/bus/pci/drivers/qla2xxx/module/parameters/
ql2xextended_error_logging
```

Configuring Driver Parameters Using sysfs

The `sysfs` virtual file system, provided by Linux 2.6 kernels, is available in RHEL 5. It exports information about supporting devices and drivers from the kernel device model into user space.

The `sysfs` virtual file system also configures devices and drivers. Changes that you make to adapter driver parameters are effective immediately, and do not interrupt the adapter I/O operations. Using `sysfs`, changes are not persistent across reboots or driver reloads.

Table 8-2 lists `sysfs` locations and the parameters that can be modified through these locations.

Table 8-2. FCoE Driver Parameters that can be Modified with Sysfs

Sysfs Location	Driver Parameters
/sys/module/qla2xxx/parameters	ql2xmaxqdepth ql2xplogiabsentdevice ql2xqfullrampup ql2xqfulltracking
/sys/class/scsi_host/hostX/	zio (operation mode) zio_timer (interrupt delay timer)

To modify FCoE driver parameters using `sysfs`:

1. Change to the `sysfs` location where the driver parameter resides by issuing the following command:

   ```
   #cd /sys/module/qla2xxx/parameters
   ```

2. Modify the `sysfs` entry for the corresponding driver parameter. The following example sets the maximum queue depth to 64:

   ```
   #echo 64 > ql2xmaxqdepth
   ```

3. Verify the changes. The following example should report 64, if the previous command was successful.

   ```
   #cat /sys/module/qla2xxx/parameters/ ql2xmaxqdepth
   ```

Configuring FCoE Parameters Using QLogic Utilities

Table 8-3 describes some of the features and characteristics of the QLogic QConvergeConsole and *Fast!*Util utilities. These utilities manage the QLogic 8100 Series Adapters in a Linux environment.

Table 8-3. QConvergeConsole and Fast!UTIL Comparison

Utility	Installation Required for RHEL 5	Online or Offline	How to Access
Agent (qlremote), QConvergeConsole GUI, or QConverge-Console CLI	Yes	Online, requires a functioning operating system to run	Download from http://driver-downloads.qlogic.com/. For information about installing QLogic utilities, refer to "Management Tool Installation" on page 4-26.
*Fast!*UTIL	No	Offline, runs from the code resident on the adapter. The operating system is not required to make changes.	Press CTRL+Q at the QLogic BIOS prompt during system startup. For more information, refer to "Offline Utilities" on page 9-1.

Configuring FCoE Driver Parameters Using QConvergeConsole

For information about installing and launching the QConvergeConsole GUI, refer to "Management Tool Installation" on page 4-26.

You can configure most of the adapter FCoE driver parameters using QConvergeConsole GUI. The application presents the driver parameters as HBA parameters and advanced HBA parameters, as shown in Table 8-4.

Table 8-4. QConvergeConsole GUI FCoE Driver Parameters

HBA Parameters	Advanced HBA Parameters
Frame Size Enable HBA Port Loop ID Hard Loop ID Loop Reset Delay Enable HBA Port BIOS Enable Fibre Channel Tape Support	Operation Mode Interrupt Delay Timer Execution Throttle Login Retry Count Port Down Retry Count Link Down Timeout LUNs Per Target Enable LIP Full Login Enable Target Reset Enable OoOFR

To configure a parameter from the list of HBA parameters:

1. Expand the port number in the system tree (left pane) of the QConvergeConsole browser window.
2. Click the FCoE port node.
3. Click the **Parameters** tab in the right pane, as shown in Figure 8-2.

Figure 8-2. QConvergeConsole HBA Parameters

To configure a parameter from the list of advanced HBA parameters:

1. Expand the port number in the system tree (left pane) of the QConvergeConsole browser window.
2. Click the FCoE port node.
3. Click the **Parameters** tab in the right pane.
4. Click the **Advanced HBA Parameters** subtab, as shown in Figure 8-3.

Figure 8-3. QConvergeConsole Advanced HBA Parameters

Configuring FCoE Driver Parameters Using Fast!UTIL

You can configure most of the adapter FCoE driver parameters using the *Fast!*UTIL utility. The application presents the driver parameters as adapter settings and advanced adapter settings, as shown in Table 8-4.

For information about using the *Fast!*UTIL BIOS utility, refer to “Fast!UTIL” on page 9-2. For information about configuring driver parameters on an EFI server, refer to “EFIUTIL” on page 9-16.

Table 8-5. Fast!UTIL FCoE Driver Parameters

Adapter Settings	Advanced Adapter Settings
Host Adapter BIOS Frame Size Loop Reset Delay Spinup Delay Fibre Channel Tape Support	Execution Throttle LUNs Per Target Enable Target Reset Login Retry Count Port Down Retry Count Link Down Timeout Operation Mode Interrupt Delay Timer Enable Interrupt EV Controller Order Primary FCF VLAN ID

To configure FCoE configuration settings using *Fast!*UTIL:

1. Select the **Select Host Adapter** option.
2. Select **Configuration Settings**.
3. Select **Adapter Settings**, as shown in Figure 8-4.

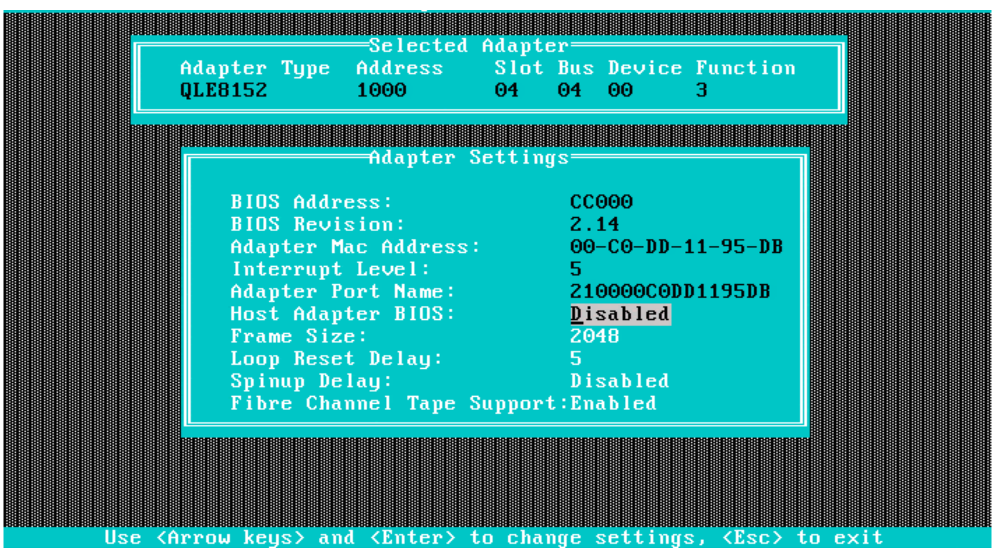


Figure 8-4.** Fast!**UTIL Adapter Settings

To configure advanced adapters settings using *Fast!*UTIL:

1. Select the **Select Host Adapter** option.
2. Select **Configuration Settings**.
3. Select **Advanced Adapter Settings**, as shown in Figure 8-4.

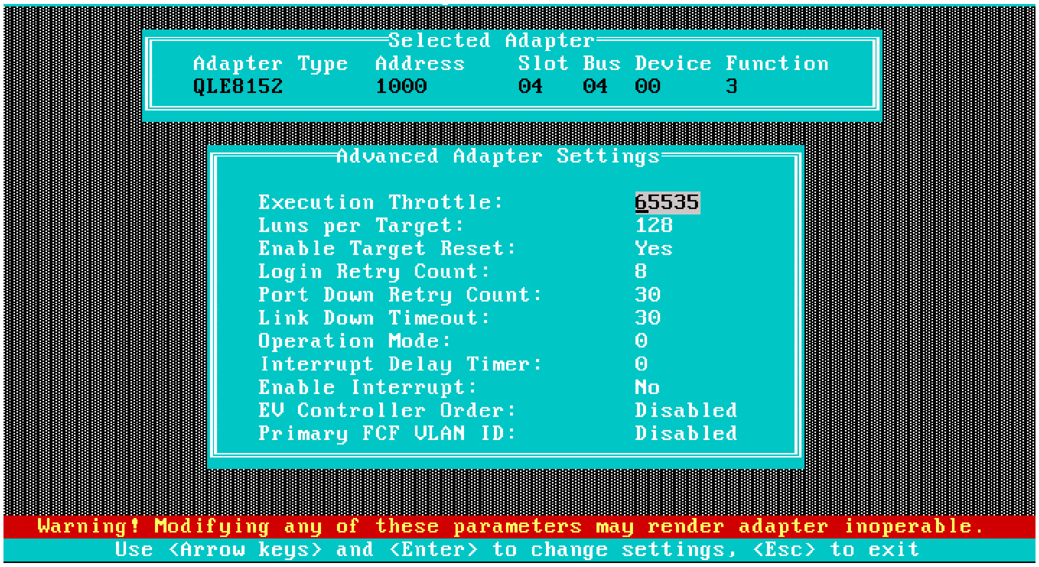


Figure 8-5. Fast!UTIL Advanced Adapter Settings

Displaying FCoE Driver Parameters Using sysfs

Table 8-6 lists the FCoE driver parameters and `sysfs` locations by which you can display parameter values using sysfs. For information about configuring FCoE driver parameters using sysfs, refer to “Configuring Driver Parameters Using sysfs” on page 8-8.

Table 8-6. sysfs FCoE Driver Parameters and File Locations

Sysfs Location	Parameters	Description
`/sys/module/qla2xxx/parameters`	ql2xallocfwdump ql2xdevdiscgoldfw ql2xenablemsix ql2xetsenable ql2xextended_error_logging ql2xfdmienable ql2xfwloadbin ql2xloginretrycount ql2xlogintimeout ql2xmaxqdepth (w) ql2xplogiabsentdevice (w) ql2xqfullrampup (w) ql2xqfulltracking (w) qlport_down_retry (w)	Refer to "FCoE Driver Parameters for Linux" on page 8-1.
`/sys/class/fc_host/hostX/`	device ->	Link to the physical PCI device
	fabric_name	Fabric WWPN
	issue_lip (wo)	Force the port to issue a LIP
	node_name	Converged Network Adapter port WWNN
	port_id	Converged Network Adapter port ID
	port_name	Converged Network Adapter port WWPN
	port_state	Current port state (online, offline)
	port_type	Fibre Channel port type. For example: F_Port
	speed	Current negotiated link speed
	statistics	Detailed Fibre Channel statistics

Table 8-6. sysfs FCoE Driver Parameters and File Locations

Sysfs Location	Parameters	Description
/sys/class/fc_host/hostX/	subsystem ->	Link to the base subsystem class
	supported_classes	Fibre Channel service class supported by the adapter
	supported_speeds	Link speeds supported by the adapter (10Gb)
	symbolic_name	String containing the Converged Network Adapter model, FCoE firmware version, and qla2xxx driver version
	system_hostname (w)	Assign and acquire a name for this port
	tgtid_bind_type (w)	Type of target binding required: WWPN or port ID
/sys/class/fc_host/hostX/statistics	dumped_frames	Number of frames dumped because of a lack of host buffers
	error_frames	Number of Fibre Channel frames with errors
	fcp_control_requests	Number of FCP control requests
	fcp_input_megabytes	Total FCP traffic received (MB)
	fcp_input_requests	Total number of FCP frames received
	fcp_output_megabytes	Total FCP traffic transmitted (MB)
	fcp_output_requests	Total number of FCP frames transmitted
	invalid_crc_count	Number of frames received with an invalid CRC checksum
	invalid_tx_word_count	Number of invalid words transmitted
	link_failure_count	Number of times the link has failed. This number is affected by SFP removals, or cable disconnections, or a bad fiber element.
	lip_count	Loop initialization primitive sequence count. The primitive sequence applies only to the loop topology, and is transmitted by an L_Port to initialize the loop.
	loss_of_signal_count	Number of times the signal on the link was lost

Table 8-6. sysfs FCoE Driver Parameters and File Locations

Sysfs Location	Parameters	Description
`/sys/class/fc_host/hostX/statistics`	loss_of_sync_count	Number of times synchronization is lost
	nos_count	Not operational primitive sequence (NOS) count. This primitive sequence is used during link initialization between two N_Ports in the to-point topology or between an N_Port and an F_Port. This primitive sequence indicates that the transmitting port has detected a link failure, or the transmitting port is offline. The expected response an NOS primitive is the OLS primitive.
	prim_seq_protocol_err_count	Number of errors encountered by the LR, LRR, NOS, OLS, LIP, LPB, and LPE primitive sequences.
	reset_statistics (w)	Resets the adapter statistics
	rx_frames	Total number of frames received since the last reset_statistics
	rx_words	Total number of words received since the last reset
	seconds_since_last_reset	Time (seconds) that has elapsed since the last port reset
	tx_frames	Number of frames transmitted
	tx_words	Number of words transmitted
`/sys/class/scsi_host/hostX/`	84xx_fw_version	Not applicable
	Beacon (w)	Enables or disables adapter port beaconing
	cmd_per_lun	Number of commands allowed per LUN
	device ->	Link to the physical PCI device
	driver_version	qla2xxx driver version
	flash_block_size	Block size used for transactions with the adapter flash memory

Table 8-6. sysfs FCoE Driver Parameters and File Locations

Sysfs Location	Parameters	Description
`/sys/class/scsi_host/hostX/`	fw_state	Firmware state
	fw_version	FCoE firmware version
	isp_id	Unused
	isp_name	QLogic adapter ASIC model number identifier
	max_npiv_vports	Maximum number of NPIV ports that are allowed per physical port
	model_desc	Full name of the QLogic Converged Network Adapter. For example: QLogic PCI-Express Dual Channel 10GbE CNA
	model_name	QLogic Converged Network Adapter model number
	mpi_version	MPI (NIC) firmware version
	npiv_vports_inuse	Number of NPIV ports currently in use
	optrom_bios_version	BIOS version on the Converged Network Adapter
	optrom_efi_version	Converged Network Adapter EFI version
	optrom_fcode_version	Converged Network Adapter FCode version
`/sys/class/scsi_host/hostX/`	optrom_fw_version	Converged Network Adapter firmware version
	pci_info	PCIe negotiated speed and lanes
	phy_version	PHY firmware version—QLogic 815*x* Series Adapters only
	proc_name	Process name
	Scan (w)	Scan for adapters
	serial_num	Not applicable
	sg_tablesize	Maximum size of the scatter gather list
	state (w)	Link status and port type

Table 8-6. sysfs FCoE Driver Parameters and File Locations

Sysfs Location	Parameters	Description
/sys/class/scsi_host /host*X*/	subsystem ->	Link to the subsystem class
	total_isp_aborts	Total number of abort requests sent to the Converged Network Adapter ASIC
	Uevent (w)	Update event
	unique_id	Unique ID
	vlan_id	VLAN ID used for FCoE frames
	vn_port_mac_address	Virtual node port MAC address
	vport_create (w)	Create a virtual NPIV port. Refer to "Creating Virtual Ports" on page 8-25.
	vport_delete (w)	Delete a virtual NPIV port. Refer to "Deleting Virtual Ports" on page 8-27.
	zio (w)	Interrupt mode. Refer to "Operation Mode (ZIO)" on page 8-22.
	zio_timer (w)	Interrupt delay timer. Refer to "Interrupt Delay Timer (zio_timer)" on page 8-22.
/proc/scsi/	scsi	List of SCSI devices, vendor names, and model numbers for the SCSI devices seen by the host. LUNs that are visible through the adapter port are also listed with local SCSI hard disk drives.

Identifying the SCSI Host ID

To identify the SCSI host ID:

1. List the PCIe bus and search for the QLogic devices. For example:

   ```
   #lspci | grep "QLogic Corp"
   ```

2. Locate the QLogic 8100 Series Adapter entries in the search list (Figure 8-6), and record the PCI bus ID for each adapter port.

```
root@apps4065:/sys/bus/pci/drivers/qla2xxx
[root@apps4065 qla2xxx]# lspci | grep QLogic
85:00.0 Ethernet controller: QLogic Corp. 10GbE Converged Network Adapter (TCP/IP Networking) (rev 02)
85:00.1 Ethernet controller: QLogic Corp. 10GbE Converged Network Adapter (TCP/IP Networking) (rev 02)
85:00.2 Fibre Channel: QLogic Corp. 10GbE Converged Network Adapter (FCoE) (rev 02)
85:00.3 Fibre Channel: QLogic Corp. 10GbE Converged Network Adapter (FCoE) (rev 02)
[root@apps4065 qla2xxx]#
```

Figure 8-6. Locating QLogic 8100 Adapter PCI Devices

Figure 8-6 shows PCI bus device IDs 85:00.2 and 85:00.3 for the two FCoE adapter ports.

3. Search the qla2xxx driver to verify that the driver is managing the PCI bus device ID as 85:00.2 and 85:00.3. For example:

   #**ls -l /sys/bus/pci/drivers/qla2xxx**

   The search list in Figure 8-7 shows that the PCI device IDs, 85:00.2 and 85:00.3, are listed under the qla2xxx section in sysfs.

```
[root@apps4065 qla2xxx]# pwd
/sys/bus/pci/drivers/qla2xxx
[root@apps4065 qla2xxx]#
[root@apps4065 qla2xxx]# ls -l
total 0
lrwxrwxrwx 1 root root    0 Jun 10 22:17 0000:85:00.2 -> ../../../../devices/pci0000:80/0000:80:07.0/0000:85:00.2
lrwxrwxrwx 1 root root    0 Jun 10 22:17 0000:85:00.3 -> ../../../../devices/pci0000:80/0000:80:07.0/0000:85:00.3
--w------- 1 root root 4096 Jun 10 22:17 bind
lrwxrwxrwx 1 root root    0 Jun 10 22:17 module -> ../../../../module/qla2xxx
--w------- 1 root root 4096 Jun 10 22:17 new_id
--w------- 1 root root 4096 Jun 10 22:17 remove_id
--w------- 1 root root 4096 Jun 10 22:17 unbind
[root@apps4065 qla2xxx]#
```

Figure 8-7. Identifying the Adapter Port PCI Device ID

3. List the contents of the soft link for the device ID. For example:

   #**cd /sys/bus/pci/drivers/qla2xxx**
   #**ls -l 0000:85:00.2/host***

4. Locate the host* entries in the search list (Figure 8-8) to determine the SCSI host ID.

```
[root@apps4065 qla2xxx]#
[root@apps4065 qla2xxx]# ls -l 0000:85:00.2/host*
total 0
-rw------- 1 root root    0 Jun 10 22:19 ct
-r-------- 1 root root    0 Jun 10 22:19 dcbx_tlv
-rw------- 1 root root    0 Jun 10 22:19 els
lrwxrwxrwx 1 root root    0 Jun 10 22:19 fc_host:host6 -> ../../../../../class/fc_host/host6
-rw------- 1 root root    0 Jun 10 22:19 fw_dump
-rw------- 1 root root  512 Jun 10 22:19 nvram
-rw------- 1 root root    0 Jun 10 22:19 optrom
--w------- 1 root root    0 Jun 10 22:19 optrom_ctl
drwxr-xr-x 2 root root    0 Jun 10 22:12 power
--w------- 1 root root    0 Jun 10 22:19 reset
lrwxrwxrwx 1 root root    0 Jun 10 22:19 scsi_host:host6 -> ../../../../../class/scsi_host/host6
-rw------- 1 root root  512 Jun 10 22:19 sfp
--w------- 1 root root 4096 Jun 10 22:19 uevent
-rw------- 1 root root    0 Jun 10 22:19 vpd
[root@apps4065 qla2xxx]# pwd
/sys/bus/pci/drivers/qla2xxx
```

Figure 8-8. Identifying the SCSI Host ID

Figure 8-8 shows that the QLogic 8100 Series Adapter FCoE function at PCI device ID 85:00.2 maps to host6. QLogic driver parameters can now be configured using `/sys/class/scsi_host/host6 and /sys/class/fc_host/host6`.

NOTE:

Rebooting the server or reloading the QLogic FCoE driver (qla2xxx) may change the value of the SCSI host ID.

Displaying and Modifying sysfs Entries

To display sysfs entries, use the Linux Cat command. For example, to display the adapter firmware version, issue the following command:

```
#cat /sys/class/scsi_host/host6/fw_version
```

To modify sysfs entries, use the Linux Echo command. For example, to enable the beacon on the adapter port, issue the following command:

```
#echo 1 > /sys/class/scsi_host/host6/beacon
```

Online Storage Configuration and Reconfiguration

For information about using RHEL 5 utilities and commands to configure and reconfigure storage devices, go to http://www.redhat.com/docs/en-US/Red_Hat_Enterprise_Linux/html/Online_Storage_Reconfiguration_Guide/index.html.

Adapter FCoE Performance Tuning

The following FCoE driver parameters affect adapter performance:

- Operation Mode
- Interrupt Delay Timer
- Execution Throttle
- Frame Size (Fibre Channel)
- Queue Depth

The default values for Frame Size and Execution Throttle provide maximum performance for most environments. The following subsections describe how to use the Operation Mode, Interrupt Delay Timer, and Queue Depth parameters to improve adapter performance.

Operation Mode (ZIO)

This parameter specifies the reduced interrupt operation (ZIO) modes. ZIO modes post multiple command completions in a single interrupt. The effects of tuning this parameter are remarkable only when the I/O being serviced by the adapter is transactional (small block size I/O operations). Experiment with Operation Mode and Interrupt Delay Timer values in a test environment before applying the changes to a production environment.

Table 8-7. Operation Mode Parameter

Value	Description
0	Disable Operation Mode
5	Mode 5 causes DMA to transfer response queue entries into the response queue. No interrupt is generated unless the Response Queue Out-Pointer is not updated during the interval specified by the Interrupt Delay Timer.
6	Mode 6 causes DMA to transfer response queue entries into the response queue, and an interrupt is generated when the firmware has no active exchanges, even if the interrupt delay timer has not expired.

Interrupt Delay Timer (zio_timer)

This parameter is valid if the Operation Mode parameter is enabled. It specifies the interval, in 100ms increments, between the time that the response queue is updated to the time that the interrupt is generated. The interrupt is not generated if the host updates the Response Queue Out-Pointer Register during this interval. The default value for this parameter is zero, which corresponds to an interval of two hours.

Queue Depth (qla2xmaxqdepth)

The Queue Depth parameter specifies the maximum number of SCSI command buffers that an adapter port can allocate. This parameter determines the maximum number of outstanding commands that can execute on any one adapter port.

The default for the Queue Depth parameter is 32, which provides the best performance for most environments. The following factors may require an adjustment to the Queue Depth parameter to obtain the best performance:

- Total number of LUNs exposed through the storage array (target) ports
- Queue depth of the storage array port

The effects of changing the Queue Depth parameter are most evident when the application workload type is transactional (small block size I/O).

N_Port ID Virtualization

N_Port ID Virtualization (NPIV) is a Fibre Channel facility that allows multiple N_Port IDs to share a single physical N_Port. N_Port sharing allows multiple Fibre Channel initiators to use a single physical port, easing hardware requirements in SAN design, especially where virtual SANs are used. NPIV is defined by the Technical Committee T11 within the INCITS standards body by the FC-DA (Fibre Channel Direct Attach) and FC-LS (Fibre Channel Link Services) specifications.

NPIV virtualizes the Fibre Channel adapter function such that each VM running on a server can share a pool of adapters, and maintain independent access to its own protected storage. This sharing enables administrators to leverage standard SAN management tools and best practices, such as fabric zoning and LUN mapping/masking, and it enables the full use of fabric-based quality-of-service and accounting capabilities. Adapter sharing also provides the most efficient use of the adapters in the server, while ensuring the highest level of data protection. NPIV allows a single, physical, Fibre Channel adapter port to function as multiple logical ports, each with its WWPN, as shown in Figure 8-9.

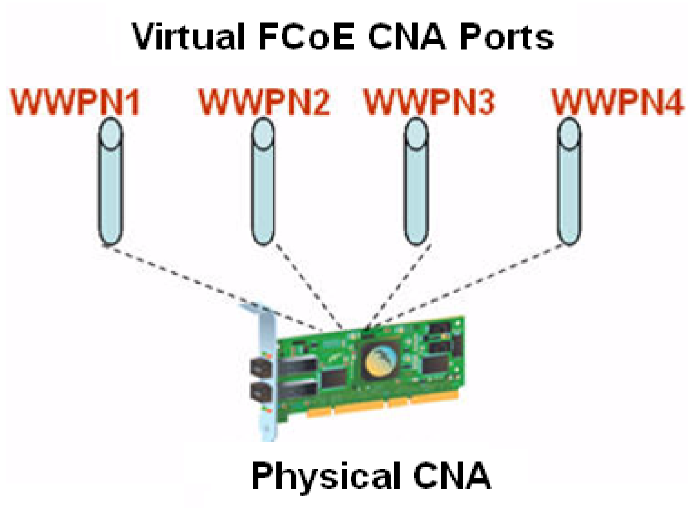


Figure 8-9. N_Port ID Virtualization

QLogic CNA NPIV Solution

To complement Linux server virtualization software solutions, QLogic has extended virtualization capabilities to the adapter hardware through NPIV. All QLogic 8100 Series Adapters support NPIV. QLogic supports creating, deleting, and managing NPIV ports through the FCoE driver sysfs interface. The `sysfs` virtual file system is available in all RHEL 5 installations.

With the combined QLogic and Linux solution, storage administrators can create virtual FCoE adapter ports within multiple zones, and assign them to VMs for migration without reconfiguring zoning or LUN masking. This solution creates a virtualized network that is easier to manage and maintain. In addition, support for Linux-based virtualization solutions combined with QLogic's 8100 Series Adapter virtualization technologies, increases hardware efficiency, and enables rapid configuration and deployment of VMs.

NPIV Deployment Requirements

The following hardware and software elements are required to deploy a QLogic NPIV solution in an RHEL 5 environment:

- A compatible Converged Networking Ethernet switch that supports NPIV. For information about compatible switches, refer to "System Requirements" on page 4-1.
- A QLogic 8100 Series Converged Networking Adapter.
- An active link (link up) between the QLogic 8100 Series Adapter and the FCoE switch.

- A QLogic 8100 Series Adapter FCoE driver—qla2xxx, latest version.
- QLogic 8100 Series Adapter FCoE firmware—the FCoE firmware is bundled with the multi boot image. Use the latest version.

NOTE:

QLogic 8100 Series Adapters support a maximum of 63 virtual ports per adapter port in RHEL 5 environments. This number may be limited by the capabilities of the FCoE switch.

Creating Virtual Ports

This subsection describes how to create virtual adapter ports using the `sysfs` interface. For more information about using `sysfs` to configure FCoE drivers, refer to "Configuring Driver Parameters Using sysfs" on page 8-8.

To create a virtual adapter port, perform the following steps on the server that houses the QLogic 8100 Series Adapter:

1. In `sysfs`, identify the QLogic 8100 Series Adapter port entry, which typically resides in the directory `/sys/class/scsi_host/hostX/`. For information about determining the value of *X* to identify the SCSI host ID, refer to "Identifying the SCSI Host ID" on page 8-19.
2. Confirm that the link is up between the adapter port and the FCoE switch by issuing the following command:

   ```
   #cat /sys/class/scsi_host/hostX/state
   Link Up - F_Port
   ```

3. Create a virtual port by typing the Echo command by issuing the following command:

   ```
   #echo wwpn:wwnn > /sys/class/scsi_host/hostX/vport_create
   ```

   In this command, *wwpn* and *wwnn* are the WWPN and WWNN of the virtual port, and *X* is the adapter SCSI host ID. Choose a WWPN and a WWNN that do not conflict with another virtual or physical adapter port in the SAN. For example:

   ```
   #echo "2100001b320ff6c2:2000001b320ff6c2" >
   /sys/class/scsi_host/host6/vport_create
   ```

   If the `echo` command succeeds, there is no acknowledgement. If the `echo` command fails with an invalid argument error, it is likely that there is a problem with the link between the adapter port and the FCoE switch.

4. To benefit from I/O segregation and NPIV monitoring after creating a virtual port, configure zoning on the FCoE switch, and configure selective LUN presentation on the Fibre Channel or FCoE target array. For information about configuring the FCoE switch and target array, refer to the switch and target array documentation.

CAUTION!

If you reload the FCoE driver (qla2xxx), or reboot the server, all virtual ports are discarded.

Verifying the Creation of Virtual Ports

Use `sysfs` to verify that a virtual adapter port has been created by searching `sys/class/scsi_host/host`*`X`* for a new entry. Issue the following command, where *X* is the virtual port SCSI host ID for the virtual port:

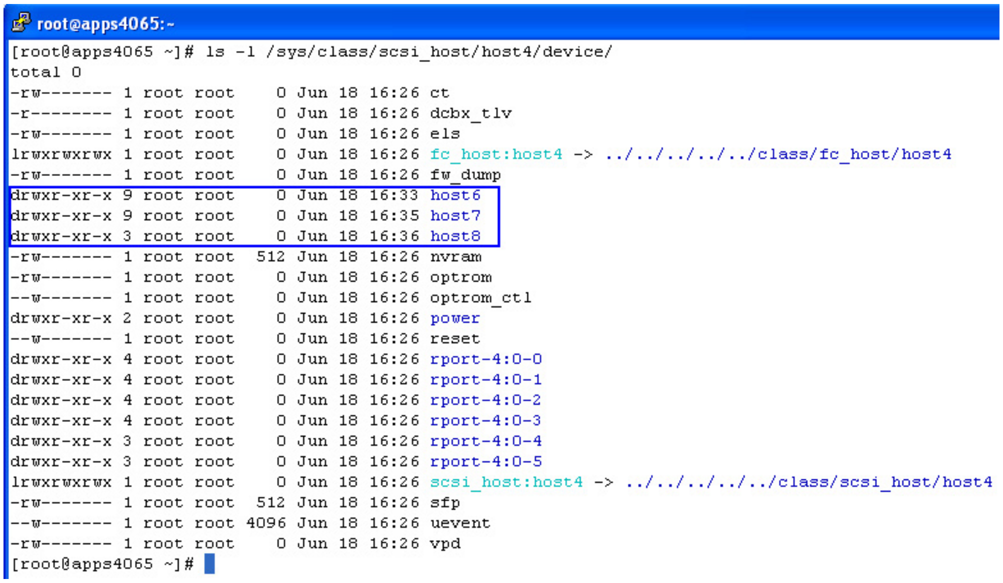
```
#ls -l /sys/class/scsi_host/hostX/
```

The new virtual port is the first available numeral in the list of host*X* entries in `/sys/class/scsi_host/`. To discern between adapter virtual and physical ports in sysfs, refer to “Differentiating Virtual Ports from Physical Ports in sysfs” on page 8-28.

Alternatively, you can display all virtual ports created on a physical adapter port. For example:

```
# ls -l /sys/class/scsi_host/host4/device/
```

Figure 8-10 shows that host6, host7 and host8 are the three virtual ports that exist for the physical port host4.



```
root@apps4065:~
[root@apps4065 ~]# ls -l /sys/class/scsi_host/host4/device/
total 0
-rw------- 1 root root    0 Jun 18 16:26 ct
-r-------- 1 root root    0 Jun 18 16:26 dcbx_tlv
-rw------- 1 root root    0 Jun 18 16:26 els
lrwxrwxrwx 1 root root    0 Jun 18 16:26 fc_host:host4 -> ../../../../../class/fc_host/host4
-rw------- 1 root root    0 Jun 18 16:26 fw_dump
drwxr-xr-x 9 root root    0 Jun 18 16:33 host6
drwxr-xr-x 9 root root    0 Jun 18 16:35 host7
drwxr-xr-x 3 root root    0 Jun 18 16:36 host8
-rw------- 1 root root  512 Jun 18 16:26 nvram
-rw------- 1 root root    0 Jun 18 16:26 optrom
--w------- 1 root root    0 Jun 18 16:26 optrom_ctl
drwxr-xr-x 2 root root    0 Jun 18 16:26 power
--w------- 1 root root    0 Jun 18 16:26 reset
drwxr-xr-x 4 root root    0 Jun 18 16:26 rport-4:0-0
drwxr-xr-x 4 root root    0 Jun 18 16:26 rport-4:0-1
drwxr-xr-x 4 root root    0 Jun 18 16:26 rport-4:0-2
drwxr-xr-x 4 root root    0 Jun 18 16:26 rport-4:0-3
drwxr-xr-x 3 root root    0 Jun 18 16:26 rport-4:0-4
drwxr-xr-x 3 root root    0 Jun 18 16:26 rport-4:0-5
lrwxrwxrwx 1 root root    0 Jun 18 16:26 scsi_host:host4 -> ../../../../../class/scsi_host/host4
-rw------- 1 root root  512 Jun 18 16:26 sfp
--w------- 1 root root 4096 Jun 18 16:26 uevent
-rw------- 1 root root    0 Jun 18 16:26 vpd
[root@apps4065 ~]#
```

Figure 8-10. Displaying All Virtual Ports for Physical Port host4

To verify the state of the virtual port, issue the following command, where *X* is the physical port SCSI host ID:

`#`**`cat /sys/class/scsi_host/host`*`X`*`/vport_state`**

Deleting Virtual Ports

CAUTION!

Deleting or disabling a virtual port is disruptive, and should not be performed on a production system or while I/O operations are in progress on LUNs that are being accessed through the virtual port.

To delete a virtual port using sysfs:

1. Obtain the virtual port WWPN and WWNN by issuing the following commands, where *X* is the port SCSI host ID:

   `#`**`cat /sys/class/scsi_host/host`*`X`*`/port_name`**

   `#`**`cat /sys/class/scsi_host/host`*`X`*`/node_name`**

2. Delete the virtual port by issuing the following command, where *wwpn* and *wwnn* are the port WWPN and WWNN, and *X* is the port SCSI host ID:

   `#`**`echo wwpn:wwnn > /sys/class/scsi_host/host`*`X`*`/vport_delete`**

To disable a virtual port, issue the following command, where *X* is the port SCSI host ID:

```
#echo 1 > /sys/class/scsi_host/hostX/vport_disable
```

To verify that the virtual adapter port has been deleted:

- Confirm that the `sysfs` entry for the virtual port has been removed from `/sys/class/scsi_host/`.
- Confirm that the virtual port is no longer logged into the FCoE switch by inspecting its Fibre Channel name server database. For information about examining the name server database, refer to the switch documentation.

Differentiating Virtual Ports from Physical Ports in sysfs

Virtual ports and physical ports have different sets of sysfs parameters. You can distinguish a virtual port from a physical port by listing the port parameters in sysfs, and then comparing the display to the unique parameter lists in Table 8-8.

Table 8-8. Unique Physical and Virtual Port sysfs Parameters

Unique Physical Port sysfs Parameters	Unique Virtual Port sysfs Parameters
max_npiv_vports	node_name
npiv_vports_inuse	port_name
vport_create	vport_disable
vport_delete	vport_id
	vport_last_state
	vport_state

Figure 8-11 shows an example the sysfs adapter port parameter lists for a physical port (left) and a virtual port (right). The distinguishing parameters are indicated by green and red arrows.

```
[root@apps4065 ~]# ls -l /sys/class/scsi_host/host4/
total 0
-r--r--r-- 1 root root 4096 Jun 18 16:32 84xx_fw_version
-rw-r--r-- 1 root root 4096 Jun 18 16:26 beacon
-r--r--r-- 1 root root 4096 Jun 18 16:32 cmd_per_lun
lrwxrwxrwx 1 root root    0 Jun 18 16:26 device -> ../../../dev
-r--r--r-- 1 root root 4096 Jun 18 16:26 driver_version
-r--r--r-- 1 root root 4096 Jun 18 16:32 fabric_param
-r--r--r-- 1 root root 4096 Jun 18 16:32 flash_block_size
-r--r--r-- 1 root root 4096 Jun 18 16:26 fw_state
-r--r--r-- 1 root root 4096 Jun 18 16:26 fw_version
-r--r--r-- 1 root root 4096 Jun 18 16:32 host_busy
-r--r--r-- 1 root root 4096 Jun 18 16:32 isp_id
-r--r--r-- 1 root root 4096 Jun 18 16:32 isp_name
-r--r--r-- 1 root root 4096 Jun 18 16:26 max_npiv_vports
-r--r--r-- 1 root root 4096 Jun 18 16:32 model_desc
-r--r--r-- 1 root root 4096 Jun 18 16:26 model_name
-r--r--r-- 1 root root 4096 Jun 18 16:26 mpi_version
-r--r--r-- 1 root root 4096 Jun 18 16:32 npiv_vports_inuse
-r--r--r-- 1 root root 4096 Jun 18 16:26 optrom_bios_version
-r--r--r-- 1 root root 4096 Jun 18 16:26 optrom_efi_version
-r--r--r-- 1 root root 4096 Jun 18 16:26 optrom_fcode_version
-r--r--r-- 1 root root 4096 Jun 18 16:26 optrom_fw_version
-r--r--r-- 1 root root 4096 Jun 18 16:32 pci_info
-r--r--r-- 1 root root 4096 Jun 18 16:26 phy_version
-r--r--r-- 1 root root 4096 Jun 18 16:26 proc_name
--w------- 1 root root 4096 Jun 18 16:32 scan
-r--r--r-- 1 root root 4096 Jun 18 16:26 serial_num
-r--r--r-- 1 root root 4096 Jun 18 16:26 sg_tablesize
-rw-r--r-- 1 root root 4096 Jun 18 16:26 state
lrwxrwxrwx 1 root root    0 Jun 18 16:26 subsystem -> ../../../
-r--r--r-- 1 root root 4096 Jun 18 16:26 total_isp_aborts
--w------- 1 root root 4096 Jun 18 16:26 uevent
-r--r--r-- 1 root root 4096 Jun 18 16:32 unchecked_isa_dma
-r--r--r-- 1 root root 4096 Jun 18 16:32 unique_id
-r--r--r-- 1 root root 4096 Jun 18 16:32 vlan_id
-r--r--r-- 1 root root 4096 Jun 18 16:32 vn_port_mac_address
--w--w--w- 1 root root    0 Jun 18 16:36 vport_create
--w--w--w- 1 root root 4096 Jun 18 16:32 vport_delete
-rw-r--r-- 1 root root 4096 Jun 18 16:32 zio
-rw-r--r-- 1 root root 4096 Jun 18 16:32 zio_timer
[root@apps4065 ~]#
```

Physical CNA Port

```
[root@apps4065 ~]# ls -l /sys/class/scsi_host/host6/
total 0
-r--r--r-- 1 root root 4096 Jun 18 17:45 84xx_fw_version
-rw-r--r-- 1 root root 4096 Jun 18 16:34 beacon
-r--r--r-- 1 root root 4096 Jun 18 17:45 cmd_per_lun
lrwxrwxrwx 1 root root    0 Jun 18 16:33 device -> ../../../dev
-r--r--r-- 1 root root 4096 Jun 18 16:34 driver_version
-r--r--r-- 1 root root 4096 Jun 18 17:45 fabric_param
-r--r--r-- 1 root root 4096 Jun 18 16:34 fw_state
-r--r--r-- 1 root root 4096 Jun 18 16:34 fw_version
-r--r--r-- 1 root root 4096 Jun 18 17:45 host_busy
-r--r--r-- 1 root root 4096 Jun 18 17:45 isp_id
-r--r--r-- 1 root root 4096 Jun 18 17:45 isp_name
-r--r--r-- 1 root root 4096 Jun 18 17:45 model_desc
-r--r--r-- 1 root root 4096 Jun 18 16:34 model_name
-r--r--r-- 1 root root 4096 Jun 18 17:45 mpi_version
-r--r--r-- 1 root root 4096 Jun 18 17:45 node_name
-r--r--r-- 1 root root 4096 Jun 18 16:34 optrom_bios_version
-r--r--r-- 1 root root 4096 Jun 18 16:34 optrom_efi_version
-r--r--r-- 1 root root 4096 Jun 18 16:34 optrom_fcode_version
-r--r--r-- 1 root root 4096 Jun 18 16:34 optrom_fw_version
-r--r--r-- 1 root root 4096 Jun 18 17:45 pci_info
-r--r--r-- 1 root root 4096 Jun 18 17:45 phy_version
-r--r--r-- 1 root root 4096 Jun 18 16:34 port_name
-r--r--r-- 1 root root 4096 Jun 18 17:45 proc_name
--w------- 1 root root 4096 Jun 18 17:45 scan
-r--r--r-- 1 root root 4096 Jun 18 16:34 serial_num
-r--r--r-- 1 root root 4096 Jun 18 16:34 sg_tablesize
-rw-r--r-- 1 root root 4096 Jun 18 16:34 state
lrwxrwxrwx 1 root root    0 Jun 18 16:33 subsystem -> ../../../
-rw-rw-rw- 1 root root 4096 Jun 18 17:45 symbolic_port_name
-r--r--r-- 1 root root 4096 Jun 18 16:34 total_isp_aborts
--w------- 1 root root 4096 Jun 18 17:45 uevent
-r--r--r-- 1 root root 4096 Jun 18 17:45 unchecked_isa_dma
-r--r--r-- 1 root root 4096 Jun 18 17:45 unique_id
-r--r--r-- 1 root root 4096 Jun 18 17:45 vlan_id
-r--r--r-- 1 root root 4096 Jun 18 17:45 vn_port_mac_address
--w--w--w- 1 root root 4096 Jun 18 17:45 vport_disable
-rw-rw-rw- 1 root root 4096 Jun 18 16:34 vport_id
-r--r--r-- 1 root root 4096 Jun 18 17:45 vport_last_state
-r--r--r-- 1 root root 4096 Jun 18 17:45 vport_state
-rw-r--r-- 1 root root 4096 Jun 18 17:45 zio
-rw-r--r-- 1 root root 4096 Jun 18 17:45 zio_timer
```

Virtual CNA Port (vPort)

Figure 8-11. Comparing NPIV Physical and Virtual Ports

Boot-from-SAN

For legacy servers, the most common boot method was to boot from a direct-attached disk. When booting from direct-attached disk, the server BIOS/UEFI locates the SCSI/IDE adapter BIOS, which contains instructions that enable the server to determine which of its internal direct-attach disks is the boot device. This boot method is called *local boot*. Local boot is not fault tolerant, nor does it allow centralized management of operating system images for rapid deployment scenarios and disaster recovery options. While many modern servers provide high-availability local disk configurations through server-based RAID controllers, other issues with local boot are paving the way for alternative boot methods.

The boot-from-SAN method places the boot device on the SAN—not locally on the server, as with direct-attached disks. This boot device is a LUN that resides on a Fibre Channel storage array device. The server communicates with the storage array on the SAN through a Fibre Channel adapter or a Converged Network Adapter. The adapter boot code (BIOS or UEFI) contains the instructions that enable the server to find the boot disk on the SAN.

Because the boot device resides on the SAN, it simplifies server management. Separating the boot image from each server allows administrators to leverage the advanced capabilities of storage arrays to achieve high availability, improved data integrity, rapid provisioning, and more efficient storage management. Replacing a failed server is as easy as moving the Converged Network Adapter to a new server, pointing it to the SAN boot device, and booting up the new host.

All QLogic 8100 Series Converged Network Adapters allow a host to boot-from-SAN for any of the supported versions of RHEL 5.

Boot-from-SAN requires the configuration of the QLogic 8100 Series Adapter, the FCoE switch, and the storage array. How you connect these SAN components is determined by the level of redundancy you require. There are minor differences when configuring the QLogic 8100 Series Adapter for boot-from-SAN between servers that support BIOS and those that support UEFI. The following summarizes the configuration process:

1. Set the boot order to disable boot-from-local-disk, or disconnect the internal hard drives.
2. Configure a single-path to the storage array when installing RHEL 5. For multiple adapter port configurations (for redundancy), connect only one adapter port to the SAN during installation. The same guidance applies to the storage controller ports.
3. Enable the adapter port BIOS.
4. Specify a boot LUN using the QLogic CNA *Fast!*UTIL BIOS configuration utility.
5. Boot from the optical drive. Install media/PXE boot, and proceed to install the operating system.
6. During the operating system installation process, select the boot LUN as the device on which to install the operating system.
7. Enable multipath (MPIO) configuration on the server after installing the operating system.

Boot-from-SAN Requirements

The following subsections describe requirements for the host/server, Converged Network Adapter, FCoE switch, and storage array.

Host/Server Requirements

Server requirements depend on the type of server, the SAN installation, and the network environment. Consider the following recommendations:

- If you plan to configure boot-from-SAN on production servers, back up all disks before proceeding.

- Set the boot order in the system BIOS configuration menu: first, the optical drive, then the disk, and then the SAN-boot device. Placing the optical drive at the top of the boot order enables the server to boot from an RHEL 5 installation media, and then install the operating system on the SAN boot device. If the boot media is a PXE server (for LAN boot), place the QLogic 8100 Series Adapter at the top of the boot order. For more information about PXE boot, refer to "PXE Boot" on page 6-25.
- If failover capabilities are required during boot-from-SAN, multiple QLogic 8100 Series Adapters are required to create redundant paths to the boot device. Consult the server documentation to determine the maximum number of QLogic 8100 Series Adapters that the server can support.

Converged Network Adapter Requirements

The Converged Network Adapter must satisfy the following:

- QLogic 8100 Series Adapter with current firmware
- QLogic 8100 Series Adapter with the boot BIOS is enabled. Typically, the boot BIOS is disabled by default. Disregard this requirement if a UEFI-enabled server is used.
- If failover capabilities are required during boot-from-SAN, multiple QLogic 8100 Series Adapters are required to create redundant paths to the boot device.
- Record the WWPN and WWNN for each adapter prior to installation. The WWPN and WWNN can be found on a label on the adapter.

FCoE Switch Requirements

Ensure that the FCoE switch has the correct zoning configuration according to the following rules:

- Locate the FCoE switch on the SAN that contains the boot LUN so that the FCoE switch is visible to the server through the QLogic adapter.
- The host must have exclusive access to the LUN from which it boots. No other host on the SAN should be able to detect or access the same logical disk.
- Only one instance of the boot LUN can be visible to the server during the initial installation. The installation may fail if multiple instances of the boot LUN are available to the server through different paths or through the same LUN presented through two different storage array controllers. If failover is required, configure boot-from-SAN after the initial installation is complete.
- Limit zones to no more than one adapter port to avoid RSCN interruptions from other hosts in the fabric.

Storage Array Requirements

Some storage arrays cannot support boot-from-SAN for specific environments. Consult the storage array documentation to confirm that the array and the firmware support boot-from-SAN. Consider the storage array and any limitations regarding boot-from-SAN.

Create and present an appropriately-sized LUN to the QLogic 8100 Series Adapter port. Ensure that:

- The adapter port has exclusive access to this LUN.
- The LUN host type matches the operating system that is to be installed on this LUN.
- Each server has its own dedicated boot LUN. Two servers cannot share the same boot LUN.

Boot-from-SAN Configuration Topologies

One of the benefits of SAN adoption, and in turn, Boot-from-SAN, is high availability, which is not easily achieved in a local boot scenario. Before proceeding to the detailed instructions about configuring boot-from-SAN, determine the level of fault tolerance and high availability required for boot-from-SAN installations. The following sections describe two boot-from-SAN topologies: single-path configuration (least fault tolerant) and multipath configuration (most fault tolerant).

Single-Path Topology

A single-path topology is the simplest configuration for boot-from-SAN for QLogic 8100 Series Adapters. The single-path configuration consists of a single adapter port connected to a converged networking switch (FCoE switch), which is then connected to the storage controller (SP) of a storage array. A single-path configuration does not use redundant components, and therefore, is not recommended for mission-critical servers.

However, single-path topology does offer some degree of fault tolerance, because the QLogic 8100 Series Adapter can configure alternate boot LUNs. As shown in Figure 8-12, if the primary boot device (LUN1) fails, or if it is not available at boot time, the QLogic adapter automatically tries to boot from the alternate boot device (LUN2). Up to four alternate boot devices can be configured, which provides failover protection by redirecting the boot device without user intervention.

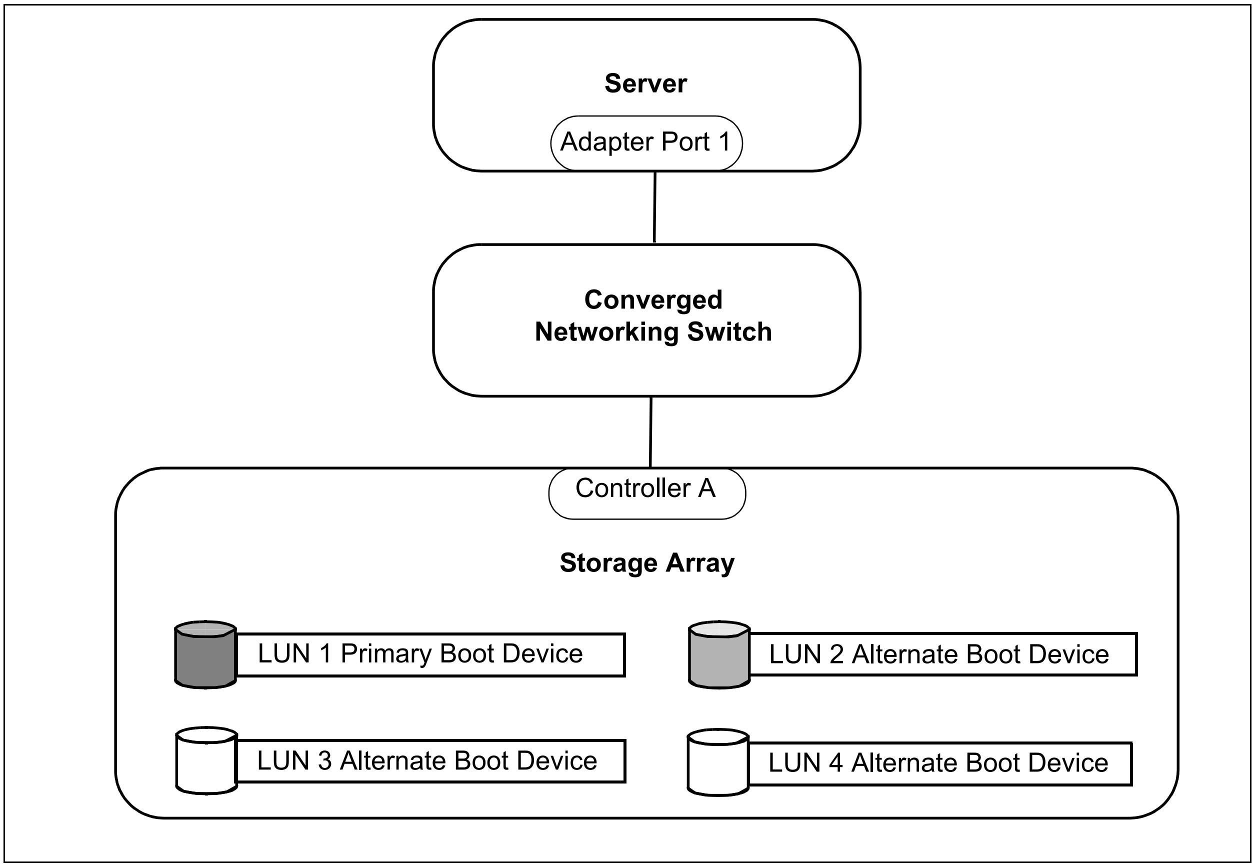


Figure 8-12. Single-Path Topology

Multipath Topology

The multipath topology provides fault tolerance through redundant SAN components: two adapter ports, two converged networking switches, and access to the boot LUNs through two independent storage array controllers. Figure 8-13 shows the SAN components and their connections. The server has access to the primary and alternate boot LUNs through two independent paths. A single point of failure is unlikely with this configuration. You can enhance this configuration further by adding more adapter ports that connect to the converged networking switches. This added level of redundancy protects against adapter board failures.

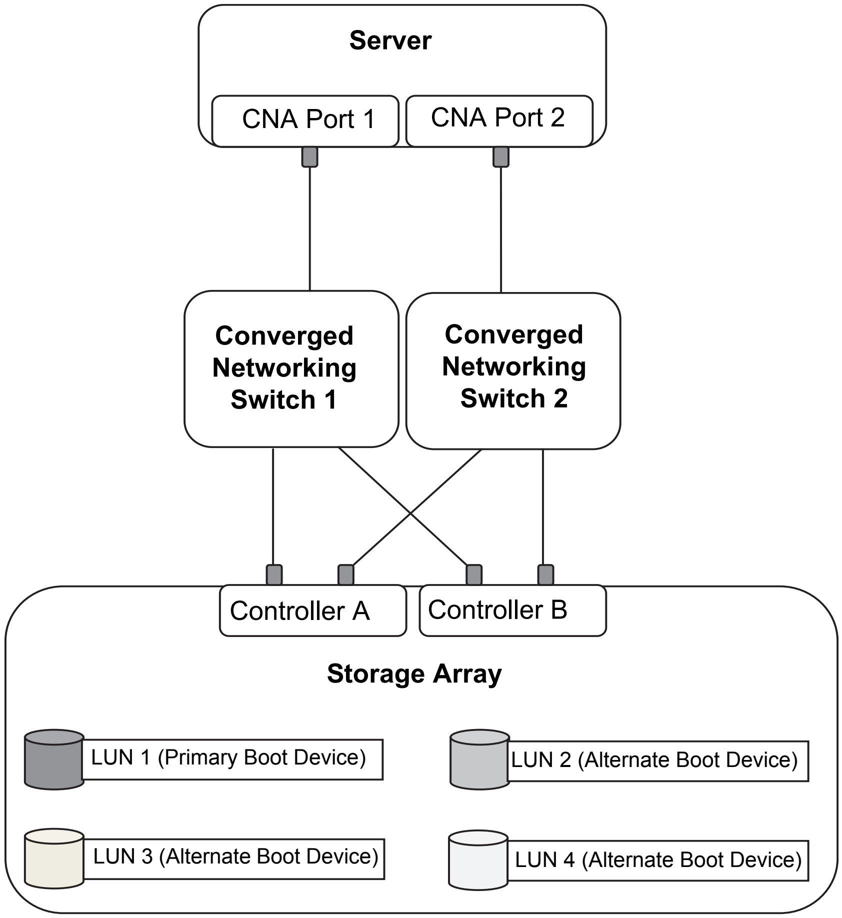


Figure 8-13. Multipath Topology

Configuring an Adapter to Boot-from-SAN

This section describes how to configure a QLogic 8100 Series Adapter to boot the RHEL 5 operating system from the SAN.

1. Install the QLogic 8100 Series Adapter, and update the firmware, if necessary. For information about updating the firmware, refer to "Firmware Upgrades" on page 4-21.
2. Connect the SAN components in a single-path topology as shown in Figure 8-12. If a multipath topology is required, make the necessary additions and connections after the initial operating system installation.
3. Power up the server.
   - If this is a BIOS server, press CTRL+Q or ALT+Q while the server is booting, to open the QLogic *Fast!*Util BIOS configuration utility. Proceed to Step 4.
   - If this is a UEFI server, select **EFI Shell** from the EFI Boot Manager menu while the server is booting. Proceed to Step 5.
4. Configure the BIOS server. For information about configuring an UEFI server, proceed to Step 5.
   a. Configure the switch with a zone that includes the adapter port and one storage array port, using either soft zoning (WWPN-based) or hard zoning (port number-based), and enable the zone. Soft zoning is recommended because, if a server malfunctions, you can move the adapter to another host without reconfiguration.
   b. Create an appropriately-sized LUN on the storage array. The LUN size depends on the operating system to be installed. Add this LUN to a host group containing the QLogic adapter.
   c. Set the host type/mode for the host group that corresponds to the operating system to be installed. The boot LUN should be LUN 0. For information about using a LUN other than LUN 0, refer to "Booting from SAN Using a LUN Other Than LUN 0" on page 8-40.
   d. In the QLogic *Fast!*UTIL BIOS configuration utility on the server, select the adapter port in the Select Host Adapter menu, and then press ENTER.
   e. Select **Configuration Settings** from the *Fast!*UTIL Options menu, and press ENTER.
   f. Select **Adapter Settings** from the Configuration Settings menu, and then press ENTER.
   g. Change **Host Adapter BIOS** to Enabled in the Adapter Settings menu, and press ENTER.

h. Press ESC to return to the Configuration Settings menu. Select **Selectable Boot Settings**, and then press ENTER.

i. Enable the **Selectable Boot** option in the Selectable Boot Settings menu. Move the cursor to the **Selectable Boot** option, and then press ENTER (Figure 8-14).

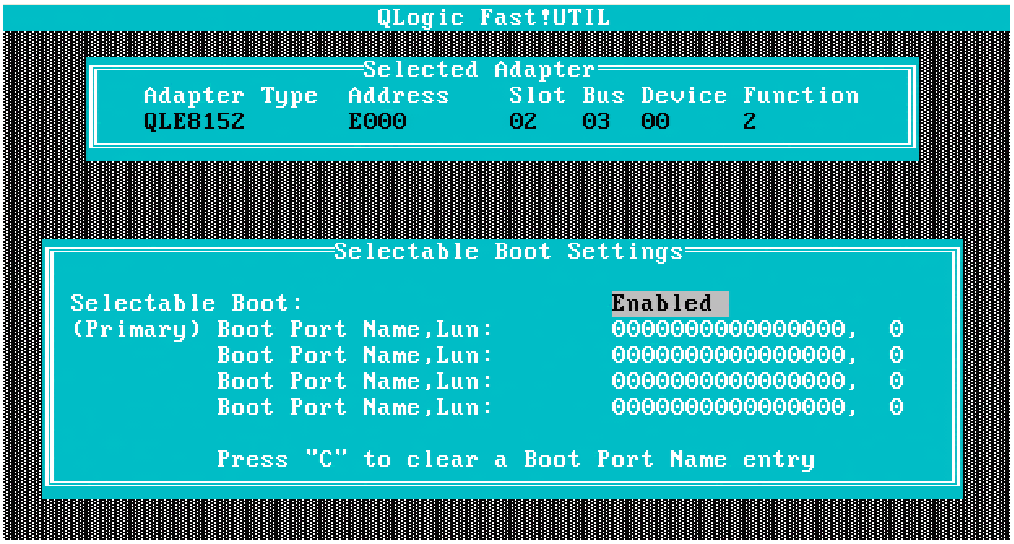


Figure 8-14. Selectable Boot Settings menu

j. Specify the primary boot LUN. Move the cursor to **(Primary) Boot Port Name, Lun** option, and then press ENTER. The adapter scans the available devices.

k. Specify the alternate boot LUNs. Move the cursor to the Boot Port Name, Lun fields,

l. Select the device from which to boot in the Select Fibre Channel Device menu, and then press ENTER. This device is the LUN that you created on the storage array in Step b.

m. Press ESC twice to save the changes. The utility prompts you to save the settings.

n. Press ESC to exit the *Fast!*UTIL BIOS configuration utility.

o. Select **Reboot System** from the Exit *Fast!*UTIL menu.

NOTE:

For information about using the QLogic 8100 Series *Fast!*UTIL BIOS configuration utility, refer to "Fast!UTIL" on page 9-2.

---

5. Configure the UEFI server. To configure a BIOS server, refer to Step 4. The boot-from-SAN configuration process for UEFI servers depends on the server make and model. The following instructions configure the adapter for boot-from-SAN using the EFI shell. If a UEFI shell is not available on the server being configured, consult the server documentation for information about obtaining a shell or for alternate ways to configure the adapter.

   a. When the server is booting up, select **EFI shell** from the EFI Boot manager menu.

   b. In the EFI shell, issue the following command to display a list of installed EFI drivers.

   ```
   drivers
   ```

   c. Under the heading DRIVER NAME, find the driver with name *QLogic Fibre Channel Driver*. Locate the DRV column, and make note of the driver handle number.

   d. To display the list of adapters that are managed by this driver, issue the following command. Locate and note the controller handle number inside the brackets labeled `Ctrl [ ]`.

   ```
   drvcfg <driverhandle>
   ```

   e. Configure the switch with a zone that includes the adapter port and one storage array port using either soft zoning (WWPN-based) or hard zoning (port number-based), and enable the zone. Soft zoning is recommended because, if a server malfunctions, you can move the adapter to another host without reconfiguration.

   f. Create an appropriately-sized LUN on the storage array. The LUN size depends on the operating system to be installed. Add this LUN to a host group containing the QLogic adapter.

   g. Set the host type/mode for the host group that corresponds to the operating system to be installed. The new LUN should be LUN 0. For information about using LUNs other than LUN 0, refer to "Booting from SAN Using a LUN Other Than LUN 0" on page 8-40.

   h. At the EFI shell, issue the following command to start the EFI driver configuration protocol.

   ```
   drvcfg -s <driverhandle> <controllerhandle>
   ```

i. Select **Show Translation**, under Information, from the Driver Configuration Main Menu (Figure 8-15). This option displays the target and LUN information.

```
Main Menu
 NVRAM Parameters
  1. Edit Adapter Settings
  2. Edit Advanced Settings
  3. Edit Database
  4. Edit Boot Settings
 Information
  5. Show Database
  6. Show Translation
  7. Show NVRAM Buffer
  8. Info
  9. Help
 Operation
  10. Abandon
  11. Write
  12. Quit
```

Figure 8-15. Driver Configuration Main Menu

j. Confirm that the LUN you created in Step f appears in the list, and make note of the WWPN and LUN number. Press ENTER to return to the Main menu.

k. Select **Edit Database**, under NVRAM Parameters, from the Configuration Main menu.

l. Type the WWPN and LUN numbers of the primary and alternate boot device (entry ID 0).

m. Return to the Driver Configuration Main Menu, and select **Edit Boot Settings** under NVRAM Parameters.

n. Enable both **Selective Login** and **Selective LUN Logins** (Figure 8-16). Enabling **Selective Logins** restricts the discovery of targets to what is specified in the database as a boot device. Enabling **Selective LUN Logins** restricts the discovery of LUNs to what is specified in the database as a boot device LUN number.

```
Edit Boot Settings

 0. Previous Menu
 1. Enable Alternate Boot Device [n]
 2. Enable Selective Login [n]  Y
 3. Enable Selective LUN Logins [n]  Y
 4. OS Mode [Windows/Linux/Other]
 5. EFI Variable EFIFCSanLevel [1]
 6. Enable World Login [n]
```

Figure 8-16. Edit Boot Settings Menu

o. Return to the Main menu, and select **Write** under Operation.

p. Select **Quit** from the driver configuration Main menu to return to the EFI shell.

q. At the EFI shell, issue the following command to reboot the server:

```
reset
```

NOTE:

For information about using the QLogic 8100 Series EFI utilities and driver configuration, refer to “Configuration Settings” on page 9-4.

---

6. Insert the RHEL 5 installation media into the optical drive on the server. The RHEL 5 installation process starts automatically, if the server boots from the optical drive. For information about installing RHEL 5 to boot-from-SAN, refer to “Installing Software” on page 3-7.
7. Some versions of RHEL 5 require that the adapter drivers be installed on the server during the installation of the operating system. For information about installing drivers with the operation system, refer to “Installing Software” on page 3-7.
8. After the operating system installation is complete, and the server reboots, type the appropriate key sequence to open the system BIOS/EFI Boot Manager.

9. Set the SAN boot device (QLogic adapter for BIOS; fibre disk for UEFI) at the top of the boot order.
10. To configure a multipath/load-balanced boot-from-SAN configuration:
    a. Connect the second adapter port, as shown in Figure 8-13.
    b. Modify the storage array configuration to present the primary and alternate boot LUNs to both storage array controllers.
    c. Modify switch zoning to ensure that the second adapter port has access to both storage array controllers.
    d. Enable the RHEL 5 dm-multipath MPIO service; or install a storage array vendor multipath solution on the RHEL 5 operating system.
    e. Repeat Steps 4 or 5 to configure the a second adapter port to provide failover for the boot-from-SAN device.

For more information about configuring RHEL 5 for boot-from-SAN, refer to the *RedHat Installation Guide* for the specific RHEL 5 version.

Booting from SAN Using a LUN Other Than LUN 0

Installing an RHEL 5 operating system into a nonzero LUN requires additional configuration during the installation process.

To configure the operating system for a nonzero LUN:

1. During the RHEL 5 install process, select **Configure advance boot loader options** on the Boot Loader Configuration screen, and then click **Next** (Figure 8-17).

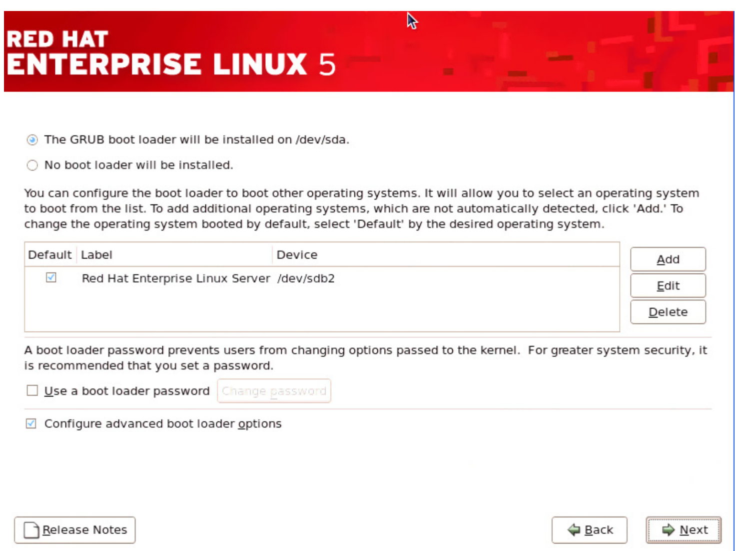


Figure 8-17. Select Advanced Boot Loader Options RHEL 5 Install

2. On the **Advanced Boot Loader Configuration** screen, select **Change Drive Order**.

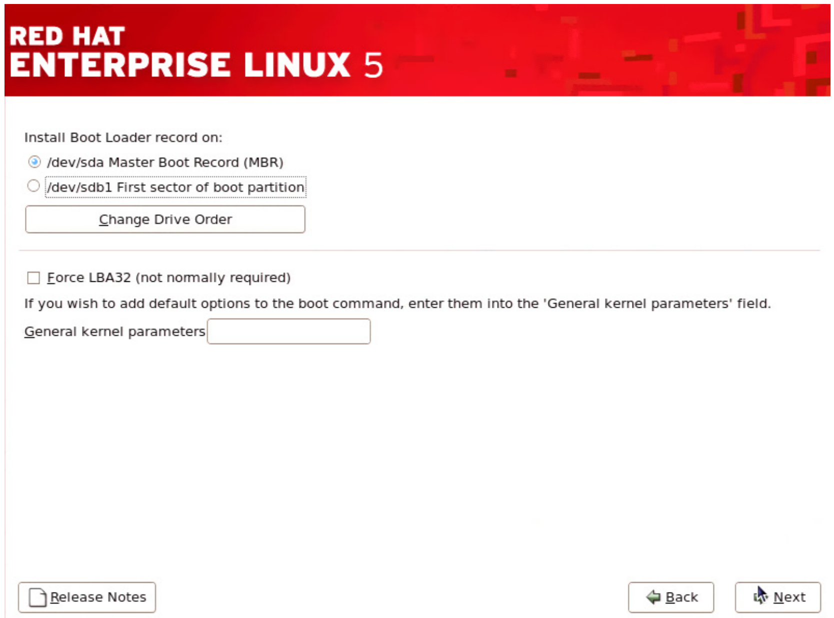


Figure 8-18. Select Advanced Boot Loader Options RHEL 5 Install step2

3. In the Edit Drive Order window, move the entry for the boot LUN up to the first entry, and then click **OK**.
4. Continue installing RHEL 5.

Using the QLogic Linux Utilities

This subsection describes how to obtain, install, and launch the QLogic Linux utilities. The QLogic Linux utilities, listed in Table 8-9, configure the adapter FCoE function.

Table 8-9. QLogic Linux Utilities

File Name	Description
Dynamic TGT-LUN Discovery utility	Scans for newly added LUNs
HBA Collect utility	Gathers troubleshooting information from Linux hosts
FC HBA Snapshot utility	Uses sysfs to display details about the QLogic Fibre Channel adapter attached to the system

Table 8-9. QLogic Linux Utilities (Continued)

File Name	Description
FC HBA Change LUN State utility	Change the state of LUNs connected to a QLogic Fibre Channel adapter from offline to online/running
Set Device Command Timeout utility	Sets the timeout on the devices connected to the QLogic Fibre Channel adapter

Dynamic TGT-LUN Discovery Utility

The Dynamic TGT-LUN Discovery utility is a combination command line/menu interface that performs the following tasks:

- Rescans all the QLogic adapters for new LUNs, using sysfs-based (default) or proc-based scanning methods
- Rescans adapters and removes lost LUNs from the system
- Sets the number of LUNs to scan. The maximum is 256.
- Selects a specific adapter to scan (menu interface only)
- Displays information for each adapter
- Scans devices for LUNs with disks that have changed size

Package Contents

Table 8-10 describes the files in the Dynamic TGT-LUN Discovery utility package:

Table 8-10. Dynamic TGT-LUN Discovery Utility Package Files

File	Description
COPYING	GNU general public license that describes rights to copy, distribute, and use the open source content in this Linux tool.
ql-dynamic-tgt-lun-disc.sh	Script file that scans the QLogic adapters for LUNs.
README.ql-dynamic-tgt-lun-disc.txt	Readme file
revision.qldynamic.txt	Text file that explains the changes that are new in this version of the package
sg3_utils-1.23.tgz	Package containing utilities that send SCSI commands to the SCSI devices.

Using the Utility

This utility has a command line interface and a menu interface.

Command Line Interface

To start the Dynamic TGT-LUN Discovery command line interface, issue the following command followed by one or more command line options:

```
# ./ql-dynamic-tgt-lun-disc.sh <command line options>
```

Table 8-11 lists the Dynamic TGT-LUN Discovery utility command line options and their abbreviations.

Table 8-11. TGT-LUN Discovery Utility Command Line Options

Option (Abbreviation)	Description
--allow-lip (-al)	Issue the loop initialization processor (LIP) when required. By default, the LIP is not issued, even if it is required for scanning LUNs. If the utility does recognize that a LIP is needed, this option is ignored.
--current-luns (-cl)	Display current LUNs on the system
--extended-scan (-e)	Rescan the LUNs to identify attribute changes in existing LUNs. You can combine this option with the --max-lun, --scan, and --scan--refresh options.
--help (? or -h)	Print the help text.
--interactive	Opens the Dynamic TGT-LUN Discovery utility menu interface. Refer to “Menu Interface” on page 8-44.
--max-lun (-m)	Set the maximum LUNs to be scanned; the default is 256 LUNs.
--proc (-p)	Use the proc file system to perform LUN scanning on the 2.6 kernel. RHEL 5 is a 2.6 kernel-based Linux distribution.
--scan (-s)	Rescans all the devices connected to the QLogic adapter. If you omit all command line options, this is the default.
--scan --refresh (-s-r)	Rescans all the devices connected to the QLogic adapter, and removes LUNs that no longer exist. Do not attempt to use this option on the adapter port with active I/O operations, because it removes the existing LUNs before rescanning.

Table 8-12 show a list of tasks and the commands that perform them.

Table 8-12. TGT-LUN Discovery Utility Tasks and Commands

Task	Command Examples
Rescan all adapters	`# ./ql-dynamic-tgt-lun-disc.sh --scan`
Rescan all adapters and remove lost LUNs	`# ./ql-dynamic-tgt-lun-disc.sh --scan --refresh`
Rescan all adapters with a Run a proc-based scan	`# ./ql-dynamic-tgt-lun-disc.sh --scan --proc`
Rescan all adapters and set the maximum number of LUNs to be scanned	`# ./ql-dynamic-tgt-lun-disc.sh --scan --max-lun 124`
List changes to attributes	`# ./ql-dynamic-tgt-lun-disc.sh --extended-scan`
Rescan all adapters and list changes to attributes	`# ./ql-dynamic-tgt-lun-disc.sh --extended-scan --scan`
Remove lost LUNs and list changes to attributes	`# ./ql-dynamic-tgt-lun-disc.sh --extended-scan -refresh`
Rescan all adapters, set the maximum number of LUNs to be scanned, and list changes to attributes	`# ./ql-dynamic-tgt-lun-disc.sh --extended-scan --scan --max-lun 120`
List the current LUNs on the system	`# ./ql-dynamic-tgt-lun-disc.sh --current-luns`

Menu Interface

To open the menu interface, and display the main menu (Figure 8-19), issue the following command:

```
# ./ql-dynamic-tgt-lun-disc.sh --interactive
```

```
 Welcome to QLogic LUN Scan Utility
====================================

MAIN MENU
        1: ALL HOSTS SCAN
        2: ALL HOST SCAN & REFRESH
        3: ALL HOSTS EXTENDED SCAN
        4: SELECT HOST TO SCAN
        5: SET MAX LUN's TO SCAN (Current: 256)
        6: DISPLAY CURRENT LUNS
        7: QUIT

Please select one of the options above :
```

Figure 8-19. Dynamic TGT-LUN Discovery Utility Main Menu

Table 8-13 describes the main menu options.

Table 8-13. Dynamic TGT-LUN Main Menu

Option	Description
ALL HOSTS SCAN	Scan all QLogic adapters in the system, and report new LUNs that are found.
ALL HOST SCAN & REFRESH	Scan all QLogic adapters in the system, and remove LUNs that no longer exist
ALL HOSTS EXTENDED SCAN	Scan all the devices connected to QLogic adapters in the system, and then rescan for LUNs whose disk size or other disk attributes that have changed.
SELECT HOST TO SCAN	Select a QLogic adapter to be scanned from the Select Host to Scan menu. Table 8-14 describes the menu options.
SET MAX LUNs TO SCAN (Current: *X*)	Change the maximum number of LUNs to be scanned (X). By default, the utility scans a maximum of 256 LUNs. Decreasing the number of LUNs reduces the scan time.
DISPLAY CURRENT LUNS	Show the current LUNs attached to all QLogic adapters in the system. LUNs are displayed in the following format: H(Host):C (Controller):T(Target):L(LUN)
QUIT	Exit the menu interface.

Table 8-14. Select Host to Scan Menu

Option	Description
HOST: scsi*X*	Specify the adapter to be scanned. Select this option to rescan the adapter that corresponds to the host number (scsi*X*). To determine the value of *X* (SCSI host ID), refer to "Identifying the SCSI Host ID" on page 8-19.
SET SCAN TYPE	Sets the scan type through following sub-options: ■ **HOST SCAN & REFRESH**—rescan without removing LUNs (default) ■ **HOST SCAN ONLY**—rescan and remove LUNs that no longer exist ■ **HOST EXTENDED SCAN ONLY**—scan hosts for LUNs with disks that may have changed in size

Table 8-14. Select Host to Scan Menu (Continued)

Option	Description
GO BACK TO PREVIOUS SCREEN	Return to the main menu.
QUIT	Exit the menu interface.

HBA Collect Utility

The HBA Collect utility creates a compressed file containing debugging and configuration options from the RHEL 5 host. Run this utility when requested by QLogic Technical Support.

The HBA Collect utility collects the following information:

- Driver-related information including debug messages in `/var/log/messages`, information in `/proc/scsi/scsi`, information in `/etc/qla2xxx.conf`, and relevant information about QLogic FCoE driver configurations
- RHEL 5 version information
- System configuration information including a list of PCI devices, device information, CPU and memory information, partitions, kernel and command line parameters, and interrupt information

The HBA Collect utility also provides reports about the following:

- Kernel defaults
- Installed RPMs
- Loaded kernel modules loaded
- Running processes
- Open files

Package Contents

Table 8-15 describes the files in the HBA Collect utility package.

Table 8-15. HBA Collect Utility Package Files

File	Description
COPYING	GNU general public license that describes rights to copy, distribute, and use the open source content in this Linux tool.
ql-hba-collect.sh	Script file that gathers diagnostic information for troubleshooting on the RHEL 5 host
ql-hba-snapshot-x.xx/	FC HBA Snapshot utility
README.ql-hba-collect.txt	Readme file
revision-qlhbacollect.txt	Text file that explains the changes that are new in this version of the package.

Using the Utility

To create a compressed file containing debugging and configuration options, issue the following command:

```
# ./ql-hba-collect.sh
```

Figure 8-20 shows an example of the execution sequence.

```
[root@apps4065 ql-hba-collect-1.10]# ./ql-hba-collect.sh

Hello,
This utility will now attempt to gather system information for debug purpose
Removing the previous archives...
Gathering /proc files...
Gathering /etc files...
Gathering API Library Log...
Gathering module information...
Gathering miscellaneous system info...
Gathering SANsurfer and driver source info...
Gathering syslog info...
Gathering OS info...
Gathering boot info...
Searching for SANsurfer CLI... not installed
Gathering HBA Information...
Creating compressed archive and cleaning up...

Following archive has been created "/tmp/QLogicDiag-061810_215029-1.9.tgz"
Please send this archive to appropriate QLogic contact.
[root@apps4065 ql-hba-collect-1.10]#
```

Figure 8-20. HBA Collect Utility Execution Example

FC HBA Snapshot Utility

The FC HBA Snapshot utility displays information about connected QLogic adapters, including the following:

- WWPN
- Port ID
- All QLogic adapters in the system
- LUNs
- Parameters or options that can be passed to the QLogic driver
- Statistics

By default, the utility uses the sysfs Linux file system, but can also use the proc file system.

Package Contents

Table 8-16 describes files in the FC HBA Snapshot utility package.

Table 8-16. FC HBA Snapshot Utility Package Files

File	Description
COPYING	GNU general public license that describes rights to copy, distribute, and use the open source content in this Linux tool
ql-hba-snapshot.sh	Script file that displays the information about QLogic adapters installed in the RHEL 5 host
README.ql-hba-snapshot.txt	Readme file
revision.qlhbasnapshot.txt	Text file that explains the changes that are new in this version of the package

Using the Utility

To display QLogic adapter information, issue the following command:

```
# ./ql-hba-snapshot.sh <Host number> | <-a/--all> <options>
```

If you omit <*options*>, the utility displays information for all QLogic adapters in the server.

Table 8-17 describes the FC HBA Snapshot utility command line options.

Table 8-17. FC HBA Snapshot Utility Command Line Options

Option (Abbreviation)	Description
Host Number or --all (-a)	Specifies the host number of the adapter for which to display information. If you omit the host number, the utility displays information for all hosts. To obtain a host number for a QLogic Converged Network Adapters port, use the --hostlist option.
--help (-h)	Displays the help text
--hostlist (-hl)	Displays the list of QLogic hosts (adapters) connected to this RHEL 5 server
--parameters (-p)	Displays the command line parameters that can be passed to the QLogic adapter driver
--statistics (-s)	Displays statistics for the specified host
--procfs (-procs)	Scans procfs-base information, instead of sysfs. This option should not be used on RHEL 5-based Linux distributions.
--verbose (-v)	Displays detailed LUN information, in addition to standard adapter information

Table 8-18 shows a set of tasks that provide information about the QLogic Converged Network Adapter and the FC HBA Snapshot utility command that performs each task.

Table 8-18. FC HBA Snapshot Utility Command Example

Task	Command Example
List default adapter information for all adapters in the server	`# ./ql-hba-snapshot.sh`
List QLogic adapter ports in the server by their host IDs	`# ./ql-hba-snapshot.sh --hostlist`
List detailed information about the QLogic Converged Network Adapter port enumerated by the host list as host 7	`# ./ql-hba-snapshot.sh 7`
List detailed information for all hosts	`# ./ql-hba-snapshot.sh --all`

Table 8-18. FC HBA Snapshot Utility Command Example (Continued)

Task	Command Example
List QLogic adapter driver parameters	`# ./ql-hba-snapshot.sh --parameters`

FC HBA Change LUN State Utility

This utility is a combination command line/menu interface that changes the state (online/offline) of LUNs connected to a QLogic adapter, without rebooting the server. For example, if a SCSI command times out on a device, and fails to recover the device, the SCSI mid-layer places the device offline. Later, when the device is online, you can use the FC HBA Change LUN State utility to change the state to online.

The FC HBA Change LUN State utility performs the following tasks:

- Selects a host (Converged Network Adapter port) on which to enable logical LUNs attached to it
- Enables all offline LUNs with single command
- Selects targets for every host (menu interface only)

Package Contents

Table 8-19 describes the files in the FC HBA LUN State utility package.

Table 8-19. FC HBA Change LUN State Utility Package Files

File	Description
COPYING	GNU general public license that describes rights to copy, distribute, and use the open source content in this Linux tool
ql-lun-state-online.sh	Script file that changes the state of LUNs connected to QLogic adapters
README.ql-lun-state-online.txt	Readme file
revision.qllunstateonline.txt	Text file that explains the changes that are new in this version of the package

Using the Utility

This utility has a command line interface and a menu interface.

Command Line Interface

To use the command line interface, type one of the following commands:

```
# ./ql-lun-state-online.sh <host number list>
```

or

```
# ./ql-lun-state-online.sh --all
```

where *host number list* a list of one or more SCSI host IDs (delimited by spaces) of the QLogic Converged Network Adapter physical or virtual ports. If you omit host number list and the --all option, the utility prompts you to correct your entry.

Table 8-20 describes the FC HBA Change LUN State Utility command line options.

Table 8-20. FC HBA Change LUN State Utility Command Line Options

Option (Abbreviation)	Description
<Host number>	Scan for all offline LUNs on the specified HOSTS (QLogic adapter ports) and enable them
--all (-a)	Scan for all offline LUNs on all the HOSTS (QLogic adapter ports) and enable them
--help (-h)	Display the help text
--interactive (-i)	Open the menu interface. Refer to “Menu Interface” on page 8-52.

Table 8-21 shows a set of tasks and the commands that perform them.

Table 8-21. HBA Change LUN State Utility Command Examples

Task	Command Example
Enable all LUNs on host 2 and 4; that is, QLogic adapter ports shown in sysfs as /sys/class/scsi_host/host2 and /sys/class/scsi_host/host4	`# ./ql-lun-state-online.sh 2 4`
Enable all LUNs on all adapt- ers	`# ./ql-lun-state-online.sh --all`
Open the menu interface	`# ./ql-lun-state-online.sh --interactive`
Display the help text	`# ./ql-lun-state-online.sh --help`

Menu Interface

To open the menu interface, issue the following command:

```
# ./ql-lun-state-online.sh -interactive
```

- If no offline LUNs are found, the menu interface does not start, the utility informs you that no offline LUNs were found, and the utility closes.
- If offline LUNs are found, the utility main menu appears, as shown in the example in Figure 8-21.

```
Welcome to QLogic LUN State Change Utility
============================================
MAIN MENU

1. HOST: 2 TGT: 0 LUN: 4
2. HOST: 3 TGT: 1 LUN: 4
3. MAKE ALL ONLINE
4. QUIT

Please select any one option:
```

Figure 8-21. FC HBA Change LUN State Utility Main Menu

The Main menu option numbers will vary depending on the number of offline LUNs.

To change the state of one LUN:

1. Type the option number of a LUN, and the press ENTER.
2. Type the option number for OFFLINE to ONLINE/RUNNING, and then press ENTER.

To change the state of all LUNS from offline to online, type the option for MAKE ALL ONLINE, and then press ENTER.

Set Device Command Timeout Utility

This utility is a combination command line/menu interface that controls the time that the target device has to execute a command. Increasing the timeout value can improve performance under heavy I/O conditions, when target devices need more time to execute commands, resulting in the Linux SCSI mid-layer driver aborting fewer tasks. However, increasing the timeout value also delays the detection of devices that have gone offline.

The Set Device Command Timeout utility can set the timeout value for target devices on a selected host, or it can set a common value for all devices on all hosts. This utility sets a timeout value for each target port and applies to all LUNs that are visible through that target port. This utility does not apply to targets that are visible through QLogic adapter virtual ports.

Package Contents

Table 8-22 describes the files in the Set Device Command Timeout utility package.

Table 8-22. Set Device Command Timeout Utility Package Files

File	Description
COPYING	GNU general public license that describes rights to copy, distribute, and use the open source content in this Linux tool
ql-set-cmd-timeout.sh	Script file that sets the timeout on the devices connected to the QLogic Converged Network Adapter
README.ql-set-cmd-timeout.txt	Readme file
revision.qlsetcmdtimeout.txt	Text file that explains the changes that are new in this version of the package

Using the Utility

This utility has a line command interface and a menu interface.

Command Line Interface

To display the timeout values for devices connected to a specified host ID, issue the following command:

```
# ./ql-set-cmd-timeout.sh <HOST #>
```

To display the timeout values for devices connected to a specified target and host ID, issue the following command:

```
# ./ql-set-cmd-timeout.sh <HOST #> <TARGET #>
```

To set the timeout values for devices connected to a specified target and host ID, issue the following command:

```
# ./ql-set-cmd-timeout.sh <HOST #> <TARGET #> <TIMEOUT #>
```

If you omit all command options, the utility displays the timeout values on devices connected to the all QLogic Converged Network Adapter ports.

Table 8-23 describes the Set Device Command Timeout utility command options.

Table 8-23. Set Device Command Timeout Utility Command Options

Option (Abbreviation)	Description
<HOST #>	QLogic adapter port SCSI host ID (host*X*) as identified in `/sys/class/scsi_host/hostX/`
<TARGET #>	Target ID connected to the adapter port
<TIMEOUT #>	Timeout value (in seconds) to set on the devices under the targets *<TARGET #>* that are visible through the host *<HOST #>*.
--help (-h)	Displays the help text
--interactive (-i)	Opens the Set Device Timeout Command utility menu interface. Refer to "Menu Interface" on page 8-56.

Table 8-24 lists a set of tasks and the commands that perform them for a target device with the following sysfs path:

```
/sys/class/scsi_host/host4/device/rport-4:0-1
```

In this path, host=4 and target=0.

Table 8-24. Set Device Command Timeout Utility Command Examples

Task	Command Example
Display the timeout value for all devices connected to QLogic adapters.	`# ./ql-set-cmd-timeout.sh`
Display the timeout value for all devices connected to host 4.	`# ./ql-set-cmd-timeout.sh 4`
Display the timeout value for devices on target 0 connected to host 4.	`# ./ql-set-cmd-timeout.sh 4 0`
Set the timeout value to 30 seconds for devices connected on target 0 connected to host 4.	`# ./ql-set-cmd-timeout.sh 2 0 30`
To invoke the utility in menu	`# ./ql-set-cmd-timeout.sh -interactive`
To show the help text	`# ./ql-set-cmd-timeout.sh --help`

Menu Interface

To open the Set Device Command Timeout utility menu interface, issue the following command to display the menu shown in Figure 8-22:

```
# ./ql-set-cmd-timeout.sh -interactive
```

```
 Welcome to QLogic Set Device Timeout Utility
=============================================

MAIN MENU
        1. HOST4
        2. HOST5
        3. SELECT ALL HOSTS
        4. SET COMMON TIMEOUT FOR ALL HOSTS
        5. QUIT

Please select one of the options above :
```

Figure 8-22. Set Device Command Timeout Utility Main Menu

Table 8-25 describes the Set Device Command Timeout Utility Main Menu Options.

Table 8-25. Set Device Command Timeout Utility Main Menu Options

Option	Description
HOST*X*	Select a QLogic adapter port for which to display or set the timeout value. Selecting this option opens the SELECT TARGET for HOSTX sub menu (Figure 8-23).
SELECT ALL HOSTS	Select the target devices connected to all QLogic adapters for which to display or set the timeout values. Selecting this option opens the Modify/Display Timeout menu (Figure 8-24).
SET COMMON TIMEOUT FOR ALL HOSTS	Set the timeout value for all the target devices that are visible by all the QLogic adapters in the server. At the prompt, type a timeout value in seconds.
QUIT	Exit the Set Device Command Timeout utility.

Figure 8-23 shows an example of the Select Target for HostX menu. The actual menu varies depending on the number of targets that are visible through the QLogic adapter port.

```
Select Target for HOST4
        1. Target 0
        2. Target 1
        3. Target 2
        4. Target 3
        5. GO BACK TO MAIN MENU
        6. QUIT

Please select one of the options above :
```

Figure 8-23. Select Target for HostX Menu

Table 8-26 describes the Select Target for HostX menu options.

Table 8-26. Select Target for HostX Menu Options

Option	Description
Target*X*	Target device for which to set or display timeout values. This option opens the Modify/Display Timeout menu (Figure 8-24).
GO BACK TO MAIN MENU	Return to the main menu.
QUIT	Exit the Set Device Command Timeout utility.

Figure 8-24 shows the Modify/Display Timeout menu.

```
Select option:
        1. MODIFY TIMEOUT
        2. DISPLAY TIMEOUT
        3. GO BACK TO PREVIOUS MENU
        4. GO BACK TO MAIN MENU
        5. QUIT

Please select one of the options above :
```

Figure 8-24. Modify/Display Timeout Menu

Table 8-27 describes the Modify/Display Timeout menu options.

Table 8-27. Modify/Display Timeout Menu Options

Option	Description
MODIFY TIMEOUT	Specify the timeout value, in seconds, for the selected target(s).
DISPLAY TIMEOUT	Display the current timeout value for the selected target(s).
GO BACK TO MAIN MENU	Return to the main menu.
QUIT	Exit the Set Device Command Timeout utility.

9 Offline Utilities

Overview

QLogic provides offline adapter configuration and Flash programming utilities with the adapter multi-boot code for advanced users. The following utilities are available for adapters installed in both BIOS and UEFI servers:

- Fast!UTIL
- EFICFG
- FlasUTIL
- EFIUTIL

The *Fast!*UTIL and EFICFG configuration utilities enable advanced users to customize the configuration of the QLogic 8100 Series Adapter and connected Fibre Channel devices. *Fast!*UTIL is for adapters installed in BIOS-based severs, and the EFICFG utility is for adapters installed in UEFI servers.

CAUTION!

The *Fast!*UTIL and EFIUTIL utilities are only for advanced users. If the configuration settings are incorrect, the adapter may become inoperable. Do not change the configuration settings from the default values, unless instructed to do so by QLogic Technical Support or by QLogic documentation. The default adapter settings are designed for a typical Microsoft Windows installation and generally do not require changes.

The FlasUTIL and EFIUTIL utilities are for advanced users primarily to update the multi-boot image (including firmware) on QLogic 8100 Series Adapters. These utilities can also display BIOS/UEFI version information, perform advanced debugging, and collect support information. The FlasUTIL utility is for BIOS servers, and the EFIUTIL utility is for UEFI servers.

CAUTION!

The FlasUTIL and EFIUTIL utilities are only for advanced users. Use caution when making changes with these utilities—mistakes are not easily reversed.

The QLogic Flash programming utility is a DOS utility with command line options.

Fast!UTIL

The *Fast!*UTIL utility is for offline QLogic 8100 Series Adapters that are installed on BIOS servers. *Fast!*UTIL performs the following tasks:

- Configures general and advanced adapter settings, selects boot devices, restores default adapter settings, and displays raw NVRAM data.
- Displays information about Fibre Channel devices connected to the adapter.
- Verifies disk data and performs low-level disk formatting.
- Verifies adapter transmit and receives functions.

Starting Fast!UTIL

To start the *Fast!*UTIL utility, press CTRL+Q or ALT+Q during the BIOS initialization after the QLogic 8100 Series Adapter BIOS banner is displayed (Figure 9-1).

```
QLogic Corporation
QLE8152 PCI Fibre Channel ROM BIOS Version 2.14
Copyright (C) QLogic Corporation 1993-2009. All rights reserved.
www.qlogic.com

Press <CTRL-Q> or <ALT-Q> for Fast!UTIL
```

Figure 9-1.** Fast!**UTIL Startup

After a few seconds, the system confirms that *Fast!*UTIL initialization is in progress. If more than one adapter is installed on the server, *Fast!*UTIL prompts you to select an adapter to configure (Figure 9-2).

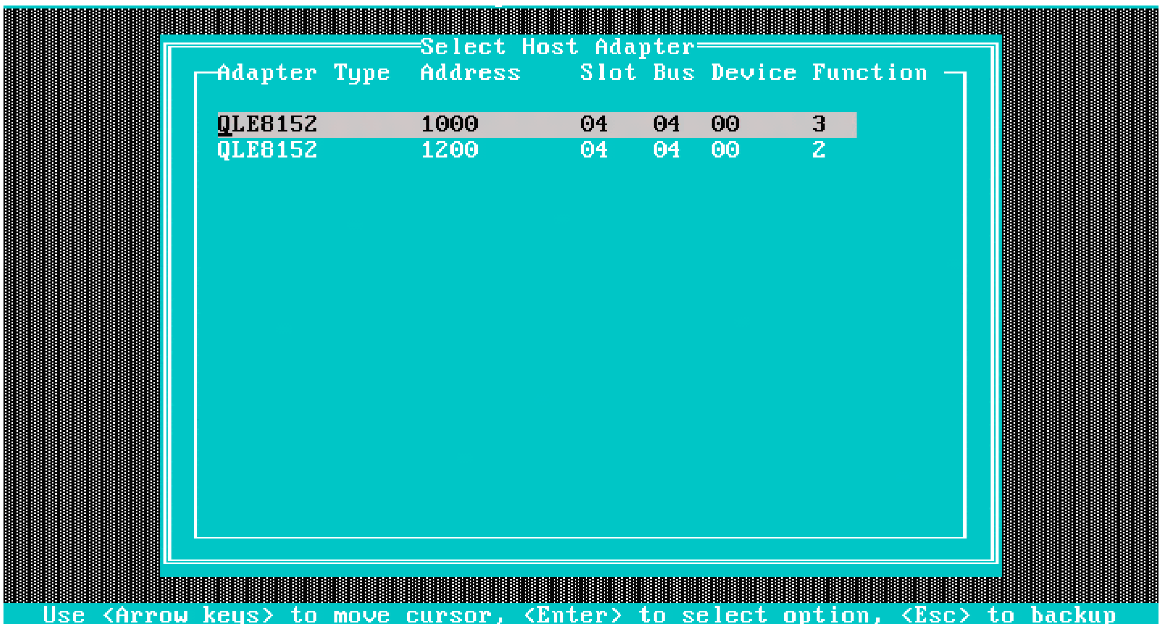


Figure 9-2. Selecting an Adapter

After an adapter is selected, the *Fast!*UTIL Options menu appears (Figure 9-3).

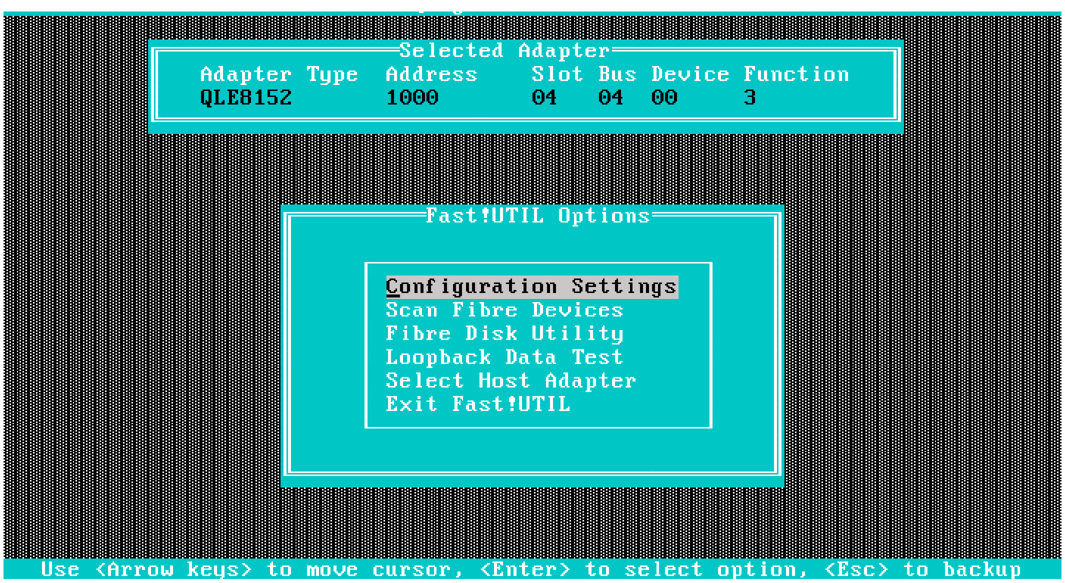


Figure 9-3.** Fast!**UTIL Options Menu

The *Fast!*UTIL Options menu presents the following options:

- Configuration Settings
- Scan Fibre Channel Devices
- Fibre Disk Utility
- Loopback Data Test
- Select Host Adapter
- Exit Fast!UTIL

After you make changes, the *Fast!*UTIL utility restarts the server to put those changes into effect.

Configuration Settings

The **Configuration Settings** option enables you to display and configure adapter parameters, select boot devices, restore default settings, and display raw NVRAM data.

- Adapter Settings
- Selectable Boot Settings
- Restore Default Settings
- Raw NVRAM Data

Adapter Settings

The **Adapter Settings** option opens the Adapter Settings window (Figure 9-4), from which you can view and modify adapter parameters.

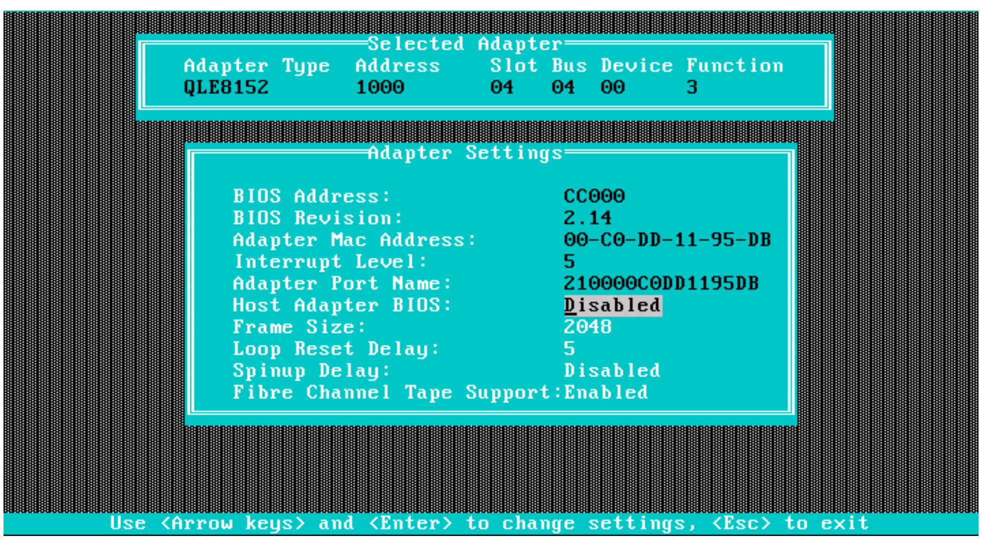


Figure 9-4. Adapter Settings Window

Table 9-1 describes the parameters in the Adapter Settings window.

Table 9-1. Adapter Setting Parameters

Parameter	Description
BIOS Address	I/O address where the QLogic BIOS code is stored when you start the *Fast!*UTIL utility or when the BIOS code is enabled by default. This is the address of the BIOS code in ROM shadow memory. Multiple adapters can be installed in the server, but only one BIOS instance is loaded for all adapters. The BIOS code is loaded from the first port of the first adapter that the server recognizes. This code is used for all remaining adapters in the same bus or server. The version of BIOS code that is loaded does not affect other adapters with earlier versions of BIOS code.
BIOS Revision	Version of BIOS code that is loaded from the first adapter that the server recognizes and enumerates. Each adapter in the server has the same BIOS code revision, because only one BIOS code instance is loaded.
Adapter Mac Address	Ethernet MAC address for the selected adapter port. This address is printed on the adapter SFP+ cage. This is not the CEE MAC address that is used for LLDP communications between the adapter and the FCoE switch.
Interrupt Level	Interrupt that is used by the adapter. The interrupt level might change when the operating system is installed. The interrupt level for the adapter under the BIOS may be different than the interrupt level under the operating system.
Adapter Port Name	WWPN that identifies the QLogic adapter port in storage area networks.
Host Adapter BIOS	Enables or disables the adapter BIOS. Disabling the adapter BIOS frees space in upper memory. The adapter BIOS must be enabled for boot-from-SAN configurations. The default is disabled. If no Fibre Channel targets are discovered at BIOS initialization, the ROM BIOS is not installed.
Frame Size	Maximum Fibre Channel frame size supported by the adapter for encapsulating in an Ethernet frame. The default is 2,048 bytes, which provides maximum performance for most deployments.
Loop Reset Delay	Time, in seconds, to delay the initiation of loop activity after the adapter firmware resets the loop. The default is five seconds.
Spinup Delay	Enables or disables the spinup delay. When enabled, the BIOS waits up to five minutes to find the first drive (target device LUN). The default setting is disabled.

Table 9-1. Adapter Setting Parameters (Continued)

Parameter	Description
Fibre Channel Tape Support	Enables or disables FCP-2 recovery. Disable Fibre Channel Tape Support if the adapter is connected to a storage subsystem and not to a tape device. Most storage subsystems do not support sending I/O from the same adapter to both a storage subsystem and a tape device. The default is enabled.

Selectable Boot Settings

The Selectable Boot Setting option opens the Selectable Boot Settings window (Figure 9-5), from which you can select one or more remote Fibre Channel drives to serve as a boot device. To preserve boot device specifications that you make, you must also enable the Host Bus Adapter BIOS parameter, described in Table 9-1. For information about configuring a server to boot from SAN, refer to “Boot from SAN” on page 7-15.

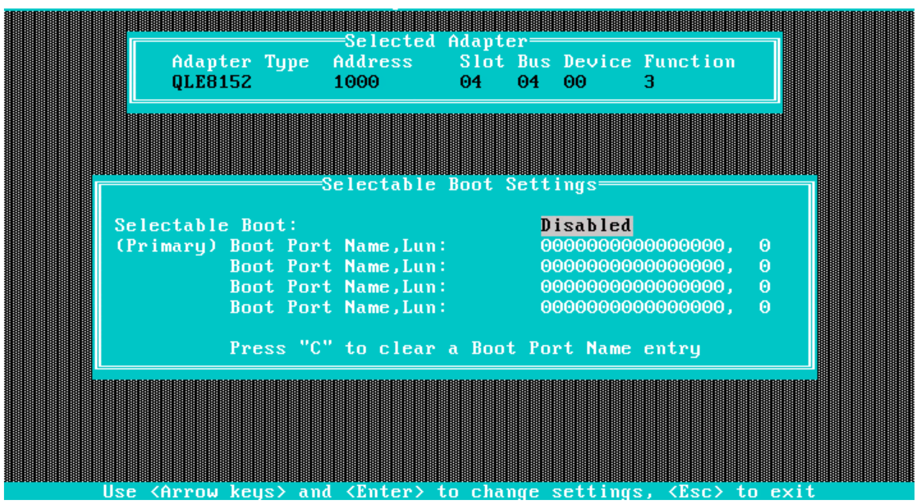


Figure 9-5. Selectable Boot Setting Window

Table 9-2 describes the selectable boot setting parameters.

Table 9-2. Selectable Boot Settings Window Parameters

Parameter	Description
Selectable Boot	Enables or disables specified boot devices. ■ If Selectable Boot is disabled, BIOS configures the first disk drive (LUN) it finds as the boot device. ■ If Selectable Boot is enabled and the Boot Port Name Lun parameter is unspecified, BIOS configures the first LUN 0 disk drive that it finds as the boot device. ■ If Selectable Boot is enabled and the Boot Port Name, Lun parameter is specified, BIOS configures the specified device as the boot drive.
Boot Port Name, Lun	Specifies up to four WWPNs/LUNs as boot devices. The first set of WWPN and LUN numbers is the primary boot device. Subsequent entries are alternate boot devices in the order they appear in the list.

Selecting the Boot Port Name, Lun parameter opens the Select Fibre Channel Device window (Figure 9-6). You can select any of the Fibre Channel devices listed.

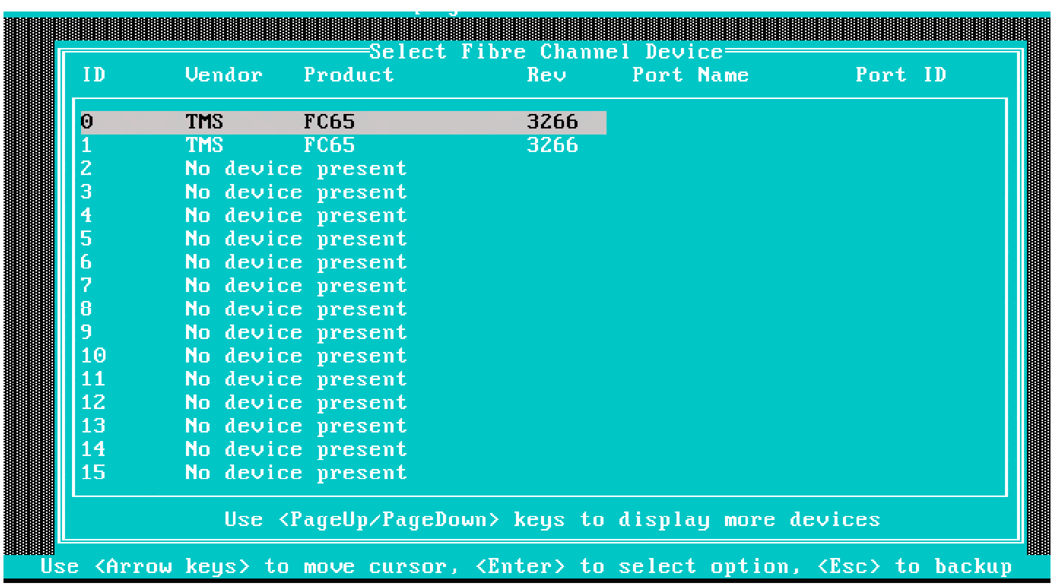


Figure 9-6. Select Fibre Channel Device Window

NOTE:

On some servers, the BIOS code supports selectable startup that overrides the *Fast!*UTIL selectable boot setting. In such cases, consult the server product documentation for information about configuring the boot device using the server's Configuration/Setup Utility menu.

Restore Default Settings

The Restore Default Settings option restores the default adapter and NVRAM settings. The NVRAM settings are the adapter settings that were saved the last time NVRAM was updated using the QLogic FlasUTIL utility (option u). If NVRAM has not been updated using the FlasUTIL utility since the adapters were installed, the factory settings are restored.

Raw NVRAM Data

The Raw NVRAM Data option displays raw NVRAM data for QLogic Technical Support to use.

Advanced Adapter Settings

The Advanced Adapter Settings option opens the Advanced Adapter Settings window (Figure 9-7), from which you can view and modify advanced adapter parameters. Modify these parameters only if you are an advanced user or if you have been instructed by QLogic Technical Support.

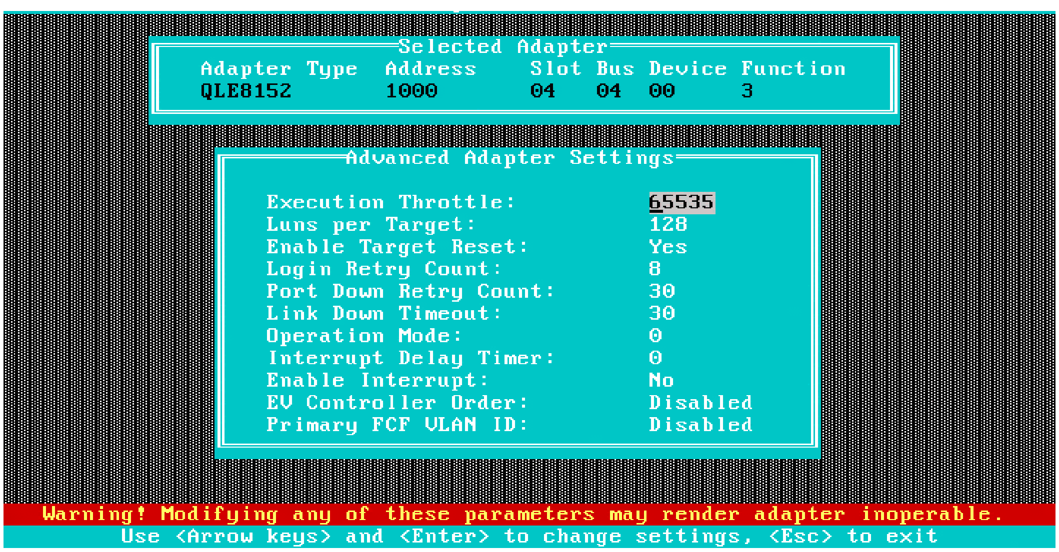


Figure 9-7. Advanced Adapter Settings Window

Table 9-3 describes the parameters in the Advanced Adapters Settings window.

Table 9-3. Advanced Settings Window Parameters

Parameter	Description
Execution Throttle	The maximum number of commands that can run on one port. When the number of commands executing on a port reaches the execution throttle value, no new commands can be initiated until the current command finishes. This parameter can be 1–65,535. The default is 65,535.
LUNs per Target	The maximum number of LUNs per Fibre Channel port or FCoE target device. Multiple LUN support is typically for RAID servers that map drives with LUNs. The default is 128.
Enable Target Reset	Enables or disables the adapter FCoE device drivers to issue a Target Reset command to all devices on the loop when a SCSI Bus Reset command is issued. The default is Yes.
Login Retry Count	The number of times that the software will try to log in to a device. The default is 8.
Port Down Retry Count	The number of seconds that the software waits before resubmitting a command to a port that was down. The default is 30 seconds. When the QLogic adapter is connected to a storage enclosure with a large number of drives, this parameter can be increased. For recommended values, consult the storage array product documentation.
Link Down Timeout	The number of seconds that the software waits for a down link to recover before reporting it to the upper layers. The default is 30 seconds.
Operation Mode	The reduced interrupt operation (RIO) mode, which enables posting multiple command completions to the host in a single interrupt. The default mode is 0. Operation Mode values are: ■ 0—Interrupt for every command completion ■ 5—Interrupt when the Interrupt Delay Timer expires ■ 6—Interrupt when the Interrupt Delay Timer expires or when there are no active commands.
Interrupt Delay Timer	The number of 200-microsecond increments that the software waits between accessing (DMA) a set of handles and generating an interrupt. This setting works in conjunction with the Operation Mode parameter. The default is 0.
Enable Interrupt	Enables or disables the use of the interrupt request queue (IRQ) assigned to the adapter ASIC. When this parameter is disabled, the BIOS polls for ISP mailbox command completion status. The default is No.

Table 9-3. Advanced Settings Window Parameters (Continued)

Parameter	Description
EV Controller Order	Enables or disables loading the adapter BIOS if the Converged Network Adapter is selected as the first controller in the system BIOS\boot controller order. If this parameter is disabled, the adapter BIOS loads in any CMOS location, allowing the system to boot from a Fibre Channel drive (boot LUN), even after other devices, such as a 3.5-inch disk or CD-ROM drive. The default is disabled. This parameter is primarily for compatibility with legacy servers.
Primary FCF VLAN ID	Enables or disables the use of the primary VLAN ID.

Scan Fibre Channel Devices

The Scan Fibre Channel Devices option displays information for all devices on the Fibre Channel loop. This information is useful when configuring the adapter and attached devices and includes the loop ID, vendor name, product name, and revision. You can also use this option to confirm that the adapter FCoE function is operating in the fabric.

Fibre Disk Utility

CAUTION!

Low-level formatting permanently removes all data on the disk.

The Fibre Disk Utility option opens the Disk Utility Options window (Figure 9-8). This window displays information for all devices on the Fibre Channel loop and provides options to perform disk maintenance functions. The disk maintenance functions include low-level formatting, media verification, and data verification. You can also select a different disk.

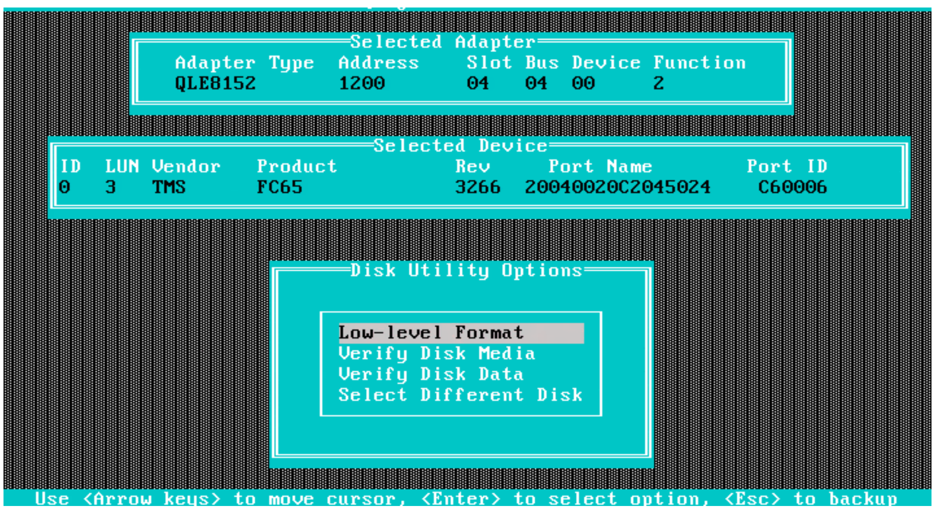


Figure 9-8. Disk Utility Functions

Loopback Data Test

NOTE:

When running the loopback data test, ensure that loopback connectors are installed in the adapter ports before starting the test. Do not run this test with the adapter connected to the fabric switch port.

The Loopback Data Test option verifies the adapter transmit and receive functions. This test is not the same as the internal loopback test that is available in QConvergeConsole GUI and QConvergeConsole CLI.

Select Host Adapter

The Select Host Adapter option enables you to select an adapter when there is more than one adapter installed in the server.

Exit Fast!UTIL

The Exit Fast!UTIL option closes the *Fast!*UTIL utility. When prompted, choose to save the changes and restart the server to put configuration changes into effect.

EFICFG

The QLogic EFI Driver Configuration protocol displays and modifies configuration parameters stored in the adapter NVRAM. The QLogic EFI Driver Diagnostic protocol provides a minimal set of adapter diagnostics. Both protocols are provided as part of the QLogic EFI SCSI pass-thru (SPT) protocol driver. Either protocol may be invoked from the EFI shell. Each protocol uses a menu-driven interface to allow the user to display and modify adapter configuration and diagnostic parameters. Both protocols support EFI and UEFI systems.

During the configuration process, all changes are made to a local copy of the NVRAM. The changes may be committed to the adapter NVRAM by using the Write selection on the Main Menu. Prior to using this selection, changes to the local copy may be abandoned by using the Abandon or Quit selections on the Main Menu.

To start the Configuration protocol from the EFI shell procedure:

1. Type the following command:

   ```
   drivers
   ```

2. A list of installed EFI drivers is displayed in table form. Under the heading Driver Name, find the driver with name OEM Fibre Channel Driver (where OEM is QLogic or an OEM name). Notice the driver's handle number in the DRV column (this number is known as driverhandle).

   There may be one or more driver instances listed. If only one driver instance is listed, then it is managing one or more adapters. If more than one driver instance is listed, then each instance is managing a subset of the available adapters.

3. Type the following command:

   ```
   drvcfg driverhandle
   ```

   A list of adapters that are managed by this driver is displayed. Notice the controller handle number inside the brackets labeled Ctrl [ ] (this number is known as controllerhandle).

4. Type the following command to start the Configuration protocol:

   ```
   drvcfg -s driverhandle controllerhandle
   ```

The Driver Configuration Main Menu will be displayed. Do not redirect the output of the Driver Configuration protocol. Redirecting console output may cause failures.

For a more detailed description of the EFI commands used in this procedure, refer to the EFI shell documentation provided with your computer or the EFI project documentation at http://www.intel.com/technology/efi/index.htm.

For information about the EFICFG utility menus and selections, refer to *Using the QLogic EFI Configuration and Diagnostic Protocols* document in the software package.

FlasUTIL

The FlasUTIL utility is for offline QLogic 8100 Series Adapters installed in BIOS servers. The FlasUTIL utility performs the following tasks:

- Read the multi-boot image
- Write the multi-boot image
- Verify the multi-boot image
- Verify the NVRAM

NOTE:

- FlasUTIL is a DOS utility that requires the server to boot in DOS, using either a DOS disk or a USB removable drive. Do not use the Microsoft Windows DOS interface to execute these utilities.
- Some FlasUTIL features, such as the NVRAM options, are intended only for QLogic Technical Support and, therefore, are not documented in this guide.
- Do not run this utility from a drive connected to the QLogic 8100 Series Adapter.

Installing FlasUTIL

To install the FlasUTIL utility:

1. Create a DOS-bootable disk or USB removable drive.
2. Download the QLogic 8100 Series Adapter multi-boot image file for your server model and operating system from http://driverdownloads.qlogic.com/.
3. Extract the multi-boot image file, and copy it to the 3.5-inch disk or USB removable drive. If your disk has insufficient space, you can delete text files and .efi files from the multi-boot image before copying the folder.

4. Boot the server with the QLogic 8100 Series Adapter using the disk or USB removable drive.
5. Change to the directory containing the multi-boot image on the disk or USB removable drive.

Using FlasUTIL

The FlasUTIL utility has a command line interface and a menu interface. The menu interface is function specific, and is not described in this guide.

The FlasUTIL command has the following format:

```
flasutil options
```

If you omit the options, the command displays all QLogic adapters and their I/O addresses. Table 9-4 describes the FlasUTIL command line options; these options are not case sensitive.

Table 9-4. FlasUTIL Command Line Options

Option	Function
/?	Display all FlasUTIL command line options
xxxx	Open the menu interface for the adapter at address *xxxx*.
/L *xxxx*	Write NVRAM to the adapter at address *xxxx*. If you omit the address, the command writes the NVRAM to all adapters.
/F *xxxx*	Write BIOS code to the adapter at address *xxxx*. If you omit the address, the command writes BIOS code to all adapters. If an adapter already contains a valid BIOS image, the existing NVRAM contents are preserved.
/FR *xxxx*	Write firmware to the adapter at address *xxxx*. If you omit the address, the command writes firmware to all adapters on the server.
/D *xxxx*	Copy NVRAM to a file (QLxxNVR.SAV) on the adapter at address *xxxx*.
/W *xxxx filename*	Copy the BIOS image from the adapter at address *xxxx*, to the file given by *filename* (for example, `QLxxROM.SAV`).
/N *filename*.dat	Use *filename*.dat as the default NVRAM update image, instead of `Qxxxxxx.DAT`.
/O *filename*.ext	Use *filename*.ext as the multi-boot image, instead of `x8xyyyyy.bin`.
/I	Ignore the subsystem ID. This may be required if FlasUTIL does not recognize the adapter.

Table 9-4. FlasUTIL Command Line Options (Continued)

Option	Function
/Q	Quiet mode suppresses all messages on the display.
/S *xxxx*	Display the serial number of the adapter at address *xxxx*. If you omit the address, the command displays the serial numbers of all adapters.
/V *xxxx*	Display the current BIOS version of the adapter at address *xxxx*. If you omit the address, the command displays the BIOS version for all adapters.
/X *xxxx*	Verify the NVRAM of the adapter at address *xxxx*. If you omit the address, the command verifies the NVRAM for all adapters.
/Y *xxxx*	Display the WWPN of the adapter at address *xxxx*. If you omit the address, the command displays the WWPNs for all adapters.

After updating the multi-boot image using FlasUTIL, issue the `vpd /a /u` command from the multi-boot image directory on the disk or USB removable drive. This command updates the version information for the newly installed multi-boot image.

Installing the Multi-boot Image

NOTE:

For QLogic adapters that are already operational with a valid multi-boot image, use the QConvergeConsole web management GUI or QConvergeConsole CLI to update the image. For information about using these applications, refer to the appropriate user guide at http://driverdownloads.qlogic.com

1. Install the FlasUTIL utility as described in “Installing FlasUTIL” on page 9-13.
2. Locate the `update.bat` file, which is bundled with the multi-boot image. Ensure that all the files that are part of the multi-boot image reside in the same directory as the `update.bat` file.
3. Execute the `update.bat` file. The `update.bat` file contains a script that calls the `FLASHUTIL.EXE` routine (to update the multi-boot image on the QLogic adapter) and the `VPD.EXE` routine (to update the vital product data).

NOTE:

Each multi-boot image version has its own `update.bat` file. Do not attempt to update a multi-boot image with an `update.bat` file from a different multi-boot image version.

The script updates the multi-boot images for all the QLogic adapters with corresponding multi-boot image versions, as shown in Figure 9-9.

```
Copyright (C) QLogic Corporation 1998-2009. All rights reserved.

Programming QLE8142 FW Table at Address B400
FW Table at Address B400 Loaded Successfully

        FLASHING FCoE NVRAM...


QLogic NOVRAM and FLASH Programming Utility Version 1.80
Copyright (C) QLogic Corporation 1998-2009. All rights reserved.

Programming QLE8142 NOVRAM at Address B400
NOVRAM at Address B400 Loaded Successfully
Programming QLE8142 NOVRAM at Address B000
NOVRAM at Address B000 Loaded Successfully

        FLASHING MULTIBOOT...


QLogic NOVRAM and FLASH Programming Utility Version 1.80
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Programming Flash Image
.....
```

Figure 9-9. FlasUTIL FW Upgrade In Progress

4. When the installation is complete, reboot the system.

EFIUTIL

The EFIUTIL utility accesses and modifies the contents of the Flash memory on the QLogic adapter. This utility is an EFI/UEFI application runs from the EFI shell. It consists of the program `efiutil.efi` and an auxiliary driver, `efiaux.drv`. The auxiliary driver is used if `efiutil.efi` is unable to detect a QLogic EFI driver capable of supporting the Flash memory protocol. All these files must be in the same directory with `efiutil.efi`.

There are two versions of EFIUTIL: `efiutil.efi` and `efiutilx64.efi`. `efiutil.efi` runs on Itanium processor (IA64) systems. `efiutilx64.efi` runs on x64 processor systems.

The utility can run in batch mode or in interactive mode (CLI mode). The mode of operation is determined by the number command line parameters used to start efiutil. If no parameters are used, EFIUTIL starts in CLI mode as follows:

- To start the EFIUTIL CLI on an IA64 system, type the following command:

  `efiutil`

- To start the EFIUTIL CLI on an x64 system, type the following command:

  `efiutilx64`

For information about the EFIUTIL commands and menus, refer to *Using the Efiutil Utility*, in the software package.

A Adapter Port LEDs

Figure A-1 shows the QLogic 8100 Series Adapter Storage Traffic and Link/Ethernet Traffic port LEDs. Each port has its own LEDs.

- The Storage Traffic LED indicates the state of data traffic exchanged with the SAN.
- The Link/Ethernet Traffic LED indicates the state of data traffic exchanged with the LAN.

Observe the LED states, and refer to Table A-1 for indications of firmware or hardware conditions.

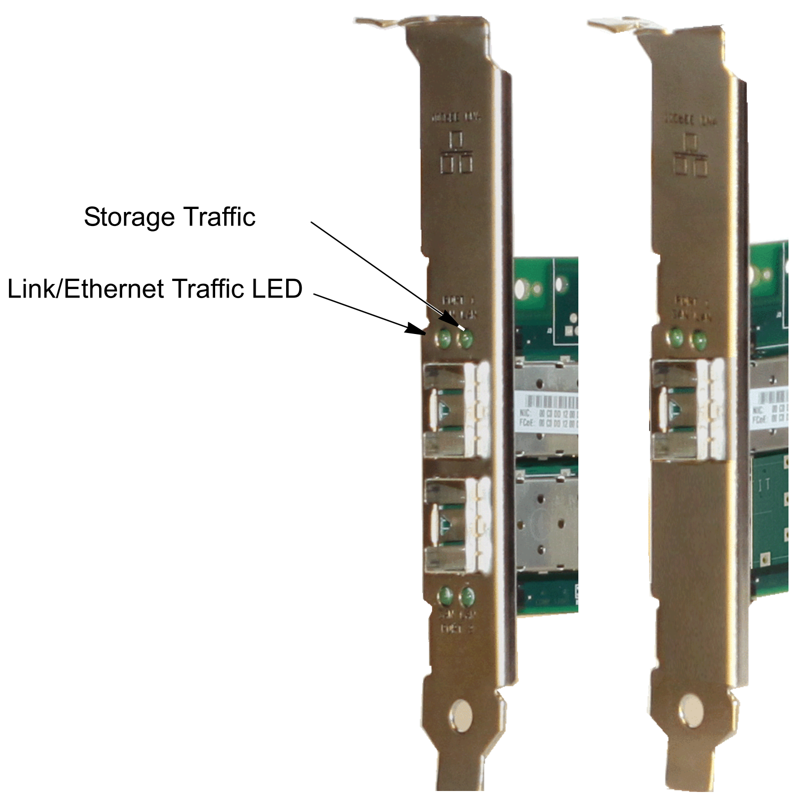

Figure A-1. QLogic 8100 Series Adapter LEDs

Table A-1. Configuration Options for Virtual Ports

Link/Ethernet Traffic LED	Storage Traffic LED	Hardware State
Off	Off	Power off
Slow flashing, unison	Slow flashing, unison	Power on, no link
On	On	Power on, link established, no activity
Flashing	On	Power on, link established, Ethernet activity only
On	Flashing	Power on, link established, storage activity only
Flashing	Flashing	Power on, link established, Ethernet and storage activity
Slow flashing, alternating with Storage Traffic LED	Slow flashing, alternating with Link/Ethernet Traffic LED	Beaconing

B Cisco Nexus 5000 Series Switch Configuration

This appendix describes how to use the switch CLI to configure the Cisco Nexus FCoE switch port as a virtual Fibre Channel port. This configuration enables communication between the Fibre Channel and FCoE devices attached to the switch.

Configuring the Cisco Nexus FCoE switch involves the following steps:

1. Enable the FCoE function on the switch.
2. Create and configure the VLAN.
3. Configure the physical Ethernet interface switch port.
4. Create and configure a virtual Fibre Channel port.
5. Verify that the Converged Network Adapter is logged into the switch.

The steps and commands presented in this appendix may vary depending on your switch model and the firmware version installed on the switch. For detailed information about configuring the switch, refer to the Cisco Nexus switch configuration guide.

This configuration procedure assumes that:

- The QLogic 8100 Series Adapter is connected to Cisco Nexus switch port 1/19.
- You have administrator authority on a workstation that is capable of running the Cisco Nexus switch CLI.
- The correct license (N5010SS or N5020SS) is installed on the switch.

Enable FCoE on the Switch

To enable the FCoE function on the switch:

1. Determine whether the FCoE function is enabled on the switch by issuing the `show feature` command. In the following example, the FCoE function is disabled.

```
nexusmv1# show feature
Feature Name          Instance  State
--------------------  --------  --------
fcsp                  1         disabled
tacacs                1         disabled
fc-port-security      1         disabled
fabric-binding        1         disabled
port_track            1         disabled
npiv                  1         enabled
lacp                  1         disabled
npv                   1         disabled
interface-vlan        1         disabled
private-vlan          1         disabled
udld                  1         disabled
vpc                   1         disabled
cimserver             1         disabled
fcoe                  1         disabled
fex                   1         enabled
```

   If the FCoE function is already enabled, proceed to "Create and Configure the VLAN" on page B-3.

2. Enter the configuration mode and enable the FCoE function by issuing the following commands:

```
#configure terminal
(config)# feature fcoe
nexusmv1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
nexusmv1(config)# feature fcoe
FC license checked out successfully
FCoE manager enabled successfully
```

3. Save the current configuration to the switch nonvolatile memory, and then exit configuration mode by issuing the following commands:

```
(config)# copy running-config startup-config
(config)# exit
```

4. Reboot the switch by issuing the following command:

```
# reload
```

   The switch may take several minutes to reboot.

5. When the reboot is complete, log in to the switch as the administrator.
6. Confirm that the FCoE function is enabled by issuing the following command:

```
# show feature
```

Create and Configure the VLAN

To create and configure the VLAN:

1. Enter the switch configuration mode by issuing the following command:

```
#configure terminal
```

2. Create the VLAN interface 1002 by issuing the following commands:

```
(config)# vlan 1002
nexusmv1(config)# vlan 1002
```

3. Enable FCoE for the VLAN, and create a mapping from this VLAN to a VSAN by issuing the following command:

```
(config)# fcoe vsan 1
```

Configure the Physical Ethernet Interface Switch Port

To configure the physical Ethernet interface switch port to which the QLogic 8100 Series Adapter is connected:

1. Enter the interface configuration mode for the CEE switch port that connects to the QLogic Converged Network Adapter by issuing the `interface ethernet` command. In the example, the QLogic adapter is connected to the Cisco Nexus FCoE switch port 1/19.

```
(config)# interface ethernet 1/19
```

2. Enable LLDP on the Ethernet interface by issuing the following commands:

   ```
   (config-if)# lldp transmit
   (config-if)# lldp receive
   ```

3. Set the PFC mode for the interface by issuing the following command:

   ```
   (config-if)# priority-flow-control mode auto
   ```

4. Configure the switch port as a trunk port by issuing the following command:

   ```
   (config-if)# switchport mode trunk
   ```

5. Configure the Ethernet interface as portfast by issuing the following command:

   ```
   (config-if)# spanning-tree port type edge trunk
   ```

6. Enable the Ethernet interface by issuing the following command:

   ```
   (config-if)# no shutdown
   ```

7. Exit the interface configuration mode by issuing the following command:

   ```
   (config-if)# exit
   ```

Create and Configure a Virtual Fibre Channel Interface

To create and configure a virtual Fibre Channel interface:

1. Create a virtual Fibre Channel interface by issuing the `interface vfc` command. In the example, the number 19 is arbitrary—you can use any available vfc number.

   ```
   (config)# interface vfc 19
   ```

2. Bind the Ethernet interface to the virtual Fibre Channel interface by issuing the following command:

   ```
   (config-if)# bind interface Ethernet 1/19
   ```

3. Enable the virtual Fibre Channel interface by issuing the following command:

   ```
   (config-if)# no shutdown
   ```

4. Exit the interface configuration mode by issuing the following command:

   ```
   (config-if)# exit
   ```

Verify that the Adapter Is Logged into the Switch

To verify that the switch has been properly configured and that the adapter has logged into the switch:

1. List the devices that have logged into the switch, and compare the device WWN with the information from the QLogic adapter port by entering the `show flogi database` command. In the example, `vfc 19` is logged into the switch and visible in the switch name server database.

```
nexusmv1(config-if)# show flogi database
-------------------------------------------------------------------------------
INTERFACE        VSAN    FCID           PORT NAME               NODE NAME
-------------------------------------------------------------------------------
fc2/1            1      0xc60000  20:04:00:20:c2:08:57:95 10:00:00:20:c2:08:57:95
fc2/2            1      0xc60001  20:03:00:20:c2:08:57:95 10:00:00:20:c2:08:57:95
fc2/3            1      0xc60004  20:02:00:20:c2:08:57:95 10:00:00:20:c2:08:57:95
fc2/4            1      0xc60002  20:01:00:20:c2:08:57:95 10:00:00:20:c2:08:57:95
fc3/1            1      0xc60006  20:04:00:20:c2:04:50:24 10:00:00:20:c2:04:50:24
fc3/3            1      0xc60005  20:02:00:20:c2:04:50:24 10:00:00:20:c2:04:50:24
fc3/5            1      0xc60007  20:01:00:20:c2:04:50:24 10:00:00:20:c2:04:50:24
fc3/7            1      0xc60008  20:03:00:20:c2:04:50:24 10:00:00:20:c2:04:50:24
vfc19            1      0xc6001c  10:00:00:00:c9:9c:c2:ed 20:00:00:00:c9:9c:c2:ed

Total number of flogi = 9.
```

2. Verify the detailed properties of the virtual Fibre Channel interface.

```
# show interface vfc 19
```

3. Configure zoning on the switch, as needed. For information about zoning the switch, refer to the Cisco switch documentation.

4. Save the current switch configuration so that the configuration is persistent across switch reboots by issuing the following command:

```
# copy running-config startup-config
```

C Brocade CEE/FCoE Switch/Blade Configuration

This appendix describes how to use the switch CLI to configure the Brocade FCoE switch port as a virtual Fibre Channel port. This configuration enables communication between the Fibre Channel and FCoE devices attached to the switch.

Configuring the Brocade FCoE switch involves the following steps:

1. Enable the Ethernet Switch Service (optional for Brocade 8000 series FCoE switch)
2. Create and configure the FCoE VLAN.
3. Create and configure the CEE-MAP.
4. Configure the LLDP/DCBX for FCoE.
5. Configure the CEE port.
6. Verify that the Converged Network Adapter is logged into the switch.

The steps and commands presented in this appendix may vary depending on your switch model and the firmware version installed on the switch. For detailed information about configuring the switch, refer to the Brocade switch configuration guide.

This configuration procedure assumes that:

- The FCoE10-24 blade resides in slot 7 of the backbone switch (DCX/DCX-4S backbone only).
- The QLogic 8100 Series Adapter is attached to the Brocade FCoE switch port 0/19.
- A Fibre Channel target device is attached to Fibre Channel port 0/1 on the Brocade switch.
- You have administrator authority on a workstation that is capable of running the Brocade switch CLI.
- The VLAN number 1002 is available for use as an FCoE VLAN.

Enable the Ethernet Switch Service

CAUTION!

To complete the configuration described in this section, the Brocade FCoE blade must be power cycled.

If you have a Brocade 8000 Series FCoE switch, the Ethernet switch service is enabled by default—proceed to "Create and Configure FCoE VLAN" on page C-3.

To enable the Ethernet switch service on the Brocade FCoE 10-24 blade for Brocade DCX and DCX-4S backbone switches:

1. Determine whether the Ethernet switch service is enabled by issuing the following command to display the Ethernet switch service status:

   ```
   admin> fosconfig –show
   ```

   If the Ethernet switch service is enabled, proceed to "Create and Configure FCoE VLAN" on page C-3.

2. If the Ethernet switch service is disabled, the status of the FCoE 10-24 blade will be Faulty. Issue the following command to confirm the status of the FCoE 10-24 blade:

   ```
   admin> slotshow –m
   ```

3. Enable the Ethernet switch service by issuing the following command:

   ```
   admin> fosconfig –enable ethsw
   ```

4. Power cycle the FCoE blade by issuing the following commands:

   ```
   admin> slotpoweroff 7
   admin> slotpoweron 7
   ```

   It will take several minutes to complete the power cycle.

5. Verify that the Ethernet switch service is enabled by issuing the following command:

   ```
   admin> fosconfig –show
   ```

6. Verify that the FCoE blade is ready by issuing the following command to display the blade status:

   ```
   admin> slotshow –m
   ```

Create and Configure FCoE VLAN

To create and configure the FCoE VLAN:

1. Enter the CEE management shell, and move to the global configuration mode by issuing the following commands:

```
admin> cmsh
# configure terminal

admin> cmsh
# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
(config)#
```

2. Create the VLAN interface 1002 by issuing the following command:

```
(config)# interface vlan 1002
```

   For QLogic Converged Network Adapters, use only VLAN 1002 to enable FCF forwarding.

3. Enable the forwarding of FCoE traffic on VLAN 1002 by issuing the following command:

```
(conf-if-vl-1002)# fcf forward
```

4. Verify the VLAN configuration by issuing the following command:

```
(conf-if-vl-1002)# do show vlan brief

VLAN     Name             State   Ports
                                  (u)-Untagged, (t)-Tagged
                                  (c)-Converged
======= ================ ======= ===============================
1       default          ACTIVE

1002    VLAN1002         ACTIVE
```

   There are no ports/interfaces under VLAN 1002.

5. Exit VLAN configuration mode by issuing the following command:

```
swd77(conf-if-vl-1002)# exit
```

6. Create VLAN rules by issuing the following commands:

```
swd77(config)# vlan classifier rule 1 proto fcoe encap ethv2
swd77(config)# vlan classifier rule 2 proto fip encap ethv2
```

7. Create a VLAN classifier group, and add the rules from the previous step to the group by issuing the following commands:

```
swd77(config)# vlan classifier group 1 add rule 1
swd77(config)# vlan classifier group 1 add rule 2
```

Create and Configure CEE-MAP

For the Brocade FCoE switch/blade, the CEE-MAP configures enhanced transmission selection (ETS) and priority flow control (PFC) to enable Ethernet to carry Fibre Channel traffic. In the following example, CoS 3 is set to table entry 1, which means that the adapter port can use 40 percent of the switch port bandwidth for FCoE traffic, and 60 percent of the switch port bandwidth for LAN traffic, if there is contention for bandwidth on the port.

To create and configure a CEE-MAP:

1. Create a CEE-MAP with a unique name by issuing the following command. In the example, the CEE-MAP name is *demo*.

```
(config)# cee-map demo
```

2. Define a CEE group for priority ID 1 and 2 by issuing the following command:

```
(conf-ceemap)# priority-group-table 1 weight 40 pfc
```

3. Enable PFC on group ID 1 by issuing the following command:

```
(conf-ceemap)# priority-group-table 2 weight 60
```

4. Define the priority group mapping (0–7) by issuing the following command:

```
(conf-ceemap)# priority-table 2 2 2 1 2 2 2 2
```

5. Exit CEE-MAP configuration mode by issuing the following command:

```
(conf-ceemap)# exit
```

6. Verify the CEE-MAP configuration by issuing the following command:

```
(config)# do show cee maps
CEE Map demo
   Precedence 1
   Priority Group Table
     1:  Weight 50, PFC Enabled, TrafficClass 3, BW% 40
     2:  Weight 50, PFC Disabled, TrafficClass 6, BW% 60
     15.0: PFC Disabled
     15.1: PFC Disabled
     15.2: PFC Disabled
     15.3: PFC Disabled
     15.4: PFC Disabled
     15.5: PFC Disabled
     15.6: PFC Disabled
     15.7: PFC Disabled
   Priority Table
      CoS:    0    1    2    3    4    5    6    7
     ---------------------------------------------
     PGID:    2    2    2    1    2    2    2    2
   FCoE CoS: None
   Enabled on the following interfaces
```

For information about associating the CEE-MAP with interfaces, refer to "Configure CEE Port" on page C-6.

Configure LLDP/DCBX for FCoE

To configure the LLDP/DCBX for FCoE:

1. Enable LLDP by issuing the following command:

```
(config)# protocol lldp
```

2. Enable the switch to advertise the DCBX FCoE application TLV by issuing the following command:

```
(config)# advertise dcbx-fcoe-app-tlv
```

3. Enable the switch to advertise the DCBX FCoE logical link TLV by issuing the following command:

```
(config)# advertise dcbx-fcoe-logical-link-tlv
```

4. Verify the LLDP/DCBX configuration (`Transmit TLVs`) by issuing the following command:

```
(config)#  do show lldp
LLDP Global Information
  system-name: swd77
  system-description: Fibre Channel Switch.
  description:
  State:                     Enabled
  Mode:                      Receive/Transmit
  Advertise transmitted:     30 seconds
  Hold time for advertise:   120 seconds
  Re-init Delay Timer:       2 seconds
  Tx Delay Timer:            1 seconds
  Transmit TLVs:             Chassis ID             Port ID
                             TTL                    IEEE DCBx
                             DCBx FCoE App          DCBx FCoE Logical Link
                             Link Prim              Brocade Link
  DCBx FCoE Priority Bits:   0x8
```

Configure CEE Port

To configure the CEE switch port to which the QLogic 8100 Series Adapter is connected:

1. Enter the interface configuration mode for the CEE switch port that connects to the QLogic adapter by issuing the following command. In the example, the QLogic adapter port is connected to CEE port 0/19 on the Brocade switch.

   ```
   (config)# interface tengigabitethernet 0/19
   ```

2. Enable the layer 2 switching mode by issuing the following command:

   ```
   (conf-if-te-0/19)# switchport
   ```

3. Set the CEE port to converged mode by issuing the following command:

   ```
   (conf-if-te-0/19)# switchport mode converged
   ```

4. Activate the VLAN classifier group 1 rule and assign VLAN 1002 to the CEE port by issuing the following command:

   ```
   (conf-if-te-0/19)# vlan classifier activate group 1 vlan 1002
   ```

5. Assign the CEE-MAP to the CEE switch port interface by issuing the following command:

   ```
   (conf-if-te-0/19)# cee demo
   ```

6. Enable the CEE port by issuing the following command:

   ```
   (conf-if-te-0/19)# no shutdown
   ```

Verify that the Adapter is Logged into the Switch

To verify that the switch has been properly configured and that the adapter has logged into the switch:

1. List the devices that have logged into the switch by issuing the `do fos fcoe` command, and compare the device MAC/WWN with the information from the QLogic adapter port. In the example, vfc19 is logged into the switch and visible in the switch name server database.

```
(conf-if-te-0/19)# do fos fcoe --loginshow
================================================================================
Port   Te port        Device WWN             Device MAC        Session MAC
================================================================================
27     Te 0/19   10:00:00:00:c9:9c:c2:ef  00:00:c9:9c:c2:ef  0e:fc:00:01:1b:01
```

2. List the name server database information by issuing the following command:

```
(conf-if-te-0/19)# do fos nsshow -t
{
 Type Pid    COS     PortName                NodeName                 TTL(sec)
 N    011b01;      3;10:00:00:00:c9:9c:c2:ef;20:00:00:00:c9:9c:c2:ef; na
    FC4s: IPFC FCP
    PortSymb: [34] "Emulex PPN-10:00:00:00:C9:9C:C2:EF"
    NodeSymb: [54] "Emulex OCe10102-FM FV2.701.462.1 DV7.2.32.002 APPS4082"
    Fabric Port Name: 20:1b:00:05:1e:d8:5f:80
    Permanent Port Name: 20:1b:00:05:1e:d8:5f:80
    Device type: NPIV Unknown(initiator/target)
    Port Index: 27
    Share Area: No
    Device Shared in Other AD: No
    Redirect: No
The Local Name Server has 1 entry
```

3. Configure zoning on the switch, as needed. For information about zoning the switch, refer to the Brocade switch documentation or DCFM documentation.

4. Save the current switch configuration so that the configuration is persistent across switch reboots.

```
# copy running-config startup-config
```

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