User's Guide

Fibre Channel Adapter

2600 Series

FC0054609-00 Z

November 22, 2019

Marvell. **Moving Forward Faster**

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Preface

This guide provides detailed instructions on installing, configuring, and troubleshooting the 2600 Series Adapters listed in Table i. It also provides details on the use of adapter features to enhance the value of server virtualization. Such features include virtual adapter configuration using N_Port ID virtualization (NPIV) and boot-from-SAN configuration.

Table i. Supported Adapter Models

Model Number	Port Quantity	Speeds			
		4Gb	8Gb	16Gb	32Gb
QLE2670	1	✔	✔	✔	—
QLE2672	2	✔	✔	✔	—
QLE2690	1	✔	✔	✔	—
QLE2692	2	✔	✔	✔	—
QLE2694	4	✔	✔	✔	—
QLE2694L	4	✔	✔	✔	—

NOTE

Forth code (FCode) and unified extensible firmware interface (UEFI) do not support 4Gb speed.

2600 Series Adapters run on the following operating systems:

- Microsoft® Windows® (including Hyper-V)
- Linux®
- VMware® ESXi
- Citrix® XenServer®
- Oracle® Solaris®

NOTE

For a detailed list of the currently supported operating systems, refer to the 2600 Series Adapter's *Read Me* and *Release Notes* at www.marvell.com.

What Is in This Guide

This preface specifies the intended audience, lists related documents, explains the typographic conventions used in this guide, and provides technical support, warranty, and regulatory information.

The remainder of this guide is organized into the following chapters and appendices:

- Quick Start provides high-level hardware and software installation instructions for advanced users, as well as additional resources.
- Chapter 1 Product Overview provides a functional description of the 2600 Series Adapters and lists the features, supported operating systems, physical characteristics, and standards specifications.
- Chapter 2 Software Installation and Initial Setup provides information about the SuperInstaller and the multi-boot image (Fibre Channel Adapter Function Configuration Utility).
- Chapter 3 Personality Configuration provides information about configuring the interface type (personality configuration).
- Chapter 4 Fibre Channel Configuration describes installing the Fibre Channel driver and agent across OSs; setting 2600 Series Adapter parameters; persistent binding; configuring the boot device, NPIV, and driver parameters; reassembling out-of-order frames; enabling the fabric to assign a world-wide port name or boot LUN; enabling end-to-end quality of service (QoS), diagnostics, and configuring VM-ID.
- Chapter 5 NVM Express over Fibre Channel describes the installation and configuration of NVMe over Fibre Channel (FC-NVMe).
- Appendix A Adapter LEDs describes the 2600 Series Adapter LEDs and defines the LED behavior.
- Appendix B Troubleshooting helps solve issues by running Fibre Channel diagnostics using QConvergeConsole® GUI, using a diagnostics port to identify and isolate link failures. It also provides a flowchart that walks you through troubleshooting problems that may occur with devices and LUNs on the 2600 Series Adapter.
- Appendix C contains a list of changes made to this guide since the last revision.

Following the appendices are a glossary of terms and acronyms used, and an index to help you quickly find the information you need.

Intended Audience

This guide is intended for those responsible for deploying 2600 Series Adapters on Windows, Linux, Solaris, VMware ESXi, VMware vCenter™ Server, and Citrix XenServer: from end users (such as data center managers and system administrators) to the test and development community.

Related Materials

For additional information, refer to following documents that are available from the Marvell Web site, www.marvell.com:

- 2600 Series Adapter *Read Me* and *Release Notes* documents contain information about installation, OS support, and known issues.
- *Installation Guide—QConvergeConsole GUI* (part number SN0051105-00) covers general information about the QConvergeConsole GUI tool.
- *User's Guide—Efiutil Utility* (part number FE0054602-00) provides information about the Efiutil Utility.
- *User's Guide—Fibre Channel and Fibre Channel over Ethernet UEFI Configuration and Diagnostic Protocols* (part number FE0054601-00) covers information about the Fibre Channel and FCoE UEFI configuration and diagnostic protocols.
- *User's Guide—UEFI Human Interface Infrastructure, 2600 Series 16Gb Fibre Channel Adapters* (part number SN0054689-00) describes how to use the HII application to configure the adapter parameters and boot-from-SAN settings.
- *User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00) provides procedures for using the two plug-in utilities: QConvergeConsole Plug-in for VMware vCenter Server and QConvergeConsole Plug-in for VMware vSphere® Web Client.
- *User's Guide—QConvergeConsole CLI* (part number SN0054667-00) provides specific command line use in both interactive and noninteractive modes.

For information about downloading documentation from the Marvell Web site, see "Downloading Updates and Documentation" on page xvii.

Documentation Conventions

This guide uses the following documentation conventions:

- The adapters described in this guide are collectively referred to as the *2600 Series Adapters*.
- **NOTE** provides additional information.
- **CAUTION** without an alert symbol indicates the presence of a hazard that could cause damage to equipment or loss of data.
- 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.marvell.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 then press the ENTER key.
  - Issue the following command: **`# sh ./install.bin`**
- Key names and key strokes are indicated with UPPERCASE:
  - Press the CTRL+P keys.
  - 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 applicable *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 *QConvergeConsole Help* throughout this document.
- QConvergeConsole CLI non-interactive command syntax conventions include the following:
  - Plain text indicates items that you must type as shown. For example:
    - **`qaucli -pr fc -ei`**
  - `< >` (angle brackets) indicate a variable whose value you must specify. For example:
    - `<hba instance>`

    NOTE

    For CLI commands only, variable names are always indicated using angle brackets instead of *italics*.

  - `[ ]` (square brackets) indicate an optional parameter. For example:
    - `[<file_name>]` means specify a file name, or omit it to select the default file name.
  - `|` (vertical bar) indicates mutually exclusive options; select one option only. For example:
    - `on|off`
    - `1|2|3|4`
  - ... (ellipsis) indicates that the preceding item may be repeated. For example:
    - `x...` means *one* or more instances of `x`.
    - `[x...]` means *zero* or more instances of `x`.
  - ⋮ (vertical ellipses) within command example output indicate where portions of repetitious output data have been intentionally omitted.
  - `( )` (parentheses) and `{ }` (braces) are used to avoid logical ambiguity. For example:
    - `a|b c` is ambiguous
    - `{(a|b) c}` means `a` or `b`, followed by `c`
    - `{a|(b c)}` means either `a,` or `b c`

Technical Support

Customers should contact their authorized maintenance provider for technical support of their Marvell QLogic products. Technical support for QLogic-direct products under warranty is available with a Marvell support account.

To set up a support account (if needed) and submit a case:

1. Go to www.marvell.com.
2. Click **Support**.
3. Scroll down if needed, and then click **Fibre Channel Adapters and Controllers**.
4. Under Related Links, click **Customer Support**.
5. Do one of the following:
   - ❑ If you do not have an account, click **Sign Up**.
   - ❑ If you have an account, enter your **User Name** and **Password**, and then click **Log In**.

Downloading Updates and Documentation

The Marvell Web site provides periodic updates to product firmware, software, and documentation.

To download QLogic firmware, software, and documentation:

1. Go to www.marvell.com.
2. Point to **Support**, and then under **Driver Downloads**, click **Marvell QLogic/FastLinQ Drivers**.
3. On the Downloads and Documentation page, click **Adapters**.
4. Click the corresponding button to search **by Model** or **by Operating System**.
5. To define a search, click an item in each selection column, and then click **Go**.
6. Locate the firmware, software, or document you need, and then click the item's name or icon to download or open the item.

Knowledgebase

The Marvell knowledgebase is an extensive collection of product information that you can search for specific solutions. Marvell is constantly adding to the collection of information in the database to provide answers to your most urgent questions.

To access the knowledgebase:

1. Go to www.marvell.com.
2. Point to **Support**, and then under **Support by Product**, click **GET SUPPORT**.
3. On the Support page, select the product line for your adapter:
   - ❑ **QLogic Fibre Channel Adapters and Controllers**
   - ❑ **FastLinQ® | LiquidIO® Ethernet Adapters and Controllers**
4. Under **Related Links**, click **Knowledgebase**.

Legal Notices

This section provides warranty, laser safety (FDA notice), agency certification, and product safety compliance for the following products:

- QLE2670 (part number HD8310405-01)
- QLE2672 (part number HD8310405-02)
- QLE2690 (part number BK3210407-06)
- QLE2692 (part number BK3210407-05)
- QLE2694 (part number BK3210408-01)
- QLE2694L (part number BK3210405-02)

MA2810401MA2810401MA2810402-15## Warranty

Warranty details for your product are available on the Marvell Web site.

To obtain warranty information:

1. Go to www.marvell.com.
2. Point to **Support**, and then under **Support by Product**, click **GET SUPPORT**.
3. On the Support page, select the product line for your adapter:
   - ❑ **QLogic Fibre Channel Adapters and Controllers**
   - ❑ **FastLinQ | LiquidIO Ethernet Adapters and Controllers**
4. Under **Related Links**, click **Warranty**.

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	**Caution**—Class 1 laser radiation when open Do not view directly with optical instruments
Appareil laser de classe 1	**Attention**—Radiation laser de classe 1 Ne pas regarder directement avec des instruments optiques
Produkt der Laser Klasse 1	**Vorsicht**—Laserstrahlung der Klasse 1 bei geöffneter Abdeckung Direktes Ansehen mit optischen Instrumenten vermeiden
Luokan 1 Laserlaite	**Varoitus**—Luokan 1 lasersäteilyä, kun laite on auki Älä katso suoraan laitteeseen käyttämällä optisia instrumenttej

Agency Certification

The following sections contain a summary of EMC and EMI test specifications performed on models HD8310405-01, HD8310405-02, BK3210407-06, BK3210407-05, BK3210408-01, BK3210405-02, and BK3210403-12 to comply with radiated emission, radiated immunity, and product safety standards.

EMI and EMC Requirements

FCC Rules, CFR Title 47, Part 15, Subpart B: 2017 Class A

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.

Industry Canada, ICES-003:2016: Class A

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conformé à la norme NMB-003 du Canada.

CE Mark 2014/30/EU EMC Directive Compliance

EN55032:2012/CISPR 32:2015 Class A
EN55024:2010
EN61000-3-2:2006 A1+A2:2014

EN61000-3-3:2013

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

AS/NZS; CISPR 32:2015 Class A

CNS 13438:2006 Class A

KCC: Class A

KC-RRA KN22 KN24 (2011 for HD series, 2014 for BK series) Class A

Product Name/Model—HD8310405-01, HD8310405-02, BK3210407-06, BK3210407-05, BK3210408-01, BK3210405-02, and BK3210403-12 Adapters
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.

VCCI: CISPR 32: 2015 Class A

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI－A

BSMI: Class A

BSMI CNS 13438:2006 Class A for the BK3210407

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.

Product Safety Compliance

UL, cUL Product Safety

UL60950-1 (2nd Edition) A1+A2 2014-10-14

CSA C22.2 60950-1-07 (2nd Edition) A1 + A2 2014-10

Use only with listed ITE or equivalent.

Complies with 21 CFR 1040.10 and 1040.11.

2014/35/EU Low Voltage Directive

TUV EN60950-1:2006+A11+A1+A12+A2 2nd Edition

TUV IEC 60950-1:2005 2nd Edition Am 1: 2009 + Am2:2013 CB

Quick Start

To help you quickly get started using the 2600 Series Adapters, this chapter provides installation steps and lists additional resources.

Installation Instructions

Install and configure your new 2600 Series Adapter in three simple steps:

- Step 1. Install the Adapter Hardware
- Step 2. Install the Adapter Drivers
- Step 3. Install QConvergeConsole

Step 1. Install the Adapter Hardware

CAUTION

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

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 on how to remove the computer cover.

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 Figure i).

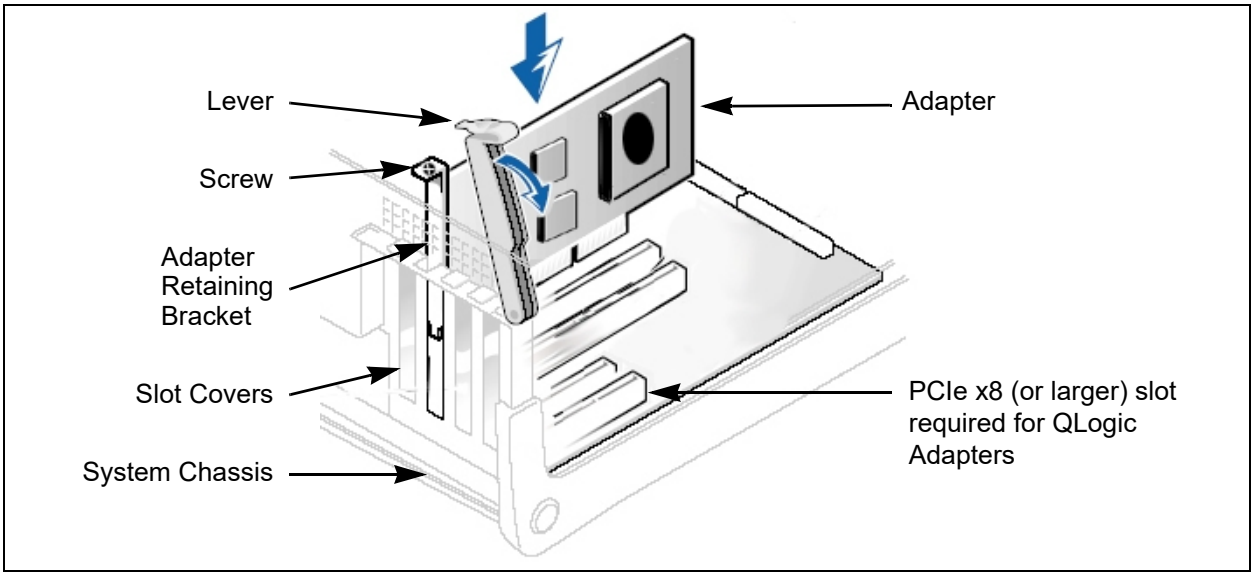

Figure i. Server Motherboard and Slots

7. Refasten the adapter's retaining bracket using the existing screw or lever.
8. Close the computer cover.
9. Plug the optical cable into the adapter.
10. Plug in the power cable and turn on the computer.

Step 2. Install the Adapter Drivers

Follow these steps to download and install adapter drivers.

To install the adapter drivers:

1. Go to www.marvell.com.
2. Point to **Support**, and then under **Driver Downloads**, click **Marvell QLogic/FastLinQ Drivers**.
3. On the Downloads and Documentation page, select **Adapters**.
4. Select **by Model**, and then click **Fibre Channel Adapters** in the first column, your adapter model in the second column, your operating system in the third column, and then click **Go**.

5. Under **Drivers**, view the product details and locate the correct driver version.

NOTE

For additional information, click the **Read Me** and **Release Notes** icons under **Support Files**.

6. Click the driver link, and then click **I Agree** to accept the end user software license agreement and start the download.
7. Follow the installation instructions in the Read Me document.

Step 3. Install QConvergeConsole

Follow these steps to download and install versions of QConvergeConsole for various OSs.

NOTE

If you are using Windows, Linux, Solaris, or Citrix XenServer, install the two QLogic management utilities: QConvergeConsole GUI and QConvergeConsole CLI.

If you are using VMware ESXi (including vCenter Server Appliance for VMware ESXi 5.5), install one of these QLogic management utilities: QConvergeConsole Plug-in for VMware vCenter Server or QConvergeConsole Plug-in for VMware vSphere Web Client.

For detailed information about using the utilities, see the documents specified in “Related Materials” on page xiv.

To install QConvergeConsole GUI or QConvergeConsole CLI:

1. Go to www.marvell.com.
2. Point to **Support**, and then under **Driver Downloads**, click **Marvell QLogic/FastLinQ Drivers**.
3. On the Downloads and Documentation page, select **Adapters**.
4. Select **by Model**, and then click **Fibre Channel Adapters** in the first column, your adapter model in the second column, your operating system in the third column, and then click **Go**.

5. Under **Management Tools**, view the product details and locate the correct QConvergeConsole GUI or QConvergeConsole CLI version.

NOTE

For additional information, click the **Read Me** and **Release Notes** icons under **Support Files**.

6. Click either the QConvergeConsole GUI or QConvergeConsole CLI link, and then click **I Agree** to accept the end user software license agreement and start the download.
7. Follow the installation instructions in the Read Me document.

To install QConvergeConsole Plug-in for VMware vCenter Server:

For detailed installation instructions, see the *User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00).

To install QConvergeConsole Plug-in for VMware vSphere Web Client:

For detailed installation instructions, see the *User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00).

Additional Resources

For more information on using the 2600 Series Adapter, Marvell provides these additional resources:

- To obtain the most current drivers, management tools, user instructions, and documentation, download the latest versions from the Downloads and Documentation page at www.marvell.com.
- For descriptions of the user instructions provided in this document, see "What Is in This Guide" on page xiii.
- For important product information, including warranty, laser safety, and agency certification, see the "Legal Notices" on page xviii.
- For descriptions and procedures related to QConvergeConsole GUI only, refer to the help system, *QConvergeConsole Help*.

1 Product Overview

This chapter describes the function and features of the 2600 Series Adapter, including:

Functional Description

The *2600 Series Adapters* are QLogic’s sixth generation Fibre Channel Adapters. They boast industry-leading native Fibre Channel (FC) performance—achieving quad-port (QLE2694 and QLE2694L) or dual-port (QLE2672 and QLE2692) line-rate, 16GFC throughput—at extremely low CPU usage with full hardware offloads.

Features

The 2600 Series Adapters provide the following features. For more information about these features, see the QConvergeConsole GUI and CLI online help.

- Device management for SAN
- QLE2670, QLE2672, QLE2690, QLE2692, QLE2694, and QLE2694L offer connectivity to 16Gb, 8Gb, and 4Gb Fibre Channel networks
- Physical PCIe characteristics:
  - PCIe 3.0 x8 (QLE2670 and QLE2672) with backward compatibility
  - PCIe 3.0 x8 (QLE2690, QLE2692, QLE2694 and QLE2694L)
- Full hardware offload for the Fibre Channel protocol
- Message-signaled interrupts (MSI-X) and legacy interrupts (INT-X)
- N_Port ID virtualization (NPIV)
- Buffer-to-buffer credit recovery (BB-CR) (QLE269*x* models only)

- Firmware and driver counter reset
- Boot from SAN
- Several advanced management features for the 2600 Series Adapter include:
  - The QConvergeConsole GUI and QConvergeConsole CLI management utilities are available if you are running Windows, Linux, Solaris, or Citrix XenServer.
  - The QConvergeConsole Plug-in for VMware vCenter Server and QConvergeConsole Plug-in for VMware vSphere Web Client management utilities are available if you are running VMware ESXi.
- Diagnostics port
- FC-NVMe—QLE269x only
- Secure Firmware Update
- Link Cable Beaconing (LCB)
- FDMI Registrations
- CS_CTL-based QoS
- Device ping
- Fibre Channel ping (Echo ELS)
- Common transport (CT) ping
- CT Fibre Channel trace route (FTR)
- Loop back testing
- Read /write buffer testing
- Send read diagnostic parameters (RDP)
- Forward error correction (FEC) reset counter
- Principal/adjacent fabric WWN
- Fabric-assigned WWPN (FA-WWPN)
- Fabric-assigned boot LUN (FA-BLD)
- VM-ID support on QLE269*x* only, running VMware ESXi 6.0U2, 6.0U3, 6.5, and 6.5U1
- Conversion to 10-gigabit Ethernet (GbE) Converged Network Adapter—QLE2672 and QLE2670 only
- Support for long range 10km/5km optics

Supported Operating Systems

The 2600 Series Adapters support commonly used operating systems, including Windows, Linux, Solaris, VMware ESXi, and Citrix XenServer.

For a detailed list of the currently supported operating systems, refer to the adapter's *Read Me* and *Release Notes* available at www.marvell.com (see "Downloading Updates and Documentation" on page xvii).

Physical Characteristics

Physical characteristics for the 2600 Series Adapters include the following:

- The QLE2670 and QLE2672Adapters are implemented as low-profile PCIe cards. The adapter ships with a standard-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.
- The QLE2690 and QLE2692 Adapters are implemented as low profile PCIe cards with standard-height brackets installed.
- The QLE2694 Adapter is implemented as a full-height PCIe card with a full-height bracket installed.
- The QLE2694L Adapter is implemented as a low-profile PCIe card. The adapter ships with soldered-down small form factor (SFF) fixed optical transceivers and a low profile bracket.

Standards Specifications

The 2600 Series Adapter supports the following standards specifications:

- SCSI Fibre Channel Protocol 4 (FCP-4)
- Fibre Channel Tape (FC-TAPE) Profile
- Fibre Channel Generic Services 8 (FC-GS-8)
- Fibre Channel-Physical Interface-5 (FC-PI-5)
- Fibre Channel-Physical Interface-6 (FC-PI-6)
- Fibre Channel Link Services 4 (FC-LS-4)
- Fibre Channel Framing and Signaling 4 (FC-FS-4)
- Fibre Channel NVMe (FC-NVMe)

For more information on these specifications, refer to the Technical Committee T11 Web site:

http://www.t11.org

2 Software Installation and Initial Setup

This chapter provides the following information about installing and setting up the software:

- Fibre Channel Adapter Installation with QLogic SuperInstallers
- “Multiboot Image for Fibre Channel Adapter Function Configuration Utility” on page 5

NOTE

If you are using VMware ESXi, see the *User’s Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00) for details on installation and initial setup.

Fibre Channel Adapter Installation with QLogic SuperInstallers

The QLogic SuperInstallers are easy-to-use tools that install the following components:

- Fibre Channel, Fibre Channel over Ethernet (FCoE), iSCSI, and Ethernet networking drivers
- QConvergeConsole CLI management tool
- Fibre Channel, FCoE, iSCSI, and networking management agents to enable remote access using the QConvergeConsole GUI management tool

For installation instructions for the QLogic Windows SuperInstaller, refer to the *QLogic Windows SuperInstaller* Read Me document.

For installation instructions for the QLogic Linux SuperInstaller, refer to the *QLogic Linux SuperInstaller* Read Me document.

Multiboot Image for Fibre Channel Adapter Function Configuration Utility

This section contains the following information:

Multiboot Package Contents

The multiboot package for the 2600 Series Adapter is a compressed file that contains the Host Bus Adapter BIOS, unified extensible firmware interface (UEFI) code, firmware, and the QLflash utility.

Fibre Channel Adapter Function Configuration Utility Package Contents

The following files are included in the boot code package:

- `update.bat`—DOS batch file that calls the executable files to update the adapter multiboot (supported on QLE267*x* Adapters only)
- `update.nsh`—UEFI batch file run from a UEFI shell that calls the executable files to update the adapter multiboot
- `QLflash.exe`—Utility to update the multiboot code and firmware (supported on QLE267*x* Adapters only)
- `ql2xxxx.drv`—UEFI driver
- `efxxxx.efi`—UEFI utility
- `Readme`—Boot Code folders contain Readme and Release notes
- `Read1st`—Component versions
- `DOS4GW.exe`—File required to use the `QLflash.exe`
- `/bkxxxx.bin`—Combined binary file, which includes the binaries for the BIOS, UEFI, FCode, and firmware for QLE269x adapters
- `/hldxxxxx.bin`—For the QLE267*x* Adapters

NOTE

The files may be different for each software release.

■

Updating the Multiboot Code for QLE269x adapters

1. Boot to the OS with the latest driver and QConvergeConsole CLI installed.
2. Download the MBI kit for your 2600 Series Adapter from Marvell Support Website: https://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/DefaultNewSearch.aspx
3. Unzip the MBI kit to a directory:

   `ql268x_img01.01.89_risc_8.08.204.zip` or later
4. Change to that directory, and then issue the following QConvergeConsole CLI command:

   `# qaucli -b all bk010189.bin`
5. Verify that the new firmware becomes active after the system reboots by issuing the following QConvergeConsole CLI command:

   `#` **`qaucli -i`** (Firmware version = 8.08.204 or later)
6.

NOTE

To minimize the security threat of unauthorized software accessing and changing configuration on networking components, Secure Firmware Download restricts unauthorized write access to the on-board non-volatile memory and ensures only authentic firmware executes.

NOTE

You can also update the MBI kit from the UEFI Shell.

1.Unzip MBI kit to a directory:
`ql268x_imgxx.xx.xx_risc_y.yy.yyy.zip`
)

2.Boot to UEFI Shell.

3.Run #update.nsh from the MBI folder.

Updating the Multiboot Code for QLE267x adapters

1. Boot to the OS with the latest driver and QConvergeConsole CLI installed.
2. Download the MBI kit for your 2600 Series Adapter from Marvell Support Website: https://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/DefaultNewSearch.aspx
3. Unzip the MBI kit (`ql_83xx_img3.34.30_risc_5.08.18_8.08.203.zip`) to a directory. Change to that directory, and then issue the following QConvergeConsole CLI command:

   `# qaucli -b all hld33430.bin`

4. Verify that the new firmware becomes active after the system reboots by issuing the following QConvergeConsole CLI command:

   `#` **`qaucli -i`** (Firmware version = 8.08.203)

NOTE

You can also update the MBI kit from the UEFI Shell and DOS.

1. Unzip MBI kit (`ql_83xx_img3.34.30_risc_5.08.18_8.08.203.zip`) to a folder.
2. Boot to UEFI Shell or DOS.
3. Run #update.nsh from UEFI Shell or #update.bat from DOS prompt.

Using QLflash (QLE267*x* Adapters Only)

QLflash is a native DOS utility for QLE267*x* Adapters (it is not applicable to QLE269*x* Adapters). This section describes how to update the multiboot code and the QLflash command line options. Refer to the *Read Me* document for more information. To run this utility, boot to a DOS hard drive or a USB removable drive.

Utility version:

`/VER` = Display version of the QLflash utility

Help options:

`/?` = Display Help menu

QLflash Command Line Options

When you are running the `.exe`, type `/?` for help.

Fibre Channel Adapter Function Configuration Utility

This section provides detailed configuration information for advanced users who want to customize the configuration of the 2600 Series Adapter and the connected devices. You can configure the 2600 Series Adapter using *Fast!*UTIL, FCode (not applicable to QLE277x models), or UEFI:

- Use *Fast!*UTIL in a pre-OS environment (see Using *Fast!UTIL for Custom Configuration*).
- Use FCode for Oracle SPARC® systems (see Using FCode for Custom Configuration (Oracle SPARC)).
- Use UEFI for Cisco®, Dell®, HP®, IBM®, Lenovo®, and Oracle x64 OEM adapters where the platform supports UEFI (see Using UEFI for Custom Configuration).

Using *Fast!*UTIL for Custom Configuration

NOTE

The *Fast!*UTIL BIOS utility does not run on Oracle SPARC systems (which run FCode), nor can it be used with 277x Series adapters.

To use *Fast!*UTIL for custom configuration:

1. To access *Fast!*UTIL, press the ALT+Q or CTRL+Q keys during the Host Bus Adapter BIOS initialization (it may take a few seconds for the *Fast!*UTIL menu to appear).
2. In the Select Host Adapter window, select the adapter type.
3. In the Adapter Settings window, select the appropriate adapter settings.

CAUTION

If the configuration settings are incorrect, your 2600 Series Adapter may not function properly.

A message window indicates that the configuration settings have been modified.

4. To save the new settings, click **Save changes**. *Fast!*UTIL reboots your system to load the new parameters.

The *Fast!*UTIL **Options** menu provides the following options:

- Configuration Settings
- Scan Fibre Devices
- Fibre Disk Utility
- Loopback Data Test
- Select Adapter
- Personality
- Exit *Fast!UTIL*

Configuration Settings

The following sections show and describe the 2600 Series Adapter configuration settings:

- Adapter Settings
- Selectable Boot Settings
- Restore Default Settings
- Raw NVRAM Data
- Advanced Adapter Settings

Adapter Settings Table 2-1 describes the adapter settings.

Table 2-1. Adapter Settings

Setting	Values	Default	Description
`Host Bus Adapter BIOS`	Enabled, Disabled	Disabled	Disabling this setting disables the ROM BIOS on the 2600 Series Adapter, which frees space in upper memory. If you are booting from a Fibre Channel disk drive attached to the 2600 Series Adapter, you must enable this setting. See “Selectable Boot Settings” on page 10 for details on specifying the boot device.
`Frame Size`	512, 1024, 2048	2048	Specifies the maximum frame payload size supported by the 2600 Series Adapter.
`Loop Reset Delay`	0–60 seconds	5 seconds	After resetting the loop, the firmware refrains from initiating any loop activity for the number of seconds specified in this setting.
`Adapter Hard Loop ID`	Enabled, Disabled	Disabled	When this setting is enabled, the adapter attempts to acquire its arbitrated loop physical address (AL_PA) during the loop initialization hard address (LIHA) phase using the `Hard Loop ID` value (see next row).

Table 2-1. Adapter Settings (Continued)

Setting	Values	Default	Description
`Hard Loop ID`	0–125	0	If the `Adapter Hard Loop ID` setting (see previous row) is enabled, the adapter attempts to acquire the loop ID specified in this setting during the LIHA or loop initialization previous address (LIPA) phase.
`Connection Options`	0, 1, 2	2	Defines the type of connection: ■ 0—Loop only (for 4Gb and 8Gb data rates) ■ 1—Point-to-point only (for 4Gb, 8Gb, and 16Gb data rates) ■ 2—Loop preferred, then point-to-point for the 4Gb and 8Gb data rates. Because the standard for 16Gb data rates does not support loop, it uses point-to-point only, even if the connection options is set to 2.
`Fibre Channel Tape Support`	Enabled, Disabled	Enabled	Enables FCP-2 recovery.
`Data Rate`	2, 3, 4, 5, 6	2	Determines the data rate: ■ 2—The adapter auto-negotiates and determines the data rate. ■ 3—The adapter runs at 4GFC. ■ 4—The adapter runs at 8GFC. ■ 5—The adapter runs at 16GFC. ■ 6—Not supported.

Selectable Boot Settings The **Configuration Settings** menu provides access to the **Selectable Boot Settings** option. If you enable the Host Bus Adapter BIOS in the adapter settings, you can select the boot device, as shown in Table 2-2.

Table 2-2. Selectable Boot Settings

Enable Selectable Boot	Boot WWPN or LUN	Device Boot
No	—	The BIOS configures the first disk drive it finds as the boot device.
Yes	None specified	The BIOS configures the first disk drive it finds that is also LUN 0 as the boot device.

Table 2-2. Selectable Boot Settings (Continued)

Enable Selectable Boot	Boot WWPN or LUN	Device Boot
Yes	Specified	The BIOS scans through the specified boot worldwide port name (WWPN) or LUN list until it finds a disk drive. This drive is configured as the boot device.

The **Selectable Boot Settings** option allows you to specify up to four WWPNs or LUNs as boot devices.

To enable the Selectable Boot option and insert devices into boot device locations:

1. On the **Configuration Settings** menu, select **Host Adapter Settings**.
2. Enable the **Host Bus Adapter BIOS**, and then press the ESC key to return to the **Configuration Settings** menu.
3. On the **Configuration Settings** menu, select **Selectable Boot Settings**.
4. To enable or disable (toggle) the **Selectable Boot** option, press the ENTER key. To move to the Primary location of the **Selectable Boot List** menu, press the DOWN ARROW key.
5. To see a list of accessible devices (in the **Select Fibre Channel Device** menu), press ENTER.
6. To select a drive to put into the **Selectable Boot** list, press the UP ARROW and DOWN ARROW keys or the PAGE UP and PAGE DOWN keys to scroll to the device. To load the device into the **Selectable Boot** list, press ENTER.
7. To specify an alternate boot device (maximum of three) on the 2600 Series Adapter:
    a. Move to the next available alternate entry by pressing the UP ARROW or DOWN ARROW.
    b. Press ENTER.
    c. Select the disk drive you want.
    d. Press ENTER again.

NOTE

- System BIOS compatibility: To boot from a host 2600 Series Adapter in a computer system with a multiboot system BIOS, the 2600 Series Adapter must be included in the list of bootable devices in the system's **Boot** menu.
- Solaris x86 boot from a SAN: To boot from a Fibre Channel drive connected to the host 2600 Series Adapter, reboot the system and enter *Fast!*UTIL. Before performing the OS (Solaris x86) installation, access the **Selectable Boot** menu, enable the selectable boot, and then insert the boot drive in the primary location of the **Selectable Boot** menu.
- For these boot-from-SAN configurations, the Solaris x86 QLogic Corporation (QLC) driver supports booting only from the Primary location. The driver does not attempt to boot from the Alternate 1, Alternate 2, and Alternate 3 entries.

Restore Default Settings The **Restore Defaults** option restores the BIOS settings to the defaults.

Raw NVRAM Data The **Raw NVRAM Data** option shows the 2600 Series Adapter NVRAM contents in hexadecimal format. This option is a troubleshooting tool; you cannot modify the raw NVRAM data.

Advanced Adapter Settings On the **Configuration Settings** menu in *Fast!*UTIL, select **Advanced Adapter Settings**. Table 2-3 describes the default settings for the 2600 Series Adapters.

Table 2-3. Advanced Adapter Settings

Setting	Values	Default	Description
`LUNs per Target`	0–256	128	Specifies the number of LUNs supported per target if the target does not support the Report LUN command. Multiple LUN support is typically for redundant array of independent disks (RAID) boxes that use LUNs to map drives.
`Enable LIP Reset`	Yes, No	No	Determines the type of LIP reset used when the OS initiates a bus reset routine as follows: ■ Yes—The driver initiates a global LIP reset to reset the target devices. ■ No—The driver initiates a global LIP reset with full login.

Table 2-3. Advanced Adapter Settings (Continued)

Setting	Values	Default	Description
Enable LIP Full Login	Yes, No	Yes	When this setting is **Yes**, the 2600 Series Adapter' reduced instruction set computer (RISC) controller logs in to all ports after any LIP.
Enable Target Reset	Yes, No	Yes	When this setting is **Yes**, the drivers issue a Target Reset command to all devices on the loop when a SCSI Bus Reset command is issued.
Login Retry Count	0–65535	8	Specifies the number of times the software tries to log in to a device.
Port Down Retry Count	0–65535 seconds	30 seconds	Specifies the number of seconds the software waits before resending a command to a port whose status indicates that the port is down.
Link Down Timeout	0–65535 seconds	30 seconds	Specifies the number of seconds the software waits for a link that is down to come up.
Operation Mode	0, 5, 6	6	Specifies the reduced interrupt operation (RIO) modes if they are supported by the software driver. The RIO modes allow posting multiple command completions in a single interrupt. This setting supports the following modes: ■ 0—Interrupt for every I/O completion ■ 5—Interrupt when the interrupt delay timer expires ■ 6—Interrupt when the interrupt delay timer expires or when there are no active I/Os
Interrupt Delay Timer	0–255 (100µs units)	2 (200µs)	Contains the value used by a timer to set the wait time before generating an interrupt.
Fabric Assigned WWPN	Enabled, Disabled	Enabled [a]	Fabric-assigned worldwide name (WWN) allows you to enable an adapter port to use a switch-assigned WWN rather than the physical adapter port WWN for communication.
Fabric Assigned Boot LUN	Enabled, Disabled	Enabled [a]	Fabric-based boot LUN discovery (F-BLD) allows you to eliminate the manual boot LUN configuration process of each adapter from individual servers. Instead, the adapters can query the SAN fabric at boot time to retrieve boot LUN configuration information. When the boot LUN configuration is available from the fabric, the server retrieves the information and boots from the SAN.

Table 2-3. Advanced Adapter Settings (Continued)

Setting	Values	Default	Description
FEC Enable	Enabled, Disabled	Disabled a [b]	Forward error correction (FEC) improves performance and link integrity to support higher end-to-end data rates by automatically recovering from transmission errors.
BB_CR Enable	Enabled, Disabled	Enabled [b]	Buffer-to-buffer credit recovery (BB-CR) enables two FC peer ports (N_Port, F_Port, or E_Port) to periodically send and receive the quantity of receiver ready (R_RDY) signals transmitted. Enable the BB-CR feature to allow the peer port to recover from possible R_RDY signals lost over a lossy link.
BB_CR Count	0–15	8 [b]	Specifies the quantity of frame RX/TX counters maintained by the port to track R_RDYs and frames received.

[a] This feature is enabled by default in adapters that are built with this release factory installed. Adapters upgraded from earlier releases retain the setting (enabled or disabled) that they had prior to upgrading to this release.

[b] Applies to QLE269*x* adapters only. For field adapters, this feature is user defined and adapters settings are not restored to defaults when you select Restore Default Settings. New 2016 adapters have default values.

Scan Fibre Devices

The **Scan Fibre Devices** option scans the Fibre Channel loop and lists all the connected devices by loop ID. For each device, it lists information such as the vendor name, product name, and revision. This information helps when configuring your 2600 Series Adapter and attached devices.

Fibre Disk Utility

The **Fibre Disk Utility** option scans the Fibre Channel loop and lists all the connected devices by loop ID. You can select a Fibre Channel hard disk and do one of the following tasks:

- Perform a low-level format
- Verify the disk media
- Verify the disk data (most targets do not support this feature)
- Select a disk device

CAUTION

Performing a low-level format destroys all data on the disk.

Loopback Data Test

The **Loopback Data Test** option allows you to perform both external and internal loopback data tests. During a loopback test, the adapter port LEDs will flash.

To perform an external loopback test, do one of the following:

- Insert a loopback connector into the 2600 Series Adapter port.
- Connect the 2600 Series Adapter port to a Fibre Channel switch,

Do not perform an internal loopback test at the OS if the target device is the SAN target from which the system boots.

Select Adapter

If you have a multiport or multiple 2600 Series Adapters in your system, use the **Select Adapter** option to select and then configure or view the settings of a specific 2600 Series Adapter or one of its ports.

Personality

The **Personality** option changes the interface type (personality) between Fibre Channel Adapter (QLE267*x* models only) and Converged Network Adapter. See the Glossary for a definition of *personality*.

For more information, see “Changing the Personality with BIOS (*Fast!UTIL)” on page 24*.

Exit *Fast!*UTIL

Select the **Exit *Fast!*UTIL** option to exit the utility and reboot the system. After making changes to the 2600 Series Adapter in *Fast!*UTIL, make sure you save the changes before you reboot the system.

Using FCode for Custom Configuration (Oracle SPARC)

For additional information, see the *FCode for ORACLE_SPARC FC and FCoE Adapters* Read Me document.

You can use FCode to select the 2600 Series Adapter device (not applicable to 277x Series), set and view NVRAM parameters, and run diagnostic commands.

When booting using FCode within a logical domain’s (LDOM's) environment, see the *Oracle VM Server for SPARC* documentation.

When booting a SPARC virtual function (VF) using FCode, the NVRAM parameters and diagnostics shown in the following sections are available only to the primary function (PF).

Setting and Viewing NVRAM Parameters

Table 2-4 describes the NRAM parameters that you can set and view.

Table 2-4. NVRAM Parameters (Oracle SPARC)

Command	Values	Description
`show-commands`	N/A	Lists all NVRAM and diagnostic commands.
`show-settings`	N/A	Shows the current value of all of the NVRAM parameters, as well as the version, serial number, and adapter worldwide name.
`set-connection-mode`	0, 1, 2	Allows you to change or view the current host adapter Fibre Channel connection mode: ■ 0—Loop only ■ 1—Point-to-point only (do not select for 16G and above) ■ 2—Loop preferred; otherwise, point-to-point
`set-data-rate`	2, 3, 4, 5, 6, 7	Allows you to change or view the current host adapter Fibre Channel data rate: ■ 2—Auto-negotiated ■ 3—4GFC ■ 4—8GFC ■ 5—16GFC ■ 6—Not supported ■ 7—Not supported

Table 2-4. NVRAM Parameters (Oracle SPARC) (Continued)

Command	Values	Description

`set-fapwwn-ena`	N/A	The FCode supports the Fabric-Assigned Worldwide Port Name (FA-WWPN) feature in a Brocade® switch running Fabric OS (FOS) 7.3.0 or later. Issue the `set-fapwwn-ena` FCode command to enable and disable this feature on the adapter. (For details, refer to your switch documentation.)
		For example:
		`{0}` **`ok set-fapwwn-ena`**
		`Current Fabric-Assign-WWPN: DISABLED`
		`Do you want to change it? (y/n)` **`y`**
		`Current Fabric-Assign-WWPN: ENABLED`
		This feature must also be enabled on the switch using the following command sequence:
		`portdisable #`
		`fapwwn -- enable - port #`
		`portenable #`
		Where `#` is the switch port number that is attached to the adapter.

`set-login-count`	1h–FFh	Sets the Login Retry Count field in the initialize firmware control block (IFCB). This field specifies the number of login retries attempted by the firmware. The default value is 8h.
`set-link-timeout`	2h–FFh	Determines the number of seconds to wait for the link to come up. The default value is 30 seconds (1Eh).
`set-port-down-count`	1h–FFh	Determines the number of retries for the Start, Read, and Write SCSI commands. The default value is 30h.
`set-max-frame-size`	1, 2, 3	Sets the Maximum Payload Length field in the IFCB: ■ 1—512 ■ 2—1024 ■ 3—2048. This setting is the default.
`set-boot-wait-time`	8–65535	Adjusts the time to wait (in seconds) for the boot device to become online. The default value is DISABLED, which sets it to 8 seconds. The maximum value is 65,535 seconds (18 hours, 6 minutes). The minimum value is 8 seconds, same as when disabled. Because this wait time can be very long, the boot process can be aborted at any time by pressing the ESC key.

Table 2-4. NVRAM Parameters (Oracle SPARC) (Continued)

Command	Values	Description
`restore-default-settings`	N/A	Restores the default values of all NVRAM parameters used by the FCode, except the fc-mode (FCode operation mode) and the boot-wait-time.
`set-personality`	FC, CNA	Sets or clears bits in the feature configuration section of the Flash memory, which controls the 2600 Series Adapter's personality. A reboot is required for a change to take effect. ■ FC—Fibre Channel only ■ CNA—Converged Network Adapter

Running Diagnostic Commands

Table 2-5 describes the diagnostic commands.

Table 2-5. Diagnostic Commands (Oracle SPARC)

Command	Description
`version`	Lists the FCode version.
`beacon`	Flashes the 2600 Series Adapter's LED.
`selftest`	Tests the 2600 Series Adapter's memory and loopback.
`selftest-loop`	Tests the 2600 Series Adapter's memory and loopback; it runs continuously until the Break Key is sent.
`ext-loopback-test`	Tests the external loopback.
`ext-loopback-test-loop`	Tests the external loopback; it runs continuously until the Break Key is sent.
`show-children`	Lists all attached targets.
`disk-test`	Tests a selected target.
`sel-dev`	Selects a device for disk test.
`sel-lun`	Selects the LUN for disk test.

Using UEFI for Custom Configuration

For details on how to use UEFI to perform custom configuration, refer to the relevant server vendor documentation. For additional information, see the latest UEFI files under **Boot Code** on the Downloads and Documentation Web pages for 2600 Series Adapter models. See also the *User's Guide—UEFI Human Interface Infrastructure, 2600 Series 16Gb Fibre Channel Adapters* (part number SN0054689-00), which describes how to use the HII application to configure adapter parameters and boot-from-SAN settings. For download assistance, see "Downloading Updates and Documentation" on page xvii.

3 Personality Configuration

This chapter describes the personality configuration features of the QLE2670 and QLE2672 Adapters, including:

- Preparing for a Personality Change
- “Changing the Adapter Personality” on page 23

The QLE2670 and QLE2672 Adapters allow you to change the interface type (personality) from a Fibre Channel Adapter to a Converged Network Adapter. This chapter covers the information that you need to know prior to changing the adapter personality, as well as the steps for performing a personality change in various interfaces.

Preparing for a Personality Change

To ensure that your 2600 Series Adapter supports a personality change, confirm the part number and revision, update the firmware, and replace the optical transceivers.

NOTE

After the 2600 Series Adapter’s mode has been changed to Converged Network Adapter, remove the 16Gb optical transceivers. You can replace these transceivers with one of the following:

- Marvell QLogic-branded 10GbE optical transceivers. Contact Marvell’s approved suppliers for purchase.
- SFP+ direct-attach copper cables. For a list of supported cables, go to: https://www.marvell.com/documents/j1hg6lc3ixd5k4e2k89l

For instructions on using the 2600 Series Adapter as a Converged Network Adapter, refer to the *User’s Guide—Converged Network Adapter 8300 Series* (part number HD8354601-00), available on the Marvell Web site. To access the guide, see “Downloading Updates and Documentation” on page xvii and select one of the 8300 Series Converged Network Adapter model numbers on the Marvell Downloads and Documentation Web page.

Confirming the Part Number and Revision

Confirm that your 2600 Series Adapter supports the personality change feature by determining the model name, part number, and revision letter.

Supported Models

Table 3-1 lists the 2600 Series Adapter models that support personality change.

Table 3-1. 2600 Series Adapters That Support Personality Change

Model Name	Part Number
QLE2670	HD8310405-01
QLE2672	HD8310405-02

To determine if your 2600 Series Adapter supports personality change:

Use one of the following methods:

- Locate the physical label on the adapter that has the part number (see Figure 3-1), and then check to see if it is listed in Table 3-1.

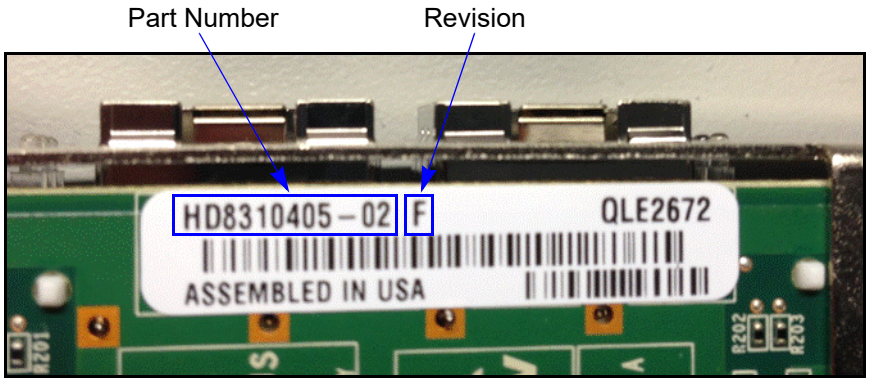

Figure 3-1. 2600 Series Adapter Part Number Location—Physical

- In QConvergeConsole GUI, select a 2600 Series port in the left pane, and then click the **VPD** tab in the right pane. Under **Port Vital Product Data (VPD)** (see Figure 3-2), view the **Engineering Date Code** for the part number, and then check to see if it is listed in Table 3-1.

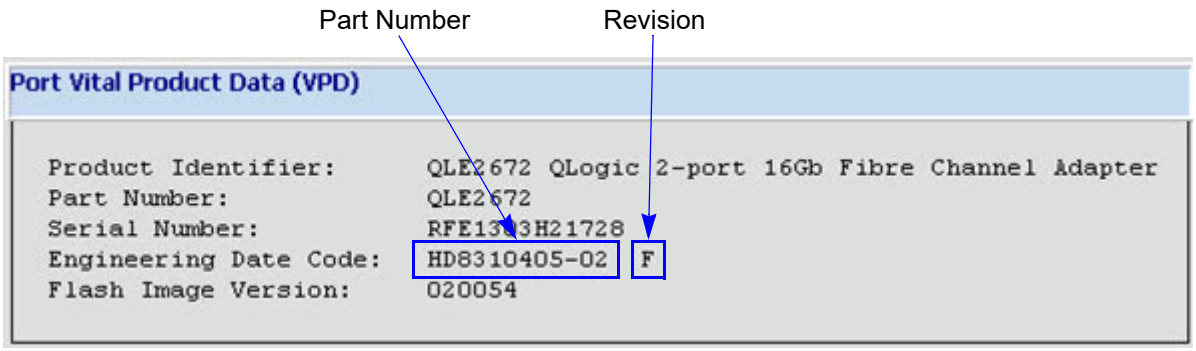

Figure 3-2. 2600 Series Adapter Part Number Location—QConvergeConsole GUI

Supported Revisions

Some 2600 Series Adapters that support personality change require an *enablement kit* (available on the QLogic Web site) for the change to work. For the adapters listed in Table 3-1 on page 21, revisions A, B, C, D, E, F, and G require the enablement kit; revisions H and later do not. The adapter revision is printed on a label on the adapter (see Figure 3-1 on page 21) and displayed in QConvergeConsole GUI (see Figure 3-2 on page 22).

If your adapter requires an enablement kit, refer to the knowledge base article, *Enabling CNA Functionality on QLogic 2600 Series Adapters*, available on the Marvell Downloads and Documentation page. To download documentation, follow the instructions in "Downloading Updates and Documentation" on page xvii.

Updating the Firmware

To enable a personality change, supported 2600 Series Adapters must have the latest firmware installed. To download the latest firmware, follow the instructions in "Downloading Updates and Documentation" on page xvii.

Replacing the Optical Transceivers

To operate the 2600 Series Adapter in Converged Network Adapter mode, replace the 16Gb optical transceivers with one of the following:

- QLogic-branded 10GbE optical transceivers. Contact QLogic's approved suppliers for purchase.
- SFP+ direct-attach copper cables. For a list of supported cables, view the *Copper Cable Support Matrix* located here:

  https://www.marvell.com/documents/j1hg6lc3ixd5k4e2k89l/

Be sure to have the new optics or copper cables available on-site before switching the 2600 Series Adapter's personality. Also, keep your 16Gb optical transceivers in a safe place in case you want to change the adapters back to Fibre Channel mode in the future.

NOTE

After the 2600 Series Adapters are converted to Converged Network Adapter mode, the adapters can no longer be connected to native Fibre Channel fabric or storage.

For instructions on converting the 2600 Series Adapter back to Fibre Channel mode, see the *User's Guide—Converged Network Adapter 8300 Series* (part number HD8354601-00), available on the Marvell Web site, Marvell Downloads and Documentation page.

Changing the Adapter Personality

NOTE

After changing the personality of a QLE267*x* Adapter, it is functionally equivalent to an 8300 Series Adapter.

You can configure the adapter personality in the following ways:

- Changing the Personality with BIOS (*Fast!UTIL)*
- Changing the Personality with UEFI or EFI
- Changing the Personality with FCode
- Changing the Personality with QConvergeConsole GUI
- Changing the Personality with Interactive QConvergeConsole CLI
- Changing the Personality with Noninteractive QConvergeConsole CLI
- Changing the Personality with QConvergeConsole Plug-in for VMware vCenter Server
- Changing the Personality with QConvergeConsole Plug-in for VMware vSphere Web Client

Changing the Personality with BIOS (*Fast!*UTIL)

To change the 2600 Series Adapter's personality mode using the BIOS *Fast!*UTIL utility on legacy x86 systems:

1. During system power-on initialization, press the CTRL+Q or ALT+Q keys. Figure 3-3 shows an example.

Figure 3-3. System Power-on Initialization

If you have more than one 2600 Series Adapter, the utility prompts you to select the adapter that you want to configure. Figure 3-4 shows an example.

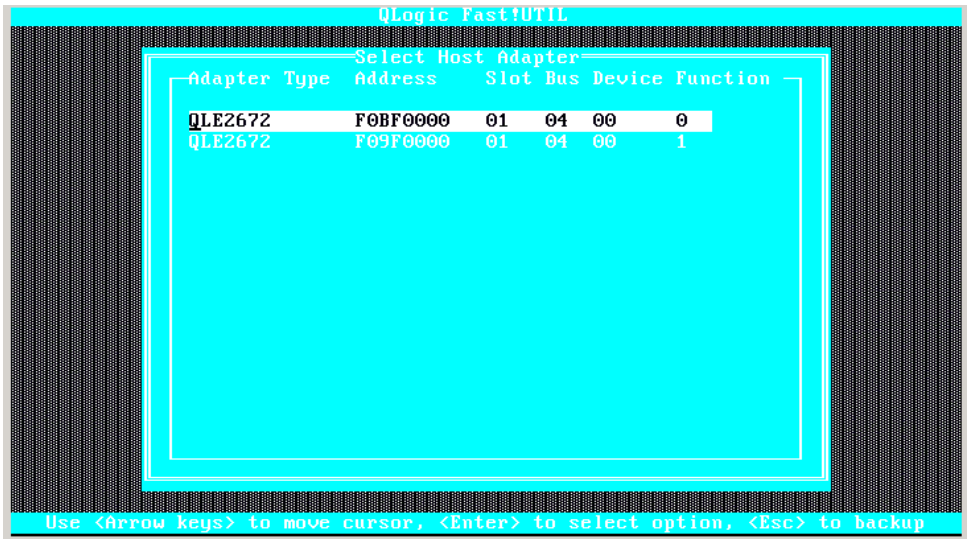

Figure 3-4. Fast!UTIL Select Host Adapter Menu

2. Select the 2600 Series Adapter that you want to configure, and then press the ENTER key.

The ***Fast!*UTIL Options** menu appears, as shown in Figure 3-5.

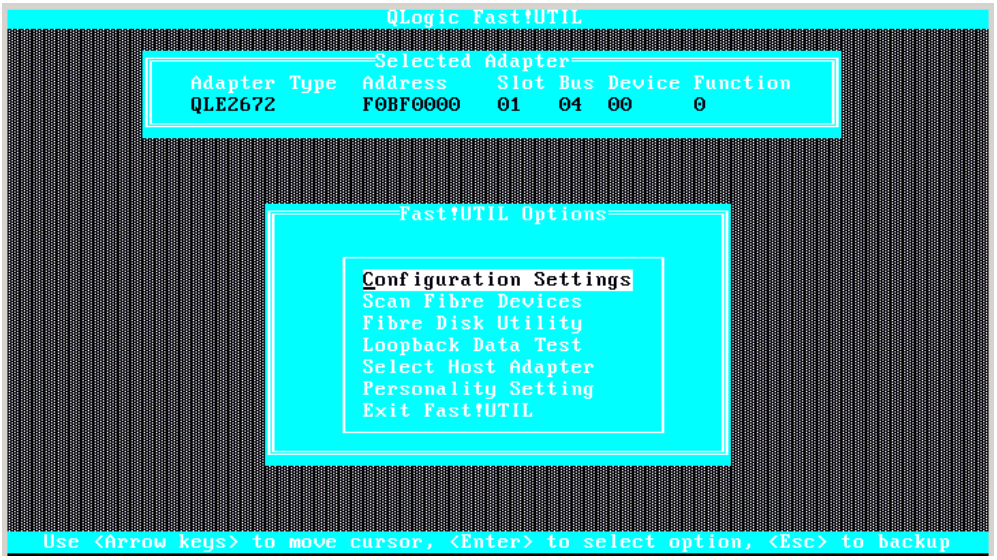

Figure 3-5. Fast!UTIL Options Menu

3. Press the arrow keys to select **Personality Setting**, and then press ENTER as shown in Figure 3-6.

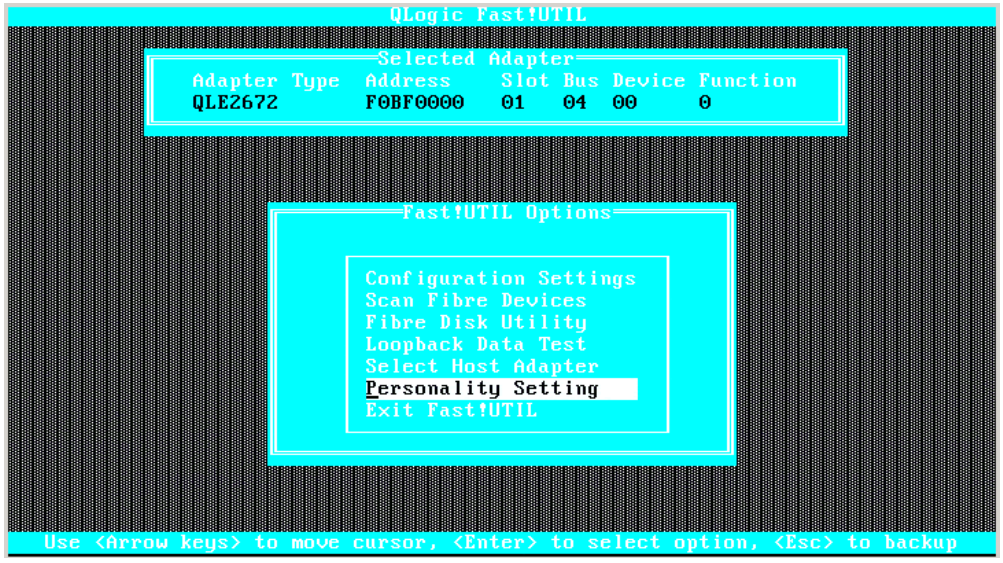

Figure 3-6. Selecting Personality Setting

The 2600 Series Adapter's current personality is displayed, as shown in Figure 3-7.

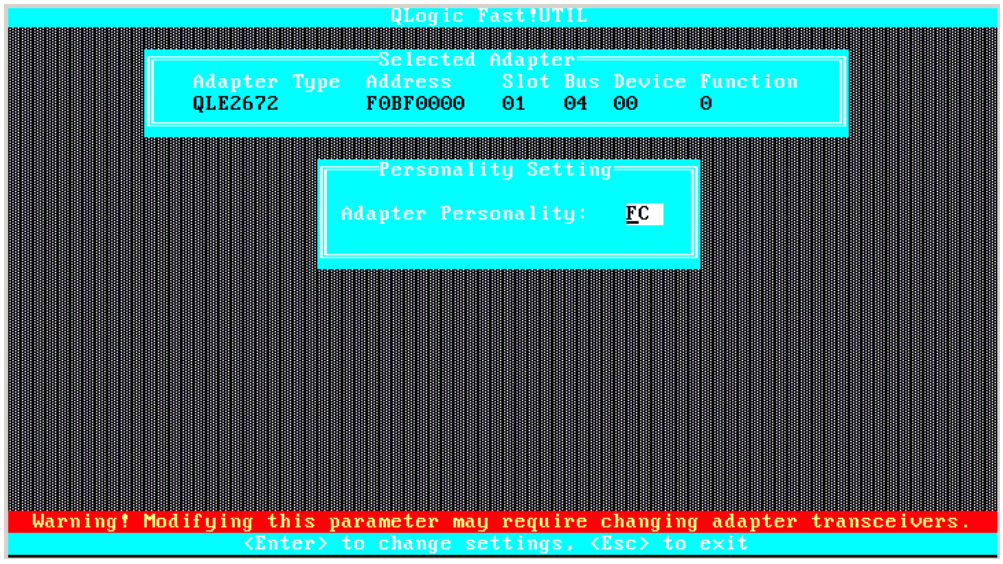

Figure 3-7. Changing the Personality from FC

4. To change the personality of the selected 2600 Series Adapter, press ENTER, and then press ESC to exit the menu. Figure 3-8 shows an example.

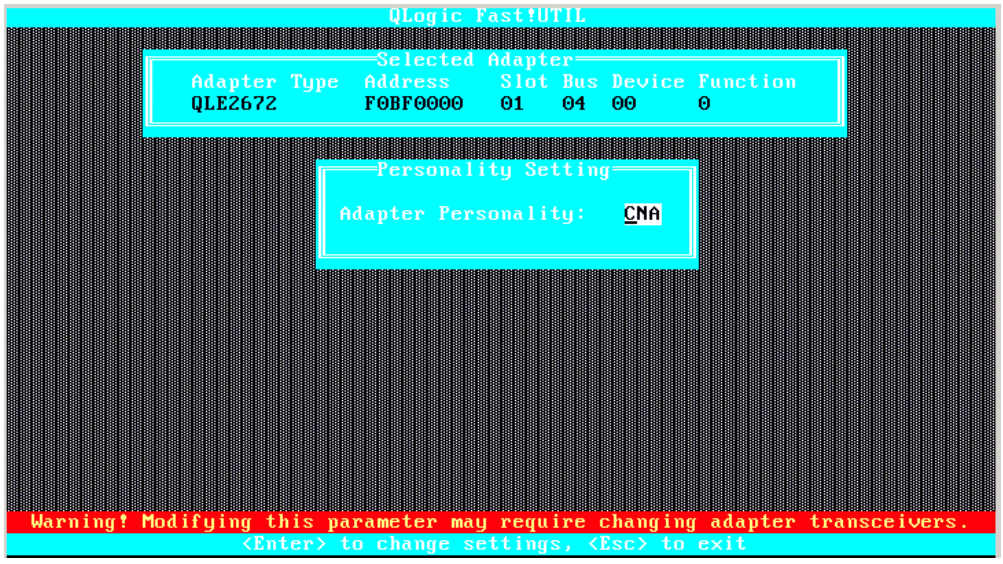

Figure 3-8. Changing the Adapter's Personality

5. Select **Save changes**, and then press ENTER, as shown in Figure 3-9.

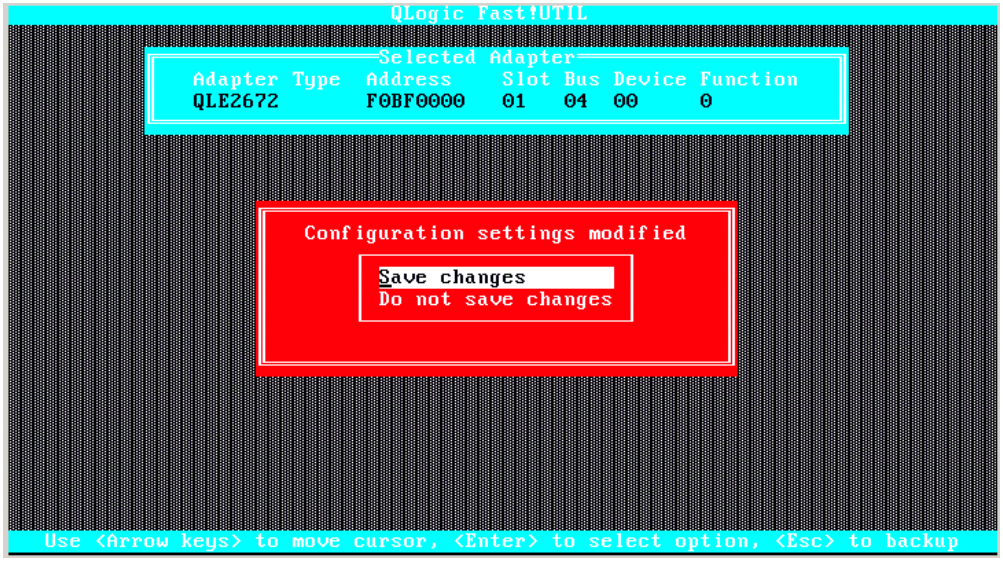

Figure 3-9. Save Your Changes

The ***Fast!*UTIL Options** menu appears. Figure 3-10 shows an example.

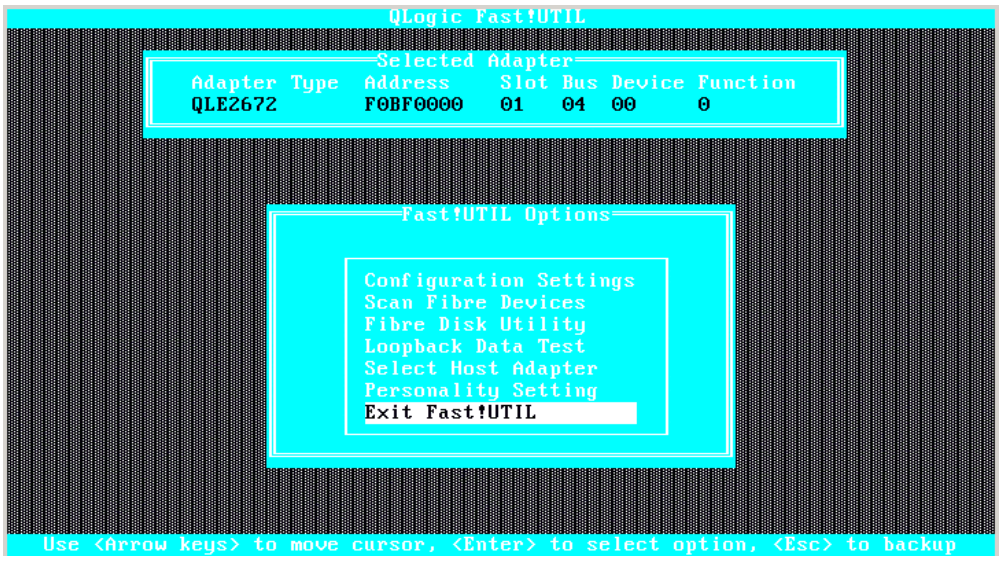

Figure 3-10. Fast!UTIL Options Menu

6. To exit the menu, do one of the following:
   - ❑ Select **Exit Fast!UTIL**, and then press ENTER.
   - ❑ Press ESC.

The **Exit *Fast!*UTIL** menu appears, as shown in Figure 3-11.

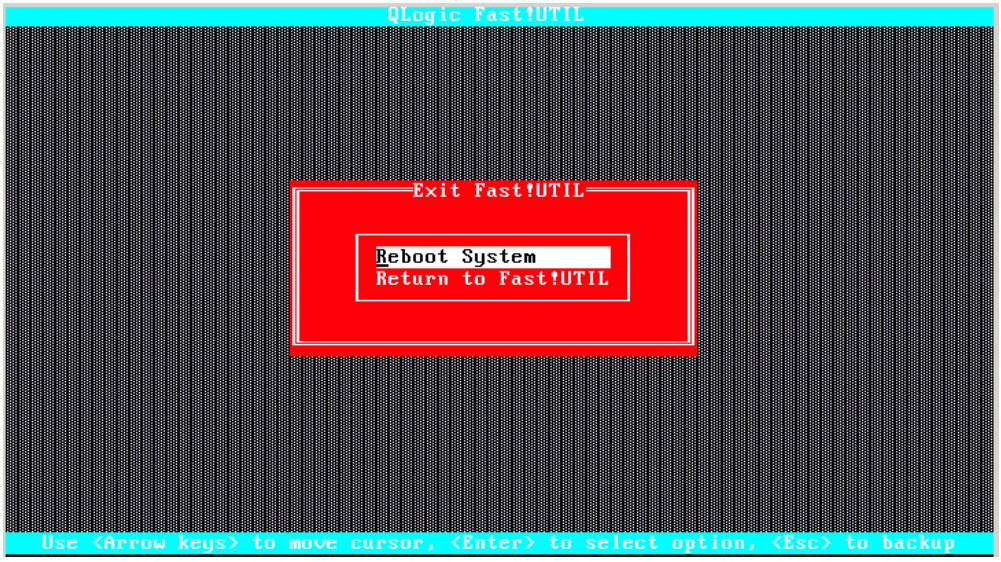

Figure 3-11. Exit Fast!UTIL Menu

7. To reboot the system, select **Reboot System**, and then press ENTER.

After you reboot the system, the new personality takes effect, as shown in Figure 3-12.

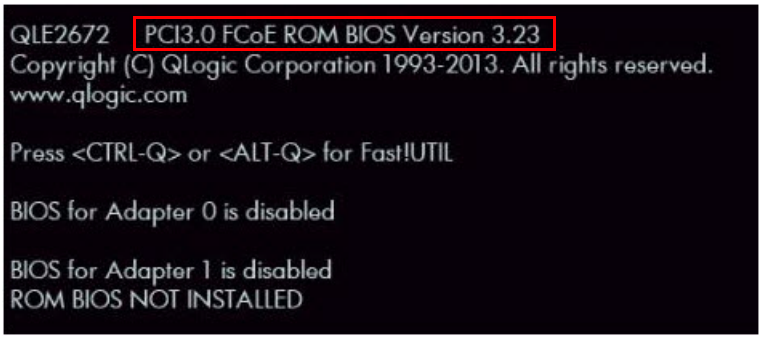

Figure 3-12. Personality Change Complete

Changing the Personality with UEFI or EFI

To change the 2600 Series Adapter's personality using the UEFI on x86 systems:

1. Enter the server's UEFI setup. (For instructions on how to enter the UEFI configuration menus, refer to your server manufacturer's documentation.)
2. To view the UEFI Driver Control page, select the **UEFI Driver Control** tab.

3. In the left pane, select a 2600 Series Adapter. Figure 3-13 shows an example.

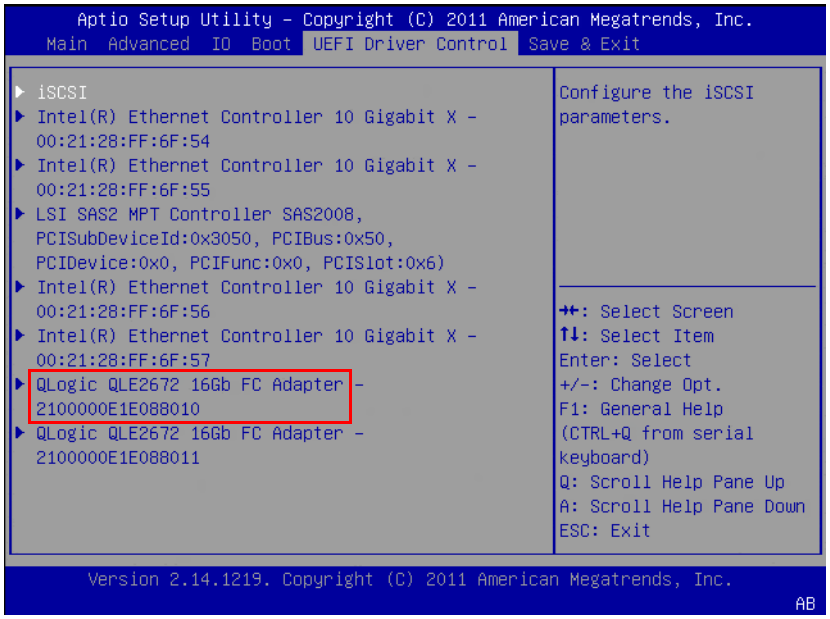

Figure 3-13. UEFI Driver Control Page in UEFI Setup

4. In the left pane, select **Advanced Settings**, as shown in Figure 3-14.

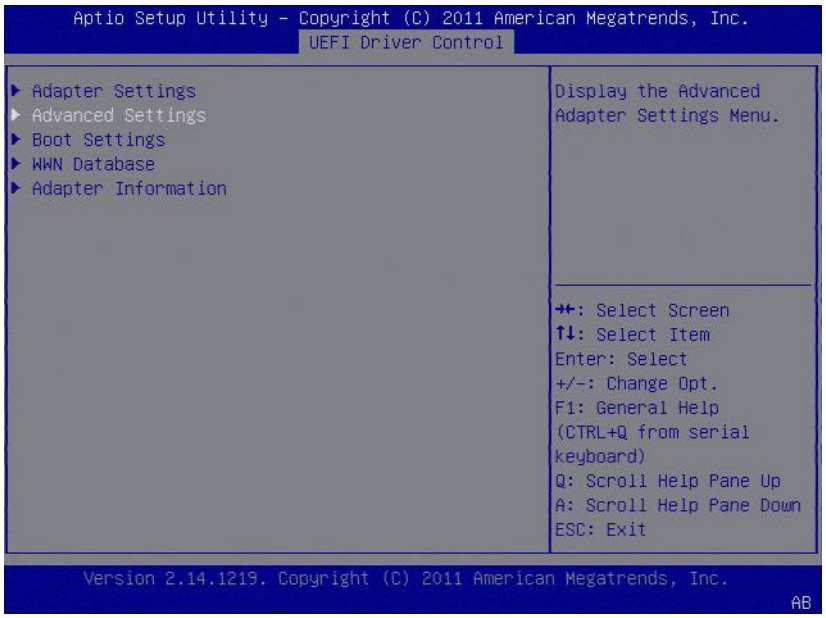

Figure 3-14. Selecting Advanced Settings

5. Select **Adapter Personality**, and then in the Adapter Personality box, select the mode, either **FC** or **CNA** (Fibre Channel or Converged Network Adapter) as required. Figure 3-15 shows an example.

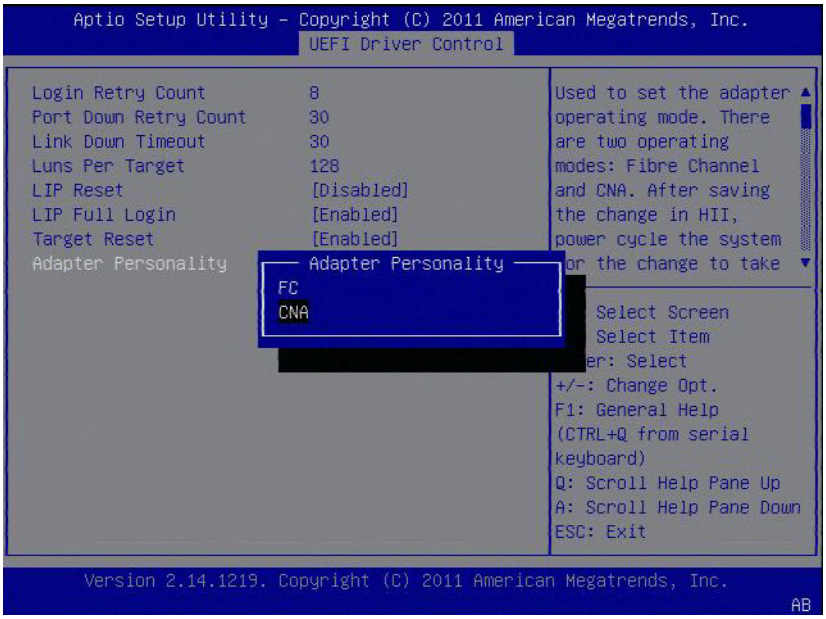

Figure 3-15. Selecting the Personality

6. Reboot the server.

Changing the Personality with FCode

NOTE

The path names shown in the examples might differ from the path names in your system. Look for the `QLGC,qlc@` section that identifies QLogic adapters.

The personality feature with FCode within the logical domain (LDOM) environment is available only to the primary function (PF).

To change the 2600 Series Adapter's personality using FCode on SPARC systems:

1. To list the QLogic Fibre Channel and FCoE device path, at the `ok` prompt, issue the `show-disks` command.

```
{0} ok show-disks
a) /pci@400/pci@1/pci@0/pci@c/LSI,sas@0/disk
b) /pci@400/pci@1/pci@0/pci@4/QLGC,qlc@0,1/fp@0,0/disk
c) /pci@400/pci@1/pci@0/pci@4/QLGC,qlc@0/fp@0,0/disk
```

```
d) /pci@400/pci@1/pci@0/pci@0/pci@0/usb@0,2/hub@3/storage@2/disk
e) /iscsi-hba/disk
q) NO SELECTION
Enter Selection, q to quit: q
{0} ok
```

2. At the `ok` prompt, issue the `select` command.

```
{0} ok select /pci@400/pci@1/pci@0/pci@4/QLGC,qlc@0
QLogic QLE2672 FC Host Adapter FCode(SPARC): x.xxxx yyyy-mm-dd
08:51
ISP Firmware version x.xx.xx
```

3. To change the 2600 Series Adapter's personality, at the `ok` prompt, issue the `set-personality` command.

   The following example shows the mode being changed (in this case, from Fibre Channel to Converged Network Adapter):

```
{0} ok set-personality
Current Personality : FC
Do you want to change it? (y/n) y
Choose Personality :
0 - FC
1 - CNA
enter: 1
.
.
.
{0} ok reset-all
```

Changing the Personality with QConvergeConsole GUI

For information about downloading and installing QConvergeConsole GUI, see "Step 3. Install QConvergeConsole" on page xxiv.

To change the personality of a 2600 Series Adapter:

1. On the QConvergeConsole GUI main window, select a 2600 Series Adapter in the tree pane on the left.
2. In the content pane on the right, click the **Personality** tab.

3. On the Personality page, click either **FC Only** (Figure 3-16) or **CNA** (Figure 3-17), as appropriate, to change the current adapter type.

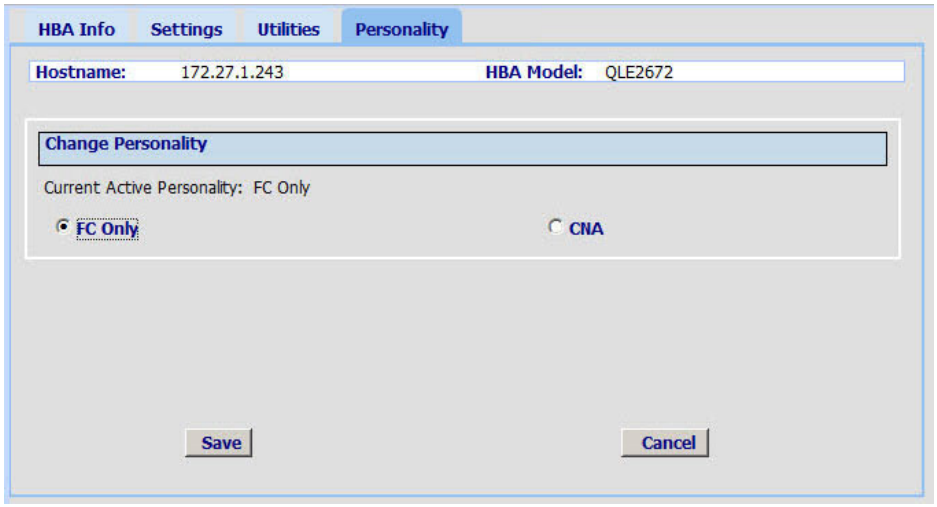

Figure 3-16. Personality Page—Current Personality Set to FC Only

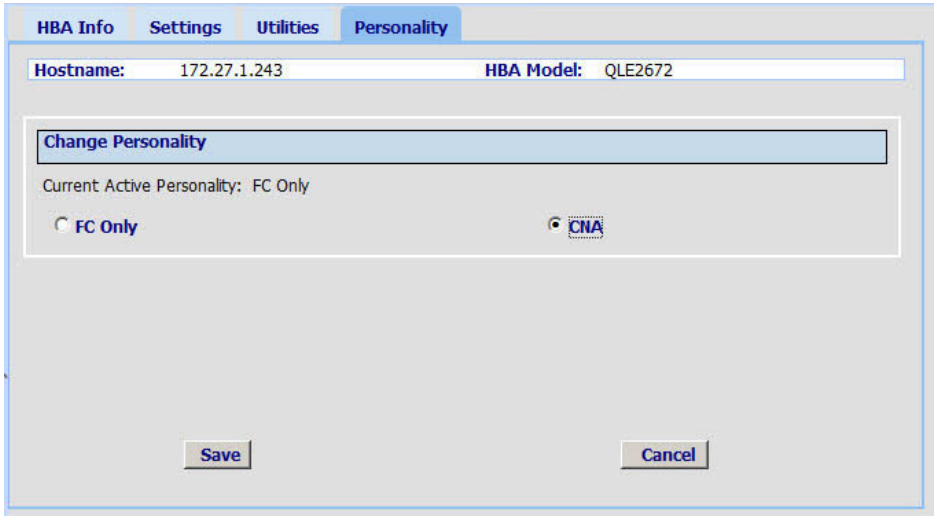

Figure 3-17. Personality Page—Changing to from FC to CNA

4. Click **Save** to activate the personality change, or click **Cancel** to cancel the personality change.
5. If prompted, in the Security Check for Host dialog box, type the password and then click **OK**.

6. Do one of the following:
   - ❑ For all systems except Solaris, reboot the system for the changes to take effect.
   - ❑ For Solaris systems, issue the `reboot -p` command for the changes take effect.

Changing the Personality with Interactive QConvergeConsole CLI

For information about downloading and installing QConvergeConsole CLI, see "Step 3. Install QConvergeConsole" on page xxiv.

To change the personality of a 2600 Series Adapter:

1. On the **Main Menu**, select **Adapter Configuration**.
2. On the **Adapter Type Selection** menu, select **Fibre Channel Adapter**.
3. On the **Fibre Channel Adapter Configuration** menu, select **Personality**.
4. On the adapter menu, select the 2600 Series Adapter whose personality is to be changed.
5. To change the personality, type **y**.

Example of changing a Fibre Channel Adapter to a Converged Network Adapter:

```
        QConvergeConsole GUI
        CLI - Version 1.0.3 (Build 37)
    Fibre Channel Adapter Configuration
     1: HBA Model: QLE2672  SN: AFE1224F05259
          Port   1 WWPN: 21-00-00-0E-1E-08-F2-00 Link Down
          Port   2 WWPN: 21-00-00-0E-1E-08-F2-01 Online
       (p or 0: Previous Menu; m or 98: Main Menu; ex or 99: Quit)
        Please Enter Selection: 1
Change personality to CNA? (y/n): y
Personality type of HBA instance 1 (QLE2672) has been changed
successfully. Please reboot machine. Make sure to change the SFP
module to a compatible one (CNA) before reboot.
        Hit <Enter> to continue:
```

Example of changing a Converged Network Adapter to Fibre Channel Adapter:

```
        QConvergeConsole GUI
        CLI - Version 1.0.3 (Build 37)
        Converged Network Adapter (CNA) FCoE Configuration
      1: HBA Model: QLE2672 SN: AFE1224F05259
```

```
          Port   1 [Protocol(s): FCoE]
          Port   2 [Protocol(s): FCoE]
        (p or 0: Previous Menu; m or 98: Main Menu; ex or 99: Quit)
        Please Enter Selection: 1
Change personality to FC? (y/n): y
Personality type of HBA instance 1 (QLE2672) has been changed
successfully. Please reboot machine. Make sure to change the SFP
module to a compatible one (FC) before reboot.
        Hit <Enter> to continue:
```

Changing the Personality with Noninteractive QConvergeConsole CLI

To display the current adapter personality type in the noninteractive mode of QConvergeConsole CLI, issue the following command:

qaucli -pr fc -pc <hba instance|hba wwpn|all> --info

To change the personality of a 2600 Series Adapter:

- Issue the following command:

  qaucli -pr fc -pc <hba instance|hba wwpn|all> --type <*mode*>

Where:

`hba instance` = Fibre Channel Adapter instance number of a Fibre Channel Adapter port (issue the `-g` command to find)

`hba wwpn` = Worldwide port name of a Fibre Channel Adapter port

`all` = All adapter ports

`mode` = Personality type:
`fc` or `0` = Change the adapter personality to Fibre Channel
`cna` or `1` = Change the adapter personality to Converged Network Adapter

Changing the Personality with QConvergeConsole Plug-in for VMware vCenter Server

To change the personality of a 2600 Series Adapter:

1. In the tree pane on the left side of the QConvergeConsole pane, select a 2600 Series Adapter.
2. In the content pane under **Configuration**, select an **Adapter Personality Type** as shown in Figure 3-18.

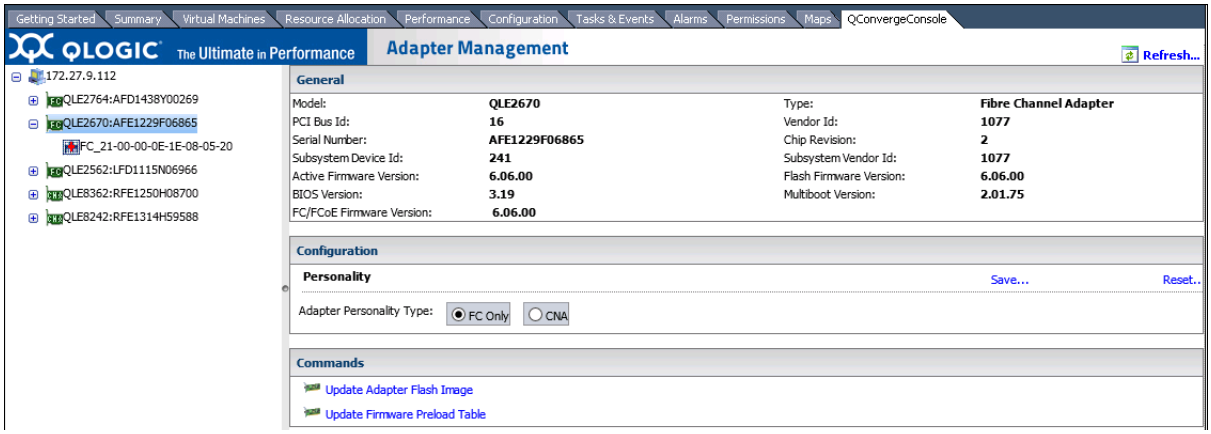

Figure 3-18. Changing Personality Type Using QConvergeConsole Plug-in for VMware vCenter Server

3. Click **Save**.

Changing the Personality with QConvergeConsole Plug-in for VMware vSphere Web Client

For information about downloading and installing QConvergeConsole Plug-in for VMware vSphere Web Client, see “Step 3. Install QConvergeConsole” on page xxiv.

To change the personality of a 2600 Series Adapter:

1. In the tree pane on the left side of the VMware vSphere® Web Client window, select a host.
2. In the content pane on the right, click the **Manage** tab.
3. On the Manage page, click the **QConvergeConsole GUI** tab.

   The QConvergeConsole GUI Adapter Management window appears in the VMware vSphere Web Client’s content pane. The QConvergeConsole GUI Adapter Management window also contains two panes: a tree pane on the left and a content pane on the right.

4. In the Adapter Management's left pane, click a node corresponding to a 2600 Series Adapter to view information pertaining to that adapter in the right pane.

   Under **Personality Type**, the plug-in indicates whether each adapter type (personality), **FC Only** and **CNA**, is enabled or disabled.

5. To change the adapter type:

   a. Click **Edit**.

   b. In the <Adapter_Name> Personality Type dialog box, click either **FC Only** or **CNA** as the new type.

   c. To change the adapter type, click **OK**.

   Figure 3-19 shows an example.

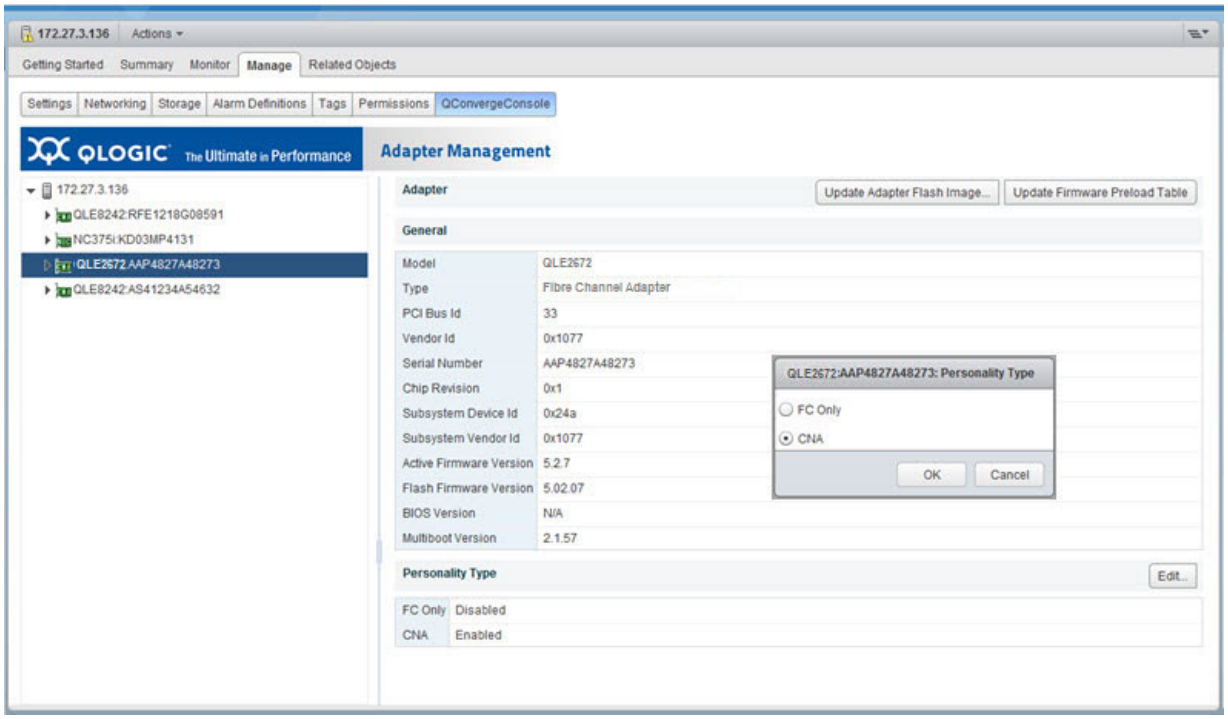

Figure 3-19. Changing Personality Type Using QConvergeConsole Plug-in for VMware vSphere Web Client

4 Fibre Channel Configuration

This chapter describes the driver and agent installation, configuration, operation, and troubleshooting of the Fibre Channel function of the 2600 Series Adapters, including:

Installing Fibre Channel

This section provides information on installing Fibre Channel on the following platforms:

- Installing Fibre Channel in Linux
- Installing Fibre Channel in VMware ESXi
- Installing Fibre Channel in Windows
- Installing Fibre Channel in Solaris

Installing Fibre Channel in Linux

For more information, refer to the *Fibre Channel Adapter and Converged Network Adapter Inbox Driver Update for Linux Kernel 2.6.x and 3.x* Read Me document.

Linux OS Support

To obtain the latest information about supported Linux operating systems, download the associated *Read Me* and *Release Notes* documents available at www.marvell.com (see "Downloading Updates and Documentation" on page xvii).

Supported Features

The Fibre Channel Adapter and Converged Network Adapter Inbox Driver for Linux Kernel 2.6.*x* and 3.*x* support the following:

- FCAL—direct attach loop, point-to-point, and fabric topologies
- Initiator mode only
- Fibre Channel tape
- MSI-X
- NPIV
- Device mapper
- Support for block SG (BSG) interface
- Support for sysfs interface
- Support for an adapter API

Deploying the Driver

For information on deploying the driver, refer to the *Fibre Channel Adapter and Converged Network Adapter Inbox Driver Update for Linux Kernel 2.6.x and 3.x* Read Me document.

Driver System Parameters

For information on setting driver system parameters, refer to the *Fibre Channel Adapter and Converged Network Adapter Inbox Driver Update for Linux Kernel 2.6.x and 3.x* Read Me document.

Boot from SAN

Booting from SAN means booting the OS from a Fibre Channel target device. You should use the QLogic inbox driver to install the OS to the Fibre Channel target device that is attached to a 2600 Series Adapter. If there is no QLogic inbox driver that supports the 2600 Series Adapter, you should use a DD-Kit[1] to boot from SAN.

NOTE

The following procedure is only for RHEL® 5.0 and later distributions.

To boot from SAN when installing to a LUN other than LUN 0 and LUN 0 is present:

1. On the Boot Loader Configuration window, select **Configure Advance Boot Loader**, and then click **Next**.
2. On the Advanced Boot Loader Configuration window, select **Change Drive Order**.
3. On the Edit Drive Order window, move the entry for the boot LUN.
4. To continue, click **OK**.
5. Continue with the OS installation as usual.

Installing Fibre Channel in VMware ESXi

For information on installing Fibre Channel in VMware ESXi, refer to the *Read Me* and *Release Notes* documents for VMware ESXi 5.*x* and 6.*x*.

NOTE

For specific service packs (SPs) and OS updates, go to the Downloads and Documentation page at www.marvell.com (see “Downloading Updates and Documentation” on page xvii).

ESXi OS Support

To obtain the latest information about supported ESXi operating systems, download the associated *Read Me* and *Release Notes* documents available at www.marvell.com (see “Downloading Updates and Documentation” on page xvii).

Using the Driver

For information on how to install and remove the driver, refer to the *Read Me* document for VMware ESXi 5.*x* and ESXi 6.*x* available at www.marvell.com (see “Downloading Updates and Documentation” on page xvii).

[1] Marvell provides DD-Kits (driver update disks) for Linux platforms.

Installing Fibre Channel in Windows

For information on how to install Fibre Channel in Windows, refer to the *Fibre Channel Adapter STOR Miniport Driver* Read Me document.

Windows OS Support

To obtain the latest information about supported Windows operating systems, download the associated *Read Me* and *Release Notes* documents available at www.marvell.com (see “Downloading Updates and Documentation” on page xvii).

Using the Driver

For information on how to create the driver disk, install the driver, and remove the driver, refer to the *Fibre Channel Adapter STOR Miniport Driver* Read Me document.

Installing Fibre Channel in Solaris

The Solaris drivers for this adapter are inbox in the Solaris OS. For additional Solaris-specific information, refer to the OS documentation.

NOTE

For a detailed list of the currently supported operating systems, refer to the adapter’s *Read Me* and *Release Notes* available at www.marvell.com (see “Downloading Updates and Documentation” on page xvii).

Solaris OS Support

To obtain the latest information about supported Solaris operating systems, download the associated *Read Me* and *Release Notes* available at www.marvell.com (see “Downloading Updates and Documentation” on page xvii).

Updating the Driver

Refer to the Solaris OS documentation for information on how to create the driver disk, install the driver, and remove the driver.

Setting Fibre Channel Adapter Parameters

You can set parameters for Fibre Channel using the QConvergeConsole GUI, QConvergeConsole CLI, or QConvergeConsole Plug-ins.

Setting Fibre Channel Adapter Parameters with QConvergeConsole GUI

For details about how to set Fibre Channel Adapter parameters using QConvergeConsole GUI, refer to the “HBA Parameters” and “Advanced HBA Parameters” topics in the *QConvergeConsole Help*.

For example, Figure 4-1 shows the data rate options for a 2600 Series Adapter.

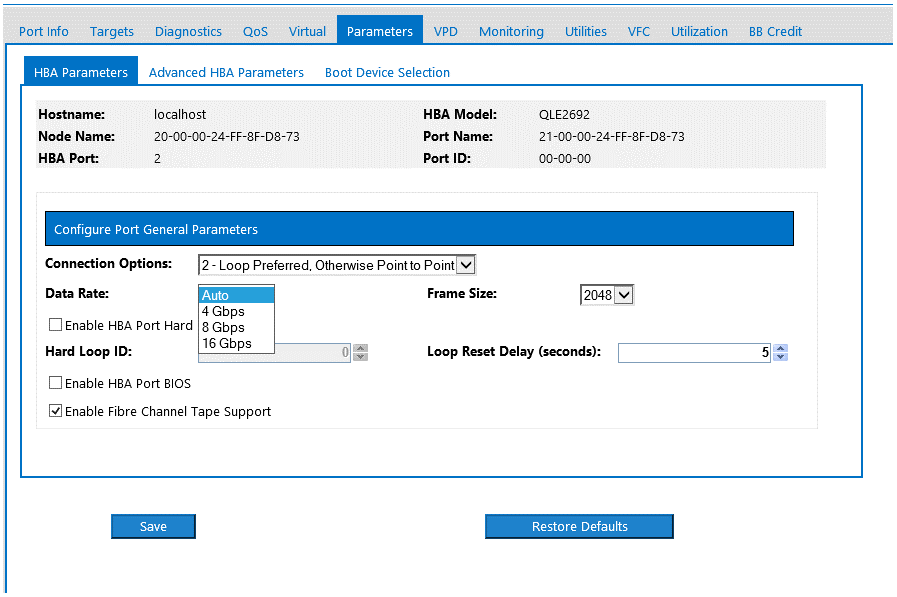

Figure 4-1. Data Rate Options for 2600 Series Adapter

Setting Fibre Channel Adapter Parameters with Interactive QConvergeConsole CLI

To set Fibre Channel Adapter parameters with interactive QConvergeConsole CLI:

1. On the **Fibre Channel Adapter Configuration** menu, select **HBA Parameters**.
2. On the port menu, select a port to open the **HBA Parameters** menu.
3. On the **HBA Parameters** menu, select the **Configure HBA Parameters** option to open the Configure Parameters menu.

For more information, refer to the section about the Fibre Channel interactive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Setting Fibre Channel Adapter Parameters with Noninteractive QConvergeConsole CLI

For information on setting Fibre Channel Adapter parameters using the noninteractive mode of QConvergeConsole CLI, refer to the section about Fibre Channel noninteractive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Setting Fibre Channel Adapter Parameters with QConvergeConsole Plug-in for VMware vCenter Server

For information on setting Fibre Channel Adapter parameters using the QConvergeConsole Plug-in for VMware vCenter Server, refer to the section "Configure Fibre Channel Port Parameters" in the *User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00).

Configuring Target Persistent Binding

You can configure target persistent binding using either the QConvergeConsole GUI or QConvergeConsole CLI tool.

NOTE

Target persistent binding is supported only for Windows.

Configuring Persistent Binding with QConvergeConsole GUI

To bind target devices attached to an adapter port using QConvergeConsole GUI:

1. In the QConvergeConsole GUI system tree, expand a Fibre Channel node.
2. For a 2600 Series Adapter, select the physical port number in the system tree.
3. Click the **Targets** tab.
4. On the Target page, click the **Target Persistent Binding** tab.
5. To bind all the devices listed to adapter ports, select the **Bind All** check box.

6. To configure a specific port and bind it to the target ID that you have selected from the **Target ID** list, select the **Bind** check box. If you do not want to configure the port, clear the check box. If you clear the check box, the corresponding port is unconfigured.
7. To save the configuration changes, click **Save**.
8. If the Security Check dialog box appears, type the password in the **Enter Password** box, and then click **OK**.

   The system overwrites any previously saved configuration for the current adapter and opens a message box.
9. To close the message box, click **OK**.

For more information, refer to the topic about binding target devices in the *QConvergeConsole Help*.

Configuring Persistent Binding with Interactive QConvergeConsole CLI

In the interactive mode of QConvergeConsole CLI, follow these steps to bind a selected target to a specific adapter.

To bind a target using interactive QConvergeConsole CLI:

1. On the **Fibre Channel Adapter Configuration** menu, select **Target Persistent Bindings**.
2. On the port menu, select a port and then select **Bind Target(s)** to bind a target to a port.
3. Select a target and specify a target ID to open the **Target Persistent Binding – FC Port Configuration** menu with options to select more targets, save changes, or cancel the binding operation.

For more information, refer to the section about Fibre Channel interactive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Configuring Persistent Binding with Noninteractive QConvergeConsole CLI

In the noninteractive mode of QConvergeConsole CLI, bind a selected target to a specific adapter by issuing the following command:

```
# qaucli -pr fc -p (<hba instance> | <hba wwpn>) (<target wwnn>
<target wwpn> <target port id> <target id>)
```

Where:

`hba instance` = Adapter number (issue the `-g` command to find)
`hba wwpn` = Worldwide port name of the adapter
`target wwnn` = Worldwide node name of the target
`target wwpn` = Worldwide port name of the target
`target port id` = Port ID of the target
`target id` = ID to which the target is bound

For more information, refer to the section about Fibre Channel noninteractive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Configuring Boot Devices

You can configure boot devices using QConvergeConsole GUI, QConvergeConsole CLI, QConvergeConsole Plug-ins, or the BIOS utility.

Configuring Boot Devices with QConvergeConsole GUI

To configure the adapter boot device with QConvergeConsole GUI:

1. In the tree pane on the left, select a 2600 Series adapter port.
2. Click the **Parameters** tab.
3. On the Parameters page, click **Boot Device Selection**.
4. On the Boot Device Selection page, configure the port boot parameters as needed. For details, refer to the "Boot Device Selection" topic in the *QConvergeConsole Help*.
5. To save any changes to the boot device, click **Save**.
6. If the Save HBA Parameter Changes dialog box appears, click **Yes** to confirm.
7. If the Security Check dialog box appears, type the password, and then click **OK**.

   Any previously saved configuration for the current adapter is overwritten.

Configuring Boot Devices with Interactive QConvergeConsole CLI

In the interactive mode of QConvergeConsole CLI, open the **Fibre Channel Adapter Configuration** menu, and then select **Boot Devices Configuration**. The **Boot Device Settings** menu shows options for viewing and configuring boot devices.

For more information on configuring boot devices with the interactive mode of QConvergeConsole CLI, refer to the section about the Fibre Channel interactive commands in the QConvergeConsole.

Configuring Boot Devices with Noninteractive QConvergeConsole CLI

In the noninteractive mode of QConvergeConsole CLI, set a specific target as the boot device for a specific adapter by issuing the following command:

```
# qaucli -pr fc -e (<hba instance> | <hba wwpn>) <target wwnn>
<target wwpn> <target id> <lun id>
```

Where:

`hba instance`	=	Adapter number (issue the `-g` command to find)
`hba wwpn`	=	Worldwide port name of the adapter
`target wwnn`	=	Worldwide node name of the target
`target wwpn`	=	Worldwide port name of the target
`target id`	=	ID to which the target is bound
`lun id`	=	ID of the LUN

For more information, refer to the section about the Fibre Channel noninteractive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Configuring Boot Devices with QConvergeConsole Plug-in for VMware vCenter Server

Follow these steps to configure boot devices with QConvergeConsole Plug-in for VMware vCenter Server.

To configure boot devices:

1. In the QConvergeConsole left pane, expand the tree and then select a port.
2. In the content pane on the right, click the **Boot** tab.
3. Enable boot from the port by setting the appropriate settings:
   a. Select the appropriate check box options.
   b. For each applicable **Boot Name**, enter the information in the **Target-WWN** and **LUN ID** boxes.
4. Click **Save Configuration**.

Figure 4-2 shows an example.

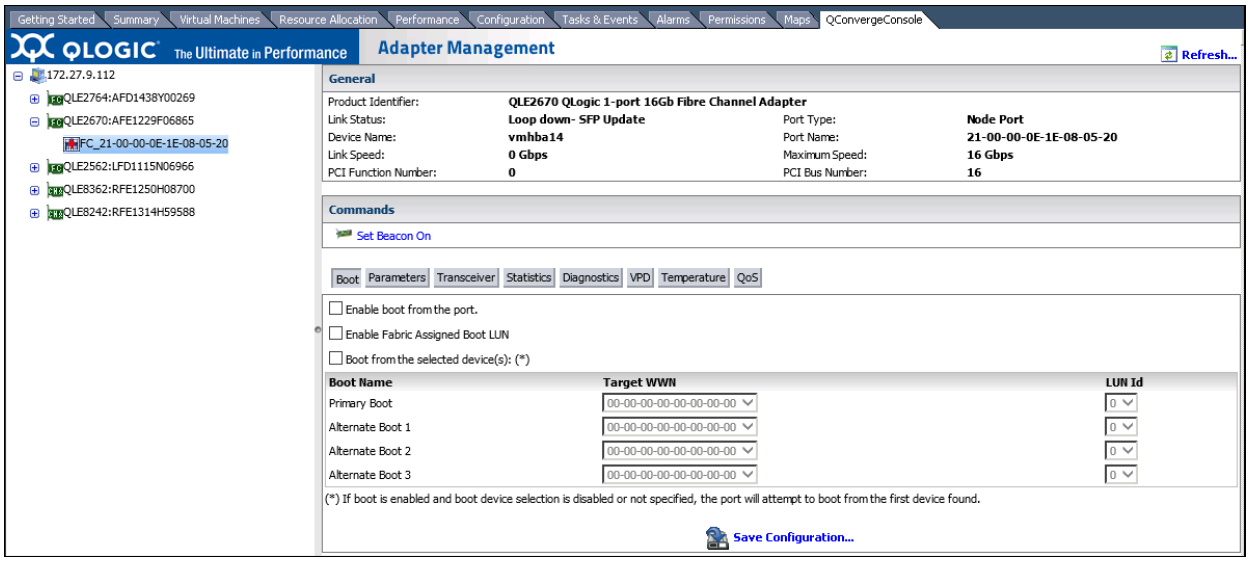

Figure 4-2. Configuring Boot Devices with QConvergeConsole Plug-in for VMware vCenter Server

Configuring Boot Devices with QConvergeConsole Plug-in for VMware vSphere Web Client

Follow these steps to configure boot devices with QConvergeConsole Plug-in for VMware vSphere Web Client.

To configure boot devices:

1. In the tree pane on the left side of the VMware vSphere Web Client window, select a host.
2. In the content pane on the right, click the **Manage** tab.
3. On the Manage page, click the **QConvergeConsole GUI** tab.

   The QConvergeConsole GUI Adapter Management window appears in the VMware vSphere Web Client's content pane. The QConvergeConsole GUI Adapter Management window also contains two panes: a tree pane on the left and a content pane on the right.
4. In the Adapter Management's left pane, click a node corresponding to a 2600 Series Adapter, and then click a Fibre Channel port node to view general information pertaining to that port in the right pane.
5. On the General page, click the **Boot** tab.
6. On the Boot page under **Boot**, click **Edit**.

7. Complete the FC Boot dialog box to specify the primary and alternate boot devices, and then click **OK** to save your changes.

   Figure 4-3 shows an example.

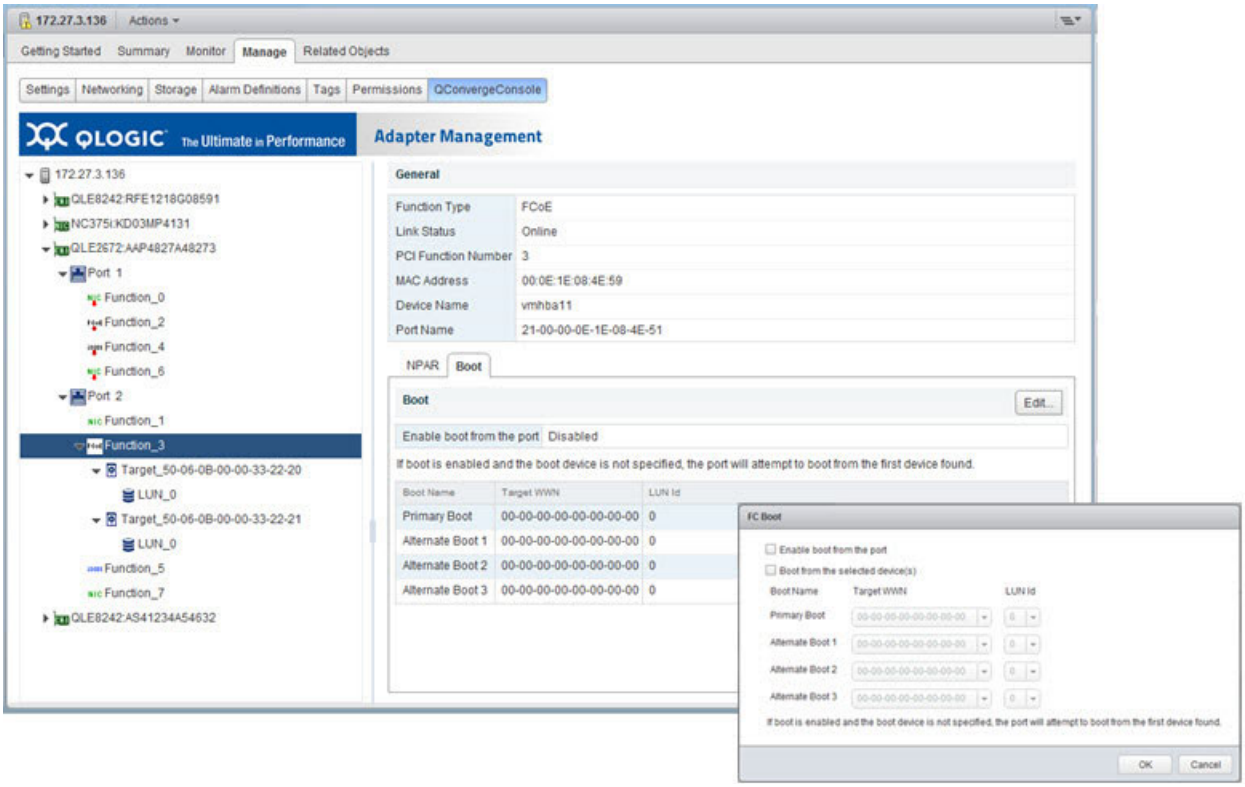

Figure 4-3. Configuring Boot Devices with QConvergeConsole Plug-in for VMware vSphere Web Client

Configuring Boot Devices with the BIOS

For information on configuring boot devices with BIOS, refer to “Fibre Channel Adapter Installation with QLogic SuperInstallers” on page 4.

Configuring Virtual Ports (NPIV)

You can configure NPIV using either the QConvergeConsole GUI or QConvergeConsole CLI tool. This section also covers NPIV quality of service (QoS).

NOTE

To configure NPIV on VMware ESXi, refer to the *Configure Fibre Channel NPIV Settings in the vSphere Client* page located here:

http://pubs.vmware.com/vsphere-50/index.jsp?topic=%2Fcom.vmware.vsphere.vm_admin.doc_50%2FGUID-C713BCA5-71B4-4539-A4AE-8E781330755C.html

Refer also to the *User's Guide—Marvell Fibre Channel and Converged Network Adapters for VMware ESXi 5.5 and 6.x* (part number SN0154529-00), "Deploying NPIV for VMware ESXi 5.*x* and 6.0" section, available at www.marvell.com (see "Downloading Updates and Documentation" on page xvii).

Configuring NPIV with QConvergeConsole GUI

For information about configuring NPIV with QConvergeConsole GUI, refer to the *QConvergeConsole Help*, "Using Virtualization (NPIV)" topic.

Configuring NPIV with Interactive QConvergeConsole CLI

In the interactive menu of QConvergeConsole CLI, open the **Fibre Channel Adapter Configuration** menu, and then select **Virtual Ports (NPIV)**. The **vPorts** menu shows options for viewing and configuring virtual ports.

For more information about configuring NPIV with interactive QConvergeConsole CLI, refer to the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Configuring NPIV with Noninteractive QConvergeConsole CLI

You can configure a virtual port in the noninteractive mode of QConvergeConsole CLI with either an automatic or a specific WWPN.

To create a virtual port with an automatic WWPN:

- Issue the following command:

```
# qaucli -vp <hba instance>|<hba wwpn> create auto
[<num_of_vport>]
```

Where:

`hba instance`	=	Adapter number (issue the `-g` command to find)
`hba wwpn`	=	Worldwide port name of the adapter
`num_of_vport`	=	Number of virtual ports to be created.

If the key word 'max' is specified, then maximum number of virtual ports will be automatically created.

To create a virtual port with a specific WWPN:

1. Issue the following command:

   `# qaucli -pr fc -vp (<hba instance> | <hba wwpn>) create <vport hex>`

   Where:

`hba instance`	=	Adapter number (issue the `-g` command to find)
`hba wwpn`	=	Worldwide port name of the adapter
`vport hex`	=	World wide port name of the virtual port with the two hexadecimal digits in byte three supplied by the user

2. When prompted, type two hexadecimal digits. The system checks these digits to ensure that they are unique and, if they are, puts them into byte 1 of the WWPN.

For more information, refer to the section about Fibre Channel noninteractive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

NPIV Quality of Service

The 2600 Series Adapter solution provides for standards-based QoS, ensuring high-quality performance for applications that require preferential delivery. The QConvergeConsole QoS solution assigns QoS levels to virtual ports (NPIV ports) in contrast to end-to-end QoS, which assigns QoS levels from initiator to target across the fabric. For information about end-to-end (CS_CTL) QoS, see "Configuring End-to-End (CS_CTL) QoS" on page 70.

You can configure the NPIV QoS using the **priority method** or the **bandwidth method**, as shown in Figure 4-4.

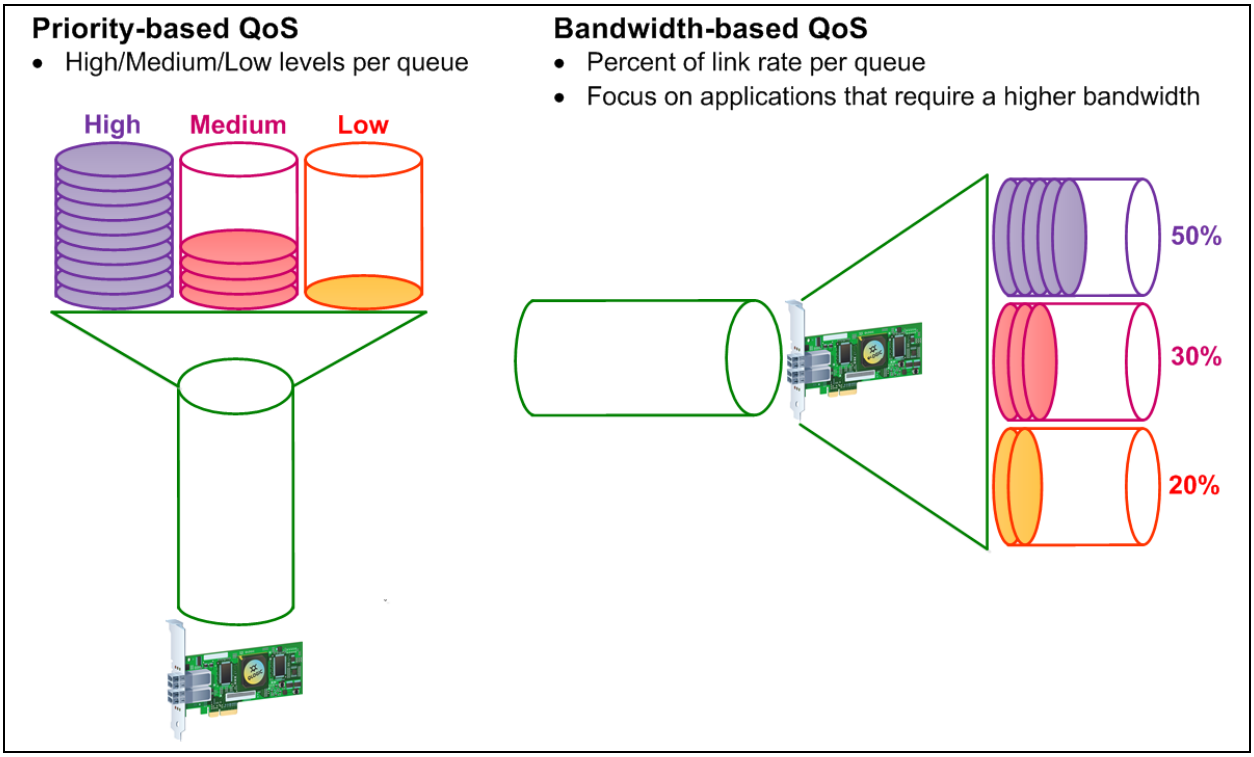

Figure 4-4. Priority- and Bandwidth-based QoS

On a single physical port, you can configure QoS using the priority method or the bandwidth method but not both.

- The **priority method** assigns priority levels (low, medium, or high) to virtual ports based on the QoS required for the applications or VMs using the virtual port. This method provides for various levels of latency requirements across virtual ports. See “Setting QoS by Priority” on page 51.
- The **bandwidth method** assigns bandwidth to applications or VMs that are using virtual ports as a percentage of the total bandwidth available (16Gbps) or a specific value, such as 1Gbps. This method provides a minimum bandwidth guarantee. The bandwidth-based QoS configuration applies only when the total bandwidth requirement of the applications exceeds the available bandwidth. The bandwidth is not reserved for a specific virtual port, and unused bandwidth is shared among the other virtual ports. See “Setting QoS by Bandwidth” on page 52.

The physical port or world-wide name (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 QConvergeConsole CLI.

To modify QoS levels, the configuration must meet the following hardware and software requirements:

- Server operating system: Microsoft Windows Server® 2008 or later
- Server support for MSI-X
- A 2600 Series Adapter
- Latest version of the QLogic STOR miniport driver, available from the Downloads and Documentation page at www.marvell.com (see “Downloading Updates and Documentation” on page xvii).
- Fibre Channel switch that supports NPIV
- Physical port attached in a point-to-point connection

Setting QoS by Priority

To set the QoS by priority with QConvergeConsole GUI:

1. In the QConvergeConsole GUI system tree in the left pane, expand a 2600 Series Adapter.
2. Select a physical port.
3. In the content pane on the right, click the **QoS** tab.
4. On the QoS page in the **QoS Type** box, select **Priority**.

5. For each virtual port, move the slider to select a low, medium, or high priority, as shown in Figure 4-5.

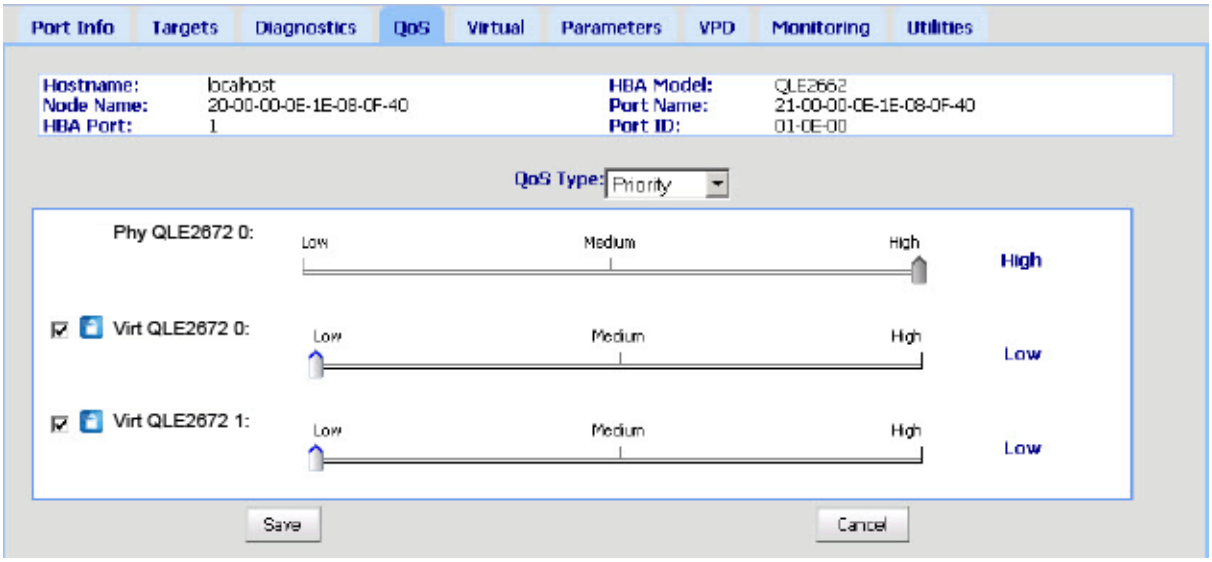

Figure 4-5. Setting the QoS by Priority

6. To preserve QoS priority changes, click **Save**.

Setting QoS by Bandwidth

Setting the QoS by bandwidth allocates up to 80 percent of the physical port's bandwidth to its virtual ports. The remaining 20 percent 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 VM associated with that virtual port. The proper QoS setting can prevent bottlenecks that occur when VMs contend for port bandwidth.

Consider how much bandwidth is required to maximize application or VM performance and set the QoS level to 105 percent of that value. For example, if a mission-critical application on a VM requires 1Gb of bandwidth to transmit its data over the fabric, Marvell recommends a bandwidth setting of 1.05Gb for the virtual port.

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 receives 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.

When the physical port is partitioned into four virtual ports, the port bandwidth is divided between the virtual ports according to traffic demands.

QConvergeConsole GUI lets you set QoS for each virtual port by setting minimum and maximum percentages of the physical port's bandwidth for each virtual port. Using this feature lets you guarantee a transmission rate for each port that requires a specific bandwidth to run mission-critical applications for business continuity using virtual ports. The setting for a specific QoS can resolve bottlenecks that exist when VMs contend for port bandwidth.

To set the QoS by bandwidth percentage with QConvergeConsole GUI:

1. In the QConvergeConsole GUI system tree in the left pane, expand a 2600 Series Adapter.
2. Select a physical port.
3. In the content pane on the right, click the **QoS** tab.
4. On the QoS page, select **Bandwidth** as the **QoS Type**.
5. For **View By**, select **Bandwidth Percentage**.
6. For each virtual port, move the slider to select between 1 percent and 100 percent bandwidth to guarantee for data transferred over the selected virtual port.

Figure 4-6 shows an example.

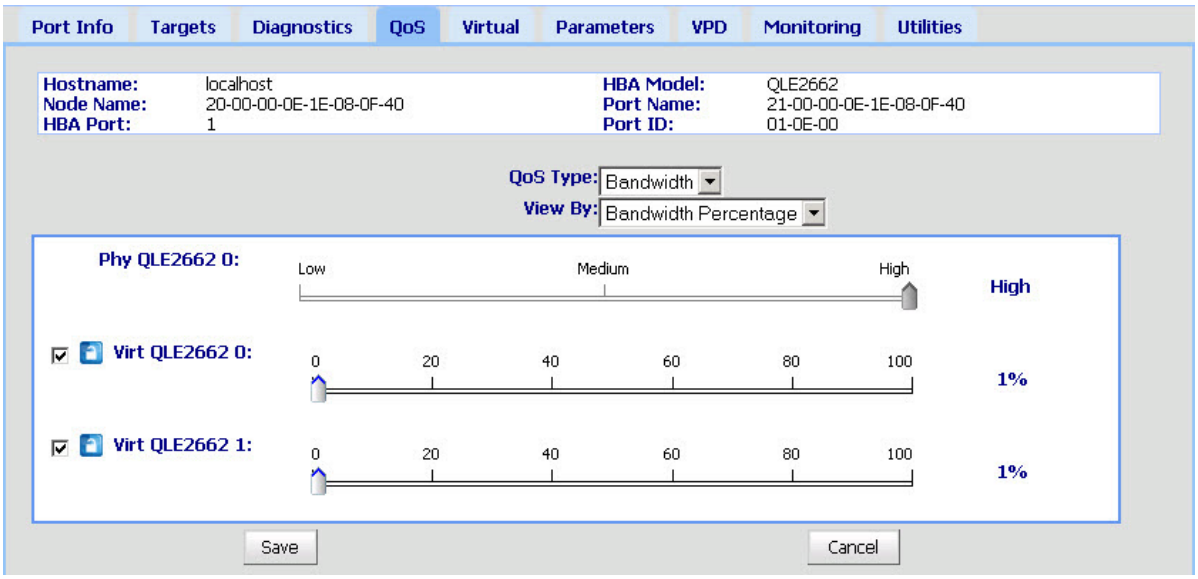

Figure 4-6. Setting the QoS by Bandwidth Percentage

7. To preserve QoS bandwidth changes, click **Save**.

To set the QoS by bandwidth speed with QConvergeConsole GUI:

1. In the QConvergeConsole GUI system tree in the left pane, expand a 2600 Series Adapter.
2. Select a physical port.
3. In the content pane on the right, click the **QoS** tab.
4. On the QoS page, select **Bandwidth** as the **QoS Type**.
5. For **View By**, select **Bandwidth Speed**.
6. Move the slider to set the bandwidth speed.

Figure 4-7 shows an example.

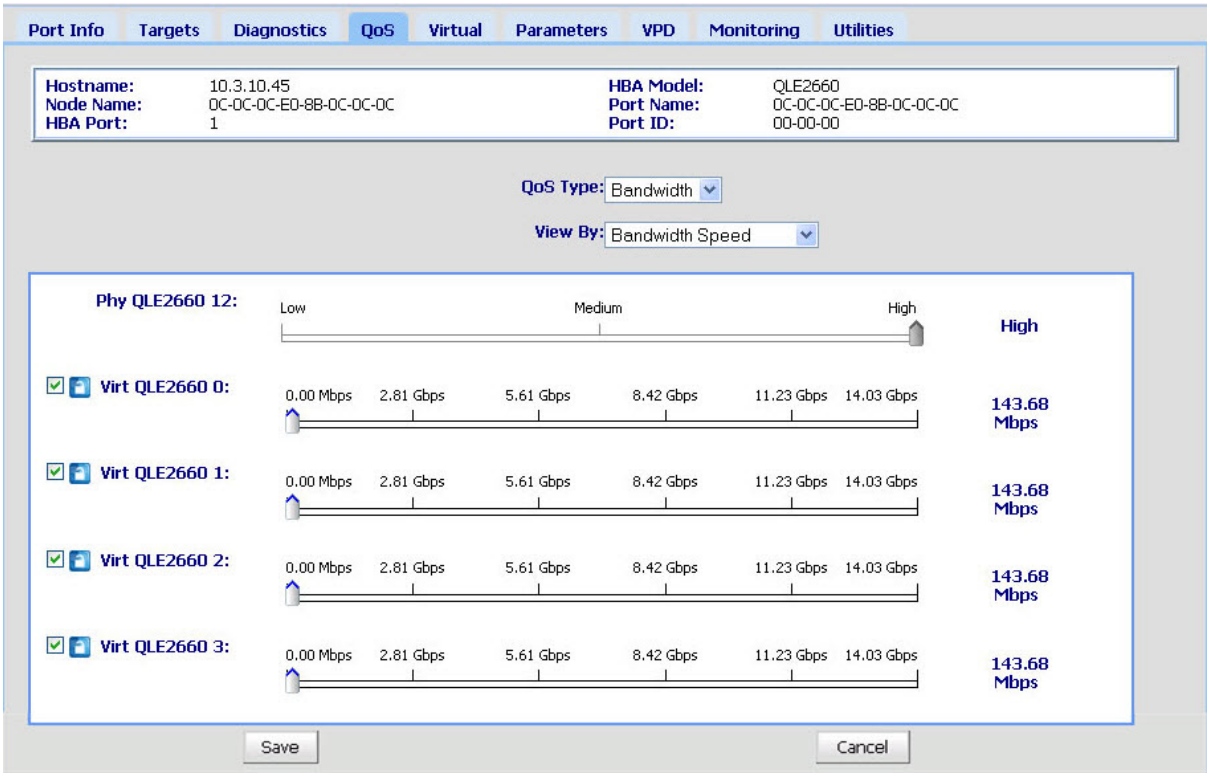

Figure 4-7. Setting the QoS by Bandwidth Speed

7. To preserve QoS bandwidth changes, click **Save**.

Configuring Driver Parameters

You can configure driver parameters for Fibre Channel using any of these tools: QConvergeConsole GUI, QConvergeConsole CLI, or QConvergeConsole Plug-in for VMware vCenter Server.

Configuring Fibre Channel Driver Parameters with QConvergeConsole GUI

For information on configuring Fibre Channel driver parameters with QConvergeConsole GUI, refer to the topics about HBA parameters and viewing or modifying port parameters in the *QConvergeConsole Help*.

Configuring Fibre Channel Driver Parameters with Interactive QConvergeConsole CLI

To configure Fibre Channel driver parameters using interactive QConvergeConsole CLI:

1. On the QConvergeConsole CLI **Fibre Channel Adapter Configuration** menu, select **Driver Parameters**.
2. On the port menu, select a port to open the **Driver Settings** menu.
3. Select options on the **Driver Settings** menu to present persistently bound targets plus new targets with driver default, present persistently bound targets only, bind devices by WWPN, and bind devices by port ID.

For more information, refer to the section about the Fibre Channel interactive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Configuring Fibre Channel Driver Parameters with Noninteractive QConvergeConsole CLI

To configure the driver settings in the noninteractive mode of QConvergeConsole CLI, issue the following command:

```
# qaucli -pr fc -fs (<hba instance> | <hba wwpn>)
{(<param name> | <param alias>) <param value>}
```

Where:

`hba instance` = Adapter port instance number (issue the `-g` command to find)

`hba wwpn` = Worldwide port name of the adapter

`param name` = Name of the parameter

`param alias` = Alias of the parameter, either:

- `PO` Persistently bound targets only
- `PN` Present persistently bound targets plus any new targets with driver default
- `NO` Present targets with driver default
- `BW` Bind devices by WWPN
- `BP` Bind devices by port ID

`param value` = New value of the parameter

For more information, refer to the section about the Fibre Channel noninteractive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Configuring Fibre Channel Driver Parameters with QConvergeConsole Plug-in for VMware vCenter Server

For details on how to configure the Fibre Channel driver parameters with the VMware plug-in, see the *User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00).

Configuring Selective LUNs

You can configure selective LUNs using QConvergeConsole CLI on Windows. QConvergeConsole GUI cannot be used to configure selective LUNs. To enable selective LUNs of a target, the selected target must be currently persistently bound. See "Configuring Target Persistent Binding" on page 42 for more additional information.

To configure selective LUNs with interactive QConvergeConsole CLI:

1. On the QConvergeConsole CLI **Fibre Channel Adapter Configuration** menu, select **Selective LUNs**.
2. On the port menu, select a port to open the **Selective LUN Menu**.

   The **Selective LUN Menu** contains options for displaying LUN configuration, manually configuring LUNs, and auto-configuring LUNs.

Figure 4-8 shows the **Selective LUN Menu (Display)** and the general view of selective LUNs.

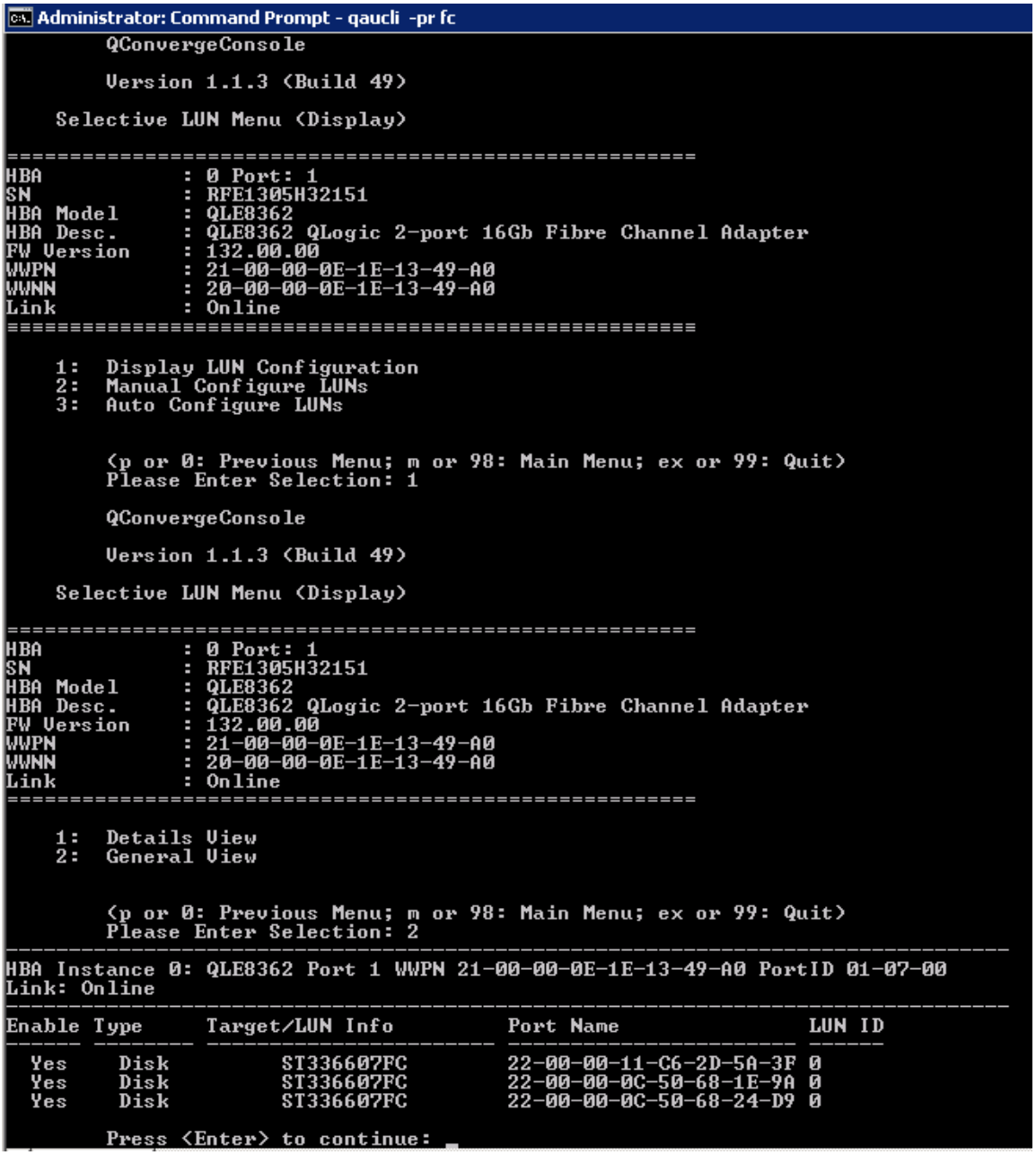

Figure 4-8. Selective LUN, General View

For more information, refer to the section about the Fibre Channel interactive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

To configure selective LUNs with noninteractive QConvergeConsole CLI:

- To enable (select) or disable (deselect) a LUN for a specific target on a specific adapter, issue the following command:

  ```
  # qaucli -pr fc -m (<hba instance> | <hba wwpn>) {<target
  wwnn> <target wwpn>} <lun id> (select | deselect)
  ```

  Where:

  `hba instance` = Adapter instance number (issue the `-g` command to find)
  `hba wwpn` = Worldwide port name of the adapter
  `param name` = Name of the parameter
  `target wwnn` = Worldwide node name of the target
  `target wwpn` = Worldwide port name of the parameter
  `lun id` = ID of the LUN

- To enable (select) or disable (deselect) all LUNs for a specific target on a specific adapter, issue the following command:

  ```
  # qaucli -pr fc -m (<hba instance> | <hba wwpn>) (select |
  deselect) {<target wwnn> <target wwpn>}
  ```

- To enable (select) or disable (deselect) all LUNs of all targets on a specific adapter, issue the following command:

  ```
  # qaucli -pr fc -m (<hba instance> | <hba wwpn>) (select |
  deselect) all
  ```

For more information, refer to the section about the Fibre Channel noninteractive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Configuring Out-of-Order Frame Reassembly

Out-of-order frame reassembly (OoOFR) reassembles out-of-order frames as they are received, which minimizes network congestion by eliminating the re-transmission of frames and exchanges. Use either QConvergeConsole GUI or QConvergeConsole CLI to configure OoOFR.

Configuring OoOFR with QConvergeConsole GUI

To enable OoOFR with QConvergeConsole GUI:

1. In the QConvergeConsole GUI system tree, select a Fibre Channel port.
2. In the content pane on the right, click the **Parameters** tab.

3. On the Parameters page, click the **Advanced HBA Parameters** subtab.
4. Select the **Enable Receive Out of Order Frame** check box.

Configuring OoOFR with Interactive QConvergeConsole CLI

To enable OoOFR with interactive QConvergeConsole CLI:

1. On the **Fibre Channel Adapter Configuration** menu, select **HBA Parameters**.
2. On the port menu, select a port to open the **HBA Parameters** menu.
3. On the **HBA Parameters** menu, select **Configure HBA Parameters**.
4. On the **Configure Parameters** menu, select **Enable Receive Out Of Order Frame**.

Configuring OoOFR with Noninteractive QConvergeConsole CLI

To enable OoOFR in the noninteractive mode of QConvergeConsole CLI:

- Issue one of the following commands:

```
# qaucli -pr fc -n <hba instance>|<hba wwpn>
EnableReceiveOutOfOrderFrame 1

# qaucli -pr fc -n <hba instance>|<hba wwpn> EO 1
```

Where:

`hba instance` = Adapter instance number (issue the `-g` command to find)
`hba wwpn` = Worldwide port name of the adapter

To disable OoOFR in the noninteractive mode of QConvergeConsole CLI:

- Issue one of the following commands:

```
# qaucli -n <hba instance>|<hba wwpn>
EnableReceiveOutOfOrderFrame 0

# qaucli -n <hba instance>|<hba wwpn> EO 0
```

Setting Queue Depth

For a detailed explanation of queue depth, including “Setting the Host Bus Adapter Queue Depth,” refer to the *Best Practices Guide—Fibre Channel Host Bus Adapters on Microsoft Windows 2012 and VMware ESXi 5.x, 2500 Series and 2600 Series* (part number SN0454502-00), available for download from the Marvell Web site.

Enabling Fabric-Assigned World Wide Port Name

This section describes how to enable the fabric to assign the 2600 Series Adapter WWPN (FA-WWPN) on the following platforms:

- Enabling FA-WWPN with QConvergeConsole GUI
- Enabling FA-WWPN with Interactive QConvergeConsole CLI
- Enabling FA-WWPN with Noninteractive QConvergeConsole CLI
- Enabling FA-WWPN with QConvergeConsole Plug-ins

When using the FA-WWPN feature:

- FA-WWPN must be enabled on both the initiator (2600 Series Adapter) and the Brocade switch for the FA-WWPN to be assigned to the 2600 Series Adapter.
- If FA-WWPN is disabled on the 2600 Series Adapter and enabled on the Brocade switch, the FA-WWPN cannot be assigned to the 2600 Series Adapter.
- If FA-WWPN is enabled on the 2600 Series Adapter and disabled on the Brocade switch, the FA-WWPN cannot be assigned to the 2600 Series Adapter.

Enabling FA-WWPN with QConvergeConsole GUI

NOTE

In the figures in the following sections, the 2600 Series Adapter may appear as an 8300 Series Adapter.

To enable FA-WWPN with QConvergeConsole GUI:

1. In the tree pane on the left, select a 2600 Series Adapter port.
2. In the content pane on the right, click the **Parameters** tab.
3. On the Parameters page, click the **Advanced HBA Parameter** tab.
4. On the Advanced HBA Parameter page, select the **Enable Fabric Assigned WWN** check box.

Alternately, clear this check box to disable FA-WWPN. Figure 4-9 shows an example.

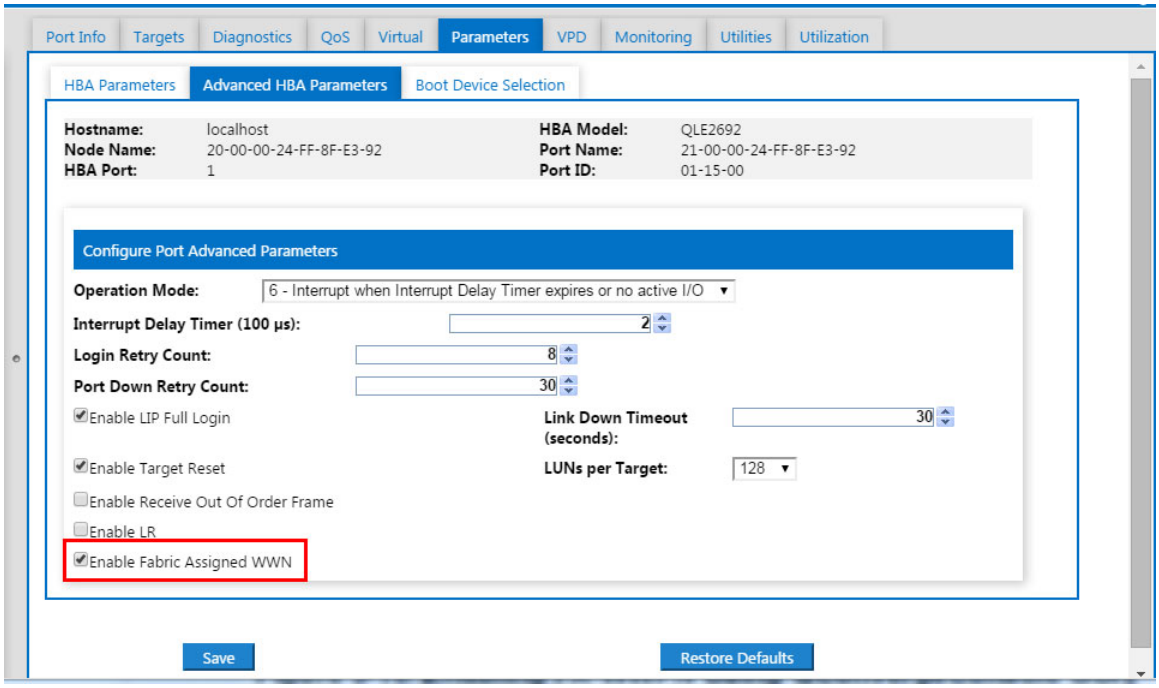

Figure 4-9. Enabling FA-WWPN Using QConvergeConsole GUI

5. Click **Save**.
6. If the Save HBA Parameter Changes dialog box appears, click **Yes** to confirm.
7. If the Security Check dialog box appears, type the password, and then click **OK**.

Any previously saved configuration for the current adapter is overwritten.

Enabling FA-WWPN with Interactive QConvergeConsole CLI

To enable FA-WWPN with interactive QConvergeConsole CLI:

1. From the main menu, select the adapter type (**Fibre Channel Adapter**).
2. On the **Fibre Channel Adapter Configuration** menu, select **HBA Parameters**.
3. On the port menu, select a port to open the **HBA Parameters Menu**.
4. Select **EnableFabricAssignWWN**.

5. Under **Enable Fabric Assigned WWN Menu**:
   - ❑ Type **1** to enable FA-WWPN.
   - ❑ Type **2** to disable FA-WWPN.

Enabling FA-WWPN with Noninteractive QConvergeConsole CLI

To enable FA-WWPN with noninteractive QConvergeConsole CLI:

- ■ Issue the following command:

```
# qaucli -pr fc -n <hba instance>|<hba WWPN>
{<EnableFabricAssignWWN>|<FN> 1}
```

Where:

`hba instance`	=	Adapter number (issue the `-g` command to find)
`hba wwpn`	=	Worldwide port name of the adapter
`EnableFabricAssignWWN` or `FN`	=	`1` enables the fabric to assign a WWN to this port `0` disables the fabric from assigning WWN to this port

To disable FA-WWPN with noninteractive QConvergeConsole CLI:

- ■ Issue the following command:

```
# qaucli -pr fc -n <hba instance>|<hba WWPN>
{<EnableFabricAssignWWN>|<FN> 0}
```

For more information, refer to the section about the Fibre Channel noninteractive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Enabling FA-WWPN with QConvergeConsole Plug-ins

To enable FA-WWPN with QConvergeConsole Plug-ins:

1. In either the QConvergeConsole Plug-in for VMware vCenter Server or QConvergeConsole Plug-in for VMware vSphere Web Client, click the **QConvergeConsole** tab.
2. In the tree pane on the left, select a 2600 Series Adapter port.
3. In the content pane on the right, click the **Parameters** tab.

4. Follow the instructions for your system:

   QConvergeConsole Plug-in for VMware vCenter Server

   In QConvergeConsole Plug-in for VMware vCenter Server, the parameters appear and can be edited. Figure 4-10 shows an example.

Figure 4-10. Enabling FA-WWPN Using QConvergeConsole Plug-in for VMware vCenter Server

   a. To enable FA-WWPN, select the **Enable Fabric Assigned WWN** check box.

   b. Click **Save Configuration**.

QConvergeConsole Plug-in for VMware vSphere Web Client

In QConvergeConsole Plug-in for VMware vSphere Web Client, the current parameter values appear (see Figure 4-11).

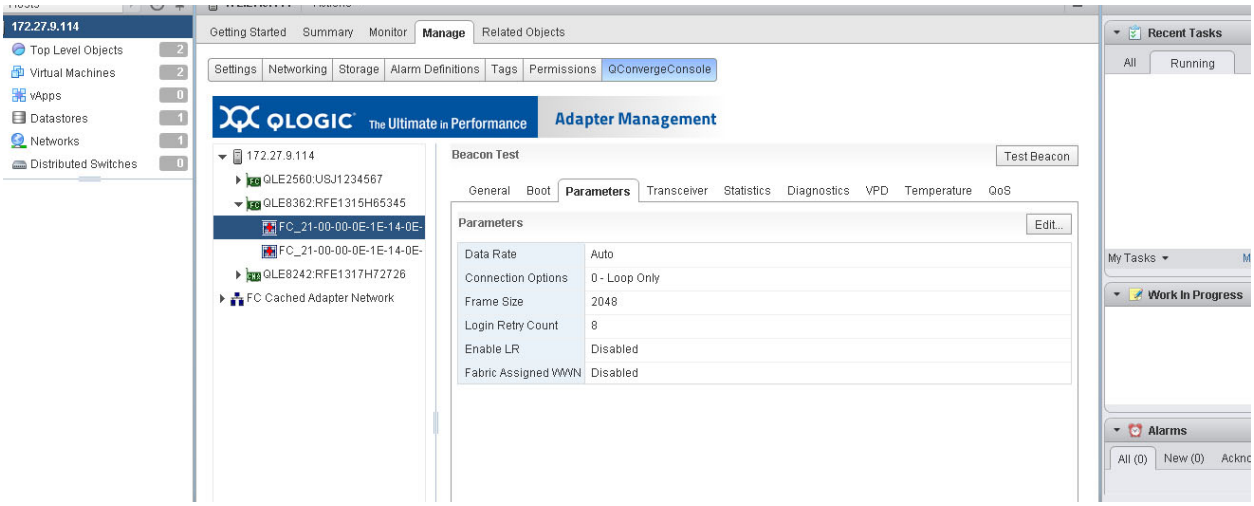

Figure 4-11. Enabling FA-WWPN Using QConvergeConsole Plug-in for VMware vSphere Web Client

a. Click **Edit**.

The Fibre Channel Port Parameter dialog box opens; Figure 4-12 shows an example.

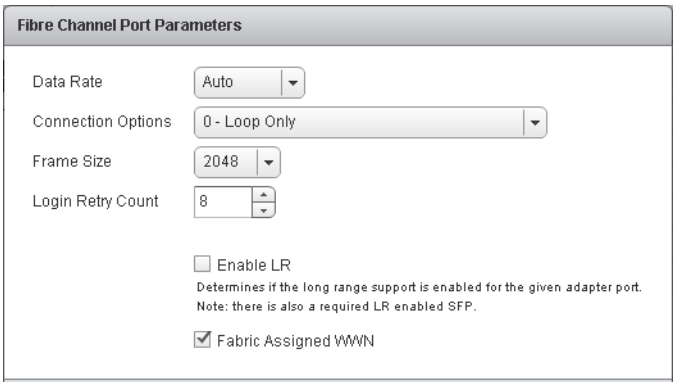

Figure 4-12. Fibre Channel Port Parameters Dialog Box

b. To enable FA-WWPN, select the **Fabric Assigned WWN** check box.

c. Click **OK**.

Any previously saved configuration for the current adapter is overwritten.

Using Fabric-Assigned Boot LUN

This section describes how to enable a fabric-assigned boot LUN on the following platforms:

- Using a Fabric-Assigned Boot LUN in QConvergeConsole GUI
- Using a Fabric-Assigned Boot LUN with Interactive QConvergeConsole CLI
- Using a Fabric-Assigned Boot LUN with Noninteractive QConvergeConsole CLI
- Using a Fabric-Assigned Boot LUN with QConvergeConsole Plug-ins

Using a Fabric-Assigned Boot LUN in QConvergeConsole GUI

For details about how to use a fabric-assigned LUN using QConvergeConsole GUI, refer to the “Fabric-Assigned Boot LUN” topic in the *QConvergeConsole Help*.

Using a Fabric-Assigned Boot LUN with Interactive QConvergeConsole CLI

To use a fabric-assigned boot LUN with interactive QConvergeConsole CLI:

1. From the main menu, select the adapter type (**Fibre Channel Adapter**).
2. On the **Fibre Channel Adapter Configuration** menu, select **Boot Devices Configuration**.
3. On the **Boot Device Settings** menu, select **Configure Boot Device(s)**, and then press ENTER.
4. Select **Enable Fabric Assigned Boot LUN**, and then press ENTER.
5. To enable this feature, on the **Enable Fabric Assign Boot LUN** menu, type **1**.

Using a Fabric-Assigned Boot LUN with Noninteractive QConvergeConsole CLI

In noninteractive QConvergeConsole CLI, set a target as the fabric-assigned boot LUN for a specific adapter by issuing the following command:

```
# qaucli -pr fc -e  <hba instance>|<hba wwpn> enable|disable
FabricAssignBootLUN|fb
```

Where:

`hba instance` = Adapter number (issue the `-g` command to find)

`hba wwpn` = Worldwide port name of the adapter

`FabricAssignBootLUN` or `fb` = Configure enable fabric assign boot LUN setting

Using a Fabric-Assigned Boot LUN with QConvergeConsole Plug-ins

To configure the boot device with QConvergeConsole Plug-in for VMware vCenter Server:

1. In the QConvergeConsole Plug-in for VMware vCenter Server, click the **QConvergeConsole** tab.
2. In the tree pane on the left, select a 2600 Series Adapter port.
3. In the content pane on the right, click the **Boot** tab.
4. On the Boot page, select the **Enable Fabric Assigned Boot LUN** check box. Figure 4-13 shows an example.

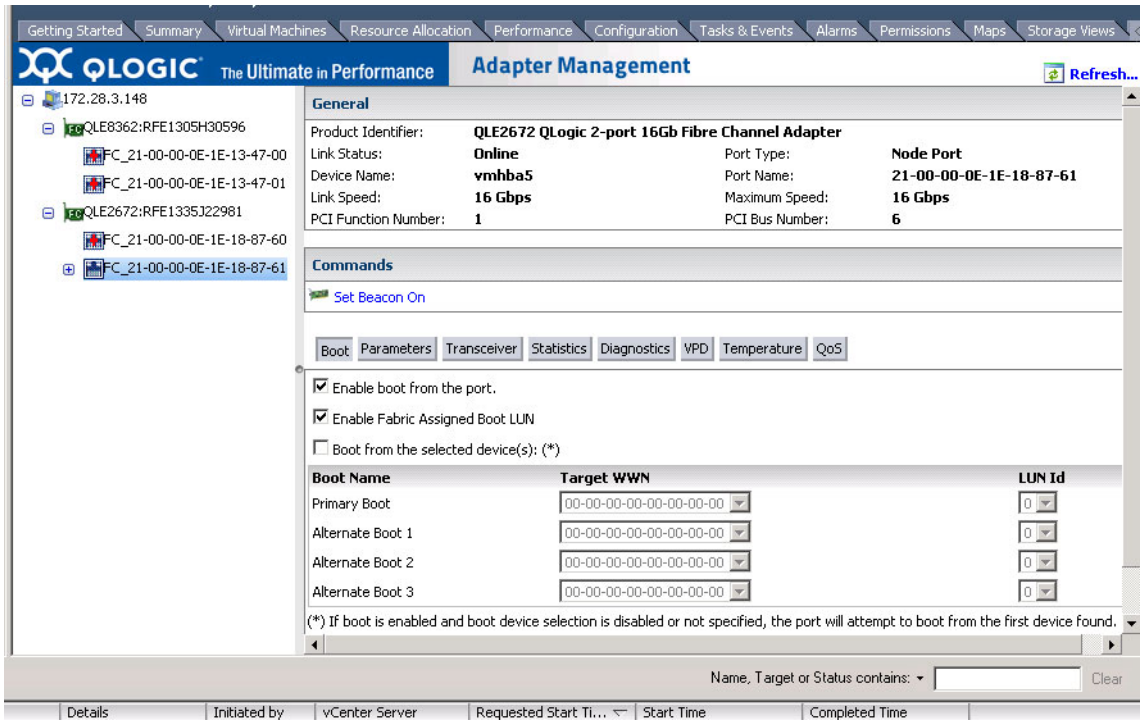

Figure 4-13. Fabric-Assigned Boot LUN in QConvergeConsole Plug-in for VMware vCenter Server

For details, refer to the “Boot Device Selection” topic in *QConvergeConsole Help*.

5. Click **Save**.

Any previously saved configuration for the current 2600 Series Adapter is overwritten.

To configure the boot device with QConvergeConsole Plug-in for VMware vSphere Web Client:

1. In the tree pane in the left side of the vSphere Web client, select the host to be configured.
2. In the content pane on the right, click the **Manage** tab.
3. On the Manage page, click the **QConvergeConsole** tab.
4. In the adapter tree in the QConvergeConsole pane, select the port to be configured.
5. In the content pane for the port, click the **Boot** tab.
6. On the Boot page, click **Edit**.
7. In the FC/FCoE Boot dialog box (see Figure 4-14), enable the fabric assigned boot LUN feature by selecting the **Fabric Assigned Boot LUN** check box.
8. Click **OK**.

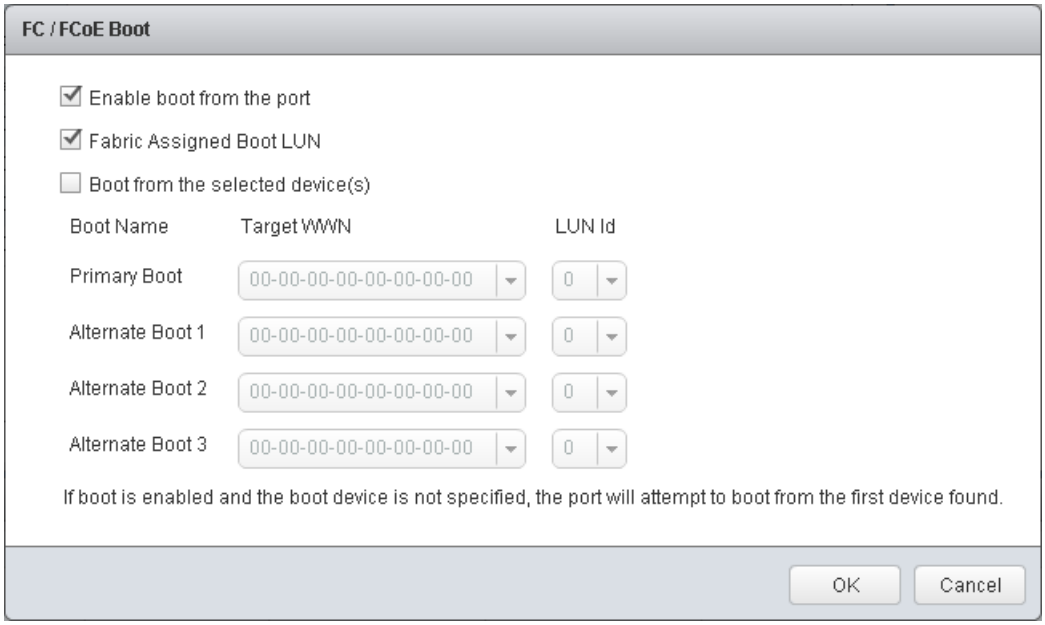

Figure 4-14. Web Client Plug-in Fabric Assigned Boot

FDMI Enhancements Support

FDMI enables the management of devices such as host adapters. Enabling additional attributes using FDMI provides you with detailed information about the 2600 Series Adapters through a centralized management entity such as the Fibre Channel fabric switches.

To verify the additional 2600 Series Adapter attributes registered on the Brocade switch, issue the `fdmishow` command on Brocade Fibre Channel switches, and then confirm that all the requested attributes are displayed in the switch. For details, refer to your Brocade switch documentation.

The following examples show output of the `fdmishow` command.

Port attributes:

```
"Device Name: QLogic Adapter"
"Node Name: 20:00:00:0e:1e:80:af:80"
"Port Name: 21:00:00:0e:1e:80:af:78"
"Port Type: 0x5"
"Port Symbolic Name: QLE8362 FW:v7.04.00 DVR:v9.1.12.20 Alpha 2"
"Class of Service: 0x00000008"
"Fabric Name: 10:00:00:05:33:8f:1a:49"
"FC4 Active Type: 0x0000010000000000000000000000000000000000000000000000000000000000"
"Port State: 0x00000002"
"Discovered Ports: 0x00000000"
```

HBA attributes:

```
"OS Name and Version: Windows Server 2012 R2 Datacenter Evaluation for Intel64"
"Max CT Payload Length: 0x00000800"
"Symbolic Name: QLE8362 FW:v7.04.00 DVR:v9.1.12.20 Alpha 2"
"Number of Ports: 1"
"Fabric Name: 10:00:00:05:33:8f:1a:43"
"Bios Version: 3.26"
"Vendor Identifier: QLOGIC"
```

The following example shows how to verify FDMI from a Cisco switch. For more details, see the Cisco switch documentation.

```
Cisco# sh fdmi database detail

-------------------------------
HBA-ID: 21:00:00:24:ff:8f:d8:88
-------------------------------
Node Name        :20:00:00:24:ff:8f:d8:88
```

```
Manufacturer     :QLogic Corporation
Serial Num       :AFD1536Y03339
Model            :QLE2692
Model Description:QLogic 16Gb LR 2-port FC to PCIe Gen3 x8 Adapter
Hardware Ver     :BK3210407-05 01
Driver Ver       :8.08.00.04.07.0-k
ROM Ver          :3.62
Firmware Ver     :8.08.03 (d0d5)
  Port-id: 21:00:00:24:ff:8f:d8:88
    Supported FC4 types:scsi-fcp
    Supported Speed    :4G 8G 16G
    Current Speed      :16G
Maximum Frame Size :2048
    OS Device Name     :qla2xxx:host1
    Host Name          :localhost.localdomain
```

Configuring End-to-End (CS_CTL) QoS

NOTE

End-to-end QoS requires the initiator, target and fabric to support CS_CTL QoS. QoS must also be supported by both the switch and target devices.

The class specific control (CS_CTL) QoS implementation is an end-to-end solution, encompassing the initiator (2600 Series Adapter), the switches, and the target (storage). The 2600 Series Adapter stamps the priority value (high, medium, low) in the CS_CTL field of the Fibre Channel frame. All three entities (initiator, switch, and target) honor this priority value at their respective levels.

This feature is enabled by default in the 2600 Series Adapter Windows and VMware drivers. Therefore, when all three entities support QoS (and it is enabled on the switch and the target), a default priority value is populated in all FCP_CMND, FCP_DATA, FCP_XFER_RDY, FCP_RSP, and FCP_CONFIRM frames.

The following sections describe how to configure CS_CTL QoS and change the default priority levels:

- Configuring CS_CTL QoS on the Switch
- Configuring CS_CTL QoS on the Storage Device
- Configuring QoS Priority Levels

Configuring CS_CTL QoS on the Switch

To enable CS_CTL QoS on the Brocade SW6510 switch:

1. From the switch, issue the following command:

   ```
   root> configurechassis
   Configure...
   ```

2. A list of attributes appear one at a time. After either accepting the default or entering a different value, the next attribute appears.

   a. To accept the default for `cfgload attributes`, `Custom attributes`, and `system attributes`, press the ENTER key.

   b. For `fos attributes`, type **`y`**.

   c. For the `CSCTL QoS Mode` attribute, type **`1`**.

   For example:

   ```
   cfgload attributes (yes, y, no, n): [no]
   Custom attributes (yes, y, no, n): [no]
   system attributes (yes, y, no, n): [no]
   fos attributes (yes, y, no, n): [no] y
   CSCTL QoS Mode (0 = default; 1 = auto mode): (0..1) [0] 1
   ```

3. Reboot the switch.

4. To verify that CS_CTL QoS is enabled, issue the following command:

   ```
   root> configshow -all | grep fos.csctlMode
   ```

   This command should return the following response:

   ```
   fos.csctlMode:1
   ```

5. To enable QoS on a switch-port basis, issue the following command:

   ```
   portcfgqos --enable [slot/]port csctl_mode
   ```

Configuring CS_CTL QoS on the Storage Device

For QoS configuration instructions, see your device's user guide.

Configuring QoS Priority Levels

The QoS priority levels are set in the 2600 Series Adapter virtual ports (vPorts). The Windows and VMware adapter drivers assign default vPort priority levels. The following sections describe how to change the default vPort priority levels in Windows and VMware ESXi systems.

Changing the Priority Levels on Windows

To change the vPort priority levels in Windows, you must first assign the vPorts, and then change the priority levels. Both procedures can be accomplished using either QConvergeConsole GUI or interactive QConvergeConsole CLI, as described in the following sections.

For more detailed information, see the *QConvergeConsole Help* and the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

To create a vPort in QConvergeConsole GUI:

1. In the QConvergeConsole GUI left pane, connect to the host that has the 2600 Series Adapter where you want to create the vPorts.
2. Expand the host in the left pane by clicking the plus icon (**+**).
3. Locate and expand the 2600 Series Adapter where you want to create the vPorts.
4. In the right pane, click the **Virtual** tab.
5. On the Virtual page, select a valid value for the **Number of vPort to create** option, and then click **Update**.
6. To create the vPorts, click **Create**.

   Figure 4-15 shows an example. (The 2600 Series Adapter appears as an 8300 Series Adapter.)

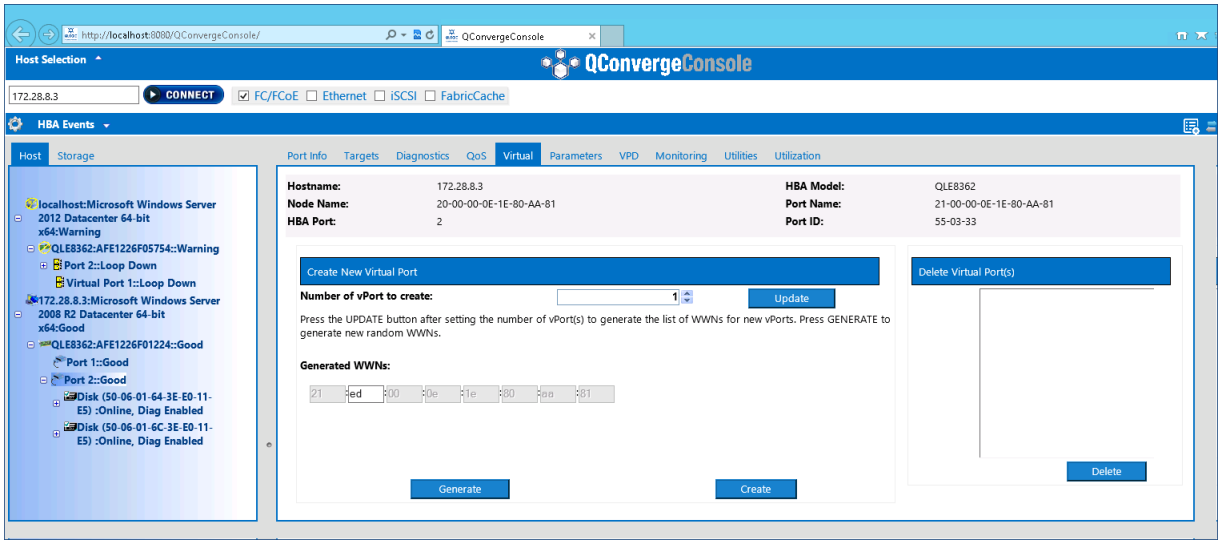

Figure 4-15. Creating vPorts Using QConvergeConsole GUI

To create a vPort in interactive QConvergeConsole CLI:

1. On the **Main Menu**, select **Adapter Configuration**.
2. On the **Adapter Type Selection** menu, select **Virtual Ports (NPIV)**.
3. On the **Virtual Ports** menu, select **Adapter Port**.
4. On the **Adapter Port** menu, select **Create vPorts**.
5. On the **Create vPorts** menu, select **Generate**.
6. To create the vPorts, select the **Commit** option.

To change the vPort priority level using QConvergeConsole GUI:

1. In the QConvergeConsole GUI tree pane on the left, connect to the host that contains the 2600 Series Adapter whose vPort levels you want to change.
2. Expand the host in the left pane by clicking the plus icon (**+**).
3. Locate and expand the 2600 Series Adapter whose vPort levels you want to change.
4. In the content pane on the right, click the **QoS** tab.
5. For the **QoS Type**, select **Priority**.
6. Ensure that the check box for the vPort you want to change is selected.
7. Set the QoS priority value for the vPort by moving the corresponding slider.
8. For each vPort whose priority you want to change, repeat Step 6 and Step 7.
9. Click **Save**.

   Figure 4-16 shows an example. (The 2600 Series Adapter appears as an 8300 Series Adapter.)

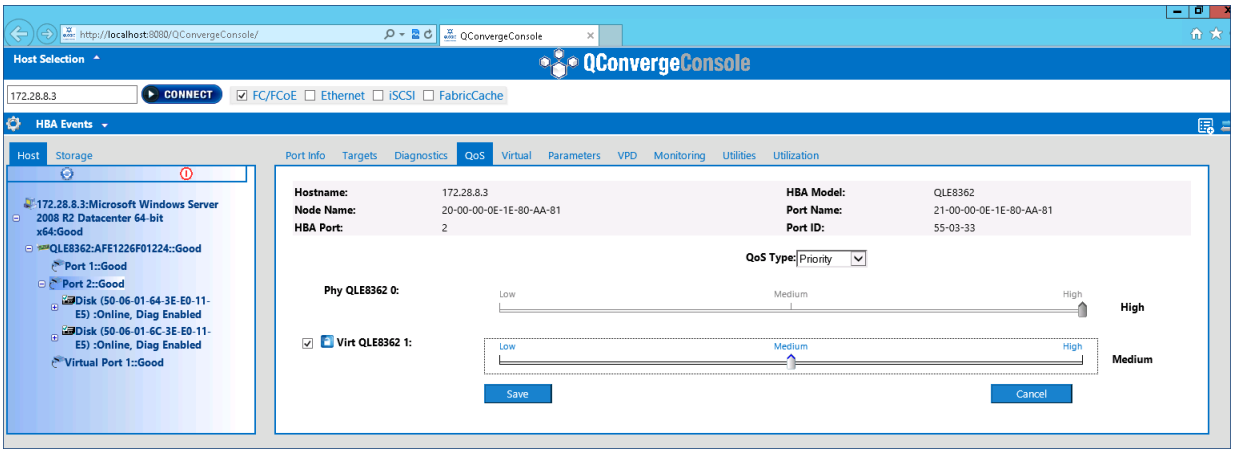

Figure 4-16. Changing vPort Priority Using QConvergeConsole GUI

To change the vPort priority level using interactive QConvergeConsole CLI:

1. On the **Main Menu**, select **Adapter Configuration**.
2. On the **Adapter Type Selection** menu, select **QoS**.
3. On the **QoS** menu, select **Adapter Port**.
4. On the **Adapter Port** menu, select **QoS Priority**.
5. On the **QoS Priority** menu, select **Modify QoS Settings**.
6. Choose the priority value for the vPorts.
7. Select **Apply QoS**.

Changing the Priority Levels on VMware ESXi

This section provides steps for changing priority levels and removing vPort priority on VMware ESXi systems.

To change the priority levels using the QConvergeConsole Plug-in for VMware vCenter Server:

1. In the tree pane on the left side of the plug-in window, select a host.
2. Expand the host in the left pane by clicking the plus icon (**+**).
3. Locate and expand the 2600 Series Adapter whose priority levels you want to change.
4. Select a port in the 2600 Series Adapter.
5. In the right pane, click the **QoS** tab.
6. On the QoS page, set the vPort priority.

   If the vPort is listed under **QoS**:

   a. Select the vPort.

   b. Set the QoS **Priority** value for the vPort by moving the slider.

   c. Click **Save**.

Figure 4-17 shows an example, where the 2600 Series Adapter appears as an 8300 Series Adapter.

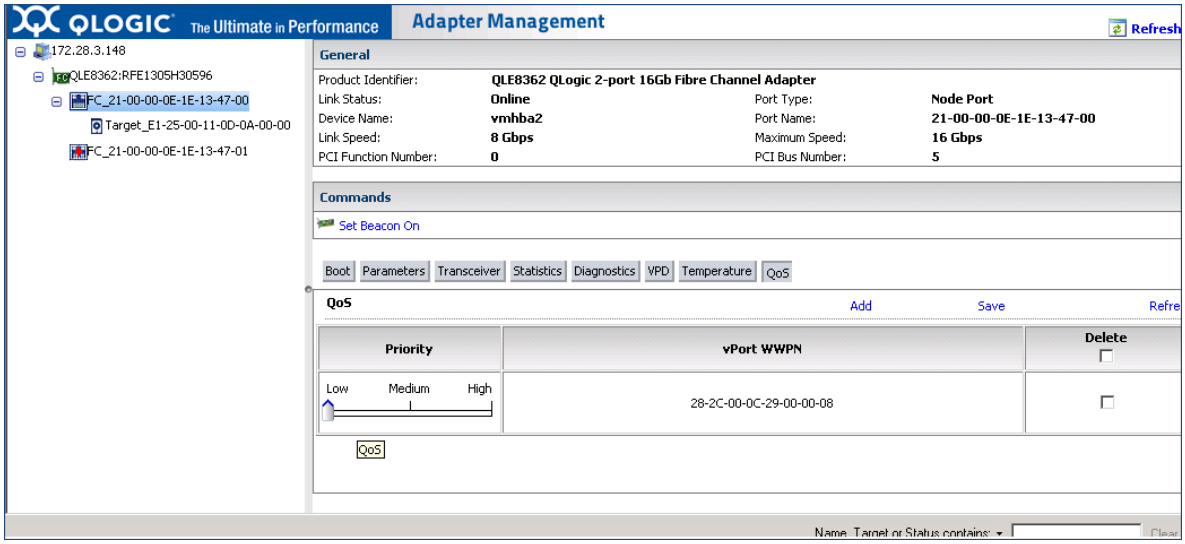

Figure 4-17. Changing vPort Priority Using QConvergeConsole Plug-in for VMware vCenter Server

If vPort is *not* listed under **QoS**:

a. Next to **QoS**, click **Add**.

b. Set the QoS **Priority** value by moving the slider.

c. Type a value for the **vPort WWPN**.

d. Click **Save**.

7. To see the new QoS settings, click **Refresh**.

To remove a vPort priority:

1. Under **QoS**, locate the vPort whose priority you want to remove.
2. Do one of the following:
   - ❑ Select the **Delete** check box of the vPort you want to remove.
   - ❑ Select the **Delete** check box in the header to select or clear all of the vPorts.
3. Click **Save**.

To change the priority level using the QConvergeConsole Plug-in for VMware vSphere Web Client:

1. Navigate to the host that contains the adapter to configure.
2. In the content pane of the vSphere Web Client, click the **Manage** tab.
3. In the content pane of the Manage page, click the **QConvergeConsole** tab.
4. In the adapter tree where the quality of service (QoS) is to be configured, select the port.
5. In the content pane, click the **QoS** tab.
6. After the QoS table refreshes, click **Edit**.
7. Complete the QoS dialog box by following the appropriate steps:
   - ❑ If the vPort is listed in the QoS dialog box:
     a. Set the QoS priority **Value** for the vPort by moving the slider.
     b. After the settings are completed, click **OK**.
   - ❑ If the vPort is *not* listed in the QoS dialog box:
     a. To add a row to the table, click the **+** icon.
     b. In the **vPort WWN** box, type the vPort WWN.
     c. Set the QoS **Priority** value by moving the slider.
     d. After the settings are completed, click **OK**.

To remove a vPort priority:

1. On the QoS page, click **Edit**.
2. In the QoS dialog box, select the check box corresponding to the QoS vPort to be deleted.
3. Click **OK**.

Figure 4-18 shows the QoS dialog box in the QConvergeConsole Plug-in for VMware vSphere Web Client.

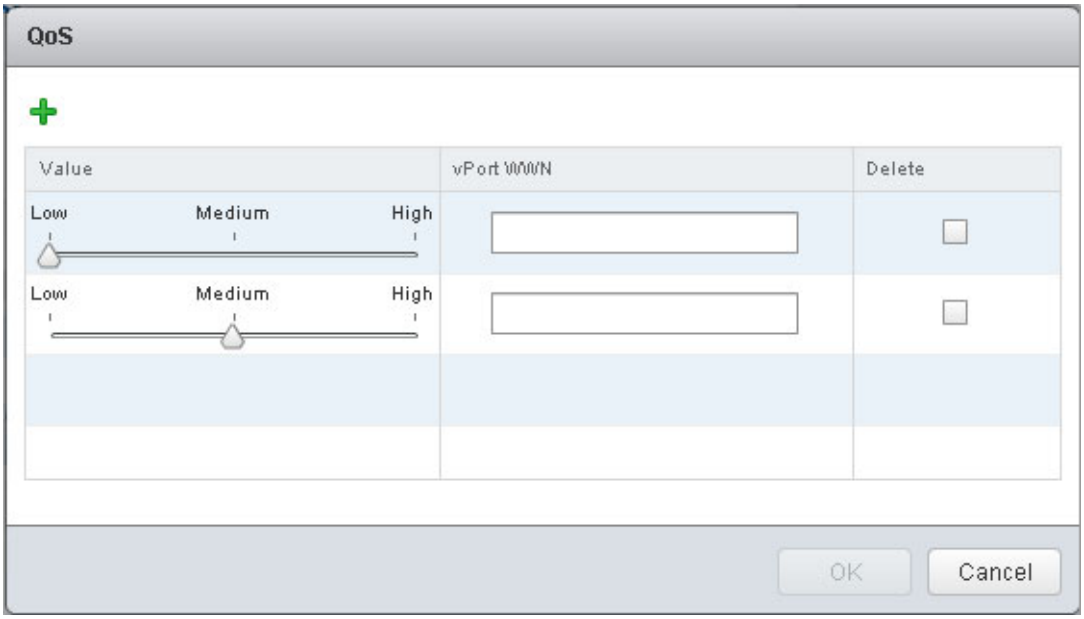

Figure 4-18. Web Client QoS

Enabling Forward Error Correction

QConvergeConsole supports forward error correction (FEC), which is a correction technique used for high-speed telecommunications devices to control errors in data transmission over unreliable or noisy communication channels.

NOTE

The FEC feature is supported only if the current adapter port is connected to a Fibre Channel switch with FEC support. For more information, refer to the section about setup tips in the *Application Note—Enabling Forward Error Correction* (part number 83830-514-03).

FEC Process Overview

The following highlights how the FEC process works between the transmitting and receiving device:

- The transmitting device:
  a. Takes the incoming data stream.
  b. Inserts a redundant amount of parity bits of information on the data stream.

c. Sends the data stream.

- The receiving device:

a. Receives the data stream.

b. Checks for missing or corrupt data:

- If there are no corrupt or missing bits of information, proceeds with normal process.
- If there are corrupt or missing bits of information, reconstructs the original data by using pieces of the original data stream (that are still intact) and combining those with the parity bits of information.

NOTE

Instead of having to request re-transmission of the entire data frame, the receiving device can recreate or reconstruct the data stream itself. This process prevents multiple CRC errors from being triggered and causing application performance issues.

Enabling and Disabling FEC

Use the appropriate procedure to enable or disable FEC:

- Enabling and Disabling FEC on ESXi
- Enabling and Disabling FEC on Linux and Windows

Enabling and Disabling FEC on ESXi

To enable or disable FEC using the QConvergeConsole Plug-in for VMware vCenter Server:

1. In the QConvergeConsole tree pane on the left, select an adapter port.
2. In the content pane on the right, click the **Parameters** tab.
3. On the Parameters page:
   - ❑ To enable FEC, select the **Enable FEC Support** check box.
   - ❑ To disable FEC, clear the **Enable FEC Support** check box.
4. Click **Save Configuration**.

To enable or disable FEC using the QConvergeConsole Plug-in for VMware vSphere Web Client:

1. In the QConvergeConsole tree pane on the left, select an adapter port.
2. Click **Edit**.

3. In the Fibre Channel Port Parameters dialog box:
   - ❑ To enable FEC, select the **Enable FEC** check box.
   - ❑ To disable FEC, clear the **Enable FEC** check box.
4. Click **OK**.

Enabling and Disabling FEC on Linux and Windows

To enable FEC using QConvergeConsole GUI, follow the instructions provided in the *Installation Guide—QConvergeConsole GUI* (part number SN0051105-00).

To enable FEC using QConvergeConsole CLI, follow the instructions in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Both guides are available on the Downloads and Documentation page at www.marvell.com (see "Downloading Updates and Documentation" on page xvii).

Figure 4-19 shows the FEC in the QConvergeConsole GUI with the initial Fibre Channel Adapter port status, along with alarm support.

Figure 4-19. QConvergeConsole FEC Support

Figure 4-20 shows the FEC status on the QConvergeConsole CLI **Adapter Information** menu.

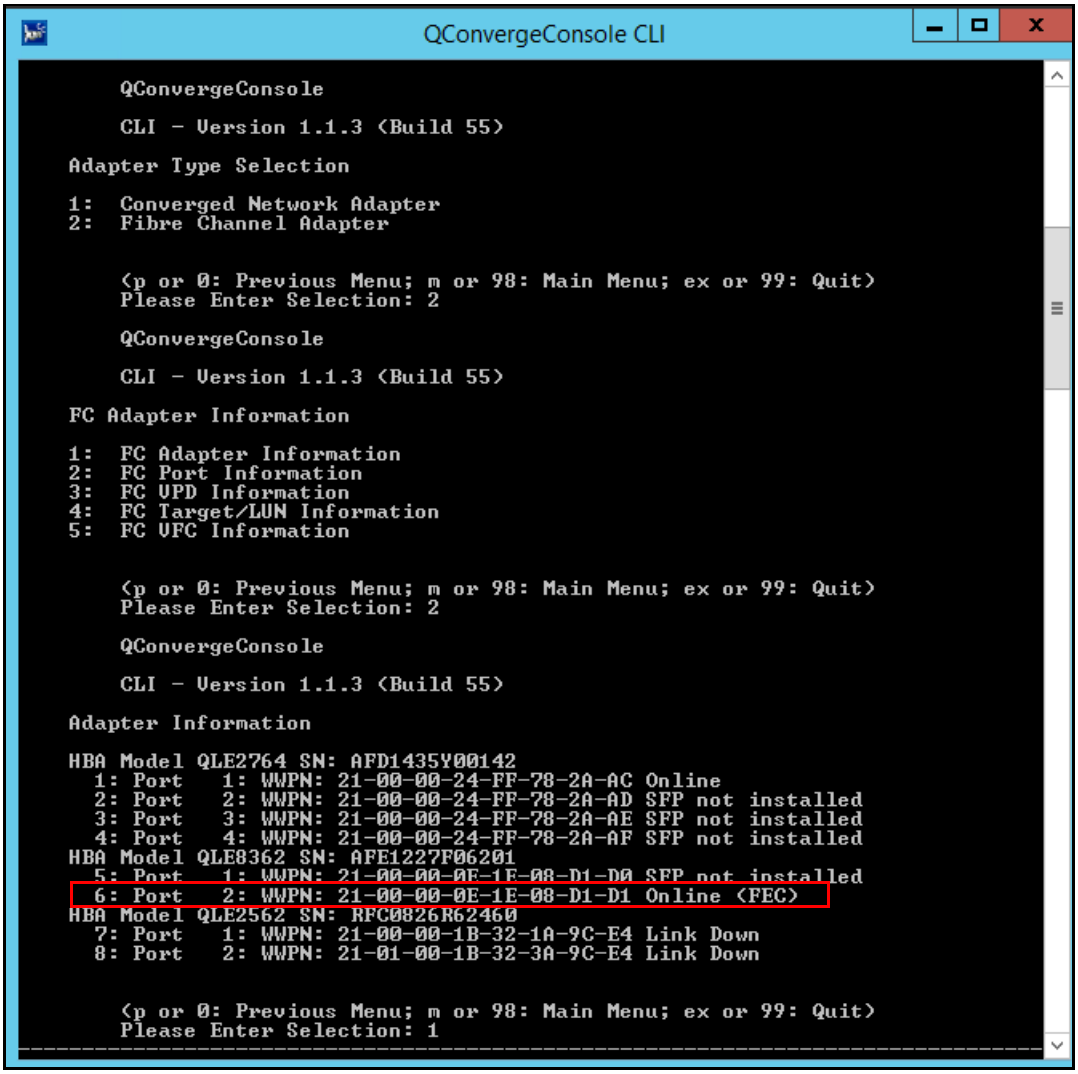

Figure 4-20. QConvergeConsole CLI Information Menu: FEC Status

Using Buffer-to-Buffer Credit Recovery

Buffer-to-buffer credit recovery (BB-CR) enables two FC peer ports (N_Port, F_Port, or E_Port) to periodically send and receive the quantity of receiver ready (R_RDY) signals transmitted. The BB-CR feature allows the peer port to recover from possible R_RDY signals lost over a lossy link. BB-CR enables two FC ports logged in with each other to recover lost buffer-to-buffer credits. These lost credits can impact throughput, cause link resets, and disrupt traffic flow.

During the login process, the peer ports exchange a nonzero BB_SC_N value. During frame transmission/reception, one port maintains counters to track the R_RDY and frames received. Based on a periodic exchange of BB_SC_N values, the receiving port determines how many R_RDYs should have been received. BB-CR compares this value with the actual counters maintained at the receiving port, from which the receiver can compute the actual quantity of credits lost, and thus recover without incurring a link reset.

By default, BB-CR functionality is enabled on the 269*x* Series Adapters that are operating at 16Gbps or higher, and that integrate with Brocade Fabric OS Manager, Brocade Network Advisor. You can disable this feature using either the boot code (BIOS or UEFI), QConvergeConsole GUI, or QConvergeConsole CLI.

For details about how to recover buffer credits, refer to the appropriate QConvergeConsole documentation.

If you are using...	Refer to...
QConvergeConsole GUI	*QConvergeConsole Help*
QConvergeConsole CLI	*User's Guide—QConvergeConsole CLI* (part number SN0054667-00)
QConvergeConsole Plug-in for VMware vCenter Server	*User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00)
QConvergeConsole Plug-in for VMware vSphere Web Client	*User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00)

Resetting Driver and Firmware Counters

When 2600 Series Adapters are running I/Os, they collect and display many driver and firmware counters, which are an accumulation of normal traffic statistics or error conditions. These counters can help you assess the traffic flow, identify I/O bottlenecks, and isolate link issues that affect the SAN performance.

Some counters are accumulated in the adapter's hardware and persist throughout the life of the adapter. Other counters are transient in memory and are reset after a reload or re-initialization. 2600 Series Adapter software provides the ability to reset counters as needed. For example, you may want to see if counters or rates change as a result of taking corrective actions in response to issues or after changing configuration parameters.

For details about how to reset counters, refer to the appropriate QConvergeConsole documentation.

If you are using...	Refer to...
QConvergeConsole GUI	*QConvergeConsole Help*
QConvergeConsole CLI	*User's Guide—QConvergeConsole CLI* (part number SN0054667-00)
QConvergeConsole Plug-in for VMware vCenter Server	*User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00)
QConvergeConsole Plug-in for VMware vSphere Web Client	*User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00)

Configuring VM-ID

VM storage I/O activity automatically generates VM-ID tagging in FC frames. VM-ID tags I/O frames with an ID that identifies the virtual machine that sent or received them. This ID allows management applications to monitor traffic flows down to the virtual machine level. VM-ID is disabled by default and requires a switch running FOS version 8.1.0a or later on Brocade switches, and NX-OS version 8.2.1 or later on Cisco switches. For detailed VM-ID information, see the documentation for your switch.

- To enable VM-ID (and disable QoS), type the following command and then reboot the system:

```
$ esxcfg-module -s "ql2xvmidsupport=1,
ql2xfabricpriorityqos=0" qlnativefc
```

- To disable VM-ID, type the following command, and then reboot the system:

```
$ esxcfg-module -s "ql2xvmidsupport=0" qlnativefc
```

For details about configuring VM-ID, see the *QLogic Fibre Channel and Converged Network Adapters for VMware ESXi 5.5 and 6.x User's Guide* (SN0154529-00 E).

Using Fibre Channel Diagnostics

The following sections show and describe the 2600 Series Adapter Fibre Channel diagnostic functions:

- Device Ping Testing
- Fibre Channel Ping Testing (Echo ELS)
- CT Ping Testing

- CT Fibre Channel Trace Route Testing
- Link Cable Beacon Extended Link Service Command
- Diagnostic Port Testing
- Read Diagnostic Parameters Extended Link Service Command

Device Ping Testing

QConvergeConsole supports device ping testing. The device ping test sends a SCSI Inquiry command to each selected target, measuring the time it takes for the target to respond.

NOTE

Before and after each SCSI command, the link statistics are collected to verify that no counters are incremented during each pass.

For more information on performing general diagnostic tests and viewing the diagnostic test results, refer to the help system, *QConvergeConsole Help*.

Fibre Channel Ping Testing (Echo ELS)

QConvergeConsole supports Fibre Channel (FC) ping testing. The FC ping test sends an ECHO extended link service (ELS) from the adapter port to the selected switch, fabric, or target. For more information on performing general diagnostic tests and viewing the diagnostic test results, refer to the help system, *QConvergeConsole Help*.

CT Ping Testing

QConvergeConsole supports common transport (CT) ping testing. The CT ping test pings each device attached to the adapter port. For more information on performing general diagnostic tests and viewing the diagnostic test results, refer to the help system, *QConvergeConsole Help*.

NOTE

Run the CT Ping test only from a switch with either FOS version 6.4.x or later or NX-OS version 8.4.1 or later.

CT Fibre Channel Trace Route Testing

QConvergeConsole supports CT Fibre Channel trace route (FTR) testing. The CT FTR test traces the route from the adapter port to the target device.

NOTE

All inter-link switches between the initiator and the target must have the Brocade switch firmware 7.1.1 or later and must support CT FTR for the test to work end-to-end. To confirm that your target is supported, contact Technical Support.

For more information on performing general diagnostic tests and viewing the diagnostic test results, refer to the help system, *QConvergeConsole Help*.

Link Cable Beacon Extended Link Service Command

NOTE

This feature is supported only on QLE2690, QLE2692, QLE2694, and QLE2694L Adapters. Run the LCB test only from a switch with FOS version 7.4.x or later or NX-OS 8.3.1 or later.

The link cable beacon (LCB) extended link service command locates the corresponding ends of a cable by flashing the specific LEDs (see “Adapter LEDs” on page 101 for more information) on the corresponding ports of a link.

The LCB command can be sent through a Brocade switch using the following commands, which show examples of enabling, disabling, or verifying the LCB. For details, refer to your switch documentation.

```
SW6505:admin> portpeerbeacon --enable 12
SW6505:admin> portpeerbeacon --show -all
portPeerBeacon is enabled on port :12
SW6505:admin> portpeerbeacon --disable 12
```

To execute the LCB command through a Cisco switch, use the following commands to issue and stop beacon. For details, refer to your switch documentation.

```
# beacon interface fc1/1 peer
# no beacon interface fc1/1 peer
```

Diagnostic Port Testing

QConvergeConsole CLI and QConvergeConsole GUI support diagnostics port testing to identify cable connection problems from a Brocade switch (FOS 7.4.x or later) or a Cisco switch (NX-OS 8.2.1 or later). For information about diagnostics port testing from the host server, see the *QConvergeConsole Help* or the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00). For information about performing diagnostics port testing from the FC switch, see "Troubleshooting with a Diagnostics Port" on page 107.

Read Diagnostic Parameters Extended Link Service Command

The read diagnostic parameters (RDP) extended link service (ELS) command is a powerful diagnostic tool that can be used while a link is up and passing traffic. When the adapter port receives an RDP command, it responds with a comprehensive diagnostic report containing several blocks of data useful for monitoring the fabric or trouble-shooting. The report includes:

- SFP Diagnostic Parameters: temperature, V_{CC}, and Tx and Rx power
- Port Speed Descriptor: speed capabilities and operating speed
- Link Error Status Block Descriptor
- Port Names Descriptor: WWNN and WWPN
- FEC Status Descriptor: corrected and uncorrectable blocks

NOTE

This feature is supported only on QLE2690, QLE2692, QLE2694, and QLE2694L Adapters. You must run the RDP test from a switch with firmware as follows:

- Brocade switches: FOS version 7.4.*x* or later.
- Cisco switches: NX-OS version 8.2.1 or later

Running RDP Test from a Brocade 16/32G Switch

The following example shows the RDP ELS command output for Port 13 on a Brocade 16G switch (FOS 7.4.*x* or later):

```
SW6505:admin> sfpshow 13 -link -force
Identifier:  3    SFP
Connector:   7    LC
Transceiver: 7004404000000000 4,8,16_Gbps M5 sw Short_dist
Encoding:    6    64B66B
Baud Rate:   140  (units 100 megabaud)
Length 9u:   0    (units km)
```

```
Length 9u:   0    (units 100 meters)
Length 50u (OM2):  3    (units 10 meters)
Length 50u (OM3):  0    (units 10 meters)
Length 62.5u:0    (units 10 meters)
Length Cu:   0    (units 1 meter)
Vendor Name: HP-F     BROCADE
Vendor OUI:  00:05:1e
Vendor PN:   QK724A
Vendor Rev:  A
Wavelength:  850  (units nm)
Options:     003a Loss_of_Sig,Tx_Fault,Tx_Disable
BR Max:      0
BR Min:      0
Serial No:   HAF314370000B7F
Date Code:   140909
DD Type:     0x68
Enh Options: 0xfa
Status/Ctrl: 0x30
Pwr On Time: 0.30 years (2666 hours)
E-Wrap Control: 0
O-Wrap Control: 0
Alarm flags[0,1] = 0x0, 0x0
Warn Flags[0,1] = 0x0, 0x0
                                          Alarm                  Warn
                                    low         high       low         high
Temperature: 60      Centigrade      -5          85         0           75
Current:     8.430   mAmps           2.500       12.000     2.000       11.500
Voltage:     3322.2  mVolts          3000.0      3600.0     3100.0      3500.0
RX Power:    -3.1    dBm (495.3uW)   31.6  uW    1258.9 uW  31.6  uW    794.3  uW
TX Power:    -3.2    dBm (481.6 uW)  125.9  uW   1258.9 uW  251.2  uW   794.3  uW

State transitions: 5
Port Speed Capabilities    4Gbps 8Gbps 16Gbps

PEER Port Gbic Info

        Laser Type:     Short Wave Laser
        SFP Type:       Optical Port Type
        Connecter Type: Other
Following SFP Parameters are Valid
        Temperature: 35      Centigrade [Range -128 - +128 C]
```

```
        Current:     8.176   mAmps     [Range 0 - 131 mAmps]
        Voltage:     3463.2  mVolts    [Range 0 - 3600 mVolts]
        Rx Power:    460.4   uW       [Range 0 - 6550 uW]
        Tx Power:    504.7   uW       [Range 0 - 6550 uW]
Signal Loss (Upstream)  :  -16.7   dBm (21.2  uW)
Signal Loss (Downstream):  -20.3   dBm (9.4   uW)
Port Speed Capabilities    4Gbps 8Gbps 16Gbps
            Last poll time: 03-24-2015 UTC Tue 18:03:14
```

Running RDP Test from a Cisco 16/32G Switch

The following command shows the RDP test results for port 10 from a Cisco 16/32G switch (NX-OS 8.2.1 or later). For information about running the RDP test from the host server, see the *QConvergeConsole Help* or the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

```
Cisco# sh rdp fcid 0x590223 vsan 10
-------------------------------------------------------------
                  RDP frame details
-------------------------------------------------------------
Link Service Request Info:
------------------------------
Port Speed Descriptor Info:
------------------------------
Port speed capabilities : 16G 8G 4G
Port Oper speed         : 16000 Mbps

Link Error Status:
------------------------------
VN PHY port type               : FC
Link failure count             : 1
Loss of sync count             : 0
Loss of signal count           : 0
Primitive sequence proto error : 0
Invalid Transmission word      : 0
Invalid CRC count              : 0

Port Name Descriptor:
------------------------------
Node WWN            : 20:00:00:24:ff:8f:d8:88
Port WWN            : 21:00:00:24:ff:8f:d8:88
Attached Node WWN   : 20:0a:00:de:fb:83:80:81
Attached Port WWN   : 20:01:00:de:fb:83:80:80

SFP Diag params:
------------------------------
SFP flags       : Optical
SFP Tx Type     : Long Wave LC

FEC Status:
```

```
------------------------------
Corrected blocks   : 0
Uncorrected blocks : 0

Buffer Credit Descriptor:
------------------------------
Rx B2B credit   : 186
Tx B2B credit   : 32
Port RTT        : 0 ns

Optical Product Data:
------------------------------
Vendor Name    : FINISAR CORP.
Model No.      : FTLF1432P3BCV-QL
Serial No.     : UVE2AN5
Revision       : A
Date           : 171106

--------------------------------------------------------------------------------
               Current              Alarms                 Warnings
               Measurement     High        Low         High          Low
  ----------------------------------------------------------------------------
  Temperature   44.25 C         75.00 C     -5.00 C     70.00 C        0.00 C
  Voltage        3.38 V          3.60 V      3.00 V      3.50 V        3.10 V
  Current       37.92 mA        70.00 mA     1.00 mA    68.00 mA       2.00 mA
  Tx Power       0.02 dBm        4.00 dBm  -10.00 dBm    3.00 dBm     -9.00 dBm
  Rx Power      -4.16 dBm        3.00 dBm  -20.00 dBm    2.00 dBm    -18.01 dBm
  ----------------------------------------------------------------------------
  Note: ++  high-alarm; +  high-warning; --  low-alarm; -  low-warning
```

5 NVM Express over Fibre Channel

This chapter describes the installation and configuration of NVMe over Fibre Channel (FC-NVMe) on the QLogic adapters from Marvell. It covers:

- Hardware and Software Requirements
- “Host Setup” on page 91
- “Limitations and Known Issues” on page 99
- “Unloading and Reloading the Linux Driver” on page 99

For assistance with the installation and configuration of FC-NVMe, contact Marvell Technical Support at this address:

https://www.marvell.com/support/contact/cust_support.do

Hardware and Software Requirements

The following sections list the required adapters, operating systems, and host software.

Adapters

FC-NVMe requires one or more of the following adapters, including models QLE2690, QLE2692, QLE2964, and QLE2964L.

Operating Systems

The following x86_64 operating systems are supported for FC-NVMe:

- SUSE® Linux Enterprise Server (SLES®):
  - ❑ SLES 12 SP4
  - ❑ SLES 15/15 SP1
- Red Hat® Enterprise Linux (RHEL):
  - ❑ RHEL 7.6
  - ❑ RHEL 7.7
  - ❑ RHEL 8.0

- Microsoft Windows Server (Tech Preview only):
  - ❑ Windows Server 2016
  - ❑ Windows Server 2019

Host Software

This section lists the required FC-NVMe software, which, unless stated otherwise, is available on the Marvell Web site (see “Documentation Conventions” on page xv).

NOTE

Marvell Beta Software Statement

Marvell has agreed to make available for download certain pre-production beta software for Windows Server 2016 and Windows Server 2019 NVMe over Fibre Channel (FC-NVMe) drivers (the “Software”). The Software is not ready for production and is in a pilot state. The purpose of providing this Software is to enable your development effort to create leading-edge solutions with a significant improvement in time-to-market. Consequently, the Software is not warrantied, nor fully tested, and certain risks are expected.

You agree that the Software is of beta quality and you acknowledge that the production test and full qualification are not completed. The Software should, therefore, not be used in a production environment.

Marvell makes no warranties, expressed or implied, statutory or otherwise, with respect to the software, including, without limitation, any implied warranty of merchantability or fitness for a particular purpose. The Software is provided to you “as is”. You assume all risk associated with use of the Software. In no event will Marvell be liable to you or any other person or entity, whether in contract, tort or any other basis, for incidental, consequential, indirect or special damages or liabilities, or the loss of revenue, loss of business, or other, financial loss arising out of the use or possession of the Software by you.

FC-NVMe software for Linux and FC-NVMe Tech Preview software for Microsoft Windows Server are available on the Marvell Web site. See “Documentation Conventions” on page xv.

- Linux out-of-box (OOB) QLogic qla2*xxx* driver for x86_64 (also supports FC-NVMe):
  - SL12 SP4
  - SL15
  - SL15 SP1
  - RH7.6
  - RH7.7
  - RH8.0
  - RH8.1
- Windows OOB driver (Tech Preview):
  - `q23wx64W16Storv9.3.3.20.zip`
- Fibre Channel firmware v8.8.204 or later for QLE26xx products.
- Linux QLogic management application, QConvergeConsole CLI version 2.3.00.36 or later:
  - `QConvergeConsoleCLI-2.3.00-36.x86_64.rpm`
- Windows QLogic management application, QConvergeConsole CLI version 2.3.00.36 or later (available from the Tech Preview site):
  - `QConvergeConsoleCLI-2.3.00-36_win_x64.zip`
- Windows QLogic management application, QConvergeConsole GUI version 5.5.0.64 or later (available from the Tech Preview site):
  - `QConvergeConsoleCLI-5.5.0-64_win_x64.zip`
- NVMe CLI native application:
  - The OS Distribution DVD contains the native `nvme-cli-x.x-y.y.x86_64.rpm`.

Host Setup

Procedures for setting up the initiator host include the following:

- Setting Up the Host
- Verifying the Adapter Firmware
- Verifying the Availability of FC-NVMe Devices

Setting Up the Host

The following sections provide setup instructions for servers running SLES 12 SP4, SLES 15/15 SP1, RHEL 7.6, RHEL 8.0, and Windows 2016/2019:

- Linux Host Setup
- Windows Host Setup

Linux Host Setup

To set up a Linux host:

1. Install the supported base Linux operating system onto a host system.
2. Download, untar, and install the Linux driver kit as follows:
   a. Download the appropriate driver kit using the FC-NVMe software as indicated in “Host Software” on page 90.
   b. Untar and install the Linux driver kit by issuing the following commands:

```
# tar -zxvf qla2xxx-src-v10.01.00.53.xx.y-k.tar.gz
# cd qla2xxx-src-v10.01.00.53.xx.y-k
# ./extras/build.sh install
```

NOTE

Be sure to update the driver with the latest version available.

The src driver kits and driver RPM kits have embedded FC-NVMe auto-discovery scripts that are installed when the driver is deployed.

   c. Verify that the FC-NVMe scripts are installed by issuing the following commands:

```
# ls -l /etc/udev/rules.d/99-nvme-fc.rules
-rw-r--r--. 1 root root 310 Dec 31 15:14 /etc/udev/rules.d/99-nvme-fc.rules
# ls -l /usr/sbin/qla2xxx/qla2xxx_nvme_boot_connections.sh
-rwxr-xr-x. 1 root root 859 Jan  31 10:56 /usr/sbin/qla2xxx/qla2xxx_nvme_boot_connections.sh
# ls -l /usr/lib/systemd/system/qla2xxx-nvmefc-connect@.service
-rwxr-xr-x. 1 root root 859 Jan  31 10:56 /usr/lib/systemd/system/qla2xxx-nvmefc-connect@.service
# ls -l /usr/lib/systemd/system/qla2xxx-nvmefc-connect@.service
-rw-r--r--. 1 root root 279 Jan  31 10:54 /usr/lib/systemd/system/qla2xxx-nvmefc-connect@.service
```

3. If the Linux Out-of-Box driver does not discover NVMe targets after a system reboot, perform the following steps to ensure the service named qla2xxx-nvmefc-boot-connection.service is enabled.

   a. Open a Linux terminal window and enter the following to check the state of the service.

      ```
      # systemctl list-unit-files | grep nvmefc-boot-connection
      qla2xxx-nvmefc-boot-connection.service disabled
      ```

   b. If the service is disabled, enter the following to enable.

      ```
      # systemctl enable qla2xxx-nvmefc-boot-connection.service
      ```

      A following example message response should be seen.

      ```
      Created symlink
      /etc/systemd/system/default.target.wants/qla2xxx-nvmefc-b
      oot-connection.service
      →/usr/lib/systemd/system/qla2xxx-nvmefc-boot-connection.s
      ervice.
      ```

   c. Check the service again; to show enabled.

      ```
      # systemctl list-unit-files | grep nvmefc-boot-connection
      qla2xxx-nvmefc-boot-connection.service enabled
      ```

4. Edit or create the `qla2xxx.conf` file to add the `ql2xnvmeenable` option. For example, `/etc/modprobe.d/qla2xxx.conf` contains:

   ```
   options qla2xxx ql2xnvmeenable=1
   ```

   For the FC-NVMe option to take effect the system boot image will need to be updated. See Step 2 and Step 5 to install the driver and to rebuild the boot image.

5. Rebuild the RAMDISK image by following the *Readme* driver guidelines to rebuild the initrd image.

   The following commands show an example of how to build a RAMDISK:

   ```
   # cd /boot
   # cp <current-initrd-image> <current-initrd-image.bak>
   # mkinitrd -f -v <current-initrd-image> `uname -r`
   ```

   NOTE

   In the `mkinitrd` command, you must use backticks (`) to surround `uname -r`.

6. Reboot the system and verify NVMe targets are discovered.

7. Install the NVMe CLI application version from the base operating system DVD.

   ```
   # rpm -ivh nvme-cli-x.x-y.y.x86_64.rpm
   ```

8. In a terminal window, verify that the NVMe CLI application version is installed by issuing the following command:

   ```
   # nvme version
   ```

9. Download and install the QConvergeConsole CLI RPM.

   a. Download the QConvergeConsole CLI RPM from the URL listed in “Host Software” on page 90.

   b. Install the QConvergeConsole CLI RPM by issuing the following command:

      ```
      # rpm -ivh QConvergeConsoleCLI-2.3.00-36.x86_64.rpm
      ```

10. Confirm that the QLogic QLE26x*x* FC Adapters are running with the minimum required firmware version, 9.02.02. For information about how to determine the firmware version and update it, see “Verifying the Adapter Firmware” on page 96.

NOTE

The OOB driver must have the FC-NVMe option enabled to attach to FC-NVMe storage devices. For details on using the FC-NVMe driver option, see either the 10.01.*xx.xx.xx.x-x* driver documentation or the example shown in Step 11.

11. (Optional) As needed, on the supported Linux OS, create a `hostnqn` file to attach to remote FC-NVMe Storage Subsystems.

    a. With the NVMe CLI already installed, issue the following command to verify that the `hostnqn` file exists. For example:

       ```
       # ls /etc/nvme/hostnqn
       /etc/nvme/hostnqn
       ```

    b. If the `hostnqn` file exists, issue the following command to view and make note of the `hostnqn` data to use when mapping the host initiator(s) to storage subsystems:

       ```
       # cat /etc/nvme/hostnqn
       nqn.2014-08.org.nvmexpress:uuid:1164eabb-e77f-4f15-ad16-cefb43d1fc9
       ```

c. If the `hostnqn` file does not exist, issue the following command to create it using the NVMe CLI:

```
# nvme gen-hostnqn
nqn.2014-08.org.nvmexpress:uuid:a0baf242-85fd-41e5-a524-e253d8531282
```

d. Take the output from the `nvme gen-hostnqn` command and save it to the `hostnqn` file. The edited file in the `/etc/nvme/hostnqn` directory should appear as follows.

```
nqn.2014-08.org.nvmexpress:uuid:a0baf242-85fd-41e5-a524-e253d8531282
```

12. Reboot the system and verify that the correct driver and firmware versions are installed. For example, issue the following QConvergeConsole CLI command:

```
# qaucli -i 0
```

13. If NVMe devices do not appear, follow the procedures in "Unloading and Reloading the Linux Driver" on page 99 and "Verifying the Availability of FC-NVMe Devices" on page 97.

Windows Host Setup

NOTE

These procedures apply only to the FC-NVMe driver. For the Fibre Channel driver, follow the instructions in the corresponding `Readme.txt` file.

To set up a Windows host:

1. Install the Windows FC driver from the update package.
   - ❑ Driver v9.3.3.20 or later
   - ❑ QConvergeConsole CLI v2.3.00.36 or later

Windows Host NQN

The driver automatically generates a host NVMe qualified name (NQN). To view the host NQN, issue the `qaucli -i` command. Figure 5-1 shows an example.

```
Y:\qaucli>qaucli.exe -i 0
Using config file: Y:\qaucli\qaucli.cfg
Installation directory: Y:\qaucli
Working dir: Y:\qaucli
------------------------------------------------------------------------------
Host Name                       : B05
Host NQN                        : nqn.2018-08.com.marvell:nvme.host.sys.wwpn:21000024ff8ff27b
HBA Instance                    : 0
HBA Model                       : QLE2692
HBA Description                 : QLE2692 Dell Dual Port 16Gb FC to PCIe Gen3 x8 Adapter
HBA ID                          : 0-QLE2692
HBA Alias                       :
HBA Port                        : 2
Port Alias                      :
Node Name                       : 20-00-00-24-FF-8F-F2-7B
Port Name                       : 21-00-00-24-FF-8F-F2-7B
```

Figure 5-1. Viewing the Host NQN

Verifying the Adapter Firmware

The following sections describe how to verify and update adapter firmware.

Verifying Adapter Firmware

Confirm that the adapter is running the minimum required firmware version, 9.3.3.20 or later.

To verify adapter firmware:

1. In QConvergeConsole CLI, issue the following command:

```
# qaucli  -g
HBA Model QLE2692 (SN AFD1517Y01945):
Port 1 WWPN 21-00-00-24-FF-7B-97-60 (HBA instance 0) Online
Port 2 WWPN 21-00-00-24-FF-7B-97-61 (HBA instance 1) Online
```

2. Choose the HBA instance for the adapter that you want to connect to FC-NVMe devices (0 in this example), and then issue the following command:

```
# qaucli -i 0
Running Firmware Version       : 8.08.204 (d0d5)
Flash Firmware Version         : 8.08.204
```

The preceding output shows the QLE2692 adapter with firmware version 8.08.204 in RAM and flash memory.

Verifying the Availability of FC-NVMe Devices

Follow the procedures in this section to confirm FC-NVMe device availability on Linux and Windows systems.

Verifying in Linux

In Linux, verify that the target devices are available by issuing either of the following commands:

```
# lsblk
```

or

```
# nvme list
```

Example: `lsblk` Command

The following example of a portion of the `lsblk` output shows the FC-NVMe attached targets. The system discovered three target controllers (nvme0, nvme1, and nvme2). Each of these controllers has one FC-NVMe LUN behind it (n1).

```
NAME         MAJ:MIN RM   SIZE RO TYPE MOUNTPOINT

nvme0n1      259:2    0     1G  0 disk
nvme0n1p1    259:25   0  1023M  0 part
nvme0n2      259:8    0     1G  0 disk
nvme0n3      259:12   0     1G  0 disk
nvme0n4      259:16   0     1G  0 disk
nvme0n5      259:18   0     1G  0 disk
nvme0n6      259:20   0     1G  0 disk
nvme0n7      259:22   0     1G  0 disk
nvme0n8      259:24   0     1G  0 disk
```

Example: `nvme list` Command

The following example of a portion of the `nvme list` output shows the FC-NVMe attached targets.

```
Node     SN                   Model    Namespace Usage Format FW Rev
-------  -------------------- -------- ---- ---- ----------------------- --------- -----------
nvme0n1 00-200100110dd89300 SANBlaze VLUN P3T0 1 67.11  MB /  67.11  MB 512   B +  0 B   V8.x-dev
nvme1n1 00-200000110dd89200 SANBlaze VLUN P2T0 1 67.11  MB /  67.11  MB 512   B +  0 B   V8.x-dev
nvme2n1 00-200000110d4d1300 SANBlaze VLUN P0T0 1 67.11  MB /  67.11  MB 512   B +  0 B   V8.x-dev
```

Verifying in Windows

In Windows, verify that the target devices are available by issuing the `qaucli -t` command. For example:

```
qaucli -t 0 (HBA instance 0)
Using config file: C:\Users\Administrator\qaucli.cfg
Installation directory: C:\Users\Administrator
Working dir: C:\Users\Administrator
------------------------------------------------------------------------------
HBA Instance 0: QLE2692Port 1 WWPN 21-00-00-24-FF-8F-E3-9A PortID 01-21-00
Link: Online (FEC)
------------------------------------------------------------------------------
Path                              : 0
Target                            : 0
Device ID                         : 0x83
Product Vendor                    : NVMe
Product ID                        : SANBlaze VLUN P2
Product Revision                  : -dev
Serial Number                     : 6001_10d0_0247_2600_0302_0000_929d_14c6.
Node Name                         : 20-02-00-11-0D-47-26-00
Port Name                         : 20-02-00-11-0D-47-26-00
Port ID                           : 01-1B-00
Product Type                      : NVME Disk (Ensure that this shows as an FC-NVMe target.)
LUN Count(s)                      : 51
Status                            : Online
------------------------------------------------------------
```

Figure 5-2 shows the devices in Windows Device Manager.

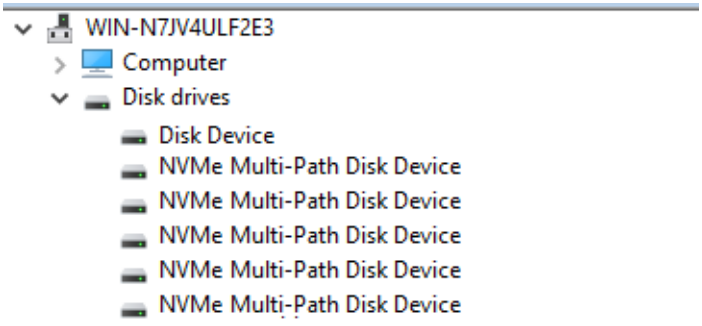

Figure 5-2. FC-NVMe Devices in Windows Device Manager

NOTE

To support formatting of an FC-NVMe drive on Windows, you may need to add the following Windows Registry entry for some OEM storage:

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\
ql2300\Parameters\Device]"DriverParameter"="ts=1"
```

NOTE

By default, NVMe is disabled. To enable NVMe on Windows, you may need to add the following Windows Registry entry for some OEM storage devices.

1.To enable NVMe, navigate to:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Ql
2300\Parameters\Device
```

2.Double click on **`DriverParameter:REG_SZ`**

3.Look for `DriverParameter:REG_SZ:nvme=1`

4.If the string `nvme=1` does not exist, append `nvme=1` to the end of string.

Limitations and Known Issues

The following Linux and Windows limitations and known issues affect the installation and configuration of FC-NVMe.

Linux

For Linux operating systems, Marvell recommends that you disconnect all FC-NVMe devices prior to unloading the driver. Refer to the procedure in Unloading and Reloading the Linux Driver.

Windows

Windows FC-NVMe does not support point to point (also called N2N) direct attach to Target/LUN configuration. It does support fabric configuration through FC Switch fabric.

Unloading and Reloading the Linux Driver

Follow the instructions in this section to unload and reload the Linux driver.

To unload and reload the Linux driver:

1. List all the FC-NVMe connected target controllers by issuing the following command:

```
# ls /dev/nvme* | grep -E nvme[0-9]+$
```

The preceding command should list all connected `/dev/nvme[x]` devices. For example:

```
/dev/nvme0
/dev/nvme1
```

2. Disconnect all of the FC-NVMe target devices by issuing the following commands to each of the `/dev/nvme[x]` devices listed in Step 1:

```
# nvme disconnect -d /dev/nvme0
# nvme disconnect -d /dev/nvme1
```

3. Unload the current driver by issuing the following command:

```
# modprobe -r  qla2xxx
```

4. Reload the driver to auto-discover the FC-NVMe subsystems by issuing the following command:

```
# modprobe -v qla2xxx
```

A Adapter LEDs

This appendix describes the LEDs on these 2600 Series Adapters:

- “QLE2670 and QLE2672 16Gb Adapter LEDs” on page 101
- “QLE2690, QLE2692, QLE2694, and QLE2694L 16Gb Adapter LEDs” on page 102

QLE2670 and QLE2672 16Gb Adapter LEDs

The QLE2670 and QLE2672 16Gb Adapter ports have three LEDs (see Figure A-1):

- The amber LED on the left is 16Gb.
- The green LED in the middle is 8Gb.
- The amber LED on the right is 4Gb.

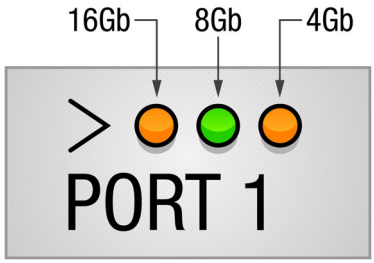

Figure A-1. QLE2670 and QLE2672 16Gb Adapter LEDs

Table A-1 defines the LED behavior for the QLE2670 and QLE2672 16Gb Adapters.

Table A-1. QLE2670 and QLE2672 16Gb Adapter LED Scheme

LED	Power Off	Power On (Before Firmware Initialization)	Power On (After Firmware Initialization)	Firmware Fault	4Gbps Link Up and Active	8Gbps Link Up and Active	16Gbps Link Up and Active	Beaconing
Amber LED (16Gbps)	Off	On	Flashing	Flashing in sequence	Off	Off	On or flashing	Flashing
Green LED (8Gbps)	Off	On	Flashing	Flashing in sequence	Off	On or flashing	Off	Off
Amber LED (4Gbps)	Off	On	Flashing	Flashing in sequence	On or flashing	Off	Off	Flashing

QLE2690, QLE2692, QLE2694, and QLE2694L 16Gb Adapter LEDs

The QLE2690, QLE2692, QLE2694, and QLE2694L 16Gb Adapter ports have three LEDs (see Figure A-2):

- The green LED on the left is 16Gb.
- The green LED in the middle is 8Gb.
- The green LED on the right is 4Gb.

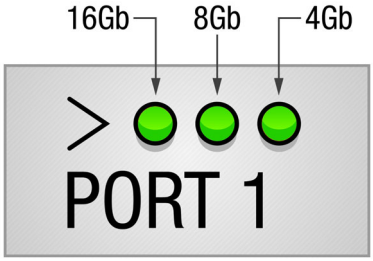

Figure A-2. QLE2690, QLE2692, QLE2694, and QLE2694L 16Gb Adapter LEDs

Table A-2 defines the LED behavior for the QLE2690, QLE2692, QLE2694, and QLE2694L 16Gb Adapters.

Table A-2. QLE2690, QLE2692, QLE2694, and QLE2694L 16Gb Adapter LED Scheme

LED	Power Off	Power On (Before Firmware Initiali-zation)	Power On (After Firmware Initiali-zation)	Firmware Fault	4Gbps Link Up and Active	8Gbps Link Up and Active	16Gbps Link Up and Active	Beaconing
Green LED (16Gbps)	Off	On	Flashing	Flashing in sequence	Off	Off	On or flashing	Flashing
Green LED (8Gbps)	Off	On	Flashing	Flashing in sequence	Off	On or flashing	Off	Off
Green LED (4Gbps)	Off	On	Flashing	Flashing in sequence	On or flashing	Off	Off	Flashing

B Troubleshooting

This appendix provides procedures for solving issues by running Fibre Channel diagnostics using QConvergeConsole GUI. In addition, a two-part flowchart walks you through troubleshooting problems that may occur with devices and LUNs on the 2600 Series Adapter.

Troubleshooting with Fibre Channel Diagnostics

The following sections describe how to use QConvergeConsole GUI and QConvergeConsole CLI to perform diagnostics on the 2600 Series Adapter when its personalty is Fibre Channel Adapter.

To perform an external loopback test, do one of the following:

- Insert a loopback connector into the 2600 Series Adapter port.
- Connect the 2600 Series Adapter port to a Fibre Channel switch.

During the loopback test, the adapter port LEDs will flash. Do not perform an internal loopback test at the OS if the target device is the SAN target from which the system boots.

Fibre Channel Diagnostics Using QConvergeConsole GUI

QConvergeConsole GUI supports the internal and external loopback, read/write buffer, and beacon on/off diagnostic tests for Fibre Channel ports.

To run the loopback or read/write buffer test:

1. Click the **Loopback Test** or **Read/Write Buffer Test** button.

   The diagnostic tests warning appears.

2. If there are no I/Os active and you want to proceed with the test, click **Yes**. Or, to cancel the diagnostic test, click **No**.

3. If you selected the loopback test, a dialog box allows you to select **Internal Loopback** or **External Loopback**. Select the appropriate test, and then click **OK**.

   If you selected **Yes** in Step 2, a dialog box appears with the data pattern generated.

4. When you want to end the test, click **Stop**.

To run the beacon on/off test:

1. On the QConvergeConsole GUI main window, click an adapter port in the tree pane on the left.
2. Click the **Information** tab.
3. On the Information page, click the **Beacon On/Off** button to run the test.

For more information, refer to the topic about performing diagnostics in *QConvergeConsole Help*.

Fibre Channel Diagnostics Using Interactive QConvergeConsole CLI

To run the loopback test, read/write buffer test, or beacon test:

1. On the **Main Menu**, select **4: Adapter Diagnostics**.
2. On the **Fibre Channel Diagnostics** menu, do one of the following:
   - ❑ Select **1: Loopback Test** to run the loopback test.
   - ❑ Select **2: Read Write Buffer Test** to run the read/write buffer test.
   - ❑ Select **3: Beacon Test** to run the beacon test.
   - ❑ Select **4: Transceiver Diagnostics Monitoring Interface (DMI)** to view the transceiver diagnostics information.

For more information, refer to the section about Fibre Channel interactive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Fibre Channel Diagnostics Using Noninteractive QConvergeConsole CLI

For more information, refer to the section about the Fibre Channel noninteractive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00).

Fibre Channel Troubleshooting Diagram

Figure B-1 and Figure B-2 provide a two-part troubleshooting flowchart.

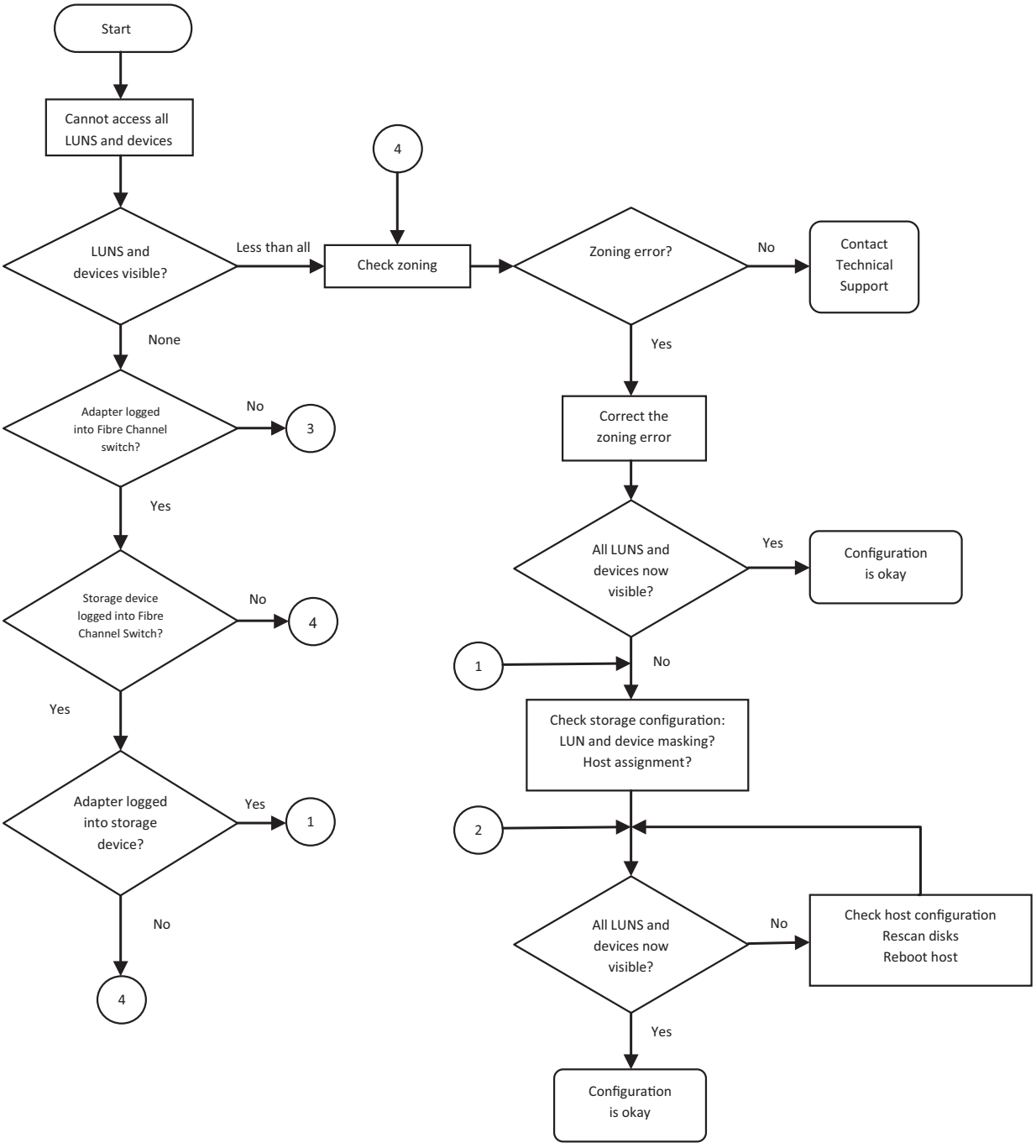

Figure B-1. Fibre Channel Troubleshooting Diagram (Part 1 of 2)

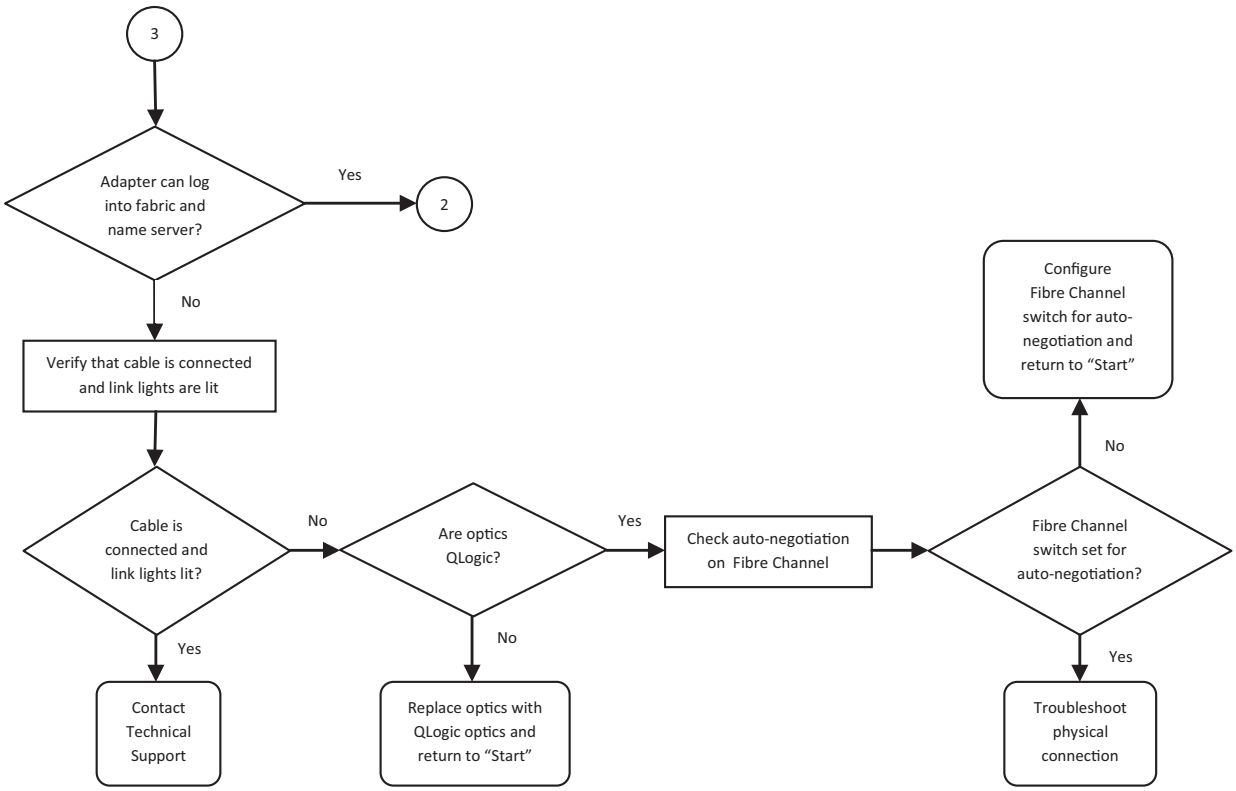

Figure B-2. Fibre Channel Troubleshooting Diagram (Part 2 of 2)

Troubleshooting with a Diagnostics Port

Use the diagnostics port feature on the 2600 Series Adapter to identify and isolate link failures resulting from faulty modules (link, cable, or SFP) by running diagnostics over a Fibre Channel link.

The diagnostics port feature is supported on Windows, Linux, ESXi, and Solaris.

NOTE

All QLogic-branded 16Gbps SFP+ transceivers support diagnostics port tests. If you have a supported non-QLogic branded transceiver, ensure that it supports the optical wrap (OWrap) and electrical wrap (EWrap) capability that is required for diagnostics port.

Before running diagnostics, verify that the FC switch supports diagnostics mode, and then enable the HBA Diagnostic option. The following example enables the HBA Diagnostic option, where `0` specifies the adapter instance number:

```
# qaucli -dport 0 --info
QLE2672
-----------
=======
Port 1:
=======
DPort  : Enable
```

When a switch port is enabled as a diagnostics port, the 2600 Series Adapter automatically runs the basic diagnostic test at both ends of the link. The Brocade switch then runs the following additional tests:

- Electric loopback test
- Optical loopback test

You should run diagnostics port tests on multipath configured boot from a SAN or fabric-assigned boot LUN. Running diagnostics port tests on a single path boot from SAN or fabric-assigned boot LUN may cause issues with OS stability in true boot from SAN environments.

The following sections describe how to configure and run diagnostics port mode from the Fibre Channel 16/32G switch, and how to verify diagnostics port mode from the QConvergeConsole utilities:

- Configuring and Running Diagnostics Port on a Brocade Fibre Channel 16/32G Switch
- Configuring and Running Diagnostics Port on a Cisco Fibre Channel 16/32G Switch
- Verifying Diagnostics Port Mode with QConvergeConsole GUI
- Verifying Diagnostics Port Mode with Interactive QConvergeConsole CLI
- Verifying Diagnostics Port Mode with Noninteractive QConvergeConsole CLI
- Verifying Diagnostics Port Mode with QConvergeConsole Plug-ins for VMware

Configuring and Running Diagnostics Port on a Brocade Fibre Channel 16/32G Switch

The following example configures and starts a diagnostic test on port 17 of a Brocade Fibre Channel 16/32G switch (FOS 7.4.*x* or later). For more detail about the switch, see the Brocade switch documentation.

To enable diagnostics port mode:

From the Fibre Channel 16/32G switch, issue the following commands:

```
# portdisable <port#>
# portcfgdport --enable <port#>
# portenable <port#>
```

The diagnostics port test starts automatically.

To view the diagnostics port test results from the Fibre Channel 16/32G switch:

1. To obtain the port number, issue the `switchshow` command as follows:

   ```
   # switchshow
   ```

   The following example output identifies port 17:

   ```
   17  17  011100  id  N16  Online  FC  D-Port Loopback->Port 17
   ```

2. Issue the `portdporttest` command as follows:

   ```
   # portdporttest --show <port#>
   ```

   For example:

```
# portdporttest --show 17
portdporttest --show 17
D-Port Information:
===================
Port:                           17
Remote WWPN:                    21:00:00:0e:1e:11:4a:31
Mode:                           Automatic
No. of test frames:             1 Million
Test frame size:                1024 Bytes
FEC (enabled/option/active):    Yes/No/No
CR (enabled/option/active):     Yes/No/No
Start time:                     Thu Aug 14 01:45:37 2014
End time:                       Thu Aug 14 01:47:40 2014
Status:                         PASSED
================================================================================
```

```
Test                    Start time      Result          EST(HH:MM:SS)   Comments
=============================================================================
Electrical loopback     01:46:08        PASSED          --------   ----------
Optical loopback        01:46:54        PASSED          --------   ----------
Link traffic test       --------        SKIPPED         --------   ----------
=============================================================================
Roundtrip link latency:          157 nano-seconds
Estimated cable distance:        3 meters
Buffers required:                1 (for 2112 byte frames at 16Gbps speed)
```

NOTE

Running diagnostics port test from the adapter is not supported while the switch port is set in diagnostic mode.

To disable diagnostics port mode:

From the Fibre Channel 16/32G switch, issue the following commands:

```
# portdisable <port#>
# portcfgdport --disable <port#>
# portenable <port#>
```

The diagnostics port test stops.

Configuring and Running Diagnostics Port on a Cisco Fibre Channel 16/32G Switch

The following example configures and starts a diagnostic test on port 2 of a Cisco Fibre Channel 9396S or 97*xx* switch (NX-OS 8.2.1 or later). For more detail about the switch, see the Cisco switch documentation.

```
Cisco# config t
Cisco# int fc 1/2
Cisco(config-if)# shut
Cisco(config-if)# switchport link-diag
Cisco(config-if)# no shut
Cisco(config-if)# diagnostic start interface fc 1/2 test link-diag
```

To check the diagnostic test status, type the following command:

```
Cisco(config-if)# show diagnostic result interface fc1/1 test
link-diag
PWWN of peer port: 21:00:00:24:ff:8f:c9:e0
Status: Supported (Reflector)
```

```
            Reflector loopback capabilities:  Xcvr-optical Electrical
            Time of Test: Mon Feb  5 16:31:02 2018
            Total time taken: 20 seconds
==================|===========|===========|=========|============================|=============
                  |           |           | Discards |        Latency (ns)        |
Loopback Level    | Tx Frames | Rx Frames | IN | OUT |BAD WORDS|In-Switch|External|    Status
==================|===========|===========|====|=====|=========|=========|========|=============
Remote-Switched(R) |          0|          0|   0|    0|        0|        0|       0|       -NA-
Mac(R)             |          0|          0|   0|    0|        0|        0|       0|       -NA-
Xcvr-optical(R)    |    7225275|    7225275|   0|    0|        0|     2112|    1064|    Success
Electrical(R)      |      20000|      20000|        -NA-         |   -NA-  |  -NA-  |    Success
=============================================================================================================

Overall Status                          : Success
Cable Length (approx. +/- 5 metres)     : 10.4 metres
```

To disable the diagnostic port, type the following commands:

```
Cisco#int fc 1/2
Cisco(config-if)# shut
Cisco(config-if)# no switchport link-diag
Cisco(config-if)# no shut
```

Verifying Diagnostics Port Mode with QConvergeConsole GUI

To verify diagnostics port mode in QConvergeConsole GUI:

1. In the QConvergeConsole GUI left pane, click the **Host** tab.
2. On the Host page, expand a 2600 Series Adapter to view its port nodes.

   If a port is in diagnostics port mode, the port node specifies **Loop Down, Diagnostic Mode**.

Figure B-3 shows an example.

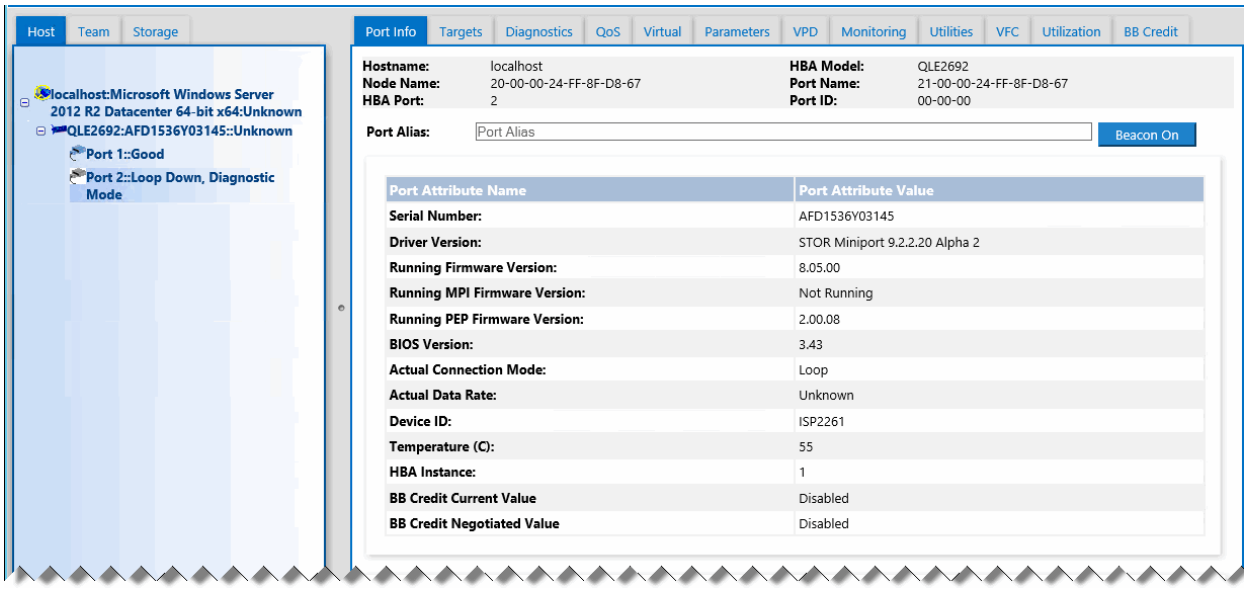

Figure B-3. Diagnostics Port Mode in QConvergeConsole GUI

Verifying Diagnostics Port Mode with Interactive QConvergeConsole CLI

To verify diagnostics port mode in interactive QConvergeConsole CLI:

1. On the QConvergeConsole CLI main menu, select the **Adapter Information** option, and then select the adapter type (**Fibre Channel Adapter**).
2. On the **FC Adapter Information** menu, select **2** (**FC Port Information**).

   The following Adapter Information window example shows the affected port with a status of **Link Down**.

```
QConvergeConsole
CLI - Version 1.1.3 <Build 23>

FC Adapater Information

1:  FC Adapter Informaton
2:  FC Port Information
3:  FC UPD Information
4:  FC Target/LUN Information

    <p or 0: Previous Menu; m or 98: Main Menu; ex or 99: Quit>
    Please Enter Selection : 2
```

```
    QConvergeConsole
    CLI Version 1.1.3 <Build 23>

Adapter Information

HBA Model QLE26xx SN: XXXXXXXXXXXXA
  1: Port   1: WWPN: xx-xx-xx-xx-xx-xx-xx-70 Link Down
  2: Port   2: WWPN: xx-xx-xx-xx-xx-xx-xx-71 Online
HBA Model QLE26xx SN: XXXXXXXXXXXXB
  3: Port   1: WWPN: xx-xx-xx-xx-xx-xx-xx-40 SFP not installed
  4: Port   2: WWPN: xx-xx-xx-xx-xx-xx-xx-41 SFP not installed
```

Verifying Diagnostics Port Mode with Noninteractive QConvergeConsole CLI

To verify diagnostics port mode in noninteractive QConvergeConsole CLI, issue the following command:

qaucli -pr fc -g

In the following example, all the 2600 Series Adapters are listed. The affected port has a status of **Link Down**.

```
C:\>qaucli -pr fc -g
-------------------------------------------------------------------------------------------------
Host Name                       : WIN-XXXXXXXXXXX
OS Type                         : Microsoft Windows Server 2008 Enterprise 32-bit x86
OS Version                      : Service Pack 2 (Build 6002)
SDM API Version                 : 1..28.0.116 QLSDM.DLL
-------------------------------------------------------------------------------------------------
HBA Model QLE26xx (SN: XXXXXXXXXXXXA)
  1: Port   1: WWPN: xx-xx-xx-xx-xx-xx-xx-CB (HBA instance 4) Online
  2: Port   2: WWPN: xx-xx-xx-xx-xx-xx-xx-CF (HBA instance 5) Online
HBA Model QLE26xx (SN: XXXXXXXXXXXXB)
  1: Port   1: WWPN: xx-xx-xx-xx-xx-xx-xx-70 (HBA instance 2) Link Down
  2: Port   2: WWPN: xx-xx-xx-xx-xx-xx-xx-71 (HBA instance 3) Online
HBA Model QLE26xx (SN: XXXXXXXXXXXXC)
  1: Port   1: WWPN: xx-xx-xx-xx-xx-xx-xx-40 (HBA instance 0) SFP not installed
  2: Port   2: WWPN: xx-xx-xx-xx-xx-xx-xx-41 (HBA instance 1) SFP not installed
-------------------------------------------------------------------------------------------------
Total QLogic HBA(s): 3
```

For more information, refer to the section about the Fibre Channel noninteractive commands in the *User's Guide—QConvergeConsole CLI* (part number SN0054667-00). For information about running diagnostics port from the host server adapter, see the *User's Guide—QConvergeConsole CLI*.

Verifying Diagnostics Port Mode with QConvergeConsole Plug-ins for VMware

For information about verifying diagnostics port mode using QConvergeConsole Plug-in for VMware vCenter Server and QConvergeConsole Plug-in for VMware vSphere Web Client, see the "Fibre Channel Adapter Management" section in the *User's Guide—QConvergeConsole Plug-ins for VMware vSphere* (part number SN0054677-00).

C Revision History

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Changes	**Sections Affected**
Corrected instructions on how to get technical support for Marvell Fibre Channel Adapters and Controllers.	“Technical Support” on page xvii
Removal of Cavium references.	
Update to Brocade software version for diagnostics port testing.	“Diagnostic Port Testing” on page 85
Addition of Note to clarify that running the diagnostics port from the adapter is not supported when the switch port is in diagnostics mode.	“Configuring and Running Diagnostics Port on a Brocade Fibre Channel 16/32G Switch” on page 109

Glossary

adapter

The board that interfaces between the host system and the target devices. Adapter is synonymous with *Host Bus Adapter*, *Host Channel Adapter*, *host adapter*, and *adapter board*.

adapter port

A port on the adapter board.

adapter port beacon

An LED on the adapter. Flashing it enables you to locate the adapter.

AL_PA

Arbitrated loop physical address. A unique one-byte value assigned during loop initialization to each node loop port (NL_Port) on a loop.

alias

A user-defined name for an adapter, adapter port, logical disk, or subsystem.

arbitrated loop physical address

See AL_PA.

bandwidth

A measure of the volume of data that can be transmitted at a specific transmission rate. A 1Gbps or 2Gbps Fibre Channel port can transmit or receive at nominal rates of 1 or 2Gbps, depending on the device to which it is connected. This corresponds to actual bandwidth values of 106MB and 212MB, respectively.

basic input output system

See BIOS.

BIOS

Basic input output system. Typically in Flash PROM, the program (or utility) that serves as an interface between the hardware and the operating system and allows booting from the adapter at startup.

boot code

The program that initializes a system or an adapter. Boot code is the first program to run when a system or a device within a system, such as an adapter, is powered on. FCode, BIOS, and extensible firmware interface (EFI) are all forms of boot code for specific hardware/operating system environments.

Boot code for QLogic Fibre Channel Adapters is required if the computer system is booting from a storage device (disk drive) attached to the adapter. The primary function of the boot code is communication with the external boot device before the operating system is up and running. Boot code can also perform secondary functions, including managing the setup for the adapter and initializing and testing the adapter's ISP.

boot device

The device, usually the hard disk, that contains the operating system the BIOS uses to boot from when the computer is started.

boot from SAN

The ability for each server on a network to boot their operating system from a Fibre Channel RAID unit located on the SAN, rather than from a local disk or direct-attached storage (DAS). This enables easier SAN management because you can replace a server and boot it from the Fibre Channel RAID unit.

CRC

Cyclic redundancy check. A scheme to check data that have been transmitted or stored and to detect errors. A CRC cannot correct errors.

cyclic redundancy check

See CRC.

device

A computer subsystem, such as an adapter card, that mediates data in a computer network. The term "device" is used interchangeably with "target" and "target device."

driver

The software that interfaces between the file system and a physical data storage device or network media.

EFI

Extensible firmware interface. A specification that defines a software interface between an operating system and platform firmware. EFI is a replacement for the older BIOS firmware interface present in all IBM PC-compatible personal computers.

Ethernet

The most widely used LAN technology that transmits information between computer, typically at speeds of 10 and 100 million bits per second (Mbps).

extensible firmware interface

See EFI.

fabric device management interface

See FDMI.

***Fast!*UTIL**

*Fast!*UTIL Fibre Channel Adapter BIOS utility.

FCode

Forth code. A type of boot code designed for use on Sun® SPARC® or Macintosh® hardware platforms. See also Flash.

FCoE

Fibre Channel over Ethernet. A technology defined by the T11 standards body that allows traditional Fibre Channel storage networking traffic to travel over an Ethernet link by encapsulating Fibre Channel frames inside Layer 2 Ethernet frames. For more information, visit www.fcoe.com.

FDMI

Fabric device management interface. A standard enabling the management of devices such as adapters through the fabric.

FEC

Forward error correction. Automatically detects and recovers from bit errors. FEC enhances transmission reliability and performance.

Fibre Channel

High-speed serial interface technology that supports other higher layer protocols such as SCSI and IP, and is primarily used in SANs. Standardized under ANSI in 1994.

Fibre Channel over Ethernet

See FCoE.

firmware

Low-level software typically loaded into read-only memory and used to boot and operate an intelligent device.

Flash

Non-volatile memory where the boot code is saved. At times, Flash and boot code are used interchangeably.

Forth code

See FCode.

forward error correction

See FEC.

Host Bus Adapter

An adapter that connects a host system (the computer) to other network and storage devices.

Internet small computer system interface

See iSCSI.

iSCSI

Internet small computer system interface. Protocol that encapsulates data into IP packets to send over Ethernet connections.

LED

Light-emitting diode. Status indicator on a switch, router, adapter, or other device.

light-emitting diode

See LED.

logical unit number

See LUN.

loopback

A diagnostic tool that routes transmit data through a loopback connector back to the same adapter.

LUN

Logical unit number. A subdivision of a SCSI target. It is the small integer handle that differentiates an individual disk drive or partition (volume) within a common SCSI target device such as a disk array.

message signaled interrupts

See MSI, MSI-X.

MSI, MSI-X

Message signaled interrupts. One of two PCI-defined extensions to support message signaled interrupts (MSIs), in PCI 2.2 and later and PCI Express. MSIs are an alternative way of generating an interrupt through special messages that allow emulation of a pin assertion or deassertion.

MSI-X (defined in PCI 3.0) allows a device to allocate any number of interrupts between 1 and 2,048 and gives each interrupt separate data and address registers. Optional features in MSI (64-bit addressing and interrupt masking) are mandatory with MSI-X.

multiboot

The act of installing multiple operating systems on a computer, and being able to choose which one to boot when starting the computer. Multibooting may require a custom boot loader.

N_Port

Node port. A port that connects by a point-to-point link to either a single N_Port or a single F_Port. N_Ports handle creation, detection, and flow of message units to and from the connected systems. N_Ports are end ports in virtual point-to-point links through a fabric, for example, N_Port to F_Port to F_Port to N_Port using a single Fibre Channel fabric switch.

node port

See N_Port.

N_Port ID virtualization

See NPIV.

non-volatile random access memory

See NVRAM.

NPIV

N_Port ID virtualization. The ability for a single physical Fibre Channel end point (N_Port) to support multiple, uniquely addressable, logical end points. With NPIV, a host Fibre Channel Adapter is shared in such a way that each virtual adapter is assigned to a virtual server and is separately identifiable within the fabric. Connectivity and access privileges within the fabric are controlled by identification of each virtual adapter and hence, the virtual server using each virtual adapter.

NVRAM

Non-volatile random access memory. A type of memory that retains data (configuration settings) even when power is removed. You can manually configure NVRAM settings or restore them from a file.

OoOFR

Out-of-order frame reassembly. A feature that reassembles the frames within an exchange in the correct order, even if they were received out of order. Used in a meshed switch topology where frames can traverse through different ISLs to arrive at the target. Otherwise, according to the Fibre Channel specification, the entire exchange of multiple frames would have to be retransmitted.

out-of-order frame reassembly

See OoOFR.

path

A path to a device is a combination of an adapter port instance and a target port as distinct from internal paths in the fabric network. A fabric network appears to the operating system as an opaque network between the adapter (initiator) and the target.

Because a path is a combination of an adapter and a target port, it is distinct from another path if it is accessed through a different adapter or it is accessing a different target port. Consequently, when switching from one path to another, the driver might be selecting a different adapter (initiator), a different target port, or both.

This is important to the driver when selecting the proper method of failover notification. It can make a difference to the target device, which might have to take different actions when receiving retries of the request from another initiator or on a different port.

PCI Express (PCIe)

A third-generation I/O standard that allows increased network throughput beyond that of the older peripheral component interconnect (PCI) and PCI extended (PCI-x) desktop and server slots.

personality

When used in the context of an adapter, the term *personality* refers to the entire adapter. It includes all the I/O ports and the functions on that adapter. For example, a QLogic adapter can have dual personality, converting from Fibre Channel to Converged Network Adapter or vice versa. Therefore, all the I/O functions and all the I/O physical ports on the adapter changes from Fibre Channel Adapter to Converged Network Adapter.

port

Access points in a device where a link attaches. The most common port types are:

- N_Port—a Fibre Channel port that supports point-to-point topology.
- NL_Port—a Fibre Channel port that supports loop topology.
- F_Port—a port in a fabric where an N_Port can attach.
- FL_Port—a port in a fabric where an NL_Port can attach.

port instance

The number of the port in the system. Each adapter may have one or multiple ports, identified with regard to the adapter as port 0, port 1 and so forth. To avoid confusion when dealing with a system containing numerous ports, each port is assigned a port instance number when the system boots up. So port 0 on an adapter might have a port instance number of 8, for example, if it is the eighth port discovered by the system.

QLflash

The executable file `QLflash.exe` is used by the `UPDATE.BAT` file to update the adapter multiboot code. The application `QLflash.exe` may be used to read, write, or verify either the multiboot image or the NVRAM on the adapter.

QoS

Quality of service. Refers to the methods used to prevent bottlenecks and ensure business continuity when transmitting data over virtual ports by setting priorities and allocating bandwidth.

quality of service

See QoS.

RAID

Redundant array of independent disks. Fault-tolerant disks that look like either single or multiple volumes to the server.

RDP

Read diagnostic parameters. A function that provides diagnostic information about a fiber optic cable and its connection.

Read diagnostic parameters

See RDP.

redundant array of independent disks

See RAID.

SAN

Storage area network. Multiple storage units (disk drives) and servers connected by networking topology.

SCSI

Small computer systems interface. The original SCSI specification was a hardware bus specification and a packet-oriented protocol specification for communicating on that bus. SCSI over Fibre Channel uses the packet-oriented protocol to communicate with storage devices on the Fibre Channel.

small computer systems interface

See SCSI.

storage area network

See SAN.

target

The storage-device endpoint of a SCSI session. Initiators request data from targets (usually disk drives, tape drives, or other media devices). Typically, a SCSI peripheral device is the target but an adapter may, in some cases, be a target. A target can contain many LUNs.

target binding

The process in which the adapter driver binds a target ID using a target's worldwide port name (WWPN) or port ID. This binding enables the target ID to always connect to the WWPN or port ID across reboots regardless of SAN reconfiguration.

UEFI

Unified extensible firmware interface. A specification detailing an interface that helps hand off control of the system for the pre-boot environment (that is, after the system is powered on, but before the operating system starts) to an operating system, such as Windows or Linux. UEFI provides a clean interface between operating systems and platform firmware at boot time, and supports an architecture-independent mechanism for initializing add-in cards.

unified extensible firmware interface

See UEFI.

virtual machine

See VM.

virtual port

See vPort.

VM

Virtual machine. A software implementation of a machine (computer) that executes programs like a real machine.

vPort

Virtual port. A port number or service name associated with one or more virtual servers. A virtual port number should be the same TCP or UDP port number to which client programs expect to connect.

worldwide node name

See WWNN.

worldwide port name

See WWPN.

WWNN

Worldwide node name. A unique 64-bit address assigned to a device.

WWPN

Worldwide port name. A unique 64-bit address assigned to each port on a device. One WWNN may contain multiple WWPN addresses.

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Marvell Technology Group
http://www.marvell.com

Marvell. Moving Forward Faster