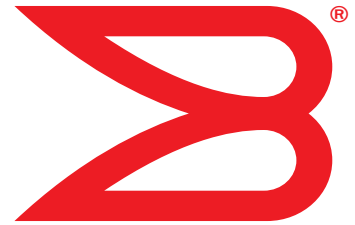


53-1002144-01
5 August 2011



Brocade Adapters

Installation and Reference Manual

Supporting CNA models 1741, 1020, 1010, 1007
Supporting HBA models 825, 815, 804, 425, 415
Supporting Fabric Adapter model 1860

BROCADE

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How this document is organized

This manual provides installation and reference information on Brocade host bus adapters (HBAs), converged network adapters (CNAs), and Fabric Adapters. It is organized to help you find the information that you want as quickly and easily as possible.

The document contains the following components:

- Chapter 1, “Product Overview,” provides a detailed product overview and description. Information on adapter hardware and software compatibility is also included.
- Chapter 2, “Hardware Installation,” provides procedures to install adapter hardware and connect to the fabric or switch. Also included are procedures to verify hardware and software installation.
- Chapter 3, “Software Installation,” provides procedures to install software, such as the Brocade Host Connectivity Manager (HCM) and driver packages. Also included are instructions to verify software and hardware installation. Use this chapter to install software on the host system where you have installed the adapter.
- Chapter 4, “Boot Code,” describes host boot support available on the adapter and provides an introduction to boot over SAN. It also includes procedures to update adapter boot code, configure boot over SAN, and configure fabric-based boot over SAN. Use this chapter when configuring a host to boot its operating system from a boot device located somewhere on the SAN instead of the host’s local disk or direct-attached storage.
- Chapter 5 “Specifications,” includes details on adapter physical characteristics, LED operation, environmental requirements, and power requirements. Also included are Fibre Channel standards, regulatory, and safety compliancy information.

- Appendix A, “Adapter Configuration,” is optional for expert network administrators, who need to modify values for adapter instance-specific persistent and driver-level configuration parameters.
- Appendix B, “List of Acronyms,” provides a list of acronyms used in this publication and their definitions.
- Appendix C, “MIB Reference,” provides information on the MIB groups and objects that support the Simple Network Management Protocol (SNMP) for CNA adapters and Fabric Adapter ports configured in CNA mode.

How to use this document for installing adapters

Figure 1 illustrates a flowchart of how to use chapters in this manual to install and configure adapters.

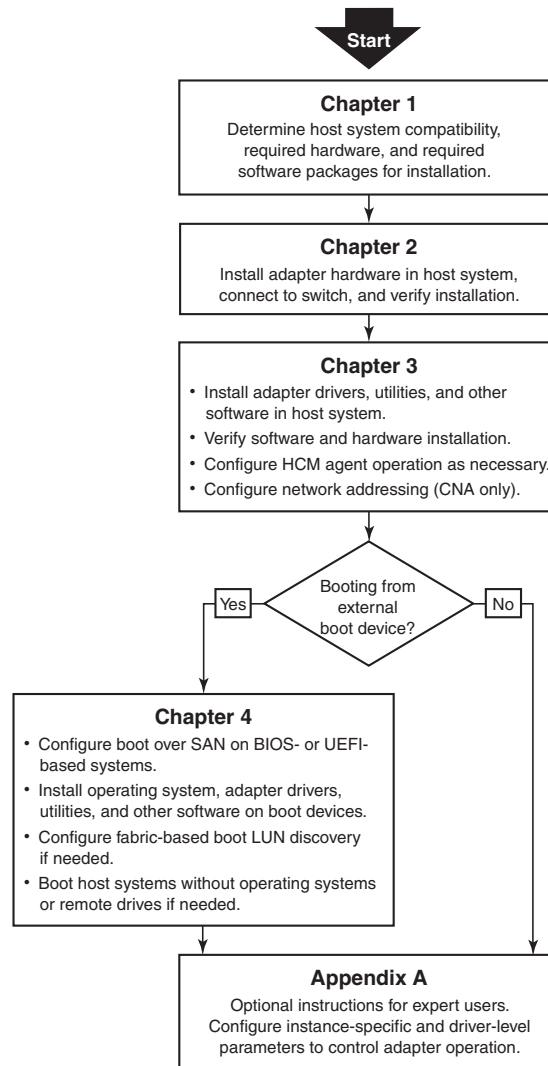


FIGURE 1 Installing adapters using this document

Supported adapter hardware and software

This section provides an overview of Brocade adapter supported hardware and software.

Fabric Adapters

Brocade Fabric Adapter ports can be configured for CNA, NIC, or HBA operation using Brocade Command Utility (BCU) commands. Ports configured in CNA or NIC mode require appropriate 10GbE SFPs or direct-attached SFP+ with copper cables and operate at a 10 Gbps maximum rate. Those configured in HBA mode require appropriate 8 or 16 Gbps Fibre Channel SFPs and operate at an 8 or 16 Gbps maximum rate depending on the installed small form factor pluggable transceiver (SFP+).

The Brocade 1860 is a single or dual-port stand-up adapter that ships in the following configurations.

- Single-port model - 16 Gbps Fibre Channel SFP, 10GbE SFP, or no optics.
- Dual-port model - Two 16 Gbps Fibre Channel, two 10GbE SFPs, or no optics).

Note that although adapters may ship with specific optics (or no optics) installed, you can replace with compatible optics, such as 8 Gbps FC SFPs, long-wave SFPs, and SFP+ direct-attach copper cables. Refer to [“Hardware compatibility”](#) on page 4 for more information.

CNAs

The following Fibre Channel over Ethernet (FCoE) CNAs are supported:

- Brocade 1007. Dual-port mezzanine CNA with a per-port maximum of 10 Gbps. This is an IBM compact form factor horizontal (CFFh) mezzanine-type adapter that installs on supported server blades.
- Brocade 1010. Single-port stand-up CNA with a per-port maximum of 10 Gbps.
- Brocade 1020. Dual-port stand-up CNA with a per-port maximum of 10 Gbps.
- Brocade 1741. Dual-port mezzanine card CNA with a per-port maximum of 10 Gbps. This is a small-form-factor (SFF) mezzanine card that mounts in a Dell blade server.

NOTE

Install only Brocade-branded small form factor pluggables (SFPs) in stand-up CNAs. Mezzanine CNAs do not have SFPs and external port connectors, but utilize internal ports and connections to switch and I/O modules installed in the blade system enclosure.

HBAs

The following Fibre Channel host bus adapters (HBAs) are supported:

- Brocade 415. Single-port stand-up HBA with a per-port maximum of 4 Gbps using a 4 Gbps SFP.
- Brocade 425. Dual-port stand-up HBA with a per-port maximum of 4 Gbps using a 4 Gbps SFP.
- Brocade 804. Dual-port mezzanine HBA with a per-port maximum of 8 Gbps. This HBA installs on Hewlett Packard blade servers that install in supported blade system enclosures.

- Brocade 815. Single-port stand-up HBA with a per-port maximum of 8 Gbps using an 8 Gbps SFP+.
- Brocade 825. Dual-port stand-up HBA with a per-port maximum of 8 Gbps using an 8 Gbps SFP+.

NOTE

Install only Brocade-branded small form factor pluggables (SFPs) in stand-up HBAs. Mezzanine HBAs do not have SFPs and external port connectors, but utilize internal ports and connections to switch and I/O modules installed in the blade system enclosure.

Note the following about HBA support

- This publication only supports the HBA models listed under “HBAs” on page xiv and does not provide information about the Brocade 410 and 420 Fibre Channel HBAs, also known as the Brocade 400 Fibre Channel HBAs.
- Although you can install an 8 Gbps SFP+ into a Brocade 415 or 425 HBA, only 4 Gbps maximum port speed is possible.

Fabric OS and switch support

Brocade adapters support Brocade Fabric OS and switches.

Fabric Adapters

Support for Fabric Adapter ports depend on the following mode (CNA, HBA, or NIC) in which they are configured:

- Ports on Fabric Adapters configured in CNA mode can connect to Fibre Channel SANs and Ethernet data networks through a compatible FCoE switch. These ports can also connect to standard Ethernet LAN switch. For a current list of compatible switches, refer to the latest interoperability matrices on the adapters website at www.brocade.com/adapters.
- Ports configured in HBA mode support Fabric OS and connect to SANs through fabric switches or connect directly to Fibre Channel storage arrays. For a current list of compatible switches, refer to the latest interoperability matrices on the adapters website at www.brocade.com/adapters.
- Ports configured in NIC mode fully support the Ethernet protocol and connect directly to the Ethernet LAN.

CNAs

Brocade CNAs must connect to Fibre Channel SANs and Ethernet data networks through a compatible FCoE switch. For a current list of compatible switches, refer to the latest interoperability matrices on the adapters website at www.brocade.com/adapters.

HBAs

Brocade HBAs connect to Fibre Channel SANs through compatible fabric switches or connect directly to Fibre Channel storage arrays. For a current list of compatible switches, refer to the latest interoperability matrices on the adapters website at www.brocade.com/adapters.

Host operating system support

Refer to “[Host operating system support for adapter drivers](#)” on page xv for information on operating systems that support the Brocade Host Connectivity Manager (HCM), Brocade Command Line Utility (BCU), and adapter drivers.

Host operating system support for adapter drivers

This section lists operating system support for all models of the following types of Brocade adapters:

- Fabric Adapters - Refer to the following subsections depending on your port mode and SFP configurations:
 - “[FCoE support](#)” on page xvi and “[Ethernet support](#)” on page xvi for ports configured in CNA mode.
 - “[Fibre Channel support](#)” on page xv, for ports configured in HBA mode.
 - “[Ethernet support](#)” on page xvi for ports configured in NIC mode.
- CNAs- Refer to the following subsections:
 - “[FCoE support](#)” on page xvi
 - “[Ethernet support](#)” on page xvi.
- HBAs - Refer to “[Fibre Channel support](#)” on page xv.

NOTE

Specific operating system release levels, service pack levels, and other patch requirements are detailed in the current adapter release notes.

NOTE

Also refer to the latest Brocade interoperability matrices on the Brocade website at www.brocade.com/adapters for a list of supported host systems and operating systems.

Fibre Channel support

The following lists operating systems that support Fibre Channel operation for HBAs and for Fabric Adapter ports configured in HBA mode:

- Windows 2003 R2/SP2 (x86 and x64)
- Windows Server 2008 (Longhorn) (x86 and x64)
- Windows Server 2008 R2/SP1 (x64)
- Microsoft Hyper V for Windows 2008 x86, x64
- Windows 7 (x86 and x64)
- Windows Server Core for Windows 2008 (x86 and x64)
- Microsoft WinPE 3.0 for Windows 2008 (x86 and x64)
- Linux RHEL4.9, 5.5, 5.6, 6.0, 6.1
- Linux SLES 10 and 11 (x86 and x64)

- Solaris 10 (x86, x64, and SPARC)

NOTE

Solaris is not supported on Brocade 804 or 1007 adapters.

- VMware ESX Server 4.0, 4.1, 5.0 (x64)

NOTE

Drivers and BCU are supported on the VMware ESX platforms. HCM is supported only on the guest system on VMware.

- Oracle Enterprise Linux (OEL) 5.6, 6.0 (x86 and x64), Oracle VM 3.0

FCoE support

The following lists operating systems that support FCoE operation for Brocade CNAs and Fabric Adaptor ports configured in CNA mode:

- Windows Server 2008 (x86 and x64)
- Windows Server 2008 R2/SP1 (x64)
- Microsoft Hyper V for Windows 2008 x86, x64
- Windows 7 (x86 and x64)
- Windows Server Core for Windows 2008 (x86 and x64)
- Microsoft WinPE 3.0 for Windows 2008 (x86 and x64)
- Linux RHEL 4.9, 5.5, 5.6, 6.0, 6.1 (x86 and x64)
- Linux SLES 10 and 11 (x86 and x64)
- Solaris 10 (x86, x64, and SPARC)

NOTE

Solaris is not supported on Brocade 804 or 1007 adapters.

- VMware ESX Server 4.0, 4.1, 5.0 (x64)

NOTE

Drivers and BCU are supported on the VMware ESX platforms. HCM is supported only on the guest system on VMware.

- Oracle Enterprise Linux (OEL) 5.6, 6.0 (x86 and x64)0

Ethernet support

The following lists operating systems that support Ethernet operation for Brocade CNAs and Fabric Adaptor ports configured in CNA or NIC modes:

- Windows Server 2008 (x86 and x64)
- Windows 2008 R2/SP1 (x64)
- Windows Server Core for Windows 2008 (x86 and x64)
- Windows 7 (x86 and x64)
- Microsoft WinPE 3.0 for Windows 2008 (x86 and x64)

- Linux RHEL 4.9, 5.5, 5.6, 6.0, 6.1 (x86 and x64)
- Linux SLES 10 and 11 (x86 and x64)
- Solaris 10 (x86, x64, and SPARC)

NOTE

Solaris is not supported on Brocade 804 or 1007 adapters.

- Xen Hypervisor (x86 and x64)
Refer to “[Hypervisor support](#)” on page xvii.
- VMware ESX Server 4.0, 4.1, and 5.0 (x64)

NOTE

Drivers and BCU are supported on the VMware ESX platforms. HCM is supported only on the guest system on VMware. Network drivers are not supported on IA-64 systems.

- Oracle Enterprise Linux (OEL) 5.6, 6.0 (x86 and x64)

Hypervisor support

The following lists operating systems that support hypervisor operation for Brocade adapters:

- Windows Server 2008 Hyper-V (x64)
- Linux RHEVH 6.x (x64)
- Linux XEN (x86 and x64)
- Linux KVM (x64)
- VMware ESX 4.0, 4.1, and 5.0 (x64)
- Oracle VM 3.0 (x64)
- Citrix XenServer 6.0 (x64)

Host operating system support for HCM

The following operating systems support HCM management for adapters.

- Windows Server 2008 (x86 and x64)
- Windows Server 2008 R2/SP1 (x86 and x64)
- Windows SBS 2011 (x64)
- Windows XP
- Windows Vista
- Windows 7 SP1 (x86 and x64)
- Linux 5.5, 5.6, 6.0, 6.1 (x86 and x64)

NOTE

HCM is a 32-bit application. To use HCM on Linux RHEL 6.0 x64 systems, you must install the x32-compatible libraries because they are not installed by default.

- Linux SLES 10 and 11 (x86 and x64)

- Solaris 11, except Open Solaris (x86, x64, and SPARC)
- VMware ESX Server 4.0, 4.1, 5.0 (x64)

NOTE

HCM is not supported in ESXi systems.

NOTE

HCM is supported only on the guest operating system for VMware.

- Oracle Enterprise Linux (OEL) 5.6, 6.0 (x86 and x64)

NOTE

Specific operating system service patch levels and other patch requirements are detailed in the current release notes for your adapter software version.

What's new in this document

This document adds details on adapter software release 3.0 and the Brocade 1860 Fabric Adapter. For further information about new features not covered in this document and documentation updates, refer to the release notes for your adapter software version.

Document conventions

This section describes text formatting conventions and important notice formats used in this document.

Text formatting

The narrative-text formatting conventions that are used are as follows:

bold text	Identifies command names Identifies the names of user-manipulated GUI elements Identifies keywords and operands Identifies text to enter at the GUI or CLI
<i>italic text</i>	Provides emphasis Identifies variables Identifies paths and Internet addresses Identifies document titles
<code>code text</code>	Identifies CLI output Identifies command syntax examples

For readability, command names in the narrative portions of this guide are presented in mixed lettercase: for example, **switchShow**. In actual examples, command lettercase is often all lowercase.

Command syntax conventions

Command syntax in this manual follows these conventions:

command	Commands are printed in bold.
-- option, option	Command options are printed in bold.
- argument , arg	Arguments.
[]	Optional element.
<i>variable</i>	Variables are printed in italics. In the help pages, values are <u>underlined</u> or enclosed in angled brackets < >.
...	Repeat the previous element, for example “member[;member...]”
value	Fixed values following arguments are printed in plain font. For example, -- show WWN
	Boolean. Elements are exclusive. Example: -- show -mode egress ingress

Command examples

This book describes how to perform configuration tasks using the Fabric OS command line interface and the BCU interface, but does not describe the commands in detail. For complete descriptions of all commands, including syntax, operand description, and sample output, see the *Brocade Fabric OS Command Reference Manual* and *Brocade Adapters Administrator's Guide*.

Notes, cautions, and warnings

The following notices and statements are used in this manual. They are listed below in order of increasing severity of potential hazards.

NOTE

A note provides a tip, guidance, or advice, emphasizes important information, or provides a reference to related information.

ATTENTION

An Attention statement indicates potential damage to hardware or data.



CAUTION

A Caution statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.



DANGER

A Danger statement indicates conditions or situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these conditions or situations.

Key terms

For definitions specific to Brocade and Fibre Channel, see the technical glossaries by logging into <http://my.brocade.com>.

For definitions specific to this document, see [Appendix C, “List of Acronyms”](#).

For definitions of SAN-specific terms, visit the Storage Networking Industry Association online dictionary at:

<http://www.snia.org/education/dictionary>

Notice to the reader

This document may contain references to the trademarks of the following corporations. These trademarks are the properties of their respective companies and corporations.

These references are made for informational purposes only.

Corporation	Referenced Trademarks and Products
Microsoft Corporation	Windows, Windows Server 2003, Windows Server 2008, Vista, XP, PE for Windows, Hyper V for Windows, Windows Automated Installation Kit (WAIK), and Windows 7
Oracle Corporation	Solaris
Red Hat Inc.	Red Hat Enterprise Linux (RHEL)
Novell, Inc.	SUSE Linux Enterprise Server (SLES)
VMware Inc.	ESX Server
SPARC International, Inc.	SPARC
Hewlett Packard Corp.	BladeSystem
IBM	BladeCenter
Dell	PowerEdge

Additional information

This section lists additional Brocade and industry-specific documentation that you might find helpful.

Brocade resources

To get up-to-the-minute information, go to <http://my.brocade.com> to register at no cost for a user ID and password. A variety of resources for Brocade products is available.

Adapters

For adapter resources, such as product information, software, firmware, and documentation, visit the adapters website www.brocade.com/adapters.

For additional information on Brocade adapters, refer to the following publications:

- *The Brocade Quick Installation Guide* (provided with your adapter model).
- *Brocade Adapters Troubleshooting Guide*
- *Brocade Adapters Administrator's Guide*
- *CIM Provider for Brocade Adapters Installation Guide*

FCoE Switch

For information on the Brocade FCoE Switch for connecting stand-up CNAs and Fabric Adapter ports configured in CNA mode, refer to the following publications:

- *Brocade 8000 Hardware Reference Manual*
- *WebTools Administrator's Guide*
- *EZSwitchSetup Administrator's Guide*
- *Fabric OS Command Reference Manual*

Blade servers and blade system enclosure components

The Brocade mezzanine card adapters are compatible with blade servers, switch modules, interconnect modules, I/O modules, and other components that install in supported blade system enclosures. For compatibility information, visit the compatible blade server and blade system enclosure manufacturer's website. Also refer to "[Hardware compatibility](#)" on page 10.

SAN information

White papers, online demonstrations, and data sheets are available through the Brocade website at:

<http://www.brocade.com/products-solutions/products/index.page>

For additional Brocade documentation, visit the Brocade website:

<http://www.brocade.com>

Other industry resources

For additional resource information, visit the Technical Committee T11 website. This website provides interface standards for high-performance and mass storage applications for Fibre Channel, storage management, and other applications:

<http://www.t11.org>

For information about the Fibre Channel industry, visit the Fibre Channel Industry Association website:

<http://www.fibrechannel.org>

Providing details for support

Contact your Brocade adapter support supplier for hardware, firmware, and software support, including product repairs and part ordering. Provide the following information:

1. General information:

- Brocade adapter model number.
- Host operating system version.
- Software name and software version, if applicable.
- syslog message logs
- Support Save output

To expedite your support call, use the Support Save feature to collect debug information from the driver, internal libraries, and firmware. You can save valuable information to your local file system and send it to support personnel for further investigation. For details on using this feature, refer to [“Support Save overview”](#) on page xxiv.

- Detailed description of the problem, including the switch or fabric behavior immediately following the problem, and specific questions.
- Description of any troubleshooting steps already performed and the results.

2. Adapter serial number:

The adapter serial number and corresponding bar code are provided on the serial number label illustrated below. This label is located on the adapter card.



You can also display the serial number through the following HCM dialog boxes and BCU commands:

- Adapter **Properties** tab in HCM.
Select an adapter in the device tree, then click the **Properties** tab in the right pane.
- **BCU adapter –list** command.
This command lists all Brocade adapters in the system and information such as model and serial numbers.

3. Port World-Wide Name (PWWN).

Determine the PWWN through the following resources:

- Label on the adapter card contains the PWWN for each port.
- Brocade BIOS Configuration Utility.
Select the appropriate adapter port from the initial configuration utility screen, then select **Adapter Settings** to display the WNN and PWWN for the port. For details, refer to [“Configuring BIOS using the Brocade configuration utility”](#) on page 136.
- Port **Properties** tab in HCM.
Select a port for a specific adapter in the device tree, then click the **Properties** tab in the right pane.

- The following BCU commands:

Command	Function
port –query <i>port_id</i>	Displays port information, including the PWWN for the FCoE port. The <port_id> parameter is the port number.
port –list	Lists all the physical ports on the adapter along with their basic attributes, such as the PWWN.

4. Media access control (MAC) addresses. These are applicable to CNAs and Fabric Adapter ports configured in CNA mode only.

The MAC address can be found in HCM by selecting the adapter in the device tree and clicking the **Properties** tab in the right pane to display the adapter **Properties** panel. Look for the **MAC Address** field.

Each port has a “burned-in” local port MAC address. This is the source MAC for LLDP communications between the adapter and FCoE switch. To find this MAC address, select a DCB port in the HCM device tree, then click the **Properties** tab in the right pane to display the port **Properties** panel. Look for the **Local port MAC** field.

The Ethernet MAC address is used for normal Ethernet operations. To find this MAC address using HCM, select an Ethernet port in the HCM device tree, then click the **Properties** tab in the right pane to display the port **Properties** panel. Look for the **Current MAC address** and **Factory MAC address** fields.

Each node logging in to the fabric through a local adapter port is assigned a MAC address during FCoE Initialization Protocol (FIP) operations. This MAC is assigned for the current FCoE communication only. To find this MAC address, perform one of the following tasks:

- Select an FCoE port in the HCM device tree, then click the **Properties** tab in the right pane to display the port **Properties** panel. Look for the **FCoE MAC** field.
- Enter the **port –query** *port_id* BCU command. Look for the FCoE MAC.

NOTE

MAC addresses assigned during FCoE initialization operations cannot be changed using device management applications.

The FCoE Forwarder (FCF) MAC address is the address of the attached FCoE switch. Select an FCoE port in the HCM device tree, then click the **Properties** tab in the right pane to display the port **Properties** panel. Look for the **FCF MAC** field.

You can also determine port MAC addresses using the following BCU commands:

Command	Function
port –query <i>port_id</i>	Displays port information, including the MAC addresses. The <port_id> parameter is the port number.
port –list	Lists all the physical ports on the CNA along with the adapter, Ethernet, and FCoE MAC addresses.

NOTE

For details on using HCM and BCU commands, refer to the *Brocade Adapters Administrator's Guide*.

Support Save overview

The Support Save feature is an important tool for collecting debug information from the driver, internal libraries, and firmware. You can save this information to the local file system and send it to support personnel for further investigation. Use one of the following options to launch this feature:

- In HCM, launch Support Save through the **Tools** menu.
- In Management applications, use the **Technical SupportSave** dialog box.
- For BCU, enter the **bfa_supportsave** command.

NOTE

For VMware ESX 5.0 and later systems, BCU commands are integrated with the esxcli infrastructure. To initiate the BCU supportsave command, enter **esxcli brocade supportsave** on the ESX system.

- Through your internet browser (Internet Explorer 6 or later or Firefox 2.0 or later), you can collect Support Save output if you do not have root access, do not have access to file transfer methods such as File Transfer Protocol (FTP) and Secure Copy (SCP), or do not have access to the Host Connectivity Manager (HCM).
- A Support Save collection can also occur automatically for a port crash event.

Launching Support Save through BCU, HCM, and during a port crash event saves the following information:

- Adapter model and serial number
- Adapter firmware version
- Host model and hardware revision
- All support information
- Adapter configuration data
- All operating system and adapter information needed to diagnose field issues
- Information about all adapters in the system
- Firmware and driver traces
- Syslog message logs
- Windows System Event log .evt file
- HCM GUI-related engineering logs
- Events
- Adapter configuration data
- Environment information
- Data .xml file
- Vital CPU, memory, network resources
- HCM Agent (logs, configuration)
- Driver logs

- Install logs
- Core files
- Details on the CNA or Fabric Adapter Ethernet interface, including IP address and mask.
- Status and states of all adapter ports, including the Ethernet, FCoE, and DCB ports on CNAs and Fabric Adapters.
- DCB status and statistics for CNAs and Fabric Adapters
- Network driver information, Ethernet statistics, offload parameters, and flow control coalesce parameters for CNAs and Fabric Adapters.
- Ethernet offload and flow control parameters for CNAs and Fabric Adapters.

NOTE

Before collecting data through the Support Save feature, you may want to disable auto-recovery on the host system. When adapters are reset after an auto-recovery from a failure, traces initiated before the failure may be lost or overwritten.

To disable auto-recovery, use the following commands:

- For Linux, use the following commands, then reboot the system:
 - To disable auto-recovery for the network (BNA) driver.


```
insmod bna.o bnad_ioc_auto_recover=0
```
 - To disable auto-recovery for the storage (BFA) driver.


```
insmod bfa.o ioc_auto_recover=0
```
- For VMware, use the following commands.
 - To unload and load the network (BNA) driver with IOC auto-recovery disabled, use the following commands:


```
esxcfg-module -u bna
esxcfg-module bna bnad_ioc_auto_recover=0
```
 - To disable IOC auto-recovery for the network (BNA) driver across reboots, use the following command:


```
esxcfg-module -s "bnad_ioc_auto_recover=0" bna
```
 - To disable IOC auto-recovery for the storage (BFA) driver across reboots, use the following command:


```
esxcfg-module -s "ioc_auto_recover=0" bfa
```
- For Windows use the Registry Edit tool (regedt32) or the BCU **drvconf --key** command. Following is the **drvconf --key** command:


```
bcu drvconf --key ioc_auto_recover --val 0
```
- For Solaris, edit /kernel/drv/bfa.conf using the following command:


```
ioc-auto-recover=0
```

NOTE

Brocade 804 and 1007 adapters are not supported on Solaris systems.

Initiating Support Save through HCM

Launching the Support Save feature in HCM collects HCM application data. Launch Support Save by selecting **Tools > Support Save**.

Messages display during the Support Save operation that provide the location of the directory where data is saved. If you are initiating Support Save from a remote management station and receive a warning message that support files and Agent logs could not be collected, the HCM Agent is unavailable on the remote host. Select **Tools > Backup** to back up data and configuration files manually.

For more information and additional options for using this feature, refer to the *Brocade Adapters Administrator's Guide*.

Initiating Support Save through BCU commands

Use the **bfa_supportsave** command to Initiate Support Save through the BCU:

- **bfa_supportsave** -
 - Creates and saves the supportsave output under the /tmp directory on Linux and Solaris systems.
 - Creates and saves the supportsave output under the current directory for Windows systems.
- **bfa_supportsave <dir>** - Creates and saves the supportsave output under a directory name that you provide.
- **bfa_supportsave <dir> <ss_file_name>** - Creates and saves the supportsave output under a directory and file name that you provide. If the directory already exists, it will be overwritten.

NOTE

If specifying a directory, make sure that the directory does not already exist to prevent overwriting the directory. Do not just specify a drive (such as C:) or C:\Program Files.

Messages display as the system gathers information. When complete, an output file and directory display. The directory name specifies the date when the file was saved.

For more information on the **bfa_supportsave** command, refer to the *Host Connectivity Manager (HCM) Administrator's Guide*.

VMware ESX systems

For VMware ESX 5.0 and later systems, BCU commands are integrated with the esxcli infrastructure. To initiate the BCU supportsave command, enter **esxcli brocade supportsave** to initiate Support Save:

Initiating Support Save through the internet browser

Initiate **bfa_supportsave** through an internet browser.

1. Open an internet browser and type the following URL:

```
https://localhost:34568/JSONRPCServiceApp/SupportSaveController.do
```

In this URL, localhost is the IP address of the server from which you want to collect the **bfa_supportsave** information.

2. Log in using the factory default user name (admin) and password (password). Use the current user name and password if they have changed from the default.

The **File Download** dialog box displays, prompting you to save the `SupportSaveController.do` file.

3. Click **Save** and navigate to the location where you want to save the file.
4. Save the file, but rename it with a “zip” extension. For example:
`supportSaveController.zip`.
5. Open the file and extract contents using any compression utility program.

Initiating Support Save through a port crash event

If the port crashes and triggers a port crash event, Support Save data is collected at a system-wide level. An Application Log message is generated with the following message:

```
Port Crash Support Save Completed
```

Port crash events have a CRITICAL severity and you can view the details in the Master Log and Application Log tables in HCM.

Support Save differences

Following are differences in data collection for the HCM, BCU, and browser applications of **bfa_supportsave**:

- BCU - Collects driver-related logs, HCM Agent information, and configuration files.
- Browser - Collects driver-related and HCM Agent logs and configuration files.
- HCM - Collects HCM application data, driver information, HCM Agent logs, and configuration files.

NOTE

Master and Application logs are saved when Support Save is initiated through HCM, but not through BCU.

Document feedback

Quality is our first concern at Brocade and we have made every effort to ensure the accuracy and completeness of this document. However, if you find an error or an omission, or you think that a topic needs further development, we want to hear from you. Forward your feedback to:

documentation@brocade.com

Provide the title and version number of the document and as much detail as possible about your comment, including the topic heading and page number and your suggestions for improvement.

Product Overview

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Fabric Adapters

The Brocade 1860 stand-up Fabric Adapter is a low-profile MD2 form factor PCI Express (PCIe) card that installs in standard host computer systems. [Figure 2](#) illustrates major components of the dual-port Brocade 1860 Fabric Adapter. Brocade 1860 single or dual-port adapter models can ship with the following configurations of small form factor pluggable (SFP) transceivers:

- Single-port model - 16 Gbps Fibre Channel SFP+, 10GbE SFP+, or without optics.
- Dual-port model - Two 16 Gbps Fibre Channel SFP+, two 10GbE SFP+, or without optics.

Although adapters may ship with specific optics (or no optics) installed, you can replace with compatible optics, such as 8 Gbps FC SFPs, long-wave SFPs, and SFP+ direct-attach copper cables. Refer to [“Hardware compatibility”](#) on page 4 for more information.

Please note that the following illustration is representative and may have minor physical differences from the card that you purchased.

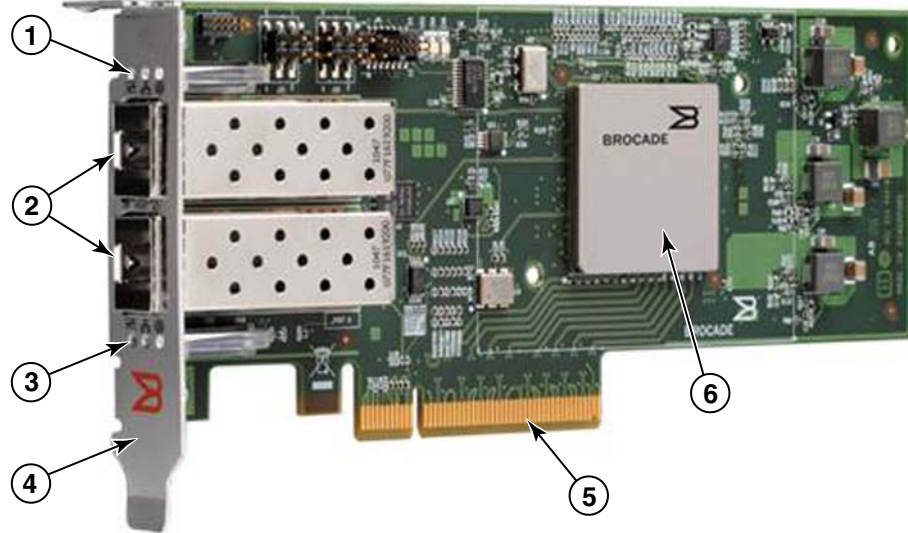


FIGURE 2 Brocade 1860 Fabric Adapter (heat sink removed)

- 1 LEDs for port 1 SFP
- 2 Cable connectors for port 1 and port 0 SFPs (Fiber optic SFP illustrated)
- 3 LEDs for port 0 SFP
- 4 Low-profile mounting bracket.
Note: The adapter ships with the standard (full-height) mounting bracket installed.
- 5 PCIe x8 connector
- 6 ASIC

ATTENTION

Only use Brocade-branded SFP+ laser transceivers supplied with stand-up Fabric Adapters.

AnyIO technology

Although the Brocade 1860 can be shipped in a variety of SFP configurations, you can change port function to the following modes using the Brocade AnyIO technology, provided the correct SFP is installed for the port:

- **HBA or Fibre Channel mode.** This mode utilizes the Brocade Fibre Channel storage driver. An 8 or 16 Gbps Fibre Channel SFP can be installed for the port. The port provides Host Bus Adapter (HBA) functions on a single port so that you can connect your host system to devices on the Fibre Channel SAN. Ports with 8 Gbps SFPs configured in HBA mode can operate at 2, 4, or 8 Gbps. Ports with 16 Gbps SFPs configured in HBA mode can operate at 4, 8, or 16 Gbps.

Fabric Adapter ports set in HBA mode appear as “FC” ports when discovered in HCM. They appear as “FC HBA” to the operating system.

NOTE

Fibre Channel mode and HBA mode may be used interchangeably in this document.

- **Ethernet or NIC mode.** This mode utilizes the Brocade network driver. A 10 GbE SFP or direct attached SFP+ copper cable must be installed for the port. This mode supports basic Ethernet, Data Center Bridging (DCB), and other protocols that operate over DCB to provide functions on a single port that are traditionally provided by an Ethernet Network Interface Card (NIC). Ports configured in this mode can operate up to 10 Gbps. Fabric Adapters that ship from the factory with 10GbE SFPs installed or no SFPs installed are configured for Ethernet mode by default.
Fabric Adapter ports set in NIC mode appear as Ethernet ports when discovered in HCM. These ports appear as “10 GbE NIC” to the operating system.

NOTE

Ethernet and NIC mode may be used interchangeably in this document.

- **CNA mode.** This mode provides all functions of Ethernet or NIC mode, plus adds support for FCoE features by utilizing the Brocade FCoE storage driver. A 10 GbE SFP or direct attached SFP+ copper cable must be installed for the port. Ports configured in CNA mode connect to an FCoE switch. These ports provide all traditional CNA functions for allowing Fibre Channel traffic to converge onto 10 Gbps DCB networks. The ports even appear as network interface controllers (NICs) and Fibre Channel adapters to the host. FCoE and 10 Gbps DBS operations run simultaneously.
Fabric Adapter ports set CNA mode appear as FCoE ports when discovered in HCM. These ports appear as “10 GbE NIC” to the operating system.

Changing the port mode

You can change the mode of individual ports on an adapter using the following BCU commands:

- The **bcu port –mode** command allows you can change the mode of individual ports on the adapter.
- The **bcu adapter –mode** command allows you can change all ports on the adapter to a specific mode.

For more information on these commands, refer to the *Brocade Adapters Administrator’s Guide*.

As general steps to change a port’s operating mode, perform the following steps:

1. Change the mode using the **bcu port –mode** or **bcu adapter –mode** BCU commands.
2. Make sure the appropriate SFP (FC or 10 GbE) and driver packages are installed to operate the port in the selected mode if they are not already installed. Refer to [Table 9](#) on page 44 for information on drivers.
3. Power-cycle the host system.

Dynamically changing the port mode is equivalent to plugging in a new device in the system. so the system must be power-cycled for this configuration change to take effect.

NOTE

For Windows systems you must install the drivers for the new mode after the system is rebooted. This is not required if the appropriate driver is already pre-installed in the system.

When you change the port mode, the port resets to factory defaults for physical functions (PF) associated with the mode (refer to “[Factory default PF configurations](#)” on page 16). For details on configuring ports for different operating modes, refer to the *Brocade Adapters Administrator’s Guide*.

Hardware compatibility

This section outlines important compatibility information.

SFP transceivers

Use only the Brocade-branded small form factor pluggable (SFP) transceivers described in this section for stand-up Brocade Fabric Adapters.

Ports configured in CNA or NIC mode

Table 1 provides the type, description, and switch compatibility information for supported SFPs that can be installed in ports configured in CNA or NIC mode.

TABLE 1 Compatible SFPs for ports configured in CNA or NIC mode

Type	Description	Switch Compatibility
10 Gbps SR (short range) SFP+, 1490 NM	Optical short range SFP+ for Distance depends on cable type. Refer to “Cabling” on page 176.	Any switch compatible with the adapter
10 Gbps LR (long range) SFP+, 10 km. 1310 NM	Optical long range SFP+ for fiber optic cable 10 km (6.2 mi.)	Any switch compatible with the adapter
1 meter direct-attached SFP+ copper cable	SFP+ for 1-meter (3.2 feet) maximum twinaxial copper cable	Any switch compatible with the cable.
3 meter direct-attached SFP+ copper cable	SFP+ for 3-meter maximum twinaxial copper cable (9.8 feet)	Any switch compatible with the cable.
5 meter direct-attached SFP+ copper cable	SFP+ for 5-meter maximum twinaxial copper cable (16.4 feet)	Any switch compatible with the cable.

Ports configured in HBA mode

Table 2 provides the type, description, and switch compatibility information for supported SFPs that can be installed in ports configured in HBA mode.

TABLE 2 Compatible SFPs for ports configured in HBA mode

Type	Description	Switch Compatibility
8 Gbps SWL (short wave laser) SFP+	SFP+ for fiber optic cable Distance depends on cable type. Refer to “Cabling” on page 176.	Any switch compatible with the adapter
8 Gbps LWL (long wave laser) 10 km SFP+	SFP+ for fiber optic cable Distance depends on cable type. Refer to “Cabling” on page 176.	Any switch compatible with the adapter

TABLE 2 Compatible SFPs for ports configured in HBA mode

Type	Description	Switch Compatibility
16 Gbps SWL (short wave laser) SFP+	SFP+ for fiber optic cable Distance depends on cable type. Refer to “Cabling” on page 176.	Any switch compatible with the adapter
16 Gbps LWL (long wave laser) 10 km SFP+	SFP+ for fiber optic cable Distance depends on cable type. Refer to “Cabling” on page 176.	Any switch compatible with the adapter

PCI express connections

Brocade Fabric Adapters are compatible with PCI express (PCIe) connections that have the following specifications:

- x8 lane or greater transfer interface.
- Gen1 (PCI Base Specification 1.0, 1.01a, and 1.1).
- Gen2 (PCI Express Base Specification 2.0).
- Gen 3 (PCI Express Base Specification 3.0)

NOTE

Install adapters in PCI express connectors with an x8 lane transfer interface or greater for best performance. You cannot install Fabric Adapters in PCI or PCI-X connectors.

Host systems and switches

For a current list of switches, servers, and applications compatible with Brocade stand-up adapters, refer to the latest interoperability matrixes on Brocade’s website at www.brocade.com/adapters.

Storage systems

Using Fabric Adapter ports configured in HBA mode, you can connect a server (host system) to a Fibre Channel SAN in a switched fabric and point-to-point topology or directly to a storage array in a point-to-point topology.

Using Fabric Adapter ports configured in CNA mode, you can connect a server (host system) to a Fibre Channel SAN through connection with a compatible FCoE switch.

Refer to the latest Brocade interoperability matrices for a list of supported server models on Brocade’s website at www.brocade.com/adapters.

Converged network adapters

Table 3 describes available Brocade FCoE PCIe Converged Network Adapters (CNAs) for PCIe x8 host bus interfaces, hereafter referred to as Brocade CNAs. These adapters provide reliable, high-performance host connectivity for mission-critical SAN environments. Provided in the table are the model number, port speed, number of ports, and adapter type for each CNA.

1 Converged network adapters

TABLE 3 Brocade Fibre Channel CNAs

Model Number	Port Speed	Number of Ports	Adapter Type
1007	10 Gbps maximum	2	Mezzanine
1020	10 Gbps maximum	2	Stand-up
1010	10 Gbps maximum	1	Stand-up
1741	10 Gbps maximum	2	Mezzanine

Two types of CNAs are available:

- Stand-up adapters.
These are low-profile MD2 form factor PCI Express (PCIe) cards, measuring 6.6 in. by 2.714 in. (16.765 cm by 6.89 cm) that install in PCIe connectors in standard host systems.
- Mezzanine adapters.
These are smaller cards that mount on server blades that install in blade system enclosures. The enclosures contain other system blades, such as switch and pass-through modules.

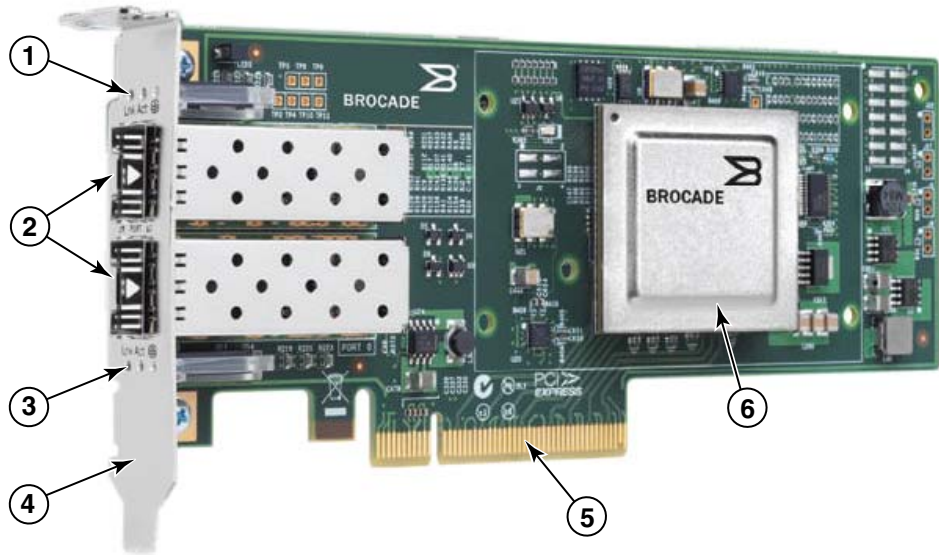
CNA ports connect to an FCoE switch. CNAs combine the functions of a Host Bus Adapter (HBA) and Network Interface Card (NIC) on one PCIe x8 card. The CNAs even appear as network interface controllers (NICs) and Fibre Channel adapters to the host. These CNAs fully support FCoE protocols and allow Fibre Channel traffic to converge onto 10 Gbps Data Center Bridging (DCB) networks. FCoE and 10 Gbps DCB operations run simultaneously.

The combined high performance and proven reliability of a single-ASIC design makes these CNAs ideal for connecting host systems on Ethernet networks to SAN fabrics based on Brocade Fabric or M-Enterprise operating systems.

Stand-up adapters

Stand-up type CNAs, such as the 1010 and 1020, are low-profile MD2 form factor PCI Express (PCIe) cards that install in standard host computer systems. [Figure 3](#) on page 7 illustrates major components of the Brocade 1020 stand-up CNA with two fiber optic small form factor pluggable (SFP) transceivers installed. Both stand-up CNAs also support direct-attached SFP+ copper cables.

Please note that the following illustration is representative and may have minor physical differences from the card that you purchased.



Note: This photo illustrates parts location only. The CNA may not look exactly like your model.

- 1 LEDs for port 1 SFP
- 2 Cable connectors for port 1 and port 0 SFPs (Fiber optic SFP illustrated)
- 3 LEDs for port 0 SFP
- 4 Low-profile mounting bracket.
Note: The CNA ships with the low-profile mounting bracket installed.
- 5 PCIe x8 connector
- 6 ASIC

FIGURE 3 Brocade 1020 stand-up CNA with low-profile mounting bracket (heat sink removed)

ATTENTION

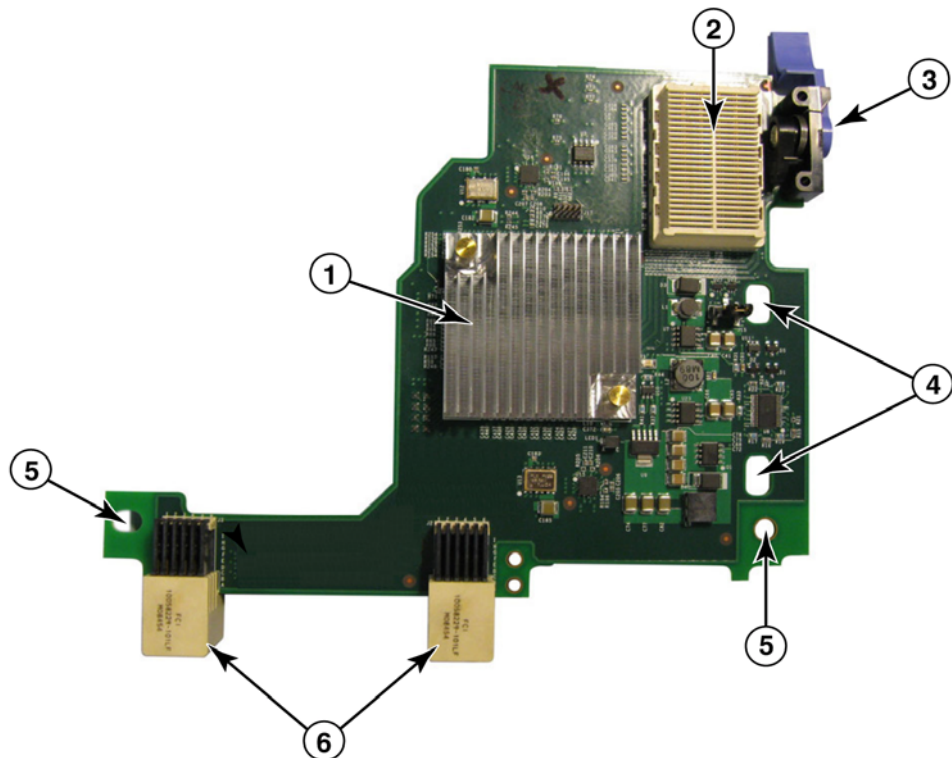
Only use Brocade-branded SFP+ laser transceivers supplied with stand-up CNAs.

Mezzanine adapters

Mezzanine adapters are smaller modules than stand-up models. These mount on server blades that install in blade system enclosures.

1007

Figure 4 illustrates major components of the Brocade 1007, which is an IBM combo form factor horizontal (CFFh) CNA containing two ports operating at 10 Gbps. Please note that the following illustration is representative and may have minor physical differences from the card that you purchased.



- 1 ASIC with heat sink
- 2 x8 PCIe interface connector.
- 3 Release lever. Pull to release adapter from blade server.
- 4 Holes for guiding card onto blade server system board mounting posts.
- 5 Holes for guiding card onto blade server system board mounting posts.
- 6 Midplane connectors

FIGURE 4 Brocade 1007 CNA

NOTE

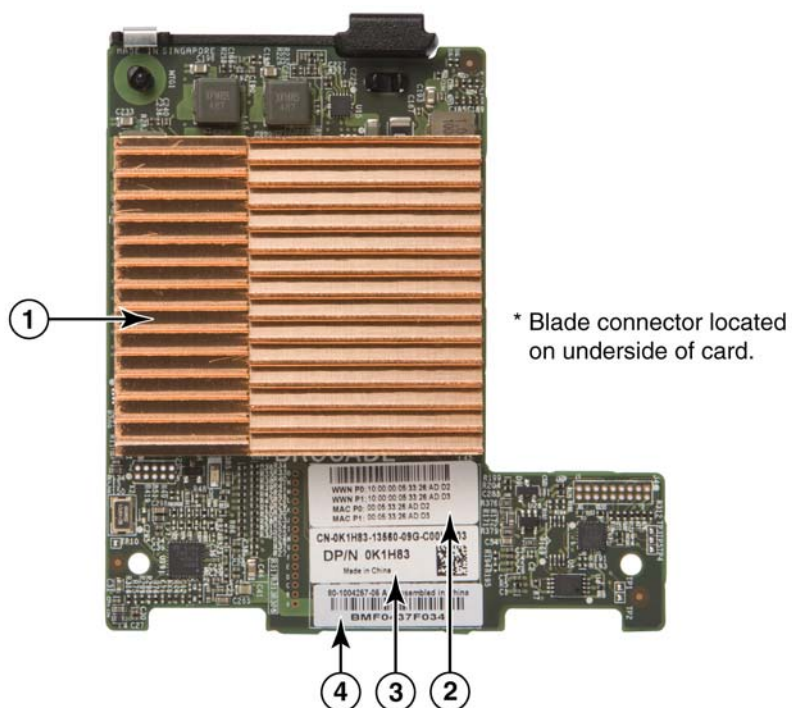
Labels showing the part number, PWWNs, port MAC addresses, model number, and serial number for the Brocade 1007 CNA are on the reverse (top) side of the card.

The Brocade 1007 mounts on a server blade that installs in an IBM BladeCenter® enclosure. The adapter uses FCoE to converge standard data and storage networking data onto a shared Ethernet link. Ethernet and Fibre Channel communications are routed through the DCB ports on the adapter to the blade system enclosure midplane, and then onto switch modules installed in the enclosure.

For information on installing the Brocade 1007 CNA on a server blade, refer to [Chapter 2, “Hardware Installation”](#). For additional information related to the supported blade server, blade system enclosure, and other devices installed in the enclosure such as I/O modules and switch modules, refer to the installation instructions provided with these products.

1741

The Brocade® BR1741M-k 2P Mezz Card, also known as the Brocade 1741 mezzanine card, is small-form factor (SFF) mezzanine card containing two ports operating at 10 Gbps that mounts on a Dell blade server. [Figure 5](#) illustrates major components of the 1741 adapter. Please note that the following illustration is representative and may have minor physical differences from the card that you purchased.



- 1 ASIC with heat sink
- 2 Port WWN and MAC address label
- 3 OEM PPID and part number label
- 4 Brocade serial number label

FIGURE 5 Brocade 1741 mezzanine card

1 Converged network adapters

The Brocade 1741 mounts on supported blade servers that install in Dell™ PowerEdge™ M1000e modular blade systems. It is used in conjunction with matching I/O modules, also installed in the blade enclosure. The adapter uses FCoE to converge standard data and storage networking data onto a shared Ethernet link. Ethernet and Fibre Channel communications are routed through the DCB ports on the adapter to the enclosure backplane then to the I/O module.

For information on installing the Brocade 1741 CNA on a blade server, refer to [Chapter 2, “Hardware Installation”](#). For additional information related to the supported server blade, blade enclosure, and other devices installed in the enclosure such as I/O and switch modules, refer to the installation instructions provided with these products.

Hardware compatibility

This section outlines important compatibility information.

SFP transceivers (stand-up adapters)

Use only the Brocade-branded small form factor pluggable (SFP) transceivers described in [Table 4](#) in Brocade stand-up CNAs. The table provides the type, description, and switch compatibility information for supported SFPs.

TABLE 4 Compatible SFPs for Brocade stand-up CNAs

10 Gbps SR (short range) SFP+, 1490 NM	Optical short range SFP+ for Distance depends on cable type. Refer to “ Cabling (stand-up adapters) ” on page 183.	Any switch compatible with the adapter
10 Gbps LR (long range) SFP+, 10 km, 1310 NM	Optical long range SFP+ for fiber optic cable 10 km (6.2 mi.)	Any switch compatible with the adapter
1 meter direct-attached SFP+ copper cable	SFP+ for 1-meter (3.2 feet) maximum twinaxial copper cable	Any switch compatible with the cable.
3 meter direct-attached SFP+ copper cable	SFP+ for 3-meter maximum twinaxial copper cable (9.8 feet)	Any switch compatible with the cable.
5 meter direct-attached SFP+ copper cable	SFP+ for 5-meter maximum twinaxial copper cable (16.4 feet)	Any switch compatible with the cable.

Host systems and switches (stand-up adapters)

For a current list of switches, servers, and applications compatible with Brocade stand-up adapters, refer to the latest interoperability matrixes on Brocade’s website at www.brocade.com/adapters.

Server blades and blade system enclosures (mezzanine adapters)

Consider the following points when installing mezzanine adapters in blade servers and system enclosures:

- For information on server blades and blade system enclosures that are compatible with adapters, refer to the “Adapters Resources” section of www.brocade.com/adapters.
- For information about enclosures, server blades, I/O modules, switch modules, and optional devices that are compatible with this adapter, visit the manufacturer websites for these products. You can also contact your server blades or blade system enclosure marketing representative or authorized reseller.
- To support each I/O module that you install in the blade system enclosure, you may also need to install a compatible adapter in each server blade that you want to communicate with the I/O module. Also, the adapter may only support switch modules or blades in specific I/O bays of the enclosure. For additional information, refer to installation and user guides and the interoperability guides provided for the blade server and blade system enclosure.
- The Brocade mezzanine adapter is compatible with the following types of modules that install in the supported blade system enclosure:
 - Pass-through modules
 - I/O modules
 - Switch modules

NOTE

For detailed information about these modules, see the installation and user guides and interoperability guides provided for these modules and the blade system enclosure.

- You may be able to install only one mezzanine adapter per server blades. The maximum number of adapters that you can install in the blade system enclosure varies according to the type of enclosure that you are using because each type of enclosure may support a different number of server blades. For additional compatibility information, see the installation, user guides and interoperability guides provided for the blade server and the blade system enclosure.

PCI express connections

Brocade CNAs are compatible with PCI express (PCIe) connections that have the following specifications:

- x8 lane or greater transfer interface.
- Gen1 (PCI Base Specification 1.0, 1.01a, and 1.1).
- Gen2 (PCI Express Base Specification 2.0).
- Gen3 (PCI Express Base Specification 3.0).

NOTE

Install CNAs in PCI express connectors with an x8 lane transfer interface or greater for best performance. You cannot install CNAs in PCI or PCI-X connectors.

Storage systems

Using Brocade CNAs you can connect a server (host system) to a Fibre Channel SAN through connection with a compatible FCoE switch. For a current list of compatible switches, servers, and applications, refer to the latest interoperability matrices on Brocade's website at www.brocade.com/adapters.

NOTE

The CNA can connect with a network switch and perform NIC functions for network traffic.

WoL and SoL limitations

The following describes limitations of support for Wake on LAN (WoL) and Serial over LAN (SoL) for the Brocade 1007 adapter:

- WoL. The adapter does not support WoL over its 10GbE links. WoL is supported using the IBM BladeCenter 1GbE NIC included on the IBM server blades.
- SoL. The adapter does not support SoL over its 10GbE links. SoL is supported using the IBM 1GbE NIC included on the IBM server blades.

Host bus adapters

Brocade [Table 5](#) provides the model number, port speed, number of ports, and adapter type for the current Brocade Fibre Channel PCIe HBAs. These adapters provide reliable, high-performance host connectivity for mission-critical SAN environments.

TABLE 5 HBA model information

Model Number	Port Speed	Number of Ports	Adapter Type
425	4 Gbps maximum ¹	2	Stand-up
415	4 Gbps maximum ¹	1	Stand-up
804	8 Gbps maximum	2	Mezzanine
815	8 Gbps maximum ²	1	Stand-up
825	8 Gbps maximum ²	2	Stand-up

1. A 4 Gbps SFP installed in Brocade 815 or 825 HBAs allows 4, 2, or 1 Gbps.
2. An 8 Gbps SFP+ installed in Brocade 425 or 415 HBAs allows 4 or 2 Gbps only.

Two types of HBAs are available:

- Stand-up adapters.
These are low-profile MD2 form factor PCI Express (PCIe) cards, measuring 6.6 in. by 2.714 in. (16.765 cm by 6.89 cm), that install in PCIe connectors in standard host systems.
- Mezzanine adapters.
These are smaller cards that mount on server blades that install in blade system enclosures. Fibre Channel communications are routed through the adapter ports on the blader server to the blade system enclosure midplane and onto the installed switch modules installed in the enclosure.

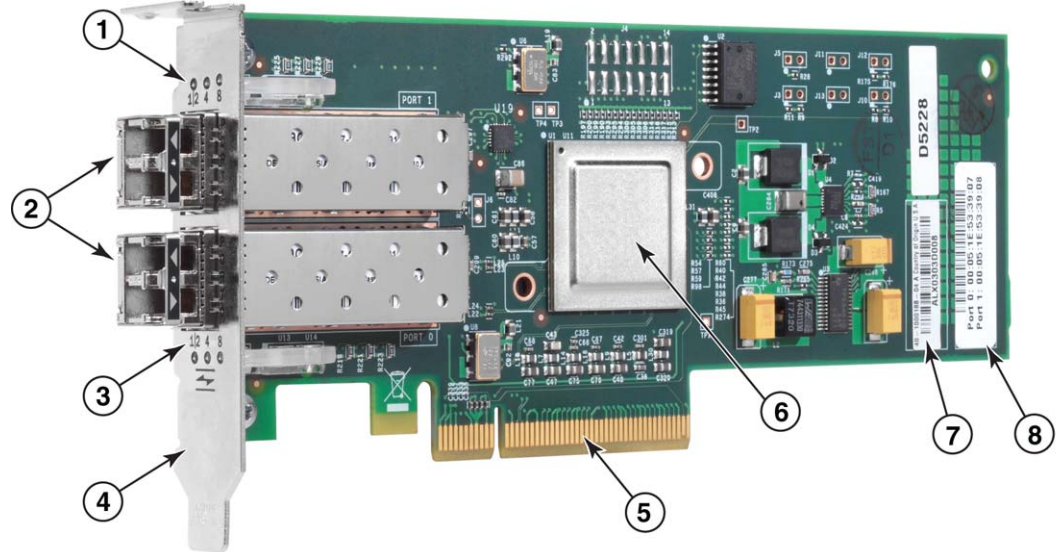
Using Brocade HBAs, you can connect your host system to devices on the Fibre Channel SAN. The combined high performance and proven reliability of a single-ASIC design makes these HBAs ideal for connecting hosts to SAN fabrics based on Brocade Fabric or M-Enterprise operating systems.

NOTE

This publication only supports the HBA models listed in [Table 5](#), and does not provide information about the Brocade 410 and 420 Fibre Channel HBAs, also known as the Brocade 400 Fibre Channel HBAs.

Stand-up models

[Figure 6](#) on page 13 illustrates major components of the Brocade 825 stand-up model HBA. Please note that the following illustration is representative and may have minor physical differences from the HBA that you purchased.



- 1 LEDs for port 1 SFP
- 2 Fiber optic cable connectors for port 1 and port 0 SFPs
- 3 LEDs for port 0 SFP
- 4 Low-profile mounting bracket. **Note:** The HBA ships with the low-profile mounting bracket installed.
- 5 PCIe x8 PCIe connector
- 6 ASIC
- 7 Serial number label
- 8 Label showing PWWN for each port.

FIGURE 6 825 HBA with low-profile mounting bracket (head sink removed)

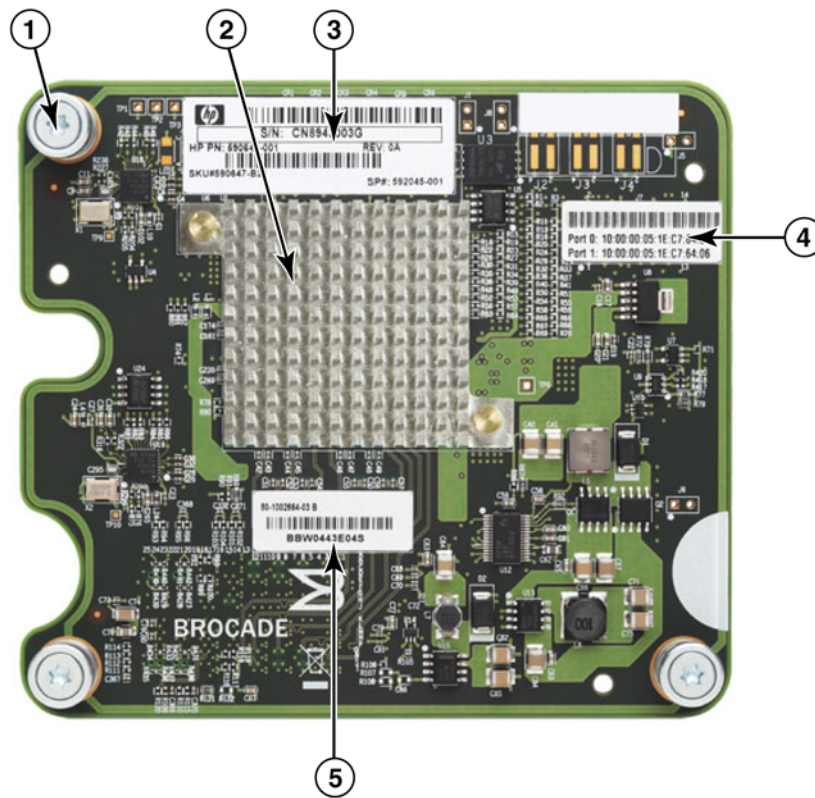
1 Host bus adapters

ATTENTION

Use only Brocade-branded SFP laser transceivers on stand-up adapters that are supplied with the adapter.

Mezzanine models

Figure 7 on page 14 illustrates major components of the Brocade 804 mezzanine HBA. This mezzanine card installs in supported blade servers that install in Hewlett Packard BladeSystem c-Class enclosures. Please note that the following illustration is representative and may have minor physical differences from the HBA that you purchased.



- 1 Mounting screws
- 2 ASIC
- 3 OEM serial and part number
- 4 PWWNs for adapter ports
- 5 Brocade serial and part number

FIGURE 7 804 mezzanine HBA

Hardware compatibility

This section outlines important compatibility information.

SFP transceivers (stand-up adapters)

Use only Brocade-branded small form factor pluggable (SFP) fiber optic 4 Gbps and 8 Gbps transceivers in the Brocade Fibre Channel stand-up HBAs.

NOTE

All Brocade 815 and 825 HBAs ship with the 8 Gbps SFP+, and Brocade 415 and 425 HBAs ship with the 4 Gbps SFP.

Host systems and switches (stand-up adapters)

Refer to the latest Brocade interoperability matrices at www.brocade.com/adapters for a list of supported server models and switches.

Server blades and blade system enclosures (mezzanine adapters)

The Brocade 804 mezzanine HBA is compatible with blade servers, switch modules, interconnect modules, and other components that install in supported blade system enclosures. For details on blade servers and system enclosures that are compatible with this adapter, refer to the following:

- The interoperability matrices on Brocade's website at www.brocade.com/adapters.
- Manufacturer websites for these products.
- Your blade server or blade system enclosure marketing representative or authorized reseller.
- Documentation provided for your blade server, blade system enclosure and enclosure components.

PCI express connections

The Brocade Fibre Channel HBAs are compatible in PCI express (PCIe) connectors with the following specifications:

- x8 lane or greater transfer interface.
- Gen1 (PCI Base Specification 1.0, 1.01a, and 1.1).
- Gen2 (PCI Express Base Specification 2.0).
- Gen3 (PCI Express Base Specification 3.0).

NOTE

Install HBAs in PCI express (PCIe) connectors with an x8 lane transfer interface or greater for best performance. You cannot install HBAs in PCI or PCIx slots.

Storage systems

Using Brocade HBAs you can connect a server (host system) to a Fibre Channel SAN in a switched fabric and point-to-point topology or directly to a storage array in a point-to-point topology. Refer to the latest Brocade interoperability matrices for a list of supported server models on Brocade's website at www.brocade.com/adapters.

Adapter features

This section describes the features associated with all models of the following types of Brocade adapters:

- Fabric Adapters - Refer to the following subsections depending on the port mode and SFP configurations:
 - “General features” on page 16.
 - “FCoE features” on page 20, for ports configured in CNA mode.
 - “Data Center Bridging and Ethernet features” on page 22, for ports configured in CNA or NIC modes.
 - “HBA features” on page 27, for ports configured in HBA mode.
- CNAs- Refer to the following subsections:
 - “General features” on page 16.
 - “FCoE features” on page 20.
 - “Data Center Bridging and Ethernet features” on page 22.
- HBAs - Refer to the following subsections:
 - “General features” on page 16.
 - “HBA features” on page 27.

General features

Brocade adapters support the following general features for enhanced performance and connectivity in the SAN and Ethernet networks.

I/O virtualization

Brocade adapters support physical function (PF) based I/O virtualization to provide data isolation and sharing of the bandwidth resources. Depending on the adapter model or the operating mode (CNA, HBA, or NIC) assigned to Fabric Adapter ports), from one to eight functions can be supported per port on the PCI bus. These PFs can be seen as multiple adapters by the host operating system or hypervisor.

Factory default PF configurations

For each type of adapter, each port has a set base or default PF as follows:

- For HBA models, each port has one Fibre Channel (FC) function.
- For CNA models, each port has one FC function and one Ethernet function.

- For Fabric Adapters, the default number of PFs depends on the mode configured for the port. Refer to [Table 6](#).

TABLE 6 Factory default physical function (PF) configurations for Fabric Adapter ports.

Mode	PFs configured per port	PF configuration per port
HBA	1	FC
CNA	2	Ethernet and FCoE
NIC	1	Ethernet

vHBA

Virtual HBAs (vHBAs) are virtual port partitions that appear as virtual or logical HBAs to the host operating system. vHBAs are supported on Brocade HBAs, CNAs, and Fabric Adapter ports configured in HBA or CNA mode. Multiple vHBAs are not supported, therefore you cannot create or delete them from an adapter. The default PF associated with an HBA port, the FCoE function on a CNA port or Fabric Adapter port configured in CNA mode, or a Fabric Adapter port configured in HBA mode is *vHBA*.

HCM discovers and displays all vHBAs as “FC.” For Fabric Adapter ports set in CNA mode, vHBAs display as “FCoE.”

The following are limitations of vHBAs:

- Multiple vHBAs per port are not supported in release v3.0.
- Target Rate Limiting (TRL) and Quality of Service (QoS) are not supported at the vHBA level (only at the physical port level).
- Boot over SAN is not supported at the vHBA level (only at the physical port level).

vNIC

Virtual Network Interface Cards (vNICs) are virtual port partitions that appear as a virtual or logical NICs to the host operating system. vNICs are supported on Brocade CNAs and on Fabric Adapter 10 GbE ports configured in CNA or NIC mode. You cannot create or delete vNICs for Brocade CNA models, such as the 1010 and 1020. Multiple vNICs are only supported on Fabric Adapter ports (vNIC create and delete functions are supported).

For Fabric Adapter ports, you can create up to four Ethernet PFs per port using the BCU **vnic -create** command. Therefore, for a two-port Fabric Adapter, eight total vNics are possible. Due to ESX memory limitations, a total of 4 vNICs in a VMware ESX system is supported.

For each vNIC, you can configure bandwidth in increments of 100 Mbps. The minimum bandwidth is 100 Mbps and maximum bandwidth per vNIC is 10,000 Mbps. The maximum bandwidth per port is also 10,000 Mbps. Therefore, you can divide the 10,000 Mbps among all PFs configured. For example, if you configure four Ethernet PFs for a Fabric Adapter port, you can assign 1,250 Mbps per PF to reach the 10,000 Mbps maximum.

HCM discovers and displays all vNICs for a physical port as “Eth.”

The following are limitations of vNICs:

- vNICs are not supported on Brocade HBA modules.
- Multiple vNICs are not supported on Brocade CNA models, such as the 1010 and 1020.
- Teaming is not supported between vNICs configured on the same port.

1 Adapter features

vHBA and vNIC BCU commands

Whether a port is configured for a single function or in the case of vNICs, multiple functions, each PF is assigned a PCI function ID (pcfid). This pcfid is used as a parameter in BCU commands to configure additional features or display information for that specific PF. For example, pcfid can be used in certain BCU debug, authentication, diagnostic, Ethernet port, lport, rport, VLAN, and FCP initiator mode commands. Specific vNIC and vHBA BCU commands are available for configuring vHBAs and vNICs. Examples of these commands follow:

- **vhba --query <pcifn>** - Queries information about the virtual HBA.
- **vhba --enable <pcifn>** - Enables a vHBA on a specified adapter port for a specified PF.
- **vhba --disable <pcifn>** - Disables a vHBA on a specified adapter port for a specified PCI function.
- **vhba --stats <pcifn>** - Displays statistics for the virtual HBA.
- **vhba --statsclr <pcifn>** - Resets statistics for the virtual HBA.

For details on using these commands, refer to the *Brocade Adapters Administrator's Guide*.

Following are available vNIC commands:

- **vnic --create <port_id> [-b <bandwidth>]** - Creates a new vNIC instance for a given adapter port. You can specify the maximum bandwidth allowable for this vNIC.
- **vnic --delete <pcifn>** - Removes the specified vNIC instance.
- **vnic --query <pcifn>** - Queries information about the virtual NIC.
- **vnic --enable <pcifn>** - Enables a vNIC on a specified adapter port for a specified PCI function.
- **vnic --disable <pcifn>** - Disables a vNIC on a specified adapter port for a specified PCI function.
- **vnic --stats <pcifn>** - Displays statistics for the virtual NIC.
- **vnic --statsclr <pcifn>** - Resets vNIC statistics.
- **vnic --bw <pcifn> <bandwidth>** - Modifies the maximum allowable bandwidth for a vNIC.

For details on using these commands, refer to the *Brocade Adapters Administrator's Guide*.

Other general adapter features

Following are brief descriptions of additional general features supported on Brocade CNA, HBA, and Fabric Adapters:

- BIOS support:
 - x86 and x64 Basic Input/Output System (BIOS)
 - Unified Extensible Firmware Interface (UEFI)
 - UEFI HII (Human Interface Infrastructure)
 - PCI BIOS 2.1 or later
- Human Interaction Interface (HII) menu support. These menus are integrated into the UEFI configuration browser. Options in these menus allow you to enable, disable, and set port speed for adapter ports.
- Host Connectivity Manager (HCM) device management and Brocade Command Line Utility (BCU) tools.

- Hyper-V. This consolidates multiple server roles as separate virtual machines (VMs) using the Windows Server 2008 operating system and provides integrated management tools to manage both physical and virtual resources.
- Management APIs for integration with a Management application, such as Network Advisor, and other management frameworks.
- Switch fabric topology - CNAs and Fabric Adapter ports configured in CNA mode can connect to an FCoE switch through 10 GbE ports.
- PCIe interface with eight lanes. The adapter operates in Gen 1 and Gen 2 server connectors that have the following specifications per lane:
 - PCIe Gen 2 connector. Transfer rate of 5 Gigatransfers per second (GT/s) per lane. Data rate of 500 MBps per lane.
 - PCIe Gen 1 connector. Transfer rate of 2.5 GT/s per lane. Data rate of 250 MBps per lane.
- Plug-n-play and power management for all supported operating systems.
- RoHS-6. Certification by the of European Union Restriction of Hazardous Substances Directive (RoHS) that adapter hardware components do not contain any of the six restricted materials. These are mercury, chromium VI, cadmium, polybrominated biphenyl ether, lead, and polybrominated biphenyl.
- Small form-factor pluggable (SFP+) optics on stand-up adapters for enhanced serviceability (stand-up adapters only).
- Storage Management Initiative Specification (SMI-S).
Specification supporting the Common Information Model (CIM) Provider, which allows any standard Common Information Model (CIM) and SMI-S based management software to manage installed Brocade adapters.

NOTE

Although SMI-S Provider and CIM Provider may be used interchangeably, CIM is the more generic term, while SMI-S is storage-specific.

- Windows Management Implementation (WMI).
- Windows Preinstallation Environment (WinPE), a minimal operating system with limited services for Windows Server or Windows Vista used for unattended deployment of workstations and servers. WinPE is designed for use as a standalone preinstallation environment and as a component of other setup and recovery technologies. WinPE is supported by Brocade Windows 2008 network and storage drivers.
- Windows Server 2008, RedHat Enterprise Linux (RHEL), SUSE Linux Enterprise (SLES), VMware ESX Server, Solaris, and Oracle Enterprise Linux (OEL). For more details, refer to [“Operating system support”](#) on page 40.
- Windows Server Core, a minimal server option for Windows Server 2008 operating systems that provides a low-maintenance server environment with limited functionality. All configuration and maintenance is done through command line interface windows or by connecting to a system remotely through a management application.
- Windows 7. Windows 7 x86 is supported by Windows 2008 x86 drivers Windows 7 x64 is supported by Windows 2008 R2 X64 drivers.

FCoE features

CNAs and Fabric Adapter ports configured in CNA mode support the following Fibre Channel over Ethernet (FCoE) features:

Brocade CNAs support the following features:

- 500,000 IOPS per port for maximum IO transfer rates.
- 10 Gbps throughput per port full duplex
- Fibre Channel Security Protocol (FC-SP), providing device authentication through key management.
- Boot over SAN. This feature provides the ability to boot the host operating system from a boot device located somewhere on the SAN instead of the host's local disk or direct attached Fibre Channel storage. Specifically, this "boot device" is a logical unit number (LUN) located on a storage device. Booting from a direct-attached device is also supported.
- Fabric-based boot LUN discovery, a feature that allows the host to obtain boot LUN information from the fabric zone database.

NOTE

This feature is not available for direct-attached targets.

- Persistent binding. This enables you to permanently assign a system SCSI target ID to a specific Fibre Channel device.
- Fibre Channel-Security Protocol (FC-SP) providing device authentication through key management.
- FCoE Initialization Protocol (FIP) support for the following:
 - FIP 2.0
 - preFIP and FIP 1.03
 - FIP Discovery protocol for dynamic FCF discovery and FCoE link management
 - FPMA type FIP fabric login
 - VLAN discovery for untagged and priority tagged FIP frames
 - FIP discovery solicitation and FCP discovery
 - Login (FIP and FCoE)
 - FIP link down handling.
 - FIP version compatibility
 - FIP keep alive
 - FIP clear virtual links

NOTE

The CNA FIP logic automatically adapts to the adequate FIP version and preFIP to enable backward compatibility.

- **Interrupt Coalescing**

This feature provides a method to delay generation of host interrupts and thereby combine (coalesce) processing of multiple events. This reduces the interrupt processing rate and reduces the time that the CPU spends on context switching. You can configure the following parameters per port to adjust interrupt coalescing:

 - **Interrupt time delay.** There is a time delay during which the host generates interrupts. You can increase this delay time and thereby coalesce multiple interrupts events into one. This results in fewer interrupts for interrupt events.
 - **Interrupt latency timer.** An interrupt is generated when no new reply message requests occur after a specific time period. You can adjust this time period and thereby minimize I/O latency.
- **Internet Protocol over Fibre Channel (IPFC) driver**

This driver supports transmission of IP traffic over Fibre Channel links. It is only included in the Linux “noarch” RPM package (brocade_driver_linux_<version>.tar.gz).
- **LUN masking.**

LUN masking establishes access control to shared storage to isolate traffic between different initiators that are zoned in with the same storage target. LUN masking is similar to zoning, where a device in a specific zone can communicate only with other devices connected to the fabric within the same zone. With LUN masking, an initiator port is allowed to only access those LUNs identified for a specific target.

Enable LUN masking on an adapter physical port through the HCM **Basic Port Configuration** dialog box and the BCU **fcpim –lunmaskadd** command to identify the logical port (initiator) and remote WWN (target) for the LUN number. Refer to the Brocade Adapter Administrator’s Guide for more information on configuration.

This feature has following limitations.

 - Only 16 LUN masking entries are allowed per physical port
 - Multiple BCU instances for adding and deleting LUN masking are not supported
 - This feature is only supported on Brocade HBAs and Fabric Adapters.

You can configure LUN masking for a particular target even without the actual devices being present in the network.

When configuring boot over SAN, mask the boot LUN so that the initiator has exclusive access to the boot LUN. Refer to the Brocade Administrator’s Guide for more information.
- **N_Port ID Virtualization (NPIV).** This allows multiple N_Ports to share a single physical N_Port. This allows multiple Fibre Channel initiators to occupy a single physical port and reduce SAN hardware requirements.
- **Simple Network Management Protocol (SNMP)**

SNMP is an industry-standard method of monitoring and managing network devices. Brocade CNA adapters and Fabric Adapter ports configured in CNA mode provide agent and MIB support for SNMP. For more information, refer to [“Simple Network Management Protocol”](#) on page 34.
- **Target rate limiting.** You can enable or disable this feature on specific ports. Target Rate Limiting relies on the storage driver to determine the speed capability of a discovered remote ports, then uses this information to throttle FCP traffic rate to slow-draining targets. This reduces or eliminates network congestion and alleviates I/O slowdowns at faster targets.

1 Adapter features

Target rate limiting is enforced on all targets that are operating at a speed lower than that of the target with the highest speed. If the driver is unable to determine a remote port's speed, 1 Gbps is assumed. You can change default speed using BCU commands. Target Rate Limiting protects only FCP write traffic.

- vHBA

Virtual HBAs (vHBAs) are virtual port partitions that appear as virtual or logical HBAs to the host operating system. Multiple vHBAs are not supported, therefore you cannot create or delete them from an adapter. For more information, refer to [“I/O virtualization”](#) on page 16.

Data Center Bridging and Ethernet features

Brocade CNAs and Fabric Adapter ports configured in CNA or NIC mode support the following Data Center Bridging (DCB) and Ethernet networking features:

- 10 Gbps throughput per port full duplex
- 1500 or 9600 byte (Jumbo) frames

These frames allow data to be transferred with less effort, reduces CPU utilization, and increases throughput. Mini-jumbo frames are required to encapsulate FCoE frames on DCB. Network administrators can change the jumbo packet size from the default setting using host operating system commands as described in [Appendix A, “Adapter Configuration”](#). Note that the MTU size refers to the MTU for network configuration only. Internally, hardware will always be configured to support FCoE frames that require mini-Jumbo size frames.

NOTE

The jumbo frame size set for the network driver cannot be greater than the setting on the attached FCoE switch or the switch cannot accept jumbo frames.

- Simple Network Management Protocol (SNMP)
SNMP is an industry-standard method of monitoring and managing network devices. Brocade CNAs and Fabric Adapter ports configured in CNA or NIC mode provide agent and MIB support for SNMP. For more information, refer to [“Simple Network Management Protocol”](#) on page 34.
- Checksum/CRC offloads for FCoE packets, IPv4/IPv6 TCP and UDP packets, and IPv4 header.
The checksum offload supports Checksum offloads for TCP & UDP packets and IPv4 header. This enables the CNA to compute the checksum, which saves host CPU cycles. The CPU utilization savings for TCP checksum offload can range from few percent with MTU of 1500, and up to 10-15% for MTU of 9000. The greatest savings are provided for larger packets.
- Data Center Bridging Capability Exchange Protocol (DCBCXP) (802.1)
Used between CNA or Fabric Adapter port configured in CNA mode and the FCoE switch to exchange configuration with directly connected peers. Uses LLDP to exchange parameters between two link peers.
- Enhanced transmission selection (802.1Qaz)
Provides guidelines for creating priority groups to enable guaranteed bandwidth per group. More important storage data traffic can be assigned higher priority and guaranteed bandwidth so it is not stalled by less-important traffic.

- Ethernet flow control

Ethernet flow control is a mechanism for managing data transmission between two network nodes to prevent a fast sender from over running a slow receiver. When an overwhelmed receiver generates a PAUSE frame, this halts transmission for a specified period of time. Traffic resumes when time specified in the frame expires or PAUSE zero is received.
- Flexible MAC address
- Hypervisor

Hypervisor is a processor-specific virtualization platform that allows multiple operating systems to share a single server platform. Refer to “[Hypervisor support](#)” on page xvii for a list of operating systems that support hypervisor operation for Brocade adapters:
- Brocade Network Intermediate Driver (BNI)

This provides support for multiple VLANs on ports and teams on Windows systems. This driver is installed with the adapter software.
- Internet Small Computer System Interface (iSCSI) over DCB.

This feature leverages pre-priority-based flow control (PFC) and enhanced transmission selection (ETS) features provided by Data Center Bridging (DCB) to Ethernet to enable more lossless delivery of iSCSI traffic in data center environments. This feature enables fabric-wide configuration of the iSCSI traffic. This is achieved by configuring the iSCSI traffic parameters on the switches, which distribute those parameters to directly-attached, DCB-capable iSCSI servers and targets. The adapter firmware obtains the iSCSI configuration from the switch through the DCB Exchange Protocol (DCBX) and applies the configuration to the network driver to classify the iSCSI traffic. The adapter will use this as a priority for all network traffic.

Note the following for the different adapter models:

 - On CNA adapters and Fabric Adapter port configured in CNA mode, ETS support will only be supported either between network and FCoE priority or one network and iSCSI priority.
 - On Fabric Adapters, a separate transmit queue will be available for iSCSI traffic. This will allow iSCSI traffic to be sent on separate queue and priority and not compete with network traffic.

This feature is not supported on Solaris systems.
- Link aggregation (NIC teaming)

A network interface “team” is a collection of physical Ethernet interfaces (CNA ports and Fabric Adapter port configured in CNA or NIC mode) acting as a single interface. Teaming overcomes problems with bandwidth limitation and redundancy often associated with Ethernet connections. Combining (aggregating) ports can increase the link speed beyond the limits of one port and provide redundancy. You can team up to eight ports across multiple CNAs (and Fabric Adapter ports configured in CNA or NIC mode) in three modes: failover, failback, or 802.3ad using BCU commands and HCM dialog boxes.

 - Failover mode provides fault tolerance. Only one port in a team is active at a time (primary port), and the others are in standby mode. If the primary port goes down, a secondary port is chosen using a round-robin algorithm as the next primary. This port continues to be primary, even if the original primary port returns.

1 Adapter features

- Failback mode is an extension of the Failover mode. In addition to the events that occur during a normal failover, if the original primary port comes back up, that port again becomes the primary port.
- 802.3ad is an IEEE specification that includes Link Aggregation Control Protocol (LACP) as a method to control how several physical ports bundle to form a single logical channel. LACP allows a network device to negotiate automatic bundling of links by sending LACP packets to the peer (a device directly connected to a device that also implements LACP). This mode provides larger bandwidth in fault tolerance.

Configuration is required on the switch for NIC teaming to function.

Be aware when configuring ports for teaming that converged FCoE and network traffic is not supported on ports that participate in an IEEE 802.3ad-based team. This must be enforced by the user as there is no mechanism to control this in the software.

Teaming is implemented by Brocade in the intermediate drivers for Windows 2008 x86_64 and R2, as well as Windows 2003 x86_64. Teaming is supported on Linux, Solaris, and VMware as implemented by the specific operating system.

- Look ahead data split
Look ahead split is a security feature for using virtual machine shared memory for a virtual machine queue, where the adapter splits the data packet so that look ahead data and post look ahead data are transmitted to the shared memory allocated for this data.
- Multiple transmit (Tx) priority queues. Support for multiple transmit priority queues in the network driver allows the driver to establish multiple transmit queues and specific priorities in the ASIC. This feature enables Brocade CNAs and Fabric Adapter ports configured in CNA mode to pass-link layer traffic using multiple transmit priorities without interfering with the assigned priority for the FCoE or iSCSI traffic on the same port. This also allows handling of FCoE or iSCSI priority changes propagated from the DCB switch. Multiple traffic priorities are used to ensure that Quality of Service (QoS) is guaranteed across different traffic classes. The driver supports one transmit queue on CNAs and eight on Fabric Adapters. If multiple vNICs are configured on a Fabric Adapter, each vNIC instance has its own set of eight Tx Queues. To configure multiple queues for sending priority tagged packets, refer to [“Network driver parameters”](#) on page 211.
Transmit NetQueues with multiple priorities allow VMware (version 4.1 or later) to assign different priorities to transmit NetQueues to ensure QoS for different classes of traffic on an ESX host. Multiple transmit priorities are supported in the following ways on Brocade adapters:
 - On CNAs and Fabric Adapter ports configured in NIC mode, all eight priorities can be assigned to transmit NetQueues by VMware.
 - On CNAs only, every request to assign a priority different from the default network priority will be denied. If a storage priority is reserved, one non-default priority could be assigned to a transmit NetQueue.
 - On Network Adapter ports configured in CNA mode, only allowed priorities can be assigned to transmit NetQueues by VMware. Requests for a priority are denied if the priority matches a reserved storage priority.
- Interrupt coalescing
Avoids flooding the host system with too many interrupts. This allows the system to reduce the number of interrupts generated by generating a single interrupt for multiple packets. Increasing the “coalescing timer” should lower the interrupt count and lessen CPU utilization.

- **Interrupt moderation**

Implements dynamic selection interrupt coalescing values based on traffic and system load profiles. Traffic is continuously monitored to place in categories between “high throughput sensitive” and “high latency sensitive.” Similarly, the host system is monitored regularly to place it in categories between “highly loaded” and “minimally loaded.” The driver dynamically selects interrupt coalescing values based on this profiling.
- **MSI-X**

This is an extended version of Message Signaled Interrupts (MSI), defined in the PCI 3.0 specification. MSI-X helps improve overall system performance by contributing to lower interrupt latency and improved utilization of the host CPU. MSI-X is supported by Linux RHEL5, SLES 10 and 11, Windows 2008, and ESX 4.0 and 4.1.
- **Network Boot (PXE and UNDI)**

The preboot execution environment (PXE) mechanism, embedded in the CNA firmware, provides the ability to boot the host operating system from a system located on the LAN instead of the over the SAN or from host’s local disk. UNDI (universal network device interface) is an application program interface (API) used by the PXE protocol to enable basic control of I/O and performs other administrative chores like setting up the MAC address and retrieving statistics through the adapter. UNDI drivers are embedded in the CNA firmware.
- **Network Priority**

The CNA and Fabric Adapter port configured in CNA mode support this feature, which provides a mechanism to enable DCB flow control (802.1Qbb Priority-based Flow Control: Pause 802.1p) on network traffic. In addition, it guarantees mutual exclusion of FCoE and network priorities to ensure proper enhanced transmission selection (ETS). This feature is not supported on HBAs or Fabric Adapter ports configured in HBA mode.

This feature does not need enabled on the CNA, Fabric Adapter port configured in CNA mode, or switch. Specific DCB attributes, including priorities for FCoE traffic, are configured on the FCoE switch. These attributes propagate to the CNA DCB port through the DCBCXP. Adapter firmware processes this information and derives priorities for network traffic. The network driver is notified of the network priority and tags both FCoE and network frames with their priorities.
- **Priority-based flow control (802.1Qbb)**

Defines eight priority levels to allow eight independent lossless virtual lanes. Pauses traffic based on the priority levels and restarts traffic through a high-level pause algorithm.
- **Receive side scaling (RSS) feature for advanced link layer**

Enables receive processing to be balanced across multiple processors while maintaining in-order delivery of data, parallel execution, and dynamic load balancing.

1 Adapter features

- Team Virtual Machine Queue (VMQ) support

VMQ support is provided by the Brocade Network Intermediate (BNI) driver for teaming (with no VLANs). VMQ support allows classification of packets that the adapter receives using the destination MAC address, and then routing the packets to different receive queues. Packets can be directly transferred to a virtual machine's shared memory using direct memory access (DMA). This allows scaling to multiple processors by processing packets for different virtual machines in on different processors. VMQ support provides the following features:

 - Improves network throughput by distributing processing of network traffic for multiple virtual machines (VMs) among multiple processors.
 - Reduces CPU utilization by offloading receive packet filtering to NIC hardware.
 - Avoids network data copy by using DMA to transfer data directly to VM memory.
 - Splits network data to provide a secure environment.
 - Supports live migration

VMQ support is only available on systems running Windows Server 2008 R2. Virtual machines must be running Windows 7, Windows Server 2008 R2, Windows SErver 2008, or Windows Vista with Integration Services Setup Disk installed.
- TCP segmentation offload (TSO) and large send offload (LSO)

Large chunks of data must be segmented to smaller segments to pass through network elements. LSO increases outbound throughput by reducing CPU overhead. Offloading to the network card, where segmentation can be done by the Transmission Control Protocol (TCP), is called TCP segmentation.
- VLAN (802.1Q)

A Virtual LAN (VLAN) is a way to provide segmentation of an Ethernet network. A VLAN is a group of hosts with a common set of requirements that communicate as if they were attached to the same LAN segment, regardless of their physical location. A VLAN has the same attributes as a physical LAN, but it allows end stations to be logically grouped together.

VLANs are implemented by Brocade in the intermediate drivers for Windows 2008 x86_64, as well as Windows 2003 x86_64. VLANs are supported on Linux, Solaris, and VMware as implemented by the specific operating system.
- MAC and VLAN filtering and tagging

A mechanism that allows multiple networks to transparently share the same physical network link without leakage of information between networks. Adapter hardware filters data frames from devices on a LAN so that only frames that match the MAC and VLAN for the configured LAN are forwarded to that LAN.
- VLANs over teams. Specific VLANs can be configured to communicate over specific teams using BCU commands and HCM. The function of the VLAN over a team is the same as a VLAN on a single port. A team can support up to 64 VLANs, and the VLANs should have the same MAC address as the team. Changing a team's MAC address changes the address of VLANs over the team. Changing the team name adds the name to the prefix of the VLAN's display name.

VLANs over teams is supported by the Brocade intermediate drivers for Windows 2008 x86_64 and R2 and later systems only. For more details on teaming, refer to [Link aggregation \(NIC teaming\)](#) in this section. For more information on VLANs, refer to [VLAN \(802.1Q\)](#) in this section.

- **VLAN and Teaming Configuration Persistence**
VLAN and teaming configurations can be maintained when updating drivers. Configurations are automatically saved during upgrade and can be restored using BCU commands or HCM.
- **VMware NetQueue**
This feature improves performance in 10 GbE virtualized environments by providing multiple receive and transmit queues, which allows processing to be scaled to multiple CPUs. The Brocade adapter network driver (CNAs only) supports receive (Rx), as well as transmit (Tx) NetQueues. This feature requires MSI-X support on host systems.
- **VMware Network IO Control or NetIOC, also known as NetIORM (Network IO Resource Management), is a QoS mechanism that allows different traffic types to coexist on a single physical NIC in a predictable manner. A primary benefit of NetIOC is that it ensures that adaptive transmit coalescing settings are not lost during data path or device reset.**
- **VMware VMdirect Path I/O**
This allows guest operating systems to directly access an I/O device, bypassing the virtualization layer. This can improve performance for ESX systems that use high-speed I/O devices, such as 10 Gbps Ethernet.
- **vNICs, or virtual network interface cards (NICs).**
Virtual Network Interface Cards (vNICs) are virtual partitions that appear as a virtual or logical NICs to the host operating system. vNICs are supported on Brocade CNAs and on Fabric Adapter 10 GbE ports configured in CNA or NIC mode. Multiple vNICs are only supported on Fabric Adapter ports.

Using BCU commands, you can create up to eight vNICs per Fabric Adapter ports configured in CNA or NIC mode. You can configure features, such as vNIC teaming, for individual vNICs. For a two-port Fabric Adapter, 16 total vNICs are possible. For more information, refer to “[I/O virtualization](#)” on page 16.

HBA features

Brocade Fibre Channel HBAs and Fabric Adapter ports configured in HBA mode provide the following features for enhanced performance and connectivity in the SAN.

- 500,000 IOPS per port for maximum IO transfer rates.
- 1,600 Mbps throughput per port full duplex.
- Host Connectivity Manager (HCM) device management and Brocade Command Line Utility (BCU) tools.
- Management APIs for integration with a Management application, such as Network Advisor, and other management frameworks.
- BIOS support:
 - x86 and x64 Basic Input/Output System (BIOS)
 - Unified Extensible Firmware Interface (UEFI)

NOTE

UEFI is not supported on the Brocade 804 adapter.

- PCI BIOS 2.1 or later

1 Adapter features

- LUN masking.

LUN masking establishes access control to shared storage to isolate traffic between different initiators that are zoned in with the same storage target. LUN masking is similar to zoning, where a device in a specific zone can communicate only with other devices connected to the fabric within the same zone. With LUN masking, an initiator port is allowed to only access those LUNs identified for a specific target.

Enable LUN masking on an adapter physical port through the HCM **Basic Port Configuration** dialog box and the BCU **fcpim –lunmaskadd** command to identify the logical port (initiator) and remote WWN (target) for the LUN number. Refer to the Brocade Adapter Administrator's Guide for more information on configuration.

This feature has following limitations.

- Only 16 LUN masking entries are allowed per physical port
- Multiple BCU instances for adding and deleting LUN masking are not supported
- This feature is only supported on Brocade HBAs and on Fabric Adapter ports configured in HBA mode.

You can configure LUN masking for a particular target even without the actual devices being present in the network.

When configuring boot over SAN, mask the boot LUN so that the initiator has exclusive access to the boot LUN. Refer to the Brocade Administrator's Guide for more information.

- Quality of Service (QoS) feature working in conjunction with the QoS feature on Brocade switches to assign high, medium (default), or low traffic priority to a given source or destination traffic flow.

The following licenses need to be installed on the edge switch connected to each HBA port or Fabric Adapter ports configured in HBA mode:

- Adaptive Networking (AN) license.
- Server Application Optimization (SAO) license.

To determine if these licenses are installed on the connected switch, execute the Fabric OS **licenseshow** command. For more information about Fabric OS commands and QoS support, refer to the *Fabric OS Administrator's Guide*.

- FCP-IM I/O Profiling

This feature, available through HCM, can be enabled or disabled on a physical port. When enabled, the driver firmware categories I/O latency data into average, minimum, and maximum categories. Use this feature to analyze traffic patterns and help tune HBAs, Fabric Adapter port configured in HBA mode, fabrics, and targets for better performance. Note that enabling this feature impacts I/O performance.

- Interrupt Coalescing

This feature provides a method to delay generation of host interrupts and thereby combine (coalesce) processing of multiple events. This reduces the interrupt processing rate and reduces the time that the CPU spends on context switching. You can configure the following parameters per port to adjust interrupt coalescing:

- Interrupt time delay. There is a time delay during which the host generates interrupts. You can increase this delay time and thereby coalesce multiple interrupts events into one. This results in fewer interrupts for interrupt events.
- Interrupt latency timer. An interrupt is generated when no new reply message requests occur after a specific time period. You can adjust this time period and thereby minimize I/O latency.
- 16 Virtual Channels (VCs) per port. VC-RDY flow control can use these multiple channels for Quality of Service (QoS) and traffic prioritization in physical and virtualized network environments.
- Storage Management Initiative Specification (SMI-S)
Specification supporting the CIM Provider, which allows any standard Common Information Model (CIM) and SMI-S based management software to manage installed Brocade adapters.

NOTE

Although SMI-S Provider and CIM Provider may be used interchangeably, CIM Provider is the more generic term, while SMI-S is storage-specific.

- Target rate limiting.
You can enable or disable this feature on specific ports. Target Rate Limiting relies on the storage driver to determine the speed capability of a discovered remote ports, then uses this information to throttle FCP traffic rate to slow-draining targets. This reduces or eliminates network congestion and alleviates I/O slowdowns at faster targets.

Target rate limiting is enforced on all targets that are operating at a speed lower than that of the target with the highest speed. If the driver is unable to determine a remote port's speed, 1 Gbps is assumed. You can change default speed using BCU commands. Target Rate Limiting protects only FCP write traffic.
- N_Port ID Virtualization (NPIV).
Allows multiple N_Ports to share a single physical N_Port. Multiple Fibre Channel initiators can share this single physical port and reduce SAN hardware requirements.
- N_Port Trunking works in conjunction with the Fibre Channel trunking feature on Brocade switches, whereby the Fabric Operating System (OS) provides a mechanism to trunk two switch ports of the same port group into one link. When trunking is enabled, two physical ports belonging to the same Brocade dual-port adapter are trunked together to form a single pipe. This provides advantages such as the following:
 - Simplified management - for example, zoning and VM setup only require one WWN instead of two if using two different ports.
 - More VMs can be deployed on a single server.
 - Higher throughput for such applications as video streaming.
 - Single failures within a port group are completely transparent to upper level applications.The following licenses must be installed on the switch connected to the HBA port or Fabric Adapter port configured in HBA mode. Note that this is in line with the licenses required on the switch for QoS to work with the adapter.
 - Server Application Optimization (SAO) license
 - Trunking license

1 Adapter features

Before enabling trunking, consider the following requirements:

- When trunking is enabled, a trunked logical port (Port 0) is created and reported per HBA or Fabric Adapter port configured in HBA mode. Most BCU commands are applicable in this logical port's context only.
 - When configuring Fabric Zones and LUN Masking for Storage, use the PWWN for adapter port 0.
 - Both adapter ports should be connected to the same port group on the switch.
 - Only two ports on the same adapter can participate in trunking and both of these should be operating at the same speed.
 - N_Port Trunking is supported on dual port HBA and Fabric Adapter models only.
 - To enable or disable trunking on the adapter, you must perform configuration tasks on both the switch using Fabric OS commands, as well as the adapter using BCU commands and HCM. Refer to the *Brocade Fabric OS Administrator's Guide* and *Brocade Adapters Administrator's Guide* for details.
- Server Application Optimization (SAO). When used with Brocade storage fabrics with enabled SAO licensing, Brocade HBAs and Fabric Adapter ports configured in HBA mode can use advanced Adaptive Networking features, such as QoS, designed to ensure Service Level Agreements (SLAs) in dynamic or unpredictable enterprise-class virtual server environments with mixed-SLA workloads.
 - End-to-end link beaconing between an HBA port or Fabric Adapter port configured in HBA mode and switch port to which it connects. (Requires Brocade Fabric OS 6.3x or above.)
 - Boot over SAN. This feature provides the ability to boot the host operating system from a boot device located somewhere on the SAN instead of the host's local disk or direct-attached Fibre Channel storage. Specifically, this "boot device" is a logical unit number (LUN) located on a storage device. Booting from direct-attached Fibre Channel storage is also supported.
 - Fabric-based boot LUN discovery, a feature that allows the host to obtain boot LUN information from the fabric zone database.

NOTE

This feature is not available for direct-attached targets.

- Support for Hyper-V. Hyper-V consolidates multiple server roles as separate virtual machines (VMs) using the Windows Server 2008 operating system and provides integrated management tools to manage both physical and virtual resources.
- Support for Windows Preinstallation Environment (WinPE), a minimal operating system with limited services for Windows Server or Windows Vista used for unattended deployment of workstations and servers. WinPE is designed for use as a standalone preinstallation environment and as a component of other setup and recovery technologies. WinPE is supported by Brocade Windows 2008 adapter drivers.
- Support for Windows Server Core, a minimal server option for Windows Server 2008 operating systems that provides a low-maintenance server environment with limited functionality. All configuration and maintenance is done through command line interface windows or by connecting to a system remotely through a management application. Windows Server Core is supported by Windows Server 2008 adapter drivers.
- Support for MSI-X, an extended version of Message Signaled Interrupts (MSI), defined in the PCI 3.0 specification. MSI-X helps improve overall system performance by contributing to lower interrupt latency and improved utilization of the host CPU. MSI-X is supported by Linux RHEL 5, RHEL 6, SLES 10, SLES 11, Windows 2008, and ESX Server 4.0, 4.1, and 5.0.

- Point-to-point topology.
- Management support for Storage Management Initiative Specification (SMI-S).
- Fibre Channel-Security Protocol (FC-SP) providing device authentication through key management.
- FCoE Initialization Protocol (FIP) support for the following:
 - FIP 2.0.
 - preFIP and FIP 1.03.
 - FIP Discovery protocol for dynamic FCF discovery and FCoE link management.
 - FPMA and SPMA type FIP fabric login.
 - FIP VLAN discovery.
 - FIP discovery solicitation and FCP discovery.
 - Login (FIP and FCoE).
 - FIP link down handling.
 - FIP version compatibility.
 - FIP keep alive.
 - FIP clear virtual links.
- Internet Protocol over Fibre Channel (IPFC) driver
This supports transmission of IP traffic over Fibre Channel links. This driver is only included in the Linux “noarch” RPM package (brocade_driver_linux_<version>.tar.gz).
- vHBA
Virtual HBAs (vHBAs) are virtual port partitions that appear as virtual or logical HBAs to the host operating system. Multiple vHBAs are not supported, therefore you cannot create or delete them from an adapter. For more information, refer to [“I/O virtualization”](#) on page 16.

Adapter management features

The Host Connectivity Manager (HCM) and Brocade Command Line Utility (BCU) are the primary management tools for HBAs, CNAs, and Fabric Adapters. You can load HCM as an optional application through the Brocade Adapter Software Installer (BASI). BCU loads with the driver package either through BASI or HCM. This section summarizes some of the features available with these tools for managing CNAs, HBAs, and Fabric Adapters.

The Brocade Network Advisor also provides management features for adapters, such as adapter discovery, in-context launch of HCM, authentication, and other features. Refer to the following manuals for more details:

- *Brocade Network Advisor SAN User Manual*
- *Brocade Network Advisor SAN and IP User Manual*

Simple Network Management Protocol provides an industry-standard method of monitoring and managing CNAs and Fabric Adapter ports configured in CNA or NIC mode. Refer to [“Simple Network Management Protocol”](#) on page 34 for details.

1 Adapter management features

For the Brocade 1007 CNA, BIOS and UEFI boot code support Advanced Management Module (AMM) connectivity and Blade Center Open Fabric Manager (BOFM) for configuring SAN and LAN connections SAN target selection, and WWN virtualization. For more information, refer to [“BladeCenter Open Fabric Manager \(BOFM\)”](#) on page 34.

This section describes the features associated with all models of the following types of Brocade adapters:

- Fabric Adapters - Refer to the following subsections depending on your AnyIO and SFP port configurations:
 - [“General adapter management”](#) on page 32.
 - [“CNA management”](#) on page 33, for ports configured in CNA or NIC modes.
 - [“HBA management”](#) on page 36, for ports configured in HBA mode.
 - [“NIC Management”](#) on page 35 for ports configured in NIC mode.
 - [“Fabric Adapter management”](#) on page 36
- CNAs- Refer to the following subsections:
 - [“General adapter management”](#) on page 32.
 - [“CNA management”](#) on page 33.
- HBAs - Refer to the following subsections:
 - [“General adapter management”](#) on page 32.
 - [“HBA management”](#) on page 36.

General adapter management

Use BCU commands and HCM for installing, configuring, troubleshooting, and monitoring the adapter and device connections. General HBA, CNA, and Fabric Adapter management functions include the following:

- Discovery of adapters and connected storage devices
- Adapter diagnostics
- Event notifications for adapter conditions and problems
- Supportsave
- Port statistics
- Host security authentication
- Port logging level configuration
- Port configuration
- Virtual port configuration
- Virtual port statistics display
- Logical port statistics display
- Interrupt control coalescing
- Performance monitoring

Fabric Adapter management

Use BCU commands, HCM, and Simple Network Management Protocol (SNMP) to manage Fabric Adapter ports. For a summary of available management features using HCM and BCU, refer to one of the following sections, depending on whether the Fabric Adapter port is configured in CNA, HBA, or NIC modes.

- [“CNA management”](#) on page 33
- [“HBA management”](#) on page 36
- [“NIC Management”](#) on page 35

CNA management

Use BCU commands and HCM to manage CNAs and Fabric Adapter ports configured in CNA mode. Other available management tools include Simple Network Management Protocol (SNMP) and BladeCenter Open Fabric Manager (Brocade 1007 adapter only).

FCoE management

HCM and BCU provide the provides the following functions for CNAs and for Fabric Adapter ports configured in CNA mode.

- CNA port statistics display
- FCoE ports configuration
- Fibre Channel Security Protocol (FC-SP) configuration
- Enabling target rate limiting
- vHBA statistics monitoring
- Port, target, and Fibre Channel Protocol (FCP) operation monitoring
- Security features for FCoE access (FC-SP) configuration
- Virtual FCoE ports creation
- FCoE statistics display
- vNIC statistics display
- Fabric statistics display
- FCP IM Module statistics display
- Historical statistics

Data Center Bridging management

HCM and BCU provide the provides the following functions for CNAs and for Fabric Adapter ports configured in CNA mode.

- DCB port statistics
- DCB statistics
- FCP IM Module statistics
- Historical statistics

Ethernet management

HCM and BCU commands provide the provide the following functions for CNAs and for Fabric Adapter ports configured in CNA or NIC modes:

- Teaming configuration
- Ethernet port statistics display
- vNIC statistics display
- VLAN configuration
- VLAN statistics display
- Ethernet logging level configuration
- VLANs over teaming configuration
- Persistent binding configuration
- NIC teaming, and VLAN statistics monitoring
- Preboot eXecution Environment (PXE) boot configuration

BladeCenter Open Fabric Manager (BOFM)

The Brocade 1007 CNA , BIOS and UEFI boot code support Advanced Management Module (AMM) connectivity and BOFM for configuring SAN and LAN connections, SAN target selection, and WWN virtualization. For more information, refer to the *Installation and User's Guide* shipped with your adapter.

NOTE

For CNAs, BOFM support in the Brocade Option ROM expects non-zero values for both PWWN and NWWN for the FCoE port. If any of these values are zero, the FCoE link will not come up, and the port status will display as **Linkdown**. Be sure to configure valid non-zero values for PWWN/NWWN when using BOFM.

Simple Network Management Protocol

Simple Network Management Protocol (SNMP) is supported by CNAs and by Fabric Adapter for ports configured in CNA or NIC mode.

SNMP is an industry-standard method of monitoring and managing network devices. This protocol promotes interoperability because SNMP-capable systems must adhere to a common set of framework and language rules. SNMP is based on manager-agent model consisting of an SNMP manager, an SNMP master-agent, a database of management information (MIB), managed SNMP devices, and the SNMP protocol.

Brocade CNA and Fabric Adapters provide the agent and management information base (MIB). The SNMP master agent provides an interface between the manager and the managed physical device(s) and uses the SNMP protocol, to exchange information defined in the MIB. Brocade adapter SNMP support is through an extension to the master agent, called the subagent, which processes SNMP queries for Brocade adapters. The subagent is only supported on Linux and Windows systems. SNMP subagent files are copied to your host system when you install adapter software through HCM and the Brocade Adapter Software Installer (BASI). You can then elect to install the subagent using Brocade Windows or Linux installation scripts.

The agent accesses information about the adapter and makes it available to an SNMP network management station. When active, the management station can get information or set information when it queries the agent. The agent uses variables (also known as managed or MIB objects) to report data such as the following.

- Model number
- Type of adapter
- Serial number
- Current status
- Hardware version
- Port statistics
- VLAN attributes and statistics
- Team attributes and statistics

All managed objects are contained in the MIB provided by the adapter. For information on the MIB groups and objects supported by the adapter, refer to

The SNMP master agent also sends unsolicited messages (called traps) to the manager. These traps, generated by the Brocade SNMP subagent, are for network adapter conditions that require administrative attention. Adapter traps included notification of VLANs added or removed; team members added or removed; team failover, failback, team added, and team removed; and port link up and link down events.

For details on MIB groups and objects supported by Brocade adapters, refer to [Appendix B, “MIB Reference”](#).

NIC Management

Ports on Fabric Adapters only can be set to operate in NIC mode. These ports appear as 10 GbE NICs to the host operating system.

BCU commands and HCM provide features for configuring, troubleshooting, and monitoring NIC connections to the Ethernet LAN. For an overview, refer to [“Ethernet management”](#) on page 34. For details, refer to the *Brocade Adapter Administrator's Guide* for full information.

In addition, BCU commands and HCM provide the following features specifically for NIC management when Fabric Adapter ports configured in NIC or CNA mode:

- vNIC configuration (only available using BCU commands)
- vNIC teaming configuration
- vNIC statistics
- vNIC discovery and display in HCM
- vNIC enable and disable

SNMP provides an industry-standard method of monitoring and managing Fabric Adapters with ports configured in NIC mode. For details, refer to [“Simple Network Management Protocol”](#) on page 34.

Management applications, such as Network Advisor, provides management support for NICs, including host and NIC discovery, in-context launch of HCM, statistics display, port and adapter property display, and other features. Refer to the *Brocade Network Advisor SAN User Manual* or *Brocade Network Advisor SAN and IP User Manual*.

HBA management

BCU commands and HCM provide the following features for HBAs and for Fabric Adapter ports configured in HBA mode:

- Port statistics display
- Discovery of adapters and connected storage devices in your SAN
- Adapter configuration
- Persistent binding
- End-to-end QoS
- Target rate limiting
- Performance monitoring, such as port and target statistics
- Supportsave operation
- Adapter diagnostics display
- N_Port trunking configuration
- Adapter, port, target, and Fibre Channel Protocol (FCP) operation monitoring
- Security features for adapter access.
- Event notifications for adapter conditions and problems.
- Monitor and analyze traffic between N_Port pairs through a mirrored port on the switch (HBA Analyzer)
- Virtual FC ports creation
- vHBA statistics display
- FCP IM Module statistics display
- Fabric statistics display
- Port configuration
- LUN masking configuration
- Historical statistics

HCM and BCU commands provide the following features only for Brocade Fabric Adapter ports configured in HBA mode:

- vHBA discovery and display in HCM
- vHBA enable and disable
- vHBA data query
- vHBA statistics display

Fabric Adapter management

Management features in BCU commands and HCM for Fabric Adapters are summarized under the following sections, depending on the operating mode set for the Fabric Adapter port:

- Port set to CNA mode - [“CNA management”](#) on page 33
- Port set to HBA mode - [“HBA management”](#) on page 36
- Port set to NIC mode - [“NIC Management”](#) on page 35

In addition to features summarized in the preceding sections of this guide, there are some unique management features for Fabric Adapters, not available for HBAs and CNAs, including the following:

- Configure port modes (CNA, HBA, NIC)
- Create, delete, enable, and disable vNICs.
- Query for information, display statistics, and set bandwidth for vNICs.
- Discover and display vNICs
- Discover and display vHBAs
- Enable and disable vHBAs
- Query for information and display statistics for vHBAs

Adapter software

Brocade adapter software includes the appropriate driver package for your host system, management utilities, and the HCM application. You can install all of these components or individual components using the Brocade Adapter Software Installer (BASI) GUI-based application or commands.

Driver packages

A single adapter driver “package” is available for installing to each supported host operation system and platform. Refer to [“Software installation and driver packages”](#) on page 43 for a list of packages for each support host systems.

Three types of adapter drivers are provided in installation packages:

- Storage driver (all adapters)

This driver provides Fibre Channel frame transport for Brocade HBAs and Fabric Adapter ports configured in HBA mode, as well as FCoE transport for Brocade CNAs. The installer logic detects either a FCoE or Fibre Channel network and the appropriate driver support is provided automatically.

NOTE

The storage driver will claim all installed Brocade adapters installed in a system. This driver will be used instead of the driver originally installed for these adapters.

- Network driver (CNAs and Fabric Adapters only)

Driver for frame transport over Ethernet and basic Ethernet services. This driver only applies to CNAs and Fabric Adapter ports configured in CNA mode only.

- Intermediate driver (CNAs and Fabric Adapters only)

For Windows systems only, this provides support for multiple VLANs on ports and teams. This driver applies to CNAs and to Fabric Adapter ports configured in CNA or NIC mode. Note that installing this driver changes the behavior of the network driver because it alters the binding of the driver and protocols in the network stack. Before installing the intermediate driver, network traffic goes from the protocols layer to the network driver directly. After installation, virtual

1 Adapter software

LANs created by BCU commands or HCM options are directly bound to upper protocols. All traffic goes from the protocols layer to the VLANs, then to the network driver. You should not enable TCP, IPV4, or other protocols or services for the network driver after installing the intermediate driver.

Each driver package contains the following components:

- Driver for your host system. In most cases, both the required storage and network drivers are included in installation packages. For systems not supporting network drivers, only the storage driver is included.
- Firmware
Firmware is installed in the adapter's on-board flash memory and operates on the adapter's CPU. It provides an interface to the host device driver and off-loads many low-level hardware-specific programming tasks typically performed by the device driver. The firmware provides appropriate support for both the storage and network drivers to manage the hardware. Depending on the adapter model, it also provides the following functions:
 - For CNAs and for Fabric Adapters with ports configured in CNA mode, it manages the physical Ethernet link to present an Ethernet interface to the network driver and a virtual FCoE link to the storage driver once DCB compliance is established for the link.
 - For Fabric Adapters with ports configured in NIC mode, it manages the physical Ethernet link to present an Ethernet interface to the network driver.

ATTENTION

The LLDP/DCBCXP engine is implemented in the firmware. Therefore, any other instance of LLDP agent or software must not be used with a CNA or Fabric Adapter port configured in CNA mode.

Management utilities

The following management Utilities are included with all driver packages.

- Brocade Command Line Utility (BCU)
An application from which you can enter commands to monitor, install, and configure Brocade adapters.
- Brocade Adapter Software Installer (BASI).
This includes a GUI-based installer and command-line installer that provides options for installing all adapter drivers, all adapter drivers and HCM, or HCM only for a specific operating system and platform.
- Installation scripts.
These allow you to install drivers, the HCM agent, and utilities to your host system without using the Brocade Adapter Software Installer.

For Windows systems, download the .exe file appropriate for your Windows system, extract files, then run the **brocade_installer.bat** command.

For Linux systems, download and extract the appropriate tar.gz file for your system. After extracting files, execute the following commands, depending on your system:

- RHEL systems.
brocade_install_rhel.sh
- SLES systems
brocade_install_sles.sh

For VMware ESX and ESXi systems, download and extract the appropriate tar.gz file for your system. After extracting files, execute the following commands, depending on your system:

- VmWare ESX 4.X
brocade_install.sh
- VmWare ESX 5.X
brocade_install_esxi.sh
- VmWare ESXi systems, use vMA commands and procedures under [“Installation on ESXi 4.0 and 4.1 systems”](#) on page 101.

For Solaris systems, download and extract the appropriate .tar file for your system. After extracting the file, execute the **brocade_install.sh** command to install software.

- HCM agent
The agent provides an interface for managing adapters installed on the host through the HCM application.
- CIM Provider
CIM Provider packages installed on your host system allow any standard Common Information Model (CIM) and SMI-S based management software to manage installed Brocade adapters. The appropriate CIM Provider rpm or msi package loads to your host system when you install the network driver package using installation scripts or installation commands that are “native” to your host system.

NOTE

The CIM Provider files do not load when you use the Brocade Adapter Software Installer (B ASI) to install driver packages.

NOTE

If you want to integrate the provider with Common Information Model Object Manager (CIM OM), install the SMI-S Provider packages using instructions in the *SMI-S Provider for Brocade Adapters Installation Guide* or *CIM Provider for Brocade Adapters Installation Guide*.

NOTE

Although SMI-S Provider and CIM Provider may be used interchangeably, CIM is the more generic term, while SMI-S is storage-specific.

1 Adapter software

- SNMP subagent.

Simple Network Management Protocol (SNMP) is an industry-standard method of monitoring and managing network devices. SNMP is supported by CNAs and by Fabric Adapter ports configured in CNA or NIC mode. SNMP support is provided through an extension to the SNMP master agent, called the subagent, which processes SNMP queries for Brocade adapters. The subagent is only supported on Linux and Windows systems. For more information on SNMP support, refer to [“Simple Network Management Protocol”](#) on page 34.

SNMP subagent files are copied to your host system when you install adapter software through HCM and the Brocade Adapter Software Installer (BASI). You can elect to install the subagent using Brocade Windows or Linux installation scripts. Refer to [“Installing SNMP subagent”](#) on page 109.

Operating system support

The following table provides general information on compatible software operating systems and environments for Brocade adapter network and storage drivers.

TABLE 7 Operating system support for network and storage drivers

Operating System	x86	x64	IA-64	SPARC
<i>Windows</i> ¹				
Windows Server 2003 ²	Both drivers supported - 32b	Both drivers supported - 64b	Both drivers not supported	N/A
Windows Server 2008 ³	Both drivers supported - 32b	Both drivers supported - 64b	Both drivers not supported	N/A
Windows Server 2008 ³ R2/SP1 ⁴	Both drivers not supported - 32b	Both drivers supported - 64b	Both drivers not supported	N/A
Windows 7 ⁴	Both drivers supported - 32b	Both drivers supported - 32b	Both drivers - not supported	N/A
Microsoft WinPE 3.x for Windows 2008 Standard/Enterprise Server	Both drivers supported - 32b	Both drivers supported - 64b	Both drivers not supported	N/A
Windows Server Core for Windows 2008	Both drivers - 32b	Both drivers - 64b ⁵	Both drivers - not supported	N/A
<i>Linux</i>				
Red Hat Enterprise Linux (RHEL) 4.9, 5.5, 5.6, 6.0, 6.1	Both drivers supported - 32b	Both drivers supported - 32b, 64b	Both drivers not supported	Both drivers not supported
SUSE Linux Enterprise Server (SLES) 10.3, 10.4, 11.0, 11.1	Both drivers supported - 32b	Both drivers supported - 32b, 64b	Both drivers not supported	Both drivers not supported
Xen Hypervisor	Both drivers supported - 32b	Both drivers supported - 32b, 64b	Both drivers not supported	Both drivers - not supported
<i>Solaris</i> ⁶				

TABLE 7 Operating system support for network and storage drivers (continued)

<i>Solaris 10.0</i>	Network driver supported - 32b Storage driver supported - 32b	Network driver supported - 32, 64b Storage driver supported - 32b, 64b	Both drivers not supported	Both drivers supported.
<i>VMware ESX/ESXi</i>				
ESX 4.0, 4.1, 5.0	N/A	Both drivers supported - 64b	N/A	N/A
Oracle Enterprise Linux (OEL) 5.6, 6.0	Both drivers supported - 32b	Both drivers supported - 64b	N/A	N/A
Oracle VM 3.0	Storage driver supported -32b	N/A	N/A	N/A

1. For Windows, the Storport miniport driver is supported (there is no support for the SCSI miniport driver).
2. Support for Windows 2003 is limited to Fabric Adapter ports configured in HBA mode and HBAs. Hot fix KB932755 (or later) is the minimum requirement and KB943545 is recommended.
3. For Windows 2008, hot fix KB968675 and KB2490742 are recommended. Hot fix KB958015 is recommended for CNAs and Fabric Adapter ports configured in CNA mode. For Windows 2008 R2 KB977977 is recommended for CNAs and Fabric Adapter ports configured in CNA mode
4. Supported by Windows 2008 drivers
5. Not supported on IEM64T systems.
6. For Solaris systems, only the Leadville-based storage driver is supported on adapters that support Solaris systems. Note that the Solaris driver does not support NPIV, authentication, and fabric device management interface (FDML). Brocade 804 and 1007 adapters are not supported on Solaris systems.

Hypervisor support

[Table 8](#) describes Hypervisor support for Brocade adapters.

TABLE 8 Hypervisor support for Brocade adapters

System	x86	x84	Intel IA64	SPARC
VMware ESX 4.0, 4.1	N/A	Yes	N/A	N/A
VMware ESX 5.0	N/A	N/A	N/A	N/A
Windows Server 2008 Hyper-V	N/A	yes	N/A	N/A
RHEVH 6.x	N/A	yes	N/A	N/A
Linux XEN	yes	yes	N/A	N/A
Linux KVM	N/A	yes	N/A	N/A
Oracle VM 3.0	N/A	yes	N/A	N/A
Citrix XenServer 6.0	N/A	yes	N/A	N/A

NOTE

For the latest support information on specific operating system release levels, service pack levels, and other patch requirements, please refer to the latest release notes for your adapter.

Host Connectivity Manager

Host Connectivity Manager (HCM) is a graphical user interface (GUI) based management software for installing, configuring, monitoring, and troubleshooting installed adapters. HCM performs the “client” function for the management software. You can only install HCM using the Brocade Adapter Software Installer. The HCM agent is installed with the driver package on systems where adapters are installed.

Install HCM on the host system containing Brocade adapters for local management or install on a network-attached system for remote management of these adapters. Refer to “[CNA management](#)” on page 33 or “[HBA management](#)” on page 36 for more information. HCM is available for all commonly used operating systems, such as Windows, Solaris, and Linux platforms. HCM is supported on VMware, but only when installed on the “guest” operating system. HCM is not supported on VMware ESXi systems.

NOTE

HCM is compatible with any version of the driver package. HCM can also manage the current version, as well as all previous versions of the HCM agent.

Boot code

The adapter boot code contains the following:

- PCI BIOS 2.1 or later, PCI firmware 3.0
Boot code for PCI system
- BIOS
Boot code for x86 and x64 platforms
- Unified Extensible Firmware Interface (UEFI)
Boot code for UEFI systems

NOTE

UEFI is not supported on the Brocade 804 adapter.

- Adapter firmware

The adapter boot code loads from Brocade adapter memory into system memory and integrates with the host system (server) BIOS during system boot to facilitate booting from LUNs, which are also referred to as “virtual drives,” “boot disks,” and “boot devices.”

To keep drivers and boot code synchronized, be sure to update your adapter with the latest boot code image on the adapter website using these steps:

1. Go to the adapters website at www.brocade.com/adapters.
2. Navigate to the adapters **Downloads** page.
3. Select your operating system from the **Downloads** list to display appropriate download files or download the ISO image.

You can download driver packages or an ISO 9660 (.iso) optical disk image files to configure boot LUNs and boot images for adapters installed in systems without operating systems or hard drives. Refer to [Chapter 4, “Boot Code”](#) for complete information.

CIM Provider

CIM Provider allows third-party SMI-S and CIM-based adapter management software to manage Brocade adapters installed on a host system.

The appropriate CIM Provider rpm or msi package loads to your host system when you manually install the driver package using instructions under [“Using software installation scripts and system commands”](#) on page 89. The CIM Provider files do not load when you use the Brocade Adapter Software Installer. The CIM Provider software is also available from the Brocade website at www.brocade.com/adapters.

For more information on CIM Provider, including operating systems supported and available installation packages, refer to the *CIM Provider for Brocade Adapters Installation Guide*.

NOTE

Although SMI-S Provider and CIM Provider may be used interchangeably, CIM is the more generic term. SMI-S is storage-specific.

Adapter event messages

When applicable events occur during adapter operation, the adapter driver generates event messages. These messages are captured in your host system logs and also display in the HCM master log. All of these event log messages are contained in HTML files that load to your system when you install adapter drivers. You can view these HTML files using any internet browser application.

For details on event messages, event log locations on supported operating systems, and where adapter event message HTML files are loaded to your host system, refer to the “Tools for Collecting Data” chapter in the *Brocade Adapters Troubleshooting Guide*. In addition, you can view all event messages in the “Message Reference” appendix of the same guide.

Software installation and driver packages

[Table 9](#) on page 44 describes the software installation packages that you can download for each supported host platform. The table provides the package name, host system supported, and package description. Using the table, you can select the following to download for your specific host platform:

- The Brocade Adapter Software Installer (.exe) application to install the driver package, HCM, or driver package and HCM. Installation instructions are provided under [“Using the Brocade Adapter Software Installer”](#) on page 68.
- A driver package that you can install using an installation script or “native” procedures for your host’s operating system. Installation procedures are provided under [“Using software installation scripts and system commands”](#) on page 89.
- An ISO 9660 (.iso) optical disk image containing all files listed in the supported software installation packages table ([Table 9](#) on page 44) and boot installation packages table ([Table 10](#) on page 51). Use this image to create CDs, DVDs, or USB drives to carry with you for installation. The image also contains product documentation, such as product manuals, current release notes, and licensing information. For Windows systems only, if using a DVD created with the ISO image, the correct installer program will automatically execute for your system. Make sure that the autorun feature is enabled.

1 Adapter software

Note that in the following ISO file name that the <date> will be replaced by the date of the software.

brocade_adapter_software_ISO_<date>.iso

Download the driver package and boot image for your host system operating system and platform from the Brocade adapter website. Use the following steps.

1. Go to the adapters website at www.brocade.com/adapters.
2. Navigate to the adapters **Downloads** page.
3. Select your operating system from the **Downloads** list to display appropriate download files or download the ISO image.

NOTE

In the package name, <version> indicates the software version number (for example v2-0-0), which will change for each release. The <platform> indicates the host processor type, such as x86 or x86_64. Network drivers are not supported on HBAs and Fabric Adapter ports configured in HBA mode.

NOTE

Although the following table lists all adapter software packages that you can download for specific operating systems and platforms, your adapter release may not be supported some of these operating systems and platforms. Refer to “[Operating system support](#)” on page 40 and the latest release notes for your adapter for more information.

TABLE 9 Supported software installation packages

Operating System and Platform	Brocade Adapter Software Installer	Driver Package
Windows Server 2003 (x86)	<i>brocade_adapter_software_installer_windows_<version>.exe</i> Installs HCM and appropriate driver package.	<i>brocade_driver_win2003_x86_<version>.exe</i> Storport miniport storage and network drivers with HCM Agent for Standard/Enterprise Server on x86 platforms. This package also contains installer script (brocade_installer.bat).
Windows Server 2003 (x86_64)	<i>brocade_adapter_software_installer_windows_<version>.exe</i> Installs HCM and appropriate driver package.	<i>brocade_driver_win2003_x64_<version>.exe</i> Storport miniport storage and network drivers with HCM Agent for Standard/Enterprise Server on the EM64T and AMD64 platforms. This package also contains installer script (brocade_installer.bat).
Windows Server 2008 (x86) ¹	<i>brocade_adapter_software_installer_windows_<version>.exe</i> Installs HCM and appropriate driver package.	<i>brocade_driver_win2008_x86_<version>.exe</i> Storport miniport storage and network drivers with HCM Agent for Standard/Enterprise Server on EM64T and AMD64 platforms. This package also contains installer script (brocade_installer.bat).
Windows Server 2008 R2 (x64) ²	<i>brocade_adapter_software_installer_windows_<version>.exe</i> Installs HCM and appropriate driver package.	<i>brocade_driver_win2008_R2_x64_<version>.exe</i> Storport miniport storage and network drivers with HCM Agent for Standard/Enterprise Server on EM64T and AMD64 platforms. This package also contains installer script (brocade_installer.bat).

TABLE 9 Supported software installation packages (continued)

Operating System and Platform	Brocade Adapter Software Installer	Driver Package
Windows Server 2008 (x64)	<i>brocade_adapter_software_installer_windows_<version>.exe</i> Installs HCM and appropriate driver package.	<i>brocade_driver_win2008_x64_<version>.exe</i> Storport miniport storage and network drivers with HCM Agent for Standard/Enterprise Server on EM64T and AMD64 platforms. This package also contains installer script (<i>brocade_installer.bat</i>).
Linux RHEL 4.9 (x86)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_rhel4_<version>.tar.gz</i>⁴
Linux RHEL 4.9 (x86_64)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_rhel4_<version>.tar.gz</i>⁴
Linux RHEL 5.5, 5.6 (x86)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_rhel5_<version>.tar.gz</i>⁴
Linux RHEL 5.5, 5.6 (x86_64)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_rhel5_<version>.tar.gz</i>⁴
Linux RHEL 6.0, 6.1 (x86)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package. ⁵	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_rhel6_<version>.tar.gz</i>⁴
Linux RHEL 6.0, 6.1 (x86_x64)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package. ⁵	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_rhel6_<version>.tar.gz</i>⁴
Linux SLES 10 SP3 (x86)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_sles10sp3_<version>.tar.gz</i>⁴
Linux SLES 10 SP3 (x86_64)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_sles10sp3_<version>.tar.gz</i>⁴
Linux SLES 10 SP4 (x86)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_sles10sp4_<version>.tar.gz</i>⁴
Linux SLES 10 SP4 (x86_64)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> <i>brocade_driver_linux_<version>.tar.gz</i>³ <i>brocade_driver_linux_sles10sp4_<version>.tar.gz</i>⁴

1 Adapter software

TABLE 9 Supported software installation packages (continued)

Operating System and Platform	Brocade Adapter Software Installer	Driver Package
Linux SLES 11 (x86)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> • <i>brocade_driver_linux_<version>.tar.gz</i>³ • <i>brocade_driver_linux_sles11_<version>.tar.gz</i>⁴
Linux SLES 11 (x86_64)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> • <i>brocade_driver_linux_<version>.tar.gz</i>³ • <i>brocade_driver_linux_sles11_<version>.tar.gz</i>⁴
Linux SLES 11 SP1 (x86)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> • <i>brocade_driver_linux_<version>.tar.gz</i>³ • <i>brocade_driver_linux_sles11sp1_<version>.tar.gz</i>⁴
Linux SLES 11 SP1 (x86_64)	<i>brocade_adapter_software_installer_linux_<version>.bin</i> Installs HCM and appropriate driver package.	<ul style="list-style-type: none"> • <i>brocade_driver_linux_<version>.tar.gz</i>³ • <i>brocade_driver_linux_sles11sp1_<version>.tar.gz</i>⁴
Solaris 10.0 (x86)	<i>brocade_adapter_software_installer_solaris10_x86_<version>.bin</i> Installs HCM and appropriate driver package for operating system and platform.	<i>brocade_driver_solaris10_<version>.tar</i> ⁶ Leadville-based storage driver with user applications, such as HCM Agent, Brocade Adapter Software Installer, and BCU, for x86 platforms.
Solaris 10.0 (x86_x64)	<i>brocade_adapter_software_installer_solaris10_x86_<version>.bin</i> Installs HCM and appropriate driver package for operating system and platform.	<i>brocade_driver_solaris10_<version>.tar</i> ⁶ Leadville-based storage driver with user applications, such as HCM Agent, Brocade Adapter Software Installer, and BCU, for x86 platforms.
Solaris 10.0 SPARC (x86_64)	<i>brocade_adapter_software_installer_solaris10_sparc_<version>.bin</i> Installs HCM and appropriate driver package.	<i>brocade_driver_solaris10_<version>.tar</i> ⁶ Leadville-based storage driver with user applications, such as HCM Agent, Brocade Adapter Software Installer, and BCU, for SPARC platforms.
VMware ESX/ESXi (x64) 4.0	Note: Use appropriate Brocade Adapter Software Installer listed in this column to install HCM on applicable “guest” operating system only. The software installer is not supported on ESX systems. The HCM agent is not supported on ESXi platforms.	<i>brocade_driver_esx4x_<version>.tar.gz</i> ⁷ 5.0 storage and network drivers with user applications, such as HCM Agent, Brocade Adapter Software Installer, and BCU for x86, EM64T, and AMD64 platforms.
VMware ESX/ESXi (x64) 4.1	Note: Use appropriate Brocade Adapter Software Installer listed in this column to install HCM on applicable “guest” operating system only. The software installer is not supported on ESX systems. The HCM agent is not supported on ESXi platforms.	<i>brocade_driver_esx41_<version>.tar.gz</i> ⁷ 4.x storage and network drivers with user applications, such as HCM Agent, Brocade Adapter Software Installer, and BCU for x86, EM64T, and AMD64 platforms.

TABLE 9 Supported software installation packages (continued)

Operating System and Platform	Brocade Adapter Software Installer	Driver Package
VMware ESX/ESXi (x64) 5.0	Note: Use appropriate Brocade Adapter Software Installer listed in this column to install HCM on applicable “guest” operating system only. The software installer is not supported on ESX systems. The HCM agent is not supported on ESXi platforms.	brocade_driver_esx50_<version>.tar.gz ⁷ 4.x storage and network drivers with user applications, such as HCM Agent, Brocade Adapter Software Installer, and BCU for x86, EM64T, and AMD64 platforms.

1. Windows 2008 x86 drivers are used for Windows 7 x86 support.
2. Windows 2008 R2 X64 drivers support Windows 7 x64.
3. This package is the source-based RPM for all RHEL and SLES Linux driver distributions, as well as user applications, such as HCM Agent, Brocade Adapter Software Installer, and BCU. The driver module is compiled on the system during the RPM installation. An installer program is available for use when you untar this package. To install this package, the appropriate distribution kernel development packages must be installed for the currently running kernel, which include the gcc compiler and the kernel sources. Although this package installs SLES drivers, the error message “bfa” or “bna” module not supported by Novell, setting U taint flag” displays. You can complete installation and use this driver although in this format it is not certified or supported by Novell, Inc.
4. This package contains the latest precompiled RPMs for either RHEL or SLES distributions, as well as user applications, such as HCM Agent, Brocade Adapter Software Installer, and BCU. An installer program is available for use when you untar this package.
5. HCM is a 32-bit application. To use HCM on Linux RHEL 6.0 x64 systems, you must install the x32-compatible libraries because they are not installed by default.
6. This package contains all network drivers, storage drivers, management utilities, and installation script for Solaris distributions
7. This package contains all network drivers, storage drivers, management utilities, and installation script for VMware ESX distributions. Note that you can use the VMware Image Builder PowerCLI to create a brocade_esx50_<version>.zip offline bundle and brocade_esx50_<version>.iso ESX 5.0 installation image that includes brocade drivers and utilities. Refer to your Image Builder documentation for details on using Image Builder PowerCLI.

NOTE

Brocade 804 and 1007 adapters are not supported on Solaris systems.

NOTE

For the latest support information on specific operating system release levels, service pack levels, and other patch requirements, please refer to the latest release notes for your adapter.

Downloading software and documentation

To download the software installer, driver packages, boot code, driver update disks, the CIM provider, and documentation, perform the following steps:

1. Go to the adapters website at www.brocade.com/adapters.
2. Navigate to the adapters **Downloads** page.
3. Select your operating system from the **Download** list to display appropriate download files or download the ISO image.

1 Items shipped with your adapter

Software installation options

You can use the Brocade Adapter Software Installer or options in “native” installation scripts and commands to install software on your host system:

- Brocade Adapter Software Installer

Use this to install the following components:

- Storage driver, network driver, and HCM
- Storage and network driver
- HCM only

For more information, refer to “[Using the GUI-based installer](#)” on page 69.

- Brocade “native” installer scripts and commands

For CNAs, use this to install the storage driver, network driver, and utilities.

For HBAs and Fabric Adapter ports configured in HBA mode, use this to install the storage driver and utilities only.

For more information, refer to “[Using software installation scripts and system commands](#)” on page 89.

NOTE

Only one driver installation is required for all types of adapters (CNA, HBA, or Fabric Adapter) installed in a host system.

Refer to “[Software installation and driver packages](#)” on page 43 for a complete list of driver and software installer packages that you can download from the Brocade adapter website at www.brocade.com/adapters. On the adapters website, navigate to the **Downloads** page.

Items shipped with your adapter

This section describes items shipped with your adapter.

Stand-up adapters

The following items are shipped with stand-up adapters for installation:

- Adapter with the following PCI mounting bracket installed, depending on your adapter model:
 - Low-profile PCI mounting bracket (all CNA and HBA models)
 - Standard (full-height) PCI mounting bracket (Fabric Adapters)
- Loose adapter packaged with adapter, depending on your adapter model:
 - Standard (full-height) PCI mounting bracket (all CNA and HBA models)
 - Low-profile PCI mounting bracket (Fabric Adapters)
- One SFP or two SFPs, depending on your adapter model. Note that for CNAs and Fabric Adapters, SFPs and copper cables may be purchased separately or shipped with the FCoE switch.
- Adapter installation instructions
- Instructions for downloading software

Mezzanine adapters

The following items may be shipped with adapters for installation, depending on the adapter model:

- Adapter
- Adapter installation instructions
- Important notices document and warranty card
- CD containing documentation for installing, removing, configuring, and troubleshooting the adapter.

Boot installation packages

Download boot installation packages to support boot operations, such as boot from SAN, network boot, and updating adapter boot code, from the Brocade website using the following steps:

1. Access the Brocade adapters website at www.brocade.com/adapters.
2. Navigate to the **Downloads** page.
3. Select your operating system from the **Downloads** list to display appropriate downloads.
4. On the download page, select the **Boot Code** area.

The following boot installation packages are available:

- Driver update disk (dud) ISO files containing the appropriate driver and necessary directory structure to install with the host operating system on remote LUNs for boot over SAN operations. ISO images are available for Windows 2008, Linux, Solaris, and VMware systems. A Zip file is available for Windows 2003 and VMware ESX 5.0 systems.

NOTE

When installing the operating system to the remote boot LUN, you must use the driver update disk (DUD) appropriate for the host operating system and platform or installation will fail. Also note that two separate DUDs are available for each operating system to provide appropriate storage and network files for your adapter model.

NOTE

For Microsoft Windows operating systems, the driver update disk does not verify prerequisite checks as part of installation. Please review the operating system prerequisites and install the necessary hotfixes after the operating system installation is complete.

- A LiveCD ISO image (live_cd.iso) containing the adapter driver, boot code, and minimum operating system to allow you to boot BIOS-based host systems that do not have installed operating systems or local drives. Once you boot the system, you can update the boot image on installed adapters and configure boot from SAN using BCU commands.

NOTE

To boot UEFI-based host systems, you can create a WinPE ISO image using steps under “[Configuring fabric-based boot LUN discovery \(Brocade fabrics\)](#)” on page 164. This image contains the adapter driver, boot code, and minimum operating system to boot systems without installed operating systems or local drives.

1 Boot installation packages

- An ISO 9660 (.iso) optical disk image containing all files listed in the supported software installation packages table (Table 9 on page 44) and boot installation packages table (Table 10 on page 51). Use this image to create CDs or USB drives to carry with you for installation. The image also contains product documentation, such as product manuals, current release notes, and licensing information. For Windows systems only, if using a DVD created with the ISO image, the correct installer program will automatically execute for your system. Make sure that the autorun feature is enabled.

Note that in the following ISO file name, <date> will be replaced by the release date of the software.

```
brocade_adapter_software_ISO_<date>.iso
```

Download this image from the Brocade adapters website at the Brocade adapters website using the following steps:

- a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Perform one of the following steps:
 - Select your operating system from the **Downloads** list to display appropriate download files.
 - Select **Download ISO Image** to download `brocade_adapter_software_ISO_<date>.iso`.
- Adapter boot code image. This contains BIOS and UEFI boot code and firmware used by the boot code to boot from the adapter. Load this code to option ROM on the adapter using the BCU **boot –update** command. Download this image from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display appropriate download files.
 - d. Download the boot code image from the Boot Code section.

NOTE

To keep drivers and boot code synchronized, be sure to update your adapter with the latest boot image whenever you install or update adapter driver packages. Refer to “[Boot code updates](#)” on page 118 for instructions.

Table 10 describes the installation packages for boot support that you can download for each supported operating system. The table provides the operating system, the driver update disk (DUD) image, the LiveCD, and the boot code.

NOTE

Although the following table lists all boot packages that you can download for specific operating systems and platforms, your adapter release may not be supported some of these operating systems and platforms. Refer to “[Operating system support](#)” on page 40 and the latest release notes for your adapter for more information.

TABLE 10 Boot installation packages

Operating System (Platform)	Driver Update Disk Image	LiveCD	Boot Code
Windows 2003 (x86)	brocade_adapter_fc_w2k3_x86_dud_<version>.zip ¹	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
Windows 2003 (x86_64)	brocade_adapter_fc_w2k3_x64_dud_<version>.zip ¹	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
Windows 2008 (x86)	brocade_adapter_fc_w2k8_x86_dud_<version>.zip ² brocade_adapter_fcoe_w2k8_x86_dud_<version>.zip ³	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
Windows 2008 (x86_64)	brocade_adapter_fc_w2k8_x64_dud_<version>.zip ² brocade_adapter_fcoe_w2k8_x64_dud_<version>.zip ³	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
Windows 2008 R2 (x86_64)	brocade_adapter_fc_w2k8_r2_x64_dud_<version>.zip ² brocade_adapter_fcoe_w2k8_r2_x64_dud_<version>.zip ³	NA	brocade_adapter_boot_fw_<version>
Linux RHEL 4.9 (x86 and x86_64)	brocade_adapter_rhel4_dud_<version>.iso ⁴	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
Linux RHEL 5.4, 5.5, 5.6, 6.0, 6.1 (x86)	brocade_fc_adapter_rhel54_i386_dud_<version>.iso ⁵ brocade_nw_adapter_rhel54_i386_dud_<version>.iso ⁶ brocade_fc_adapter_rhel55_i386_dud_<version>.iso ⁵ brocade_nw_adapter_rhel55_i386_dud_<version>.iso ⁶ brocade_fc_adapter_rhel56_i386_dud_<version>.iso ⁵ brocade_nw_adapter_rhel56_i386_dud_<version>.iso ⁶ brocade_fc_adapter_rhel60_i386_dud_<version>.iso ⁵ brocade_nw_adapter_rhel60_i386_dud_<version>.iso ⁶ brocade_fc_adapter_rhel61_i386_dud_version.iso ⁵ brocade_nw_adapter_rhel61_i386_dud_version.iso ⁶	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
Linux RHEL 5.4, 5.5, 5.6, 6.0, 6.1 (x86_64)	brocade_fc_adapter_rhel54_x86_64_dud_<version>.iso ⁵ brocade_nw_adapter_rhel54_x86_64_dud_<version>.iso ⁶ brocade_fc_adapter_rhel55_x86_64_dud_<version>.iso ⁵ brocade_nw_adapter_rhel55_x86_64_dud_<version>.iso ⁶ brocade_fc_adapter_rhel56_x86_64_dud_<version>.iso ⁵ brocade_nw_adapter_rhel56_x86_64_dud_<version>.iso ⁶ brocade_fc_adapter_rhel60_x86_64_dud_<version>.iso ⁵ brocade_nw_adapter_rhel60_x86_64_dud_<version>.iso ⁶ brocade_fc_adapter_rhel61_x86_64_dud_<version>.iso ⁵ brocade_nw_adapter_rh61_x86_64_dud_version.iso ⁶	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
Linux SLES 10, SP3, SP4 (x86, x86_64)	brocade_adapter_sles10sp3_dud_<version>.iso ⁴ brocade_adapter_sles10sp4_dud_<version>.iso ⁴	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
Linux SLES 11	brocade_adapter_sles11_dud_<version>.iso ⁴	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>

1 Downloading software and publications

TABLE 10 Boot installation packages (continued)

Operating System (Platform)	Driver Update Disk Image	LiveCD	Boot Code
Linux SLES 11 SP1	brocade_adapter_sles11sp1_dud_<version>.iso ⁴	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
Solaris 10	brocade_adapter_sol_dud_<version>.iso ⁷	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
VMware ESX/ESXi 4.0	bfa_esx4x_<version>.iso ⁸ bna_esx4x_<version>.iso ⁹	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
VMware ESX/ESXi 4.1	bfa_esx41_<version>.iso ⁸ bna_esx41_<version>.iso ⁹	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>
VMware ESX/ESXi 5.0	bfa_esx50_<version>.zip ⁸ bna_esx50_<version>.zip ⁹	live_cd_<version>.iso	brocade_adapter_boot_fw_<version>

1. Windows 2003 (w2k23) v3-0-0-0 only supports Fabric Adapter ports configured in HBA mode. Windows 2003 (w2k23) v2-3-0-2 only supports HBAs. Note that for Windows 2003, boot over SAN is not supported on CNAs, but only on HBAs and Fabric Adapter HBA ports. After installing the boot package, be sure to upgrade to the latest driver.
2. 2008 DUDs support Fabric Adapters and HBAs. Zip file contains files for floppy disk.Windows.
3. Network drivers for CNAs and for Fabric Adapter ports configured in CNA or NIC mode. Zip file contains files for floppy disk. For network boot, the network driver is injected as part of the PXE Server prior to Windows installation. The driver is passed over during PXE installation on the server.
4. Storage drivers and network drivers are part of ISO package.
5. Drivers for HBAs, CNAs, and Fabric Adapter ports for boot over SAN. Note that you can use the VMware Image Builder PowerCLI to create a brocade_esx50_<version>.zip offline bundle and brocade_esx50_<version>.iso ESX 5.0 installation image that includes brocade drivers and utilities. Refer to your Image Builder documentation for details on using Image Builder PowerCLI.
6. Drivers for network (PXE) boot. Install these drivers after Fibre Channel drivers for network boot. Note that you can use the VMware Image Builder PowerCLI to create a brocade_esx50_<version>.zip offline bundle and brocade_esx50_<version>.iso ESX 5.0 installation image that includes brocade drivers and utilities. Refer to your Image Builder documentarian for details on using Image Builder PowerCLI.
7. Solaris is not supported for the Brocade 804 and 1007 adapters.
8. Storage drivers for HBAs and Fabric Adapter ports configured in HBA mode.
9. Network drivers for CNAs and Fabric Adapter ports configured in CNA or NIC mode.

Downloading software and publications

To download all HBA software and boot code, use the following steps.

1. Go to the adapters website at www.brocade.com/adapters.
2. Navigate to the adapters **Downloads** page.
3. Select your operating system from the **Downloads** list to display appropriate download files.
4. On the download screen, select the appropriate software from the Software Installer, drivers, boot code, and Driver Update Disks (DUD) areas. Select product publications from the Documentation section.
5. If downloading software, acknowledge the adapter **Download Agreement**.

6. When the **File Download** screen displays, save the file to an appropriate location on your system.

Using BCU commands

Some procedures in this manual reference BCU commands for adapter monitoring and configuration.

To use BCU commands, enter commands at the BCU> command prompt. For Windows systems, launch the command prompt using the Brocade BCU desktop aa, which automatically installs to your desktop with the adapter software. If installation fails (possibly because devices are not present on the system), the shortcut is still created. The BCU shortcut provides quick access to the installation folder where you can perform the following tasks:

- Run the Support Save feature
- Reinstall drivers
- Run adapter utilities

NOTE

Launching BCU on Windows systems through methods other than through the desktop shortcut is not recommended and may result in display of inconsistent information.

To list all the commands and subcommands, type the following command:

```
bcu -help
```

To check the CLI and Driver version number, type the following command:

```
bcu -version
```

To launch a BCU command at the BCU> prompt, enter the command as in the following example:

```
port -list
```

NOTE

For complete details on BCU commands, refer to the *Brocade Adapters Administrator's Guide*.

VMware ESX 5.0 and later systems

For VMware ESX 5.0 and later systems, BCU commands are integrated with the esxcli infrastructure.

To run a BCU command, use the following syntax:

```
esxcli brocade bcu --command="command"
```

where:

command BCU command, such as **port -list**.

For example:

```
esxcli brocade bcu --command="port -list"
```

1 Using BCU commands

Hardware Installation

In this chapter

- [Introduction](#) 55
- [ESD precautions](#) 55
- [Stand-up adapters](#) 56
- [Mezzanine adapters](#) 61

Introduction

This chapter provides instructions for installing and replacing the following types of Brocade adapters:

- Stand-up HBA, CNA, and Fabric Adapters.
Instructions are also provided for removing and installing small form factor pluggable (SFP) transceivers.

NOTE

Use only Brocade-branded SFP laser transceivers supplied for stand-up adapters.

- HBA mezzanine adapter
- CNA mezzanine adapter

NOTE

When installing Fabric Adapters with ports configured in CNA or NIC mode and CNAs on a VMware systems, it is advisable to install the driver before the adapter so that the NICs will be properly numbered in the system. Perform appropriate steps under [Chapter 3, “Software Installation”](#) then return to this chapter.

To troubleshoot problems after installation, refer to the *Brocade Adapters Troubleshooting Guide*.

For details in items shipped with various adapter models for installation, refer to [“Items shipped with your adapter”](#) on page 48.

ESD precautions

When handling the adapter, use correct electrostatic discharge (ESD) procedures:

- Be sure that you are properly grounded before beginning any installation.
- When possible, wear a wrist grounding strap connected to chassis ground (if system chassis is plugged in) or a bench ground.
- Store the adapter in antistatic packaging.

Stand-up adapters

Use information in this section to install stand-up adapter hardware on your host system.

What you need for installation

Have the following items available for installing the adapter hardware:

- Phillips #1 screwdriver.
- Adapter with appropriate mounting bracket attached.
- Appropriate cable with appropriate connectors to connect the adapter to the switch.
 - For Fabric Adapter cable and SFP specifications, refer to [“Cabling”](#) on page 176.
 - For CNA cable and SFP specifications, refer to [“Cabling \(stand-up adapters\)”](#) on page 183.
 - For HBA and Fabric Adapter HBA port cable and SFP specifications, refer to [“Cabling \(stand-up adapters\)”](#) on page 190.
- Fully operational host.
- Access to a host from your user workstation either through LAN connection or direct attachment.

Installing an adapter

ATTENTION

The adapter can be damaged by static electricity. Before handling, use standard procedures to discharge static electricity, such as touching a metal surface and wearing a static ground strap. Handle the adapter by the edge and not the board components or gold connector contacts.

1. Check that you have received all items needed for installation. Refer to [“Items shipped with your adapter”](#) on page 48.
2. Remove the adapter from its packaging and check for damage. If it appears to be damaged, or if any component is missing, contact Brocade or your reseller support representative.
3. Make a backup of your system data.
4. Power down the host. Unplug all power cords and network cables.
5. Remove all covers necessary from the system to access the PCIe slot where you want to install the adapter. Refer to documentation provided with your system to locate PCIe slots and cover removal procedures.
6. Remove the blank bracket panel from the system that covers the PCIe slot where you want to install the adapter. If the panel is secured with a screw, remove the screw and save it for securing the adapter’s bracket panel back in the slot.

NOTE

For best performance, install the adapter into a PCIe slot with an x8 lane or greater transfer interface. Also, do not install this adapter in a PCI slot. PCIe slots are shorter than PCI slots.

7. Remove all SFP transceivers from the adapter if clearances inside your system case prohibit you from installing the adapter with transceivers installed. Follow the instructions under [“Removing and installing SFP transceivers”](#) on page 59. Otherwise go on to the next step.

8. Install the longer, standard bracket on the adapter if the low-profile mounting bracket (shipped installed on adapter) does not fit your system case. Use the following steps. If the installed low-profile bracket works, go on to [step 9](#).
 - a. Remove all SFP transceivers from the adapter. Refer to [“Removing and installing SFP transceivers”](#) on page 59 for procedures.
 - b. Remove the two screws attaching the bracket to the adapter, and pull off the bracket. Refer to [Figure 8](#).

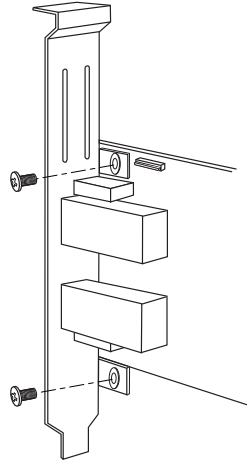
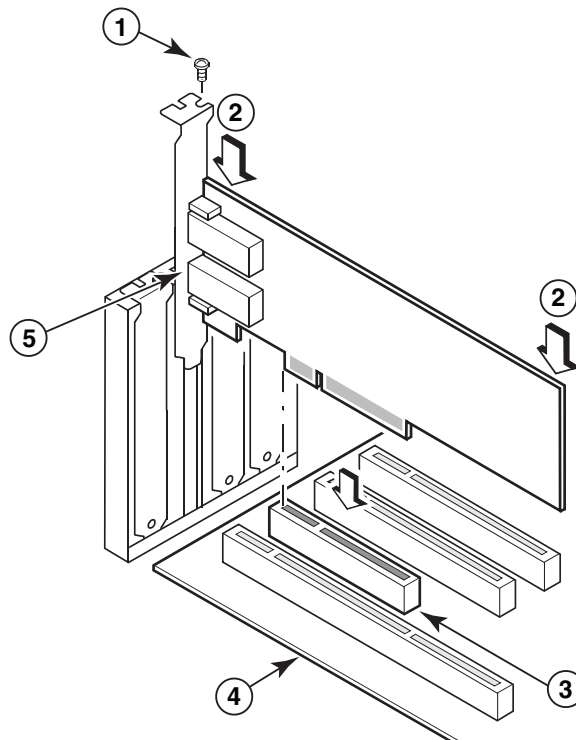


FIGURE 8 Removing or installing adapter mounting bracket

- c. Carefully guide the new mounting bracket onto the adapter, making sure the bracket mounting tabs align with the holes in the adapter.
 - d. Replace and tighten the two screws.
 - e. Store the mounting bracket that you removed for future use.
9. Insert the adapter into the desired empty PCIe bus slot. Press firmly until the adapter seats. Refer to [Figure 9](#) for seating directions.



- 1 Mounting screw
- 2 Top edge of adapter (press down into slot)
- 3 PCI X8 slot
- 4 Edge of host board
- 5 SFP receivers

FIGURE 9 Installing adapter in system chassis

10. Secure the adapter's mounting bracket to the case using the method required for your case. Note that in some systems, the bracket may secure to the case with a screw.
11. If you removed transceivers in step [step 7](#), make sure to install adapter receivers. Refer to ["Removing and installing SFP transceivers"](#) on page 59 for procedures.
12. Replace the system's case or cover and tighten all screws.

Connecting an adapter to a switch or direct-attached storage

Use multimode fiber optic cable or twinaxial copper cable (Fabric Adapters with ports configured in CNA mode and CNAs only) with appropriate connectors when connecting the adapter to the switch. Use multimode fiber optic cable when connecting an HBA or Fabric Adapter port configured in HBA mode to a switch or direct-attached storage. Refer to ["Cabling \(stand-up adapters\)"](#) on page 183 for cable specifications.

1. Pull out the protective rubber inserts from fiber optic SFP connectors, if installed in adapters or the switch.
2. Connect the cable from the switch to the appropriate SFP connector on the adapter.

Removing and installing SFP transceivers

User the following procedures to remove and install fiber optic SFP transceivers.

NOTE

Use only the Brocade-branded small form factor pluggable (SFP) transceivers in the Brocade adapters. Refer to [“Hardware compatibility”](#) on page 10.

Removing transceivers

If you need to remove SFP transceivers from the adapter to provide clearance for installing into the server cabinet, use the following steps.

1. Pull out the protective rubber plug from the SFP connector.
2. Remove the SFP.
 - For SFPs with optical transceivers, use your thumb and forefinger to unlatch the bail from the side of the cable connector. Using the bail or pull tab as a handle, pull the SFP straight out of the receiver. Refer to the left illustration in [Figure 10](#).

NOTE

For 16 Gbps optical transceivers, a pull tab may be available for pulling the SFP out of the receiver.

- For copper SFPs with attached cables, use your thumb and forefinger to pull the tab on the cable to release the SFP latch, then pull the SFP straight out of the receiver. Refer to the right illustration in [Figure 10](#).

NOTE

In the following figure, the fiber optic SFPs are shown illustration A, and the copper SFPs with attached cable are shown in the illustration B.

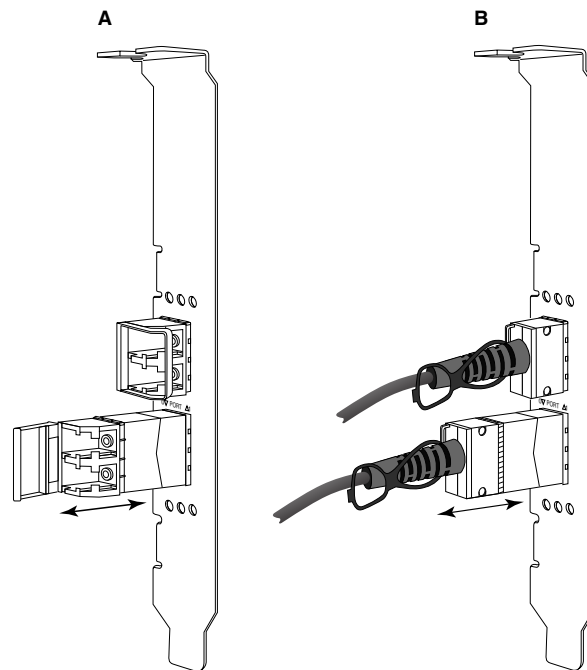


FIGURE 10 Removing or installing fiber optic and copper SFPs

Installing transceivers

1. Orient the SFP in front of its slot on the adapter so that it can slide into the adapter receiver slot. The SFP can only be oriented one way into the slot.
2. Carefully guide the SFP into the adapter's receiver until it seats.
 - For optical SFPs close the bail to latch the SFP into the receiver.
 - For copper SFPs, push the SFP into the receiver until it clicks into place.

Replacing an adapter

If you are replacing an adapter, perform the following steps.

1. Make a backup of your system data.
2. Power down the host. Unplug all power cords and network cables.
3. Remove all covers necessary from the system to access the PCIe slot where you want to install the adapter. Refer to documentation provided with your system to locate PCIe slots and cover removal procedures.
4. Unlatch the mounting bracket for the installed adapter or remove the screw (if applicable) securing it to the case.
5. Pull the adapter gently from PCIe connectors.
6. Install the new adapter following the appropriate steps for your adapter under [“Stand-up adapters”](#) on page 56.

All configuration settings for the old adapter in the slot will automatically apply to the new adapter.

Mezzanine adapters

Mezzanine adapters are smaller modules than stand-up models that mount on server blades that install in blade system enclosures. Instead of connecting fiber optic cables between stand-up adapters ports in traditional servers and switches, mezzanine adapters connect to switch or I/O modules installed in the blade system enclosure through the enclosure midplane.

Use information in this section as a guideline for install these adapters in compatible blade servers from supported manufacturers.

Brocade 804 HBA

To install the 804 mezzanine card adapter into the server blade, refer to the installation instructions shipped with the adapter.

Also refer to the setup and installation guide and user guide for the blade system enclosure for the following information:

- Instructions for removing and installing the server blade in the enclosure.
- Details about the association between the mezzanine bay and interconnect bays in the blade system enclosure. The location where you install the mezzanine adapter determines where you install the interconnect modules.
- Instructions for accessing the server blade through a console or workstation to install adapter drivers and software.

For details on other devices that install in the blade system enclosure, refer to the *Installation and User Guide* that came with the device.

For details on compatibility with blade servers, switch modules, I/O modules, and other devices that install in the blade system enclosure, refer to [“Server blades and blade system enclosures \(mezzanine adapters\)”](#) on page 11.

What you need for installation

Have the following available before installing the adapter:

- Mezzanine card shipping carton, which includes the mezzanine card and necessary documentation.
- Fully operational blade server.
- Access to the blade server through local or remote console connection for installing adapter drivers and software.
- Blade server installation and user guide.
- Blade system enclosure installation and user guides.
- Interconnect and switch module installation guides for the blade system enclosure.

NOTE

[“Verifying adapter installation”](#) on page 108 provides a list of general items to verify during and after installing hardware and software to avoid possible problems. You can use the list to verify proper installation and make corrections as necessary.

Brocade 1007 CNA

For details on installing this adapter in a blade server, refer to the *Installation and User Guide* that ships with the adapter.

The adapter (expansion card) *Installation and User's Guide* provides full details on installation guidelines, installing and removing the blade server from the blade system enclosure, installing and removing the adapter from the blade server, resolving problems, obtaining help and technical assistance, related documentation, safety, electronic emission notices, and important notes.

Review information in the adapter (expansion card) and blade system enclosure *Installation and User's Guide* about required location of switch modules in enclosure bays for connection to CNA ports.

To support each I/O module that you install in the blade system enclosure, you may also need to install a compatible CNA in each blade server that you want to communicate with the I/O module. Refer to the documentation for your blade system enclosure for details.

For details on compatibility with blade servers, switch modules, I/O modules, and other devices that install in the blade system enclosure, refer to [“Server blades and blade system enclosures \(mezzanine adapters\)”](#) on page 11.

What you need for installation

Have the following available for installing the adapter:

- Adapter shipping carton, which includes the adapter and necessary documentation.
- Fully operational blade server.
- Access to blade server through local or remote console connection.
- Blade server or storage expansion unit *Installation and User's Guide*.
- Blade system enclosure *Installation and User's Guides*.
- I/O module installation guide for the blade system enclosure.

NOTE

[“Verifying adapter installation”](#) on page 108 provides a list of general items to verify during and after installing hardware and software to avoid possible problems. You can use the list to verify proper installation and make corrections as necessary.

Brocade 1741 CNA

For details on installing this mezzanine card on a blade server, refer to the supported blade enclosure's *Hardware Owner's Manual* for the Dell™ PowerEdge™ M1000e modular blade system. Refer to that manual for the following:

- Full details on installing and removing blades from the blade enclosure and installing and removing mezzanine cards from blades.
- Guidelines for installing mezzanine cards. Before installing the mezzanine card, review the installation guidelines, especially to identify blade slots for installing mezzanine cards and enclosure bays for installing supported I/O modules.
- Guidelines for installing I/O modules. To support each I/O module that you install in the blade enclosure, you may also need to install a compatible mezzanine card in each blade server that you want to communicate with the I/O module.

- Instructions for accessing the blade server through a console or workstation to install adapter drivers and software.

What you need for installation

Have the following available for installing the adapter:

- Mezzanine card shipping carton, which includes the adapter and necessary documentation.
- Fully operational blade server.
- Access to the blade server through local or remote console connection.
- The blade enclosure's *Hardware Owner's Manual*.

Updating PHY firmware

The Ethernet PHY module, located in the 1740 mezzanine card port hardware only, aids in communications to and from the Ethernet LAN. Instructions are provided in this section to update this firmware if required.

Determining firmware version

To query the PHY module and determine attributes, such as the PHY module status and installed firmware version, use the **bcu phy –query** command.

```
bcu phy --query <port_id>
```

where:

<port_id> ID of port for which you want to determine the firmware version. This could be the PWWN, port hardware path, or user-specified port name. This could also be the adapter-index/port-index. For example, to specify adapter 1, port 1 you would use 1/1 as the port identification.

Updating firmware

Download the latest PHY firmware file and update the PHY using the **bcu phy –update** command.

```
bcu phy --update <ad_id> | -a <binary_file>
```

where:

-a If specified, update will apply to all adapters in the system that contain the PHY module.

ad_id ID of the adapter.

file_name Name of binary firmware file.

NOTE

After updating the firmware, you must disable then enable the adapter to activate it.

2 Mezzanine adapters

Software Installation

In this chapter

- Introduction 65
- Installation notes 66
- Using the Brocade Adapter Software Installer 68
- Using software installation scripts and system commands 89
- Confirming driver package installation 103
- Verifying adapter installation 108
- Updating drivers with HCM 110
- Installing HCM to a host from the HCM Agent 112
- HCM Agent operations 112
- HCM configuration data 114
- Setting IP address and subnet mask on CNAs 115

Introduction

This chapter provides procedures to install the adapter driver, HCM, and other software using the following options:

- “Using the Brocade Adapter Software Installer” on page 68.
- “Using software installation scripts and system commands” on page 89.

Procedures are also provided for removing software using the Brocade Adapter Software Uninstaller (refer to “Software removal using Adapter Software Uninstaller” on page 83), and upgrading software using the Brocade Adapter Software Installer (refer to “Software upgrade using Adapter Software Installer” on page 87). Procedures are also provided for configuring HCM agent operations, and setting the IP address and subnet mask on CNAs and Fabric Adapter ports configured in CNA or NIC mode.

To troubleshoot problems after installation, refer to the *Brocade Adapters Troubleshooting Guide*.

To keep adapter drivers and boot code synchronized, be sure to update your adapter with the latest boot image whenever you install or update adapter driver packages. Use the following steps:

1. Go to the adapters website at www.brocade.com/adapters.
2. Navigate to the **Downloads** page.
3. Select your operating system from the **Downloads** list or download the ISO image.
4. Download the boot image file from the “Boot Code” section.
5. Refer to “Boot code updates” on page 118 for instructions to install the image.

Installation notes

Please read through the following notes before installing adapter software:

- For details on operating system requirements for installing adapter drivers, refer to “[Operating system support](#)” on page 40 and “[Software installation and driver packages](#)” on page 43. Also download the latest release notes from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list or download the ISO image.
 - d. Download the release notes from the “Documentation” section.
- Find the installer program for your host’s operating system and platform under “[Software installation and driver packages](#)” on page 43. Following are generic names for the Installer program for supported operating systems.
 - Windows systems
`brocade_adapter_software_installer_windows_<version>.exe`
 - Linux systems
`brocade_adapter_software_installer_linux_<version>.bin`
`brocade_adapter_software_installer_linux_<platform>_<version>.bin`
 - Solaris systems
`brocade_adapter_software_installer_Solaris10_<platform>_<version>.bin`

NOTE

The <platform> variable in the installer commands is the host system architecture, such as SPARC, x86, or x64.

- The Brocade Adapter Software Installer is not supported on the VMware ESX platforms for installing drivers, HCM, or utilities. However, you can use an appropriate Brocade Adapter Software Installer to install HCM on a “guest” system. For VMware, drivers and utilities are provided as ISO images packed in a tarball. A Brocade installer script is available for installation.
- To use the Brocade Adapter Software Installer on Linux RHEL 6.0 x64 systems, you must install the x32-compatible libraries as they are not installed by default. Refer to “[RHEL 6.x version x64 systems](#)” on page 69 for procedures.
- Software installation or upgrade on a host system with a large number of adapters could take much longer than normal.
- If you receive errors when launching the GUI-based Brocade Adapter Software Installer, such as InvocationTargetException errors, your system may not be able to run a GUI-based application. Instead use the instructions under “[Software installation using Software Installer commands](#)” on page 76.
- Brocade 804 and 1007 adapters are not supported on Solaris systems so Solaris commands in this section do not apply.
- After installing drivers on a Linux or Solaris system, you must reboot the system to enable the drivers.

- You must use the Brocade Adapter Software Installer application to install HCM to the host system where the adapter is installed or to a separate remote management platform. You cannot install HCM using the Brocade-provided installation scripts or your system's "native" installation commands. After installation, an HCM desktop shortcut is available on Windows and Linux systems.
- Ensure that Visual Studio 2005 SP1 (or later) Redistributable package is installed on Windows 2003 R2 SP3 systems to avoid problems starting HCM Agent.
- There are firewall issues with HCM Agent on Windows 2008 and VMware systems. When installing the driver package on these systems, open TCP/IP port 34568 to allow agent communication with HCM.
 - For VMware, use the following command to open port 34568:

```
/usr/sbin/cfg-firewall -o 34568,tcp,in,https
/usr/sbin/cfg-firewall -o 34568,udp,out,https
```
 - For Windows, use Windows Firewall and Advanced Service (WFAS) to open port 34568. Note that you can change the default communication port (34568) for the agent using the procedures under "[HCM Agent operations](#)" on page 112.
- On Linux SLES 10 and 11 systems when installing the source-based (noarch) driver packages (brocade_driver_linux_<version>.tar.gz) or when using the Brocade Adapter Software Installer and the kernel has been upgraded to a version without pre-compiled binaries, perform the following tasks to make sure the drivers will load on system reboot:
 - For Linux SLES 10 systems, make sure that the LOAD_UNSUPPORTED_MODULES_AUTOMATICALLY variable on your system is set to "yes." This variable is in the following configuration file.

```
/etc/sysconfig/hardware/config
```
 - For Linux SLES 11, change the "allow_unsupported_modules" value from 0 to 1 in the following file.

```
/etc/modprobe.d/unsupported-modules
```
- Only one driver installation is required for all Brocade adapters (HBAs, CNAs, or Fabric Adapters) installed in a host system.
- Root or administrator privileges are required for installing the driver package.
- The procedures in this section assume that the host's operating system has been installed and is functioning normally.
- Before installing the driver on Windows systems, install the following hot fixes from the Microsoft "Help and Support" website, then reboot the system:
 - Windows 2003
KB932755 (or later) is the minimum requirement.
KB943545 is recommended if the HP command view management application is used to manage HP EVA arrays in the target system.
 - Windows 2008
KB968675 is recommended. This fixes a non-paged memory leak in a Windows 2008 storage stack.
KB2490742 is recommended when installing storage drivers to avoid a "0x000000B8" stop error when shutting down or hibernating a system running Windows 7 or Windows Server 2008 R2.

KB958015 is recommended for CNAs and Fabric Adapter ports configured in CNA mode.

- Windows 2008 R2

KB977977 is recommended for CNAs and Fabric Adapter ports configured in CNA mode.

- Installing software with the Brocade Adapter Software Installer automatically starts the HCM Agent. You can manually start and stop the agent using the instructions under [“HCM Agent operations”](#) on page 112.
- When using the Brocade Adapter Software Installer to install HCM, a “Found Backed up data” message displays if a backup directory exists for previously installed software. This message prompts you to restore or not to restore old configuration data. Refer to [“HCM configuration data”](#) on page 114 for more information.
- By default, the initrd file will be backed up automatically during Linux installations. During installation, a dialog box displays with the location of the file. If a file exists, a dialog box displays with its current location and allows you to overwrite the file, not overwrite the file, or quit.
- For Windows systems, installing the management utilities creates a Brocade BCU desktop shortcut on your system desktop. Use this to launch the BCU> command prompt and enter BCU commands.
- Because the ESX 5.0 driver installation process does not enforce maintenance mode, it is recommended that you put the host in maintenance mode since a system reboot is required after installation.

Using the Brocade Adapter Software Installer

Use information in this section to install the Host Connectivity Manager (HCM) and driver packages for your host platform using the Brocade Adapter Software Installer (BASI) application. Instructions for using the GUI-based installer and command line installer are provided. The Brocade Adapter Software Installer application allows you to install all software or to selectively install the HCM or driver packages.

NOTE

The Brocade Adapter Software Installer is available for Windows, Linux, and Solaris operating systems. For VMware systems, it will only operate on “guest” operating systems for installing the HCM application. To install the driver and utilities package for VMware systems, refer to [“Driver installation and removal on VMware systems”](#) on page 99.

For instructions on using the Brocade installation scripts and installation commands that are “native” to your host operating system, refer to [“Using software installation scripts and system commands”](#) on page 89.

For details on HCM, driver packages, and other adapter software components for each supported host system, refer to [“Adapter software”](#) on page 37.

Two installation options are available when using the Brocade Adapter Software Installer:

- Installation using a GUI-based installer. Refer to [“Using the GUI-based installer”](#) on page 69.
- Installation using commands. This method completely installs the driver package, HCM, or all components without user interaction. Refer to [“Software installation using Software Installer commands”](#) on page 76.

NOTE

The storage driver will claim all installed Brocade Fiber Channel HBAs, FCoE CNAs, and Fabric Adapter ports configured in HBA or CNA mode installed in a host system.

RHEL 6.x version x64 systems

The Brocade Adapter Software Installer and HCM are 32-bit applications. To use these applications on Linux RHEL 6.x version x64 systems, you must install the x32-compatible libraries because they are not installed by default.

To install these libraries, use the following steps.

1. Install `glibc.i686` or select “Compatibility Libraries” under “Base System” when installing RHEL 6.x.
2. Install the following RPMs once you install RHEL 6.x:

NOTE

These RPMs should be available under the Packages folder on the RHEL 6.0 or 6.1 DVD.

- `libX11-*.el6.i686.rpm`
- `libXau-*.el6.i686.rpm`
- `libXext-*.el6.i686.rpm`
- `libXi-*.el6.i686.rpm`
- `libXtst-*.el6.i686.rpm`
- `libxcb-*.el6.i686.rpm`
- `nss-softokn-freebl-*.el6.i686.rpm`
- `glibc-*.el6.i686.rpm`

Using the GUI-based installer

The Brocade Adapter Software Installer (BASI) GUI-based application or commands are the preferred methods to install the following components on your host system:

- Storage and network drivers
- Management Utilities. These include the HCM agent, BCU, BASI, installation scripts, CIM provider, and SNMP agent files.
- HCM only

This application operates on systems specified under [Table 9](#) on page 44. To use the command-line version of this application, refer to [“Software installation using Software Installer commands”](#) on page 76.

The Adapter Software Installer installs HCM, all driver packages, and management utilities based on your host operating system. The HCM Agent starts automatically after installation. You can also install software components using software installer scripts and “native” system commands (refer to [“Using software installation scripts and system commands”](#) on page 89).

NOTE

The software installer is not supported on VMware ESX platforms. However, you can use the appropriate Brocade Adapter Software Installer to install HCM to a guest system (Windows, Linux, or Solaris). To install adapter drivers on VMware systems, refer to [“Using software installation scripts and system commands”](#) on page 89.

Use the following steps to install all software required for Brocade adapters with the GUI-based installer program.

NOTE

It is strongly recommended that you shut down the HCM application if it is running on your system.

1. Access the downloads pages of the adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 1. Navigate to the **Downloads** page.
 2. Use one of these options to download software from the adapter’s Downloads page:
 - View the appropriate download page for your host’s operating system by selecting an operating system from the **Download Individual Software Installers, Drivers, or Documents** list, then download the appropriate Brocade Adapter Software Installer or driver package for your system.

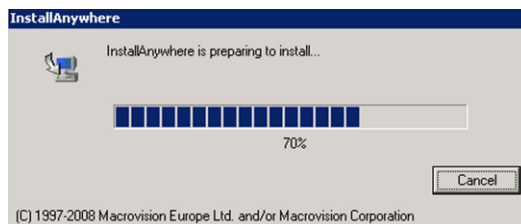
Find the installer program for your system’s operating system and platform under [“Software installation and driver packages”](#) on page 43.
 - Select **Download ISO Image** to download an ISO 9660 (.iso) optical disk image containing the Brocade Adapter Software Installer, individual driver packages, HCM, and documentation. You can use this ISO file to create a CD that you can carry to your system for installation.

NOTE

For Windows systems only. Using a DVD created with the ISO image will automatically start the correct installer program for your system. Make sure that the autorun feature is enabled. If using this DVD, you do not need to execute the installer program command (.exe or .bin) as explained in [step 2](#).

2. Execute the appropriate Brocade Adapter Software Installer program (.exe or .bin file), depending on your host’s operating system and platform.

A progress bar displays as files are extracted.



When all files are extracted, a **Brocade Adapter Software** title screen displays.

3. When the Brocade Software Installer **Introduction** screen displays ([Figure 11](#)), read the recommendations and instructions, then click **Next**.

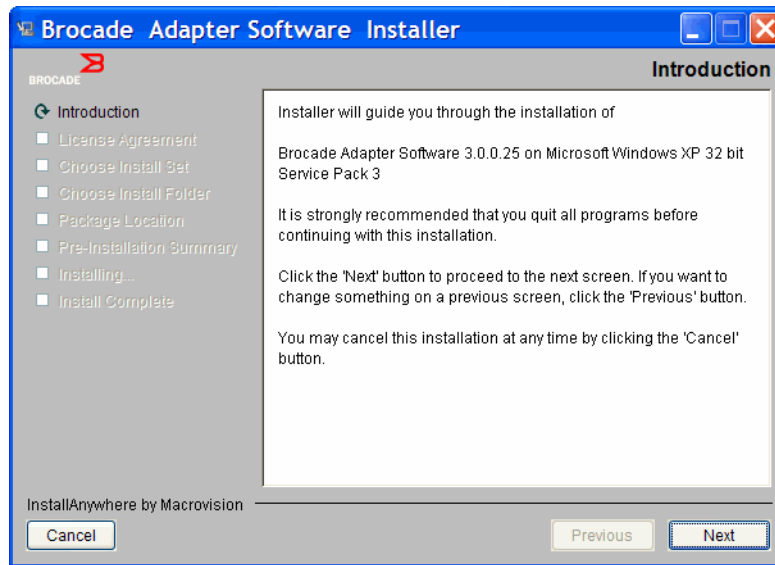


FIGURE 11 Brocade Adapter Installer Introduction screen

4. When the **License Agreement** screen displays, select **I accept the terms of the License Agreement**, then click **Next** to continue.
5. If a backup directory exists for previously installed software, a “Found Backed up data” message displays prompting you to restore old configurations. Select either to restore or not to restore and continue installation. Refer to “[HCM configuration data](#)” on page 114 for more information. If this message does not display, go on to [step 6](#).
6. If a screen such as the one in [Figure 12](#) on page 72 displays listing software components already installed on your system, select one of the following options, click **Continue**, then skip to [step 10](#).
 - **Install with existing configuration.** The installer compares each configured property and keeps the original value if different than the default value.
 - **Install with default configuration.** The installer upgrades the software and loads with default configurations.

NOTE

Existing versions of the adapter’s software components will be overwritten with the current versions you are installing if you continue.

If this screen does not display, go on to [step 7](#).

3 Using the Brocade Adapter Software Installer

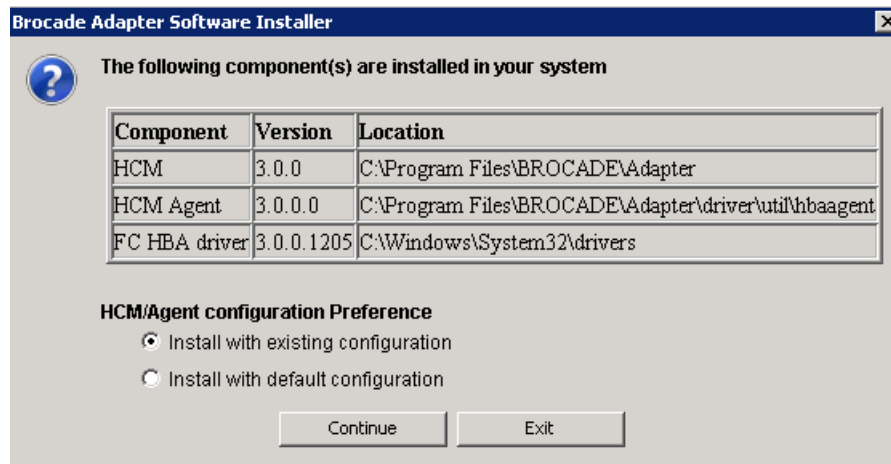


FIGURE 12 Existing software components installed screen

7. If message box displays prompting you to close all HCM applications, close all applications if they are still running, then click **OK**.

The **Choose Install Set** screen displays (Figure 13 or Figure 14).

NOTE

This following screen displays for all adapter models except the Brocade 804 adapter.

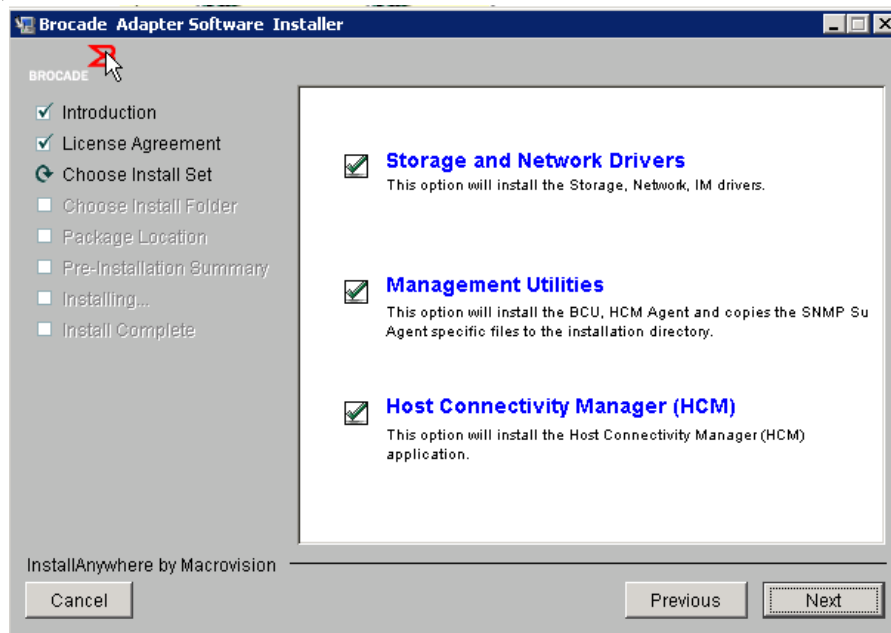


FIGURE 13 Choose Install Set screen (models except the 804 adapter)

NOTE

The following screen displays for the Brocade 804 adapter only.



FIGURE 14 Choose Install Set screen (804 adapter only)

8. Select which software you want to install, then select **Next**.

If you are installing the management utilities and messages display warning that HCM agent requires storage and network driver installation or does not match current driver installation, click **OK**. and select the **Management Utilities** and **Storage and Network Drivers** options.

If a message displays warning that the installed boot image is not compatible with the driver installation, perform one of the following steps:

- Select **Yes** to update the image and continue installation.
 - Select **No** to not update the image and continue installation.
9. If the **Choose Install Folder** screen displays, prompting you to choose a destination folder for the software, select either of the following options. If this screen does not display, go on to [step 10](#).
 - Enter a location for installing the software where the default installation folder displays.
 - Select **Choose** to browse to a location on your file system.
 - Select **Restore Default Folder** to enter the default installation folder.
 10. When the **Package Location Information** screen displays listing the installed software components and their location on your system, select **Next** to continue.
 11. When the **Pre-Installation Summary** screen displays ([Figure 15](#) on page 74), review the information and select **Install** to confirm and begin the installation.

3 Using the Brocade Adapter Software Installer

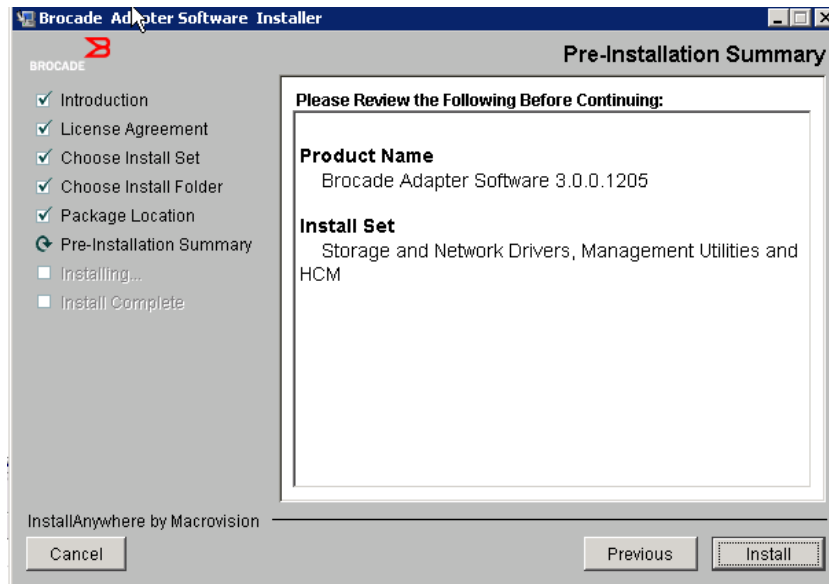


FIGURE 15 Pre-Installation Summary screen

A progress bar displays showing installation progress for the various software components.

NOTE

For Windows systems, a **Force Driver Installation** message box displays if a better driver is already installed for the adapter. If message displays, select **OK** to overwrite the existing driver or **Cancel** to quit installation.

After software installs, the **Install Complete** screen displays listing installed drivers and other components ([Figure 16](#) on page 75).

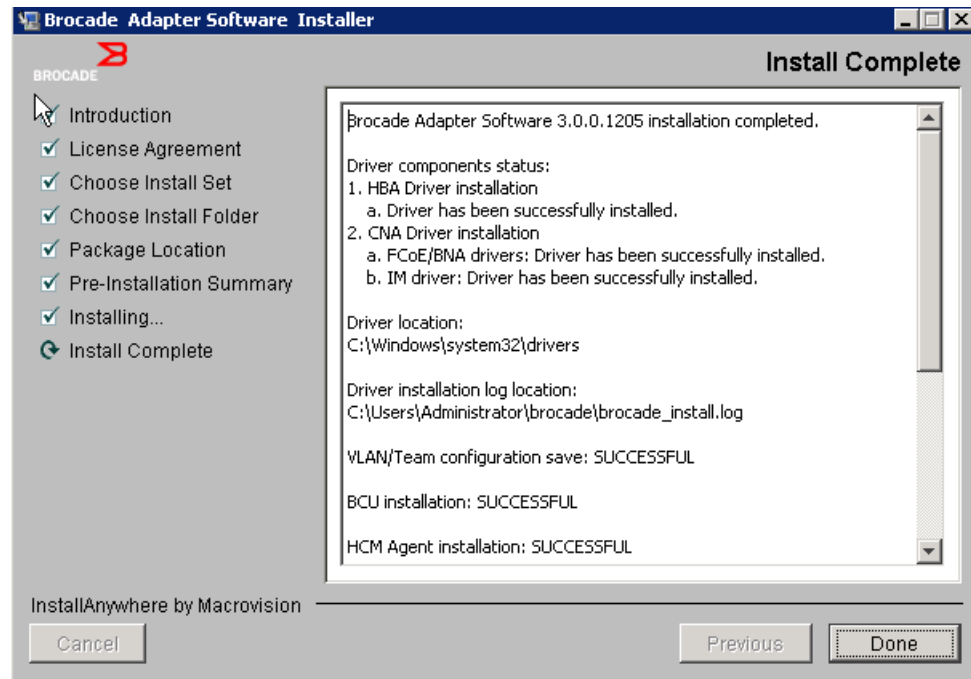


FIGURE 16 Install Complete screen

12. Confirm that all software installed successfully. If the screen instructs you to restart or reboot the system, select any options that apply.
13. Select **Done**.
14. Verify installation using tools available on your host system. Refer to [“Confirming driver package installation”](#) on page 103 for details.
15. To make sure that the drivers and adapter boot code are synchronized, be sure to update your adapter with the latest boot image from the Brocade website at www.brocade.com/adapters whenever you install or update adapter driver packages. From the adapters website, navigate to the drivers **Downloads** page. Access the appropriate download page by selecting your host’s operating system from the **Download Individual Software Installers, Drivers, or Documents** list. Refer to [“Boot code updates”](#) on page 118 for instructions to install the boot image.

NOTE

Installing management utilities on Windows systems creates a Brocade BCU shortcut on your system desktop. Use this shortcut to launch the BCU> command prompt and enter BCU commands.

Software installation using Software Installer commands

Execute Brocade Adapter Software Installer commands detailed in this section on the host system's command line with your choice of parameters to step through the installation or automatically install network and storage driver packages, the HCM application, or both without requiring further user interaction. The HCM Agent starts automatically after installation.

For details on operating system requirements for installing adapter drivers, refer to “[Operating system support](#)” on page 40 and “[Software installation and driver packages](#)” on page 43. Also download the latest release notes from the Brocade adapters website at www.brocade.com/adapters whenever you install or update adapter driver packages using the following steps:

1. Go to the adapters website at www.brocade.com/adapters.
2. Navigate to the **Downloads** page.
3. Select your operating system from the **Downloads** list.
4. On the downloads page, download the release notes from the “Documentation” section.

Note that on systems without a configured GUI, using the installer command without parameters as outlined in “[Using the GUI-based installer](#)” on page 69 may generate errors and the installer program will fail. Using the installer command with parameters outlined in this section will allow you to install all or individual adapter software components.

NOTE

Brocade 804 and 1007 adapters are not supported on Solaris systems.

Following are the commands you can use for supported operating systems:

- Windows systems - possible commands
 - Install drivers, HCM GUI, both, or management utilities. Overwrites the existing driver installed on the system.

```
brocade_adapter_software_installer_windows_<version>.exe  
-DCHOSEN_INSTALL_SET=[ DRIVER | GUI | BOTH | UTIL ]  
-DFORCE_WIN_DRIVER_INSTALLATION=1  
-i silent
```
 - Install drivers and HCM GUI in silent mode (no interaction required).

```
brocade_adapter_software_installer_windows_<version>.exe -i silent
```
 - Install drivers and the HCM GUI using a default installation properties file.

```
brocade_adapter_software_installer_windows_<version>.exe -f  
HCMDefaultInstall.properties
```
 - Install software in silent mode using default installation properties file. Note that this is recommended for silent mode.

```
brocade_adapter_software_installer_windows_<version>.exe -l silent -f  
HCMDefaultInstall.properties
```
- Linux systems - possible commands
 - x_86 and x_86_64 platforms
Install drivers, HCM GUI, both, or management utilities. Overwrites the existing driver installed on system.


```
sh brocade_adapter_software_installer_linux_<version>.bin
-DCHOSEN_INSTALL_SET=[DRIVER|GUI|BOTH|UTIL]
-DFORCE_WIN_DRIVER_INSTALLATION=1 -i silent
```

Install drivers and HCM GUI in silent mode (no interaction required).

```
sh brocade_adapter_software_installer_linux_<version>.exe -i silent
```

Install drivers and the HCM GUI using a default installation properties file.

```
sh brocade_adapter_software_installer_linux_<version>.bin -f
HCMDefaultInstall.properties
```

Install software in silent mode using default installation properties file. Note that this is recommended for silent mode.

```
sh brocade_adapter_software_installer_linux_<version>.bin -i silent -f
HCMDefaultInstall.properties
```

Install noarch driver when kernel-specific driver is not available and select to install HCM GUI, both, or management utilities

```
sh brocade_adapter_software_installer_linux_<version>.bin
-DCHOSEN_INSTALL_SET=[DRIVER|GUI|BOTH|UTIL] -DCONT_NOARCH_DRIVER=[NO|YES]
-i silent
```

Install drivers, HCM GUI, both, or management utilities. Overwrites the backed-up initrd file.

```
sh brocade_adapter_software_installer_linux_<version>.bin
-DCHOSEN_INSTALL_SET=[DRIVER|GUI|BOTH|UTIL] -DFORCE_INITRD_BACKUP=[NO|YES]
-i silent
```

- Solaris systems

- x_86 platforms

Install drivers, HCM GUI, both, or management utilities. Overwrites the existing driver installed on system.

```
sh brocade_adapter_software_installer_solaris10_x86_<version>.bin
-DCHOSEN_INSTALL_SET=[DRIVER|GUI|BOTH|UTIL]-i silent
```

Install drivers and HCM GUI in silent mode (no interaction required).

```
sh brocade_adapter_software_installer_solaris10_x86_<version>.exe -i
silent
```

Install software in silent mode using default installation properties file. Note that this is recommended for silent mode.

```
sh brocade_adapter_software_installer_solaris10_x86_<version>.bin -i
silent -f HCMDefaultInstall.properties
```

Install software in silent mode using default installation properties file. Note that this is recommended for silent mode.

```
sh brocade_adapter_software_installer_solaris10_x86_<version>.bin -i
silent -f HCMDefaultInstall.properties
```

Install driver, HCM GUI, both, or management utilities. Overwrites the existing driver installed on the system.

3 Using the Brocade Adapter Software Installer

```
sh brocade_adapter_software_installer_solaris10_x86_<version>.bin
-DCHOSEN_INSTALL_SET=[DRIVER|GUI|BOTH|UTIL] -i silent
```

- SPARC platforms

Install driver, HCM GUI, both, or management utilities. Overwrites the existing driver installed on the system.

```
sh brocade_adapter_software_installer_solaris10_sparc_<version>.bin
-DCHOSEN_INSTALL_SET=[DRIVER|GUI|BOTH|UTIL] -i silent
```

Installs drivers and HCM GUI in silent mode (no interaction required).

```
sh brocade_adapter_software_installer_solaris10_sparc_<version>.exe -i
silent
```

Install drivers and the HCM GUI using a default installation properties file.

```
sh brocade_adapter_software_installer_solaris10_sparc_<version>.bin -f
HCMDefaultInstall.properties
```

Install software in silent mode using default installation properties file. Note that this is recommended for silent mode.

```
sh brocade_adapter_software_installer_solaris10_sparc_<version>.bin -i
silent -f HCMDefaultInstall.properties
```

Command options

Following are the options that you can modify and in command strings. You can also edit these fields in the properties file to change the default install set:

- **INSTALLER_UI=silent**
Specifies that the installation mode should be silent.
- **CHOSEN_INSTALL_SET=BOTH**
Specifies to install either the network and storage driver packages, the GUI (HCM), or all components.:
 - **BOTH** - This parameter installs both the GUI and the driver. The HCM Agent starts automatically after installation.
 - **DRIVER** - This parameter installs only the driver. The HCM Agent starts automatically after installation.
 - **GUI** - This parameter installs only HCM.
 - **UTIL** - This parameter installs the management utilities.
- **CONT_NOARCH_DRIVER=[NO|YES]**
Use for installing non-specific architecture drivers when kernel-specific driver is not available. If set to YES, installs the noarch driver on Linux systems. No is the default value if you do not specify the parameter as an argument.

- **FORCE_WIN_DRIVER_INSTALLATION=1**
Be sure to uncomment the "FORCE_WIN_DRIVER_INSTALLATION=1" to overwrite the existing driver on Windows platform. Note that this may require system reboot.
For Linux or Solaris systems, use the standard DCHOSEN_INSTALL_SET command to overwrite existing software.
- **#FORCE_INITRD_BACKUP=YES**
For Linux systems, a "YES" value overwrites the backed-up initrd file.

All parameters are case-sensitive and make sure to spell the parameters correctly.

Complete details on editing and executing the properties file are available under the "Guidelines for silent installation" section located in the HCMDefaultproperties.file.

Important notes

Review these notes before using Brocade Adapter Software Installer commands.

- Brocade 804 and 1007 adapters are not supported on Solaris systems.
- Executing the following commands without parameters will launch the GUI-based installer described under "Using the GUI-based installer" on page 69.
 - Windows systems
`brocade_adapter_software_installer_windows_<version>.exe`
 - Linux systems
`sh brocade_adapter_software_installer_linux_<version>.bin`
 - Solaris systems
`sh brocade_adapter_software_installer_solaris10_<x86_<version>.bin`
`sh brocade_adapter_software_installer_solaris10_<x64_<version>.bin`
`sh brocade_adapter_software_installer_solaris10_sparc_<version>.bin`
- Complete details on editing and executing the properties file are available under the "Guidelines for silent installation" section located in the HCMDefaultproperties.file.
- If you choose to install the driver, both the storage and network drivers will be installed.
- Software installation or upgrade on a host system with a large number of adapters could take much longer than normal.
- Parameters are case-sensitive.
- Find the installer program for your server's operating system and platform under "Software installation and driver packages" on page 43. Before using any commands described in this section, use the following steps to download the Brocade Adapter Software Installer to your system.
 - Go to the adapters website at www.brocade.com/adapters.
 - Navigate to the **Downloads** page.
 - Perform one of the following steps:
 - Select your host's operating system from **Download Individual Software Installers, Drivers, or Documents** list to display the Downloads page, then download the Brocade Adapter Software Installer to your host system.

3 Using the Brocade Adapter Software Installer

- Select **Download ISO Image** and download an ISO 9660 (.iso) optical disk image. This contains the Brocade Adapter Software Installer, individual driver packages containing installer scripts, HCM, and documentation. You can use this ISO file to create a CD that you can carry to your system for installation.
 - To enter these commands, first change to the directory where the adapter software is installed (cd <install directory>). Default install directories are the following:
 - Windows systems
C:\Program Files\BROCADE\Adapter
 - Linux and Solaris systems
/opt/brocade/adapter
 - On Windows XP, Vista, NT, 2000, and Windows 2003 service pack1, only the GUI will install for all DCHOSEN_INSTALL_SET values (DRIVER, GUI, or BOTH).
 - To launch the installer in silent mode, you must use and provide values for the following parameters:
 - DCHOSEN_INSTALL_SET
 - -i silent
 - By default, the initrd file will be backed up automatically during Linux installations. During installation, a dialog box displays with the location of the file. If a file exists, a dialog box displays with its current location and allows you to overwrite the file, not overwrite the file, or quit.
 - To make sure that the drivers and adapter boot code are synchronized, be sure to update your adapter with the latest boot image from after you install or update adapter driver packages. using the following steps.
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the **Downloads** page.
 - c. Select your operating system from the **Downloads** list.
 - d. Download the boot code image from the “Boot Code” area.Refer to “[Boot code updates](#)” on page 118 for instructions to install the boot code image.
 - Installing management utilities on Windows systems creates a Brocade BCU desktop shortcut on your system desktop. Use this to launch the BCU> command prompt and enter BCU commands. If installation fails (possibly devices are not present on the system), the shortcut is still created. The BCU shortcut provides quick access to the installation folder where you can perform the following tasks:
 - Run the Support Save feature
 - Reinstall drivers
 - Run adapter utilities
-
- NOTE**
Launching BCU on Windows systems through methods other than through the desktop shortcut is not recommended and may result in display of inconsistent information.
-
- Because the ESX 5.0 driver installation process does not enforce maintenance mode, it is recommended that you put the host in maintenance mode since a system reboot is required after installation.

Installation examples

Following are some examples of using commands and parameters to install adapter software:

- To install the storage and network drivers in silent mode and start the HCM Agent automatically by default.

Windows systems

```
brocade_adapter_software_installer_windows_<version>.exe
-DCHOSEN_INSTALL_SET=DRIVER -i silent
```

Linux systems

```
sh brocade_adapter_software_installer_linux_<version>.bin
-DCHOSEN_INSTALL_SET=DRIVER -i silent
```

Solaris systems

```
sh brocade_adapter_software_installer_solaris10_x86_<version>.bin
-DCHOSEN_INSTALL_SET=DRIVER -i silent
```

```
sh brocade_adapter_software_installer_solaris10_x64_<version>.bin
-DCHOSEN_INSTALL_SET=DRIVER -i silent
```

```
sh brocade_adapter_software_installer_solaris10_sparc_<version>.bin
-DCHOSEN_INSTALL_SET=DRIVER -i silent
```

- To install the driver packages, HCM, and management utilities in silent mode.

Windows systems

```
brocade_adapter_software_installer_windows_<platform>_<version>.exe
-DCHOSEN_INSTALL_SET=BOTH UTIL -i silent
```

Linux systems

```
sh brocade_adapter_software_installer_linux_<version>.bin
-DCHOSEN_INSTALL_SET=BOTH UTIL -i silent
```

Solaris systems

```
sh brocade_adapter_software_installer_solaris10_x86_<version>.bin
-DCHOSEN_INSTALL_SET=BOTH UTIL -i silent
```

```
sh brocade_adapter_software_installer_solaris10_x64_<version>.bin
-DCHOSEN_INSTALL_SET=BOTH UTIL -i silent
```

- To overwrite existing driver packages with the new driver packages on a Windows system using silent mode.

```
brocade_adapter_software_installer_windows_<version>.exe
-DCHOSEN_INSTALL_SET=DRIVER -DFORCE_WIN_DRIVER_INSTALLATION=1 -i silent
```

- To install drivers in silent mode and overwrite the existing backed-up initrd file in Linux systems.

```
sh brocade_adapter_software_installer_linux_<version>.bin
-DCHOSEN_INSTALL_SET=BOTH -FORCE_INITRD_BACKUP=YES -i silent
```

3 Using the Brocade Adapter Software Installer

- To install HCM interactively.

Windows systems

```
brocade_adapter_software_installer_windows_<platform>_<version>.exe
```

Linux systems

```
sh brocade_adapter_software_installer_linux_<version>.bin
```

Solaris systems

```
sh brocade_adapter_software_installer_solaris10_x86_<version>.bin
```

```
sh brocade_adapter_software_installer_solaris10_sparc_<version>.bin
```

- To install the noarch driver on Linux systems in silent mode.

```
sh brocade_adapter_software_installer_linux_<version>.bin  
-DCHOSEN_INSTALL_SET=DRIVER -DCONT_NOARCH_DRIVER=YES -i silent
```

Installing HCM and driver package in silent mode using file option

By identifying the default installation properties file after the software installer command, HCM, the storage driver, and the network driver are installed by default in silent mode. The HCM Agent starts automatically after installation. This is the recommended method for silent installation.

NOTE

Brocade 804 and 1007 adapters are not supported on Solaris systems, so Solaris options in this section do not apply.

Use the following steps.

1. At the command line, change to the directory where the installer is located.
2. Use the following commands to initiate silent installation using the properties file.

- Windows systems

```
brocade_adapter_software_installer_windows_<version>.exe -f  
HCMDefaultInstall.properties
```

- Linux systems

```
brocade_adapter_software_installer_linux_<version>.bin -f  
HCMDefaultInstall.properties
```

- Solaris systems

```
brocade_adapter_software_installer_solaris10_x86_<version>.bin -f  
HCMDefaultInstall.properties
```

```
brocade_adapter_software_installer_solaris10_sparc_<version>.bin -f  
HCMDefaultInstall.properties
```

Software removal using Adapter Software Uninstaller

Use the following steps to remove the adapter driver packages and HCM. Instructions are provided for using the GUI-based or command-based Brocade Adapter Software Installer. Instructions are provided for Windows, Solaris, and Linux systems.

Important notes

Review these notes for removing the Brocade adapter software from your system:

- Use steps in this section to remove HCM.
- Before removing adapter software, it is strongly recommended that you stop the HCM agent and shut down the HCM application if it is running on your system. For instructions on stopping the HCM Agent, refer to “[HCM Agent operations](#)” on page 112.
- When removing HCM you may be prompted to backup existing configuration data. Refer to “[HCM configuration data](#)” on page 114 for more information.

Using the Brocade Software Uninstaller

Use the following steps to remove software that was installed with the GUI-based Brocade Adapter Software Installer, native system scripts, and system commands. Instructions are provided for Windows, Linux, and Solaris systems.

NOTE

Also use these procedures if HCM is installed on VMware and VMware operates as a “guest” on your Windows system.

1. Perform one of the following steps depending on your host operating system:

For Windows systems, perform one of the following steps:

- Select **Brocade Adapter Software** from the Windows **Start** menu, then select **Uninstall BROCADE Adapter Software**.
- To use the command line, use the following steps.
 - a. At the command line, change to the directory where the installer is located.

```
cd <install directory>\UninstallBrocade Adapter Software <version>
```

NOTE

The default <install directory> is C:\Program Files\BROCADE\Adapter.

- b. Enter the following command to launch the Brocade Adapter Software Uninstaller.

```
Uninstall.bat
```

3 Using the Brocade Adapter Software Installer

For Linux and Solaris systems, perform the following steps.

- a. Change to the directory where the Adapter Software Installer application is installed using the following command:

```
cd <install directory>/UninstallBrocade Adapter Software <version>
```

where:

<install directory> - default install directory is /opt/brocade/adapter.

<version> - the application version, such as v3.0.

- b. Enter the following command to launch the Brocade Adapter Software Installer:

```
sh Uninstall.sh
```

2. When an Introduction message displays about the uninstall, click **Next**.
3. If a message displays prompting you to close HCM, close the application if it is running, then click **OK** on the message box.
4. When the **Uninstall Options** screen displays with uninstall options, select an option.
 - Select **Complete Uninstall** to remove the driver packages and all other installed Brocade adapter software components.
 - Select **Uninstall Specific Features** to selectively uninstall specific software components.



5. Select **Next**.
 - If you selected **Complete Uninstall**, a screen displays showing software removal progress.
 - If you selected **Uninstall Specific Features**, a **Choose Product Features** screen displays from which you can select features for removal. Remove check marks by features that you wish to uninstall, then select **Uninstall** to continue with software removal.

6. If a message box displays asking if you want to back up HCM configurations, click **Yes** or **No**.
If you select **Yes**, a dialog box displays prompting you to select a backup directory. Use the default directory or browse to another location. Select **Uninstall** to perform backup and remove software.

A screen eventually displays notifying you of a successful uninstall. If a message displays on this screen notifying you of leftover files in the installation path, make sure that you delete these manually after removal completes.
7. Click **Done**.
8. If a message for rebooting the system displays, select the reboot option to complete the software removal process.

Removing Adapter Software from Windows 2008 Programs and Features list

If **Brocade Adapter Software** is still listed under the **Programs and Features** list after using the software uninstaller to remove software on Windows 2008 systems, use the following steps to remove it.

1. Go to the **Programs and Features** list (typically **Control Panel>Programs>Programs and Features**)
2. Right-click **Brocade Adapter Software**
3. Select **Uninstall/Change**.

Using Software Uninstaller commands

The following steps explain how to use the Adapter Software Uninstaller commands to remove the network and storage driver packages and HCM from Windows, Linux, and Solaris systems. These commands automatically remove software that you specify without using a GUI-based program that requires user interaction.

Executing the following commands without parameters will launch the GUI-based uninstaller described under [“Using the Brocade Software Uninstaller”](#) on page 83.

- Windows systems
`Uninstall.bat`
- Linux and Solaris systems
`sh Uninstall.sh`

Execute these same commands on the host system's command line with various parameters to automatically remove the network and storage driver packages, HCM application, both, or management utilities without requiring further user interaction.

- Windows systems
`Uninstall.bat -DCHOSEN_INSTALL_SET=[DRIVER|GUI|BOTH|UTIL] -DEBUG=[true|false] -i silent`
- Linux and Solaris systems
`sh Uninstall.sh -DCHOSEN_INSTALL_SET=[DRIVER|GUI|BOTH|UTIL] -DEBUG=[true|false] -i silent`

3 Using the Brocade Adapter Software Installer

where:

- **DCHOSEN_INSTALL_SET**
Specifies to remove either the network and storage driver packages, the GUI (HCM), management utilities, or all components.
- **DEBUG** - specifies whether the debug log messages are needed. Possible values are true or false.
- **i silent** - specifies that the uninstallation mode is silent.

Important notes

Review these notes before using the software uninstaller commands.

- If you choose to remove the driver, both the storage and network drivers are removed.
- Parameters are case-sensitive.
- To enter uninstaller commands, first change to the directory where the adapter software is installed (`cd <install directory>`).
 - Windows systems
`cd <install directory>\UninstallBrocade Adapter Software`

The default <install directory> is `C:\Program Files\BROCADE\Adapter`.
 - Linux and Solaris systems
`cd <install directory>/UninstallBrocade Adapter Software`

The default <install directory> is `/opt/brocade/adapter`.
- To launch the uninstaller in silent mode, you must use and provide values for both the following parameters:
 - **DCHOSEN_INSTALL_SET**
 - **-i silent**

Uninstall examples

- To remove the network and storage drivers only in silent mode with debug messages.

Windows systems

```
Uninstall.bat -DCHOSEN_INSTALL_SET=DRIVER -DEBUG=true -i silent
```

Linux or Solaris systems

```
sh Uninstall.sh -DCHOSEN_INSTALL_SET=DRIVER -DEBUG=true -i silent
```

- To remove the network and storage drivers, HCM, and management utilities in silent mode, but without debug messages.

Windows systems

```
Uninstall.bat -DCHOSEN_INSTALL_SET=BOTH UTIL -DEBUG=false -i silent
```

Linux or Solaris systems

```
sh Uninstall.sh -DCHOSEN_INSTALL_SET=BOTH UTIL -DEBUG=false -i silent
```

- To remove HCM only without using silent mode, but with debug messages.

Windows systems

```
Uninstall.bat -DCHOSEN_INSTALL_SET=GUI -DEBUG=true
```

Linux or Solaris systems

```
sh Uninstall.sh -DCHOSEN_INSTALL_SET=GUI -DEBUG=true
```

Software upgrade using Adapter Software Installer

To upgrade HCM, adapter driver packages, or the driver packages and HCM, simply follow the instructions under [“Using the GUI-based installer”](#) on page 69 or [“Software installation using Software Installer commands”](#) on page 76. You do not need to remove the existing software first. However, refer to the following important notes when upgrading, as procedures may vary from first-time installation on specific operating systems.

- Windows systems
 - When upgrading the driver for Windows systems, you do not need to reboot after installation.
 - The recommended procedure for upgrading Windows drivers is to install the new driver without first removing the existing driver.
 - When using the Brocade Adapter Software Installer commands for installation and an existing driver is installed on the system, you must use the following parameter to overwrite with the new driver.

```
-DFORCE_WIN_DRIVER_INSTALLATION=1
```

For example, to overwrite the existing driver packages with the new driver packages and start the HCM Agent automatically, use the following command.

```
brocade_adapter_software_installer_windows_<platform>_<version>.exe  
-DCHOSEN_INSTALL_SET=DRIVER -DFORCE_WIN_DRIVER_INSTALLATION=1 -i silent
```

For example, to overwrite the existing drivers with the new drivers, use the following command.

```
brocade_adapter_software_installer_windows_<platform>_<version>.exe  
-DCHOSEN_INSTALL_SET=BOTH -DFORCE_WIN_DRIVER_INSTALLATION=1 -i silent
```

- If VLAN configurations exist (CNAs and Fabric Adapter ports configured in CNA mode), a backup message displays during upgrade or reinstallation of drivers. This message will note the location where configurations were stored. You can restore these configurations after installation completes.
- Linux systems

When upgrading the driver for Linux systems, you do not need to reboot the host system after installation.
- Solaris systems

When upgrading the driver for Solaris systems, you must reboot the host system. The new driver is effective after system reboot.

- VMware systems
When upgrading the driver for VMware systems, you must reboot the host system. The new driver is effective after system reboot. Because the ESX 5.0 driver installation process does not enforce maintenance mode, it is recommended that you put the host in maintenance mode, as since a system reboot is required after installation.
- Software installation or upgrade on a host system with a large number of adapters could take much longer than normal.

NOTE

To make sure that the drivers and adapter boot code are synchronized, be sure to update your adapter with the latest boot image from the Brocade adapters website at www.brocade.com/adapters whenever you install or update adapter driver packages. On the website, navigate to the drivers **Downloads** page. Select your operating system from the Downloads list or download the ISO image. Refer to “[Boot code updates](#)” on page 118 for update instructions.

Software downgrade using Adapter Software Installer

Although driver and HCM downgrades are not supported, the following procedures are recommended for downgrading between versions 3.0, 2.3, 2.2, 2.1, 2.0, and 1.1.

NOTE

Downgrading the driver is not supported when downgrading from 3.0 to earlier versions. However, it is possible to restore the 3.0 configuration for version 2.3 if you explicitly save the configuration before removing 3.0 and installing version 2.3.

Downgrading HCM and driver or HCM only

To downgrade HCM and adapter drivers or HCM only, follow these steps.

1. Uninstall HCM and drivers or HCM only using procedures under “[Software removal using Adapter Software Uninstaller](#)” on page 83.
2. When a message box displays asking to back up the HCM configuration, be sure to click **Yes** and proceed with the software removal. (Refer to “[HCM configuration data](#)” on page 114).
3. Install the desired version of the software using “[Using the Brocade Adapter Software Installer](#)” on page 68.
4. During installation, when the “Found Backed up data” message displays prompting you to restore old configurations, select to restore the data and continue with the installation.

Downgrading driver only

1. Uninstall existing drivers using the procedures under “[Software removal using Adapter Software Uninstaller](#)” on page 83.
2. Install new drivers using the procedures under “[Using the Brocade Adapter Software Installer](#)” on page 68.

Installer log

A status log is available after installation that provides complete status of installed software components. The name of the installed component, version, and location in file system are provided. The Installation_Status.log is in the following locations:

- Windows - <user home>/brocade
- Linux and Solaris - /var/log/brocade

Using software installation scripts and system commands

This section provides instructions for to use Brocade “native” installation scripts and commands to install, remove, and upgrade individual driver package components described under “[Driver packages](#)” on page 37. You can use these steps for installing software on your system instead of using the Brocade Adapter Software Installer.

NOTE

To upgrade existing software using the Brocade Adapter Software Installer, refer to “[Using the GUI-based installer](#)” on page 69.

Instructions are provided in this section for the following tasks:

- Selectively installing network drivers, storage drivers, and utilities to Windows, Linux, and VMware systems using Brocade-provided installation scripts.
- Installing driver packages on Solaris systems using “native” system installer commands.

Software installation and removal notes

- The following steps assume that the host’s operating system is functioning normally and that all adapters have been installed in the system.
- When upgrading Windows drivers, install the new driver without first removing the existing driver. This is the is recommended procedure.
- Software installation or upgrade on a host system with a large number of adapters could take much longer than normal.
- Download the driver package for your host system operating system and platform from the Brocade adapters website at www.brocade.com/adapters. On the website, navigate to the **Downloads** page. Select your operating system from the **Downloads** list or download the ISO image

Note that you can also download an ISO 9660 (.iso) optical disk image containing the latest Brocade HCM, adapter driver package, and documentation from which you can create a CD. You can carry this CD to your system for installation.

NOTE

For Windows systems only, using a DVD created with the ISO image will automatically start the correct installer program for your system. Make sure that the autorun feature is enabled.

3 Using software installation scripts and system commands

- Refer to “[Software installation and driver packages](#)” on page 43 and “[Operating system support](#)” on page 40 for details on driver packages and operating system support. Also download the latest release notes on the Brocade adapters website at www.brocade.com/adapters. On the website, navigate to the drivers **Downloads** page. Select an operating system from the **Download Individual Software Installers, Drivers, or Documents** list, and then download the release notes.
- There are firewall issues with HCM Agent on Windows 2008 and VMware systems. When installing the driver package on these systems, open TCP/IP port 34568 to allow agent communication with HCM.
 - For VMware, use the following commands to open port 34568:

```
/usr/sbin/cfg-firewall -o 34568,tcp,in,https
/usr/sbin/cfg-firewall -o 34568,udp,out,https
```
 - For Windows, use Windows Firewall and Advanced Service (WFAS) to open port 34568.
- The storage driver will claim all Brocade Fiber Channel HBAs, FCoE CNAs, and Fabric Adapters with ports configured in HBA and CNA mode installed in a system.
- Installing a driver package or other adapter software does not automatically start the HCM Agent. You must manually start the agent using instructions under “[HCM Agent operations](#)” on page 112.
- If removing a driver package or other adapter software, first exit the HCM application and stop the HCM Agent. Stop the agent using instructions under “[HCM Agent operations](#)” on page 112.
- Removing driver packages with system commands is not recommended since this only removes the driver from the operating system stack and does not clean up the driver and utility directories. Use the Brocade Adapter Software Uninstaller program instead.
- When upgrading Windows 2008 drivers on adapters used for booting over SAN, install the new driver without removing the existing driver. Installation may fail and the operating system will become unbootable if you remove the existing driver before installing a new driver.
- To make sure that the drivers and adapter boot code are synchronized, be sure to update your adapter with the latest boot image f whenever you install or update adapter driver packages. Use the following steps.
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the **Downloads** page.
 - c. Select your operating system from the **Downloads** list.
 - d. Download the boot image file from the “Boot Code” section.
 - e. Refer to “[Boot code updates](#)” on page 118 for instructions to install the image.
- Installing management utilities on Windows systems creates a Brocade BCU desktop shortcut on your system desktop. Use this to launch the BCU> command prompt and enter BCU commands.
- Since the ESX 5.0 driver installation process does not enforce maintenance mode, it is recommended that you put the host in maintenance mode, since a system reboot is required after installation.

Driver installation and removal on Windows systems

Use the following procedures to install, remove, and update driver packages on a Windows system. Only one driver installation is required for all adapters (CNAs, HBAs, or Fabric Adapters) installed in a host system.

Installation Notes

- Before installing the driver on Windows systems, install the following hot fixes from the Microsoft “Help and Support” website, then reboot the system:
 - Windows 2003
KB932755 (or later) is the minimum requirement.
KB943545 is recommended if the HP command view management application is used to manage HP EVA arrays in the target system.
 - Windows 2008
KB968675 is recommended. This fixes a non-paged memory leak in a Windows 2008 storage stack.
KB2490742 is recommended when installing storage drivers to avoid a “0x000000B8” stop error when shutting down or hibernating a system running Windows 7 or Windows Server 2008 R2.
KB958015 is recommended for CNAs and Fabric Adapter ports configured in CNA mode.
 - Windows 2008 R2
KB977977 is recommended for CNAs and Fabric Adapter ports configured in CNA mode.
- Although you can install the driver using the Windows Device Manager, use the driver installer script (brocade_installer.bat) or use the Brocade GUI- or command-based Adapter Software Installer (brocade_adapter_software_installer_windows_<platform>_<version>.exe) instead for installing, removing, and upgrading the driver. The Brocade installer programs provide these advantages:
 - Automatically updates all Brocade adapters in one step. With Device Manager, you will need to update each adapter instance.
 - Enables the driver to register the symbolic names for the adapter ports with the switch. With Device Manager, the driver cannot obtain the operating system information to register these names with the switch.
 - Avoids errors, especially for Windows 2003 systems, that can occur from removing software with the Device Manager that was originally installed with the Brocade installer programs, then attempting future updates or removals.
- If removing driver packages or the HCM agent, determine if the HCM Agent is running using procedures under “[HCM Agent operations](#)” on page 112. If it is, stop the agent using steps under the same heading.

Installing and removing drivers on Windows systems

Use these steps to install storage and network driver packages on Windows systems. Refer to [“Software installation and driver packages”](#) on page 43 for a description of Windows driver packages.

1. Boot the host and log on with Administrator privileges.

NOTE

For Windows 2008 systems, you must disable User Account Control (UAC) to use the installer program (brocade_installer.bat). To do this, select **Control Panel > User Accounts > User Accounts** to display the **User Accounts** task window, then turn User Account Control off.

2. Create a “CNA Drivers” or “HBA Drivers” directory in your host’s file system depending on your installed adapter or mode configurations for installed Fabric Adapter ports.
3. Download the appropriate .exe driver package for your system. Refer to [“Software installation and driver packages”](#) on page 43 for a description of Windows driver packages.
4. Extract the driver packages to the folder you created in [step 2](#) using the following steps.
 - a. Double-click the package file (for example, brocade_driver_win2003_x86_<version>.exe) to extract the driver files.
 - b. Enter a path or browse to the driver directory where you want to install the extracted files when prompted (for example, C:\Adapter Drivers). Note that you can specify a directory other than the default directory.
5. Go to the command prompt and change directories (cd) to the path where you extracted files in [step 4](#).
6. Enter the following command, using appropriate parameters to install or uninstall the driver package:

```
brocade_install.bat [INSTALL_OP=<INSTALL | UNINSTALL | PREINSTALL>]
[DRIVER_TYPE=<HBA | CNA | AUTO>] [LOG_FILE_PATH=<path to installer log>]
[FORCED_INSTALL=TRUE] [SILENT_INSTALL=TRUE] [SNMP=TRUE] [SNMP_ONLY=TRUE]
[W2K8_HOTFIX=< " " | [<KBnnnnnn> :<Required|Optional><Description>]]>]
[W2K3_HOTFIX=< " " | [<KBnnnnnn> :<Required|Optional><Description>]]>]
```

where:

- **INSTALL_OP=**
INSTALL - Installs the storage and network drivers. This is the default behavior no options are used with brocade_install.bat.
UNINSTALL - Removes all drivers corresponding to the DRIVER_TYPE option.
PREINSTALL - Depending on the DRIVER_TYPE option used, either the HBA, CNA (or both) driver will install to the driver store on the host system, However, this driver is only used when a new adapter is installed into an empty slot or an existing adapter is replaced. The operating system will continue to load the existing driver until this occurs. This is useful in mass deployment of operating systems when adapters have not been installed. Please note that preinstallation will not automatically be attempted when the installer does not find the corresponding hardware.

- **DRIVER_TYPE=**
 HBA - The operation as specified by `INSTALL_OP` will be performed for Fibre Channel drivers only.
 CNA - The operation as specified by `INSTALL_OP` will be performed for network drivers only.
 AUTO - The operation as specified by `INSTALL_OP` will be performed for the drivers for adapters that are present in the system.
- **LOG_FILE_PATH**
 Specify path to installer log. Quote marks need to enclose the path needs when it contains a space. You can also specify system environmental variables for the path component. For example, `LOG_FILE_PATH="%ProgramFiles%\Brocade\Adapter\Driver\util\myinstal.log"`.
- **FORCED_INSTALL= TRUE**
 Use this option to force driver installation when the operating system displays messages such as, "The existing driver on this system is already better than the new one you are trying to install."
- **SILENT_INSTALL=TRUE**
 Use this in automated script environments to avoid displaying any Windows dialog boxes during installation failure scenarios. In this case, you must analyze the log file to decode any failures during driver installation, uninstallation, or preinstallation operations.
- **W2K3_HOTFIX, W2K8_HOTFIX=**
 If `INSTALL_OP = INSTALL`, use this option to override the installed hot fix with a new hot fix or to avoid checking for a hot fix.
 To specify a new hot fix for override, use the format "`<KBnnnnnn>:<Required|Optional>:<Description>`". For example `W2K8_HOTFIX="KB9987654:Required:newer_hotfix"`.
 To avoid checking for hot fix, use the value `" "`. For example, `W2K3_HOTFIX=" "`.
- **SNMP=TRUE**
 If management utilities containing SNMP files were installed, this installs the SNMP subagent, drivers, and other utilities.
- **SNMP_ONLY=TRUE**
 If management utilities containing SNMP files were installed, this installs the SNMP subagent only.

After entering options to install the software, a message box may display indicating that the target (existing) driver is newer than the source (upgrade) driver. Depending on the number of adapters installed, this message box may display more than once.

NOTE

You can also use the **brocade_install.bat** command to install the SNMP subagent. For details, refer to ["Installing SNMP subagent"](#) on page 109 for details.

7. Click **Continue Anyway** each time the message box displays to continue.
 As installation continues, a series of screens may display. The **Command Prompt** should return when installation completes.
8. If required by your Windows system, reboot the host. VMware and Solaris require rebooting after installation.

9. Verify installation by launching the Device Manager to display all installed devices.
 - For CNAs, HBAs, and Fabric Adapters, when you expand the list of **SCSI and RAID controllers** or **Storage controllers** an instance of the adapter model should display for adapter port installed.
 - For CNAs and Fabric Adapter ports configured in CNA or NIC mode, when you expand **Network adapters**, an instance of **Brocade 10G Ethernet Adapter** should also display for each port installed.

For example, if two two-port CNAs (total of four ports) are installed, four instances of the adapter model display (two under **SCSI and RAID controllers** and two under **Network adapters**). As another example, if only one port on a Fabric Adapter is configured in CNA or NIC mode, two instances of the adapter model display (one under **SCSI and RAID controllers** and one under **Network adapters**).

10. If device instances do not display and instead instances display with yellow question marks under **Other Devices**, scan the Device Manager for hardware changes. To scan, right click on any device in the list and select **Scan for hardware changes**.

After you scan for changes, the adapter should display in the Device Manager as described under [step 9](#).

11. If necessary, start the HCM Agent using steps under [“HCM Agent operations”](#) on page 112.

NOTE

Manually installing the driver package does not automatically start the HCM Agent.

12. When the driver is installed and the host system is connected to the fabric turn on host power and verify adapter operation. Verify proper LED operation for stand-up adapters by referring to [“Adapter LED operation \(stand-up adapters\)”](#) on page 184.

Command examples

Following are examples of using the **brocade_install.bat** command to install driver packages on Windows systems.

- Install all drivers
`brocade_install.bat`
- Install all drivers in silent mode
`brocade_install.bat SILENT_INSTALL=TRUE`
- Uninstall all drivers
`brocade_install.bat INSTALL_OP=UNINSTALL`
- Install the Fibre Channel (storage) driver only
`brocade_install.bat DRIVER_TYPE=HBA`
- To uninstall FC driver only
`brocade_install.bat INSTALL_OP=UNINSTALL DRIVER_TYPE=HBA`
- Forcefully install the drivers
`brocade_install.bat FORCED_INSTALL=TRUE`
- Override the installed hotfix with a new hotfix

```
brocade_install.bat W2K8_HOTFIX= "KB9987654:Required:newer_hotfix"
```

- Avoid checking for hot fix

```
brocade_install.bat W2K3_HOTFIX=""
```

Upgrading driver on Windows systems

To update the drivers, follow procedures under [“Installing and removing drivers on Windows systems”](#) on page 92.

Notes:

- When upgrading the driver for Windows systems, you do not need to reboot the host system as the driver upgrades immediately. The upgrade reloads the adapter firmware and reinitializes the link.
- When upgrading Windows 2008 drivers on adapters used for booting over SAN, install the new driver without removing the existing driver. If you remove the existing driver before installing a new driver, installation may fail and the operating system will become unbootable.

Driver installation and removal on Linux systems

Use the install script to selectively install storage driver packages, network driver packages, and utilities to Linux systems.

The driver package is provided as an RPM package. If you are using a supported Linux driver package and standard host configuration, you can use these RPMs. Refer to [“Software installation and driver packages”](#) on page 43 for a description of packages and kernel versions that they support.

1. Boot the host and log on with Administrator privileges.
2. Create an installation directory such as /opt/CNA or /opt/HBA, depending on your adapter.
3. Download the appropriate .tar.gz file for your Linux distribution. Refer to [“Software installation and driver packages”](#) on page 43 for a description of Linux driver packages.
4. Extract the driver packages to the directory you created in [step 2](#) using the following steps.
 - a. Enter a path or browse to the driver directory where you want to install the extracted files when prompted (for example /opt/CNA or /opt/HBA). Note that you can specify a directory other than the default directory.
 - b. To untar the source-based RPM for all RHEL and SLES Linux distributions.


```
tar -zxvf brocade_driver_linux_<version>.tar.gz
```
 - c. To untar the precompiled RPMs for RHEL distributions.


```
tar -zxvf brocade_driver_linux__rhel_<version>.tar.gz
```
 - d. To untar the precompiled RPMs for SLES distributions.


```
tar -zxvf brocade_driver_linux__sles_<version>.tar.gz
```
5. Enter the following command to run the installer on RHEL and SLES systems:

```
brocade_install_rhel.sh
[-u, -h][--update|--add|--rm-initrd][--force-uninstall][--snmp] [--snmp-only]
```

3 Using software installation scripts and system commands

```
brocade_install_sles.sh [-u, -h] [--update|--add|--rm-initrd]
[--force-uninstall]
```

where:

-u Uninstalls driver RPM packages.
-h Displays help for install script.

Initial RAM disk options:

--update-initrd Updates or adds the storage driver (bfa) to initrd. Note that you should only update the initrd if you are intending to use the boot from SAN feature. If the storage driver (bfa) is listed under /etc/sysconfig/kernel (SUSE) and /etc/modprobe.conf (RHEL), RPM installation automatically updates the initrd.

--add-initrd Adds the driver to initrd and rebuilds.

--rm-initrd Removes the driver from initrd and rebuilds.

--force-uninstall Removes all installed drivers (network, storage, and utilities). Reboot may be required if removal of bna or bfa driver fails.

--snmp If management utilities containing SNMP files were installed, this installs the SNMP subagent, drivers, and other utilities.

--snmp-only If management utilities containing SNMP files were installed, this installs the SNMP subagent only.

Examples:

- To install all RPMs (network, storage, and utilities), enter one of the following commands:

```
brocade_install_rhel.sh
brocade_install_sles.sh
```

- To install all RPMs and add storage (bfa) driver to initrd, enter one of the following commands.

```
brocade_install_rhel.sh --update-initrd
brocade_install_sles.sh --update-initrd
```

- To remove all RPMs, enter one of the following commands:

```
brocade_install_rhel.sh -u
brocade_install_sles.sh -u
```

- To force removal of all RPMs, enter one of the following commands.

```
brocade_install_rhel.sh --force-uninstall
brocade_install_sles.sh --force-uninstall
```

- To display help, enter one of the following commands:

```
brocade_install_rhel.sh -h
brocade_install_sles.sh -h
```

6. Verify if a network or storage driver package is loaded to the system with the following commands:

```
rpm -qa|grep bfa
```

This command prints the names of the storage driver package (bfa) if installed.

```
rpm -qa|grep bna
```

This command prints the names of the network driver package (bna) if installed.

lspci

This utility displays information about all PCI buses in the system and all devices connected to them. **Fibre Channel: Brocade Communications Systems, Inc.** displays for an HBA or Fabric Adapter port configured in HBA mode. **Fibre Channel: Brocade Communications Systems, Inc.** and **Ethernet Controller** display for a CNA or Fabric Adapter port configured in CNA or NIC mode if driver packages have correctly loaded.

lsmod

This command displays information about all loaded modules. If **bfa** appears in the list, the storage driver is loaded to the system. If **bna** appears in the list, the network driver is loaded to the system.

dmesg

This command prints kernel boot messages. Entries for **bfa** (storage driver) and **bna** (network driver) should display to indicate driver activity if the hardware and driver are installed successfully.

7. Start the HCM Agent by using steps under [“HCM Agent operations”](#) on page 112.

NOTE

Manually installing the driver package with installation scripts does not automatically start the HCM Agent.

8. When the driver is installed and the system is connected to the fabric, verify adapter operation. Verify LED operation for stand-up adapters by referring to [“Adapter LED operation \(stand-up adapters\)”](#) on page 184.

Upgrading driver on Linux systems

To update the driver package simply install the new driver and HCM package using steps under [“Driver installation and removal on Linux systems”](#) on page 95.

NOTE

When upgrading the driver for Linux systems, you do not need to reboot the host system. The new driver is effective after system reboot.

Driver installation and removal on Solaris systems

Use the following steps to install, remove, and upgrade the driver and utility packages on Solaris systems.

NOTE

Brocade 804 and 1007 adapters are not supported on Solaris systems, so Solaris options do not apply to these adapters.

Installing driver packages on Solaris systems

Use the following steps to install driver and utility packages to Solaris systems. Driver packages install as the following:

- Storage drivers - bfa_driver_<operating system>_<version>.pkg

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- Network drivers - bna_driver_<operating system>_<version>.pkg
- User utilities - brcd_util_<operating system>_<version>.pkg

Refer to [“Software installation and driver packages”](#) on page 43 for a description of host systems that this driver package supports.

NOTE

Root access is required to install or remove the driver package.

1. Log on to the Solaris system as a super user.
2. Copy the brocade_driver_<operating system>_<version>.tar to a temporary directory on your system.

NOTE

brocade_driver_<operating system>_<version>.tar contains all drivers for specific Solaris distributions. For example, brocade_driver_solaris10_<version>.tar contains all storage drivers for Solaris 10 systems, where <version> is the version number of the driver release.

3. Using the change directory (cd) command, change to the directory where you copied the driver file.
4. Perform the following steps.

- a. Enter the following command and press **Enter** to untar the file.

```
# tar xvf brocade_driver_<operating system>_<version>.tar
```

This extracts the driver, packages, utilities packages, and installation script:

- Storage drivers - bfa_driver_<operating system>_<version>.pkg
- Network drivers - bna_driver_<operating system>_<version>.pkg
- User utilities - brcd_util_<operating system>_<version>.pkg
- Installation script - brocade_install.sh

- b. Enter the following command to remove all old packages (if installed) and install new ones.

```
# ./brocade_install.sh
```

5. Enter the following to restart, load the driver, and reconfigure the system:

```
# reboot --r
```

6. Verify if the driver and utility packages are loaded to the system with the following commands:

```
# pkginfo|grep bfa
# pkginfo|grep bna
# pkginfo|grep brcd-util
```

NOTE

You can use the pkginfo -l command to display details about installed drivers.

7. Start the HCM Agent by using steps under [“HCM Agent operations”](#) on page 112.

NOTE

Manually installing the driver package does not automatically start the HCM Agent.

- When a driver is installed and the host system is connected to the fabric turn on host power and verify adapter operation. Verify proper LED operation for stand-up adapters by referring to [“Adapter LED operation \(stand-up adapters\)”](#) on page 184.

Removing driver packages from Solaris systems

Use the following steps to remove driver and utility packages.

NOTE

Root access is required to remove the packages.

- Log on to your system as root user.
- Determine if the driver and utility packages are installed using the following commands:


```
# pkginfo|grep bfa
# pkginfo|grep bna
# pkginfo|grep brcd-util
```
- Determine if the HCM Agent is running using procedures under [“HCM Agent operations”](#) on page 112. If it is, stop the agent using steps under the same heading.
- From any directory, enter the following commands to remove installed packages:


```
# pkgrm bfa
# pkgrm bna
# bkgrm brcd-util
```
- Respond to prompts “Do you want to remove this package?” by entering **y**.
- Respond to prompts “Do you want to continue with the removal of this package?” by entering **y**.
After a series of messages, the following confirms removal:


```
# Removal of <bfa> was successful.
# Removal of <bna> was successful.
# Removal of <brcd-util> was successful.
```

Upgrading driver on Solaris systems

To update driver packages, simply install new packages using steps under [“Installing driver packages on Solaris systems”](#) on page 97.

NOTE

When upgrading the drivers for Solaris systems, you must reboot the host system. The new drivers are not effective until after system reboot.

Driver installation and removal on VMware systems

Instructions are provided in this section to install adapter drivers on ESX and ESXi systems.

NOTE

Since the ESX 5.0 driver installation process does not enforce maintenance mode, it is recommended that you put the host in maintenance mode, as since a system reboot is required after installation.

NOTE

Note that you can use the VMware Image Builder PowerCLI to create a `brocade_esx50_<version>.zip` offline bundle and `brocade_esx50_<version>.iso` ESX 5.0 installation image that includes brocade drivers and utilities. Refer to your Image Builder documentation for details on using Image Builder PowerCLI.

Installation on ESX 4.X and ESXi 5.0 systems

Use the following steps for ESX 4.X and ESXi 5.0 systems. For ESXi 4.X systems, use steps under [“Installation on ESXi 4.0 and 4.1 systems”](#) on page 101.

Drivers are provided as ISO images packaged in a tarball. Use the install script to selectively install storage and network driver packages with utilities to VMware systems. Refer to [“Software installation and driver packages”](#) on page 43 for a description of host systems that this VMware driver package supports.

1. Download, then copy the VMware driver package to your system's /tmp directory.
2. From the temporary directory, extract the file using the following commands.

```
tar zxvf brocade_driver_<esxversion>_<driverversion>.tar.gz
```

3. Enter one of the following command to run the installer.

- For ESX 4.X systems, use the following command.

```
brocade_install.sh {-u, -h, -t}
```

where:

- u Uninstalls driver RPM packages.
- h Displays help for install script.
- t Installs tools only.

- For ESX 5.0 systems, use the following command.

```
brocade_install_esxi.sh {-u, -h, -t}
```

where:

- u Uninstalls driver RPM packages.
- h Displays help for install script.
- t Installs tools only.

Examples:

- To install network and storage RPMs with utilities, enter one of the following commands:

```
brocade_install.sh
```

```
brocade_install_esxi.sh
```

- To remove the storage and network RPM and utilities, enter one of the following command:

```
brocade_install.sh -u
```

```
brocade_install_esxi.sh -u
```


- To display help, enter one of the following commands:

```
brocade_install.sh -h
```

```
brocade_install_esxi.sh -h
```

4. Reboot the system.
5. Determine if the driver package is installed using the following commands:

```
esxcfg-module -l
```

This lists loaded module names. Verify that an entry for bfa exists for the storage driver and an entry for bna exists for the network driver.

```
cat /proc/vmware/version
```

This displays the latest versions of installed drivers. Look for bfa (storage driver) and bna (network driver) entries and related build number.

6. Start the HCM Agent by using steps under “[HCM Agent operations](#)” on page 112.

NOTE

Manually installing the driver package does not automatically start the HCM Agent.

7. When the driver is installed and host is connected to the fabric, turn on the host system and verify adapter operation. Verify proper LED operation for stand-up adapters by referring to one of the following locations:
 - “[Adapter LED operation \(stand-up adapters\)](#)” on page 184.
 - “[Adapter LED operation \(stand-up adapters\)](#)” on page 191

Installation on ESXi 4.0 and 4.1 systems

Drivers are provided as ISO images packaged in a tarball. Use the install script to selectively install storage and network driver packages with utilities to VMware systems. Refer to “[Software installation and driver packages](#)” on page 43 for a description of host systems that this VMware driver package supports.

Prerequisites

- The vSphere Management Assistant (vMA) must be installed on an ESX system other than where you are installing the driver. Download vMA from the VMware website. Once vMA is downloaded please refer to the *vSphere Management Assistant Guide* for instructions on how to deploy vMA.
- Put the ESXi server (where the driver is to be installed) in maintenance mode using vSphere client. Using the vSphere Client, right click ESXi and select the **Enter Maintenance Mode** option.

Procedure

1. Download the VMware driver package from the Brocade website, then copy it to a temporary (/tmp) directory on your ESXi system.
2. From the temporary directory, extract the file using the following command:


```
tar zxvf brocade_driver_<esxversion>_<driverversion>.tar.gz
```
3. Power on the vMA virtual machine.
4. Follow instructions from *vSphere Management Assistant Guide* to set DHCP and the password.

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5. Log in as *vi-admin*, using the password from [step 4](#).
6. Copy the adapter driver iso file from the temporary directory to the vMA.
7. Run the following command for superuser privileges:

```
# sudo -s
```
8. When prompted for the password, enter the superuser account password (same as from [step 4](#)).
9. Add the ESXi server IP Address to vMA using the following command.

```
# vifp addserver <ESXi address>
```

where
ESXi address ESXi server's IP Address where driver is to be installed.
10. Run the following command to make sure that the added ESXi server is listed in the vMA.

```
vifp listservers
```
11. Execute the following command on the vMA terminal.

```
# vifpinit <ESXi address>
```

where
ESXi address ESXi server's IP entered at [step 9](#).
12. Mount the adapter driver iso file on a temporary directory such as `/ISO`. Create `/ISO` if does not exist.

```
# mkdir -p /ISO  
# mount -o loop <Brocade Driver ISO file> /ISO
```

As an example,

```
# mount -o loop bfa_esx40_2.3.0.0.iso /ISO
```
13. Scan the ESXi 4 host against the driver CD bulletin IDs using the following command.

```
# vihostupdate -s --bundle=<path of driver.zip in mount location>
```

As an example,

```
# vihostupdate -s --bundle=/ISO/offline-bundle/offline-bundle.zip
```
14. Install the driver CD bulletin IDs using the following command.

```
# vihostupdate -i --bundle=<path of driver.zip in mount location>
```

As an example,

```
# vihostupdate -i --bundle=/ISO/offline-bundle/offline-bundle.zip
```
15. Unmount the adapter driver ISO and delete the temporary `/ISO` directory created in [step 12](#) using the following commands

```
# umount /ISO  
# rmdir -p /ISO
```
16. Repeat steps 12-15 for each adapter driver to be installed.
17. After the host updates successfully, exit from maintenance mode.

Using the vSphere Client, right click ESXi and choose the **Exit Maintenance Mode** option.

18. Reboot ESXi 4.

Right-click the ESXi 4 server and select **Reboot**.

NOTE

Be sure to reboot ESXi server where we are installing the driver and NOT the vMA

19. After the ESXi server has rebooted, run the following command to make sure the driver is installed. The Brocade driver should show up in the list

```
# vihostupdate -q
```

Upgrading driver on VMware systems

To update the driver package, simply install the new driver using steps under “[Driver installation and removal on VMware systems](#)” on page 99.

NOTE

When upgrading the driver for VMware systems, you must reboot the host system. The new driver is effective after system reboot.

Confirming driver package installation

Adapter driver packages from Brocade contain the current driver, firmware, and HCM agent for specific operating systems. Make sure the correct package is installed for your operating system. Current driver packages are listed under “[Software installation and driver packages](#)” on page 43.

An out of date driver may cause the following problems:

- Storage devices and targets not being discovered by device manager or appearing incorrectly in the host’s device manager.
- Improper or erratic behavior of HCM (installed driver package may not support HCM version).
- Host operating system not recognizing adapter installation.
- Operating system errors (blue screen).

NOTE

If the driver is not installed, try re-installing the driver or re-installing the adapter hardware and then the driver.

You can use HCM and tools available through your host’s operating system to obtain information such as driver name, driver version, adapter WWN, adapter PWWNs, firmware name and version, and current BIOS version.

Confirming driver installation with HCM

Following is the HCM procedure to display adapter information.

1. Launch HCM.
2. Select the adapter in the device tree.
3. Select the **Properties** tab in the right pane to display the **Properties** dialog box.

The dialog box displays adapter properties.

Confirming driver installation with Windows tools

You can use two methods to determine driver installation, depending on your Windows installation: the Driver Verifier and Device Manager.

Driver Verifier Manager

Verify that the adapter storage driver (bfa) is loaded for HBAs, CNAs, Fabric Adapters and that the storage driver and network driver (bna) are loaded for CNAs and Fabric Adapters with ports configured in CNA or NIC mode using the Driver Verifier Manager tool (Verifier.exe). The **verifier.exe** command is located in the Windows\System32 folder in Windows Server 2003 systems.

Select the option to display the following information about currently installed drivers:

- **Loaded:** The driver is currently loaded and verified.
- **Unloaded:** The driver is not currently loaded, but it was loaded at least once since you restarted the system.
- **Never Loaded:** The driver was never loaded. This status can indicate that the driver's image file is corrupted or that you specified a driver name that is missing from the system.

Device Manager

Verify if the driver is installed and Windows is recognizing the adapter using the following steps.

1. Open the Device Manager.
 - For CNAs, HBAs, and Fabric Adapters, when you expand the list of **SCSI and RAID controllers** or **Storage controllers** an instance of the adapter model should display for adapter port installed.
 - For CNAs and Fabric Adapter ports configured in CNA or NIC mode, when you expand **Network adapters**, an instance of **Brocade 10G Ethernet Adapter** should also display for each port installed.

For example, if two two-port CNAs (total of four ports) are installed, four instances of the adapter model display (two under **SCSI and RAID controllers** and two under **Network adapters**). As another example, if only one port on a Fabric Adapter is configured in CNA or NIC mode, two instances of the adapter model display (one under **SCSI and RAID controllers** and one under **Network adapters**).

2. Right-click an instance of your adapter displayed under Device Manager.
3. Select **Properties** to display the **Properties** dialog box.

4. Click the **Driver** tab to display the driver date and version. Click **Driver Details** for more information.

NOTE

If driver is not installed, try re-installing the driver or re-installing the adapter hardware and then the driver.

Linux

Verify if the adapter driver installed successfully using the following commands:

- **# rpm -qa |grep -i bfa**
This command prints the names of the Brocade adapter storage driver package (bfa) if installed.
- **# rpm -qa |grep -i bna**
This command prints the names of the Brocade adapter network driver package (bna) if installed.
- **# lspci**
This utility displays information about all PCI buses in the system and all devices connected to them. **Fibre Channel: Brocade Communications Systems, Inc.** displays for an HBA or Fabric Adapter port configured in HBA mode. **Fibre Channel: Brocade Communications Systems, Inc.** and **Ethernet Controller** display for a CNA or Fabric Adapter port configured in CNA or NIC mode if driver packages have correctly loaded.
- **# lsmod**
This command displays information about all loaded modules. If **bfa** appears in the list, the storage driver is loaded to the system. If **bna** appears in the list, the network driver is loaded to the system.
- **# dmesg**
This command prints kernel boot messages. Entries for **bfa** (storage driver) and **bna** (network driver) should display to indicate driver activity if the hardware and driver are installed successfully.
- These commands display the location of the driver modules if loaded to the system:
 - The following command displays the storage driver module location. The module will have a **bfa** prefix.

```
# modprobe -l bfa
```
 - The following command displays the network driver module location. The module will have a **bna** prefix.

```
# modprobe -l bna
```

Confirming driver installation with Solaris tools

Verify if the driver packages installed successfully using the following commands:

NOTE

Brocade 804 and 1007 adapters are not supported on Solaris systems, so commands in this section do not apply to these adapters.

- These commands display information about loaded kernel modules.

```
modinfo|grep bfa
modinfo|grep bna
```

If the storage driver package is installed, **bfa Brocade Fibre Channel Adapter Driver** should display.

If the network driver package is installed, **bna Brocade Fibre Channel Adapter Driver** should display.

- These commands check for and lists the installed driver package files.

```
pkgchk -nv bfa
pkgchk -nv bna
```

- This command displays all available information about software packages or sets that are installed on the system.

```
pkginfo -l
```

For example, if the storage driver package is installed, `bfa_pkg` should display with a “complete” install status in the list of installed packages.

```
PKGINST:  bfa
          NAME:  Brocade Fibre Channel Adapter Driver
          CATEGORY:  system
          ARCH:  sparc&i386
          VERSION:  alpha_bld31_20080502_1205
          BASEDIR:  /
          VENDOR:  Brocade
          DESC:  32 bit & 64 bit Device driver for Brocade Fibre Channel adapters
          PSTAMP:  20080115150824
          INSTDATE:  May 02 2008 18:22
          HOTLINE:  Please contact your local service provider
          STATUS:  completely installed
```

VMware

Verify if the adapter driver installed successfully using the following commands:

```
esxcli software vib list | grep bfa
```

Confirming driver installation with VMware tools

Verify if the driver installed successfully using the following commands:

- The following commands print the names of the Brocade storage driver (bfa) if installed.

- For ESX 4.0 and 4.1 systems

```
# rpm -qa|grep -i bfa
```

- For ESX 5.0 systems

```
esxcli software vib list | grep bfa
```

- These commands print the names of the Brocade network driver (bna) if installed.

- For ESX 4.0 and 4.1 systems

```
# rpm -qa|grep -i bna
```

- For ESX 5.0 systems

```
esxcli software vib list | grep bfa
```

- This command lists loaded modules.

```
esxcfg-module -l
```

For the storage driver, verify that an entry for **bfa** exists and that the ID loaded.

For the network driver, verify that an entry for **bna** exists and that the ID loaded.

- This command displays the latest versions of installed drivers for ESX 4.X systems.

```
cat /proc/vmware/version
```

For the storage driver, verify that an entry for **bfa** exists.

For the network driver, verify that an entry for **bna** exists.

- These commands display the latest versions of installed drivers for ESX 5.0 systems

```
esxcli software vib list | grep bfa
```

```
esxcli software vib list | grep bna
```

- This command prints the names of the Brocade adapter storage driver package (bfa) if installed.

```
rpm -qa|grep -i bfa
```

- This command prints the names of the Brocade adapter network driver package (bna) if installed.

```
rpm -qa|grep -i bna
```

- This utility displays information about all PCI buses in the system and all devices connected to them. **Fibre Channel: Brocade Communications Systems, Inc.** displays for an HBA or Fabric Adapter port configured in HBA mode. **Fibre Channel: Brocade Communications Systems, Inc.** and **Ethernet Controller** display for a CNA or Fabric Adapter port configured in CNA or NIC mode if driver packages have correctly loaded.

```
# lspci
```

- This command displays information about all loaded modules. If **bfa** appears in the list, the storage driver is loaded to the system. If **bna** appears in the list, the network driver is loaded to the system.

3 Verifying adapter installation

```
# lsmod
```

- This command prints kernel boot messages. Entries for **bfa** (storage driver) and **bna** (network driver) should display to indicate driver activity if the hardware and driver are installed successfully.

```
# dmesg
```

- These commands display the location of the driver modules if loaded to the system:

The following command displays the storage driver module location. The module will have a **bfa** prefix.

```
# modprobe -l bfa
```

The following command displays the network driver module location. The module will have a **bfa** prefix.

```
# modprobe -l bna
```

Verifying adapter installation

Problems with adapter operation may be due to improper hardware or software installation, incompatibility between the adapter and your host system, improper configuration of the host system, unsupported SFPs installed (stand-up adapters only), an improper cable connected from adapter to the switch (stand-up adapters only), or an adapter is not operating within specifications. Determine if problems exist because of these factors by verifying your installation with information located in the following chapters in this manual.

- [“Product Overview”](#) on page 1.
This includes hardware and software compatibility information. This chapter also describes software installation packages supported by host operating system and platforms.
- [“Hardware Installation”](#) on page 55.
This chapter provides hardware installation instructions.
- [“Software Installation”](#)
This chapter provides software installation instructions.
- [“Specifications”](#)
This chapter describes product specifications.

Following is a list of general items to verify during and after installation to avoid possible problems. Verify the following and make corrections as necessary.

- Make sure that the adapter is correctly installed and seated in the connector in the host system slot or connector. Press firmly down on the top of the adapter to make sure it has seated in the connector. Check your system hardware manual and Fabric Adapter [“Hardware compatibility”](#) on page 4, CNA [“Hardware compatibility”](#) on page 10, or HBA [“Hardware compatibility”](#) on page 15 to verify that you installed the adapter in the correct slot.
- Make sure that the correct driver package for the host operating system and platform is properly installed.
- If the host system requires special configuration to enable adapters, adapter connectors, and interrupt request (IRQ) levels, verify these options in the system BIOS menu and in your system documentation.

- Make sure that all Fibre Channel devices connected through the adapter and associated FCoE or Fibre Channel switch are correctly connected, powered up, and operating correctly. If not powered up, devices will be unavailable.
- Verify host system storage, switch, and operating system compatibility using the interoperability matrices on the Brocade adapters website at www.brocade.com/adapters.
- Verify the following for stand-up adapters only:
 - Observe LED operation on adapter and refer to the “[Adapter LED operation](#)” on page 177 for Fabric Adapters, “[Adapter LED operation \(stand-up adapters\)](#)” on page 191 for CNAs, and “[Adapter LED operation \(stand-up adapters\)](#)” on page 184 for HBAs. LEDs are visible through the adapter’s mounting bracket.

If LEDs indicate that the link between the adapter and switch is not operational, this could mean that a problem on the link between the switch and adapter or that the driver is not loaded and communicating with the switch.
 - The adapter is installed in the appropriate connector in the host system.
 - All small form factor pluggable (SFP) optic receivers are correctly installed, seated, and latched in adapter SFP receiver slots.
 - Cables are properly connected to the appropriate adapter port and seated in the SFP connector.
 - Correct options are configured for the slot where the adapter is installed,
- Verify the following for mezzanine adapters only:
 - The blade server or server blade is turned on.
 - The adapter is installed in the appropriate connector. On some blade servers or server blades, connectors may only support a specific adapter type. Refer to your blade sever documentation for help.
 - Whether the blade server or server blade on which the adapter is installed is correctly configured and installed in the blade system enclosure. Refer to your blade server and blade system enclosure documentation for help.
 - Any modules or blades in that support adapter operation are installed in the appropriate enclosure bays and correctly configured. Refer to the documentation for your blade system enclosure for help.
 - The blade system enclosure is configured for adapter operation. Refer to your blade system enclosure and documentation for blade system enclosure components for help.
 - You are using the latest device drivers, firmware, and BIOS for the blade server (or server blade) and other components in the blade system enclosure that support adapter operation.

Installing SNMP subagent

Simple Network Management Protocol (SNMP) is supported by CNAs and by Fabric Adapters for ports configured in CNA or NIC mode. For more information, refer to “[Simple Network Management Protocol](#)” on page 34. Brocade adapter SNMP is supported through an extension to the SNMP master agent, called the subagent, which processes SNMP queries for Brocade adapters. The subagent is only supported on Linux and Windows systems. SNMP subagent files are copied to your host system when you install adapter management utilities through HCM and the Brocade Adapter Software Installer (BASi).

Windows systems

For Windows systems, use the following steps.

1. Go to the following directory where the SNMP files are installed.
c:\program files\brocade\adapter
2. Enter one of the following commands:
 - **brocade_install.bat SNMP=TRUE**
Installs the SNMP subagent, drivers, and other utilities.
 - **brocade_install.bat SNMP_ONLY=TRUE**
Installs only the SNMP subagent.
3. Start SNMP services using the following commands.
 - `service <snmpd> start`
This starts the master agent “snmpd” service if it is not already running.
 - `service <bnasd> start`
This starts the subagent “bnasd” service.
4. Start SNMP subagent services using the following steps.
 - a. Open Services (typically **Start>Control Panel>Administrative Tools>Services**)
 - b. Right-click **SNMP** and select **Start**.

Linux systems

1. Go to the following directory where the subagent files are installed.
/opt/brocade/adapter
2. For RHEL systems, enter one of the following commands:
 - Enter **brocade_install_rhel.sh -snmp** to install the SNMP subagent, drivers, and other utilities.
 - Enter **brocade_install_rhel.sh -snmp-only** to install the SNMP subagent only
3. For SLES systems, enter one of the following commands:
 - Enter **brocade_install_rhel.sh -snmp** to install the SNMP subagent, drivers, and other utilities.
 - Enter **brocade_install_rhel.sh -snmp-only** to install the SNMP subagent only

Updating drivers with HCM

You can update installed drivers on connected hosts using the **Adapter Software** dialog box in HCM. Updating the driver updates all of the following components to the latest versions:

- Network and storage driver
- HCM Agent
- initrd file (Linux systems)

To update drivers with HCM, use the following steps:

1. Determine the correct driver package for your host system platform by reviewing [Table 9](#) on page 44.
2. Download the driver package for your host system operating system and platform from the Brocade adapters website using the following steps.
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the **Downloads** page.
 - c. Use one of these options to download the driver package:
 - Select your host's operating system from the **Download Individual Software Installers, Drivers, or Documents** list, then select the driver package.
 - Select **Download ISO Image** to download an ISO 9660 (.iso) optical disk image containing the Brocade Adapter Software Installer, individual driver packages, HCM, and documentation.
3. Select a host on the device tree, and then select **Adapter Software** under the **Configure** menu. The **Adapter Software** dialog box displays.
4. Enter the filename of the updated driver in the **Driver File** text box.
OR
Click the **Browse** button and navigate to the location of the driver file to update.
5. Select **Start Update**.
The selected file downloads. If an error occurs during the downloading process, an error message displays.
6. Review the installation progress details that display in the dialog box to determine if the files install successfully.

NOTE

During the installation, a warning message may display that the installed boot image is not compatible with drivers being installed. You can obtain current boot image files from the adapters website and install these through the Adapter Software dialog box. Refer to "[Updating boot code with HCM](#)" on page 119 for instructions.

Notes

- This feature upgrades existing software installed on the host system. Downgrades are not supported.
- During installation, dialog boxes validate installation success. Since the Solaris and VMware ESX Server operating systems require a reboot for the driver update to take effect, successful installation is not validated in the dialog boxes.
- Since the ESX 5.0 driver installation process does not enforce maintenance mode, it is recommended that you put the host in maintenance mode, as since a system reboot is required after installation.

Installing HCM to a host from the HCM Agent

You can install HCM to any host system from a functioning HCM Agent on a server system. The following are prerequisites for the server system:

- The adapter and driver package must be installed.
- The HCM agent must be running.

Use the following steps to install HCM:

1. Enter the following URL into your host system's web browser:

```
https://server-host:34568/index.html
```

where:

`server-host` Is the IP address of a server system with the Brocade adapter and driver installed and HCM Agent running.

`34568` Is the TCP/IP port where the HCM Agent communicates with HCM.

2. Respond to prompts as required during HCM installation, and the HCM GUI will launch.
3. Log in to HCM when prompted.

To launch HCM in the future, use the HCM shortcut icon. On Windows, the shortcut is located under **Start menu > Brocade > Host Connectivity Manager**. For Solaris, launch HCM from the command prompt using the following command.

```
sh /opt/brocade/fchba/client/Host_Connectivity_Manager
```

HCM Agent operations

This section outlines the commands used to perform the following actions. The commands are grouped and presented by operating system.

- Verifying that the HCM Agent is running
- Starting the agent
- Stopping the agent
- Changing the agent's default communication port

NOTE

The HCM Agent will not start automatically if it stops unexpectedly during operation. You must restart the agent.

Managing the HCM Agent on Linux and VMware systems

Use the following commands:

- Determining agent operation.

```
/usr/bin/hcmagentservice status
```
- Starting the agent (agent will not restart if system reboots or agent stops unexpectedly).

```
/usr/bin/hcmagentservice start
```

- Starting the agent (agent restarts if system reboots).
`chkconfig --add hcmagentservice`
- Stopping the agent.
`/usr/bin/hcmagentservice stop`
- Stopping the agent from restart after system reboots.
`chkconfig --del hcmagentservice`
- Changing the default communication port. Use the following steps.
 - a. Change to the agent installation directory (default is `/opt/brocade/adapter/hbaagent/conf`).
 - b. Edit `abyss.conf` to change the entry “SecurePort 34568” to any other nonconflicting TCP/IP port (for example, SecurePort 4430).

Managing the HCM Agent on Solaris systems

Use the following commands:

NOTE

The Brocade 804 and 1007 adapters are not supported on Solaris systems, so Solaris options do not apply.

- Determining agent operation
`svcs hcmagentservice`
- Starting the agent (agent will not restart if system reboots or agent stops unexpectedly)
`svcadm enable -t hcmagentservice`
- Starting the agent (agent restarts if system reboots)
`svcadm enable hcmagentservice`
- Stopping the agent
`svcadm disable -t hcmagentservice`
- Stopping the agent from restart after system reboots
`svcadm disable hcmagentservice`
- Changing the default communication port
 - a. Change to the agent installation directory (default is `/opt/brocade/adapter/hbaagent/conf`).
 - b. Edit `abyss.conf` to change the entry “SecurePort 34568” to any other nonconflicting TCP/IP port (for example, SecurePort 4430).

Managing the HCM Agent on Windows systems

Use the following options:

- Determining agent operation
 - a. Run the `services.msc` command to display the **Services** window.
 - b. Right-click **Brocade HCM Agent Service** and select **Status**.
- Starting the agent (agent will not restart if system reboots or agent stops unexpectedly)
 - a. Run the `services.msc` command to display the **Services** window.
 - b. Right-click **Brocade HCM Agent Service** and select **Start**.
- Starting the agent (agent restarts if system reboots)
 - a. Run the `services.msc` command to display the **Services** window.
 - b. Right-click **Brocade HCM Agent Service** and select **Start**.
 - c. Right-click **Brocade HCM Agent Service** and select **Properties**.
 - d. Select the **Automatic** option in **Startup type**.
 - e. Click **OK**.
- Stopping the agent
 - a. Run the `services.msc` command to display the **Services** window.
 - b. Right-click **Brocade HCM Agent Service** and select **Stop**.
- Stopping the agent from restart after system reboots
 - a. Run the `services.msc` command to display the **Services** window.
 - b. Right-click **Brocade HCM Agent Service** and select **Stop**.
 - c. Right-click **Brocade HCM Agent Service** and select **Properties**.
 - d. Select the **Manual** option in **Startup type**.
 - e. Click **OK**.
- Changing the default communication port
 - a. Change to the agent installation directory (default is `c:/opt/brocade/adapter/hbaagent/conf`).
 - b. Edit `abyss.conf` to change the entry "SecurePort 34568" to any other nonconflicting TCP/IP port (for example, SecurePort 4430).

HCM configuration data

HCM configuration data is compatible between versions 3.0.x.x, 2.3.x.x, 2.2.x.x, 2.1.x.x, 2.0, 1.1.x.x, and 1.0. Configuration data backed up when prompted during software removal with the Adapter Software Uninstaller and when using the HCM **Backup Data** dialog box includes the following:

- Adapter application data
- HCM user data

- Alias data
- Setup discovery data
- Syslog data
- HCM logging data
- Support save data

Backing up configuration data

Use the HCM **Backup Data** dialog box to back up configuration data before removing HCM. Also, be sure to back up data when the backup message displays when removing software with the Adapter Software Uninstaller.

Following are default locations for HCM configuration data:

- Versions 1.1.0.8 and above - <user home>\HCM\data
- Versions 1.1.0.6 and below - <installation location>\FC HBA\data

Restoring configuration data

Follow these guidelines when restoring configuration data backed up during software removal or with the HCM **Backup Data** dialog box:

- For HCM 2.0 and earlier, you can only restore data that you backed up during software removal when you are prompted to restore data during software installation.
- For HCM 2.0 and later, you can restore data when prompted to do so during software installation or by using the HCM **Restore Data** dialog box.

Setting IP address and subnet mask on CNAs

After installing a CNA or Fabric Adapter with ports configured in CNA or NIC mode, you must assign an IP address and subnet mask to function on a DCB network. Work with your network administrator to obtain the correct address and mask for your network.

Windows

1. From **Control Panel**, select **Network Connections**.
2. Right-click the installed “Brocade Ethernet XX” Network Adapter Interface instance and click **Properties**.
3. In the **This connection uses the following items** box, click **Internet Protocol (TCP/IP)**, then click **Properties**.
4. Select **Use following IP address radio button**, and configure the IP address and subnet mask.
5. Click **OK** to apply the configuration.

3 Setting IP address and subnet mask on CNAs

Linux

Following is an example for using the **ifconfig** command to set the IP address and subnet mask. Note that a CNA and a Fabric Adapter with ports configured in CNA or NIC mode are typically named "eth0."

```
ifconfig eth0 193.164.1.10 netmask 255.255.255.0 up
```

VMware

Please refer to ESX/ESXi Configuration Guide on network configuration for VMware ESX/ESXi 4.x and 5.0.

Boot Code

In this chapter

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- [Network boot](#) 120
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- [Fabric-based boot LUN discovery](#) 163
- [Boot systems over SAN without operating system or local drive](#) 167
- [Updating Windows driver on adapter used for boot over SAN](#) 170

Boot support

Boot support is provided for Brocade adapters and drivers installed on your host.

- To note changes to boot support and procedures detailed in this chapter, please download the current release notes for your adapter software version from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display appropriate download files.
 - d. Download the release notes from the “Documentation” section.

The following system BIOS and platforms support Brocade adapters:

- Peripheral Component Interconnect (PCI) firmware 3.0 and earlier PCI BIOS versions
Boot code for PCI system
- BIOS
Boot code for x86 and x86_x64 platforms
- Unified Extensible Firmware Interface (UEFI)
Boot code for UEFI systems

NOTE

UEFI is not supported on the Brocade 804 adapter.

- PXE (preboot eXecution environment) and UNDI (universal network device interface)
Network boot support for x86 and x86_x64 platforms.

A single, updatable boot code image, stored in the adapter option read-only memory (option ROM) memory, contains all boot code for supported host platforms.

NOTE

By default, BIOS and UEFI are enabled on adapter ports for booting over SAN.

Boot code updates

The adapter boot code contains the following:

- PCI BIOS 2.1 or later, PCI firmware 3.0
Boot code for PCI system
- BIOS
Boot code for x86 and x64 platforms
- Unified Extensible Firmware Interface (UEFI)
Boot code for UEFI systems

NOTE

UEFI is not supported on the Brocade 804 adapter.

- Adapter firmware

Update the adapter with the latest boot code image for installed Brocade adapters from the Brocade adapters website at [using](#) the following steps.

1. Go to the adapters website at www.brocade.com/adapters.
2. Navigate to the adapters **Downloads** page.
3. Select your operating system from the **Downloads** list to display appropriate download files.
4. Download the boot code image from the “Boot Code” area.

Update the boot code image file to the adapter installed on your host system using the Host Connectivity Manager (HCM) and BCU commands. Although BCU updates the file from the host’s local drive, you can use HCM to update from a remote system.

NOTE

All Brocade adapters installed in a host system must use the same boot code version.

NOTE

To keep drivers and boot code synchronized, be sure to update your adapter with the latest boot image *after* you install or update adapter driver packages. Be sure to update drivers before updating the boot code.

You can determine the current BIOS version installed on your adapter using the following methods:

- Viewing the BIOS that displays on your system screen during hardware reinitialization, just before you are prompted to press Ctrl and B or Alt and B to enter the Brocade adapter Configuration Utility.
- Entering the `bcu adapter --query` command. The installed BIOS version displays in the Flash Information section of the command output.

- Viewing the adapter **Properties** panel in HCM. To view the panel, select the adapter in the device tree, then click the **Properties** tab in the right pane.

For servers with operating system and Brocade adapter drivers installed, you can use BCU commands or HCM directly to update boot code on adapters.

For servers without a hard disk, operating system, and adapter drivers installed, you can download Linux LiveCD ISO images and create WinPE ISO images to boot the server, then use BCU commands to update the boot code. For instructions on using these ISO images, refer to “[Boot systems over SAN without operating system or local drive](#)” on page 167.

Updating boot code with HCM

Follow these steps to upgrade adapter flash memory with the latest boot code.

1. Download the boot code image zip file (brocade_adapter_boot_fw_<version>.zip) from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display appropriate download files.
 - d. Download the boot code image from the “Boot Firmware” area.
2. Extract the boot code image file.
3. Launch HCM.
4. Select a host on the device tree, and then select **Adapter Software** from the **Configure** menu. The **Adapter Software** dialog box displays.
5. Enter the filename of the boot image in the **Boot Image File** text box.
OR
Click the **Browse** button and navigate to the location of the file to update.
6. Click **Start Update**.
The selected file downloads. If an error occurs during the downloading process, an error message displays.
7. Review the installation progress details that display in the dialog box to determine if the files install successfully.

NOTE

Since updating the Solaris and VMware ESX driver requires rebooting the system, the boot code cannot be updated along with the driver using the **Adapter Software** dialog box. HCM will not restrict selecting the Boot image for update on the Solaris or ESX platforms.

Updating boot code with BCU commands

Use the following procedure to update boot code using BCU commands.

1. Download the boot code image zip file (brocade_adapter_boot_fw_<version>.zip) from the Brocade adapters website to a folder on your local drive using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display appropriate download files.
 - d. Download the boot code image from the “Boot Code” area.
2. Extract the boot code image file.
3. Enter the following BCU command:

```
bcu boot --update <ad_id> <image file> -a
```

where:

<ad_id> ID of the adapter (adapter)

<image file> name of firmware image file

-a Indicates that the boot code should be updated on all installed Brocade adapters found on the host. Note that the adapter identification (ad_id) should not be specified if the -a option is specified.

Network boot

The Network or the preboot eXecution environment (PXE) boot feature allows a host to boot its operating system from a system located somewhere on the Ethernet LAN instead of the host's local disk or over the SAN. Booting from a remote LAN location provides the obvious advantage of recovering quickly from a host or adapter malfunction. With PXE BIOS enabled on the adapter for a specific port ID (or a VLAN ID for a specified port), replacing an old host with a new one involves installing the adapter from the old host into the new one with the same configuration, then booting the new host. The host's operating system automatically boots from the remote LAN device.

NOTE

Enabling VLAN during network boot requires support from the operating system and has not been fully validated due to operating system limitations.

Although fast recovery from a malfunction is a big advantage, following are considerations for the host and adapter, depending on the replacement situation:

- Even though you install a similar host, the new host may require unique System BIOS options and other settings, or internal IDE drives may need to be disconnected or disabled to initiate a network boot.
- If replacing the Brocade adapter in a host with a similar Brocade adapter, you will need to reconfigure the adapter to boot from the appropriate remote boot device.
- If replacing a host with a different model, you may be prompted to install the adapter driver for the existing adapter.

Booting servers over the network can significantly streamline server administration and facilitate server deployment. Instead of manually configuring each individual server, boot images on LAN-based systems can be cloned and assigned to groups of servers at the same time. This not only simplifies initial configuration, but makes ongoing software updates and maintenance much easier to administer. When boot images are centrally managed on the network, server security, integrity, and ability to recover data are also enhanced.

Following are additional benefits of booting over the network:

- Disaster recovery.
- More control and efficiency for software distribution.
- Booting diskless systems such as thin clients and dedicated systems.
- Automating system maintenance such as backups.
- Automating system checking such as virus scanning.
- Ensuring security where a guaranteed secure system is needed.
- Centralized storage management and administration of client workstations.
- Increased host reliability since operating system boots from highly available devices.
- Improved security.

Brocade BIOS support for network boot

The PXE mechanism, embedded in the adapter firmware, provides the ability to boot the host operating system from a remote system located on the Ethernet LAN instead of the over the SAN or from the host's local disk. UNDI (universal network device interface) is an application program interface (API) used by the PXE protocol to enable basic control of I/O. It performs other administrative chores like setting up the MAC address and retrieving statistics through the adapter. UNDI drivers are embedded in the adapter firmware.

When PXE boot or PXE BIOS is enabled, the following occurs to execute the system boot process:

- The PXE client (or adapter) uses the Dynamic Host Configuration Protocol (DHCP) protocol to obtain information on available PXE boot servers on the network, such as the IP addresses, from a DHCP server.
- The client contacts the appropriate boot server and obtains the file path for a network bootstrap program (NBP).
- The client downloads the NBP into the system's RAM using Trivial File Transfer (TFTP), verifies it, and finally executes it.
- The PXE protocol sets the proper execution environment, such as availability of basic network IO services and areas of client memory, then transfer control to the NBP.
- The NBP loads other files, such as configuration files and executable files. This action can run diagnostics, execute firmware update utilities, or boot an entire operating system over the network.

The PXE boot client is implemented in the adapter firmware. It supports legacy BIOS for servers that do not support UEFI or UEFI for the newer servers. The Client PXE code provides the following services for use by BIOS or a downloaded NBP.

- Preboot Services API
This provides several global control and information functions.

- **TFTP API**
The TFTP (Trivial File Transfer Protocol) API enables opening and closing of TFTP connections and reading packets from and writing packets to a TFTP connection. The PXE client downloads the PXE boot loader from an TFTP server.
- **UDP API**
The User Datagram Protocol (UDP) API enables opening and closing of UDP connections and reading packets from and writing packets to a UDP connection.
- **UNDI API**
The Universal Network Device Interface (UNDI) API enables basic control of I/O through the adapter. This allows the use of universal protocol drivers that can be used on any network interface that implements this API. UNDI is used by the PXE protocol to enable basic control of I/O and performs other administrative chores like setting up the MAC address and retrieving statistics through the adapter.

The Brocade PXE BIOS Configuration Utility (embedded with the boot code), BCU commands, and the HCM allow you to perform the following tasks:

- **Enable or disable BIOS.**
When enabled, the system BIOS can execute the Brocade BIOS code for a specific adapter port for PXE boot over the network.
- **Set a VLAN ID to be used during network boot for the specific port.**

NOTE

Enabling VLAN during network boot requires support from the operating system and has not been fully validated due to operating system limitations.

Host system requirements for network boot

Consider these requirements for your host system when configuring network boot:

- You may need to disconnect internal IDE hard drives to disable them in the system BIOS and allow the adapter boot BIOS to boot from the remote system. Some systems may allow these drives to be enabled in the system BIOS if they correctly support the bootstrap protocol.
- Typically, the boot order must be CD-ROM, diskette, then remote boot system. After the operating system installs, you can change this order if desired.

Due to the variety of configurations and variables in a LAN installations, your specific environment must determine any additional requirements to guide installation and configuration for best results.

Driver support for network boot

Refer to “[Boot installation packages](#)” on page 49. [Table 10](#) on page 51 for applicable DUDs for supported operating systems. Notes following the table identify DUDs that support network boot. Note the following:

- **Windows 2008**
For network boot, the network driver is injected as part of the PXE Server prior to Windows installation. The driver is passed over during PXE installation on the server.

- Linux (RHEL)
For supported versions later than RHEL 4.9, “nw” drivers support network (PXE) boot. Install these drivers after fc drivers. For RHEL 4.9, network drives are part of a single ISO package.
- Linux (SLES)
Network drivers are part of a single ISO package.
- VMware ESX
Network boot is currently not supported.

Configuring network boot

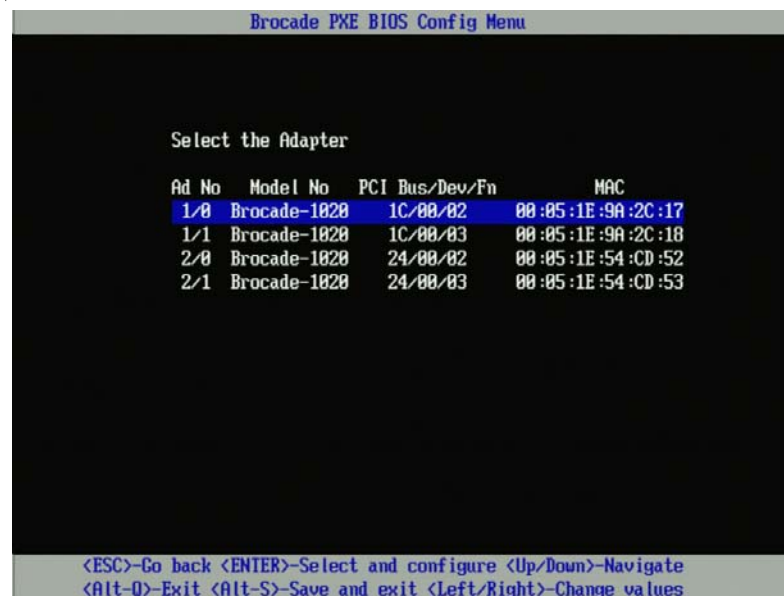
Configure Network Boot on the adapter using the Brocade PXE BIOS Configuration Utility, BCU commands, and HCM.

Configuring PXE BIOS using the Brocade Configuration Utility

Use the following procedures to configure network boot using the PXE PXE BIOS Configuration Menu.

1. Power on the host system.
2. Watch the screen as the system boots. When “Brocade PXE 2.1 BIOS 2010-11 All rights reserved” displays, press *Alt+B* or *Ctrl+B*.

The Brocade **PXE BIOS Configuration Menu** displays a list of installed adapter ports, similar to the following.



The screenshot shows a terminal window titled "Brocade PXE BIOS Config Menu". The main content is a table titled "Select the Adapter" with the following data:

Ad No	Model No	PCI Bus/Dev/Fn	MAC
1/0	Brocade-1020	1C/00/02	00:05:1E:9A:2C:17
1/1	Brocade-1020	1C/00/03	00:05:1E:9A:2C:18
2/0	Brocade-1020	24/00/02	00:05:1E:54:CD:52
2/1	Brocade-1020	24/00/03	00:05:1E:54:CD:53

At the bottom of the screen, there is a legend for navigation keys:

<ESC>-Go back <ENTER>-Select and configure <Up/Down>-Navigate
<Alt-Q>-Exit <Alt-S>-Save and exit <Left/Right>-Change values

Under the **Ad No** column, 1/0 and 1/1 are the first port and second port respectively on the first installed adapter while 2/0 and 2/1 are the first and second port on the second installed adapter.

The Configuration Utility supports a maximum of 16 ports, and 8 ports can display on a screen at a time. Select **Page Up** to go to a previous screen or **Page Down** to go to the next screen.

NOTE

To bypass functions and stop loading BIOS, you must to press **X** for each port. Press **X** within 5 seconds to bypass execution of functions displayed on screens. If you press **X** after 5 seconds, the next function (instead of current function) will be bypassed.

3. Select a port that you want to configure.

A screen similar to the following displays showing the port's current BIOS version, MAC address, and BIOS settings.

```

Brocade PXE BIOS Config Menu

Adapter Selected
Adapter Model  PCI Bus/Dev/Fn      MAC
Brocade-1860   06/00/02      BC:7C:FF:03:AD:02

Adapter Settings

BIOS Version : 3.0.0.0_beta_bld04
MAC          : BC:7C:FF:03:AD:02
BIOS         - [ Disabled ]
VLanID       - [      0  ]

Press "R" to restore factory defaults
Press "M" to Manually edit the values
<ESC>-Go back <ENTER>-Select and configure <Up/Down>-Navigate
<Alt-Q>-Exit <Alt-S>-Save and exit <Left/Right>-Change values
  
```

4. Change any parameters by following the instructions at the bottom of the BIOS Configuration Utility screen. For example, use the following keys to select and change information:
 - Up and Down keys - Scroll to a different field.
 - Enter - Select a field and configure values.
 - Left and Right arrow keys - Change a value.
 - Alt - S - Save configuration values to adapter flash memory.
 - Alt - Q - Exit the utility.
 - Esc - Go back a screen.
 - Page Up or Page Down - Go to preceding or next screen.

NOTE

To restore factory default settings, press R.

5. Configure the following settings as required:
 - Enable or disable BIOS to support network boot.
You must enable BIOS to support network boot for an adapter port. If disabled, the host system cannot boot from a network system. The default state for Adapter ports is disabled.
 - Enter a VLAN ID for the port to be used during network boot. Enter a value from 0 through 4094.

NOTE

Enabling VLAN during network boot requires support from the operating system and has not been fully validated due to operating system limitations.

6. Save or exit the configuration utility.
 - To save the configuration, press the **Alt** and **S** keys.
 - To exit without saving press the **Alt** and **Q** keys.

Configuring PXE BIOS using HCM or BCU commands

You can enable or disable PXE BIOS on a specific adapter port for booting over the network and configure a VLAN ID for the port to be used during network boot using HCM dialog box options and BCU commands,

NOTE

Enabling VLAN during network boot requires support from the operating system and has not been fully validated due to operating system limitations.

Configuring PXE BIOS using HCM

To configure BIOS using HCM, perform the following steps.

1. Select one of the following in the device tree.
 - CNA
 - CNA port
 - Fabric Adapter port configured in CNA or NIC mode
2. Select **Configure > Basic Port Configuration** to display the **Basic Port Configuration** dialog box.
3. Select the **PXE Boot** tab to display network boot parameters.
4. Perform any or all of the following actions as appropriate for your needs:
 - Click the **PXE Boot enable** check box to enable or disable BIOS.

You must enable BIOS to support network boot for an adapter port. If disabled, the host system cannot boot from network systems. The default setting for the adapter boot BIOS is disabled.
 - Enter a VLAN ID between 0 through 4094 for the port to be used during network boot

NOTE

Enabling VLAN during network boot requires support from the operating system and has not been fully validated due to operating system limitations.

5. Click **OK** to exit and save values.

All configuration values are stored to adapter flash memory.

For details in using HCM options to enable BIOS for network boot, refer to the instructions for configuring PXE boot support using HCM in the Host Configuration chapter of the *Brocade Adapters Administrator's Guide*.

Configuring PXE BIOS using BCU commands

You can use BCU commands to configure PXE BIOS for the following:

- CNA port
- Fabric Adapter port configured in CNA or NIC mode

Use BCU commands for the following tasks:

- Enable BIOS for PXE boot

You must enable BIOS to support network boot for an adapter port. If disabled, the host system cannot boot from network systems. The default setting for the adapter boot BIOS is disabled. We recommend to only enable one adapter port per host to boot over the network.

```
bcu ethboot --enable <port_id>
```

where:

port_id Specifies the ID of the port for which you want to set network boot attributes. This could be the adapter_id/port_id, port PWWN, port name, or port hardware path.

- Disable BIOS for PXE boot:

```
bcu ethboot --disable <port_id>
```

where:

port_id Specifies the ID of the port for which you want to set network boot attributes. This could be the adapter_id/port_id, port PWWN, port name, or port hardware path.

- Enter a VLAN ID for a specific port for use when booting over the network:

```
bcu ethboot --vlan <port_id> <vlan_id>
```

where:

port_id Specifies the ID of the port for which you want to set network boot attributes. This could be the adapter_id/port_id, port PWWN, port name, or port hardware path.

VLAN id A value from 0 through 4094.

NOTE

Enabling VLAN during network boot requires support from the operating system and has not been fully validated due to operating system limitations.

- Displays the PXE configuration on the specified port.

```
bcu ethboot --query <port_id>
```

where:

port_id Specifies the ID of the port for which you want to display configuration information.

All configuration values are stored to adapter flash memory.

NOTE

For details on using BCU commands, refer to instructions for ethboot in the Brocade Command Utility appendix of the *Brocade Adapters Administrator's Guide*.

Boot over SAN

The “Boot Over SAN” feature allows a host to boot its operating system from a boot device directly attached to the host system or located somewhere on the SAN instead of the host’s local disk. Specifically, this “boot device” is a logical unit number (LUN) located on a storage device. LUNs can be specifically targeted to boot hosts running Windows, Linux, or VMware, or Solaris. For more information on how the Brocade Boot BIOS functions to implement this feature, refer to [“Brocade BIOS support for boot over SAN”](#) on page 128.

Booting from a remote SAN location provides the obvious advantage of recovering quickly from a host or adapter malfunction. With the adapter boot BIOS enabled for booting over SAN and configured with boot device locations and boot sequences, replacing an old host with a new one involves installing the adapter from the old host into the new one with the same configuration, then booting the new host. The host’s operating system automatically boots from the remote SAN boot device.

Although fast recovery from a malfunction is a big advantage, following are considerations for the host and adapter, depending on the replacement situation:

- Even though you install a similar host, the new host may require unique System BIOS options and other settings, or internal IDE drives may need to be disconnected or disabled to boot over SAN.
- If replacing the Brocade adapter in a host with a similar Brocade adapter, you will need to reconfigure the adapter and storage to boot from the appropriate remote boot device. You must also update access on storage device ports to reflect the adapter PWWN. Finally, you must update the single-initiator target zone created for the adapter port and storage device port with the new adapter PWWN.
- If replacing a host with a different model, you may be prompted to install the adapter driver for the existing adapter.

Booting servers from SAN-attached storage can significantly streamline server administration and facilitate server deployment. Instead of manually configuring each individual server, boot images on SAN-attached storage can be cloned and assigned to groups of servers at the same time. This not only simplifies initial configuration, but makes ongoing software updates and maintenance much easier to administer. When boot images are centrally managed on the SAN, server security, integrity, and ability to recover data are also enhanced.

Following are additional benefits of boot over SAN:

- Eliminating the requirement for local hard drives.
- Centralized storage management and administration of client workstations.
- Disaster recovery.
- More control and efficiency for software distribution.
- Increased host reliability since operating system boots from highly available storage devices.
- Improved security.

Brocade BIOS support for boot over SAN

The Brocade adapter boot BIOS provides boot support for the Brocade adapters in x86 and x64 host platforms. The BIOS can discover up to 256 storage targets, such as RAID units, and the logical unit numbers (LUNs) on those units when the LUNs are bound to adapter ports.

When adapter BIOS is enabled, the boot code loads from adapter option ROM into system random access memory (RAM) and integrates with the host system (server) BIOS during system boot to facilitate booting from LUNs, which are also referred to as “virtual drives” and “boot devices.” LUNs targeted as boot devices must contain the boot image for the host’s operating system and adapter driver. The process for booting from these locations is referred to as “booting over SAN.” Boot over SAN can be supported on a maximum of 16 ports (for example, 8 dual-port adapters). For more information and configuration procedures for booting over SAN, refer to [“Configuring boot over SAN”](#) on page 131.

NOTE

You can enable or disable BIOS for boot over SAN, set port speed (HBAs and Fabric Adapter port configured in HBA mode only), and display adapter BIOS settings using BCU commands. By default, BIOS is enabled on all adapter ports.

The Brocade BIOS Configuration Utility (embedded with the boot code), BCU commands, and the HCM allow you to perform the following tasks:

- Enable or disable BIOS.
When enabled, the system BIOS can execute the Brocade BIOS code to boot over SAN.
- Set port speed (HBAs and Fabric Adapter ports configured in HBA mode only):
- Review adapter properties, such as the following:
 - Port speed
 - PWWN
 - NWWN
 - BIOS version
- Select a boot device from discovered targets.
- Enable one of the following boot LUN options.

NOTE

To boot from direct-attached Fibre Channel targets, you must use the **First LUN** or **Flash Values** options.

- Fabric Discovered. When enabled, boot information, such as the location of the boot LUN, is provided by the fabric (refer to [“Fabric-based boot LUN discovery”](#) on page 163 for more information).

NOTE

Fabric-based boot LUN discovery (Fabric Discovered) is not supported for booting from direct-attached Fibre Channel targets.

- First LUN. The host boots from the first LUN visible to the adapter that is discovered in the fabric.
 - Flash Values. Boot LUN information will be obtained from flash memory. Note that values are saved to flash when you configure and save them through the BIOS Configuration Utility and BCU.
-

NOTE

“Brocade BIOS configuration utility” and “Brocade BIOS configuration menu” are used interchangeably in this manual.

For general information and configuration procedures for booting over SAN, refer to [“Configuring boot over SAN”](#) on page 131.

Brocade UEFI support for boot over SAN

Unified Extensible Firmware Interface (UEFI) boot code for Brocade adapters allows boot support on UEFI-based platforms. The UEFI boot code can discover storage targets, such as RAID units and logical unit numbers (LUNs) when the LUNs are bound to adapter ports. The UEFI boot code loads from Brocade adapter option ROM into system memory and integrates with the host system (server) UEFI during system boot to facilitate booting from target LUNs, which are also referred to as “virtual drives” and “boot devices.” LUNs targeted as boot devices must contain the boot image for the host, which consists of the adapter driver, host operating system, and other files that allow the host to boot from the LUN. The process for booting from a boot LUN is referred to as “booting over SAN.” For more information and configuration procedures for booting over SAN, refer to [“Configuring boot over SAN”](#) on page 131.

After the Brocade UEFI boot code integrates with the system UEFI during system boot, use configuration options on your system to perform the following tasks. Configuration values are stored in adapter memory.

- Enable or disable the adapter port.
When enabled, available Fibre Channel devices attach as UEFI devices and obtain UEFI device names. Once the Fibre Channel devices have UEFI device names, you can select them using the host’s **Boot Configuration** menu as boot devices.
- Set the port speed (HBAs only and Fabric Adapter ports configured in HBA mode).

For general information and configuration procedures for booting over SAN, refer to [“Configuring boot over SAN”](#) on page 131.

NOTE

UEFI is not supported on the Brocade 804 adapter.

Legacy BIOS parameters

The following parameters configured in legacy BIOS and saved on the adapter when using the Brocade BIOS Configuration Utility, CLI, or HCM, are only applicable when configured in legacy BIOS mode on a UEFI-capable or non-UEFI capable system.

- Fabric Discovered (also known as Fabric Based Boot LUN Discovery)
- First LUN
- Flash Values

The following parameters, if saved on the adapter during legacy BIOS configuration, will apply if UEFI is enabled on the system:

- Port speed (HBAs and Fabric Adapter port configured in HBA mode only)
- Enable or disable BIOS

If legacy BIOS is enabled on the system, these parameters will apply. Refer to [“Brocade BIOS support for boot over SAN”](#) on page 128).

Fabric Based Boot LUN Discovery

Fabric Based Boot LUN Discovery (fabric discovered) is only applicable when configured in legacy BIOS mode on a UEFI-capable or non-UEFI capable system.

NOTE

This feature is not supported for booting from direct-attached Fibre Channel targets.

Host system requirements for boot over SAN

Consider these requirements for your host system when configuring boot over SAN:

- You may need to disconnect internal IDE hard drives to disable them in the system BIOS and allow the adapter boot BIOS to boot from the remote boot device. Some systems may allow these drives to be enabled in the system BIOS if they correctly support the bootstrap protocol.
- Typically, the boot order must be CD-ROM, diskette, then Fibre Channel drive. After the operating system installs, you can change this order if desired.
- Boot over SAN is not supported on Windows 2003 systems for CNA models and for Fabric Adapter ports configured in CNA or NIC modes.

Due to the variety of configurations and variables in a SAN installations, your specific environment must determine any additional requirements to guide installation and configuration for best results.

Storage system requirements for boot over SAN

Consider these requirements for your storage system for booting over SAN:

- The SAN must be properly installed so that the location on the SAN containing the boot image is visible to the host. Verify links between the adapter and storage are working properly before attempting a boot over SAN.
- The boot LUN must contain the appropriate operating system for the host and the adapter driver. For information on minimum operating system support for drivers, refer to [“Boot installation packages”](#) on page 49 and [“Operating system support”](#) on page 40. Refer to [“Operating system and driver installation on boot LUNs”](#) on page 148 for installation details.

NOTE

Some storage devices need the appropriate host type associated with the logical drive configured for the correct operating system. This is necessary so that the storage device can send the correct format of inquiry data to the host. Refer to your storage system documentation for specific requirements.

- Configure the storage system so that the adapter port has exclusive access to the LUN. Accomplish this by binding an adapter port PWWN to a LUN. You can easily find an adapter port PWWN using the Brocade BIOS Configuration Utility (refer to “[Configuring BIOS using the Brocade configuration utility](#)” on page 136). Exclusive access to the LUN can also be assured by using a LUN-management feature, such as LUN masking, zoning, or a combination of these.
-

NOTE

You should use LUN masking to avoid boot failures. To configure LUN masking using the Brocade LUN Masking feature, refer to the Brocade Administrator’s Guide.

- Only one path to the boot LUN must be visible to the operating system during the host’s boot process. If the storage device has multiple controller ports, only one port can be enabled or connected to the SAN during the operating system boot process.
- Create a specific zone containing the adapter port world-wide name (PWWN) and the target PWWN to keep RCSN interruptions from other hosts to a minimum.
- If trunking is enabled, use the PWWN of Adapter Port-0 when configuring Fabric Zones and LUN Masking for storage.
- For Microsoft Windows and Linux environments, the SAN must be connected to the host system in a switched fabric or point-to-point topology. Fibre Channel Arbitrated Loop (FC-AL) connections are not supported.

Disabling N_Port trunking

The Fibre Channel N_Port Trunking feature works in conjunction with the trunking feature on Brocade switches, whereby the Fabric Operating System (FOS) provides a mechanism to trunk different switch ports of the same port group into one. Disabling the N_Port trunking feature on the adapter when using boot over SAN requires specific procedures that are included in the *Brocade Adapters Administrator’s Guide*. Refer to that guide for details.

Configuring boot over SAN

You must configure boot over SAN on the adapter, as well as the storage device. Use this section to guide you through other sections in this chapter that contain complete procedures for configuring the adapter to boot from a SAN device.

Instructions are provided in this section for configuring boot over SAN on BIOS-based systems using the Brocade BIOS Configuration Utility, BCU commands, and HCM. You can also configure adapters using the Legacy BIOS mode (if the system supports Legacy mode) or by using another non-UEFI mode system.

Instructions are provided in this section for configuring boot over SAN on UEFI-based systems that support EFI shell commands. Configuring Brocade adapters in UEFI mode may not be supported on some host systems. However, since Brocade adapters ship with all ports enabled and auto-negotiated speed enabled by default, adapters should work in most systems.

Overview

[Figure 17](#) on page 133 provides a flow chart for the “[Procedures](#)” on page 134 and information elsewhere in this chapter to configure your adapter, host system, and remote boot device for booting over SAN.

Note: Step numbers reference procedures on the following page.

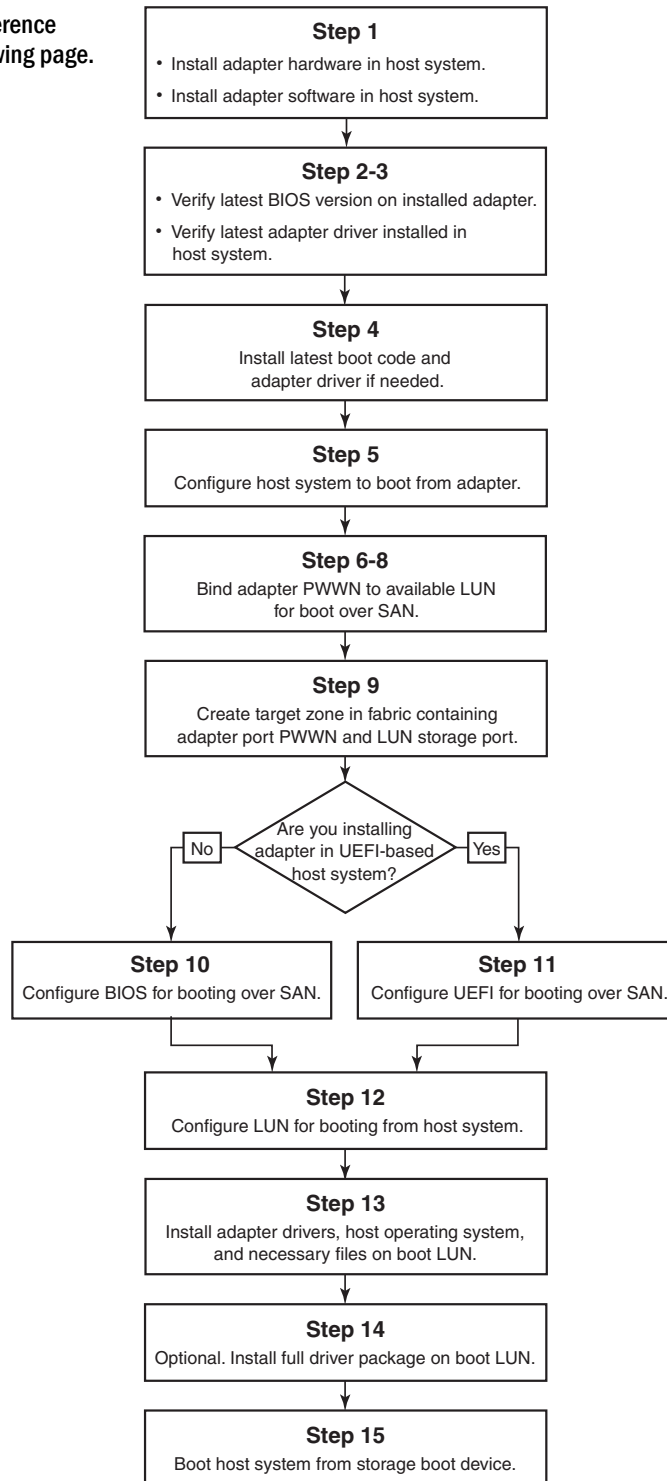


FIGURE 17 Configuring boot over SAN

Procedures

The following procedures are illustrated in the flow chart in [Figure 17](#) on page 133. You may be referenced to more detailed sections of this chapter to complete some of these steps.

1. Install the adapter and software into the host system using instructions in [Chapter 2, “Hardware Installation”](#) and [Chapter 3, “Software Installation”](#).
2. Verify that the adapter contains the latest BIOS version. You can use HCM or BCU commands.
For HCM, perform the following steps.
 - a. Select an adapter in the device tree.
 - b. Click the **Properties** tab in the right pane to display the adapter Properties pane.For BCU, enter the following commands.
 - a. Enter the following command to list the Brocade adapters installed in the system and their adapter IDs.

```
bcu adapter --list
```
 - b. Enter the following command to display information about an adapter with a specific adapter ID. The installed BIOS version displays in the *Flash Information* section of the display.

```
bcu adapter --query <adapter_id>
```
3. Verify that the latest adapter driver is installed on your host system using information under [“Confirming driver package installation”](#) on page 103.
For information on minimum operating system support for drivers, refer to [“Software installation and driver packages”](#) on page 43 and [“Operating system support”](#) on page 40.
4. Install the latest adapter boot code and driver using the following steps.
 - a. Download the latest boot code and driver package from the Brocade adapters website using the following steps.
 1. Go to the adapters website at www.brocade.com/adapters.
 2. Navigate to the adapters **Downloads** page.
 3. Select your operating system from the **Downloads** list to display appropriate download files.
 4. Download the boot code image and driver package from the **Downloads** page.
 - b. Upgrade your adapter and boot code if necessary using the following steps.
 1. Driver package. Refer to [“Using software installation scripts and system commands”](#) on page 89.
 2. Boot code. Refer to [“Boot code updates”](#) on page 118.
5. Use your host system’s boot menu to enable the system to boot from the CD/DVD, diskette, and then the appropriate adapter. If multiple adapters are installed on your system, be sure to configure the system to boot from the appropriate adapter first in the boot order. Booting from the CD/DVD and diskette first allows you to install the host operating system and adapter driver on the boot LUN, but you may change this after installation. Depending on your host system, you may need to enable booting from the adapter in your system boot menu, or you may need to disable the host’s hard drive to boot from the adapter.

NOTE

If you need to disable the system's hard drive to allow booting from the adapter and wish to utilize both the boot from SAN feature and your system's hard drive, refer to your system documentation. Procedures for this configuration are beyond the scope of this publication.

6. Verify that the appropriate storage device is connected to the fabric and functioning. This device must have at least one LUN available that is appropriate for booting your host's operating system.
7. Determine which adapter port you want to use for booting from SAN and note its PWWN.
To locate the PWWN for an installed adapter port, refer to the discussion on PWWN on [page xxii](#). To find the PWWN for the port using the Brocade BIOS Configuration Utility, refer to ["Configuring BIOS using the Brocade configuration utility"](#) on page 136.
8. Configure the storage system so that the adapter port has exclusive access to the LUN. Consider using the following methods:
 - Using an appropriate storage management or configuration utility, bind the adapter port's PWWN to the selected LUN.
 - Mask the boot LUN for exclusive access by the adapter port and avoid boot failures using the BCU `fcpim -lunmaskadd` command and the LUN Masking tab on the HCM **Basic Port Configuration** dialog box. Refer to the *Brocade Administrator's Guide* for more information on configuring the LUN Masking feature.
9. Create a new single-initiator target zone in the SAN fabric where the adapter and storage device are attached. The zone should contain only the PWWN of the storage system port where the boot LUN is located and the PWWN of the adapter port. Refer to the *Brocade Fabric OS Administrator's Guide* for zoning procedures.
10. For BIOS systems, use one of the following sections to enable or disable BIOS to boot over SAN, set adapter port speed (HBAs and Fabric Adapter ports configured in HBA mode only), display BIOS configuration parameters, select boot LUNs, and enable "Fabric Discovered."
 - ["Configuring BIOS using the Brocade configuration utility"](#) on page 136.
 - ["Configuring BIOS using HCM or BCU commands"](#) on page 142.
11. For UEFI systems, enable the adapter and boot devices for booting over SAN using instructions under ["Configuring UEFI"](#) on page 146.
12. Configure the LUN for booting your host system. Refer to procedures required by your host platform and operating system.
13. Install boot image on the boot LUN. The boot image consists of the adapter driver, host operating system, and other necessary files to allow the host to boot from the boot device. Refer to ["Operating system and driver installation on boot LUNs"](#) on page 148.

For information on minimum operating system support for drivers, refer to ["Boot installation packages"](#) on page 49 and ["Operating system support"](#) on page 40.
14. Install full driver package (drivers, utilities, HCM agent) to boot LUN. Refer to ["Installing the full driver package on boot LUNs"](#) on page 162.
15. Boot the host from the SAN storage boot device using procedures required by your host system. As the system boots, information about successful Brocade BIOS installation should display. In addition, information should display about the Brocade adapter and boot LUN in the systems boot device menu.

Configuring BIOS using the Brocade configuration utility

NOTE

“Brocade BIOS configuration utility” and “Brocade BIOS configuration menu” are used interchangeably in this manual.

The Brocade BIOS Configuration Utility allows you to perform the following operations on selected adapters:

- Enable or disable BIOS to support boot over SAN.
 - You must enable BIOS to support boot over SAN for an adapter port. If disabled, the host system cannot boot from Fibre Channel disk drives.
 - The default setting for the adapter boot BIOS is *BIOS is enabled with Fabric Discovered* on all adapter ports.
- Enable one of the following Boot Options:

NOTE

For booting from direct-attached Fibre Channel targets, select the **Flash Values** or **First LUN** options.

- Fabric Discovered
Host boots from LUN information provided by the fabric.

NOTE

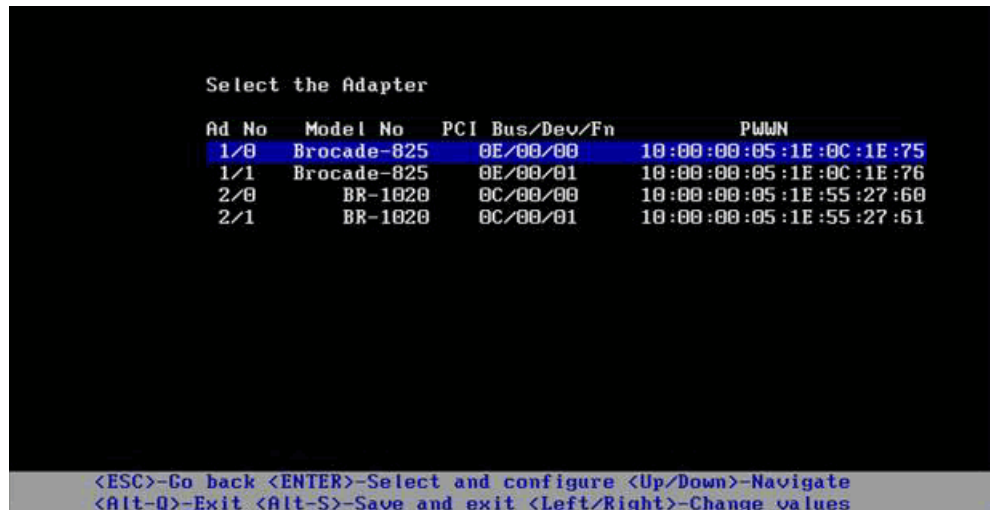
Fabric-based boot LUN discovery (Fabric Discovered) is not supported for booting from direct-attached targets.

- Flash Values
Host boots from LUN information stored in flash memory.
- First LUN
Host boots from the first visible LUN.
- Set port speed for the adapter (HBAs and Fabric Adapter ports configured in HBA mode only).
- Select boot LUNs from discovered targets.
- Review adapter properties, such as the following:
 - Port speed
 - PWWN
 - NWWN
 - BIOS version

To configure BIOS parameters using the Brocade BIOS Configuration Utility, use the following steps.

1. Power on the host system.
2. Watch the screen as the system boots. When “Brocade BIOS configuration utility” displays, press *Alt+B* or *Ctrl+B*.

The Brocade BIOS Configuration Menu displays a list of installed adapter ports, similar to the following.



Under the **Ad No** column, 1/0 and 1/1 are the first port and second port respectively on the first installed adapter while 2/0 and 2/1 are the first and second port on the second installed adapter.

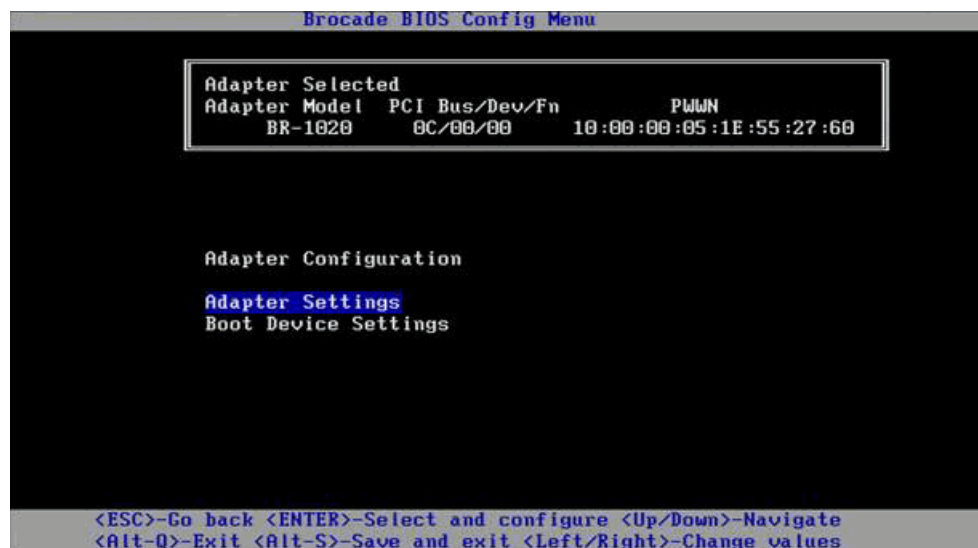
A maximum of 8 ports can display on a screen, and a maximum of 16 ports are supported by the BIOS Configuration Utility. Select **Page Up** to go to a previous screen or **Page Down** to go to the next screen.

NOTE

To bypass functions and stop loading BIOS, you must to press **X** for each port. Press **X** within 5 seconds to bypass execution of functions displayed on screens. If you press **X** after 5 seconds, the next function (instead of current function) will be bypassed.

3. Select a port that you want to configure.

A screen similar to the following displays. (In the following example, port 0 on the Brocade 1020 CNA was selected.)



4. Select one of the following:
 - **Adapter Settings.** Use the Adapter Settings screen to enable BIOS, adapter port speed (HBAs and Fabric Adapter ports configured in HBA mode only), and discovery of boot LUN information from the fabric. You can determine adapter N and PWWN. Proceed to [step 5](#).
 - **Boot Device Settings.** Use the Device Settings screen to select the boot target and LUN for booting the host system. Proceed to [step 7](#).
5. Select **Adapter Settings** and press Enter to begin adapter configuration.

A screen similar to the following displays showing the port's current BIOS version, NWWN, PWWN, and MAC (CNAs and Fabric Adapter ports configured in CNA mode only). [Table 11](#) on page 138 explains options available for BIOS, Port Speed, and Boot LUN settings.

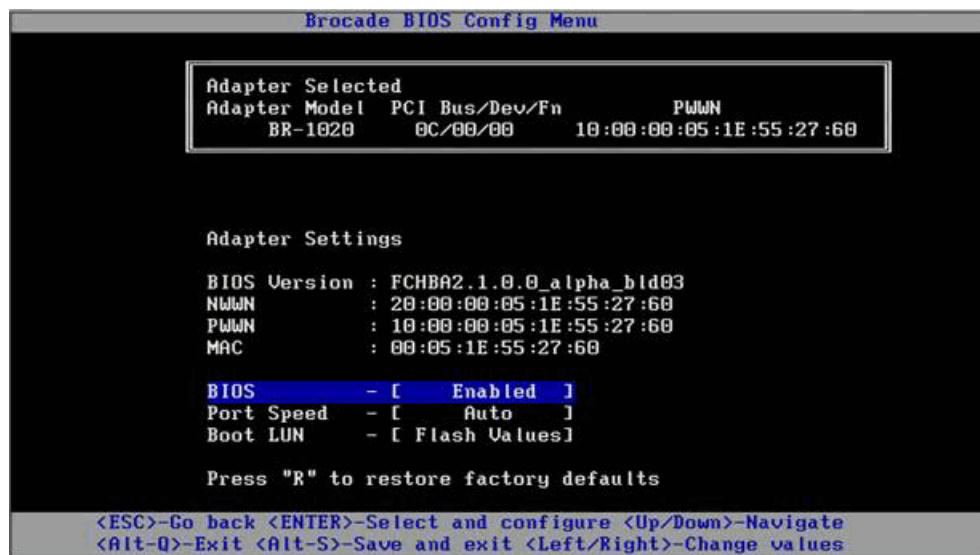


TABLE 11 Brocade BIOS Configuration Utility field descriptions

Field	Description
BIOS	The value of BIOS must be <i>Enable</i> for the selected adapter port to support boot over SAN. If this setting is set to <i>Disable</i> , the system will not boot from the Fibre Channel disk drives that are connected to the selected adapter port. NOTE: The default setting for all adapter ports is enabled.
BIOS Version	Displays the Brocade BIOS boot code version installed on the card.

TABLE 11 Brocade BIOS Configuration Utility field descriptions (continued)

Boot LUN	<ul style="list-style-type: none"> Fabric Discovered. When enabled, LUN information, such as the location of the boot LUN, is provided by the fabric (refer to “Fabric-based boot LUN discovery” on page 163). Flash Values. Boot LUN information will be obtained from flash memory. Note that values are saved to flash when you configure and save them through the BIOS Configuration Utility and BCU. First LUN. The host boots from the first LUN visible to the adapter that is discovered in the fabric. <p>NOTE: To boot from direct-attached Fibre Channel targets, you must use the First LUN or Flash Values options.</p> <p>NOTE: Fabric-based boot LUN discovery (Fabric Discovered) is not supported for booting from direct-attached targets.</p>
NWWN	Displays the port’s Node World-Wide Name.
PWWN	Displays the port’s unique Port World-Wide Name.
MAC	Displays the port’s Media Access Control (MAC) address for CNAs and Fabric Adapter ports configured in CNA or NIC mode.
Port Speed	<p>Sets the speed for the adapter port.</p> <p>NOTE: Auto allows the adapter port to automatically negotiate link speed with the connected port. Auto is the only speed option for the 10 Gbps CNAs and Fabric Adapter ports configured in CNA or NIC mode.</p>

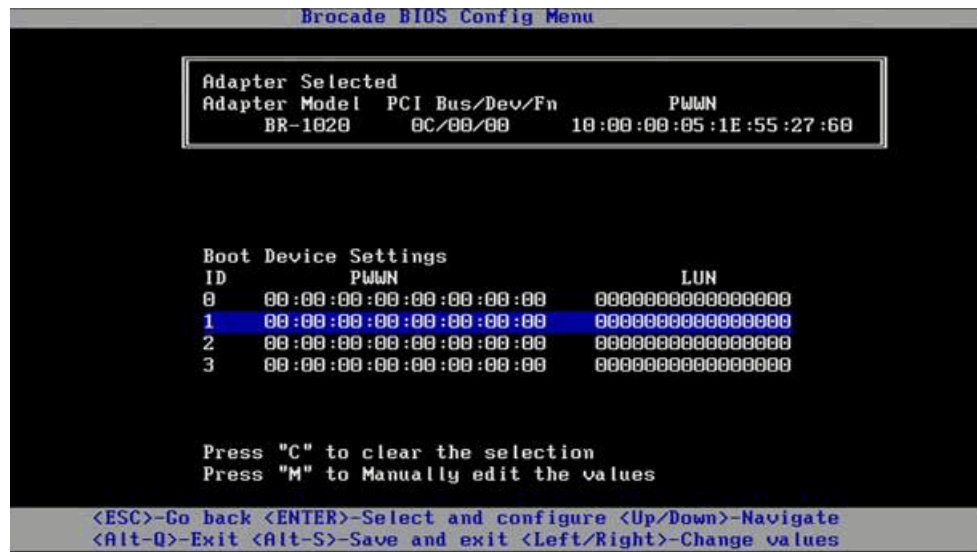
- Change any parameters by following the instructions at the bottom of the BIOS Configuration Utility screen. For example, use the following keys to select and change information:
 - Up and Down keys - Scroll to a different field.
 - Enter - Select a field and configure values.
 - Left and Right arrow keys - Change a value.
 - Alt - S - Save configuration values to adapter flash memory.
 - Alt - Q - Exit the utility.
 - Esc - Go back a screen.
 - Page Up or Page Down - Go to preceding or next screen.

NOTE

To restore factory default settings, press R.

- To configure boot devices, select **Boot Device Settings** from the initial menu screen for the adapter port ([step 4](#)) and press Enter to designate a discovered LUN as a boot device.

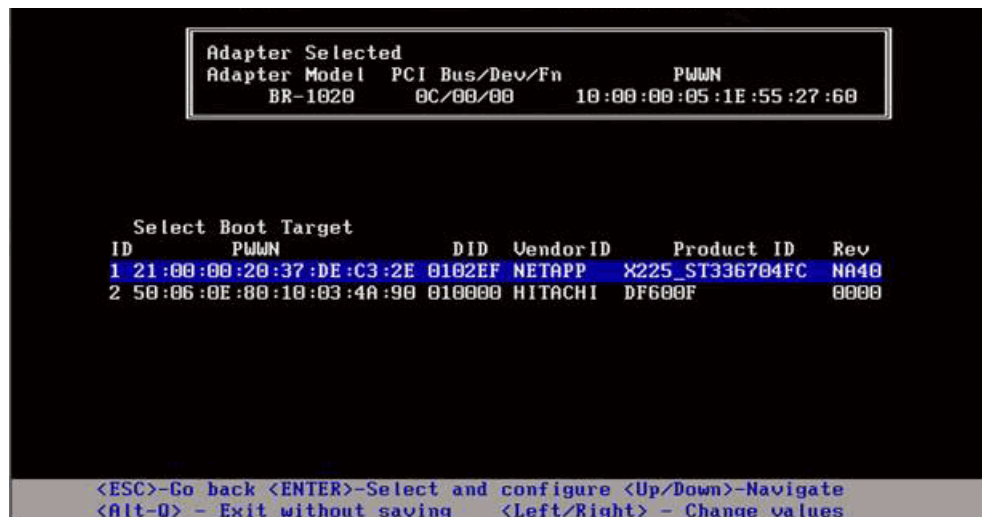
A list of up to four boot devices display, showing the PWWN of the storage port and the LUN number designated as a boot LUN. The first device listed is the primary boot device. The host first tries to boot from the primary device, then the succeeding devices in the list.



8. Use the Up and Down arrow keys to select a boot device, then use one of the following options to configure boot device settings:

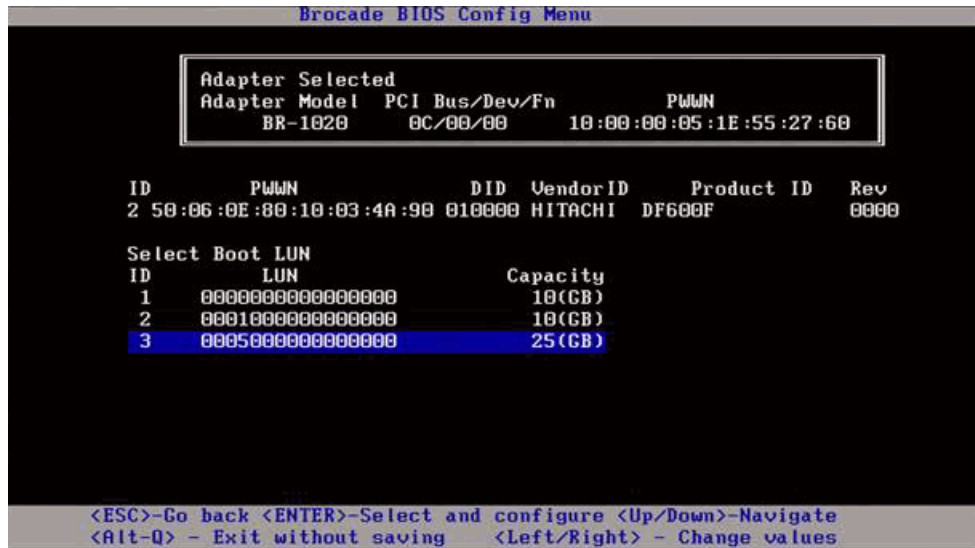
- Press **C** to clear a selected boot device from the list.
- Press **M** to manually edit boot device information, then enter the PWWN and LUN values for the boot device. Press **M** to exit.
- Select a device and press Enter. This displays additional screens that allow you to select discovered LUNs as boot devices.

If you select a device under Boot Device Settings and press Enter, a screen similar to the following displays listing all discovered boot targets.



9. Select a target on which you want to designate a boot LUN and press Enter.

A screen similar to the following displays listing device information and LUNs visible to the adapter.

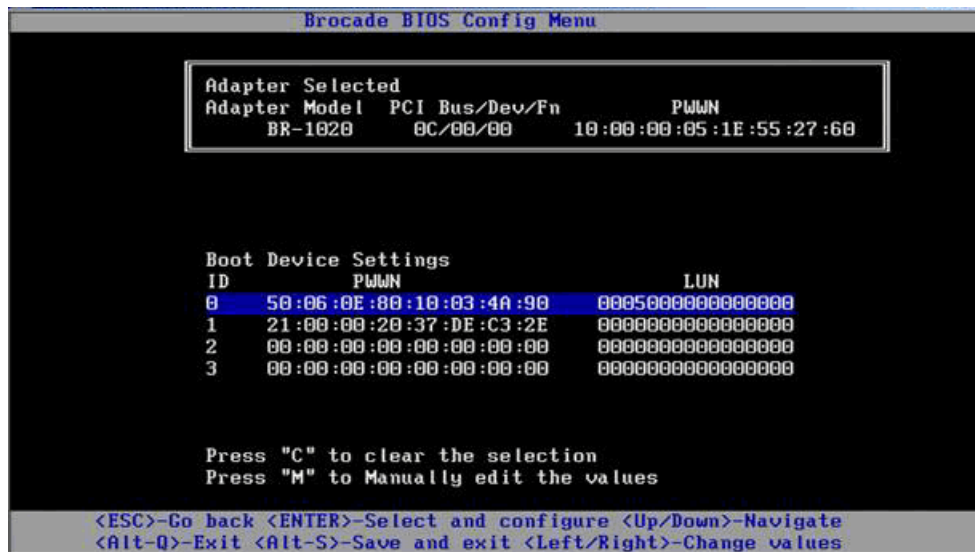


10. Select the LUN on the target device you that want to designate as the boot LUN for the host. This must be the same LUN that you bound to the adapter port using the storage system's management or configuration utility (refer to [step 8](#) under "Procedures" on page 134).

NOTE

You only need to select the bootable LUN once. After the first boot, the same LUN will be used until changed through the BIOS Configuration Utility.

11. Press Enter. The selected device will be added to the list of boot devices for the adapter.



12. Save or exit the configuration utility.
 - To save the configuration, press the **Alt** and **S** keys.
 - To exit without saving press the **Alt** and **Q** keys.

Configuring BIOS using HCM or BCU commands

You can enable or disable BIOS for booting over the SAN, set adapter port speed (HBAs and Fabric Adapter port configured in HBA mode only), display BIOS configuration parameters, select boot LUNs, and enable automatic discovery of the boot LUN from the fabric using HCM dialog box options and BCU commands,

NOTE

You can only designate bootable devices (LUNs) using the Boot Device Settings feature of the Brocade BIOS Configuration Utility,

Configuring BIOS using HCM

To configure BIOS using HCM, perform the following steps.

1. Select an adapter in the device tree.
2. Select **Configure > Basic Port Configuration** to display the **Basic Port Configuration** dialog box.
3. Click the **Boot-over-SAN** tab to display the **Boot over SAN** dialog box.
4. Perform any or all of the following actions as appropriate for your needs:

- Enable or disable BIOS.

Click the **BIOS Enable** check box to enable boot over SAN. You must enable BIOS to support boot over SAN for an adapter port. If disabled, the host system cannot boot from Fibre Channel disk drives. The default setting for the adapter boot BIOS is enabled.

NOTE

For mezzanine adapters only, if BIOS was enabled through a blade system management application, the Pre-boot BIOS Enable option will be selected and cannot be changed. The **BIOS Enable** option will also be disabled.

- Set port speed for adapter ports.

NOTE

Auto Negotiate allows the port to automatically negotiate link speed with the connected port. This is the only speed option for the 10 Gbps CNA and for Fabric Adapter ports configured in CNA or NIC mode.

NOTE

For mezzanine adapters only, if speed was set through another application, such as the blade system management application, a **Pre-boot BIOS Speed** will be indicated and cannot be changed.

- Enable one of the following boot options:

NOTE

For booting from direct-attached Fibre Channel targets, select the **First Visible LUN** or **User Configurable LUN** options.

- Fabric Discovered - When enabled, the boot LUN identification is provided by the fabric (refer to "[Fabric-based boot LUN discovery](#)" on page 163).

NOTE

Fabric-based boot LUN discovery (Fabric Discovered) is not supported for booting from direct-attached Fibre Channel targets.

- First Visible LUN - The host boots from the first LUN visible to the adapter that is discovered in the fabric.
- User Configured LUNs - Allows the user to select and prioritize the remote target and LUN for booting over SAN.

The User Configured LUNs table displays LUNs visible to the adapter. If you select this option, up to four boot user-configured LUNs can be configured as boot devices. If you select **User Configured LUNs**, the system will attempt to boot the first LUN in the table, then each succeeding LUN in order.

NOTE

For mezzanine adapters only, if LUNs have been configured through another application, such as a blade system management application, these are considered “pre-boot” configured LUNs. In pre-boot configurations, up to eight total LUNs can be configured as boot devices for HBAs and Fabric Adapter ports configured in HBA mode. Up to two LUNs can be configured for CNAs and Fabric Adapter ports configured in CNA mode.

Click the Boot Device PWWN and LUN fields to edit WWNs. For the LUN to be accessible to the port it must be bound to the LUN using the appropriate management or configuration utility for the storage system. In addition, a zone set must be created on the attached switch containing PWWN of the storage system port where the boot LUN is located and the PWWN of the adapter port.

Click the up and down arrows to the right of the table to reorder boot devices in the table. Click the delete symbol (X) to remove a device from the table.

5. Click **OK** to exit and save values.

All configuration values are stored to adapter flash memory.

For details in using HCM options to configure BIOS and boot over SAN options, refer to the instructions for enabling boot over SAN using HCM in the Host Configuration chapter of the *Brocade Adapters Administrator's Guide*.

Configuring BIOS using BCU commands

Use the BCU commands to perform the following tasks:

- Enable BIOS, set port speed (HBAs and Fabric Adapter ports configured in HBA mode only), and configure boot LUN information.

You must enable BIOS to support boot over SAN for an adapter port. If disabled, the host system cannot boot from Fibre Channel disk drives. The default setting for the adapter boot BIOS is enabled. It is recommended to enable BIOS on only one adapter port per host for booting over SAN.

Use the following BCU command to enable BIOS, set port speed (if required), and configure target PWWN and LUN values.

```
bcu bios --enable <port_id> [-s <speed>][-o <auto|flash|firstlun>[-p pos][[-b pwwn,lun* ]
```

where:

port_id	Specifies the ID of the port for which you want to set the port's boot from SAN attributes. This could be the adapter_id/port_id, port PWWN, port name, or port hardware path.
-s <speed>	Specifies the speed for the port. Default is autonegotiate. Note that autonegotiate is the only speed option for 10 Gbps CNAs and Fabric Adapter ports configured in CNA or NIC mode.
-o:	Begins options for obtaining boot LUN information (auto, flash, firstlun).
auto	Enables automatic identification of the boot LUN from fabric. Refer to "Fabric-based boot LUN discovery" on page 163 for more information. This value is not supported for booting from direct-attached targets.
flash	Boot LUN information is obtained from flash memory. Note that values are saved to flash when you configure them and save them through the BIOS Configuration Utility, HCM, and BCU.
firstlun	The host boots from the first LUN visible to the adapter that is discovered in the fabric.
-p pos	Specifies the start position in the flash array of boot LUNs. The range is 0-3. The default value of 0 means the existing PWWN, LUN information in flash would be erased.
-b pwwn,lun*	<p>The host boots from the LUN information defined by the target PWWN and LUN value (lun*).</p> <p>Specify PWWN as a colon-separated value and the LUN ID as a hexadecimal value (without 0x prefix).</p> <p>The LUN must be the same LUN that you bound to the adapter port using the storage system's management or configuration utility (refer to step 8 under "Procedures" on page 134).</p>
	<ul style="list-style-type: none"> • Disable BIOS and boot over SAN support for an adapter port using the following command: <pre>bcu bios --disable <port_id></pre> • Display BIOS settings, current port speed, and boot LUN information for the selected port using the following command: <pre>bcu bios --query <port_id></pre> <p>where:</p>
port_id	Specifies the ID of the port for which you want to set the port's interrupt attributes.

All configuration values are stored to adapter flash memory.

NOTE

For details on using BCU commands, refer to instructions for enabling boot over SAN using BCU commands in the Host Configuration chapter of the *Brocade Adapters Administrator's Guide*.

Configuring UEFI

Depending on your UEFI-based host system, different tools may be available to perform the following tasks to configure the adapter values that are stored in adapter flash memory.

NOTE

UEFI is not supported on the Brocade 804 adapter.

- Enable or disable adapter ports for booting over SAN.
When enabled, available Fibre Channel devices attach as UEFI devices and obtain UEFI device names. Once the Fibre Channel devices have UEFI device names, you can select them in the systems Boot Configuration menu as boot devices.
- Set the port speed (HBAs and Fabric Adapter ports configured in HBA mode only).

NOTE

Autonegotiate is the only speed option for the 10 Gbps CNAs and Fabric Adapter ports configured in CNA or NIC mode.

- Select LUNs for booting over SAN.

Depending on your system, different tools may be available to obtain adapter and controller handle numbers that identify the appropriate adapter for configuration, enable adapter port(s), and change port speeds. Although the following provides some examples using EFI shell commands, refer to your system documentation and help system for specific details.

- On systems with EFI shell commands, you can use such commands as **drvcfg**, **dh**, and **drivers** to configure adapter values (an example procedure for these systems follows).
- On some systems, you can access **drvcfg** and other commands from a menu system to configure adapter values. Refer to instructions or online help provided for your system.
- On other systems, you will need to use BCU commands and the system's BIOS menus to configure adapter values. Refer to instructions or online help provided for your system. To use HCM options or BCU commands, Refer to [“Configuring BIOS using HCM or BCU commands”](#) on page 142.

The following procedures provide an example for configuring adapter values on systems that support EFI shell commands.

1. Power on the host system.
2. When the EFI Boot Manager menu displays, select EFI Shell.
3. Enter the following EFI shell command to display the device or driver handle number for each driver loaded on the system.

```
drivers -b
```

Output displays one screen at a time and includes the two-digit driver handle number, version, and driver name. Look for entries labeled “Brocade Fibre Channel Adapter.” In the following example, the Brocade adapter has a driver handle of 25.

```

          T   D
D        Y C I
R        P F A
V VERSION E G G #D #C DRIVER NAME                IMAGE NAME
-----
25 0000000A D X - 2 - Brocade Fibre Channel Adapter Bus D PciROM:03:00:00:00:

```

4. Enter the following command to display all drivers and controllers that support the driver configuration protocol.

```
drvcfg -c
```

Once the driver initializes, look for entries for the Brocade adapter driver handle that you found in the previous step. In the following example, two controller handles (27 and 28) display for driver handle 25. Each controller represents a port on the adapter.

```
Configurable Components
Drv[1F] Ctrl[20] Child[67] Lang[eng]
  Drv[25] Ctrl[27] Lang[eng]
  Drv[25] Ctrl[28] Lang[eng]
```

5. Configure an adapter port using the **drvcfg -s** command in the following format.

```
drvcfg -s [driver handle] [controller handle]
```

Following is an example of how to use this command with the driver and controller handles from the previous steps.

- a. To configure one of the adapter ports, enter the following:

```
drvcfg -s 25 27
```

NOTE

The **-s** option for **drvcfg** provides prompts for setting adapter options. You can use the **-v** option (**drvcfg -v 25 27**) to check that options currently set on the adapter are valid.

- b. When you are prompted to enable the adapter port, press the Y or N key to enable or disable the port.
- c. When prompted, enter a port speed (HBAs and Fabric Adapter ports configured in HBA mode only).
- d. To terminate and not save values that you have selected, press Esc, and go to the next step.

Following is example output from the **drvcfg** command using driver handle 25 and controller handle 27. Note that for a CNA and Fabric Adapter ports configured in CNA mode, an option to set the port speed will not display as it does for an HBA or Fabric Adapter port configured in HBA mode.

```
Set Configuration Options
Drv[25] Ctrl[27] Lang[eng]Bfa Fibre Channel Driver Configuration
=====
Port nwn 200000051E301492
Port pwn 100000051E301492
Enable Brocade Fibre Channel adapter/port 1/0 (Y/N)? [Y] -->Y
Set Brocade Fibre Channel Adapter Port Speed 1/0 (0,2,4,8)? [Auto] -->Auto
Drv[25] Ctrl[27] Lang[eng] - Options set. Action Required is None
```

NOTE

Entering the **drvcfg** command with an **-f** option (**drvcfg -f**) sets adapter options to default values. For example, enter **drvcfg -f 25 27**. Entering the command with the **-v** option (**drvcfg -v**) checks whether options configured for the adapter are valid. For example, enter **drvcfg -v 29 3F**.

NOTE

You could configure the other adapter port using the `drvcfg -s` command by keeping the driver handle the same and using the other controller handle (`drvcfg -s 25 28`).

6. Execute a **reset** EFI shell command to reinitialize the system.

When the system restarts, all available Fibre Channel devices display in map output as the EFI Shell initializes. SAN drives display with “Fibre” as part of the device name.

7. Find the LUN that you have targeted for boot over SAN in the system’s map output.

Note that you can also enter the following EFI shell command to list all storage targets and LUNs visible to the adapter port. SAN drives display with “Fibre” as part of the device name.

```
dh -d [controller handle]
```

8. Refer to procedures for your system’s **Boot Configuration** menu to verify that your host is configured to automatically boot from the target remote LUN.
9. Refer to instructions under [“Operating system and driver installation on boot LUNs”](#) on page 148 to install the host’s operating system and adapter driver to the LUN

Operating system and driver installation on boot LUNs

Use the procedures in this section to install the host operating system and adapter drivers on an unformatted disk that you that you configured as a bootable device when setting up the adapter BIOS or UEFI on the host system. Instructions are provided for the following:

- [“Installing Windows Server 2003 and the driver”](#)
- [“Installing Windows Server 2008 and the driver”](#)
- [“Installing Linux RHEL 4.x or 5.x and the driver”](#)
- [“Installing Linux \(SLES 10 and later\) and the driver”](#)
- [“Installing Solaris and the driver”](#)
- [“Installing VMware and the driver”](#)
- [“Installation on systems supporting UEFI”](#)

For information on operating system support for drivers, refer to [“Boot installation packages”](#) on page 49 and [“Operating system support”](#) on page 40.

Before installing the operating system and adapter drivers, be sure you have bound the PWWN of the appropriate adapter port to the designated boot LUN and have configured the BIOS or UEFI on your host system for booting over SAN. Refer to [“Configuring boot over SAN”](#) on page 131, [“Configuring BIOS using the Brocade configuration utility”](#) on page 136, and [“Configuring UEFI”](#) on page 146 for instructions.

NOTE

The following procedures load the operating system, adapter drivers, and utilities to the designated boot LUN to allow adapter operation and booting your host system from the LUN. However, the HCM Agent and full range of Brocade Command Line Utilities, such as `bfa_supportsave`, are not installed. To install the complete driver package with HCM Agent and full-range of utilities, refer to [“Installing the full driver package on boot LUNs”](#) on page 162 after completing the following steps.

Installing Windows Server 2003 and the driver

If the LUN you have targeted for booting the host system already has an operating system installed, be sure to use options for reformatting the LUN during Windows Server 2003 installation. Refer to your operating system documentation for details.

1. Driver update disk files are provided for x86 and x64 systems. Refer to “[Boot installation packages](#)” on page 49 for a list of driver update disk files and the operating systems that support these files. Also refer to “[Operating system support](#)” on page 40 for information on operating system support for adapter drivers.

NOTE

For booting over SAN, you will need the fc dud file, `brocade_adapter_fc_<operating system>_<platform>_dud_<version>.zip`. Note that only HBAs and Fabric Adapter HBA ports are supported for boot over SAN in Windows 2003. For network boot, you will need the `brocade_adapter_nw_<operating system>_<platform>_dud_<version>.zip`

NOTE

For Microsoft Windows operating systems, the driver update disk does not verify prerequisite checks as part of installation. Please review the operating system prerequisites and install the necessary hotfixes after the operating system installation is complete.

2. Download the appropriate Windows 2003 adapter driver update disk (dud) .zip file for your host platform from the Brocade adapters website at www.brocade.com/adapters using the following steps:
 - a. On the adapters website, navigate to the drivers **Downloads** page.
 - b. On the downloads page, select your host’s operating system from the **Download Individual Software Installers, Drivers, or Documents** list to access the appropriate downloads.
 - c. Download the dud from the “Driver Update Disks (DUDs)” area.
3. Unzip the file and copy to a formatted disk to create the adapter driver update disk.
4. Insert the Windows 2003 operating system installation media into the host system’s CD/DVD drive and boot from the CD or DVD.
5. Respond to prompts that display as Windows installs. When prompted to press F6 to install a third-party SCSI or RAID driver, press F6.

NOTE

If you miss the message to press F6, you will need to reboot from the operating system CD or DVD.

The following messages display:

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

```
S=Specify Additional Device ENTER=continue F3=Exit.
```

6. Select S to specify additional devices.

NOTE

You must load the Brocade adapter driver by selecting “S” and using the following steps so that the system can access the boot LUN for Windows 2003 Server installation.

7. When a message displays to insert the disk labeled manufacturer-supplied hardware support disk, insert the Brocade adapter driver update disk that you created in [step 3](#) and press Enter.
A list of devices displays.
8. Select Brocade's adapter from the list and press Enter.
The following message displays:
Setup will load support for the following mass storage device(s): Brocade Fibre Channel Adapter.
9. Press Enter.
10. Remove the driver update disk after the driver update files load.
11. Continue responding to on-screen instructions and refer to your system documentation as necessary to format and complete installation on the target boot LUN.
After Windows installs on the remote LUN, the system should automatically reboot from the LUN.
Messages should display on the host system as BIOS or UEFI loads successfully. System boot setup screens should also display a hard drive entry containing the Brocade adapter, boot LUN number, and target storage device.

Installing Windows Server 2008 and the driver

Use the following steps to install Windows Server 2008 and the adapter driver on an unformatted disk that you configured as a bootable device when setting up the adapter BIOS or UEFI on the host system.

If the LUN you have targeted for booting over SAN already has an operating system installed, be sure to use options for reformatting the LUN during Windows Server 2008 installation. Refer to your operating system documentation for details.

NOTE

For HBAs and Fabric Adapter ports configured in HBA mode, you will need the fc dud file, `brocade_adapter_fc_<operating system>_<platform>_dud_<version>.zip`. For CNAs and Fabric Adapter ports configured in CNA mode, you will need the fcoe dud file, `brocade_adapter_fcoe_w2k8_x86_dud_<version>.zip`.

NOTE

For Microsoft Windows operating systems, the driver update disk does not verify prerequisite checks as part of installation. Please review the operating system prerequisites and install the necessary hotfixes after the operating system installation is complete.

1. Driver update disk files are provided for x86 and x64 systems. Refer to [“Boot installation packages”](#) on page 49 for a list of driver update disk files and the operating systems that support these files. Also refer to [“Operating system support”](#) on page 40 for information on operating system support for adapter drivers.
2. Download the appropriate Windows 2008 adapter driver update disk (dud) .zip file for your host platform from the Brocade adapters website at www.brocade.com/adapters using the following steps:
 - a. On the adapters website, navigate to the drivers **Downloads** page.
 - b. On the downloads page, select your host's operating system from the **Download Individual Software Installers, Drivers, or Documents** list to access the appropriate downloads.

- c. Download the dud from the “Driver Update Disks (DUDs)” area.
3. Unzip the file and copy to a CD, USB drive, or formatted floppy disk to create the adapter driver update disk.
4. Insert the Windows 2008 operating system installation DVD into the system drive and boot from the DVD.
5. Respond to prompts that display on the Windows installer screens. Be sure to select a Standard (Full Installation) and accept the software license.
6. When the **Which type of installation do you want?** screen displays, select **Custom (advanced)**.
7. When the **Where do you want to install Windows?** screen displays, select the **Load Driver** option at the bottom of the screen.

The **Load Driver** dialog box displays, prompting you to insert the installation media containing the driver files.

ATTENTION

You must load the Brocade adapter driver at this stage so that the system can access the boot LUN for Windows 2008 Server installation.

8. Insert the media containing the Brocade adapter driver update files that you created in [step 3](#).
9. Select **Browse** on the **Load Driver** dialog box and select the adapter driver update disk.
10. Click **OK**.

NOTE

If “Hide drivers that are not compatible with hardware on this computer” is selected, only drivers for installed adapter models will display on the **Select the drive to be installed** screen. If not selected, drivers for all adapter models display.

11. Select the driver for the adapter that you are configuring for boot over SAN and click **Next**.
After the driver loads, remote LUNs display on the **Where do you want to install Windows?** screen that are visible to the adapter port.
12. Replace the driver update disk with the Windows 2008 DVD.
13. Select the LUN that you have identified as the boot device for the adapter port and click **Next**.

NOTE

Selecting **Drive options (advanced)** provides other options for editing the destination disk, such as formatting a partition (when the operating system already installed) and creating a new partition.

14. Continue responding to on-screen instructions and refer to your system documentation as necessary to format and complete installation on the target boot LUN.

After Windows installs on the remote LUN, the system should automatically reboot from the LUN.

Messages should display on the host system as the Brocade BIOS or UEFI loads successfully. System boot setup screens should also display a hard drive entry containing the Brocade adapter, boot LUN number, and target storage device.

Installing Linux RHEL 4.x or 5.x and the driver

Use the following steps to install RHEL and the adapter driver on an unformatted disk that you configured as a bootable device when setting up the adapter BIOS or UEFI on the host system.

If the LUN you have targeted for booting the host system already has an operating system installed, be sure to use options for reformatting the LUN during Linux installation. Refer to your operating system documentation for details.

NOTE

The following procedures load the operating system, adapter driver, and utilities to the designated boot LUN to allow adapter operation and booting your host system from the LUN. However, the HCM Agent and full range of Brocade Command Line Utilities, such as `bfa_supportsave`, are not installed. To install the complete driver package with HCM Agent and full-range of utilities refer to [“Installing the full driver package on boot LUNs”](#) on page 162 after completing the following steps.

1. Refer to [“Boot installation packages”](#) on page 49 for a list of driver update disk files and the operating systems that support these files. Also refer to [“Operating system support”](#) on page 40 for information on operating system support for adapter drivers.

NOTE

For RHEL 5 x86 and x86_64 systems, install the `fc DUD` files for CNAs and Fabric Adapter ports configured in CNA mode and for HBAs and Fabric Adapter ports configured in HBA mode. The `fc dud` file format is `brocade_fc_adapter_<operating system>_<platform>_dud_<version>.iso`.

2. Download the appropriate RHEL adapter driver update disk (`dud`) `.iso` file for your host platform from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display appropriate download files.
 - d. Download the `dud` from the “Driver Update Disks (DUDs)” area.
3. Create a driver update disk CD or USB drive from the ISO image.
4. Insert the Linux Red Hat product CD #1 into the host system’s CD drive and boot the system.
5. At the boot prompt enter one of the following commands and press **Enter**:
 - For booting over SAN, use the following command.

```
linux dd
```
 - For booting over SAN with multi path, use the following command.

```
linux dd mpath
```

NOTE

The `mpath` option installs the operating system and driver to a LUN connected to the server through multiple paths and provides a unique and single name for the device. If the `mpath` option were not used in a multi-path configuration, a separate device instance would display for each path during installation. By using the option, only one instance displays for the device, although multiple paths still exist.

6. When the **Driver Disk** message box displays the “Do you have a driver disk” prompt, select **Yes**, then press Enter.

ATTENTION

You must load the Brocade adapter driver at this stage so that the system can access the boot LUN for Linux installation.

7. From the **Driver Disk Source** window, select the driver source *hdx* (where x is the CD or USB drive letter), then press Enter.

The **Insert Driver Disk** window displays.

8. Insert the driver update disk (dud) that you created in [step 3](#) into the CD or DVD.

9. Select **OK**, then press Enter.

The driver loads automatically.

10. When the **Disk Driver** window displays prompting for more drivers to install, select **No** or **Yes** depending on the installed adapter and operating system, then press Enter.

For RHEL 5 and later on x86 and x86_x64 platforms install the fc dud for an HBA, Fabric Adapter port configured in HBA mode, CNA, or Fabric Adapter port configured in CNA mode. The fc file format is `brocade_fc__adapter_<operating system>_<platform>_dud_<version>.iso`.

11. Insert the Linux Red Hat product CD #1 in the CD drive (remove the adapter driver update CD first if necessary), then press Enter.

12. Continue responding to on-screen instructions and refer to your system documentation as necessary to format and complete installation on the target boot LUN.

Installing Linux (SLES 10 and later) and the driver

Use the following steps to install SLES 10 and later and the adapter driver on an unformatted Fibre Channel disk configured as a bootable device.

- For HBAs installed on SLES 11 on UEFI-supported systems, refer to [“UEFI mode install and boot with HBAs”](#) on page 160. For Fabric Adapter ports configured in HBA mode, refer to the following procedures.
- For CNAs and Fabric Adapter ports configured in CNA mode on SLES 11 on UEFI-supported systems, refer to [“UEFI mode install and boot with CNAs and Fabric Adapter ports configured in CNA mode”](#) on page 161.

If the LUN you have targeted for booting over SAN already has an operating system installed, be sure to use options for reformatting the LUN during Linux installation. Refer to your operating system documentation for details.

NOTE

If you are installing SLES 11 for systems with HBAs and Fabric Adapter ports configured in HBA mode only, the appropriate drivers are included with the SLES product CD, so you can ignore steps 1 through 3 in the following procedures. However, if the driver is not detected on the SLES product CD during installation, you should download the latest driver update ISO file, create a driver update disk CD or USB drive, and use this to install drivers as outlined in the following steps.

1. Refer to “[Boot installation packages](#)” on page 49 for a list of these files and the operating systems that support these files. Also refer to “[Operating system support](#)” on page 40 for information on operating system support for adapter drivers.
2. Download the Brocade adapter driver update .iso file appropriate for your SLES system from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapter **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display appropriate download files.
 - d. Download the file from the “Driver Update Disks (DUDs)” area.
3. Create a driver update disk CD or USB drive from the ISO image.
4. Insert the SLES product CD #1 into the host system drive and follow your system procedures to boot from the CD.

The main installation screen eventually appears.

5. Perform the following steps depending on your host platform:
 - For SLES 10 systems, press F5.
When the system prompts to select **Yes**, **No**, or **File**, select **Yes** and press **Enter**.
 - For SLES 11 systems, press F6.
When the system prompts to select **Yes**, **No**, or **File**, select **Yes** and press **Enter**.
6. When the “Please choose the driver update medium” prompt displays, install the CD or USB drive containing the driver update disk that you created in [step 3](#).

NOTE

You must load the Brocade adapter driver at this stage so that the system can access the boot LUN for Linux installation. If you are installing SLES 11 drivers for HBAs and Fabric Adapter ports configured in HBA mode only, drivers are located on the SLES product CD. You do not have to use the SLES driver update disk to install drivers unless the appropriate driver is not detected on the product CD.

7. Select the drive where the driver update disk is loaded then press Enter.
The driver update loads to the system.
If the driver update was successful, a “Driver Update OK” message displays.
8. Press Enter.
9. If the system prompts you to update another driver, select **BACK**, then press Enter.
10. When the “Make sure that CD number 1” message displays, insert the SLES product CD #1 into the drive and select **OK**.
11. Continue responding to on-screen instructions and refer to your system documentation as necessary to format and complete installation on the target boot LUN.

After SLES installs on the remote LUN, the system should automatically reboot from the LUN.

Installing RHEL 6.x or Oracle Enterprise Linux (OEL) 6.x and the driver

Use the following steps to install RHEL 6.x, RHEL 6.x U1, OEL 6.x, or OEL 6.x U1 and the adapter driver on an unformatted disk that you configured as a bootable device when setting up the adapter BIOS or UEFI on the host system.

If the LUN you have targeted for booting the host system already has an operating system installed, be sure to use options for reformatting the LUN during Linux installation. Refer to your operating system documentation for details.

The following instructions apply to Brocade adapter models 415, 425, 815, 825, 1010, 1020, 1007, 1741, and 1860. If using another adapter, you can install RHEL drivers as usual (refer to [“Installing Linux RHEL 4.x or 5.x and the driver”](#) on page 152). This installs the noarch version of the adapter drivers.

NOTE

The following procedures load the operating system, adapter driver, and utilities to the designated boot LUN to allow adapter operation and booting your host system from the LUN. However, the HCM Agent and full range of Brocade Command Line Utilities, such as `bfa_supportsave`, are not installed. To install the complete driver package with HCM Agent and full-range of utilities refer to [“Installing the full driver package on boot LUNs”](#) on page 162 after completing the following steps.

1. Refer to [“Boot installation packages”](#) on page 49 for a list of driver update disk files and the operating systems that support these files. Also refer to [“Operating system support”](#) on page 40 for information on operating system support for adapter drivers.

NOTE

Install the `fc dud` for an HBA, Fabric Adapter port configured in HBA mode, CNA, or Fabric Adapter port configured in CNA mode. The `fc` file format is `brocade_fc__adapter_<operating system>_<platform>_dud_<version>.iso`.

2. Download the appropriate RHEL 6.x adapter driver update disk (`dud`) `.iso` file for your host platform from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display the appropriate download files.
 - d. Download the `dud` from the “Driver Update Disks (DUDs)” area.
3. Create a driver update disk CD or USB drive from the ISO image.
4. Insert the operating system CD or USB drive into the host system’s CD drive, depending on the operating system you are installing.
5. Boot the system.
6. When the Welcome screen displays with a message to “Press [Tab] to edit options,” press the **Tab** key.

NOTE

For UEFI mode, press any key to edit options.

7. Press `a` to modify kernel arguments, then append “`linux dd`” to the following line:

```
vmlinuz initrd=initrd.img linux dd
```

8. When prompted to load the driver, insert the driver update disk (dud) that you created in [step 3](#) into the CD, DVD, or USB drive.
9. Follow system prompts to load the driver and continue with operating system installation. Refer to your system documentation as necessary to format and complete installation on the target boot LUN.
10. Reboot the system.

The system will default to the Unbreakable Kernel. The following message may display:

```
No root device found. Boot has failed, sleeping forever.
```

This error occurs because Brocade adapter drivers do not support this kernel for boot over SAN. You must switch to the Red Hat Compatible Kernel using [step 11](#) through [step 14](#).

11. Reboot the system again.
12. When the following messages display, press any key.

```
Press any key to enter the menu
Booting Oracle Linux Server-uek (2.6.32-100.28.5.el6.x86_64) in 1 seconds...
```
13. When the screen displays for selecting the Oracle Linux Server-uek or Oracle Linux Server-base kernels, select the *base* kernel.
14. When the operating system successfully boots, make the base kernel the default boot option using the following steps:
 - a. Log in as “root.”
 - b. Right-click the screen and select **Open Terminal** from the menu.
 - c. Edit the `/boot/grub/menu.lst` file and change “default=0” to “default=1”. Also comment out the “hiddenmenu” line (`#hiddenmenu`).
 - d. Change the timeout to 15 seconds instead of the default 5 (recommended).
 - e. Save the file and reboot.
15. The RHEL-compatible kernel should now boot by default.

Installing Solaris and the driver

Use the following steps to install Solaris and drivers on an unformatted Fibre Channel disk that you that you configured as a bootable device when setting up the adapter BIOS or UEFI on the host system.

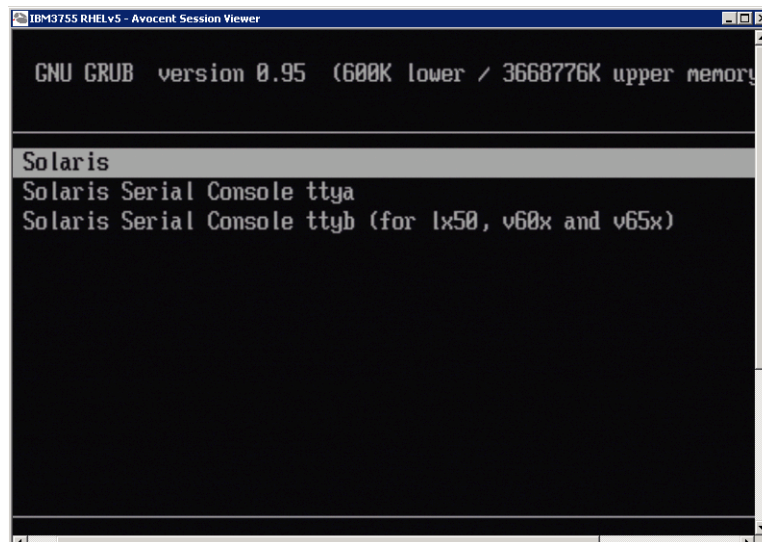
Installation notes

Read through these important notes before installing Solaris and adapter drivers on the LUN.

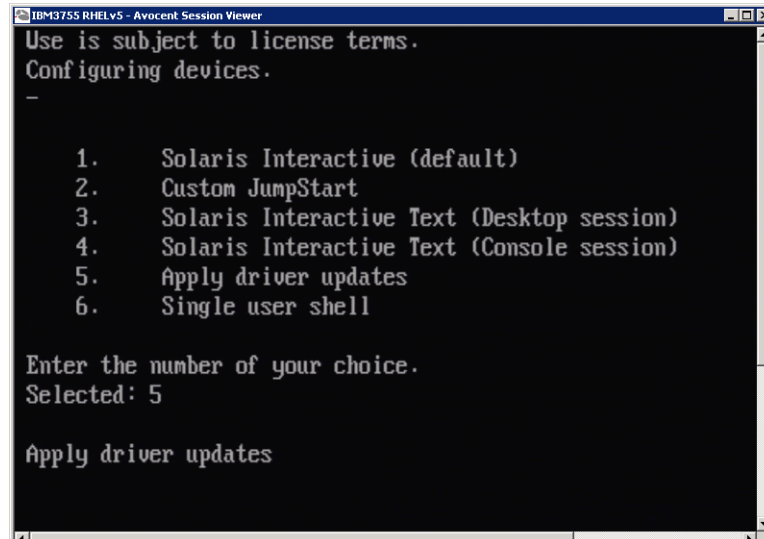
- If the LUN you have targeted for booting over SAN already has an operating system installed, be sure to use options for reformatting the LUN during Solaris installation. Refer to your operating system documentation for details.
- Before proceeding with these steps, detach or disable any existing local hard disks on your host system since the installation will pick the local disk by default for installation. You can reconnect or enable this drive after installing these procedures.
- Boot over SAN is not supported on Solaris SPARC systems.
- Brocade 804 and 1007 adapters are not supported on Solaris systems.

Installation procedure

1. Refer to “[Boot installation packages](#)” on page 49 for a list of these files and the operating systems that support these files. Also refer to “[Operating system support](#)” on page 40 for information on operating system support for adapter drivers.
2. Download the Brocade adapter driver update .iso file appropriate for your system from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display the appropriate download files.
 - d. Download the file from the “Driver Update Disks (DUDs)” area.
3. Create an “install time update” CD or USB drive from the ISO image.
4. Power up the host system.
5. Insert the Solaris 10 installation DVD into the system DVD drive.
6. Select **Solaris** installation at the GRUB boot menu.



If devices are configured, a menu should display such as the following:



```
IBM3755 RHELv5 - Avocent Session Viewer
Use is subject to license terms.
Configuring devices.
-
1. Solaris Interactive (default)
2. Custom JumpStart
3. Solaris Interactive Text (Desktop session)
4. Solaris Interactive Text (Console session)
5. Apply driver updates
6. Single user shell

Enter the number of your choice.
Selected: 5

Apply driver updates
```

7. Press “5” to select **Apply Driver Updates**.
8. Replace the Solaris installation DVD with the install time update CD or USB drive that you created in [step 3](#).

ATTENTION

You must load the Brocade storage driver at this stage so that the system can access the boot LUN for Solaris installation.

9. When the update completes, press “e” to eject the install time update CD or USB drive containing the driver update.
10. Insert the Solaris installation CD/DVD.
11. Continue responding to on-screen instructions and refer to your system documentation as necessary to format and complete installation on the target boot LUN.

Installing VMware and the driver

Use the following steps to install VMware and the adapter driver on an unformatted Fibre Channel disk that you that you configured as a bootable device when setting up the adapter BIOS or UEFI on the host system.

If the LUN you have targeted for booting over SAN already has an operating system installed, be sure to use options for reformatting the LUN during VMware installation. Refer to your operating system documentation for details.

NOTE

For boot over SAN on VMware 4.0 and later systems, if driver installation or updates are done for CNAs and Fabric Adapter ports configured in CNA mode using the ISO image, update the storage drivers using the *bfa* DUD. For HBAs and Fabric Adapter ports configured in HBA mode, just use the *bfa* ISO image.

NOTE

Note that you can use the VMware Image Builder PowerCLI to create a `brocade_esx50_<version>.zip` offline bundle and `brocade_esx50_<version>.iso` ESX 5.0 installation image that includes Brocade drivers and utilities. Refer to your Image Builder documentation for details on using Image Builder PowerCLI.

1. Refer to “[Boot installation packages](#)” on page 49 for a list of driver update files and the operating systems that support these files. Also refer to “[Operating system support](#)” on page 40 for information on operating system support for adapter drivers.
2. Download the Brocade adapter driver update .iso file appropriate for your system from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display appropriate download files.
 - d. Download the file from the “Driver Update Disks (DUDs)” area.
3. Create a Fibre Channel driver CD or USB drive from the ISO image. This will contain the appropriate VMware drivers for the system.
4. Insert the ESX OS disk into the host system.
5. When prompted for an upgrade or installation method, select the graphical mode. Installation messages display followed by a welcome screen.
6. Follow on-screen prompts to continue and accept license agreement.
7. If prompted for Installation Options, select “Complete Server install, formatting installation hard disks.”
8. Select your keyboard type when prompted.
9. When prompted to load “custom drivers,” insert the Fibre Channel Driver CD or USB drive into the host system.

ATTENTION

You must load the Brocade adapter driver at this stage so that the system can access the boot LUN for VMware installation.

After adding drivers to the list, you are prompted to reinsert the ESX 4.X OS disk into the host system.

10. Reinsert the ESX disk and follow prompts to load the drivers.
11. Continue responding to on-screen instructions to configure the system for installing ESX. For detailed instructions, refer to the *Server Installation and Upgrade Guide* for your operating system version.
12. When prompted for a location to install ESX, be sure to select the boot LUN that you have configured as a bootable device from the list of discovered storage targets.
13. Continue responding to system prompts complete configuration and installation on the boot LUN.

14. When you reboot the system, be sure to set up BIOS to boot from the LUN where you installed ESX.

Installation on systems supporting UEFI

The newer IBM 3xxx M2 and Dell 11G x86_64 systems can operate in either UEFI mode or Legacy BIOS mode. There are various differences in loading the operating system and drivers to these systems for HBAs, CNAs, or Fabric Adapters with ports configured in CNA or HBA modes. Following are procedures for three different installation scenarios that supplement procedures in [“Operating system and driver installation on boot LUNs”](#) on page 148.

UEFI mode install and boot with HBAs

NOTE

These procedures are for HBAs installed on SLES 11 and SLES 11 SP1 systems only. For Fabric Adapter ports configured in HBA mode, refer to [“Installing Linux \(SLES 10 and later\) and the driver”](#) on page 153

If the LUN you have targeted for booting over SAN already has an operating system installed, be sure to use options for reformatting the LUN operating system installation. Refer to your operating system documentation for details.

1. Set the appropriate mode, depending on your host system. Following are some examples:
 - Dell 11G systems - Set UEFI boot mode.
 - IBM 3xxx M2 systems - Move boot option “Legacy only” below UEFI boot entries in the boot options menu.
2. Insert the SLES 11 product CD in your host system and follow your system procedures to boot from the CD.
3. Proceed with the SLES 11 installation, making certain to set up the UEFI /boot/efi partition and to select the “elilo” boot loader.

During the installation, the boot loader installation process will display an error dialog box. Retrying the boot loader installation will not correct the problem, so just continue with installation. The problem will be corrected using the UEFI system boot options functions.

4. Allow the installation to continue through the reboot. When the system is rebooting, watch for an opportunity to set UEFI boot options using the UEFI boot manager menu.
5. From the boot manager menu, select **Add Option** to navigate to the appropriate drive from which you will boot over SAN, and select the efi directory and the elilo.efi program.

This corrects the boot loader installation failure that was reported during installation.

6. Use the UEFI start option to boot the OS entry for the SAN drive (elilo.efi).

The boot operation will load the SLES 11 kernel and initrd then start the Linux system

When the Linux kernel attempts to mount the root file system a second error may occur which is caused by the boot installation setup selecting the wrong disk partition for the root file system. After the kernel's initial failure to mount the root file system it will attempt to mount a fall-back root file system. This will be the proper root file system and the SLES system should

continue and complete SLES 11 installation. Once the installation is complete, the boot loader configuration can be fixed using the `yast2->system->boot loader->Section Management->Edit` tool. The identity of the proper root file system can be found in the `/var/log/boot.msg` file, associated with the fall-back message for the failed mount of the root file system.

If the LUN you have targeted for booting over SAN already has an operating system installed, be sure to use options for reformatting the LUN operating system installation. Refer to your operating system documentation for details.

UEFI mode install and boot with CNAs and Fabric Adapter ports configured in CNA mode

NOTE

These procedures are for SLES 11 and SLES 11 SP1 only for CNAs and Fabric Adapter ports configured in CNA mode.

If the LUN you have targeted for booting over SAN already has an operating system installed, be sure to use options for reformatting the LUN operating system installation. Refer to your operating system documentation for details.

1. Refer to “[Boot installation packages](#)” on page 49 for a list of these files and the operating systems that support these files. Also refer to “[Operating system support](#)” on page 40 for information on operating system support for adapter drivers.
2. Download the Brocade adapter driver update .iso file appropriate for your system from the Brocade adapters website using the following steps:
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** to display appropriate download files.
 - d. Download the file from the “Driver Update Disks (DUDs)” area.
3. Create a driver update disk CD or USB drive from the ISO image.
4. Set one of the following modes, depending on your system:
 - Dell 11G systems - Set UEFI boot mode.
 - IBM 3xxx M2 systems - Move boot option “Legacy only” below UEFI boot entries in the boot options menu.
5. Insert the SLES 11 product CD #1 into your host system’s drive and follow your system procedures to boot from the CD.
6. During installation, at the first opportunity choose to abort the installation.
The **Expert Mode** menu should display.
7. From the **Expert Mode** menu, select **Kernel Settings**, then the option to load a driver update disk.
8. Insert the CD or USB drive with driver update that you created in [step 3](#).

NOTE

You must load the Brocade adapter driver at this stage so that the system can access the boot LUN for Linux installation.

9. Select the appropriate disk drive with the driver update disk then press Enter.

The driver loads to the system.

If the driver update was successful, a “Driver Update OK” or similar message displays:

10. Press Enter.
11. If the system prompts you to update another driver, select **BACK**, then press Enter.
12. When prompted to insert the SLES 11 product CD #1, insert the CD into the drive and select **OK**.
13. Continue responding to on-screen instructions and refer to your system documentation as necessary to format and complete installation on the target boot LUN.

After SLES installs on the remote LUN, the system should automatically reboot from the LUN.

Installing the full driver package on boot LUNs

The preceding procedures for each operating system under “[Operating system and driver installation on boot LUNs](#)” on page 148, do not install the HCM Agent and the full range of Brocade Command Line Utilities. To install the full driver package with adapter agent and all BCU commands, including bfa_supportsave, perform these additional steps.

NOTE

For information available driver packages and operating system support for drivers, refer to “[Software installation and driver packages](#)” on page 43 and “[Operating system support](#)” on page 40.

1. Compare the version of the full driver package that you wish to install with the version of the driver already installed on the boot LUN. There are a variety of methods to determine the driver version installed on your operating system. Refer to “[Confirming driver package installation](#)” on page 103 for more information.

If the versions do not match, you will perform additional steps to initialize the new package on your system.

2. Install the full driver package using steps for your operating system under “[Using the Brocade Adapter Software Installer](#)” on page 68
 - If the driver that you install and the driver already installed on the LUN match, perform steps as normal to complete installation. You will be able to use the additional utilities and HCM Agent installed with the full package.

For Linux systems, install the latest version of brocade_driver_linux_<version>.tar.gz using instructions under “[Driver installation and removal on Linux systems](#)” on page 95. This will install all package utilities without updating the driver. You do not need to reboot the system.
 - If the driver that you install and the driver already installed on the LUN do not match, go on to [step 3](#).
3. If the version of the driver installed on the boot LUN and the driver you are installing do not match, perform these additional steps for your operating system:

Windows

Reboot the system to initialize the new driver.

Linux

Driver unloading will fail when the new driver package installs, To make the new driver become effective, perform the following steps.

- a. Change to the boot directory.

All platforms - `cd /boot`

- b. Make a backup of the current RAMDISK image.

```
#cp initrd-[kernel_version].img initrd-[kernel_version].img.bk
```

- c. Build the RAMDISK image.

RHEL

```
#mkinitrd -f initrd-[kernel_version].img [kernel_version]
```

SLES

```
#mk_initrd
```

- d. Reboot the system to load the new RAMDISK image.

Solaris

Reboot the system to initialize the new driver.

VMware

Reboot the system to initialize the new driver.

Fabric-based boot LUN discovery

This feature allows the Brocade adapter to automatically discover and boot from LUN information retrieved from the SAN fabric zone database and therefore not require the typical server boot interrupt and BIOS setup.

When Brocade's Fabric-based boot LUN discovery is enabled, the host's boot LUN information is stored in a SAN fabric zone. This zone contains zone members that include the PWWN of the adapter port and PWWN and LUN WWN of the storage target. The adapter boot code will query the zone member list for the zone name that matches the adapter PWWN to determine the boot target and LUN.

NOTE

Fabric Based Boot LUN Discovery (auto discovery from fabric) is only applicable when configured in legacy BIOS mode for either UEFI-capable or non-UEFI capable system.

Fabric Based Boot LUN Discovery is a unique Brocade adapter feature and is the default setting for the Brocade BIOS *Boot LUN* option. The feature does not apply to UEFI, as the UEFI stack implemented by the server vendor does not support boot LUN discovery from the fabric.

This automated feature requires that the connected SAN fabric switch support the Get Zone Member List (GZME) command. Fabric-Based Boot LUN Discovery has been tested with Brocade switches (Fabric OS 6.2 and above) and Cisco SAN switches (SAN-OS 3.2.x and 4.1.x).

Example configuration procedures are provided for Brocade fabrics following and Cisco fabrics on [page 165](#).

NOTE

Fabric-based boot LUN discovery is not supported for booting from direct-attached targets.

Configuring fabric-based boot LUN discovery (Brocade fabrics)

For Brocade fabrics, the following methods are available to store the boot LUN information in the fabric zone database:

- Using the Fabric OS **bootluncfg** command to transparently configure the boot LUN.
- Using the BCU **boot --blunZone** command to provide the zone name and zone members to use as operands in the Fabric OS **zoneCreate** command.

Using Fabric OS bootluncfg command

Fabric-based boot LUN discovery allows the host's boot LUN information to be stored in the fabric zone database by using a zone name that contains the PWWN of an HBA port. The zone members consist of storage target PWWN and LUN ID.

The **bootluncfg** command provides a simplified and transparent procedure for configuring the boot LUN. Once configured, the HBA boot code queries the zone member list for the zone name matching the HBA PWWN to determine the boot target and LUN. For details on this command and additional parameters, refer to the *Fabric OS Command Reference Guide*.

Using BCU boot --blunZone command

Use the Fabric OS **zoneCreate** command to create a zone on the switch where the adapter is connected.

```
zonecreate "zonename", "member[; member...]"
```

- The “zonename” operand will be “BFA_[adapter port WWN]_BLUN.” For example, if the adapter PWWN is 01:00:05:1E:01:02:03:04, the zone name will be the following.
BFA_0100051E01020304_BLUN
- The zone “member” operands must be specially coded values for the target PWWN and LUN identification (for example, 06:00:00:02:DD:EE:FF:00).

To obtain the **zoneCreate** operand values, you will run the BCU **boot --blunZone** command from your host system's command line.

Use the following steps to configure fabric-based boot LUN discovery.

1. Set the adapter's BIOS configuration to fabric discovered using one of the following interfaces:

- Brocade BIOS Configuration Utility
Adapter Settings > Boot LUN > Fabric Discovered
- HCM
Basic Port Configuration > Boot-over-SAN > Fabric Discovered
- BCU

```
bios --enable <port_id> -o auto
```

2. Enter the following BCU command to provide the zone name and zone members to use as operands in the Fabric OS **zoneCreate** command.


```
bcu boot --blunZone -c <cfg> -p <port_wwn> -r <rport_wwn> -l <lun_id | lun#>
```

where:

c cfg	Specifies boot LUN (use -c BLUN).
p port_WWN	The hexadecimal WWN of the adapter port connecting to the boot LUN. For example, 10:00:00:05:1e:41:9a:cb.
r rport_WWN	The hexadecimal WWN of the remote storage target's port. For example, 50:00:00:05:1e:41:9a:ca.
l lun_id lun#	The hexadecimal LUN identification. You can provide this as a hexadecimal one-Byte value or an eight-Byte value (four-level LUN addressing). For example, an eight-Byte value could be 09AABBCCDDEEFF00.

NOTE

Enter **boot --blunZone** without operands to display the command format.

For example, enter the following:

```
bcu boot --blunZone -c BLUN -p 10:00:00:05:1e:41:9a:cb -r
50:00:00:05:1e:41:9a:ca -l 09AABBCCDDEEFF00
```

The command output will contain the proper encoding and be in the exact format for the FOS OS **zoneCreate** command.

3. Configure the zone on the switch using the Fabric OS **zoneCreate** command. Use the displayed output from the BCU **boot --blunZone** command as the zonename and member operands:

```
zonecreate "zonename", "member[; member...]"
```

For example, if the output from **boot --blunZone** is the following, you simply enter this for the **zoneCreate** command operands on the switch.

```
"BFA_100000051E419ACB_BLUN", "00:00:00:00:50:00:00:05;
00:00:00:01:1e:41:9a:ca; 00:00:00:02:DD:EE:FF:00; 00:00:00:03:09:AA:BB:CC"
```

4. Enter the FOS OS **cfgSave** command on the switch to save the zone configuration.

NOTE

The zone created is only an entity to store boot LUN data. There is no zone enforcement by the fabric. You must create a separate zone containing the adapter port and storage target port to ensure that the adapter port is able to see the target.

Configuring fabric-based boot LUN discovery (Cisco fabrics)

For CISCO fabrics, zones are configured within VSANs. Before you begin, determine the VSAN configured in a current fabric for which you want to configure a zone to include boot LUN information. Also, you must enable enterprise zoning. Note that zone information must always be identical for all switches in the fabric.

To store the boot LUN information in the fabric zone database, you must use the **zone name** and **member** commands while in switch configuration mode.

- The “zone name” command will be “BFA_[adapter port WWN]_BLUN.” For example, if the adapter PWWN is 01:00:05:1E:01:02:03:04, the zone name will be the following.

```
BFA_0100051E01020304_BLUN
```

4 Fabric-based boot LUN discovery

- The “member” command must be specially coded values for the target PWWN and LUN identification (for example, 06:00:00:02:DD:EE:FF:00).

To obtain the **zone name** and **member** values, you will run the BCU **boot --blunZone** command from your host system’s command line.

Use the following steps to configure fabric-based boot LUN discovery.

1. Set the adapter’s BIOS configuration to automatic discovery of the boot LUN from the fabric using one of the following interfaces:

- Brocade BIOS Configuration Utility
Adapter Settings > Boot LUN > Fabric Discovered
- HCM
Basic Port Configuration > Boot-over-SAN > Fabric Discovered
- BCU

```
bios --enable <port_id> -o auto
```

The command output will contain the proper encoding and be in the exact format for the **zone name** and **member** commands.

2. Enter the following BCU command to provide the zone name and member for the switch commands.

```
bcu boot --blunZone -c <cfg> -p <port_wwn> -r <rport_wwn> -l <lun_id | lun#>
```

where:

c cfg	Specifies boot LUN (use -c BLUN).
p port_wwn	The hexadecimal WWN of the adapter port connecting to the boot LUN. For example, 10:00:00:05:1e:41:9a:cb.
r rport_wwn	The hexadecimal WWN of the remote storage target’s port. For example, 50:00:00:05:1e:41:9a:ca.
l lun_id lun#	The hexadecimal LUN identification. You can provide this as a hexadecimal one-Byte value or an eight-Byte value (four-level LUN addressing). For example, an eight-Byte value could be 09AABBCCDDEEFF00.

NOTE

Enter **boot --blunZone** without operands to display the command format.

For example, enter the following:

```
bcu boot --blunZone -c BLUN -p 10:00:00:05:1e:41:9a:cb -r  
50:00:00:05:1e:41:9a:ca -l 09AABBCCDDEEFF00
```

The command output will contain the proper encoding for the **zone name** and **member** commands. As an example, refer to the following output.

```
"BFA_100000051E419ACB_BLUN", "00:00:00:00:50:00:00:05;  
00:00:00:01:1e:41:9a:ca; 00:00:00:02:DD:EE:FF:00; 00:00:00:03:09:AA:BB:CC"
```

3. Enter the following command to launch configuration mode.

```
switch# config t
```

4. Enter the following command to name the zone for a specific VSAN, for example VSAN 8.

```
switch (config)# zone name [name]
```

where

name Use the output from the **boot -blunZone** command. For example, from the output example shown in [step 3](#), you would use

```
switch (config)# zone name BFA_100000051E419ACB_BLUN vsan 8
```

5. Enter the following command to add the zone members.

```
switch (config)# member pwwn [value]
```

where

pwwn Port World Wide Name

value Use the output from the **boot -blunZone** command. For example, from the output example shown in [step 3](#), you would use the following commands.

```
switch (config-zone)# member pwwn 00:00:00:00:50:00:00:05
switch (config-zone)# member pwwn 00:00:00:01:1e:41:9a:ca
switch (config-zone)# member pwwn 00:00:00:02:DD:EE:FF:00
switch (config-zone)# member pwwn 00:00:00:03:09:AA:BB:CC
```

6. Save the zone configuration.

NOTE

The zone created is only an entity to store boot LUN data. There is no zone enforcement by the fabric. You must create a separate zone containing the adapter port and storage target port to ensure that the adapter port is able to see the target.

NOTE

For additional details on configuring zones and zone sets, refer the configuration guide for your Cisco switch.

Boot systems over SAN without operating system or local drive

This section provides generic procedures for using ISO 9660 (.iso) optical disk images to boot host systems that do not have an installed operating system or local drive. Once you boot the host system, you can use BCU commands to update the boot code on installed adapters if necessary, configure BIOS to boot over SAN, and install the operating system and driver to a remote boot LUN.

Use one of the following ISO images for your system:

- LiveCD (live_cd.iso) that you can download from the Brocade adapters website using the following steps.
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** to display appropriate download files.
 - d. Download the file from the “Boot Code” area.

4 Boot systems over SAN without operating system or local drive

- WinPE ISO image that you can create for x86 and x64 platform. You can use a WinPE image to boot UEFI-based systems. To create these images, refer to “[Creating a WinPE image](#)” on page 169.

For more detailed procedures to create a bootable CD or USB drive from the ISO image, refer to documentation for your CD or USB drive burning software. As an example of open source USB burning software for bootable Live USB drives, refer to <http://unetbootin.sourceforge.net>. For details on booting your operating system from a CD, DVD, or USB drive, refer to your host system documentation and online help.

Using a LiveCD image

NOTE

The following procedures assume that the Brocade adapter has been installed in the host system.

1. For BIOS-based systems, obtain the LiveCD image from the Brocade adapters website using the following steps.
 - a. Go to the adapters website at www.brocade.com/adapters.
 - b. Navigate to the adapters **Downloads** page.
 - c. Select your operating system from the **Downloads** list to display appropriate download files.
 - d. Download the file from the “Boot Code” area.

NOTE

For UEFI-based systems, create a WinPE image for your system using steps under “[Creating a WinPE image](#)” on page 169.

2. Create a bootable CD or USB drive using the ISO image. Refer to the documentation for your CD or USB drive burning software for details. As an example of open source USB burning software for bootable Live USB drives, refer to <http://unetbootin.sourceforge.net>.
3. Install the CD into the CD/DVD ROM drive or USB drive into a USB port and boot the system.
4. When self-testing completes, access you system’s boot manager menu and select the option to boot from the appropriate CD or USB drive.
5. Follow on-screen prompts and instructions to boot from the CD or USB drive.
6. Access your system’s command shell so that you can use BCU commands. (Refer to “[Using BCU commands](#)” on page 53 for more information.)
7. To update adapter boot code, refer to steps under “[Updating boot code with BCU commands](#)” on page 120.
8. To configure boot from SAN on an installed adapter, refer to “[Configuring boot over SAN](#)” on page 131 and “[Configuring BIOS using HCM or BCU commands](#)” on page 142.
9. To install the operating system and driver to a remote boot LUN, refer to “[Configuring boot over SAN](#)” on page 131 and “[Operating system and driver installation on boot LUNs](#)” on page 148.

Creating a WinPE image

Microsoft Windows Preinstallation Environment (Windows PE) is a bootable tool that provides minimal operating system features for installation, troubleshooting, and recovery. Please refer to the *Microsoft Preinstallation Environment User's Guide* for more information about Windows PE.

You can customize WinPE to boot a diskless host system (system without a hard disk or operating system) that contains Brocade Fibre Channel adapters and accomplish the following tasks.

- Update the firmware and BIOS/EFI images in the adapter. The adapter tools and utilities bundled in the driver aid in updating the adapter flash.
- Install pre-configured Windows system images from a network share onto new computers that access the storage through Brocade adapters.

Use the following procedures to create a WinPE image that includes the Brocade driver package and utilities for your system.

1. Download Windows Automated Installation Kit (WAIK) for Windows 7 from the Microsoft website. This kit is in .ISO format.
2. Create a bootable CD or USB drive from this image using appropriate burning software and install WAIK on your local system where you will create the WinPE image.
3. Determine the appropriate adapter driver package for your operating system and host platform using information in “[Software installation and driver packages](#)” on page 43.

The WinPE image creation is based on the Vista kernel. Therefore, use the driver package for Windows Server 2008 or later. You cannot use the Windows Server 2003 driver packages to create the WinPE image.

4. Download the latest Windows Server 2008 driver package for your host platform from the Brocade adapters website using the following steps.
 - a. Go to the adapters website at www.brocade.com/adapters.
 3. Navigate to the adapters **Downloads** page.
 4. Select your operating system from the **Downloads** list to display appropriate download files.
 - b. Download the file from the “Driver Packages” area.

This package contains the script `build_winpe.bat`, which you will use to create the customized WinPE image.

5. Double-click the driver package and extract to a folder (such as `C:\temp`) on your local system. The `build_winpe.bat` script will be located under the `\util` sub-directory.
6. Go to `C:\temp\util` and enter the following command to create the WinPE iso image.

```
build_winpe.bat
```
7. Burn the ISO image into a CD or USB drive using appropriate software.

Updating Windows driver on adapter used for boot over SAN

When updating the driver on Windows 2008 systems where the adapter is used for booting over SAN, install the new adapter driver without removing the existing driver. This is the recommended procedure to update drivers. If you remove the adapter driver (which requires a system reboot because the adapter was modified) then reinstall the driver, installation will fail because the operating system cannot update the driver while a system reboot is pending. However, if you reboot the system after removing the driver, the operating system will not come up because the driver accessing the operating system was removed.

Specifications

In this chapter

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- [Converged Network Adapters 179](#)
- [Host Bus Adapters 187](#)
- [Fibre Channel standards compliance 192](#)
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Fabric Adapters

The Brocade stand-up Fabric Adapters are low-profile MD2 form factor PCI Express (PCIe) cards, measuring 6.6 in. by 2.731 in. (16.765 cm by 6.93 cm). One and two-port models are available. Ports support 10 GbE, 8 Gbps FC, or 16 FC small form factor pluggable (SFP+) optics. With the appropriate optic installed, ports can be configured for HBA, CNA, or NIC operation using the AnyIO feature.

Fabric Adapters are shipped with a full-height, standard bracket installed, and a low-profile bracket included for mounting in your host system. [Table 18](#) lists the two bracket types and dimensions.

TABLE 12 Fabric Adapter mounting brackets

Bracket Type	Dimensions
Low Profile	7.3 in. by 3.15 in. (1.84 cm by 8.01 cm)
Standard	7.3 in. by 3.15 in. (1.84 cm by 12.08 cm)

PCI Express interface

Install Brocade stand-up adapters in PCI Express (PCIe) computer systems with an Industry Standard Architecture/Extended Industry Standard Architecture (ISA/EISA) bracket type.

Following are some of the features of the PCIe interface:

- PCI Gen 2 system interface.
- On-board flash memory provides BIOS support over the PCIe bus.
- The adapter is designed to operate on an x8 lane DMA bus master at 250 GMhz. Operation can negotiate from x8 to x4, x2, and x1 lanes.
- Effective data rate of 32 Gbps for Gen 2 and 16 Gbps for Gen 1.
- Eight physical functions supported per port.

- Single Root I/O Virtualization (SRIOV), which provides a total of 256 functions. This includes a maximum of 16 Physical Functions (PFs) and 255 Virtual Functions (VFs) for a dual-port adapter.
- Support for 2, 0000 MSI-X interrupt vectors.
- Support for INT-X.

PCI system values

All Brocade Fabric Adapters share a common PCI Vendor ID (VID) value to allow drivers and BIOS to recognize them as supported Fibre Channel and network devices. Adapters are also assigned PCI subsystem vendor IDs (SVIDs) and subsystem IDs (SSIDs) to allow drivers and BIOS to distinguish between individual host adapter variants. You can locate PCI device, vendor, and subsystem IDs for the installed Fabric Adapters through your host’s operating system tools. For example, if using Windows, use the following steps.

1. Access the Device Manager
2. Open the **Properties** dialog box for the adapter by right-clicking the adapter and selecting **Properties** from the shortcut menu.
3. Select the **Details** and **Driver** tabs to locate specific values.

Hardware specifications

The adapter supports features outlined in [Table 19](#) on page 180.

TABLE 13 Fabric Adapter hardware specifications

Feature	Description
Port speeds	<ul style="list-style-type: none"> • 10.312 Gbps for installed 10GbE SFPs • 16, 8, or 4 Gbps and auto negotiated speeds per port for installed 16 Gbps Fibre Channel SFPs • 8, 4, 2 Gbps, and auto negotiated speeds per port for installed 8 Gbps Fibre Channel SFPs
SFP transceivers (stand-up adapters)	Ethernet <ul style="list-style-type: none"> • Multimode fiber optic small form factor pluggable plus (SFP+) • Copper SFP+ Fibre Channel <ul style="list-style-type: none"> • Multimode fibre optic SFP
Connectivity	<ul style="list-style-type: none"> • Stand-up adapters - LC cable connectors •
ASIC	<ul style="list-style-type: none"> • Provides the Fibre Channel, FCoE, DCB functionality for the adapter. • Two on-board processors, each operating at 400 MHz, which coordinate and process data in both directions. • Hardware acceleration for network and FCoE functions. • AnyIO technology for setting port operating modes to HBA (Fibre Channel), CNA, or NIC (Ethernet).

TABLE 13 Fabric Adapter hardware specifications (continued)

Feature	Description
External serial FLASH memory	<ul style="list-style-type: none"> • Stores firmware and adapter BIOS code • 4 MB capacity
Fibre Channel performance	500,000 IOPs (maximum) 1,000,000 IOPS per dual-port adapter Throughput per port (full-duplex mode): <ul style="list-style-type: none"> • 1600 MB at 16 Gbps • 1600 MB at 8 Gbps • 800 MB at 4 Gbps • 400 MB at 2 Gbps
Ethernet performance	10.312 Gbps throughput per port Line rate performance for 700-byte packets. Low latency: receive 1.5us, transmit 2us.
Topology	Ethernet - 10 Gbps DCB Fibre Channel - Point-to-Point (N_Port)
Data protection	Cyclic redundancy check (CRC) on PCIe and line-side links ECC within the ASIC memory blocks (2-bit detection and 1-bit correction) Error correction code (ECC) and parity through the ASIC

TABLE 13 Fabric Adapter hardware specifications (continued)

Feature	Description
Supported Ethernet protocols and features	<ul style="list-style-type: none"> • 803.3ae (10 Gbps Ethernet) • 802.1q (VLAN) • 802.1q (tagging) • 802.1P (tagging) • 802.1Qaz (enhanced transmission selection) • 802.1Qbb (priority flow control) • 802.1AB (Link Layer Discovery Protocol) • 802.3ad (link aggregation) • 802.1p (priority encoding) • 802.3x (Ethernet flow control) • 802.3ap - KX/KX4 (auto negotiation) • 802.3ak - CX4 • PXE (Pre-Boot Execution Environment) • UNDI (Universal Network Device Interface) • NDIS (Network Data Interface Specification) 6.2 • Dell iSCSI DCB • EEE 1149.1 (JTAG) for manufacturing debug and diagnostics. • IP/TCP/UDP Checksum Offload • IPv4 Specification (RFC 791) • IPv6 Specification (RFC 2460) • TCP/UDP Specification (RFC 793/768) • ARP Specification (RFC 826) • Data Center Bridging (DCB) Capability • DCB Exchange Protocol (DCBXP) 1.0 and 1.1 • RSS with support for IPV4TCP, IPV4, IPV6TCP, IPV6 hash types • Syslog • SRIOV • Jumbo frames • Interrupt coalescing • Interrupt moderation • Multiple transmit priority queues • Network Priority • Large and small receive buffers • TCP Large Segment Offload • Unicast MAC address • MAC filtering • Multicast MAC addresses • Multiple transmit queues for Windows and Linux • SNMP (Windows and Linux) • Team VM queues • VLAN Discovery using proprietary logic • VLAN discovery for untagged/priority-tagged FIP frames • VLAN filtering • VMware NetIOC • VMware NetQueues v3 (VMware 4.1 and later) • VMware multiple priority levels

TABLE 13 Fabric Adapter hardware specifications (continued)

Feature	Description
Supported FCoE protocols and features	<ul style="list-style-type: none"> • VMware VM direct path I/O support • LKA (Link Keep Alive) protocol • Look ahead split • preFIP, FIP 1.03, and FIP 2.0 (FC-BB5 rev. 2 compliant) <ul style="list-style-type: none"> • FIP discovery protocol for dynamic FCF discovery and FCoE link management. • FPMA and SPMA type FIP fabric login. • FCoE protocols <ul style="list-style-type: none"> • FC-SP • FC-LS • FC-GS • FC-FS2 • FC-FDMI • FC-CT • FCP • FCP-2 • FCP-3 • FC-BB-5 • FCoE checksum offload • SCSI SBC-3 • NPIV • IP-over-FC (IPoFC) • Target rate limiting • Boot Over SAN (including direct-attached) • Fabric-Based Boot LUN Discovery • Persistent binding • I/O interrupt coalescing and moderation • Class 3, Class 2 control frames
Fibre Channel Protocols and features	<ul style="list-style-type: none"> • SCSI over FC (FCP) • FCP2 • FCP3 • FC-SP Authentication • NPIV • Quality of Service (QoS) • Target Rate Limiting • Boot Over SAN • Fabric-Based Boot LUN Discovery • I/O Interrupt Coalescing • T10 Data CRC • Multiple Priority (VC_RDY) • Frame-Level Load Balancing • Persistent Binding • Fabric-Based Configuration • vHBA
Other adapter features	<ul style="list-style-type: none"> • ASIC Flip-flops Parity Protected • T10 Data CRC • ECC Memory Parity Protected

Cabling

This section describes cabling specifications for Fabric Adapters.

[Table 20](#) lists the supported cabling for Ethernet transceivers for stand-up adapters.

TABLE 14 GbE transceiver cable specifications

Transceiver	Cable	Minimum Length	Maximum Length
Ethernet 10 Gbps SR (short range) SFP+ 1490 nm	OM1 - 6.25/125 multimode	NA	33m (104.98 ft.)
	OM2 - 50/125 multimode		82m (269 ft.)
	OM3 - 50/125 multimode		300m (984.25 ft.)
	OM4 - 50/125 multimode		550 m (1804 ft.)
Ethernet 10 Gbps LR (long reach) SFP+, 10 km, 1310 nm	Single mode media (9 microns)	NA	10 km (6.2 mi.)
1m direct-attached SFP+ copper cable	Copper twinaxial cable	1m (3.2 ft.)	1m (3.2 ft.)
3m direct-attached SFP+ copper cable	Copper twinaxial cable	3m (9.8 ft.)	3m (9.8 ft.)
5m direct-attached SFP+ copper cable	Copper twinaxial cable	5m (16.4 ft.)	5m (16.4 ft.)

[Table 15](#) summarizes maximum distances supported on fiber optic cable types for Fibre Channel transceivers. This table assumes a 1.5 dB connection loss and an 850 nm laser source.

TABLE 15 Fibre Channel transceiver cable specifications

Transceiver type	Speed	OM1 (M6) 62.5/125 micron	OM2 (M5) 50/125 micron	OM3 (M5E) 50/125 micron	OM4 (M5F) 50/125 micron	Single Mode Media (9 microns)
SWL	2 Gbps	150 m (492 ft.)	300 m (984 ft.)	500 m (1640 ft.)	N/A	N/A
SWL	4 Gbps	70 m (229 ft.)	150 m (492 ft.)	380 m (1,264 ft.)	400 m (1,312 ft.)	N/A
SWL	8 Gbps	21 m (68 ft.)	50 m (164 ft.)	150 m (492 ft.)	190 m (623 ft.)	N/A
SWL	16 Gbps	15 m (49 ft.)	35 m (115 ft.)	100 m (328 ft.)	125 m (410 ft.)	NA
LWL	2 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)
LWL	4 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)
LWL	8 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)
LWL	16 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)

NOTE

Cables are not shipped with the stand-up Fabric Adapter.

NOTE

For stand-up adapters, use only Brocade-branded SFP laser transceivers supplied with the adapters

Adapter LED operation

Figure 19 illustrates LED indicator locations on a Brocade dual-port 1860 (A) and a Brocade single-port (B) stand-up Fabric Adapters. LED indicators for each port are visible through the mounting brackets.

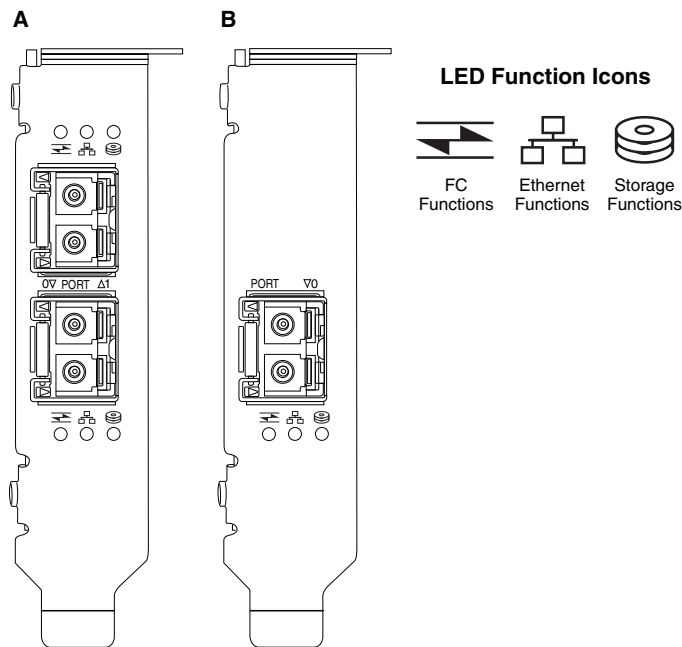


FIGURE 18 LED locations for Brocade dual-port (A) and single-port (B) 1860 Fabric Adapters

Table 21 describes operation for the following LEDs visible on the CNA:

TABLE 16 LED operation







			State
			
Slow flashing green ¹	Slow flashing green	Slow flashing green	Beaconing
Slow flashing green	Slow flashing green	Off	Invalid optic
Slow flashing green	Off	Off	Power on Port in FC mode No Link
On	Off	Off	Power on FC link established No activity

TABLE 16 LED operation

			State
On	Off	Fast flashing green ²	Power on Link established Receive and Transmit FC activity
Off	Slow flashing green	Off	Power on Port in Ethernet mode No link
Off	On	Off	Power on Ethernet link established No activity
Off	On	Fast flashing green	Power on Link established Receive and Transmit FCoE activity
Off	Fast flashing green	Off	Power on Link established Receive and Transmit Ethernet activity only
Off	Fast flashing green	Fast flashing green	Power on Link established Receive and Transmit Ethernet and FCoE activity

- 1 second on / 1 second off
- 50 msec on / 50 msec off

Environmental and power requirements

This section provides environmental and power specifications for the stand-up Fabric Adapters.

These are low-profile MD2 form factor PCI Express (PCIe) cards, measuring 6.6 in. by 2.731 in. (16.765 cm by 6.93 cm), that install in PCIe connectors in standard host systems.

[Table 22](#) lists environmental and power specifications for the stand-up type Fabric Adapters.

TABLE 17 Environmental and power requirements

Property	Requirement
Airflow	45 LFM
Altitude	Operating - 3,048 meters (10,000 ft.) at 40 °C (104 °F) Nonoperating - 12,192 meters (40,000 ft.) at 25 °C (77 °F)
Operating Temperature	0 °C to 55 °C (32 °F to 131 °F) dry bulb
Operating Humidity	5% to 93% (relative-noncondensing)
Nonoperating Temperature	Minimum: -42 °C (-40 °F) Maximum: 73 °C (163 °F)
Nonoperating Humidity	5% to 95% (relative-noncondensing)

TABLE 17 Environmental and power requirements (continued)

Property	Requirement
Power Consumption adapter and optics	9 W typical with SFP running 16 Gbps traffic
Operating Voltage	12V

Converged Network Adapters

Two types of CNAs are available:

- Stand-up adapter
- Mezzanine adapter

The Brocade stand-up CNAs are low-profile MD2 form factor PCI Express (PCIe) cards, measuring 6.60 in. by 2.71 in. (16.77 cm by 6.89 cm). CNAs are shipped with a low-profile bracket installed and a standard bracket included for mounting in your host system. [Table 18](#) lists the two bracket types and dimensions.

TABLE 18 CNA mounting brackets

Bracket Type	Dimensions
Low Profile	73 in. by 3.15 in. (1.84 cm by 8.01 cm)
Standard	73 in. by 3.15 in. (1.84 cm by 12.08 cm)

Mezzanine CNAs are smaller than stand-up modules. For example, the Brocade 1007 adapter is an IBM compact form factor horizontal (CFFh) adapter measuring approximately 4.9 in. (12.44 cm) by 0.5 in. (1.27 cm) by 6.3 in. (16 cm). Mezzanine adapters mount on blade servers that install in supported blade system enclosures. Refer to the [“Server blades and blade system enclosures \(mezzanine adapters\)”](#) on page 11 for references to CNA compatibility information. Note that mezzanine CNAs do not have external port connectors with optics such as stand-up CNAs, but internal ports that connect to switch and I/O modules installed in the blade system enclosure through high-speed links in the internal enclosure backplane.

PCI Express interface

Install Brocade stand-up CNAs in PCI Express (PCIe) computer systems with an Industry Standard Architecture/Extended Industry Standard Architecture (ISA/EISA) bracket type. Install the Brocade mezzanine CNAs in supported server blades that install in supported blade system enclosures. On-board flash memory provides BIOS support over the PCIe bus.

The CNA is designed to operate on an x8 lane DMA bus master at 250 GMHz. Operation can negotiate from x8 to x4, x2, and x1 lanes. Following are transfer and data rate specifications for operation in PCIe Gen 2 and Gen 1 connectors:

- PCIe Gen 2 connector. Transfer rate of 5 Gigatransfers per second (GT/s) per lane. Data rate of 500 MBps per lane.
- PCIe Gen 1 connector. Transfer rate of 2.5 GT/s per lane. Data rate of 250 MBps per lane.

PCI system values

All Brocade FCoE CNAs share a common PCI Vendor ID (VID) value to allow drivers and BIOS to recognize them as supported Fibre Channel and network devices. CNAs are also assigned PCI subsystem vendor IDs (SVIDs) and subsystem IDs (SSIDs) to allow drivers and BIOS to distinguish between individual host adapter variants. You can locate PCI device, vendor, and subsystem IDs for the installed FCoE CNAs through your host's operating system tools. For example, if using Windows, use the following steps.

1. Access the Device Manager

The CNA appears as a Fibre Channel adapter and as an Ethernet controller or adapter.

2. Open the **Properties** dialog box for the CNA by right-clicking the CNA and selecting **Properties** from the shortcut menu.
3. Select the **Details** and **Driver** tabs to locate specific values.

Hardware specifications

The CNA supports features outlined in [Table 19](#).

TABLE 19 CNA hardware specifications

Feature	Description
Port speeds	10.312 Gbps
SFP transceivers (stand-up adapters)	<ul style="list-style-type: none"> • Multimode fiber optic small form factor pluggable plus (SFP+) • Copper SFP+
Connectivity	<ul style="list-style-type: none"> • Stand-up adapters - LC cable connectors • Mezzanine adapters - Interfaces to enclosure midplane for connection to switch, I/O, and other modules are built on the card surface.
ASIC	<ul style="list-style-type: none"> • Provides the FCoE functionality for the CNA. • Two on-board processors, each operating at 400 MHz, which coordinate and process data in both directions.
External serial FLASH memory	<ul style="list-style-type: none"> • Stores firmware and CNA BIOS code • 4 MB capacity
Data transfer rate	10.312 Gbps full-duplex
Performance per port	500,000 IOPs (maximum) 1 M IOPS per dual-port adapter
Topology	10 Gbps DCB

TABLE 19 CNA hardware specifications (continued)

Feature	Description
Supported Ethernet protocols and features	<ul style="list-style-type: none"> • 803.3ae (10 Gbps Ethernet) • 802.1q (VLAN) • 802.1q (tagging) • 802.1P (tagging) • 802.1Qaz (enhanced transmission selection) • 802.1Qbb (priority flow control) • 802.1AB (Link Layer Discovery Protocol) • 802.3ad (link aggregation) • 802.1p (priority encoding) • 802.3x (Ethernet flow control) • 802.3ap - KX/KX4 (auto negotiation) • 802.3ak - CX4 • PXE (Pre-Boot Execution Environment) • UNDI (Universal Network Device Interface) • NDIS (Network Data Interface Specification) 6.2 • EEE 1149.1 (JTAG) for manufacturing debug and diagnostics. • IP/TCP/UDP Checksum Offload • IPv4 Specification (RFC 791) • IPv6 Specification (RFC 2460) • TCP/UDP Specification (RFC 793/768) • ARP Specification (RFC 826) • Data Center Bridging (DCB) Capability • DCB Exchange Protocol (DCBXP) 1.0 and 1.1 • Dell iSCSI • Flexible MAC addressing • RSS with support for IPV4TCP, IPV4, IPV6TCP, IPV6 hash types • Syslog • Jumbo frames • Interrupt coalescing • Interrupt moderation • Multiple transmit queues for Windows and Linux • Multiple transmit priority queues • Network Priority • Large and small receive buffers • SNMP (Windows and Linux) • TCP Large Segment Offload • Team VM queues • NetQueues with multiple priority levels for VMware • Unicast MAC address • MAC filtering • Multicast MAC addresses • VLAN Discovery using proprietary logic • VLAN discovery for untagged/priority-tagged FIP frames • VLAN filtering • VMware NetQueues v3 (VMware 4.1 and above)

TABLE 19 CNA hardware specifications (continued)

Feature	Description
Supported FCoE protocols and features	<ul style="list-style-type: none"> • VMware NetIO • VMware VM Direct Path I/O • Look-ahead data split • LKA (Link Keep Alive) protocol • preFIP, FIP 1.03, and FIP 2.0 (FC-BB5 rev. 2 compliant) <ul style="list-style-type: none"> • FIP discovery protocol for dynamic FCF discovery and FCoE link management. • FPMA and SPMA type FIP fabric login. • FCoE protocols <ul style="list-style-type: none"> • FCP-3 -(initiator mode only) • FC-SP • FC-LS • FC-GS • FC-FS2 • FC-FDMI • FC-CT • FCP • FCP-2 • FCP-3 • FC-BB-5 • FCoE checksum offload • SCSI SBC-3 • NPIV • IP-over-FC (IPoFC) • Target rate limiting • Boot Over SAN • Fabric-Based Boot LUN Discovery • Persistent binding • I/O interrupt coalescing and moderation • Class 3, Class 2 control frames • vHBA
Other features	<ul style="list-style-type: none"> • ASIC Flip-flops Parity Protected • T10 Data CRC • ECC Memory Parity Protected

ATTENTION

For stand-up adapters, use only Brocade-branded SFP laser transceivers supplied with the adapters.

Cabling (stand-up adapters)

Table 20 lists the supported cabling for adapter transceiver types.

TABLE 20 Transceiver and cable specifications

Transceiver	Cable	Minimum Length	Maximum Length
Ethernet 10 Gbps SR (short range) SFP+ 1490 nm	OM1 - 6.25/125 multimode	NA	33m (104.98 ft.)
	OM2 - 50/125 multimode		82m (269 ft.)
	OM3 - 50/125 multimode		300m (984.25 ft.)
	OM4 - 50/125 multimode		550 m (1804 ft.)
Ethernet 10 Gbps LR (long reach) SFP+, 10 km, 1310 nm	Single mode media (9 microns)	NA	10 km (6.2 mi.)
1m direct-attached SFP+ copper cable	Copper twinaxial cable	1m (3.2 ft.)	1m (3.2 ft.)
3m SFP+ direct-attached copper cable	Copper twinaxial cable	3m (9.8 ft.)	3m (9.8 ft.)
5m direct-attached SFP+ copper cable	Copper twinaxial cable	5m (16.4 ft.)	5m (16.4 ft.)

NOTE

Cables are not shipped with the stand-up CNA.

Adapter LED operation (stand-up adapters)

Figure 19 illustrates LED indicator locations on a Brocade 1020 (A) and a Brocade 1010 (B) stand-up CNA. LED indicators for each port are visible through the mounting brackets.

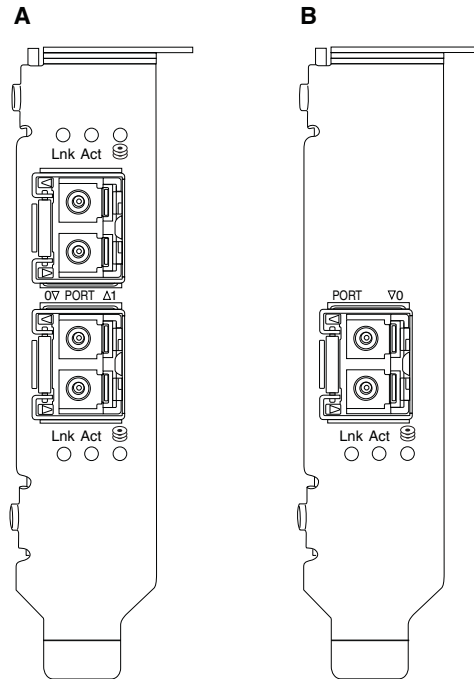


FIGURE 19 LED locations for Brocade 1020 CNA (A) and Brocade 1010 CNA (B)

Table 21 describes operation for the following LEDs visible on the CNA:

- Lnk - Link state (up or down).
- Act - Storage or network activity (traffic) is occurring over the Ethernet link.
- Storage (icons) - FCoE activity is occurring over link.

TABLE 21 LED operation



Lnk	Act	Storage	State
			
Off	Off	Off	Adapter not operational. It may not be powered up or not initialized.
Slow flashing green ¹	Off	Off	Adapter is operational, but the physical link is down.
Steady green	Off	Off	Link is up. No Ethernet or storage traffic.
Steady green	Off	Fast flashing green ²	Link is up. Storage traffic only.
Steady green	Fast flashing green ²	Off	Link is up. Ethernet traffic only.
Steady green	Fast flashing green ²	Fast flashing green ²	Link is up. Both Ethernet and storage traffic.

TABLE 21 LED operation

Lnk	Act	Storage	State
			
Beacon flashing green	Beacon flashing green ³	Beacon flashing green ³	Port beaconing function.
Beacon flashing green	Beacon flashing green ⁴	Beacon flashing green ⁴	End-to-end beaconing function. CNA port and port on connected switch beacon.
Flashing amber ⁵	Off	Off	Unsupported SFP.

1. 1 second on / 1 second off
2. 50 msec on / 50 msec off
3. 1 sec on / 250 msec off
4. 1 sec on / 250 msec off
5. 640 msec on / 640 msec off

Environmental and power requirements

This section provides environmental and power specifications for the stand-up and mezzanine card CNAs.

Stand-up CNAs

[Table 22](#) on page 185 lists environmental and power specifications for the stand-up type CNAs.

TABLE 22 Environmental and power requirements

Property	Requirement
Airflow	45 LFM
Altitude	Operating - 3,048 meters (10,000 ft.) at 40 °C (104 °F) Nonoperating - 12,192 meters (40,000 ft.) at 25 °C (77 °F)
Operating Temperature	-5 °C to 50 °C (23 °F to 122 °F) dry bulb
Operating Humidity	10% to 93% (relative-noncondensing)
Nonoperating Temperature	Minimum: -43 °C (-40 °F) Maximum: 73 °C (163 °F)
Nonoperating Humidity	5% to 95% (relative-noncondensing)
Power Consumption CNA and optics	12 W maximum
Operating Voltage	Per PCIe 2.0 specifications

Mezzanine CNAs

This section provides specifications for mezzanine CNAs.

Brocade 1007 CNA

Table 23 lists environmental and power specifications for the Brocade 1007 CNA.

TABLE 23 Environmental and power requirements for Brocade 1007 CNA mezzanine card

Property	Requirement
Airflow	Provided by blade system enclosure.
Altitude	Operating - 3,048 meters (10,000 ft.) Nonoperating - 12,193 meters (40,000 ft.)
Operating Temperature	0 to 50 °C (32 to 122 °F)
Nonoperating Temperature	Maximum: 73 °C (163 °F) Minimum: -40 °C (-40 °F)
Operating Humidity	50 °C (122 °F) at 10% to 93%
Nonoperating Humidity	60 °C (140 °F) at 10% to 93%
Power Dissipation	9.5 W maximum 8.5 W nominal
Operating Voltage	Per PCIe 2.0 specifications
Dimensions	Approximate height: 13 mm (0.5 in) Approximate width: 160 mm (6.3 in) Approximate depth: 124 mm (4.9 in) Approximate weight: 127 g (0.28 lb)

The Brocade 1007 adapter conforms to environmental and power specifications for the supported blade servers and blade system enclosures where they install. Refer to the documentation provided for these products for information. Also refer to [“Server blades and blade system enclosures \(mezzanine adapters\)”](#) on page 11. for references to CNA compatibility information.

Brocade 1741 CNA

Table 24 lists environmental and power specifications for the Brocade 1741 CNA.

TABLE 24 Environmental and power requirements for Brocade 1741 CNA mezzanine card

Property	Requirement
Airflow	Provided by blade system enclosure.
Altitude	Operating - 3,048 meters (10,000 ft.) Nonoperating - 10,600 meters (35,000 ft.)
Operating Temperature	0 to 35 °C (32 to 95 °F)
Nonoperating Temperature	Maximum: 65 °C (149 °F) Minimum: -40 °C (-40 °F)
Operating Humidity	35 °C (95 °F) at 20% to 80%
Nonoperating Humidity	65 °C (149 °F) at 5% to 95%
Power Consumption	15 W required 12 W measured

TABLE 24 Environmental and power requirements for Brocade 1741 CNA mezzanine card

Property	Requirement
Operating Voltage	Per PCIe 2.0 specifications
Dimensions	3.6 in. by 1.5 in. by 3.3 in. (9.144 cm by 3.81 cm by 8.382 cm)

The Brocade 1741 mezzanine adapter conforms to environmental and power specifications for the supported server blades and blade system enclosures where they install. Refer to the documentation provided for these products for more information. Also refer to “[Server blades and blade system enclosures \(mezzanine adapters\)](#)” on page 11 for references to CNA compatibility information.

Host Bus Adapters

Two types of HBAs are available:

- Stand-up
- Mezzanine

The stand-up HBAs are low-profile MD2 form factor PCI Express (PCIe) cards, measuring 6.6 in. by 2.714 in. (16.765 cm by 6.89 cm), that install in standard host computer systems. HBAs are shipped with a low-profile bracket installed and a standard bracket included for mounting in your host system). These HBAs contain either one or two external ports for connecting to Fibre Channel switches via fiber optic cable. [Table 25](#) provides the dimensions for the two bracket types.

TABLE 25 Mounting brackets for stand-up HBAs

Bracket Type	Dimensions
Low Profile	1.84 cm by 8.01 cm (73 in. by 3.15 in.)
Standard	1.84 cm by 12.08 cm (73 in. by 4.76 in.)

The mezzanine type HBAs are smaller cards. For example, the Brocade 804 adapter measures approximately 4 in. by 4.5 in. (10.16 cm by 11.43 cm). Mezzanine adapters mount on server blades that install in supported blade system enclosures. Refer to “[Hardware compatibility](#)” on page 15 for references to HBA compatibility information. Note that mezzanine adapters do not have external port connectors with optics such as stand-up HBAs, but internal ports that connect to the switch and interconnect modules installed in the enclosure through high-speed links in the internal enclosure backplane.

PCI Express interface

Install Brocade stand-up HBAs in PCI Express computer systems with an Industry Standard Architecture/Extended Industry Standard Architecture (ISA/EISA) bracket type.

Install Brocade mezzanine HBAs in supported blade servers that install in supported blade system enclosures. Multiple HBAs may be mounted in connectors located at different locations in the blade server.

Following are some of the features of the PCIe interface:

- Supports PCI Express specifications Gen2 (PCI Base Specification 2.0) and Gen1 (PCI Base Specification 1.0, 1.1a, and 1.1).
- Operates as an x8 lane DMA bus master at 2.5 GHz, full duplex.
- Effective data rate on Gen2 systems is 32 Gbps and on Gen1 systems is 16 Gbps.
- On-board flash memory provides BIOS support over the PCI bus.

PCI system values

All Brocade HBAs share a common PCI Vendor ID (VID) value to allow drivers and BIOS to recognize them as supported Fibre Channel products. HBAs are also assigned PCI subsystem vendor IDs (SVIDs) and subsystem IDs (SSIDs) to allow drivers and BIOS to distinguish between individual host adapter variants. You can locate PCI device, vendor, and subsystem IDs for the installed Fibre Channel HBA through your host’s operating system tools. For example, if using Windows, use the following steps.

1. Access the Device Manager
2. Open the **Properties** dialog box for the HBA by right-clicking the HBA and selecting **Properties** from the shortcut menu.
3. Select the **Details** and **Driver** tabs to locate specific values.

Hardware specifications

The Fibre Channel interface supports features outlined in [Table 26](#).

TABLE 26 Supported Fibre Channel features

Feature	Description
Port Speeds	<p>Brocade 804: Internal ports allow user-selectable or auto-negotiated speeds of 8, 4, 2, or 1 Gbps per port.</p> <p>Brocade 825 and 815:</p> <ul style="list-style-type: none"> • An installed 8 Gbps SFP+ allows user-selectable or auto-negotiated speeds of 8, 4, or 2 Gbps per port. • An installed 4 Gbps SFP allows user-selectable or auto-negotiated speeds of 4, 2, or 1 Gbps per port. <p>Brocade 425 and 415:</p> <ul style="list-style-type: none"> • An installed 4 Gbps SFP allows user-selectable or auto-negotiated speeds of 4, 2, or 1 Gbps per port. • An installed 8 Gbps SFP+ allows user-selectable or auto-negotiated speeds of 4 or 2 Gbps per port. <p>NOTE: 8 Gbps adapters support 1 Gbps at the driver level, but not in a BIOS or boot over SAN configuration.</p>
SFP transceivers (stand-up adapters)	Multimode small form factor pluggable (SFP)

TABLE 26 Supported Fibre Channel features (continued)

Feature	Description
Cable connector (stand-up adapters)	LC
ASIC	<ul style="list-style-type: none"> Provides the Fibre Channel functionality for all HBA models. Two on-board processors, each operating at 400 MHz, generate signal timing and link protocol in compliance with Fibre Channel standards.
External serial FLASH memory	<ul style="list-style-type: none"> Stores firmware and HBA BIOS code 4 MB capacity
Data Rate Per Port - Full Duplex	<ul style="list-style-type: none"> 1600 MB at 8 Gbps 800 MB at 4 Gbps 400 MB at 2 Gbps
Performance Per Port	500,000 IOPs (maximum)
Distance Support (stand-up adapters)	50 m at 8 Gbps with 62.5/125 micron multimode fiber
Topology	Point-to-Point (N_Port)
Protocols	<ul style="list-style-type: none"> SCSI over FC (FCP) FCP3 - initiator mode only FC-SP Authentication NPIV
Other Features	<ul style="list-style-type: none"> ASIC Flip-flops Parity Protected ECC Memory Parity Protected Quality of Service (QoS) Target Rate Limiting Boot Over SAN Fabric-Based Boot LUN Discovery I/O Interrupt Coalescing T10 Data CRC Multiple Priority (VC_RDY) Frame-Level Load Balancing Persistent Binding Fabric-Based Configuration

ATTENTION

For stand-up HBAs, use only Brocade-branded SFP laser transceivers supplied with this product.

Cabling (stand-up adapters)

Table 27 summarizes maximum distances supported for different fiber optic cable types. This table assumes a 1.5 dB connection loss and an 850 nm laser source.

TABLE 27 Fibre Channel transceiver and cable specifications

Transceiver type	Speed	OM1 (M6) 62.5/125 micron	OM2 (M5) 50/125 micron	OM3 (M5E) 50/125 micron	OM4 (M5F) 50/125 micron	Single Mode Media (9 microns)
SWL	2 Gbps	150 m (492 ft.)	300 m (984 ft.)	500 m (1640 ft.)	N/A	N/A
SWL	4 Gbps	70 m (229 ft.)	150 m (492 ft.)	380 m (1,264 ft.)	400 m (1,312 ft.)	N/A
SWL	8 Gbps	21 m (68 ft.)	50 m (164 ft.)	150 m (492 ft.)	190 m (623 ft.)	N/A
LWL	2 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)
LWL	4 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)
LWL	8 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)

Adapter LED operation (stand-up adapters)

Figure 20 illustrates LED indicator locations on a Brocade 825 and a Brocade 815. LED indicators for each port are visible through the mounting brackets. Since the Brocade 825 operates at speeds up to 8 Gbps, each port has a 1|2, 4, and 8 Gbps LED. The 4 Gbps models, such as the Brocade 415 and Brocade 425, have a 1|2 and 4 Gbps LED for each port.

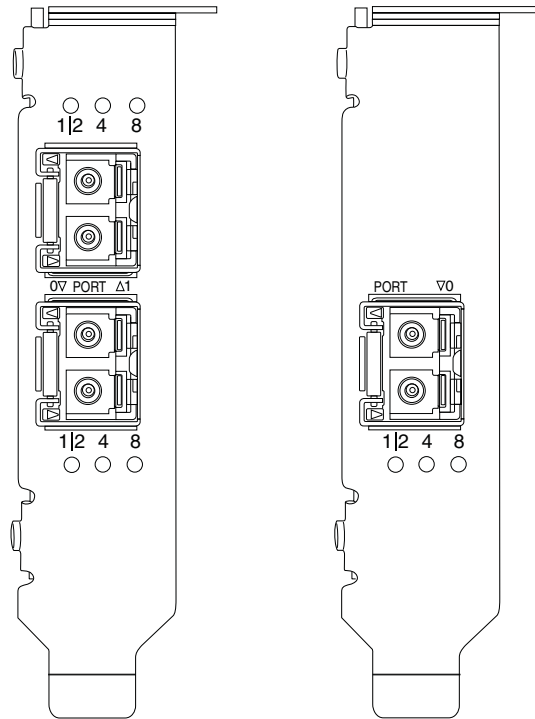


FIGURE 20 LED locations for Brocade 825 HBA (A) and Brocade 815 (B)

Table 28 provides the meanings for LED operation on a specific port.

TABLE 28 LED operation

LED Operation	Meaning
LED is steady green	Depending on the LED illuminated, link is active at 1-2, 4, or 8 Gbps. Port is online (connected to an external device) but has no traffic. Note that only one of these LEDs will be steady green to indicate speed.
LED flickering green	Activity, such as data transfers, is occurring on the active link.
All LEDs flashing green 1 sec on - 250 msec off	Beaconing is enabled on the port.
All LEDs flashing green 50 msec on - 50 msec off - 350 msec off	End-to-end beaconing is enabled for connected switch and HBA port.
4 Gbps LED flashes amber	Unsupported SFP. Appropriate Brocade-branded SFP is not installed.

Environmental and power requirements

This section provides environmental and power specifications for the stand-up and mezzanine HBAs.

Stand-up HBAs

The following table provides environmental and power specifications for the stand-up HBAs.

TABLE 29 Environmental and power requirements

Property	Requirement
Airflow	None required.
Operating Temperature (dry bulb)	0 °C to 55 °C (32 °F to 131 °F)
Operating Humidity	5% to 93% (relative-noncondensing)
Nonoperating Temperature	-43 °C to 73 °C (-40 °F to 163 °F) (dry bulb)
Nonoperating Humidity	5% to 95% (relative-noncondensing)
Power Dissipation	6.3W Maximum not including SFP.
Operating Voltage	Per PCIe 2.0 specifications

Mezzanine HBAs

The Brocade 804 mezzanine adapter conforms to environmental and power specifications for the supported blade servers and blade system enclosures where they install. Refer to the documentation provided for these products for information. Also refer to “[Server blades and blade system enclosures \(mezzanine adapters\)](#)” on page 11.

Fibre Channel standards compliance

Brocade adapters meet or exceed the Fibre Channel standards for compliance, performance, and feature capabilities as defined in the Brocade standards compliance list. This information is available through links under the **Solutions and Technology** heading on the Brocade website at www.brocade.com.

Regulatory compliance

This section provides international regulatory compliance notices for the Brocade adapters.

Stand-up adapters

The regulatory statements in this section pertain to the following stand-up adapters:

- 415 HBA

- 425 HBA
- 815 HBA
- 825 HBA
- 1010 CNA
- 1020 CNA
- 1860 Fabric Adapter

FCC warning (US only)

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.

Changes or modifications not expressly approved by “Brocade” for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or locate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Communications Commission (KCC) statement

This is the Republic of Korea Communications Commission (KCC) regulatory compliance statement for Class B products.

Class B device (Broadcasting Communication Device for Home Use): This device obtained EMC registration mainly for home use (Class B) and may be used in all areas.

B급 기기(가정용 방송통신기기): 이 기기는 가정용(B급)으로 전자파적합등록을 한 기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

VCCI statement (Japan)

This is Class B product based on the standard of the Voluntary Control Council For Interference by Information Technology Equipment (VCCI).

If this equipment is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

BSMI warning (Republic of Taiwan)

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。

CE statement

ATTENTION

This is a Class B product. In a domestic environment, this product might cause radio interference, and the user might be required to take corrective measures.

The standards compliance label on the adapter contains the CE mark which indicates that this system conforms to the provisions of the following European Council directives, laws, and standards:

- Electromagnetic Compatibility (EMC) Directive 89/336/EEC and the Complementary Directives 92/31/EEC, 93/68/EEC, and (2004/108/EEC).
- Low Voltage Directive (LVD) 73/23/EEC and the Complementary Directive 93/68/EEC
- EN50082-2/EN55024:1998 (European Immunity Requirements)
 - EN61000-3-2/IEC61000-3-2 (European and Japanese Harmonics Spec)
 - EN61000-3-3

Canadian requirements

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

Laser compliance

This equipment contains Class 1 laser products and complies with FDA Radiation Performance Standards, 21 CFR Subchapter I and the international laser safety standard IEC 825-2.



CAUTION

Use only optical transceivers that are qualified by Brocade Communications Systems, Inc. and comply with the FDA Class 1 radiation performance requirements defined in 21 CFR Subchapter I, and with IEC 825-2. Optical products that do not comply with these standards might emit light that is hazardous to the eyes.

Safety and EMC regulatory compliance

Table 30 lists the regulatory compliance standards and certifications for which the adapter is certified.

TABLE 30 Regulatory certifications and standards

Country	Safety specification	EMC specification
Australia and New Zealand		EN55022 or CISPR22 or AS/NZS CISPR22 C-Tick Mark
Canada	Bi-Nat UL/CSA 60950-1 2nd Ed or latest. cCSAus	ICES-003 Class B
European Union (Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, The Netherlands, and United Kingdom)	EN 60950-1 or latest TUV	CE EN55022:2006 Class B EN 55024 (Immunity) EN 61000-4-2 Electrostatic Discharge EN 61000-4-3 Radiated Fields EN 61000-4-4 Electrical Fast Transients EN 61000-4-5 Surge Voltage EN 61000-4-8 Magnetic Fields (N/A) EN 61000-4-11 Voltage Dips and Interruptions EN 61000-3-2 Limits for Harmonic Current Emissions EN 61000-3-3 Voltage Fluctuations
Japan		CISPR22 and JEIDA (Harmonics) VCCI-B and Statement
Republic of Korea		KN24 KN22 KCC Mark Class B
Russia	IEC60950-1 or latest GOST Mark	51318.22-99 (Class B) and 51318.24-99 or latest GOST Mark
Taiwan	CNS14336(94) Class B or latest BSMI Mark	CNS13438(95) Class B or latest BSMI Mark
United States	Bi-Nat UL/CSA 60950-1 2nd Ed or latest. cCSAus	ANSI C63.4 FCC Class B and Statement

Environmental and safety compliance

This section provides international environmental and safety compliance notices for Brocade adapters.

Environmental Protection Use Period (EPUP) Disclaimer

In no event do the EPUP logos shown on the product and FRUs alter or expand that warranty that Brocade provides with respect to its products as set forth in the applicable contract between Brocade and its customer. Brocade hereby disclaims all other warranties and representations with respect to the information contained on this CD including the implied warranties of merchantability, fitness for a particular purposes and non-infringement.

The EPUP assumes that the product will be used under normal conditions in accordance with the operating manual of the product.

环保使用期限 (EPUP) 免责声明:

EPUP 标志不会出现在产品和 FRU 的改装产品中, 也不会对 Brocade 所提供的相关产品保修条款 (该保修条款在 Brocade 及其客户间达成的适用合同中列出) 进行增补。对于此 CD 上包含的相关信息, 如适销性、针对特定用途的适用性和非侵权性的暗示保证, Brocade 在此郑重声明本公司对于与上述信息相关的所有其他保证和陈述概不负责。EPUP 假设在“产品操作手册”中注明的常规条件下使用该产品。

China RoHS

The contents included in this section are per the requirements of the People's Republic of China-Management Methods for Controlling Pollution by Electronic Information products.

遵守环境法规



中国 **RoHS**

本节中包含的内容都遵守了中华人民共和国《电子信息产品污染控制管理办法》的要求。

Names and Contents of the Toxic and Hazardous Substances or Elements

In accordance with China's Management Measures on the Control of Pollution caused by Electronic Information products (Decree No. 39 by the Ministry of Information Industry), the following information is provided regarding the names and concentration level of Hazardous substances (HS) which may be contained in this product.

TABLE 31 Hazardous Substances/Toxic Substances (HS/TS) concentration chart

Name of the Component	Hazardous/Toxic Substance/Elements					
	Lead (PB)	Mercury (Hg)	Cadmium (CD)	Hexavalent Chromium (CR6+)	Polybrominated Biphenyl (PBB)	Polybrominated Diphenyl Ether (PBDE)
Fiber Channel Switch	X	O	O	O	O	O
Fan , Blower assemblies	X	O	O	O	O	O
PCBA cards	X	O	O	O	O	O
Host Bus Adapter (HBA)	X	O	O	O	O	O
USB Flash Drive	O	O	O	O	O	O
Power Supply kit	X	O	O	O	O	O
SFPs (optical cable connectors) 	X	O	O	O	O	O
Sheet Metal	X	O	O	O	O	O
Chassis Assembly	X	O	O	O	O	O
Mechanical brackets & Slides	X	O	O	O	O	O
Slot Filler	X	O	O	O	O	O
Cable management tray	X	O	O	O	O	O
Cable Comb	O	O	O	O	O	O
Cables and power cords 	O	O	O	O	O	O
Replacement Doors	X	O	O	O	O	O
Software / Documentation CDs	O	O	O	O	O	O

X indicates that the concentration of such hazardous/toxic substance in all the units of homogeneous material of such component is higher than the SJ/T11363-2006 Requirements for Concentration Limits.

O indicates that no such substances are used or that the concentration is within the aforementioned limits.

CHINA ROHS 有害物质/有毒物质(HS/TS)限量列表

有毒与有害物质或元素的名称及含量

根据中国的<<电子信息产品污染控制管理办法>> (信息产业部第 39 号令), 本公司提供以下有关产品中可能含有的有害物质(HS)的名称及含量水平的信息。

主要部件名称	有害/有毒物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (CR6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
光纤通道交换机	X	O	O	O	O	O
风扇/冷却组装件	X	O	O	O	O	O
线路板部件	X	O	O	O	O	O
主机总线适配器 (HBA)	X	O	O	O	O	O
USB 闪存器	O	O	O	O	O	O
电源	X	O	O	O	O	O
 SFP (光纤接头)	X	O	O	O	O	O
钣金件	X	O	O	O	O	O
机箱部件	X	O	O	O	O	O
机械支架及滑轨	X	O	O	O	O	O
插槽填充物	X	O	O	O	O	O
电缆整理盘	X	O	O	O	O	O
梳状线缆	O	O	O	O	O	O
 线束及电源线	O	O	O	O	O	O
替换门	X	O	O	O	O	O
软件/文档光盘	O	O	O	O	O	O

X 表示此类部件内同质材料中的有害/有毒含量高于 SJ/T 11363-2006 的限量要求。

O 表示未使用此类物质或其含量低于上述限量要求。

Safety

Because these boards are installed in a PCIe bus slot, all voltages are below the SELV 42.4 V limit. The adapters are recognized per Bi-Nat UL/CSA 60950-1 1st Ed. or later for use in the US and Canada. They also comply with IEC 60950-1 and EN60950-1. A CB Scheme certificate is available upon request

Mezzanine adapters

The regulatory information in this section pertains to the following mezzanine adapters.

- 804 HBA
- 1007 CNA
- 1741 CNA

Brocade 804 HBA

For the Brocade 804 HBA, refer to the regulatory compliance information in the Mezzanine Card Installation Instructions that ship with your adapter and to information in your blade system enclosure documentation.

Brocade 1007 CNA

For the Brocade 1007 CNA, refer to the regulatory compliance information in the Installation and User's Guide that ships with your adapter.

Brocade 1741 CNA

This section provides regulatory compliance information for the Brocade 1741 mezzanine card. Also refer to regulatory information provided by Dell for the blade server and Dell™ PowerEdge™ M1000e modular blade system.

FCC warning (US only)

This equipment has been tested and complies with the limits for a Class A computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense. Korea

Communications Commission (KCC) statement

This is the Republic of Korea Communications Commission (KCC) regulatory compliance statement for Class A products.

Class A device (Broadcasting Communication Device for Office Use): This device obtained EMC registration for office use (Class A), and may be used in places other than home. Sellers and/or users need to take note of this.

A급 기기(업무용 방송통신기기): 이 기기는 업무용(A급)으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

VCCI statement (Japan)

This is Class A product is based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance might arise. When such trouble occurs, the user might be required to take corrective actions.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラス 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により要求されることがあります。

CE statement

ATTENTION

This is a Class A product. In a domestic environment, this product might cause radio interference, and the user might be required to take corrective measures.

The standards compliance label on the adapter contains the CE mark which indicates that this system conforms to the provisions of European Council directives, laws, and standards listed in [Table 32](#).

Canadian requirements

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

Safety and EMC regulatory compliance

Table 30 lists the regulatory compliance standards and certifications for which the adapter is certified.

TABLE 32 Regulatory certifications and standards

Country	Safety specification	EMC specification
Australia and New Zealand		EN55022 or CISPR22 or AS/NZS CISPR22 C-Tick Mark
Canada	CSA 60950-1-07 2nd Edition cCSAus	ICES-003 Class A
European Union (Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, The Netherlands, and United Kingdom)	EN60950-1:2006+A11 TUV	CE EN55022:2006 Class A (Emissions) EN55024 (Immunity) EN61000-3-2, 2000 (A14) (Harmonics) EN61000-3-3, +A1:2001 (Voltage Fluctuations) EN55022 (Emissions) EN55024 (Immunity)
International		IEC 61000-4-2 (Electrostatic Discharge) IEC 61000-4-3 (Radiated Fields) IEC 61000-4-4 (Electrical Fast Transients) IEC 61000-4-5 (Surge Voltage) IEC 61000-4-6 (Immunity) IEC 61000-4-8 (Magnetic Fields) IEC 61000-4-11 (Voltage Dips and Interruptions)
Japan		CISPR22 VCCI V-3 /2009.04 VCCI V-4 2009.04 VCCI-A and Statement
Republic of Korea		KN24 KN22 KCC Mark Class A
United States	UL 60950-1 2nd Edition cCSAus	ANSI C63.4 FCC Class A and Statement

5 Regulatory compliance

Adapter Configuration

In this appendix

- [Introduction](#) 203
- [Storage instance-specific persistent parameters](#) 203
- [Storage driver-level parameters](#) 206
- [Network driver parameters](#) 211

Introduction

Information in this appendix is optional for power users who want to modify values for adapter instance-specific persistent and driver-level configuration parameters. Rely on your operating system or storage vendor for guidance. Storage driver parameters can be modified for HBA, CNA, and Fabric Adapter CNA or HBA port operation. Network driver parameters can be modified only for CNA or Fabric Adapter CNA port operation.

Storage instance-specific persistent parameters

Instance-specific persistent configuration parameters for storage drivers with valid value ranges are listed in [Table 33](#). You can change these values using the BCU commands provided in the table. These parameters are stored in the following locations on your system:

- Linux and VMware - /etc/bfa.conf
- Solaris - /kernel/drv/bfa.conf
- Windows - Windows registry, under the following registry hives:

For the HBA FC driver, Windows registry is
 HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\bfad\Parameters\Device

For the CNA FCoE driver, Windows registry is
 HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\bfadfcoe\Parameters\Device

Values for these parameters should not be changed in the repository directly; instead use the corresponding BCU commands listed in [Table 33](#).

A Storage instance-specific persistent parameters

TABLE 33 Adapter instance-specific parameters

Function	Parameter	Default Value	Possible Values	BCU Command	Notes
authorization algorithm	bfa#-auth-algo	1	1: MD5 2: SHA1 3: MS 4: SM	auth --algo	Not supported in Solaris.
authorization policy	bfa#-auth-policy	off	0: on 1: off	auth --policy	Not supported in Solaris.
authorization secret	bfa#-auth -secret	NA	min chars - 0 max chars - 256	auth --secret	Not supported in Solaris.
Adapter name	bfa#adapter-serialnum-name	NA	min chars - 0 max chars - 64	adapter --name	
vHBA interrupt coalesce	bfa#-coalesce	1	0: Off 1: On	vhba --intr	
vHBA interrupt delay	bfa#-delay	HBAs - 1125 804 HBA - 25 CNAs - 25	min: 0 max: 1125	vhba --intr	
vHBA interrupt latency	bfa#-latency	HBAs - 225 804 HBA - 5 CNAs - 5	0 microseconds 225 microseconds	vhba --intr	
log level	bfa#-log-level	3	1: Critical 2: Error 3: Warning 4: Info	log --level	
path time out value (TOV)	bfa#-pathtov	30	min: 1 max: 60	fcvim --pathtov	Supported in release 2.0 and above. A value of 0 forces an immediate failover. 1 - 60 sets a delay in seconds.
PCIe maximum read request size	bfa# pcie-max-read-reqsz	512	128 256 512 1024 2048	Not available	This parameter is used to determine the maximum size of a DMA read through PCIe. Supported on Solaris only.
port maximum frame size	bfa#-maxfrsize	2112	512 1024 2048 2112	port --dfsize	
port name	bfa#-port-name	NA	min chars - 0 max chars - 64	port --name	

TABLE 33 Adapter instance-specific parameters (continued)

Function	Parameter	Default Value	Possible Values	BCU Command	Notes
port speed	bfa#-port-speed	0	0: auto select 1: 1 Gbps (HBAs) 2: 2 Gbps (HBAs) 4: 4 Gbps (HBAs) 8: 8 Gbps (HBAs) 16:16 Gbps (HBAs) 10: 10 Gbps (CNAs)	port --speed	Brocade 425 and 415, and 804 support 1, 2, 4, and 8 Gbps Brocade 1860 support 2,4,8, and 16 Gbps 8 Gbps HBAs support 1 Gbps at the driver level, but not in a BIOS or boot over SAN configuration.
port topology	bfa#-port-topology	1	1: point to point 3: autoselect	port --topology	
port enable	bfa#-port-enable	0	0: True 1: False	port --enable port --disable	

Managing instance-specific persistent parameters

Use BCU commands to modify instance-specific persistent parameters for storage drivers. For details on using these commands, refer to the *Brocade Adapters Administrator's Guide*.

vHBA Interrupt parameters

Following is an example of modifying the vHBA interrupt parameters.

```
bcu vhba --intr <pcifn-id> <-coalesce | -c> {on|off} [<-l <usecs> <-d <usecs>
```

where:

pcifn-id	PCI function number for the port where you want to set the log level.
-coalesce c	Sets the coalesce flag. Possible values are on or off.
-l latency	Sets the latency monitor timeout value. Latency can be between 0 to 225 microseconds. A latency value of 0 disables latency monitor timeout interrupt.
-d delay	Sets the delay timeout interrupt value. A delay can be between 0 to 1125 microseconds. A delay value of 0 disables the delay timeout interrupt.

NOTE

You can also modify vHBA Interrupt Coalescing parameters through HCM. Refer to the *Brocade Adapters Administrator's Guide* for details.

Modifying PCIe max read request size

Refer to the comment section in the `/kernel/drv/bfa.conf` file on your system for an example.

Storage driver-level parameters

The driver-level configuration parameters are global parameters used by all storage driver instances. The default values for the driver configuration parameters are compiled into the driver.

NOTE

These parameters are should only be changed by power users with great caution.

Linux and VMware driver configuration parameters

The driver-level configuration values in [Table 34](#) are in the following locations on your system:

- Linux - `/etc/modprobe.conf`
- VMware - `/etc/vmware/esx.conf`

[Table 34](#) describes the Linux and VMware configuration parameters.

TABLE 34 Linux and VMware driver configuration parameters

Parameter	Default Value	Notes
<code>bfa_ioc_queue_depth</code>	2048	Maximum I/O requests that can be queued by the SCSI transport layer. This parameter is passed to the SCSI layer during SCSI transport attach.
<code>bfa_io_max_sge</code>	128	Maximum Scatter gather elements supported (per I/O request). This parameter is passed to the SCSI layer during SCSI transport attach.
<code>bfa_lun_queue_depth</code>	32	Maximum SCSI requests per LUN. This parameter is passed to the SCSI layer during SCSI transport attach.
<code>fdmi_enable</code>	1 (enabled)	Enables or disables Fabric Device Management Interface (FDMI) registrations. To disable, set this parameter to 0.
<code>host_name</code>	NULL	Host name.
<code>ioc_auto_recover</code>	1 (enabled)	Auto-recover IOC (IO Controller) on heartbeat failure.
<code>log_level</code>	2 (Error)	BFA log level setting. See <code>bcu log -level</code> information in the <i>Brocade Administrator's Guide</i> your adapter for more information.
<code>msix_disable</code>	1	Disable MSix interrupt (and use INTx).
<code>num_fcxps</code>	64	Maximum number of unassisted FC exchanges.
<code>num_ios</code>	512	Maximum number of FCP IO requests.
<code>num_rports</code>	512	Maximum number of remote ports.
<code>num_sgpgs</code>	512	Maximum number of scatter gather pages.
<code>num_tms</code>	128	Maximum number of task management commands.
<code>num_ufbufs</code>	64	Maximum number of unsolicited Fibre Channel receive buffers.
<code>os_name</code>	NULL	OS name.

TABLE 34 Linux and VMware driver configuration parameters

Parameter	Default Value	Notes
os_patch	NULL	OS patch level.
reqq_size	256	Number of elements in each request queue (used for driver-to-firmware communication).
rport_del_timeout	30 (seconds)	Delay (in seconds), after which an offline remote port will be deleted.
rspq_size	64	Number of elements in each request queue (used for firmware-to-driver communication).

Managing Linux driver configuration

Either the driver configuration parameter values can be loaded with the driver or can be set in `/etc/modprobe.conf` before loading the driver. Display current driver configuration settings using the following command.

```
cat /sys/module/bfa/parameters/<parameter>
```

Examples

Following are examples to set the LUN queue depth:

- Load driver with the parameter value.
`modprobe bfa_lun_queue_depth=40`
- Add the following entry in `/etc/modprobe.conf`, then load the driver.
`bfa options lun_queue_depth=40`

Examples

Following are examples to disable IOC auto-recovery:

- Load driver with the parameter value.
`modprobe bna bnad_ioc_auto_recover=0`
- Add the following entry in `/etc/modprobe.conf`, then load the driver.
`bfa options ioc_auto_recover=0`

Following are examples for disabling FDMI:

- Load driver with the parameter value.
`modprobe bfa__fdmi_enable=0`
- Add the following entry in `/etc/modprobe.conf`, then load the driver.
`bfa options fdmi_enable=0`

Managing VMware driver configuration

To set a configuration parameter use the following steps.

1. Enter the following command.
`esxcfg-module -s 'param_name=param_value' bfa`
2. When you have set all desired parameters, reboot the system.

Examples

Following is an example to set the LUN queue depth.

```
esxcfg-module -s 'lun_queue_depth=1' bfa
```

Following is an example to disable FDMI.

```
esxcfg-module -s 'fdmi_enable=0 bfa' bfa
```

Important notes

Observe these notes when modifying driver configuration parameters:

- The esxcfg-module reads and updates from the file /etc/vmware/esx.conf.
- Editing this file directly is not recommended.
- Be careful not to overwrite the existing options. Always query the existing configuration parameter value before changing it using the following command:

```
esxcfg-module -q
```

Windows driver configuration parameters

The BFA driver configuration parameters are located under the registry hive:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\bfad\Parameters\Device
```

Table 35 describes the Windows configuration parameters.

TABLE 35 Windows driver configuration parameters

Parameter	Default Value	Notes
fdmi_enable	1	Enables or disables Fabric Device Management Interface (FDMI) registrations. To disable, set this parameter to 0.
bfa_lun_queue_depth	32	Maximum SCSI requests per LUN. This parameter is passed to the SCSI layer during SCSI transport attach
ioc_auto_recover	1	Auto recovers IOC (IO Controller) on heartbeat failure.
rport_del_timeout	90	Delay in seconds, after which an offline remote port will be deleted.
msix_disable	1	Disable MSix interrupt (and use line-based INTx).

Managing Windows driver configuration parameters

To change any driver configuration parameter, use the Registry Edit tool (regedt32) or the BCU **drvconf -key** command. For details on using these commands, refer to the *Brocade Adapters Administrator's Guide*.

Important notes:

- We recommend using the applicable BCU command to dynamically update the value (where available), rather than reloading the driver.
- Disabling the devices will disrupt adapter connectivity.
- To find out if the driver has unloaded successfully after disabling the Brocade HBA or CNA devices in the Device Manager, run any BCU command. This should result in an “Error: No Brocade HBA Found” or “Error: No Brocade CNA Found” message. If the driver did not unload for some reason, the BCU command should complete normally.

- If the device icon display in Device Manager does not change to indicate that each HBA port device is disabled and if a message displays when you attempt to disable the devices that your hardware settings have changed and you must restart your computer for changes to take effect, confirm that the hcmagent.exe (Brocade HCM Agent Service) is not running on the host and that there are no open handles to file systems on disks accessed through the adapter.

Configuration using Registry Edit tool

Use the following steps to modify the `rport_del_timeout` parameter using the Registry Edit tool. Following is an example sequence of modifying the `rport_del_timeout` parameter.

1. Navigate to the following location:
For HBA (FC), the registry is
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\bfad\Parameters\Device
For CNA (FCoE), the registry is
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\bfadfcoe\Parameters\Device
2. Click **rport_del_timeout**.
3. Click **Edit ? Modify**.
4. For Value data, enter 60.
5. Click **OK**
6. Use the following steps to reload the driver and reinitialize the driver parameters from the modified registry:
 - a. Quiesce all application access to disks that are connected through the adapter.
 - b. Stop the Brocade HCM Agent Service (refer to “[HCM Agent operations](#)” on page 112 for instructions).
 - c. Open the Windows Device Manager (devmgmt.msc), and navigate to **SCSI and RAID controllers**. For CNAs, also navigate to **Ethernet controllers**.
 - d. To unload the driver, disable all Brocade HBA or CNA devices (each port has a device entry).

NOTE

For CNAs, you need to unload both the storage and network driver, so disable the CNA instances under **SCSI and RAID controllers** and **Ethernet controllers**.

- e. To reload the driver, enable all Brocade HBA or CNA devices.

Configuration using BCU commands

Use the following format for changing parameter values.

```
bcu drvconf --key <key_name> --val <value>
```

Following is an example for disabling FDMI.

```
bcu drvconf --key fdmi_enable --val 0
```

Following are possible key names and value ranges:

- key = `bfa_ioc_queue_depth`, value range [0-2048] default = 2048
- key = `bfa_lun_queue_depth`, value range [0- 32] default = 32

A Storage driver-level parameters

- key = ioc_auto_recover, value range [0-1] default = 1
- key = rport_del_timeout, value range [0-90] default = 90
- key = msix_disable, value range [0-1] default = 1
- key = fdmi_enable, value range [0-1) default = 1

Following is an example for disabling FDMI.

```
bcu drvconf --key fdmi_enable --val 0
```

Solaris driver configuration parameters

Table 36 describes the Solaris configuration parameters.

NOTE

Brocade 804 and 1007 adapters are not supported on Solaris systems.

TABLE 36 Solaris driver configuration parameters

Parameter	Default Value	Notes
ioc-auto-recover	1	Auto recover IOC (IO controller) on heartbeat failure.
msix-disable	1	Disable MSix interrupt (and use INTx).
num-fcxps	64	Maximum number of unassisted Fibre Channel exchanges.
num-ios	512	Maximum number of FCP IO requests.
num-rports	512	Maximum number of remote ports.
num-sgpgs	512	Maximum number of scatter gather pages.
num-tms	128	Maximum number of task management commands.
num-ufbufs	64	Maximum number of unsolicited Fibre Channel receive buffers.
reqq-size	256	Number of elements in each request queue (used for driver-to-firmware communication).
rspq-size	64	Number of elements in completion queues (used for firmware-to-driver communication).

Managing Solaris driver configuration parameters

To modify any driver parameter values, use the following steps.

1. Edit /kernel/drv/bfa.conf.

For example, to set the number of FCP IO requests, use the following.

```
num-ios=600
```

2. When you have set all desired parameters, reboot the system.

Network driver parameters

The driver configuration parameters are global parameters used by all network driver instances. The default values for the driver configuration parameters are compiled into the driver. Network drivers are only used for CNAs and for Fabric Adapter ports configured in CNA or NIC mode.

The driver-level configuration values discussed in this section are in the following locations on your system:

- Linux - /etc/modprobe.conf
- VMware - /etc/vmware/esx.conf
- Windows - Device Manager

NOTE

These parameters are should only be changed from the default values by power users with great caution.

Windows

[Table 37](#) describes the instance-specific network configuration parameters available for Windows hosts.

TABLE 37 Network driver configuration parameters

Function	Default Value	Possible Values	Method to Configure	Notes
Autorecovery	Disable	Enable Disable	Device Manager	Supported on Windows Server 2003 and 2008
FlowControl, Transmit (Tx) and Receive (Rx)	Enable	Enable Disable	Device Manager	Enables 802.3x flow control for Windows 2008 only.
Interrupt Moderation	Enable	Enable Disable	Device Manager	
IPv4 Checksum Offload	Enable	Enable Disable	Device Manager	Supported on Windows Server 2003 and 2008 for IPv4 traffic.
Jumbo Packet Size	1500	1500-9000	Device Manager	Sets MTU size. Size must not be greater than size set on FCoE switch
Large Segmentation Offload V1 IPv4 (LSOv1)	Enable	Enable Disable	Device Manager	Supported on Windows Server 2003 and 2008 for IPv4 traffic.
Large Segmentation Offload V2 IPv4 (LSOv2)	Enable	Enable Disable	Device Manager	Supported on Windows Server 2003 and 2008 for IPv4 traffic.
Large Segmentation Offload V2 IPv6 (LSOv2)	Enable	Enable Disable	Device Manager	Supported on Windows Server 2003 and 2008 for IPv4 traffic.

TABLE 37 Network driver configuration parameters (continued)

Function	Default Value	Possible Values	Method to Configure	Notes
Locally Administered Address	N/A	Hexadecimal value for MAC address	Device Manager	Overrides the burned-in MAC address.
Priority and VLAN	Disable	Enable Disable	Device Manager	Enables hardware-assisted VLAN tagging.
Receive Buffers	32	32-1024	Device Manager	Tunes receive buffer value.
Transmit Buffers	16	4-64	Device Manager	Tunes transmit buffer value.
Receive Side Scaling (RSS)	Enable	Enable Disable	Device Manager	Supported on Windows Server 2003, 2008
Priority and VLAN Support	Enable	Enable Disable	Device Manager	
TCP/UDP IPv4 Checksum Offload	Enable	Enable Disable	Device Manager	Supported on Windows Server 2003 and 2008 for IPv4 traffic.
TCP/UDP IPv6 Checksum Offload	Enable	Enable Disable	Device Manager	Supported on Windows Server 2008 for IPv6 traffic.
Teaming	N/A	Team up to eight ports.	Device Manager HCM ¹ BCU commands. ¹	Creates team of adapter ports of following types: <ul style="list-style-type: none"> • Failover and failback • 802.3ad based link aggregation
VLAN ID	Disabled = 0	Can enable VLAN IDs with values from 0-4094	Device Manager HCM ¹ BCU commands ¹	<ul style="list-style-type: none"> • Create a single port VLAN with Device Manager. • Creates multiple VLANs using BCU commands or HCM. Disable VLANs in Device Manager. • Supported by Windows Server 2003 and 2008
VMQ	Enabled = 1	<ul style="list-style-type: none"> • Enabled =1 Virtual machine queue capability is published to the operating system. • Disabled =0 Virtual machine queue capability is not published to the operating system. 	Device Manager Configuring the VM to use VMQ can be done through SCVMM or hyper-V manager.	<ul style="list-style-type: none"> • Virtual Machine Queue. • VMQ is only available when 2008 R2 driver is installed on a 2008 R2 operating system. • Unless the administrator configures a VM to use VMQ through SCVMM or hyper-V manager, it will not be used by the operating system.

1. Refer to the Brocade Adapters Administrator's Guide for details.

Managing Windows driver configuration with Device Manager

Use the Windows Device Manager to configure the following parameters:

- Autorecovery
- Flow Control
- Interrupt Moderation
- IPv4 Checksum Offload
- Jumbo Packet Size
- Large Segmentation Offload V1 IPv4 (LSOv1)
- Large Segmentation Offload V2 IPv4 (LSOv2)
- Large Segmentation Offload V2 IPv6 (LSOv2)
- Locally Administered Network Address
- Priority and VLAN support
- Receive Side Scaling (RSS)
- TCP/UDP IPv4 Checksum Offload
- TCP/UDP IPv6 Checksum Offload

Following is an example for using the Device Manager on Windows 2008 Server. To configure these parameters, use the following steps.

1. Run `devmgmt.msc` to open the **Device Manager** window.
2. Expand **Network Adapters**.
An instance of the adapter model should display for each installed adapter port.
3. Right-click an adapter port instance and select **Properties** to display the **Properties** dialog box for the port.
4. Select the **Advanced** tab.

[Figure 21](#) on page 214 illustrates the **Advanced** tab from a host running Windows Server 2008.

A Network driver parameters

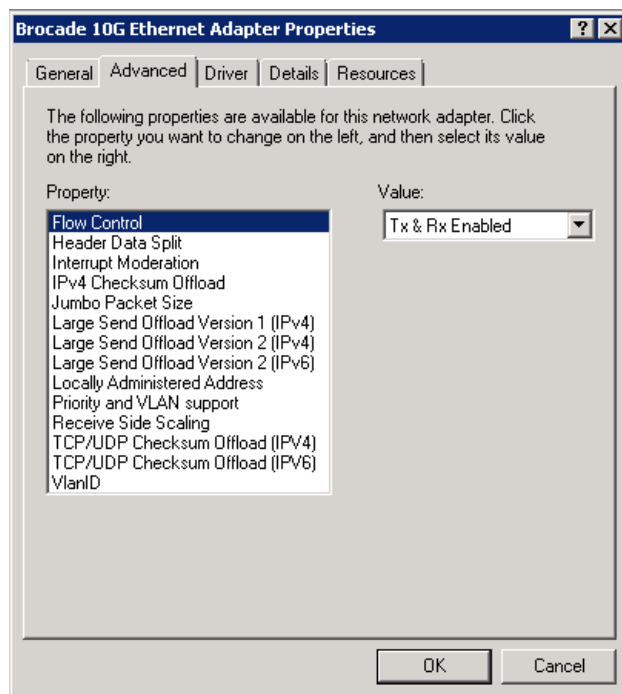


FIGURE 21 Properties dialog box for adapter port (Advanced tab)

5. Select the **Property** that you want to configure and select the **Value**.
6. Click **OK** when finished.
7. Repeat steps 2 through 5 for each port that you want to configure.

NIC Teaming

When adapter ports are configured as members of NIC teams, an instance of the team name (Team#Team_Name) appears in the **Device Manager**. Right-clicking this instance displays a **Properties** dialog box similar to the example shown in [Figure 22](#) on page 215. Note that the team name (Failover) displays in the dialog box title. Configure team-related parameters for all ports belonging to a team using the **Advanced** tab.

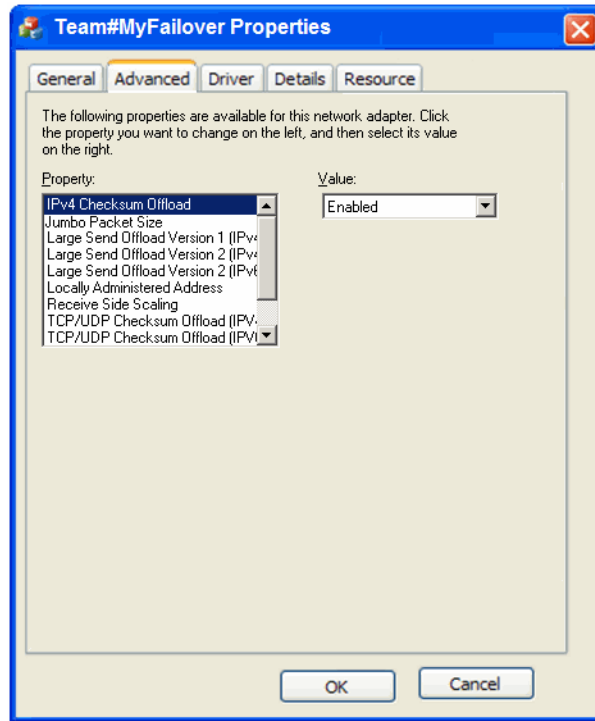


FIGURE 22 Advanced Properties dialog box for team

An instance of a physical port that is part of a team displays in the **Device Manager** as “Team#Team Name” followed by the physical adapter name, for example, “Team#Failover Brocade 10G Ethernet Adapter.” Right-clicking this instance displays a **Properties** dialog box labeled “Team#Failover Brocade 10G Ethernet Adapter.” The **Advanced** tab contains the same parameters as shown in [Figure 21](#) on page 214 for the physical port. Note that you cannot configure the parameters in this dialog box that are configured for a team without removing the port as a member of the team. However, you can configure other parameters, such as VLAN ID, Receive Buffers, Autorecovery, or Priority and VLAN Support, as they are not team parameters.

Linux

Table 38 describes the instance-specific network configuration parameters available for Linux hosts.

TABLE 38 Network driver configuration parameters

Function	Default Value	Possible Values	Method to Configure	Notes
Log Level	3	0 = EMERG 3 = Warning 6 = INFO 7 = DEBUG	Module parameter (bnad_log_level)	Linux log level
Interrupt Moderation (Set for receive interrupts)	On	On Off	ethtool -C command	Reduces context switching and CPU utilization. When enabled, the hardware will not generate an interrupt immediately after it receives a packet, but waits for more packets or a time-out to expire
Jumbo Packet Size	1500	1500-9000 bytes	ifconfig command	Sets MTU size. Size must not be greater than size set on FCoE switch
TCP-UDP Checksum Offload (instance-specific parameter)	Enable	Enable Disable	ethtool -K command (offload -K ethX)	Enable or disable transmit and receive checksum offload.
TCP Segmentation Offload (TSO) (instance-specific parameter)	Enable	Enable Disable	ethtool -K command (ethtool -K ethX)	
MSI-X (Message Signaled Interrupts Extended)	1	1 = Enable 0 = Disable	Module parameter (bnad_msix)	Parameter is only supported on 2.6 kernels that support MSI.
Locally Administered Address (MAC)	NA	Hexadecimal digits for MAC address.	ifconfig hw ether command	Overrides the burned-in MAC address.
Interrupt Coalescing ¹	60 rx-usecs 100 tx-usecs 32 tx-frames 6 rx-frames ²	1-1280 (8 bits) 0-1280 (8 bits) 0-256 (8 bits) 0-256 (8 bits)	ethtool -C command (coalescing ethX)	
Legacy Ethernet pause	NA	autoneg: off, on rx: off, on tx: off, on	ethtool -A command	Flow control mechanism for Ethernet.

1. The default values are optimized for this feature and should only be modified by expert users with knowledge of how values change operation.

2. Modifying rx-frame values have no effect at this time as the inter-pkt mechanism is not enabled for the receive side.

Managing Linux driver configuration with ethtool

Following are examples of using the ethtool K commands to change adapter settings for driver parameters:

- TCP-UDP Checksum Offload

To enable or disable TCP-UDP checksum offload, enter the following command:

```
ethtool -K|--offload ethX [rx on|off] [tx on|off]
```

where:

ethx Adapter position in server. For example, eth0 is the first Ethernet interface found in the system, eth1 is the second, eth2 is the third, and so on. Use appropriate name for the adapter.

rx Receive

tx Transmit

- TCP Segmentation Offload (TSO)

```
ethtool -K ethX tso [on|off]
```

where:

ethx Adapter position in server. For example, eth0 is the first Ethernet interface found in the system, eth1 is the second, eth2 is the third, and so on.

tso TCP Segmentation Offload

- Display current offload settings, enter the following command:

```
ethtool -k ethX
```

where:

ethx Adapter position in server. For example, eth0 is the first Ethernet interface found in the system, eth1 is the second, eth2 is the third, and so on.

- Interrupt Moderation

```
ethtool -C vmnicX adaptive-rx on|off
```

where:

ethx Adapter position in server. For example, eth0 is the first Ethernet interface found in the system, eth1 is the second, eth2 is the third, and so on.

NOTE

For more information on using the **ethtool** command, refer to your Linux system documentation or ethtool man pages.

- Following is an example to enable or disable Ethernet pause.

```
ethtool -A ethx [autoneg on|off] [rx on|off] [tx on|off]
```

where:

ethx Adapter position in server. For example, eth0 is the first Ethernet interface found in the system, eth1 is the second, eth2 is the third, and so on.

autoneg Autonegotiate on or off

rx	Receive on or off
tx	Transmit on or off

Managing Linux driver configuration with module parameter

Either the driver configuration parameter values can be loaded with the driver or can be set in `/etc/modprobe.conf` before loading the driver. Following are examples of using `modprobe` to change network driver configuration:

- This example, sets the Linux logging level to debugging mode and loads the driver with the parameter value.

```
modprobe bna bnad_log_level=7
```

- This example sets the Linux logging level to debugging mode. Add the entry in `/etc/modprobe.conf`, then load the driver.

```
options bna bnad_log_level=7
```

- This example enables or disables MSI-X and loads the driver with the parameter value.

```
modprobe bna bnad_msix=[0|1]
```

- This example enables or disables MSI-X. Add the entry in `/etc/modprobe.conf`, then load the driver.

```
options bna bnad_msix=[0|1]
```

NOTE

MSI-X is enabled in the network driver by default, and must remain enabled for NetQueue to function. Enabling NetQueue in VMware system also enables MSI-X in the system. If enabling NetQueue, make sure that `bnad_msix=0` is not listed in VMware module parameters because that would disable NetQueue.

Managing Linux driver configuration with module ifconfig

Following are examples of using `ifconfig` to change network driver configuration.

- This example, sets the locally administered MAC address.

```
ifconfig ethX hw ether [addr]
```

where:

`ethx` Adapter position in server. For example, `eth0` is the first Ethernet interface found in the system, `eth1` is the second, `eth2` is the third, and so on.

- This example, sets the Jumbo Packet (MTU) size.

```
ifconfig ethx mtu <MTU size>
```

where:

`ethx` Adapter position in server. For example, `eth0` is the first Ethernet interface found in the system, `eth1` is the second, `eth2` is the third, and so on.

`MTU size` MTU size (1500-9000 kb)

VMware

Table 39 describes the instance-specific network configuration parameters available for VMware hosts. You can list all module parameters that you can configure for the network driver using the following command.

```
vmkload_mod -s bna
```

TABLE 39 Network driver configuration parameters

Function	Default Value	Possible Values	Method to Configure	Notes
Jumbo Packet Size	1500	1500-9000	esxcfg-vswitch command	<ul style="list-style-type: none"> • Sets MTU size. • Size must not be greater than size set on FCoE switch. • You must enable the MTU size for each vswitch or VMkernel interface.
VLAN ID	Disabled = 0	Can enable VLAN IDs with values from 0-4094	esxcfg-vswitch command	Assign a VLAN ID to a port group on a specific vswitch
MSI-X (Message Signaled Interrupts Extended)	Enable (0)	Disable (1) Enable (0)	cfg module parameter (bnad_msix_disable)	<ul style="list-style-type: none"> • Advanced user configuration • This parameter is used to disable (MSI-X). • The parameter is enabled by default in the network driver. However, the NetQueue feature of VMware must be enabled in the VMware system to enable MSI-X in the system. • Driver will attempt to enable, but use INTx in case MSI-X is not supported or NetQueue is not enabled.
Interrupt Moderation (Set for receive interrupts)	On	On Off	ethtool -C command	Reduces context switching and CPU utilization. When enabled, the hardware will not generate an interrupt immediately after it receives a packet, but waits for more packets or a time-out to expire
NetQueue	Enabled	Enable Disable	VM Client interface	Enables NetQueue for improving receive-side networking performance on servers with multiple CPUs.

TABLE 39 Network driver configuration parameters (continued)

Function	Default Value	Possible Values	Method to Configure	Notes
Other NetQueue Configuration <ul style="list-style-type: none"> Number of NetQueues and filters Heap values 	NA	NA	esxcfg-module VM Client interface	Refer to “Configuring NetQueue” on page 221.
Legacy Ethernet pause	NA	autoneg: off, on rx: off, on tx: off, on	ethtool -A command	Flow control mechanism for Ethernet.

Managing VMware driver configuration with *cfg*

- Following is an example of using the **esxcfg-module** command to disable message signaled interrupts (MSI-X).

```
esxcfg-module -s "bnad_msix_disable=1" bna
```

where:

bnad_msix_disable Brocade network adapter message signaled interrupts

1 Disables MSI-X and enables INTx mode instead.

NOTE

MSI-X is enabled in the network driver by default, and must remain enabled for NetQueue to function. Enabling NetQueue in VMware system also enables MSI-X in the system by default. If enabling NetQueue, make sure that bnad_msix_disable=1 is not listed in VMware module parameters because that would disable NetQueue.

- Display current driver configuration settings using the following command:

```
esxcfg-module -g bna
```

- Following is an example of using the **esxcfg** command to set the Jumbo Packet (MTU) size. First, set the MTU size on a virtual switch using the following command.

```
esxcfg-vswitch -m <MTU size> <vSwitch ID>
```

where:

MTU size MTU size (1500-9000 kb)

vSwitch ID Virtual switch identification, such as vSwitch0

Display a list of virtual switches on the host system and their configurations using the following command.

```
esxcfg-vswitch -l
```

Next, create VMkernel interface with the MTU setting.

```
esxcfg-vmknic -a "VM Kernel" -i <IP address> -n <subnet mask> -m <MTU size>
```

where:

VM Kernel VMkernel name.

IP address IP address for VMkernel NIC
 subnet mask Subnet mask for VMkernel NIC
 MTU size MTU size (1500-9000 kb)

- Following is an example to configure a VLAN ID for a port group on a specific virtual switch.
`esxcfg-vswitch -v <VLAN ID> -p <port group name> <virtual switch name>`

where:

VLAN ID ID of 0-4094. A value of 0 disables VLANs.
 port group name Name of port group you have configured for virtual switch.
 virtual switch name Name of virtual switch containing port group.

NOTE

For more information on using the **esxcfg** commands, refer to your VMware system documentation or man pages.

- Following is an example to enable or disable Ethernet pause.

`ethtool -A eth<X> [autoneg on|off] [rx on|off] [tx on|off]`

where:

ethx Adapter position in server. For example, eth0 is the first Ethernet interface found in the system, eth1 is the second, eth2 is the third, and so on.
 autoneg Autonegotiate on or off
 rx Receive on or off
 tx Transmit on or off

Managing VMware driver configuration with ethtool

To enable or disable interrupt moderation, use the following command.

`ethtool -C ethX adaptive-rx on|off`

where:

ethx Adapter position in server. For example, eth0 is the first Ethernet interface found in the system, eth1 is the second, eth2 is the third, and so on.

Configuring NetQueue

NetQueue improves receive-side networking performance on servers in 10 Gigabit Ethernet virtualized environments. NetQueue provides multiple receive and transmit queues on the CNA, which allows processing on multiple CPUs to improve network performance.

NOTE

MSI-X is enabled in the network driver by default, and must remain enabled for NetQueue to function. Enabling NetQueue in VMware system also enables MSI-X in the system. Please make sure that `bnad_msix_disable=1` is not listed in VMware module parameters because that would disable NetQueue.

You can use *ethtool* to obtain hardware statistics to verify traffic over different receive and transmit queues. You can also use the VMware *vsish* utility to display current NetQueue information, such as maximum number of queues, number of active queues, and default queue identification.

Use the following example procedures to enable or disable NetQueue, change the number of NetQueues and filters, and to set system heap values appropriately for using NetQueue and jumbo frames.

Enable or disable NetQueue with VI Client screens

Following is an example of using VI Client configuration screens to enable and disable NetQueue.

Enable NetQueue in VMkernel using the VI Client as follows.

1. Log in to the VI Client.
2. Click the **Configuration** tab for the Server host.
3. Click **Advanced Settings**.
4. Click **VMkernel**.
5. Select the check box for **VMkernel.Boot.netNetqueueEnabled**, then click **OK**.
6. Reboot the server.

Disable NetQueue in VMkernel using the VI Client as follows.

1. Log in to the VI Client.
2. Click the **Configuration** tab for the Server host.
3. Click **Advanced Settings**.
4. Click **VMkernel**.
5. Select the checkbox for **VMkernel.Boot.netNetqueueDisabled**, then click **OK**.
6. Reboot the server.

NOTE

For more information on using this command, refer to your VMware system documentation on enabling NetQueue in VMware 4.0.

Managing the number of NetQueues and filters with *cfg*

For the Brocade driver, you cannot directly configure the number of NetQueues and filters per NetQueue. By default, these values are based on the number of receive queue sets used, which are calculated from the number of CPUs in the system. In general, NetQueues and filters per NetQueue are calculated according to the following guidelines:

- Including the default NetQueue, the number of NetQueues equals the number of CPUs in the system, or a maximum of 8. When Jumbo frames are enabled, the maximum is 4.
- The number of filters per receive NetQueue is calculated so that hardware resources are distributed equally to the non-default NetQueues.

[Table 40](#) summarizes NetQueues and Receive Filters per NetQueue values per number of CPUs for CNA models.

TABLE 40 NetQueues and filters per NetQueue for CNAs

CPUs	NetQueues (no default)	NetQueues (jumbo)	Receive Filters per NetQueue
1	0	0	0
2	1	1	63
4	3	3	21
8	7	3	9
16	7	3	9
32	7	3	9
64	7	3	9
128	7	3	9

Table 41 summarizes NetQueues and Receive Filters per NetQueue values per number of CPUs for Fabric Adapter ports configured in CNA mode.

TABLE 41 NetQueues and filters per NetQueue for Fabric Adapter ports in CNA mode

CPUs	NetQueues (no default)	NetQueues (jumbo)	Receive Filters per NetQueue
1	0	0	0
2	1	1	31
4	3	3	10
8	7	3	4
16	7	3	4
32	7	3	4
64	7	3	4
128	7	3	4

Setting heap size

Enabling NetQueue and using jumbo frames can cause the network stack to run out of heap when default values are set for netPktHeapMaxSize and netPktHeapMinSize. To set heap values to appropriate values, use the following steps.

1. Log in to the VI Client.
2. Click the **Configuration** tab for the Server host.
3. Click **Advanced Settings**.
4. Click **VMkernel**.
5. Find the corresponding value field for VMkernel.Boot.netPktHeapMaxSize, and enter 128.
6. Find the corresponding value field for VMkernel.Boot.netPktHeapMinSize, and enter 32.
7. Click **OK** to save the changes.
8. Reboot the system.

Enabling jumbo frames for Solaris

For Solaris 10, you can enable support for jumbo packet frames and set the MTU size for these frames up to 9000. Use the following steps:

1. Add the following line to the bna.conf file. This file is located in /kernel/drv/bna.conf.

```
bfa<x>_port-mtu=<mtu_value>
```

where:

x BNA (Brocade Network Adapter) driver instance number

mtu_value 1500 to 9000

NOTE

Size must not be greater than size set on the FCoE switch.

2. Reload the driver.
3. Enter the following command:
ifconfig bna<instance number> mtu <MTU size set in Step 1>

MIB Reference

In this appendix

Table 42 provides information on the MIB groups and objects that support the Simple Network Management Protocol for CNA adapters and Fabric Adapter ports configured in CNA mode. For more information on adapter SNMP support, refer to “Simple Network Management Protocol” on page 34.

TABLE 42 Supported MIB groups and objects for SNMP

Group	MIB Objects	Function
Product Identification Group	productIDDisplayName	Name of this product
	productIDDescription	Short description of the product
	productIDVendor	Manufacturer
	productIDVersion	Firmware version
	productIDBuildNumber	Build version
	productIDURL	URL of WEB based application to manage this product.
Product Status Group	productIDDeviceNetworkName	Operating system specific computer name
	productStatusGlobalStatus	Current status of the product
	productStatusLastGlobalStatus	Other/Unknown/OK/Non?]Critical/Critical/Non?]recoverable
Physical Group (Adapter Attributes)	productStatusTimestamp	The status before the current status
	adapterIndex	Index of the adapter
	adapterName	Name of the adapter
	adapterType	Type such as FC, CNA
	adapterSerialNumber	Serial Number
	adapterModelInfo	Model information of the adapter (for example, Brocade 1010)
	adapterOEMInfo	An OEM-specific information (if applicable)
	adapterPCIVendorId	PCI Vendor ID
	adapterPCIDeviceId	PCI Device ID
	adapterPCISsvId	PCI Subsystem Vendor ID
adapterHWVersion	Hardware version	

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TABLE 42 Supported MIB groups and objects for SNMP (continued)

Group	MIB Objects	Function
Physical Group (Port Attributes)	portAdapterIndex	Adapter index of the port
	portIndex	Port Index
	portLinkStatus	Port link status
	portDuplexMode	Port duplex mode
	portAutonegotiateMode	Port autonegotiate mode enabled or disabled
Physical Group (Interface Attributes)	portMaxSpeed	Max speed of the port
	ethAdapterIndex	Adapter Index of the interface
	ethPortIndex	Interface port index
	ethLargeReceiveOffload	Enabled or disabled state of large receive offload
	ethLargeSendOffloadv4	Enabled or disabled state of large send offload for IPv4
	ethLargeSendOffloadv6	enabled/disabled state of large send offload for IPv6
	ethIPv4ChecksumOffload	Enabled or disabled state of IPv4 checksum offload
	ethIPv6ChecksumOffload	Enabled or disabled state of IPv6 checksum offload
	ethMode	Loopback, promiscuous, or normal mode
ethMTU	Maximum transmission unit configured	
Statistics Group (Port Statistics)	portStatsAdapterIndex	Adapter index of the port
	portStatsPortIndex	Port Index
	portRxPackets	Number of packets received
	portTxPackets	Number of packets transmitted
	portRxErrors	Number of receive errors
	portTxErrors	Number of transmission errors
	portRxDropped	Number of packets dropped
	portTxDropped	Number of packets not transmitted
	portRxMulticast	Number of multicast packets received
	portRxBroadcast	Number of broadcast packets received
	portMacRxDrop	Number of packets dropped
	portMacTxErrs	Number of transmission errors

TABLE 42 Supported MIB groups and objects for SNMP (continued)

Group	MIB Objects	Function
	portMacRxBytes	Number of bytes received
	portMacRxPackets	Number of packets received
	portMacTxBytes	Number of bytes transmitted
	portMacTxPackets	Number of packets transmitted
	portRxCRCErrors	Number of packets received with CRC errors
	portHeartbeatErrors	Number of heartbeat errors
Statistics Group (VLAN Statistics)	vLANId	VLAN identification
	vLanAdapterIndex	VLAN adapter Index
	vLanPortIndex	VLAN port Index
	vLANTxPackets	Number of packets transmitted
	vLANRxPackets	Number of packets received
	vLANTxErrors	Number of transmission errors
	vLANRxErrors	Number of receive errors
Logical Group (VLAN Attributes)	vLANId	VLAN index
	vLanAdapterIndex	VLAN adapter Index
	vLanPortIndex	VLAN port index
	vLANName	Name of the device as it appears in device manager (for example, Brocade 10G advanced virtual miniport #1)
	vLANInterfaceName	Name of the interface as it appears in network connections list (for example, local area connection #X)
	vLANEnabled	VLAN state enabled 1, disabled 0
	vLANStatus	Connected or disconnected
Logical Group (Team Attributes)	teamId	Unique Identifier of the team
	teamName	Unique team name
	teamMode	Team mode such as {none, failback, 802-2ad}
	teamPreferredPrimaryIndex	Index of the primary member
	teamCurrentPrimaryIndex	Current primary member index
	teamMACAddress	MAC Address of the team
	teamNumberOfMembers	Number of members of the team
	teamIPAddress	Team IP Address
	teamLinkState	Team Link State

B In this appendix

TABLE 42 Supported MIB groups and objects for SNMP (continued)

Group	MIB Objects	Function
	teamSpeed	Team speed
Logical Group (Team Members)	teamAdapterIndex	Index of the adapter
	teamPortIndex	Index of the port
	teamMemberType	Type of the team member
	teamMemberStatus	Status of the member
	teamMemberMACAddress	MAC address of the member
Traps and Events Group	vLANAdded	VLAN added
	vLANRemoved	VLAN removed
	teamMemberAdded	Team member added
	teamMemberRemoved	Team member removed
	teamFailover	Team failover
	teamFailback	Team failback
	teamAdded	Team added
	teamRemoved	Team removed
	LinkUp (supported by native SNMP service)	Port link up event
	LinkDown (supported by native SNMP service)	Port link down event

List of Acronyms

Following is a list of acronyms used in this publication and their meaning.

AEN

Asynchronous Event Notification

BASI

Brocade Adapter Software Installer

BCU

Brocade Command Line Utility

BFA

Brocade Fabric Adapter

BFAD

Brocade Fabric Adapter Driver

BFAL

Brocade Fabric Adapter Driver Library

BNA

Brocade Network Advisor

BNI

Brocade Network Intermediate driver

BIOS

Basic Input/Output System

BNA

Brocade Network Adapter

BNAD

Brocade Network Adapter Driver

BOFM

BladeCenter Open Fabric Manager

CEE

Converged Enhanced Ethernet

C List of Acronyms

CFFh

Compact Form Factor Horizontal

CFFv

Compact Form Factor Vertical

CIM

Common Information Model

CIOv

Channel I/O Virtualization

CNA

Converged Network Adapter

DCBCXP

Data Center Bridging Capability Exchange Protocol

DHCP

Dynamic Host Configuration Protocol (DHCP)

DCB

Data Center Bridging

DCBX

Data Center Bridging Exchange

DMA

Direct Memory Access

EMC

Electromagnetic Compatibility

EPUP

Environmental Protection Use Period

ESD

Electrostatic Discharge

ETS

Enhanced Transmission Selection

FAA

Fabric Assigned Address

FCF

Fibre Channel Forwarder

FCoE

Fibre Channel over Ethernet

FCP

Fibre Channel Protocol

FC-SP

Fibre Channel-Security Protocol

FDMI

Fabric Device Management Interface

FIP

FCoE Initialization Protocol

FTP

File Transfer Program

GUI

Graphical User Interface

GZME

Get Zone Member List

HBA

Host Bus Adapter

HCM

Host Connectivity Manager

HS/TS

Hazardous Substances/Toxic Substances

initrd

Initial RAM disk

IRQ

Interrupt Request

ISA/EISA

Industry Standard Architecture/Extended Industry Standard Architecture

KVM

Keyboard, Video or Visual Display Unit, Mouse

LKA

Link Keep Alive

LLDP

Link Layer Discovery Protocol

C List of Acronyms

LUN	Logical Unit Number
iSCSI	Internet Small Computer System Interface
ISO	International Standards Organization
LACP	Link Aggregation Control Protocol
LSO	Large Send Offload
LVD	Low Voltage Directive
MAC	Media Access Control
MSI	Message Signaled Interrupts
MSI-X	Message Signaled Interrupts Extended
MTU	Maximum Transmission Unit
NBP	Network Bootstrap Program
NDIS	Network Driver interface Specification
NETIOC	Network I/O Control
NIC	Network Interface Card
NPIV	N_Port ID Virtualization
NWWN	Node World Wide Name

OEL

Oracle Enterprise Linux

PF

Physical function

PHY

Physical layer

PFC

Pre-Priority-Based Flow Control

PCI

Peripheral Component Interconnect

PCIe

Peripheral Component Interconnect Express

POM

Pluggable Optical Module

PWWN

Port World Wide Name

PXE

Preboot eXecution Environment

QoS

Quality of Service

RHEL

Red Hat Enterprise Linux

RPSC

Remote Port Speed Capability

SAN

Storage Area Network

SCP

Secure Copy

SFCB

Small Footprint CIM Broker

SFP

Small Form Factor Pluggable

C List of Acronyms

SLES

SUSE Linux Enterprise Server

SMI-S

Storage Management Initiative Specification

SoL

Serial Over LAN

SSID

Subsystem ID

SVID

Subsystem Vendor Identification

SRIOV

Single Root I/O Virtualization (SRIOV)

TCP

Transmission Control Protocol

TFTP

Trivial File Transfer

TLV

type-length-values

TSO

TCP Segmentation Offload

TRL

Target Rate Limiting

UAC

User Account Control

UDP

User Datagram Protocol

UEFI

Unified Extensible Firmware Interface (UEFI) boot support

UNDI

Universal Network Device Interface

VC

Virtual Channel

VCCI

Voluntary Control Council For Interference by Information Technology Equipment

VID

Vendor ID

vHBA

Virtual Host Bus Adapter

VM

Virtual Machine

vNIC

Virtual Network Interface Card

VLAN

Virtual Local Area Network

VMQ

Virtual Machine Queue

WFAS

Windows Firewall and Advanced Service

WHQL

Windows Hardware Quality Lab

WinPE

Windows Preinstallation Environment

WMI

Windows Management Initiative

WoL

Wake on LAN

WWN

World-Wide Name

WWPN

World-Wide Port Name

C List of Acronyms

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