Emulex® OneCommand® Manager Application for LightPulse® Adapter

User Guide
Release 12.0

Table of Contents

Chapter 1: Introduction

The Emulex® OneCommand ® Manager application is a comprehensive management utility for Emulex adapters that provides a powerful, centralized adapter management suite. Adapter management includes discovery, reporting, and management of local and remote adapters from a single console anywhere in the network and across operating system platforms. Remote configuration capability is provided by Transmission Control Protocol/Internet Protocol (TCP/IP) access from IP addresses of remote machines. The OneCommand Manager application contains a graphical user interface (GUI) and a command line interface (CLI). Refer to the *Emulex OneCommand Manager Command Line Interface for LightPulse Adapters User Guide* for information about installing and using the CLI.

NOTE: Screen captures in this user guide are for illustrative purposes only. Your system information can vary.

The OneCommand Manager application can be installed on multiple operating systems, including Windows, Linux, and Solaris. For supported versions of operating systems, platforms, and adapters, go to www.broadcom.com.

For VMware hosts, use the OneCommand Manager application for VMware vCenter. For more details, refer to the *Emulex OneCommand Manager for VMware vCenter for LightPulse Adapters User Guide*. You can manage adapters using the OneCommand Manager application on Windows, but you must install and use the appropriate Emulex CIM Provider.

1.1 Abbreviations

AL_PA	Arbitrated Loop Physical Address
AP	access point
API	application programming interface
ASIC	application-specific integrated circuit
ASCII	American Standard Code for Information Interchange
BIOS	basic input/output system
BOFM	Blade Open Firmware Management Protocol
CIM	Common Interface Model
CLI	command line interface
CND	congestion notification domain
CLP	Command Line Protocol
CRC	cyclic redundancy check
CSV	comma-separated values
D_ID	destination identifier
DCB	Data Center Bridging
DCBX	Data Center Bridging Capabilities Exchange
DDR	double data rate
DH	Diffie-Hellman
DHCHAP	Diffie-Hellman Challenge Handshake Authentication Protocol
DHCP	Dynamic Host Control Protocol
DID	device ID
DMA	direct memory access
EDD	Enhanced Disk Drive
EFD	Enhanced FAT Dump
EFI	Extensible Firmware Interface
F_BSY	FC port busy
FA-PWWN	Fabric Assigned Port Word Wide Name
FC	Fibre Channel
FC-SP	Fibre Channel Security Protocol
FLOGI	Fabric login
GFC	gigabit Fibre Channel
GFO	Get Fabric Object
GUI	graphical user interface
HBA	host bus adapter
HTTP	Hypertext Transfer Protocol
I/O	input/output
IEEE	Institute of Electrical and Electronics Engineers
IIS	Internet Information Services

IP	Internet Protocol
IPL	initial program load
JEDEC	Joint Electron Device Engineering Council
JNLP	Java Network Launching Protocol
JRE	Java Runtime Environment
LAN	local area network
LDAP	Lightweight Directory Access Protocol
LED	light-emitting diode
LIP	Loop Initialization Primitive
LLDP	Link Layer Discovery Protocol
LUN	logical unit number
MAC	Media Access Control
MIME	Multipurpose Internet Mail Extension
MTU	maximum transmission unit
NCSI	Network Communication Services Interface
NOS	network operating system
NPIV	N_Port ID Virtualization
NVRAM	non volatile random access memory
OS	operating system
OUI	Organizationally Unique Identifier
PAM	pluggable authentication modules
PCI	Peripheral Component Interconnect (interface)
PFC	priority flow control
PG	priority group
POST	power-on self-test
PXE	Preboot Execution Environment
QoS	quality of service
RAID	redundant array of independent disks
RHEL	Red Hat Enterprise Linux
RMAPI	Remote Management application programming interface
SAN	storage area network
SCSI	Small Computer System Interface
SFP	small form-factor pluggable
SFS	Software Foundation Software
SLES	SUSE Linux Enterprise Server
TCP	Transmission Control Protocol
TCP/IP	TCP over Internet Protocol
Tx	transmit
UEFI	Unified Extensible Firmware Interface

UFP	Universal Fabric Port
ULP	Upper Layer Protocol
VF	virtual function
VLAN	virtual local area network
VLAN ID	VLAN identifier
VM	virtual machine
VPD	vital product data
vPort	virtual port
WLAN	wireless LAN
WWN	World Wide Name
WWNN	World Wide Node Name
WWPN	World Wide Port Name

Chapter 2: Installing and Uninstalling OneCommand Manager Application Components

This section describes installing and uninstalling the OneCommand Manager application.

2.1 Installing the OneCommand Manager Application

2.1.1 In Windows

The OneCommand Manager application can be installed two ways:

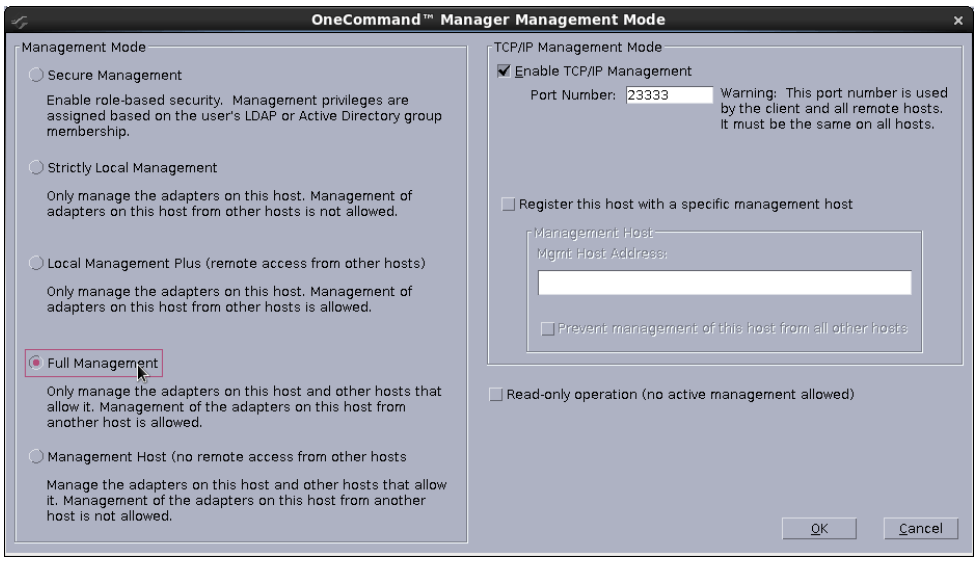
- Attended installation using the GUI.
- Unattended installation using the command line.

2.1.1.1 Attended Installation in Windows

To install the OneCommand Manager application in Windows, perform these steps:

1. Download the x64 or x86 OneCommand Manager Enterprise Kit installation file from the Documents and Downloads area of www.broadcom.com.
2. Navigate to the directory to which you downloaded the file.
3. Double-click the `elxocm-windows-<version>.exe` file. The **Emulex OCManager Enterprise** window appears. Click **Next**. The **Installation Options** window appears.
4. Select the components that you want to install and click **Install**. After installing the OneCommand Manager application files, the **OneCommand Manager Management Mode** dialog appears (Figure 1).

Figure 1: Management Mode Dialog



The **OneCommand Manager Management Mode** dialog enables you to select Secure Management to assign the desired user privileges, or you can choose one of the other management modes. See Section 4.2, Using OneCommand Manager Secure Management, or Section 4.3, Changing Management and Read-Only Mode, for more information. Choose the management type you want and click **OK**.

5. Select or clear the **Enable TCP/IP Management** check box to enable or disable remote management over TCP/IP. You can also change the TCP/IP port used (23333 is the IANA registered port for Broadcom).
6. The **Installation Completed** window appears when the installation is finished. Click **Finish**. A shortcut is added to the **Start** menu. You do not need to reboot the system.

2.1.1.2 Unattended Installation in Windows

To install the OneCommand Manager application in Windows, perform these steps:

1. Download the x64 or x86 OneCommand Manager Enterprise Kit installation file to your system from the Documents and Downloads area of www.broadcom.com.
2. Activate the kit with switch `/q` or `/q2`.
   – The `/q` switch displays progress reports.
   – The `/q2` switch does not display progress reports.
3. Enable Secure Management mode by adding the `sec=1` argument or disable it by adding the `sec=0` argument. If the sec argument is not entered, Secure Management mode is disabled by default. See Section 4.2, Using OneCommand Manager Secure Management, for more information.

   To enable Secure Management mode, type the following command at the command prompt:
   `elxocm-windows-x86-<version>.exe  sec=1 /q2`
   To disable Secure Management mode, type the following command at the command prompt:
   `elxocm-windows-x86-<version>.exe  sec=0 /q2`

NOTE: The management mode defaults for unattended installation are:

- `mmode = 2` (Local Plus Management mode)
- `achange = 1`

4. Select a management mode by adding the `mmode` argument and the ability to change that management mode by adding the `achange` argument with selected values as in the following example. See Section 4.3, Changing Management and Read-Only Mode, for more information.

NOTE: If you enabled Secure Management mode in Step 3 and entered an `mmode` value, it results in a 'conflicting parameters' error.

For example, type the following command at the command prompt:
`elxocm-windows-x86-<version>.exe mmode=3 achange=1 /q2`
The following are the possible `mmode` values:

`1` – Local Only Management mode

`2` – Local Plus Management mode

`3` – Full Management mode

`4` – Local Plus Management mode and read only

`5` – Full Management mode and read only

`6` – Management host

The following are the possible `achange` values:

`0` – Do not allow management mode to change

`1` – Allow management mode to change

You can also set the following optional parameters:

– `MHost` – This optional switch allows a non-management-host user to select a Management Host with which to register. If this switch is not specified, the default value of 0 is used, and the capability is disabled. If the switch is specified, the value can be a host name or an IP address that is validated by the installer. An error message appears if `/mmode` is set as Local Only or Management Host.

– `excl` – This optional switch allows the non-management-host user to select whether the OneCommand Manager application processes requests exclusively from the Management Host specified by the `MHost` parameter. This option is only accepted if accompanied by a valid `MHost` value; otherwise, an error message appears. If this switch is not specified, the default value of `0` is used. If the parameter is specified, the valid values are:

- `0` – Remotely managed by other hosts.
- `1` – Remotely managed by Management Host *only*.

– `Mtcp` – This optional parameter allows you to enable or disable remote management and to specify the TCP/IP port number over which management occurs. If this parameter is not specified, the default TCP/IP port number 23333 is used.

If the **Management Host** option is selected, you must either select the default port number or enter a valid TCP/IP port number on the command line. A value of `0` is not accepted.

If one of the non-management host options is selected, you can enter the TCP/IP port number on the command line.

2.1.2 In Linux

NOTE: The OneCommand Manager application GUI is not supported on Citrix XenServer; however, the OneCommand Manager application CLI is supported. Refer to the *Emulex OneCommand Manager Command Line Interface for LightPulse Adapters User Guide* for Citrix instructions.

The following must be installed before you can install the OneCommand Manager application:

- The appropriate driver version for your operating system. Refer to the Documents and Downloads area of www.broadcom.com for the latest drivers.

NOTE: The RHEL 6 Enterprise kit requires the installation of the libstdc++-5.so library. This library is available through the `compat-libstdc++-33-3.2.3-68.<arch>.rpm` or later. The PPC and x86_64 builds require the 64-bit version, which is installed in `/usr/lib64`. The i386 build requires the 32-bit version, which is installed in `/usr/lib`.

- Previous versions of the Linux driver must be uninstalled. You must run the uninstall script that shipped with the version of the Linux driver you want to remove.

2.1.2.1 Attended Installation in Linux

To install the OneCommand Manager application, or to update an existing installation, perform these steps:

1. Log on as root.
2. Download the utilities from the Documents and Downloads area of www.broadcom.com.
3. Copy the OneCommand `elxocm-<Platform>-<AppsRev>.tgz` file to a directory on the installation machine.
4. Change to the directory to which you copied the tar file.
5. Untar the file.
   – For RHEL 6 and RHEL 7, type the following:
   `tar zxvf elxocm-rhel6-rhel7-<apps_ver>-<rel>.tgz`

– For SLES 11 and SLES 12, type the following:
`tar zxvf elxocm-sles11-sles12-<apps_ver>-<rel>.tgz`

6. Change to the `elxocm` directory created in Step 3.
   – For RHEL 6 and RHEL 7, type the following:
   `cd elxocm-rhel6-rhel7-<apps_ver>-<rel>`
   – For SLES 11 and SLES 12, type the following:
   `cd elxocm-sles11-sles12-<apps_ver>-<rel>`

NOTE: Prior to installation, OneCommand Manager application groups must be configured on the LDAP network or the local host machine for Secure Management operation. See Section 4.2.1, OneCommand Manager Secure Management Configuration Requirements, for configuration instructions.

7. Run the install script. Type the following:
   `./install.sh`
8. When prompted, choose whether or not to enable Secure Management for OneCommand:
   ```
   Do you want to enable Secure Management feature for OneCommand? (s/u)
   Enter 's' to select secure management. (LDAP/NIS OCM group configuration required)
   Enter 'u' to run without secure management (default).
   Enter the letter 's' or 'u'.
   ```
   If you enter s, proceed to Step 11. You cannot choose a management mode as described in Step 9.
9. When prompted, enter the type of management mode you want to use:
   ```
   Enter the type of management you want to use:
   1 Local Mode : HBA's on this Platform can be managed by OneCommand clients on this Platform Only.
   2 Managed Mode: HBA's on this Platform can be managed by local or
   remote OneCommand clients.
   3 Remote Mode : Same as '2' plus OneCommand clients on this Platform can manage local and remote
   HBA's.
   4 Management Host : Same as '1' plus OneCommand clients on this Platform can manage remote HBA's.
   ```

NOTE: If you enabled Secure Management in Step 8, you cannot configure management mode.
– If you select option 2, you are asked if you want to enable TCP/IP management from remote hosts.
– If you select option 3, you are asked if you want to enable TCP/IP management of remote hosts, and enable TCP/IP management from remote hosts. You are prompted to enter the TCP/IP port number to use. (Leaving the field blank defaults to 23333.)
– If you select options 2 or 3, you are prompted for the management host address. (Leaving the field blanks means none.)
– You can enter an IP address or host name. If you enter a management host address, you are prompted to exclude management of this host from any other host.
– If you select option 4, management of remote hosts is automatically selected, and you are prompted to enter the TCP/IP port number to use. (Leaving the field blank defaults to 23333.)

NOTE: Management hosts cannot be managed by remote hosts.

10. If you answered 2, 3, or 4 in Step 9, you must decide whether you want the OneCommand Manager application to operate in read-only mode. Read-only mode prevents users from performing some operations, such as resetting adapters, updating an adapter's firmware, or changing adapter driver properties and bindings. It only affects the local OneCommand Manager application interface. These operations can still be performed using remote management. Enter either y for yes to allow users to perform these operations, enter n for no if read-only mode is desired.
11. You are prompted about allowing users to change the management mode after installation. Enter either y for yes, or n for no.

2.1.2.2 Unattended Installation in Linux

For unattended or silent installation of the OneCommand Manager application for Linux, installation settings are defined using the installation script command line.

NOTE: Prior to installation, OneCommand groups must be configured on the LDAP network or the local host machine for Secure Management operation. See Section 4.2.1, OneCommand Manager Secure Management Configuration Requirements, for configuration instructions.

To view the options for unattended installation, type the following:

```
./install.sh --help
```

To perform an unattended, silent installation, type the following command:

```
#./install.sh –q2
```

NOTE: The management mode default for unattended installation is Local Management Plus.

2.1.2.3 Updating an Installation in Linux

The OneCommand Manager application supports the following update paths:

- You can update from an earlier Core Kit to a later Enterprise Kit.
- You can update from an earlier Enterprise Kit to a later Enterprise Kit.

See Section 2.1.2.1, Attended Installation in Linux, or Section 2.1.2.2, Unattended Installation in Linux, for instructions.

2.1.3 In Solaris

The following Solaris drivers must be installed for the utilities to function properly:

- For all LightPulse® adapters, use the inbox driver.

To install the OneCommand Manager application in Solaris, perform these steps:

1. Copy the Solaris utility kit to a temporary directory on your system.
2. Untar the utility kit:
   `tar xvf elxocm-solaris-<version>.tar`
3. Change to the newly created `elxocm-solaris-<version>` directory:
   `cd ./elxocm-solaris-<version>/`

NOTE: Prior to installation, OneCommand groups must be configured on the LDAP network or the local host machine for Secure Management operation. See Section 4.2.1, OneCommand Manager Secure Management Configuration Requirements, for configuration instructions.

4. Run the installation script to begin installation. If the HBAnyware utility, OneCommand Manager Core, or OneCommand Manager Enterprise applications or the Solaris driver utilities are already present on the system, the installation script attempts to remove them first:
   `./install`
5. When prompted, choose whether to enable Secure Management for OneCommand:

   ```
   Do you want to enable Secure Management feature for OneCommand? (s/u)
   Enter 's' to select secure management. (LDAP/NIS OCM group configuration required)
   Enter 'u' to run without secure management (default).
   Enter the letter 's' or 'u'.
   ```

   If you enter `s`, proceed to Step 7. You cannot choose a management mode as described in Step 6.

6. When prompted, enter the type of management you want to use:

```
Enter the type of management you want to use:
1 Local Mode:HBA's on this Platform can be managed by OneCommand clients on this Platform Only.
2 Managed Mode:HBA's on this Platform can be managed by local or
remote OneCommand clients.
3 Remote Mode:Same as '2' plus OneCommand clients on this Platform can manage local and remote
HBA's.
4 Management Host:Same as '1' plus OneCommand clients on this Platform can manage remote HBA's.
```

NOTE: If you enabled Secure Management in Step 5, you cannot configure management mode.

- If you select option 2, you are asked if you want to enable TCP/IP management from remote hosts.
- If you select option 3, you are asked if you want to enable TCP/IP management of remote hosts, and enable TCP/IP management from remote hosts. You are prompted to enter the TCP/IP port number to use. Leaving the field blank defaults to 23333.
- If you select options 2 or 3, you are prompted for the management host address. Leaving the field blank means none.
- You can enter an IP address or host name. If you enter a management host address, you are prompted to exclude management of this host from any other host.
- If you select option 4, management of remote hosts is automatically selected and you are prompted to enter the TCP/IP port number to use. Leaving the field blank defaults to 23333.

NOTE: Management hosts cannot be managed by remote hosts.

7. If you answered 2, 3, or 4 in Step 6, you must decide whether you want the OneCommand Manager application to operate in read-only mode. Read-only mode prevents users from performing some operations such as resetting adapters, updating an adapter's firmware, or changing adapter driver properties and bindings. It only affects the local OneCommand Manager application interface. These operations can still be performed using remote management. Enter either y for yes to allow users to perform these operations, or enter n for no if read-only mode is desired.
8. You are prompted whether to allow users to change the management mode after installation. Enter either y for yes, or n for no.

2.1.4 In VMware

For VMware hosts, you can manage adapters using the OneCommand Manager application on Windows, but you must install and use the appropriate Emulex CIM Provider.

The Emulex CIM Provider is available as an offline bundle in ESXi platforms. Use the offline bundle to update software on VMware platforms. For more information about the ESXi Patch Management activities, refer to the VMware website.

For the best real-time management of Emulex adapters in VMware ESXi environments, use the OneCommand Manager application for VMware vCenter. For more information, refer to the *Emulex OneCommand Manager for VMware vCenter for LightPulse Adapters User Guide*.

To install the Emulex CIM Provider in a VMware ESXi hypervisor environment, use the esxcli command line utility and perform theses steps:

1. Copy the CIM Provider zip file to `/var/log/vmware`.
2. Log in to the VMware hypervisor host, and execute the following command all on one line:
   `esxcli software vib install -d vmware-esx-provider-emulex-cim-provider-<version>.zip`
3. Reboot the system.

2.2 Uninstalling the OneCommand Manager Application

To uninstall the OneCommand Manager application, perform these steps:

- In Windows:
  a. Select **Start > Control Panel > Programs > Uninstall a Program**.
  b. Select **Emulex OCManager Enterprise <*version*>**, and click either **Remove** or **Uninstall**.
- In Linux:
  a. Log on as root.
  b. Change to the `elxocm-<platform>-<version>` installation directory.
  c. Type the following:
  `./uninstall`
- In Solaris:
  a. Log on as root.
  b. Run the OneCommand Manager application uninstallation script:
  `/opt/ELXocm/scripts/uninstall`
- In VMware
  a. Type the following:
  `esxcli software vib remove -n emulex-cim-provider`

Chapter 3: Starting and Stopping the OneCommand Manager Application

This section describes how to start and stop the OneCommand Manager application.

NOTE: For VMware systems, if you are only running a CIM client you do not need to stop it.

3.1 In Windows

To start the OneCommand Manager application, from the Windows desktop, select **Start > All Programs > Emulex > OCManager**. If Secure Management is enabled, you are prompted for your user name and password. See Section 4.2, Using OneCommand Manager Secure Management, for more information.

To stop the OneCommand Manager application, from the OneCommand Manager application menu bar, select **File > Exit**.

3.2 In Linux and Solaris

OneCommand Manager application Linux and Solaris installations include two basic daemon processes that are affected by the start and stop scripts:

- `elxhbamgrd` – Remote management daemon that services requests from OneCommand Manager application clients running on remote host machines.
- `elxdiscoveryd` – Discovery daemon that maintains all discovery data (remote and local) for OneCommand Manager application clients running on the local machine.

`elxhbamgrd` starts at system boot time. `elxdiscoveryd` starts whenever the OneCommand Manager application GUI process first runs on the host machine.

To start the OneCommand Manager application, use the `ocmanager` script. The script is located in the following OneCommand Manager installation directory:

- Linux: `/usr/sbin/ocmanager`

  Example usage on Linux:

  ```
  # /usr/sbin/ocmanager/ocmanager
  ```

- Solaris: `/opt/ELXocm`

  Example usage on Solaris:

  ```
  # /opt/ELXocm/start_ocmanager
  ```

If Secure Management is enabled, you are prompted for your user name and password. See Section 4.2, Using OneCommand Manager Secure Management, for more information.

To stop the OneCommand Manager application, use one of the following methods:

- From the menu bar, select **File > Exit**.
- From the shell, use the `stop_ocmanager` script located in the OneCommand Manager installation directory.

Example usage on Linux:

```
# /usr/sbin/ocmanager/stop_ocmanager -n
```

Example usage on Solaris:

```
# /opt/ELXocm/stop_ocmanager -n
```

NOTE: The `-n` parameter stops only the OneCommand Manager application and associated `elxdiscoveryd` daemon. When the `stop_ocmanager` script is run without parameters, the script stops the OneCommand Manager application and all associated daemons.

Chapter 4: Using the OneCommand Manager Application

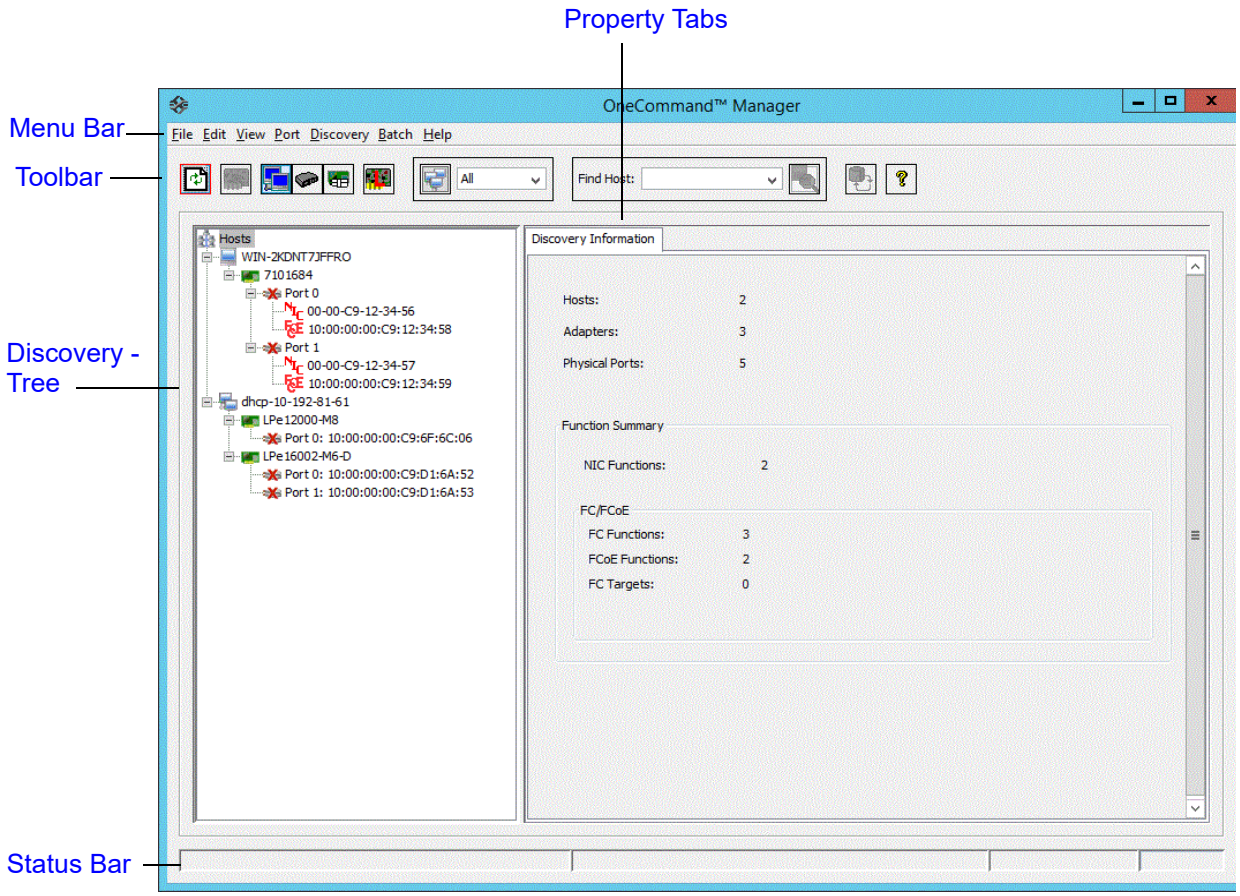
To properly view the OneCommand Manager application, make sure that your system meets the following display requirements:

- For Windows, Linux, and Solaris systems, the display resolution must be set to 1024 × 768 or higher. For Windows systems, use the default font size.
- The display must run in 256-color mode or higher. OneCommand Manager application icons use 256 colors. If the display is set for 16 color mode, OneCommand Manager application icons are not displayed.

4.1 The OneCommand Manager Application Window Element Definitions

The **OneCommand Manager** application window (Figure 2) contains five basic components: the menu bar, the toolbar, the discovery-tree, the property tabs, and the status bar.

Figure 2: OneCommand Manager Application Window



NOTE: The element you select in the discovery-tree determines whether a menu item or toolbar icon is active. For example, if you select the local host or other system host, the **Reset Port** item on the **Adapter** menu is unavailable. The **Reset Port** toolbar button is unavailable as well.

The capabilities displayed by your local interface match those of the remote server. When accessing a remote server running an older version of the OneCommand Manager application, capabilities that are not supported by the server's older version of the OneCommand Manager application are unavailable.

In some instances, the type of information displayed and available functionality is determined by the operating system in use.

4.1.1 Menu Bar

The menu bar contains commands that enable you to perform a variety of tasks, such as exiting the OneCommand Manager application, resetting adapters, and sorting items in the discovery-tree view. Many of the menu bar commands are also available from the toolbar.

4.1.2 Toolbar

The toolbar (Figure 3) contains buttons that enable you to refresh the discovery-tree, reset the selected adapter, and choose how you want to view discovered SAN elements in the discovery-tree. Many of the toolbar functions are also available from the menu bar.

Figure 3: Toolbar

The toolbar is visible by default. Use the **Toolbar** item in the **View** menu to hide the toolbar. If the item is checked, the toolbar is visible.

4.1.2.1 Toolbar Buttons

The toolbar buttons perform the following tasks.

Discovery Refresh button

- Initiates a discovery refresh cycle.

Reset Port button

- Resets the selected port.

View Buttons on the Toolbar

The View buttons on the toolbar enable you to view SAN elements from the host, fabric, virtual ports, or by local or remote adapter perspective. By default, both local and remote adapters are displayed in the Host view. The OneCommand Manager application displays elements in ascending order.

Host View button (default)

Displays the host system.

NOTE: You cannot change host names using the OneCommand Manager application; names must be changed locally on that system.

- Displays the installed adapters within each host system.
- Displays adapter ports and the port numbers; if available.
- Displays adapters by the WWNN if multiple adapters have the same model number.
- Displays the WWPN if targets are present. Multiple adapters can refer to the same target.
- Displays the LUN number if LUNs are present.

Fabric View button

- Displays the fabrics in the SAN with their fabric IDs.
- Displays the ports under each switch.
- If targets are present, displays each WWPN. Multiple adapters can refer to the same target.
- If LUNs are present, displays each LUN number.
- If the fabric ID is all zeros, no fabric is attached.

Virtual Ports View button

- Displays virtual ports in the SAN.

Local HBAs Only button

- Displays only local adapters.

Show Host Groups button and menu

- Displays hosts by their associated groups.
- Displays available host groups.

Find Host button and search field

- Enables you to search by host name for a particular host in the discovery-tree.

Refresh LUNS button

- Initiates a LUN discovery refresh cycle.

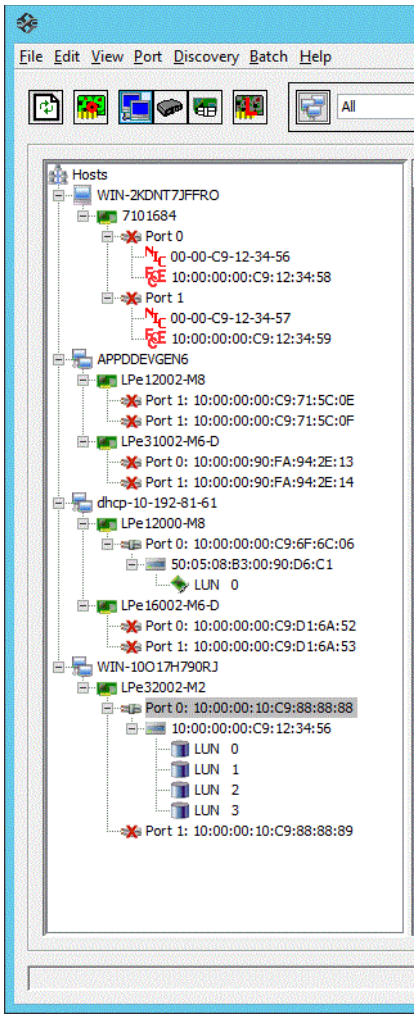
Help button

- Displays the OneCommand Manager application's online help.
- Displays the **About OneCommand Manager** dialog. The dialog displays version information including RMAPI, Discovery, DFClib, MILI Library Version (Windows), and Remote Management Agent Version (Windows). It also enables you to contact Broadcom Technical Support.

4.1.3 Discovery-Tree

The discovery-tree (Figure 4) has icons that represent discovered hosts, adapters, ports, virtual ports, fabrics, targets, and LUNs.

Figure 4: Discovery-Tree



4.1.3.1 Discovery-Tree Icons

Discovery-tree icons represent the following:

The local host.

Other hosts connected to the system.

A green **Adapter** icon with black descriptive text represents an online adapter. Blue text represents an adapter port that had previously been discovered, but currently is not being seen by the discovery engine (service). The adapter is removed from the discovery-tree if it still is not seen after the undiscovered adapter expiration time has elapsed (default is 1800 seconds, or 30 minutes). If the adapter is discovered again before the expiration time has elapsed, it reverts back to normal black text. See Section 5.2, Configuring Discovery and Default CIM Credentials, for more information about discovery settings.

The **Port** icon represents an adapter port. A **Port** icon with a red X indicates the link is down.

NOTE: Multiport adapters are represented in the discovery-tree with separate port icons for each port with the port number displayed next to the icon.

The **ASIC Node** icon, only displayed for dual ASIC adapters, represents each ASIC on the adapter. Each ASIC is managed independently. The ASIC node format **ASIC bus#-sub-adapter#** represents the PCI bus number and the sub-adapter number, which is a concatenation of the discovered port numbers for the ASIC. For example, **ASIC 64-12** represents PCI bus number 64, and 12 represents ports 1 and 2. If there were no discovered functions for a port on that ASIC, the label would be **ASIC 64-2** (port 1 is missing).

The **Virtual Port** icon represents a virtual port.

The **Target** icon represents connections to individual storage devices.

The **LUN** icon represents connections to individual disk LUNs.

The **Masked LUN** icon represents a LUN not presented to the host.

The **ExpressLane LUN** icon represents a LUN with ExpressLane™ priority queuing enabled.

The **Media Exchanger** icon represents connections to individual media exchangers. A media exchanger is a jukebox-type device that is capable of swapping various media device instances (such as records or CDs) in and out.

The **Tape LUN** icon represents LUNs that are tape devices.

The **Target Controller LUN** icon represents LUNs that are storage controllers.

The **Switch** icon represents connections to the switch.

4.1.3.2 Expanding or Collapsing the Discovery-Tree View

You can use the expand/collapse capability on the **View** menu to change the way discovered elements are displayed. By selecting one of the five levels, the discovery-tree (Figure 4) is expanded or collapsed to that level. You can choose hosts/fabrics (depending on the view), adapters, ports, PCI functions, and targets.

4.1.4 Property Tabs

The property tabs display configuration, statistical, and status information for network elements (Figure 2). The set of available tabs is context-sensitive, depending on the type of network element or adapter port currently selected in the discovery-tree (Figure 4).

4.1.5 Status Bar

The status bar is located near the bottom of the **OneCommand Manager application** window (Figure 2). The status bar displays messages about OneCommand Manager application functions, such as `Discovery in progress` or the progress when performing an Export SAN Info operation.

The status bar is visible by default. Use the **Status Bar** item in the **View** menu to hide the status bar. If checked, the status bar is visible.

4.2 Using OneCommand Manager Secure Management

OneCommand Manager Secure Management gives system administrators the ability to further enhance the active management security of their networks. Using Secure Management, administrators can define each user's privileges for managing both local and remote adapters. When running in Secure Management mode, users must log on with their user name and password to run the OneCommand Manager application. If users are authenticated, they can only perform the functions allowed by the OneCommand Manager user group to which they belong. If the systems are running in an LDAP or Active Directory domain, the OneCommand Manager application authenticates users with those defined in that domain. For Linux and Solaris systems, this is accomplished using PAM.

NOTE: OneCommand Manager Secure Management is not supported on VMware hosts.

Administrators set up user accounts such that users belong to one of the OneCommand Manager application user groups. The user groups define the management capabilities for each user.

Table 1 defines the OneCommand Manager application user groups and each group's management capabilities.

Table 1: Secure Management User Privileges

Group Name	OneCommand Manager Capability
ocmadmin	Allows full active management of local and remote adapters.
ocmlocaladmin	Permits full active management of local adapters only.
ocmuser	Permits read-only access of local and remote adapters.
ocmlocaluser	Permits read-only access of local adapters.

On Linux or Solaris systems, the UNIX `getent group` utility can be run on the target host system's command shell to verify the correct configuration of the groups. The groups, and users within the groups, appear in the output of this command.

NOTE: Although users may belong to the administrator group or be root users, they do not have full privileges to run the OneCommand Manager application unless they are also members of the ocmadmin group. Otherwise, if secure management is enabled, root users or administrators can only manage local adapters (similar to the ocmlocaladmin users).

Remote management operations between two machines are allowed or denied depending on the OneCommand Manager secure management status of the machines, and the domains to which the machines belong. The following tables list the behavior (assuming appropriate user credentials are used).

Table 2: Active Commands: Machines on Same Domain

	Remote Server (Secure)	Remote Server (Not Secure)
Client (Secure)	Allowed	Denied [a]
Client (Not Secure)	Denied	Allowed

a. To inform you of an unsecured server that you may want to secure.

Table 3: Active Commands: Machines on Different Domain

	Remote Server (Secure)	Remote Server (Not Secure)
Client (Secure)	Denied[a]	Denied [b]
Client (Not Secure)	Denied	Allowed

a. Allowed if the username and password are the same on both domains.

b. To inform you of an unsecured server that you may want to secure.

Table 4: Passive Commands: Machines on Any Domain

	Remote Server (Secure)	Remote Server (Not Secure)
Client (Secure)	Allowed	Allowed
Client (Not Secure)	Allowed	Allowed

4.2.1 OneCommand Manager Secure Management Configuration Requirements

For systems to run OneCommand Manager Secure Management, they must be configured to provide the following two capabilities:

- Authentication – On Linux and Solaris systems, this is accomplished using the PAM interface and must be configured as follows:
  - For Solaris systems, place the correct setting in the `auth` section of `/etc/pam.d/other` file or its earlier equivalent `/etc/pam.conf`.
  - For Linux systems, this is the `/etc/pam.d/passwd` file `auth` section or equivalent.
- User Group Membership – From the host machine, OneCommand Manager Secure Management must be able to access the OneCommand Manager group to which the user belongs. For Linux and Solaris systems, it uses the `getgrnam` and `getgrid` C-library API calls. The equivalent to the API calls can be obtained by typing `getent group` from the shell command line. If the four OneCommand Manager group names are listed with their member users, the machine is ready to use OneCommand Manager secure management.

For Solaris systems, you must use `useradd -G <groupname>` for authentication to work. You cannot use a lowercase `g`.

4.3 Changing Management and Read-Only Mode

NOTE: This functionality is only available to root users and administrators even when running in Secure Management mode.

During installation, a management and a read-only mode are selected. If modification of these settings after installation was selected, you can change the management mode:

- Secure Management – The setting enables roles-based security. See Section 4.2, Using OneCommand Manager Secure Management, for details.
- Strictly Local Management – This setting allows management of adapters on this host. Management of adapters on this host from other hosts is not allowed.
- Local Management Plus – This setting only allows management of adapters on this host, but management of adapters on this host from another host is possible.
- Full Management – This setting enables you to manage adapters on this host and other hosts that allow it.
- Management Host – This setting allows this host to manage other hosts, but prevents it from being managed by other hosts.

- Enable TCP/IP Management (of or from the remote host) – This setting enables you to manage remote hosts or to manage this host remotely. If enabled, you must supply the port number (between 1024 and 65535). The default port number is 23333. If the port number or the **Enable TCP/IP Management** check box is changed, a set of warning messages may appear before changes are made. Click **Yes** to continue with the change.

  If the IP port number is changed, the utility restarts the OneCommand Manager application discovery server and management agent to use the new settings. If the servers cannot be stopped and restarted, you are prompted to reboot the host for the new TCP/IP management settings to take effect.

CAUTION! The IP port number must be the same for all hosts that are to be managed. Setting an IP port number for one host to a different value than the other hosts makes the host unable to manage other hosts over TCP/IP using a different port. It also makes the host unmanageable over TCP/IP from other hosts using a different port.

- Register this host with specific management host – This setting enables you to register this host with a specific host for management. If enabled, you must supply the IP address or host name of the management host. You can also choose to prevent management of this host from any other host but the management host. See Section 4.3.1, Management Host, for more information.

If Local Management Plus or Full Management mode is selected, you can also set read-only mode.

- Read-only operation – This setting prevents some operations from being performed, such as resetting adapters, updating the adapter firmware image, and changing adapter settings and driver properties. Dialog controls that pertain to these tasks are completely hidden or disabled.

4.3.1 Management Host

The OneCommand Manager application management host provides enhanced discovery and security by enabling a managed host to register with a management host. The management host receives these registrations when the remote host is started and updates its hosts file so the discovery server discovers the remotely managed host. You do not need to manually add remote hosts to be managed.

If you choose to exclude management from all hosts except the management host, the managed host only responds to requests from the management host. All requests from other hosts are rejected. This TCP/IP management security solution only allows the management host to manage the remote host.

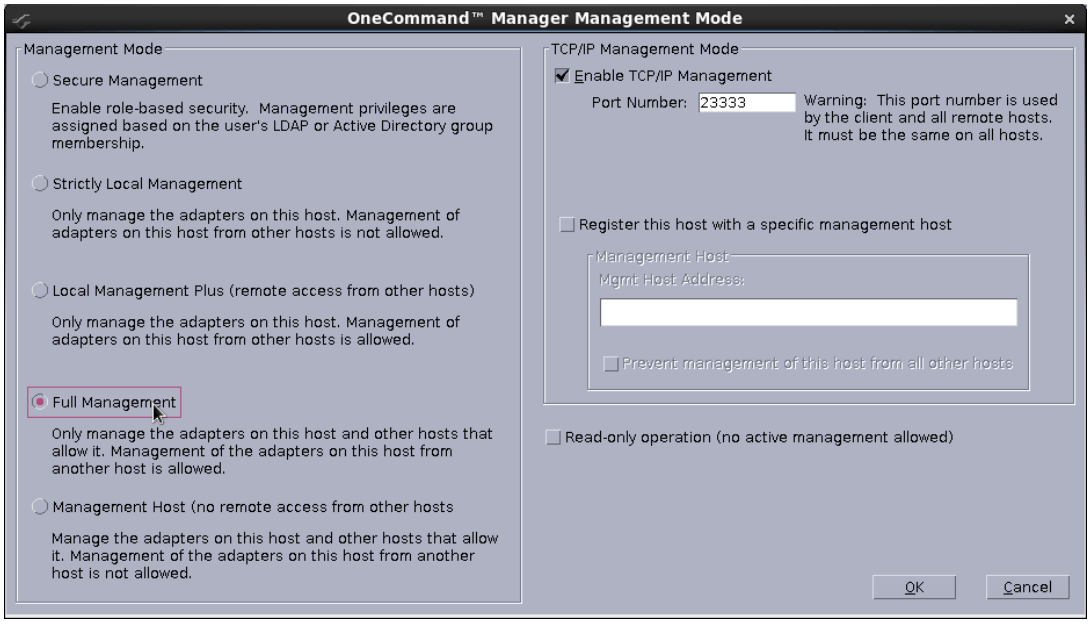
To change management mode and read-only type, perform these steps:

NOTE: After making changes, you must restart the OneCommand Manager application to see the new management mode settings.

- In Windows:

  a. From the **File** menu, select **Management Mode**. The **Management Mode** dialog appears (Figure 5).

Figure 5: Management Mode Dialog



b. Choose the management type and read-only mode you want.

c. Click **OK**.

- In Solaris:
  a. Run the following script:
  b. /opt/ELXocm/set_operating_mode
  c. Choose the management type and read-only mode you want.
- In Linux:
  a. Stop the OneCommand Manager application.
  b. Run the following script:
  `/usr/sbin/ocmanager/set_operating_mode`
  c. Choose the management type and read-only mode you want.

4.4 Using CIM (Windows Only)

VMware uses CIM as the only standard mechanism for device management. The OneCommand Manager application uses the standard CIM interfaces to manage the adapters in the Visor environment and supports CIM-based devices and HBA management.

To manage the adapters on a VMware host using the OneCommand Manager application, you must install the Emulex CIM Provider on the VMware host.

For more information about the VMware Patch Management activities, refer to the VMware website.

NOTE: For VMware hosts, if advanced adapter management capabilities are required (for example, port disable), use the OneCommand Manager application for VMware vCenter. For more details, refer to the *Emulex OneCommand Manager for VMware vCenter for LightPulse Adapters User Guide*.

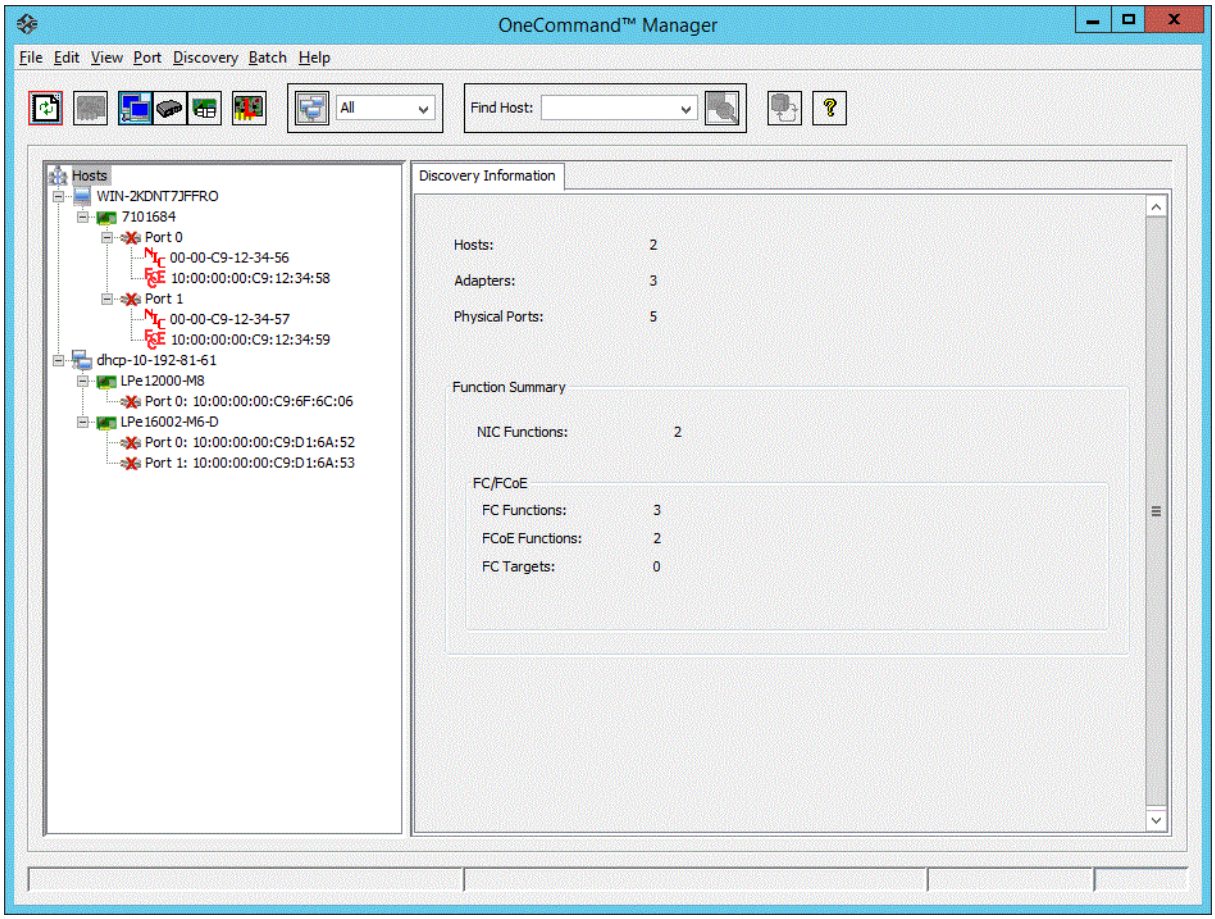
Chapter 5: Configuring Discovery

This chapter describes how to configure discovery to find Emulex adapters on remote hosts.

5.1 Discovery Using the TCP/IP Access Protocol

You can discover adapters on IPv4 and IPv6 TCP/IP hosts and on hosts configured to support the CIM interface that have the OneCommand Manager application installed (Figure 6). Remote SAN management over TCP/IP sends remote management requests using the TCP/IP access protocol to remote hosts. TCP/IP access enables you to access adapters by using their host IP address or by the name of the host on which they reside.

Figure 6: Discovery Information



NOTE: In Windows, if you are running a firewall, you may have to add the OneCommand Manager application remote server to the firewall's exception list. This remote server's path is:

```
\Program Files\Emulex\Util\Common\rmserver.exe
```

5.1.1 Hosts File

The TCP/IP discovery function of the OneCommand Manager application discovery server relies on a file called the `hosts` file. This plain-text file contains a list of hosts that the utility attempts to discover. The discovery server does not attempt to discover hosts over TCP/IP through any other mechanisms (such as ping sweeps and broadcasts).

The `hosts` file is automatically created or modified when you perform any of the following operations:

- Adding a single host from the **Add Remote Host** window (Figure 7). If the host is discovered, the OneCommand Manager application adds its IP address and name to the `hosts` file.
- Scanning a range of IP addresses for hosts that can be managed. This function is performed in the **Add Remote Hosts** window (Figure 7). For each discovered host, the OneCommand Manager application adds its IP address and name to the `hosts` file.
- Removing a host from the host file using the **Remove Remote Hosts** window. For each removed host, the OneCommand Manager application removes its IP address and name from the `hosts` file.
- Adding or removing a host using the CLI.

5.1.1.1 Manually Editing the `Hosts` File

You can open the `hosts` file with any text editor, modify the contents, and save the file. The name of the `hosts` file is `hbahosts.lst`. After the file is modified and saved, the updated file is used after the next TCP/IP discovery cycle is complete. If the discovery server is running, it does not need to be restarted.

To manually edit the `hosts` file, perform these steps:

1. Locate and open the `hosts` file.
   - Windows – The file is located on the system drive in the directory `\Program Files\Emulex\Util`.
   - Solaris – The file is located in the directory `/opt/ELXocm`.
   - Linux – The file is located in the directory `/usr/sbin/ocmanager`.
2. Edit the file. Guidelines for editing the file are as follows:
   - Each line of the file starts with an IPv4 or IPv6 address. Following the IP address can be any number of tabs or spaces. These are followed by a # character, zero, or more tabs or spaces, and the name of the host for that IP address. The host name is not required for discovery. Its purpose is to make the file more readable and is used by the OneCommand Manager application to display the host name in the **Remove Remote Hosts** window when the host is not discovered. However, the discovery server only needs the IP address to discover the host.
   - IPv6 address tuples are delimited by colons and can be added in shortened notation as defined by the IPv6 address specification.
   - An IP port number can be specified after the IPv4 address by appending a colon and port number to the address (such as 10.192.80.24:23333).
   - An IP port number can be specified after an IPv6 address by putting the IPv6 address in brackets and following it with a colon and the port number. For example, `[fe80::50f1:832:3ce4:8d30]:23333`
   - Each line in the file can be up to 1023 characters, although this is longer than is typically needed for a host IP address and host name. A line longer than 1023 characters is truncated, possibly causing discovery to not discover some of the hosts.
   - Blank lines are ignored.
3. Save the file.

5.1.1.2 Copying the File

A `hosts` file on one host can be copied and used on another host. This is useful when there are multiple hosts on the same network running the OneCommand Manager application. For example, after the remote hosts are added to the `hosts` file on one host, you can copy it to other hosts so you do not need to create another `hosts` file.

NOTE: Because of the line terminator differences between Windows, Solaris, and Linux hosts, `hosts` files cannot be shared between Windows, Solaris, or Linux hosts.

5.1.2 Adding a Single Host

NOTE: This option is not available in read-only mode.

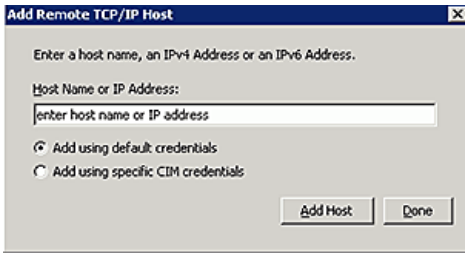
The OneCommand Manager application enables you to specify a single TCP/IP host to manage. You can add an RMAPI host or a CIM host using the host name or IP address. If the host is successfully discovered, it is added to the `hosts` file. If it has not been discovered over FC already, the host and its adapter ports are added to the discovery-tree (Figure 4).

NOTE: The OneCommand Manager application must be installed on the remote host.

To add a single host, perform these steps:

1. From the **Discovery** menu, select **TCP/IP > Add Host**. The **Add Remote TCP/IP Host** dialog appears (Figure 7).

Figure 7: Add Remote TCP/IP Host Dialog



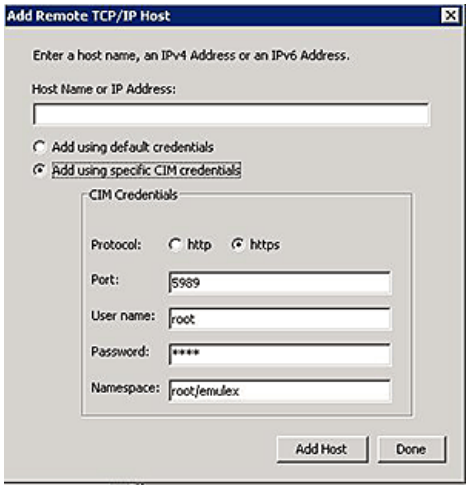
2. Enter the name or the IPv4 or IPv6 address of the host to be added.

NOTE: Entering the IP address to identify the host avoids possible name resolution issues. IPv6 address tuples are delimited by colons and can be entered in a shortened form suppressing 0s as defined by the IPv6 address specification.

3. Configure the discovery method:
   - If you want to add the host using the default discovery methods, check **Add using default credentials** and click **Add Host**. A message appears indicating whether the new host was successfully added.
   - If you want to add the new host using specific CIM credentials, check **Add using specific CIM credentials**, modify any additional CIM settings and click **Add Host**. The **Add Remote TCP/IP Host** dialog appears with the default CIM settings (Figure 8).

NOTE: Remote CIM hosts can only be managed by Windows client systems.

Figure 8: Add Remote TCP/IP Host Dialog with CIM Credentials



4. Edit the default CIM settings if necessary and click **Add Host**. A message appears indicating the new host was successfully added.

5.1.3 Adding a Range of Hosts (IPv4 Only)

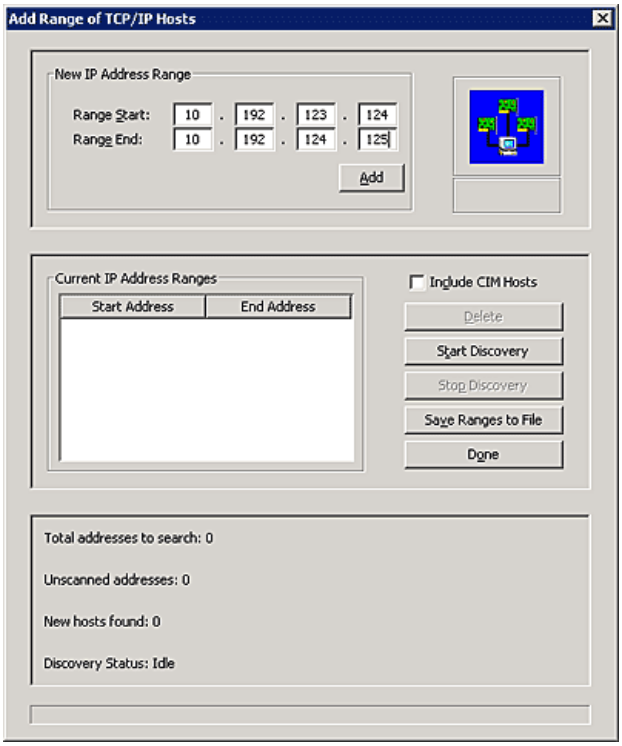
NOTE: This option is not available in Strictly Local or Local Plus Management modes.

You can find the TCP/IP-accessed manageable hosts by searching a range of IPv4 addresses. The **Add Range of TCP/IP Hosts** dialog (Figure 9) enables you to build the initial list of TCP/IP accessed manageable hosts.

NOTE:

- The ranges of IP addresses are only scanned each time you open the **Add Remote TCP/IP Hosts** dialog and click **Start Discovery**. The ranges are not automatically scanned by the discovery server during its discovery cycles.
- Discovery of VMware (CIM) hosts is only supported on Windows systems. Adding a range of hosts is only supported for IPv4 addresses. It is not supported for IPv6 addresses.
- The OneCommand Manager application must be installed on all remote hosts.

Figure 9: Add Range of TCP/IP Hosts Dialog



To add a range of remote hosts, perform these steps:

1. From the **Discovery** menu, select **TCP/IP > Add Range of Hosts**. The **Add Range of TCP/IP Hosts** dialog appears (Figure 9).
2. Enter the complete start and end address range (IPv4 only) and click **Add**. The added address range appears in the dialog. Add any additional ranges you want to search.
3. Click **Start Discovery**. If an address is remotely manageable, it is added to the list of addresses that the discovery server attempts to discover. The utility creates a `hosts` file if necessary, and checks each address in the range to determine if the host is available and remotely manageable. The number of addresses (of manageable hosts) discovered is periodically updated on the dialog.

NOTE: The number of hosts found does not correspond directly to the number of hosts added to the discovery-tree (Figure 4). A host can have more than one IP address assigned to it. If multiple IP addresses for a host are discovered during the search, the host is added to the discovery-tree only once.

4. You can save the IP address ranges. Click **Save Ranges to File** to save the specified ranges to a file so that these address ranges appear the next time you use the **Add Range of TCP/IP Hosts** dialog (Figure 9).

5.1.4 Removing Hosts

NOTE: This option is not available in read-only mode.

Removing hosts that are no longer discovered improves the operation of the discovery server. For example, you may want to remove a host when it is removed from the network.

To remove hosts, perform these steps:

1. From the **Discovery** menu, select **TCP/IP > Remove Host(s)**. The **Remove Hosts** dialog shows a list of discovered hosts. Any host that is not currently discovered appears in red. Click **Show Undiscovered Hosts Only** to display only currently undiscovered hosts.
2. From the **Remove Hosts** dialog, select the hosts you want to remove. You can select all the displayed hosts by clicking **Select All**.
3. Click **Remove** to remove the selected hosts.

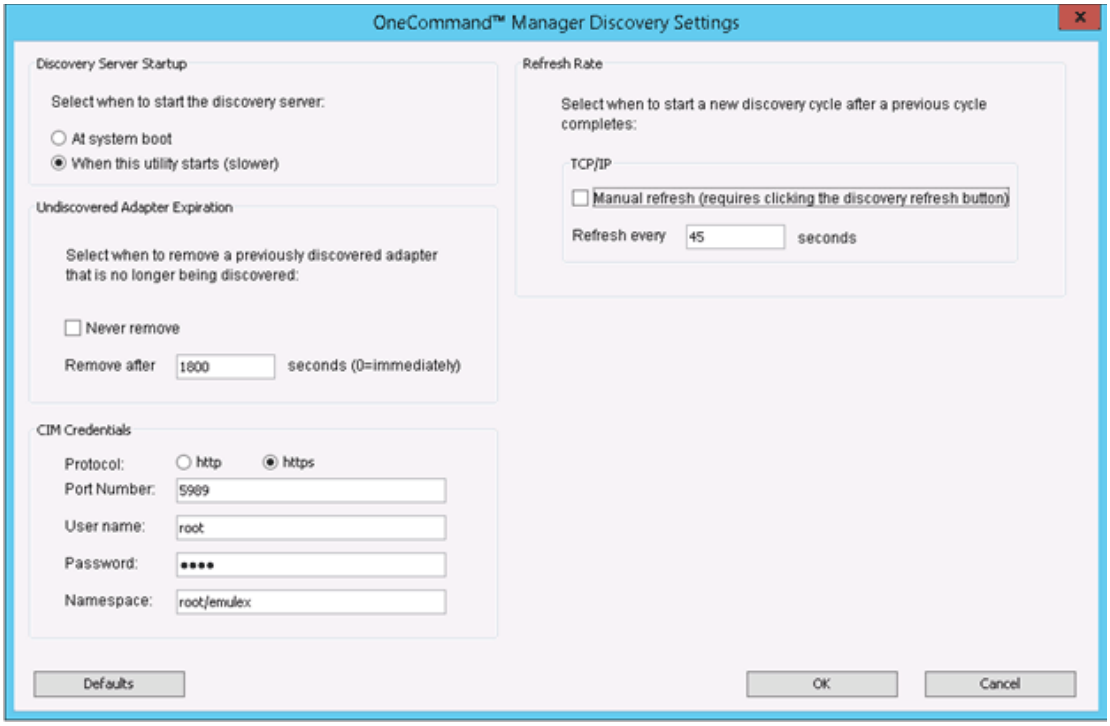
5.2 Configuring Discovery and Default CIM Credentials

Use the **Discovery Settings** dialog (Figure 10) in OneCommand Manager application to configure several discovery server parameters. You can define when to remove previously discovered adapters that are no longer being discovered. You can also define default CIM credentials, such as the protocol, user name, port number, password, and name space.

NOTE: Management of CIM hosts is supported only on Windows systems.

A host can have more than one IP address assigned to it. If multiple IP addresses for a host are discovered during the search, the host is added to the discovery-tree (Figure 4) only once. If the same host name appears for more than one host, the adapters of all these hosts are displayed by the OneCommand Manager application as a single host entry.

Figure 10: Discovery Settings Dialog



To configure discovery settings, perform these steps:

1. From the **Discovery** menu, select **Modify Settings**. The **OneCommand Manager Discovery Settings** dialog appears (Figure 10).

2. Define the discovery properties you want.
3. Set the default CIM credentials in the CIM credentials area that are used to connect to all the ESXi hosts that are managed through the CIM interface.
   - **Protocol:** The HTTP or HTTPS protocol can be used to connect to the VMware hosts.
   - **Port Number:** The default port numbers used for HTTP and HTTPS are `5988` and `5989`, respectively. The port number changes automatically according to the protocol selected. You can also manually change the port number. By default, the HTTP is disabled on `sfcb` in VMware host, so you must use HTTPS to communicate to the VMware host.
   - **User name**: The **User name** field contains the user name with which to connect to the VMware hosts. By default, this is `root`.
   - **Password**: The **Password** field contains the password of the user name that is used to connect to the VMware host.
   - **Namespace**: Namespace is the namespace of the Emulex provider.

     The default namespace is `root/emulex`.
4. Choose the refresh rate settings you want to apply.
5. Click **OK** to apply your changes. Click **Defaults** to return the discovery properties to their default settings.

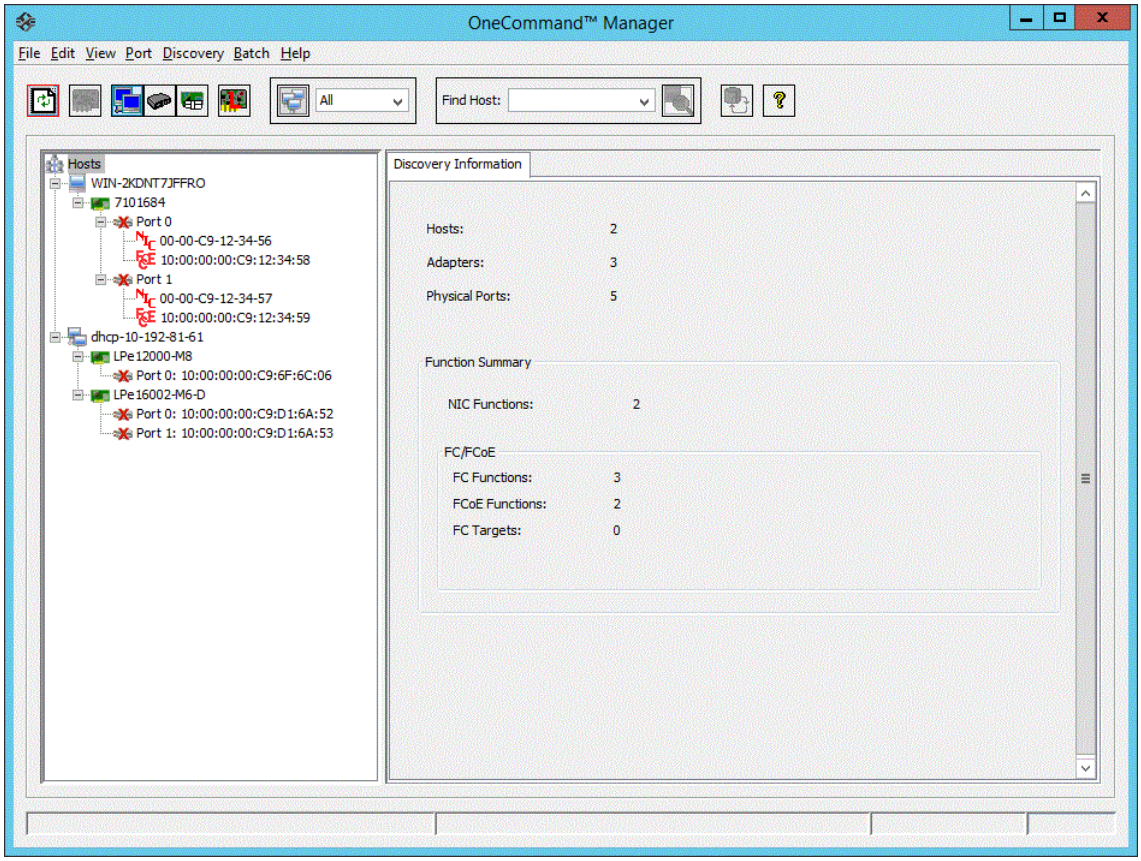
5.3 Viewing Discovery Information

The Discovery Information page (Figure 11) contains a general summary of the discovered elements. The **Host**, **Fabric**, or **Virtual Port** icon, depending upon which view you select, is the root of the discovery-tree, but it does not represent a specific network element. Expanding it reveals all hosts, LUNs, targets, adapter ports, and virtual ports that are visible on the SAN.

To view discovery information, perform these steps:

1. Click the **Hosts**, **Fabrics**, or **Virtual Port** icon at the root of the discovery-tree. Discovered SAN elements appear in the discovery-tree.
2. Select an element from the discovery-tree to learn more about it.

Figure 11: Discovery Information (Host View Selected)



The following **Discovery Information** fields are displayed:

- **Hosts** – The total number of discovered host computers containing manageable Emulex adapters. This number includes servers, workstations, personal computers, multiprocessor systems, and clustered computer complexes.
- **Adapters** – The total number of discovered adapters.
- **Physical Ports** – The number of discovered physical ports that can be managed by this host.
- **Function Summary** – Listed by protocol, the total number of discovered functions and targets.

Chapter 6: Managing Hosts

This section describes viewing host information, managing host groups, and searching for hosts.

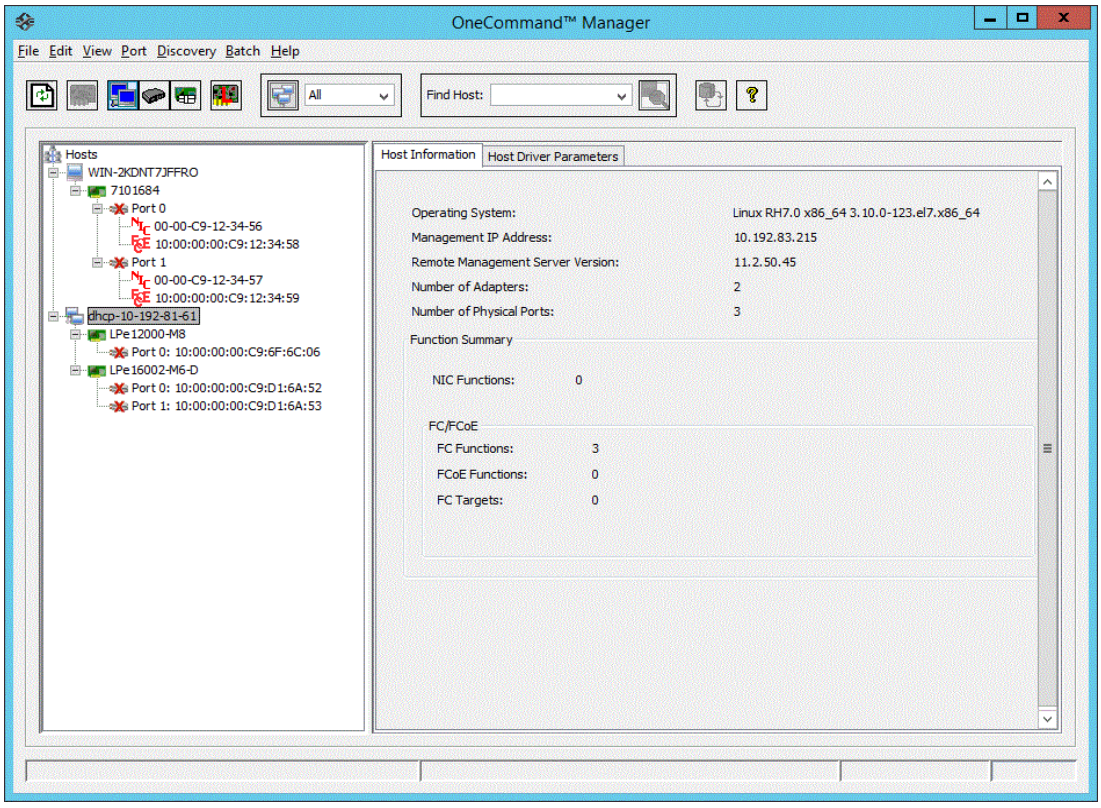
6.1 Viewing Host Information

Two tabs show host information: the **Host Information** tab (Figure 12) and the **Host Driver Parameters** tab (Figure 48). The **Host Information** tab is read-only. The **Host Driver Parameters** tab enables you to view and define adapter driver settings for a specific host. See Section 8.13.2, Host Driver Parameters Tab, for more information about the **Host Driver Parameters** tab.

To view the **Host Information** tab, perform these steps:

1. Perform one of the following tasks:
   – From **View** menu, click **Group Adapters by Host Name**.
   – From the toolbar, click **Group Adapters by Host Name**.
2. Select a host in the discovery-tree.
3. Select the **Host Information** tab (Figure 12).

Figure 12: Host Information Tab



The **Host Information** tab (Figure 12) displays the following fields:

- **Operating System** – Details about the installed operating system.
- **Management IP Address** – The Management IP Address field displays the host's IP address; for example, 138.239.82.131. **Local Host** is displayed if you selected the host from which you are actually running the OneCommand Manager application.
- **Remote Manager Server Version** – The version of the OneCommand Manager application server that is running on the host.
- **Number of Adapters** – The number of adapters installed in the host.
- **Number of Physical Ports** – The number of discovered physical ports that can be managed by this host.
- **CIM Provider Version** – If the host is being managed using the CIM interface, the **CIM Provider Version** field displays the version of the Emulex CIM Provider that is running on the remotely managed system.

NOTE: The **CIM Provider Version** field only appears if the host is managed through the CIM interface.

6.1.1 Function Summary Area

The Function Summary area has the following information:

- **FC Functions** – The number of FC functions running on the discovered adapters on this host.
- **FC Targets** – The number of FC targets discovered on the FC functions on this host.
- **VPorts** – The number of discovered virtual ports that can be managed by this host (not supported on VMware ESXi servers being managed through the CIM interface).

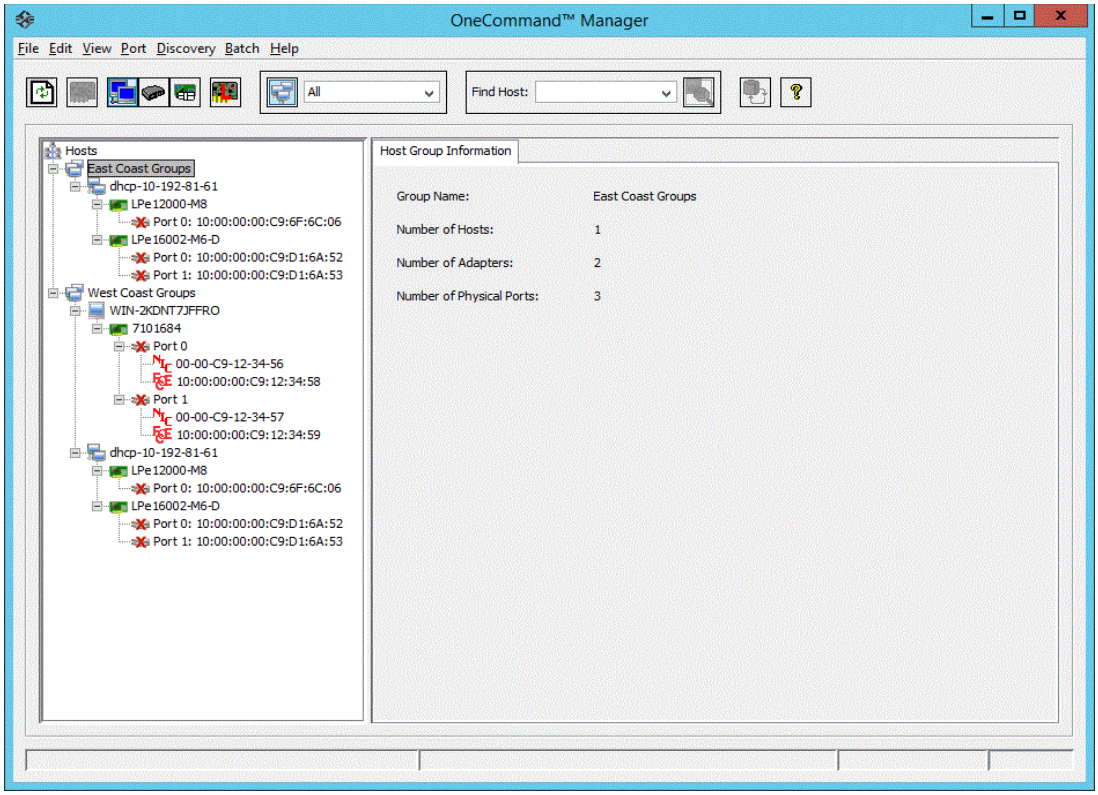
6.2 Viewing Host Grouping Information

The **Host Group Information** tab (Figure 13) displays information about the selected host group, such as the group name and the total number of hosts. See Section 6.3, Grouping Hosts, to learn about creating host groups.

NOTE: Host grouping is not supported for VMware.

To view host grouping information, from the discovery-tree (Figure 4), select the host group whose information you want to view.

Figure 13: Host Group Information Tab



The following Host Group Information fields are displayed:

- **Group Name** – The name of the selected group.
- **Number Hosts** – The total number of hosts assigned to the group.
- **Number of Adapters** – The total number of discovered adapters in the group.
- **Number of Physical Ports** – The total number of ports in the group.

6.3 Grouping Hosts

The OneCommand Manager application enables you to assign related hosts to host groups. Typically, hosts within the same host group share some common functions, or they may simply reside within the same organizational unit within an enterprise, such as a Payroll group or a Shipping/Receiving group.

You can display the hosts in the discovery-tree (Figure 4) in either a group-centric format or in the host-based flat format. The Host grouping capability is available in the Host view, Vport view, or Fabric view mode.

NOTE: The same fabric may appear under more than one host group. For example, some ports on the fabric may be attached to ports and hosts in one host group, and other ports on the same fabric may be attached ports and hosts in a different host group.

You can also perform batch operations, such as firmware download and driver parameter updates on a selected set of groups. See Section 9.2, Updating Firmware for Multiple Adapters, for more information.

NOTE: Grouping hosts is not supported on VMware.

To display all hosts without grouping, perform one of the following tasks:

- From the **View** menu, clear **Show Groups**.
- From the toolbar , unclick **Show Host Groups**.

To display all hosts groups, perform these steps:

1. Perform one of the following tasks:
   - From the **View** menu, check **Show Groups**.
   - From the toolbar , click **Show Host Groups**.
2. From the **Available Host Group** list, choose **All**.

To display all hosts assigned to a particular group, perform these steps:

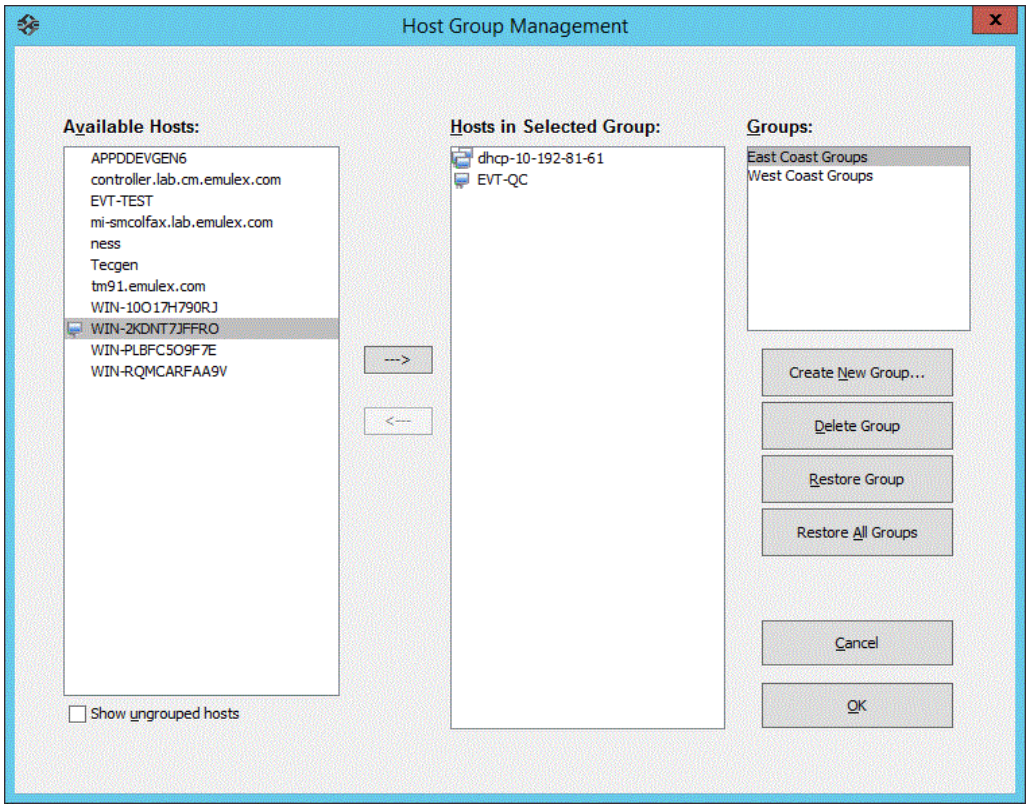
1. Perform one of the following tasks:
   - From the **View** menu, check **Show Groups**.
   - From the toolbar , click **Show Host Groups**.
2. From the **Available Host Group** list, choose the group whose hosts you want to view.

6.3.1 Managing Host Groups

Use the **Host Group Management** dialog (Figure 14) to create and delete host groups, add and remove hosts, and restore host groups.

NOTE: Managing host groups is not supported on VMware.

Figure 14: Host Group Management Dialog



The following Host Group Management fields are displayed:

- **Available Hosts** – The list of hosts that can be added to a host group. You can select a host and right-click to see its group assignments.
- **Show ungrouped hosts** – If selected, displays only hosts that are currently assigned to a host group.
- **Hosts in Selected Group** – The list of hosts assigned to the currently selected host group.
- **Groups** – The list of the currently defined host groups. If you select a group in this list, its host members appear in the Hosts in Selected Group list.

The following icons are used in the **Host Group Management** window:

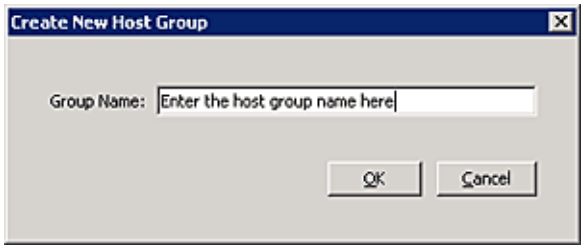
- Indicates the host is currently assigned to a single host group.
- Indicates the host is currently assigned to multiple host groups.

6.3.2 Creating a Host Group

To create a new host group, perform these steps:

1. From the **View** menu, select **Manage Groups**. The **Host Group Management** dialog appears (Figure 14).
2. Click **Create New Group**. The **Create New Host Group** dialog appears (Figure 15).

Figure 15: Create New Host Group Dialog



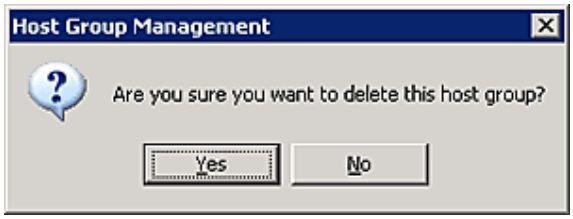
3. Enter the name of the group you want to create and click **OK**. The new group appears in the Groups list on the **Host Group Management** dialog.

6.3.3 Deleting a Host Group

To delete a host group, perform these steps:

1. From the **View** menu, select **Manage Groups**. The **Host Group Management** dialog appears (Figure 14).
2. From the **Groups** list, select the group you want to delete. The **Host Group Management warning** dialog appears (Figure 16).

Figure 16: Host Group Management Warning Dialog



3. Click **Yes** to delete the selected host group.

6.3.4 Adding a Host to a Host Group

To add a host to a group, perform these steps:

1. From the **View** menu, select **Manage Groups**. The **Host Group Management** dialog appears (Figure 14).
2. From the **Groups** list, select the group to which you want to add the host.
3. From the **Available Hosts** list, select the host you want to add (or select multiple hosts by using **Ctrl**-Click or **Shift**-Click), and click the Right Arrow. The selected host is removed from the Available Hosts list and is added to the Hosts in Selected Group list.
4. Click **OK** to commit your changes. The discovery-tree (Figure 4) displays the new configuration.

6.3.5 Removing a Host from a Host Group

To remove a host from a host group, perform these steps:

1. From the **View** menu, select **Manage Groups**. The **Host Group Management** dialog appears (Figure 14).
2. From the **Groups** list, select the group containing the host you want to remove.
3. From the **Hosts in Selected Group** list, select the host you want to remove and click the Left Arrow. The selected host is removed from the Hosts in Selected Group list and is added to the Available Hosts list.
4. Click **OK** to commit your changes. The discovery-tree (Figure 4) displays the new configuration.

6.3.6 Restoring a Host Group

To restore a host group, perform these steps:

1. From the **View** menu, select **Manage Groups**. The **Host Group Management** dialog appears (Figure 14).
2. Click **Restore Group** to return the configuration settings for the currently selected host group to those in use when the dialog was opened.

NOTE: If the currently selected group was created during the current configuration session, clicking **Restore Group** deletes the new group name.

6.3.7 Restoring All Host Groups

To restore all host groups, perform these steps:

1. From the **View** menu, select **Manage Groups**. The **Host Group Management** dialog appears (Figure 14).
2. Click **Restore All Groups** to return the entire host group configuration to the state that existed when the dialog was opened. All host group assignments are returned to their original configuration. Newly added host groups yet to be committed are removed, and host groups that were deleted are restored.

6.3.8 Exporting Host Grouping Configurations

To export the host grouping configuration to a remote host, you must copy the various host group configuration files from the host on which the configuration was created to the remote host. Copy the entire contents of the `config/hostgroups` subdirectory under the OneCommand installation directory to the equivalent location on the remote system.

The hostgroups configuration file locations for the supported platforms are:

- Windows: <*InstallationDriveLetter*>:\Program Files\Emulex\Util\Config\hostgroups
- Linux: /usr/sbin/ocmanager/config/hostgroups
- Solaris: /opt/ELXocm/config/hostgroups

The host group configuration files are completely interchangeable between different operating systems. For example, the host group configuration files created on a Solaris host can be copied directly to a Linux or Windows host, with no conversion required.

6.4 Searching for Hosts in the Discovery-Tree

The OneCommand Manager application enables you to search the discovery-tree (Figure 4) for a particular host by the host's name. If the specified host name is found, the discovery-tree scrolls up or down to bring the desired host name into view.

This capability is especially useful when you are searching for a host in a large installation with hundreds or thousands of hosts. It is also helpful in the Fabric view mode because the ports on a specific host may be dispersed among several fabrics, making the ports on that host difficult to find in the discovery-tree (Figure 4).

To search for a host, perform these steps:

1. Perform one of the following tasks:
   – From the **Edit** menu, select **Find** and enter the name of the host you are searching for into the **Find Host** field.
   – From the toolbar, enter the name of the host you are searching for into the **Find Host** field.
2. From the toolbar, click  **Find Host** or press **Enter** on the keyboard.
   The host you are searching for is highlighted in the discovery-tree (Figure 4).
   Selecting the **Find Next** option on the **Edit** menu, or pressing **F3**, enables you to continue searching for more instances of the name you specified.

Chapter 7: Managing Adapters and Ports

This section describes the various adapter and port management functions you can perform using the OneCommand Manager application.

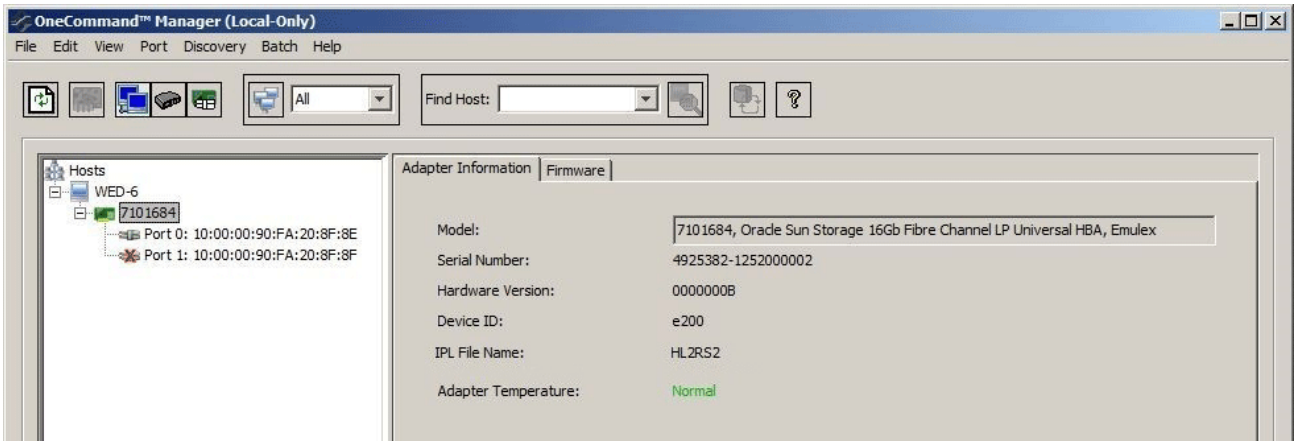
7.1 Viewing Adapter Information

When you select an adapter from the discovery-tree (Figure 4), the **Adapter Information** tab (Figure 17) contains general attributes associated with the selected adapter.

To view adapter information, perform these steps:

1. Select the **Host**, **Fabric,** or **Virtual Ports** view.
2. Select an adapter in the discovery-tree. The **Adapter Information** tab appears (Figure 17).

Figure 17: Adapter Information Tab



The following Adapter Information fields are displayed:

- **Model** – The complete model name of the adapter.
- **Serial Number** – The manufacturer's serial number for the adapter.
- **Hardware Version** – The JEDEC ID.
- **Device ID** – The default device ID for the selected adapter.
- **IPL File Name** – The initial program load (IPL) file name for the selected adapter.
- **Adapter Temperature** – If the adapter's temperature is not available, **Not Supported** is displayed. If supported by the adapter, this field displays the adapter's temperature and one of the following temperature-related status messages:
  - **Normal:** The adapter's temperature is within normal operational range.
  - **Warning:** The adapter's temperature is beyond normal operational range. If the temperature continues to increase, the adapter shuts down. You must determine the cause of the temperature issue and fix it immediately. Check for system cooling issues. Common causes of system cooling issues include clogged air filters, inoperative fans, and air conditioning issues that cause high ambient air temperatures.
  - **Exceeds operational range – Adapter stopped:** The temperature has reached critical limit, forcing the adapter to shut down. You must determine the cause of the temperature issue and fix it before resuming operation. Check for system cooling issues. Common causes of system cooling issues include clogged air filters, inoperative fans, and air conditioning issues that cause high ambient air temperatures.

After the system overheating issue is resolved and the adapter has cooled down, reboot the system, or if the system supports hot swapping, cycle the power of the adapter slot.

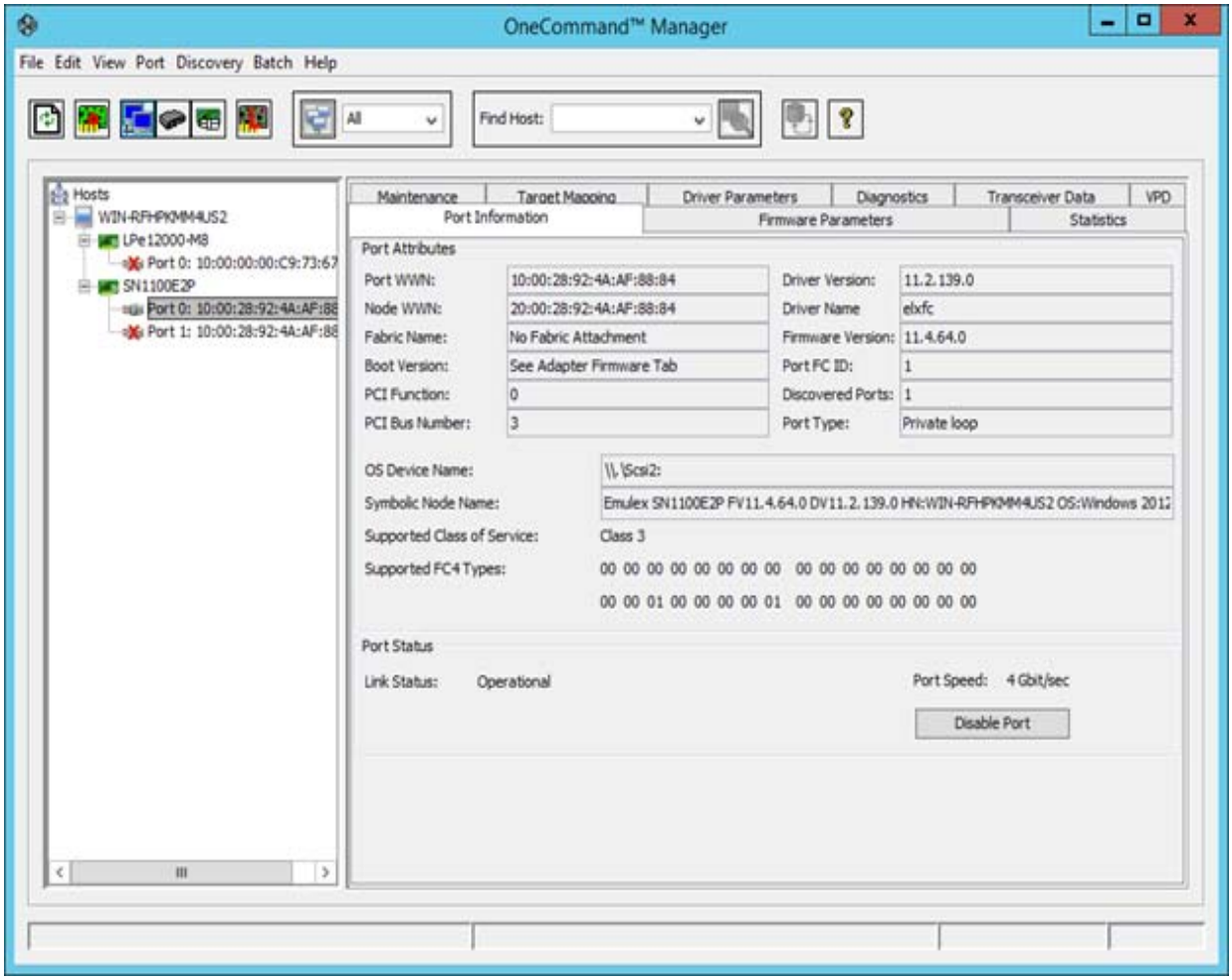
7.2 Viewing Port Information

When you select a port from the discovery-tree, the **Port Information** tab (Figure 18) contains general attributes associated with the selected adapter.

To view port information, perform these steps:

1. Select the **Host** or **Fabric** view.
2. Select a port in the discovery-tree.
3. Select the **Port Information** tab (Figure 18).

Figure 18: Port Information Tab



The following Port Information fields are displayed:

- Port Attributes area:
  - **Port WWN** – The WWPN of the adapter.
  - **Node WWN** – The WWNN of the adapter.
  - **Fabric Name** or **Host Name** – The **Fabric Name** field is displayed in the Host view. This is a 64-bit worldwide unique identifier assigned to the fabric. The **Host Name** field is displayed in the Fabric view and is the name of the host containing the adapter.
  - **Boot Version** – The version of boot code installed on the selected adapter port. If the boot code is disabled, the field displays **Disabled**.
  - **PCI Function** – The PCI function number assigned by the system.
  - **PCI Bus Number** – The PCI bus number assigned to the FC function.
  - **Driver Version** – The version of the driver installed for the adapter.
  - **Driver Name** – The executable file image name for the driver as it appears in the Emulex driver download package.
  - **Firmware Version** – The version of Emulex firmware currently active on the adapter port.
  - **Port FC ID** – The FC ID for the selected adapter port.
  - **Discovered Ports** – The number of mapped and unmapped ports found during discovery by the Emulex adapter driver. The mapped ports are targets and the unmapped ports are non-targets, such as switches or adapters.
  - **Port Type** – The FC type of the selected adapter's port (not available if the port link is down).
  - OS Device Name – The platform-specific name by which the selected adapter is known to the operating system.
  - **Symbolic Node Name** – The FC name used to register the driver with the name server.
  - **Supported Class of Service** – A frame delivery scheme exhibiting a set of delivery characteristics and attributes. Three classes of service include:
    - **Class 1** – Provides a dedicated connection between a pair of ports with confirmed delivery or notification of non-delivery.
    - **Class 2** – Provides a frame switched service with confirmed delivery or notification of non-delivery.
    - **Class 3** – Provides a frame switched service similar to Class 2 but without notification of frame delivery or non-delivery.
  - **Supported FC4 Types** – A 256-bit (8-word) map of the FC-4 protocol types supported by the port containing the selected adapter.
- Port Status area:
  - **Link Status** – The status of the link on the selected adapter port.
  - **Port Speed** – The current port speed of the selected adapter port.

7.2.1 Enabling and Disabling a Port

You can enable or disable a port from the **Port Information** tab. When you disable a port, you disable all functions for the port.

CAUTION! Do not disable a boot port; this could result in data loss or corruption.

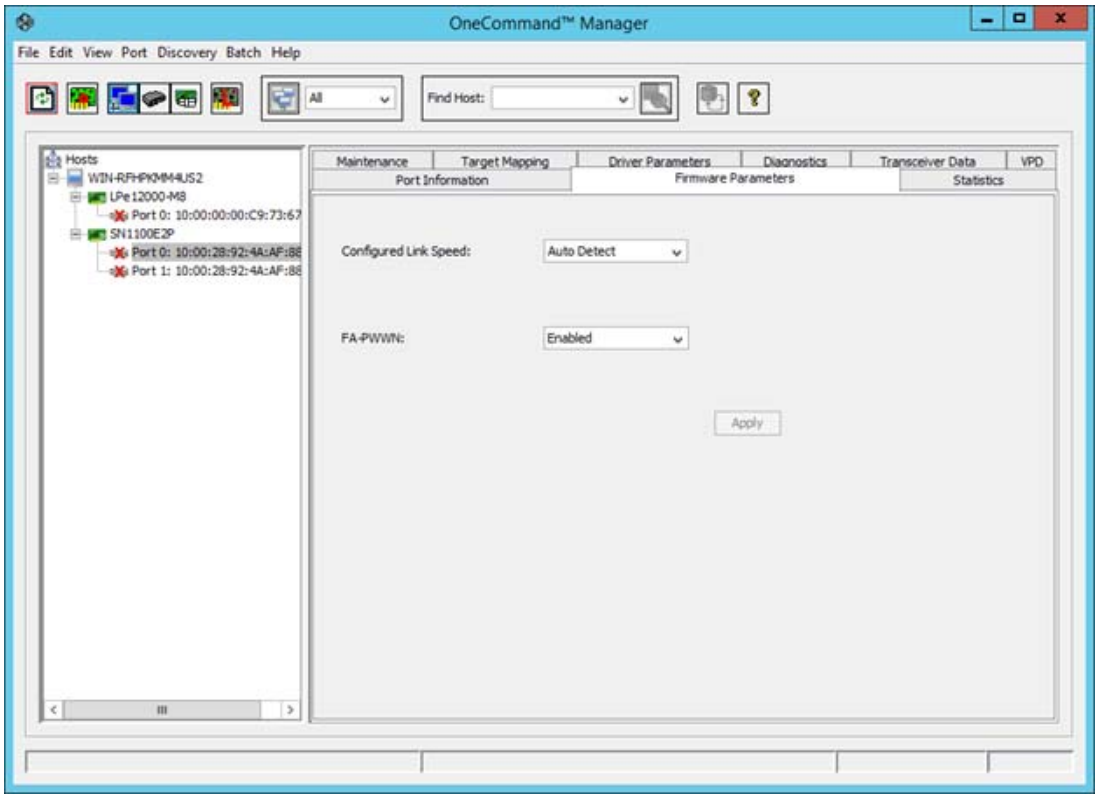
NOTE: Ensure that there is no I/O traffic on the port before disabling it.

To enable or disable a port, from the **Port Information** tab, click **Enable Port** or **Disable Port**.

7.3 Viewing Firmware Parameters

To view firmware parameters, select the **Firmware Parameters** tab (Figure 19).

Figure 19: Firmware Parameters Tab



The following fields are displayed:

- **Configured Link Speed** – This field displays the link speeds that are supported on the port. The list varies depending on the adapter type. The list also includes an Auto Detect option, which indicates that the link speed should be auto-negotiated.

NOTE: If an installed adapter does not support forced link speeds, the Configured Link Speed settings and the **Apply** button are not shown.

- **FA-PWWN** – This field displays the FA-PWWN status. FA-PWWN allows a switch to assign a virtual WWPN to the initiator. **Disabled** is the default setting.

NOTE:

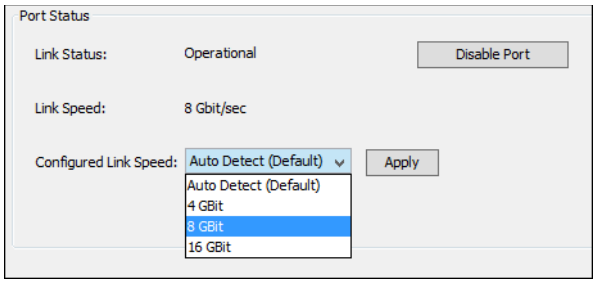
- FA-PWWN is not supported on VMware ESXi servers being managed through the CIM interface.
- The switch must support FA-PWWN. Refer to the documentation that accompanied the switch for instructions on configuring FA-PWWN on the switch.
- After enabling or disabling FA-PWWN, the port must be reset for changes to take effect.
- When a new WWPN is assigned using FA-PWWN, persistently stored configuration information associated with the original WWPN, such as driver parameters and LUN frame priority settings, is not applied to the newly assigned WWPN. The configuration information associated with the original WWPN must be reconfigured for the new WWPN.

7.3.1 Configuring Link Speed

To configure a link speed, perform these steps:

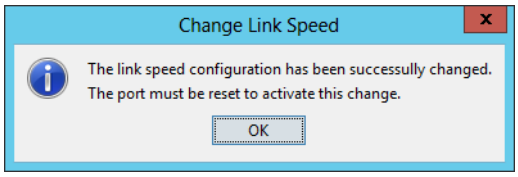
1. Select the **Firmware Parameters** tab (Figure 19).
2. Select a link speed from the **Configured Link Speed** drop-down list (Figure 20).

Figure 20: Port Status Dialog



3. Click **Apply** to set the new link speed. The **Apply** button will only be enabled if the currently selected link speed does not match the currently configured speed.

   If the speed has been set successfully, the following message is displayed stating that the port must be reset to activated the new speed setting.



4. Click **OK**.
5. From the toolbar, click **Reset Port**.

In some situations, the currently configured link speed is not in the supported speed list for the port, which can occur if a new SFP is installed that supports a different set of link speeds than the previously installed SFP. If the currently configured link speed is not in the supported speed list, the following message is displayed:

```
Warning: The currently configured port speed is not a valid supported speed.
Please select a link speed and click Apply.
```

The **Apply** button remains enabled until you select a valid port speed.

If the installed SFP is not supported by the adapter, you cannot configure a link speed. If this is attempted, the following message is displayed:

```
Unsupported optics installed.
```

If an adapter does not support forced link speed, the **Firmware Parameters** tab does not show a Link Speed drop-down list.

7.3.1.1 Enabling and Disabling FA-PWWN

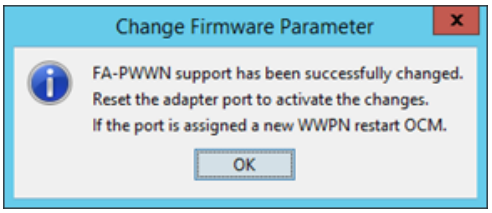
NOTE:

- Fabric Assigned Port Word Wide Name (FA-PWWN) is not supported on VMware ESXi servers being managed through the CIM interface.
- The switch must support FA-PWWN. Refer to the documentation that accompanied the switch for instructions on configuring FA-PWWN on the switch.
- After enabling or disabling FA-PWWN, the port must be reset for changes to take effect.
- When a new WWPN is assigned using FA-PWWN, persistently stored configuration information associated with the original WWPN, such as driver parameters and LUN frame priority settings, is not applied to the newly assigned WWPN. The configuration information associated with the original WWPN must be reconfigured for the new WWPN.

To enable or disable FA-PWWN, perform these steps:

1. Select the **Firmware Parameters** tab (Figure 19).
2. Select **Enable** or **Disable** from the **FA-PWWN** drop-down list.
3. Click **Apply**. The **Change Firmware Parameter** dialog appears (Figure 21).
4. Click **OK**.

Figure 21: Change Firmware Parameter Dialog



5. From the toolbar, click **Reset Port**.
6. Restart the OneCommand Manager application.

NOTE: An **error** dialog notifies you if the FA-PWWN change was unsuccessful (Figure 22).

Figure 22: FA-PWWN Failure Dialog

7.3.2 Viewing Firmware Information

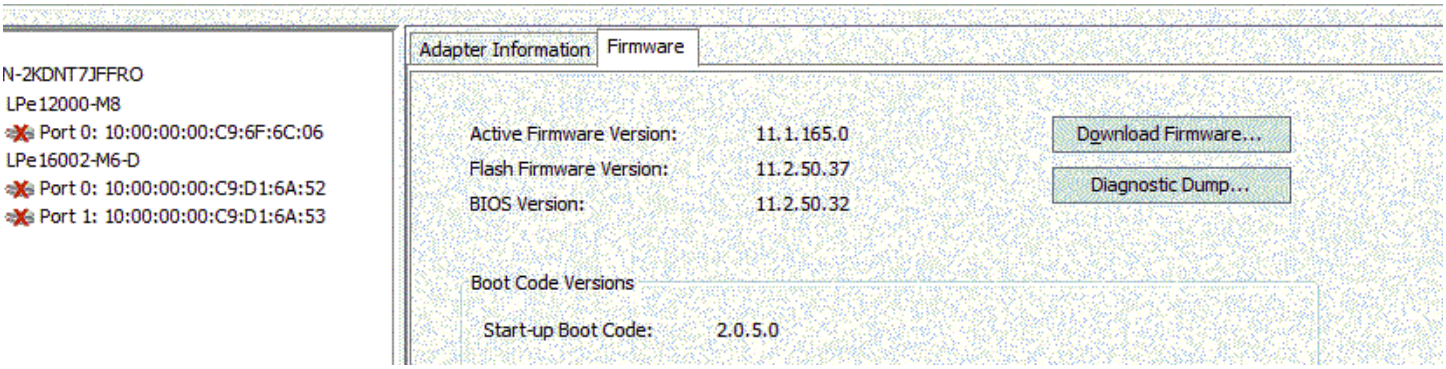
Use the **Firmware** tab (Figure 23) to download firmware and create diagnostic dumps for LPe16000-series, LPe31000-series, and LPe32000-series adapters.

NOTE: For LPe12000-series adapters, see Section 8.7, Viewing Maintenance Information.

To view firmware information, perform these steps:

1. Select the **Host** view.
2. Select an adapter in the discovery-tree (Figure 4).
3. Select the **Firmware** tab (Figure 23).

Figure 23: Firmware Tab



The following Firmware fields are displayed:

- **Active Firmware Version** – The firmware version currently being used by the adapter.
- **Flash Firmware Version** – The flash firmware version currently being used by the adapter.
- **BIOS Version** – The version of the BIOS currently being used by the adapter.
- Boot Code Versions area:
  - **Startup-up Boot Code** – The boot code version currently being used by the adapter.
    This is the version of the code that boots the adapter. It has no relation to the FC or PXE boot code versions.

NOTE: The **Firmware** tab buttons are not available in read-only mode.

See Section 9, Updating Adapter Firmware, for information on updating firmware.

See Section 11.7, Creating Diagnostic Dumps, for information about performing a diagnostic dump.

Chapter 8: Managing Ports

This section describes how to manage ports.

8.1 Viewing and Clearing Statistics

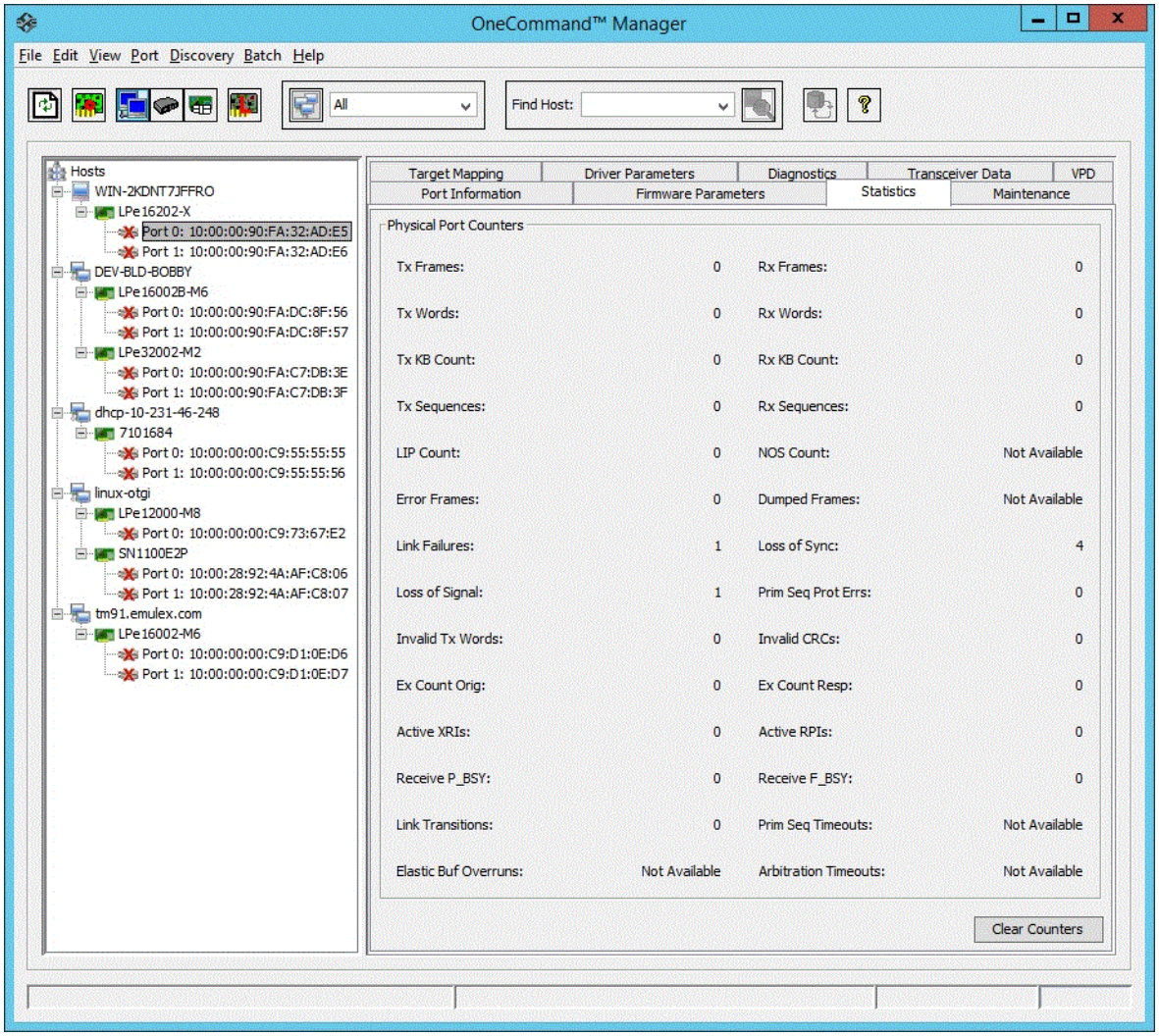
When you select a port from the discovery-tree, the **Statistics** tab (Figure 24) provides cumulative totals for various error events and statistics on the port. When supported by the adapter, you can also clear all the values displayed in the tab.

NOTE: Some statistics are cleared when the adapter is reset.

To view statistics, perform these steps:

1. Select the **Host** or **Fabric** view.
2. Select a port in the discovery-tree.
3. Select the **Statistics** tab.

Figure 24: Statistics Tab



The following Port Statistics fields are displayed:

- **Tx Frames** – FC frames transmitted by this FC function.
- **Tx Words** – FC words transmitted by this FC function.
- **Tx KB Count** – FC kilobytes transmitted by this FC function.
- **Tx Sequences** – FC sequences transmitted by this FC function.
- **LIP count** – The number of loop initialization primitive (LIP) events that have occurred for the FC function. This field is not supported if the topology is not arbitrated loop. Loop initialization consists of the following:
  - Temporarily suspending loop operations.
  - Determining whether loop capable ports are connected to the loop.
  - Assigning AL_PA IDs.
  - Providing notification of configuration changes and loop failures.
  - Placing loop ports in the monitoring state.
- **Error Frames** – The number of frames received with CRC errors.
- **Link Failures** – The number of times the link has failed. A link failure is a possible cause of a timeout.
- **Loss of Signal** – The number of times the signal was lost.

- **Invalid Tx Words** – The total number of invalid words transmitted by this FC function.
- **Ex Count Orig** – The number of FC exchanges originating on this FC function (not supported on VMware ESXi servers being managed through the CIM interface).
- **Active XRIs** – The number of active exchange resource indicators (not supported on VMware-based ESXi platforms using the CIM interface).
- **Received P_BSY** – The number of FC port-busy link response frames received.
- **Link Transitions** – The number of times the SLI port sent a link attention condition.
- **Elastic Buf Overruns** – The number of times the link interface has had its elastic buffer overrun.
- **Rx Frames** – The number of FC frames received by this FC function.
- **Rx Words** – The number of FC words received by this FC function.
- **Rx KB Count** – The received kilobyte count by this FC function.
- **Rx Sequences** – The number of FC sequences received by this FC function (not supported on VMware ESXi servers being managed through the CIM interface).
- **NOS count** – The number of NOS events that have occurred on the switched fabric. The NOS count is not currently supported for Emulex Windows drivers or for arbitrated loop.
- **Dumped Frames** – The number of frames that were lost because of a lack of host buffers available. This option is not currently supported for the Storport Miniport driver or the driver for Solaris.
- **Loss of Sync** – The number of times loss of synchronization has occurred.
- **Prim Seq Prot Errs** – The primitive sequence protocol error count. This counter is incremented whenever there is any type of protocol error.
- **Invalid CRCs** – The number of frames received that contain CRC failures.
- **Ex Count Resp** – The number of FC exchange responses made by this FC function (not supported on VMware ESXi servers being managed through the CIM interface).
- **Active RPIs** – The number of RPIs (not supported on VMware ESXi servers being managed through the CIM interface).
- **Receive F_BSY** – The number of FC port-busy link response frames received.
- **Primitive Seq Timeouts** – The number of times a primitive sequence event timed out (not supported on VMware ESXi servers being managed through the CIM interface).
- **Arbitration Timeouts** – The number of times the arbitration loop has timed out. Large counts could indicate a malfunction somewhere in the loop or heavy usage of the loop (not supported on VMware ESXi servers being managed through the CIM interface).

If supported by the adapter, click **Clear Counters** to clear all the values displayed on the tab.

8.2 Viewing Virtual Port Information

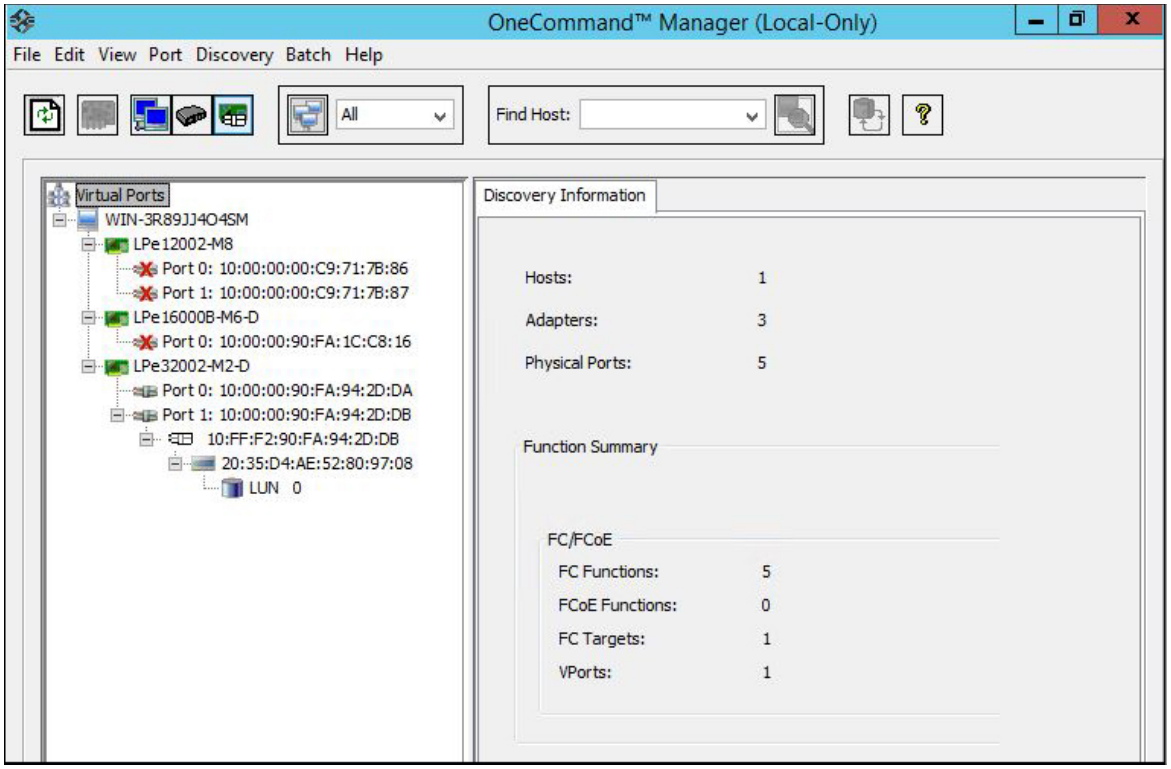
The **Discovery Information** tab (Figure 25) displays information about virtual ports and their associated targets and LUNs.

To view virtual port information, perform these steps:

1. Perform one of the following tasks:
   – From the **View** menu, select **Group Adapters by Virtual Port**.
   – From the toolbar, click  **Group Adapters by Virtual Port**.

   The **Discovery Information** tab appears (Figure 25).

Figure 25: Discovery Information Tab



The following Discovery Information fields are displayed:

- **Hosts** – The total number of hosts discovered in the SAN.
- **Adapters** – The total number of adapters discovered in the SAN.
- **Physical Ports** – The total number of physical ports discovered in the SAN.
- Function Summary area:
  - **FC Functions** – The total number of FC functions discovered in the SAN.
  - **FC Targets** – The total number of FC targets discovered in the SAN.
  - **VPorts** – The total number of virtual ports discovered in the SAN.

8.3 Creating and Deleting Virtual Ports

This section describes how to create and delete virtual ports.

8.3.1 Creating Virtual Ports

Using the **Virtual Ports** tab (Figure 26), you can automatically generate the WWPN for the virtual port based on the WWPN for the physical port or you can manually type the WWPN.

NOTE:

- The OneCommand Manager application cannot create or delete virtual ports on VMware ESXi server systems. Although VMware ESXi server supports NPIV, only VMware management tools can create or delete virtual ports.
- In Linux, virtual ports do not persist across system reboots.

The NPIV driver parameter must be enabled before you attempt to create a virtual port. The driver parameter name varies slightly depending upon your operating system:

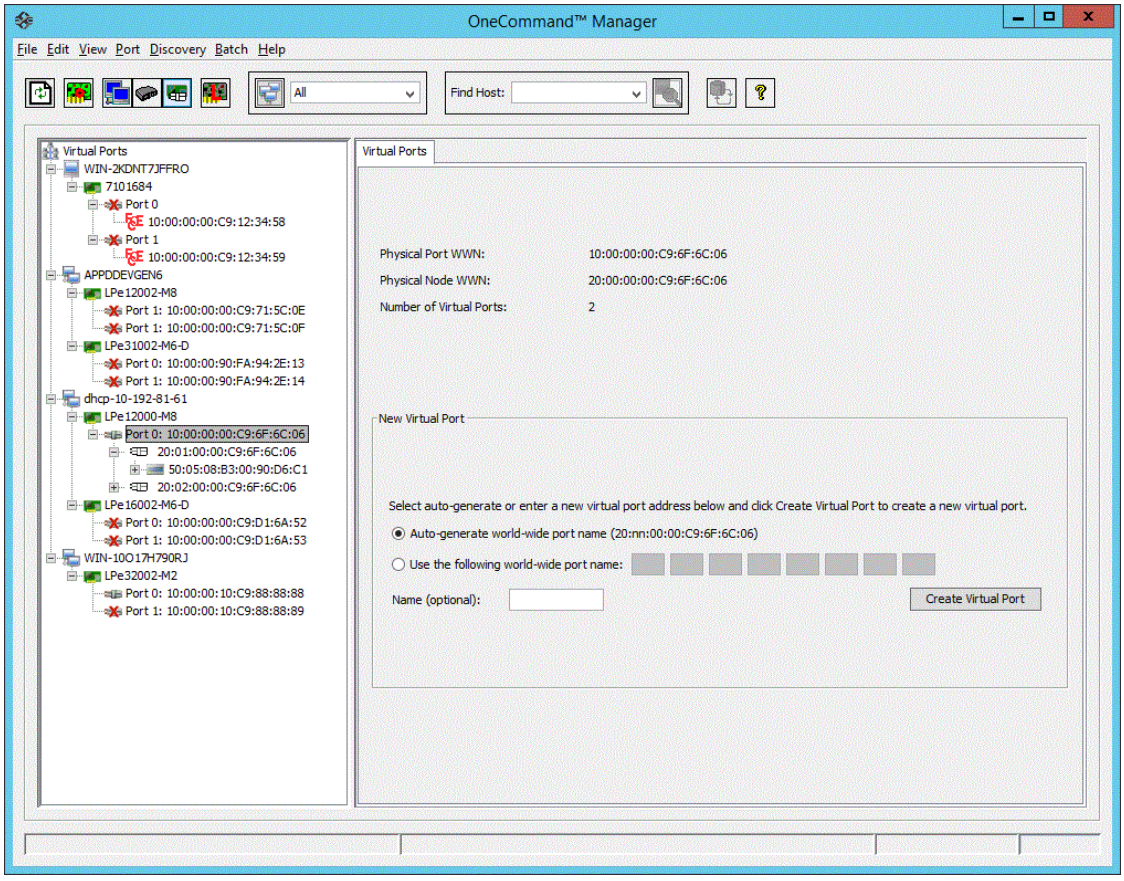
- For Windows: From the **Driver Parameters** tab, highlight **enableNPIV**, then select **Enable**. On the Storport Miniport system, the `SLIMode` driver parameter must also be set to `0` or `3`.
- For Solaris: `enable-npiv`
- For Linux: `lpfc_enable_npiv`

See Section 8.13, Configuring the Driver Parameters, for more information on enabling driver parameters.

To create a virtual port, perform these steps:

1. Perform one of the following tasks:
   – From the **View** menu, select **Group Adapters by Virtual Ports**.
   – From the toolbar, click **Group Adapters by Virtual Ports**.
2. From the discovery-tree, select the FC function on which you want to create a virtual port. The **Virtual Ports** tab appears (Figure 26).

Figure 26: Virtual Ports Tab



3. Perform one of the following tasks:
   – Select **Auto-generate world wide port name**. The OneCommand Manager application creates the unique WWPN for the new virtual port based on the WWPN of the FC function. This option allows you to automatically create up to 255 unique virtual ports for each physical port. It also has the advantage that the new WWPN is unique.

NOTE: After auto-generating 255 unique virtual ports, you cannot auto-generate any more virtual ports even if you delete existing auto-generated virtual ports. However, you can still enter your own WWPN to create a virtual port.

– Check **Use the following world-wide port name** and enter a unique WWPN you want to use. You can create as many virtual ports as you want. A valid port name must have one of the following formats:

`10:00:`*`xx:xx:xx:xx:xx:xx`*
`2`*`x:xx:xx:xx:xx:xx:xx`*
`3`*`x:xx:xx:xx:xx:xx:xx`*
`5`*`x:xx:xx:xx:xx:xx:xx`*

where *x* is a hexadecimal value.

CAUTION! Make sure that a manually entered WWPN is unique to your particular SAN. Otherwise, a non-functioning SAN and data loss could occur.

4. Enter an optional name for the virtual port if you want. You can give the new virtual port any name you want up to 99 characters in length. This name is used as part of the Symbolic Node Name for the vPort.
5. Click **Create Virtual Port**. A dialog appears notifying you that the virtual port was created. The dialog also displays the new virtual port's WWPN. Each virtual port has its own WWPN, but its WWNN is the same as the physical port's WWNN.

NOTE: If you entered a WWPN that is already in use, you are prompted to enter another WWPN.

6. Click **OK**. The new virtual port is added to the discovery-tree (Figure 4) under the physical port where it was created and the **Number of Virtual Ports** field is updated.

NOTE: The OneCommand Manager application automatically refreshes its discovery after a virtual port is created. However, targets for a new virtual port may not be discovered during the refresh. Therefore, you must refresh the discovery until the targets appear under the virtual port in the discovery-tree (Figure 4).

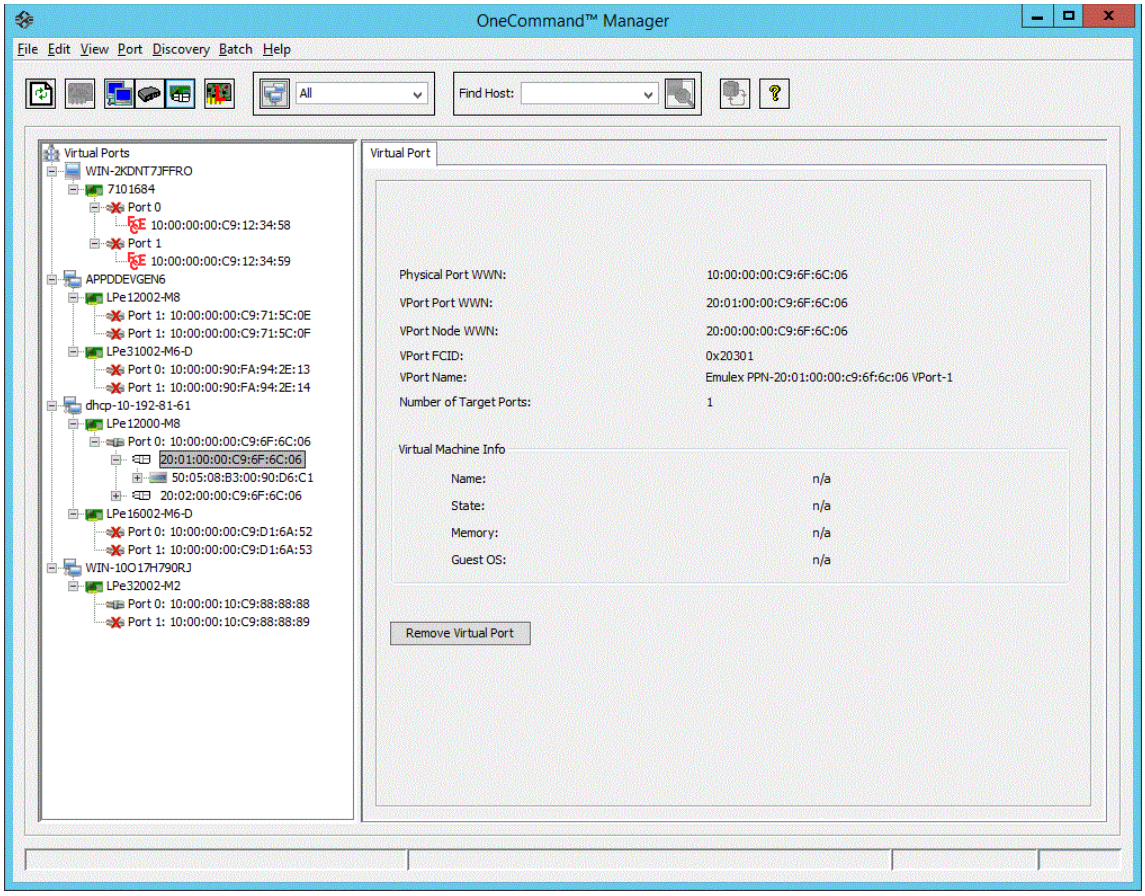
8.3.2 Deleting Virtual Ports

NOTE: The OneCommand Manager application cannot create or delete virtual ports on VMware ESXi server systems. Although VMware ESXi server supports NPIV, only VMware management tools can create or delete virtual ports.

To delete a virtual port, perform these steps:

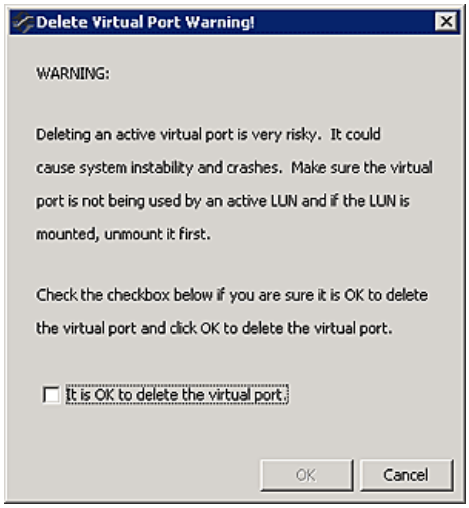
1. Perform one of the following tasks:
   – From the **View** menu, select **Group Adapters by Virtual Ports**.
   – From the toolbar, click  **Group Adapters by Virtual Ports**.
2. From the discovery-tree, select the virtual port you want to delete. The **Virtual Port** tab appears (Figure 27).

Figure 27: Virtual Port Tab



3. Click **Remove Virtual Port.** The **Delete Virtual Port Warning** dialog appears (Figure 28).

Figure 28: Delete Virtual Port Warning Dialog



NOTE: The link on the physical port must be up to delete a virtual port. The **Remove Virtual Port** button on the **Virtual Port** tab is disabled if the link is down.

4. Select **It is OK to delete the virtual port** and click **OK**. You are notified that the virtual port is no longer available and that it was removed from the discovery-tree (Figure 4).
5. Click **OK**.

8.4 Viewing Fabric Information

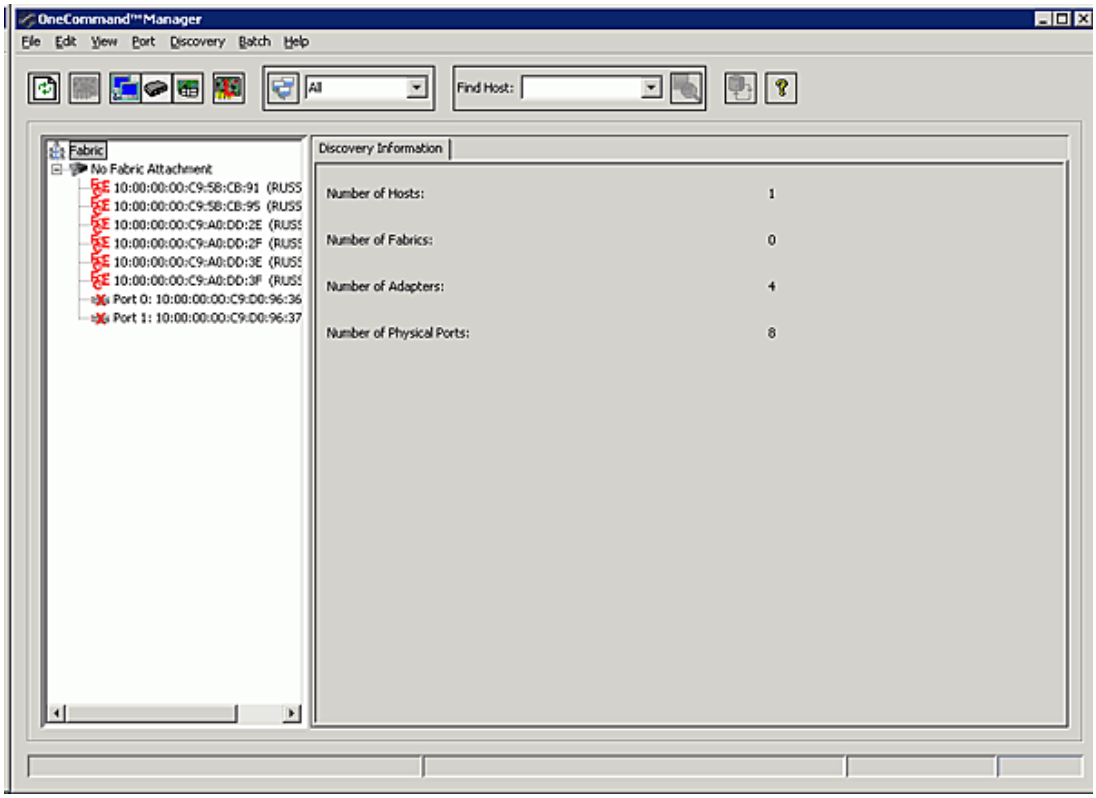
The **Discovery Information** tab (Figure 29) contains information about the selected fabric.

To view fabric discovery information, perform one of the following tasks:

– From the **View** menu, select **Group Adapters by Fabric Address**.
– From the toolbar, click **Group Adapters by Fabric Address**.

The **Discovery Information** tab is displayed (Figure 29).

Figure 29: Fabric Discovery Information



The following Discovery Information fields are displayed:

- **Number of Hosts** – The number of hosts discovered or seen by this host on the selected fabric.
- **Number of Fabrics** – The number fabrics identified during discovery.
- **Number of Adapters** – The number of adapters discovered by this host on the selected fabric.
- **Number of Physical Ports** – The number of discovered physical ports on this host that can be managed by this host.

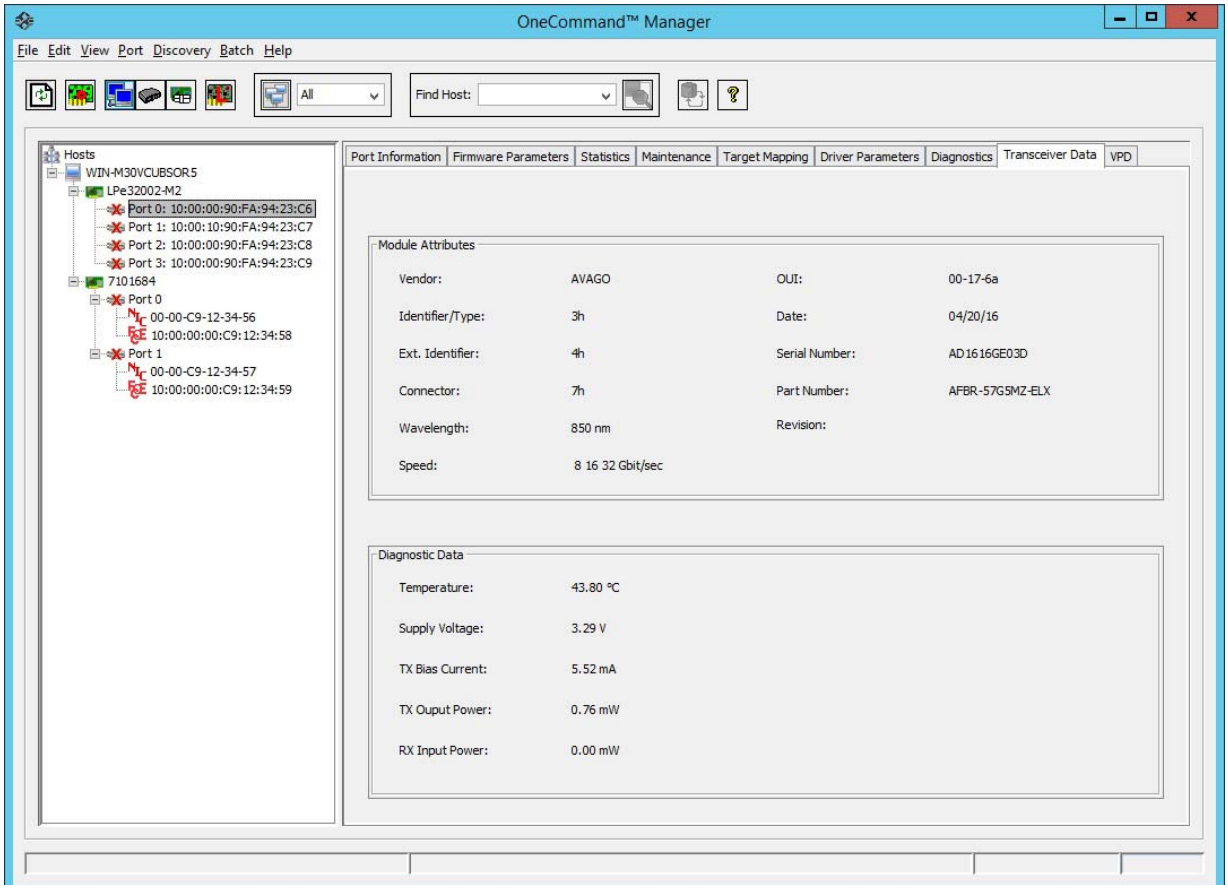
8.5 Viewing Port Transceiver Information

When you select a port from the discovery-tree (Figure 4), the **Transceiver Data** tab (Figure 30) enables you to view transceiver information, such as vendor name, serial number, and part number. If the adapter/transceiver does not support some or all of the transceiver data, the fields display N/A.

To view transceiver information, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree (Figure 4), select the port whose transceiver information you want to view.
3. Select the **Transceiver Data** tab (Figure 30).

Figure 30: Transceiver Data Tab



The following Transceiver Data fields are displayed:

- Module Attributes area:
  - **Vendor** – The name of the vendor.
  - **Identifier/Type** – The identifier value that specifies the physical device described by the serial information.
  - **Ext. Identifier** – Additional information about the transceiver.
  - **Connector** – The external optical or electrical cable connector provided as the media interface.
  - **Wavelength** – The nominal transmitter output wavelength at room temperature.
  - **Speed** – The speed, or speeds, at which the selected port can run.

  - **OUI** – The vendor's OUI. It is also known as the IEEE Company Identifier for the vendor.
  - **Date** – The vendor's date code in the MM/DD/YY format.
  - **Serial Number** – The serial number provided by the vendor.
  - **Part Number** – The part number provided by the SFP vendor.
  - **Revision** – The vendor revision level.
- Diagnostic Data area:
  - **Temperature** – The internally measured module temperature.
  - **Supply Voltage** – The internally measured supply voltage in the transceiver.
  - **TX Bias Current** – The internally measured transmitted bias current.
  - **TX Output Power** – The measured transmitted output power.
  - **RX Input Power** – The measured received input power.

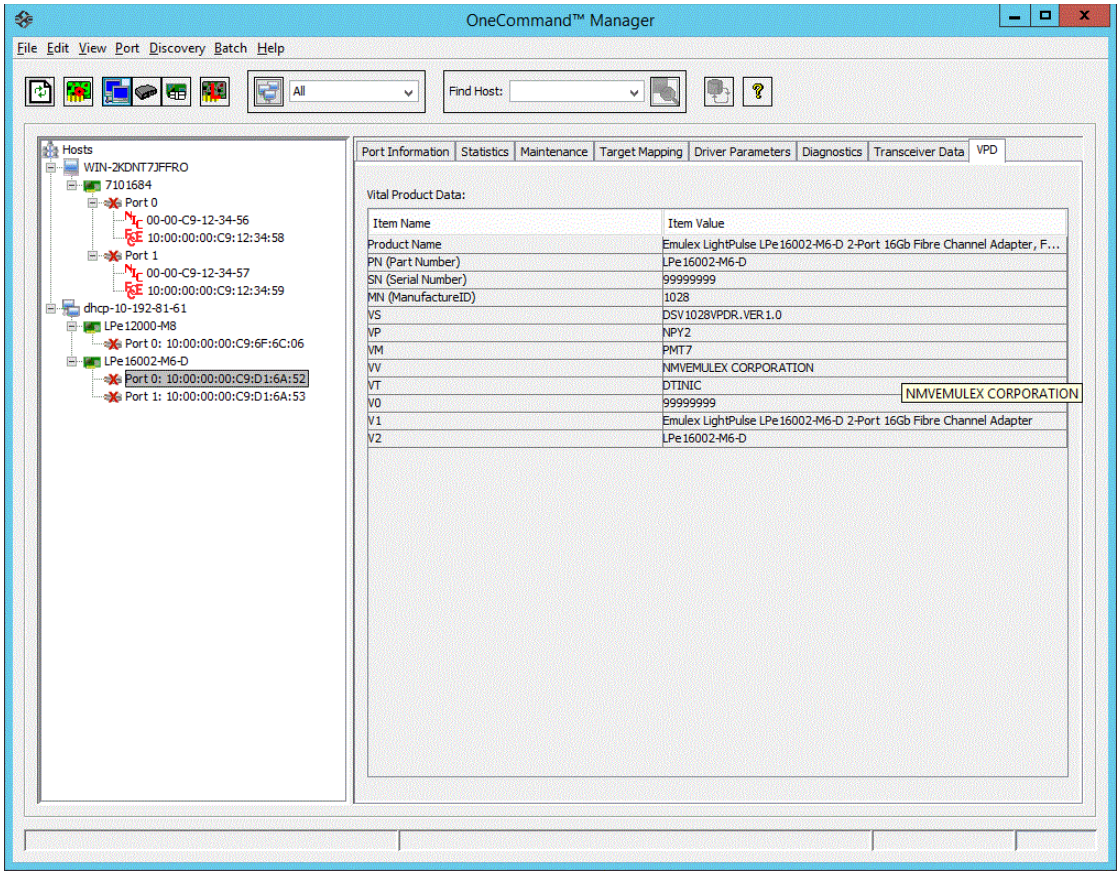
8.6 Viewing VPD Information

The **VPD** tab (Figure 31) displays vital product data (if available) for the selected adapter port such as the product name, part number, and serial number.

To view VPD information, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree, select the FC function whose VPD information you want to view.
3. Select the **VPD** tab.

Figure 31: VPD Tab



The following Virtual Product Data fields are displayed:

- **Product Name** – Product information about the selected FC function.
- **PN (Part Number)** – The adapter's part number.
- **SN (Serial Number)** – The adapter's serial number.
- **MN (Manufacture ID)** – The manufacturer’s identification number.
- **VO** – Vendor unique data. **V** indicates a vendor-specific field. An adapter may have none, one, or more of these fields defined. Valid values for this field are VO (the letter O, not the number zero) and V*x* (where *x* is a number).

NOTE: Some adapters may show additional VPD information, such as EC (EC level), MN (manufacturer ID), and XY data. Data in the **XY** field is a vendor-specific hexadecimal dump.

8.7 Viewing Maintenance Information

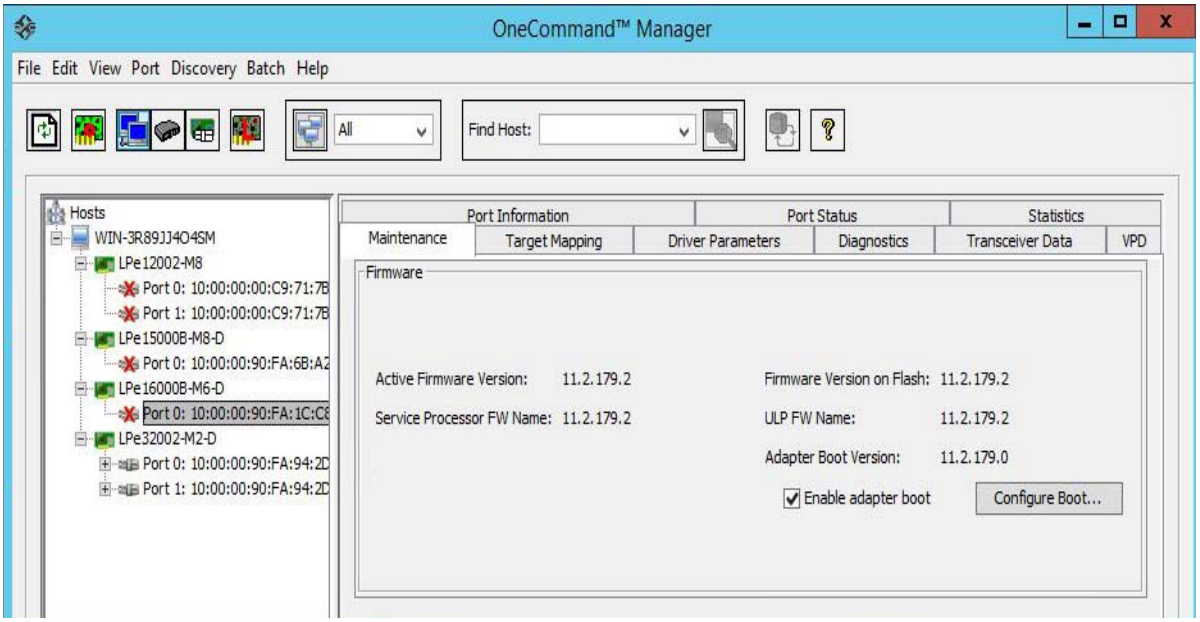
NOTE: This option is not available in read-only mode.

Use the **Maintenance** tab (Figure 32) to view firmware information and update adapter firmware. You can also configure boot from SAN and change WWPN and WWNN information for the selected adapter port.

To view firmware information, perform these steps:

1. Select the **Host** or **Fabric** view.
2. Select a port in the discovery-tree.
3. Select the **Maintenance** tab (Figure 32).

Figure 32: Maintenance Tab



The following **Maintenance** tab fields are displayed:

- Firmware area:
  - **Active Firmware Version** – The Emulex firmware version number for this port.
  - **Service Processor FW Name** – The Emulex firmware name for this port.
  - **Firmware Version on Flash** – The flash firmware version currently being used by the adapter.
  - **ULP FW Name** – The firmware version running on the ULP processors within the ASIC.
  - **Adapter Boot Version** – Displays one of the following:
    - The selected adapter port's boot code version if boot code is present.
    - Disabled if the boot code is disabled.
    - Not Present if boot code is not loaded. If boot code is not loaded, the **Enable Adapter boot** check box is not visible and you cannot configure the selected port to boot from SAN.
  - **Enable adapter boot** check box – Select this check box if you want the port to load and execute boot code during system startup. Click **Configure Boot** to configure boot from SAN (not available in read-only mode).

NOTE: Enabling adapter boot only causes the port to load the boot code and run it during system startup. It does not mean that the port boots from SAN. To boot from SAN, the boot type must be enabled. Enable this in the **Boot from SAN configuration** window for each boot type.

- WWN Management area:

NOTE: The WWN Management area is disabled when FA-PWWN is enabled on an adapter port.

  - Current:
    - **WWPN** – The World Wide Port Name for the selected port.
    - **WWNN** – The World Wide Node Name for the selected port.
  - Pending Changes:
    - **WWPN** – Works with the **Change WWN** button. It displays the WWPN you assigned for the selected port, but the system must be rebooted for these changes to take effect and appear under the Current listing. See Section 8.12, Changing the WWPN and WWNN, for more information.
    - **WWNN** – Works with the **Change WWN** button. It displays the WWNN you assigned for the selected port, but the system must be rebooted for these changes to take effect and appear under the Current listing. See Section 8.12, Changing the WWPN and WWNN, for more information.

For LPe12000-series adapters, the tab includes a **Download Firmware** button. For instructions on updating firmware on a port of an LPe12000-series adapter, see Section 9, Updating Adapter Firmware.

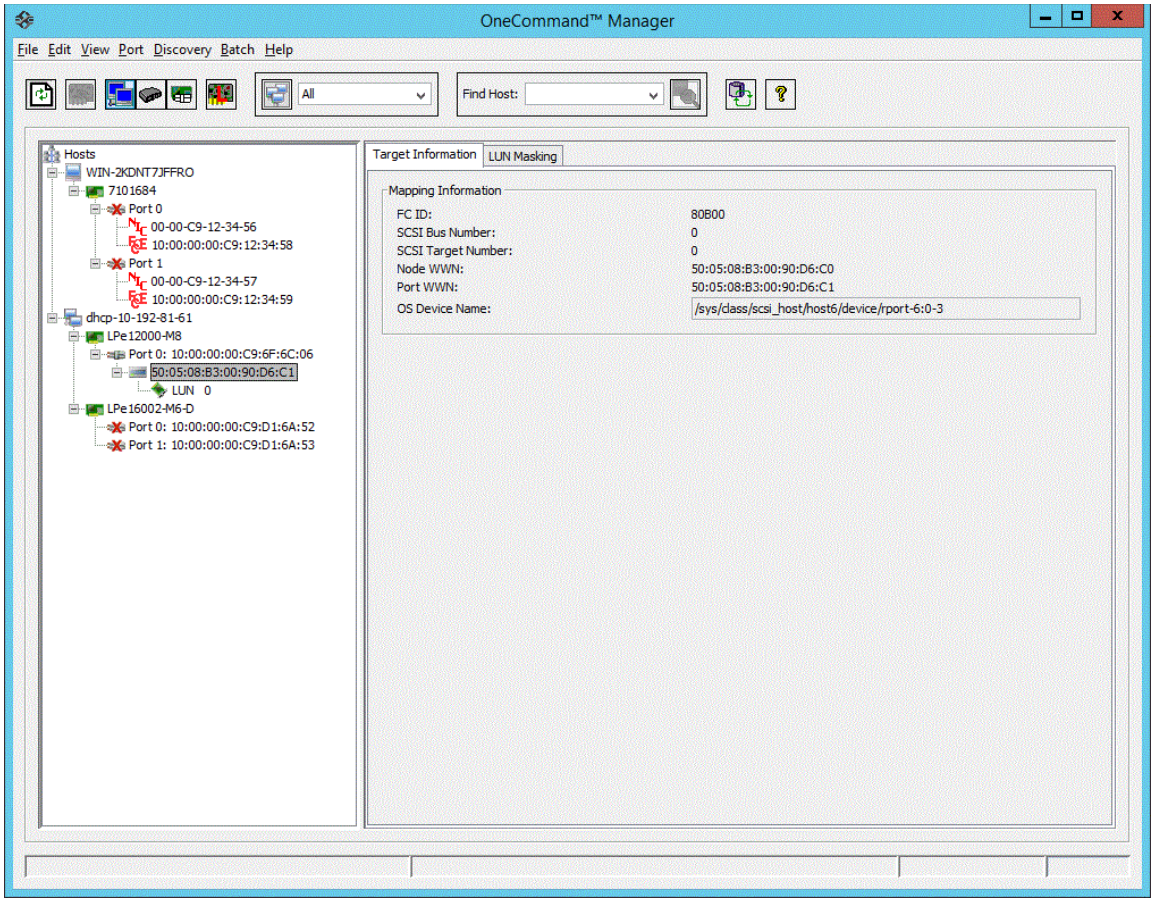
8.8 Viewing Target Information

When you select a target associated with an adapter from the discovery-tree (Figure 4), the **Target Information** tab (Figure 33) displays information associated with that target.

To view target information, perform these steps:

1. Select the **Host**, **Fabric,** or **Virtual Port** view.
2. In the discovery-tree (Figure 4), select the target whose information you want to view. The **Target Information** tab appears (Figure 33).

Figure 33: Target Information Tab



The following Target Information fields are displayed:

- Mapping Information area:
  - **FC ID** – The FC ID for the target; assigned automatically in the firmware.
  - **SCSI Bus Number** – The SCSI bus number to which the target is mapped.
  - **SCSI Target Number** – The target's identifier on the SCSI bus.
  - **Node WWN** – A unique 64-bit number, in hexadecimal, for the target (N_PORT or NL_PORT).
  - **Port WWN** – A unique 64-bit number, in hexadecimal, for the fabric (F_PORT or Switched Fabric Loop Port [FL_PORT]).
  - **OS Device Name** – The operating system device name.

8.9 Viewing LUN Information

When you select a LUN associated with a target from the discovery-tree (Figure 34), the **LUN** tab displays information associated with that LUN.

NOTE: The **Refresh LUNs** button refreshes only the LUN list for the currently selected target.

NOTE: On Linux systems, to make LUNs that are newly added to a storage array appear on the host, the following script must run from the command shell:

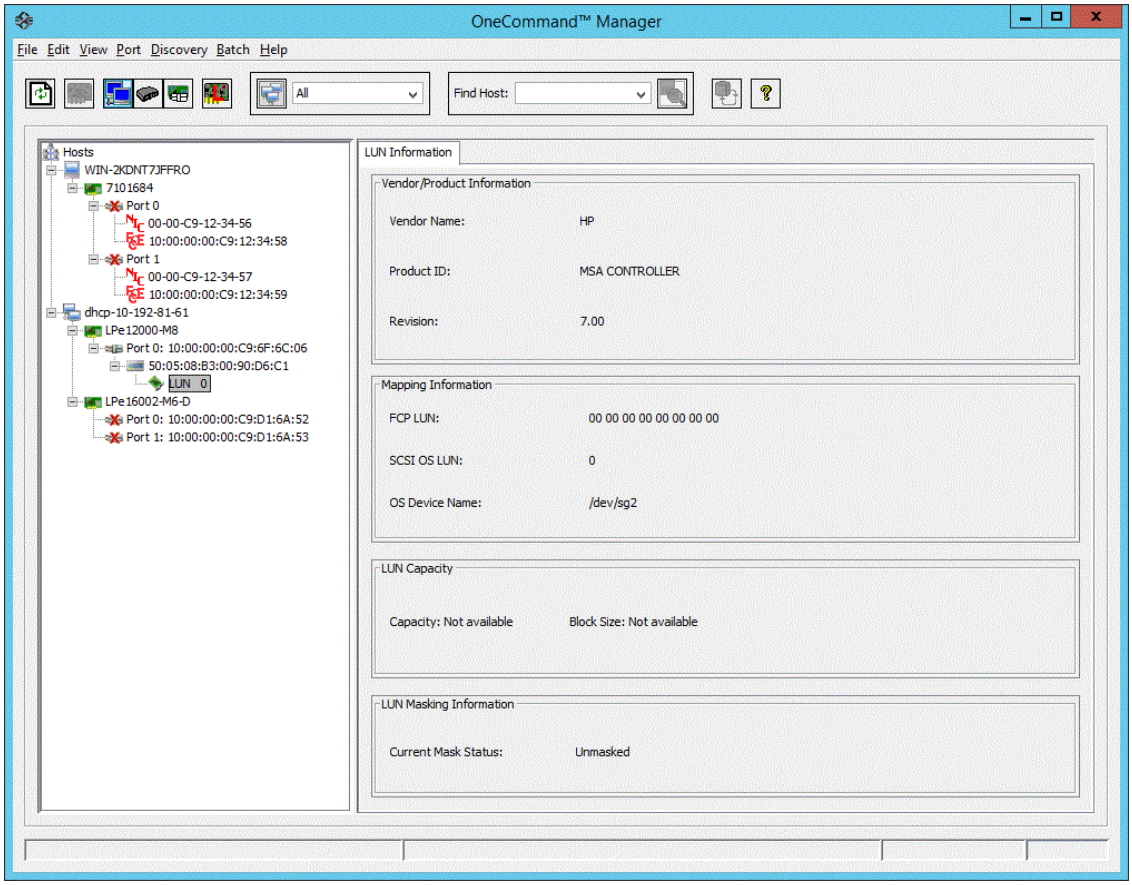
```
/usr/sbin/lpfc/lun_scan all
```

This script prevents you from having to reboot. If the host machine is rebooted after the LUN is added to the target array, you do not need to run the script.

To view the LUN information, perform these steps:

1. Select the **Host**, **Fabric,** or **Virtual Port** view.
2. From the discovery-tree, select a LUN. The **LUN Information** tab appears (Figure 34).

Figure 34: LUN Information Tab



The following LUN Information fields are displayed:

- Vendor Product Information area:
  - **Vendor Name** – The name of the vendor of the LUN.
  - **Product ID** – The vendor-specific ID for the LUN.
  - **Revision** – The vendor-specific revision number for the LUN.
- Mapping Information area:
  - **FCP LUN** – The FC identifier used by the adapter to map to the SCSI OS LUN.
  - **SCSI OS LUN** – The SCSI identifier used by the operating system to map to the specific LUN.
  - **OS Device Name** – The name assigned by the operating system to the LUN.
- LUN Capacity area:

NOTE: LUN capacity information is only provided if the LUN is a mass-storage (disk) device. Other devices, such as tapes and scanners, do not display capacity.

  - **Capacity** – The capacity of the LUN, in megabytes.
  - **Block Size** – The length of a logical unit block in bytes.
- LUN Masking area:
  - **Current Mask Status** – Possible states are masked or unmasked. See Section 8.11, Masking and Unmasking LUNs (Windows) for more information on LUN masking.

8.10 Viewing Target Mapping

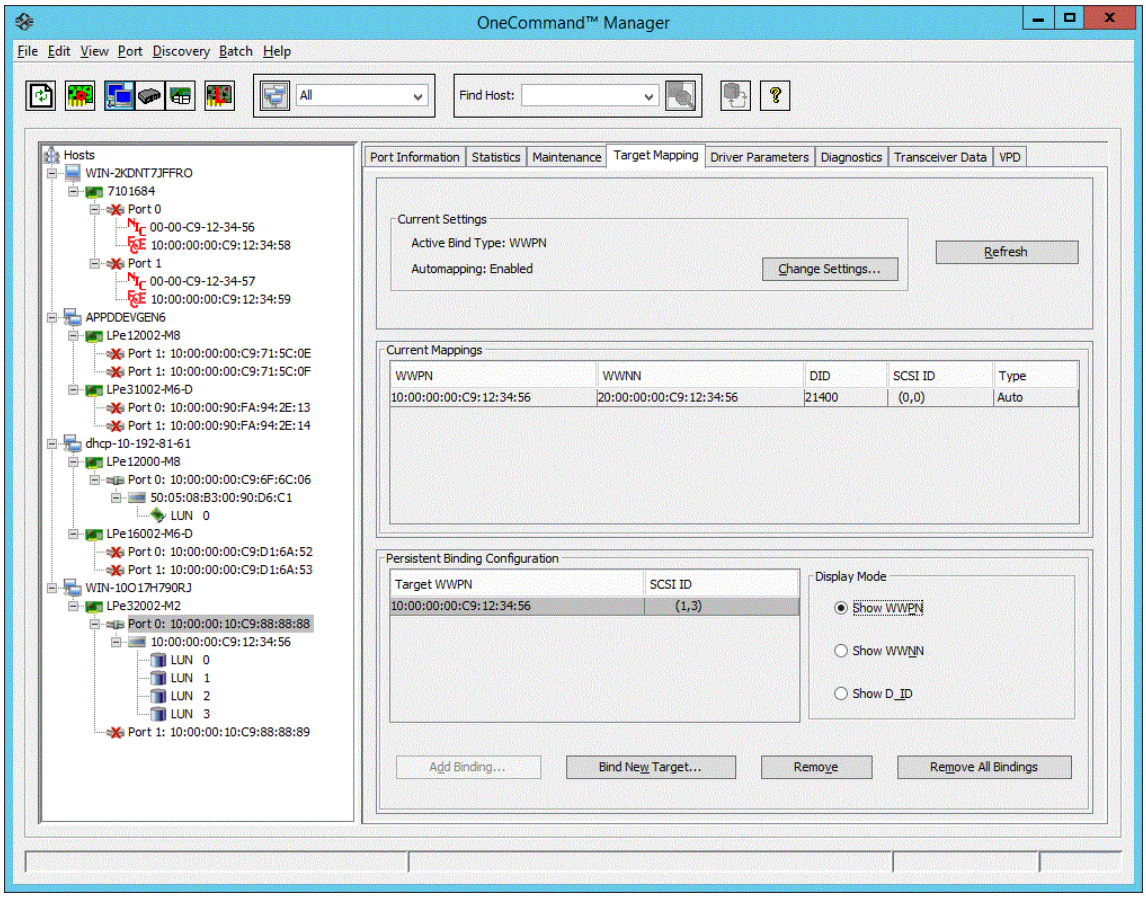
The **Target Mapping** tab (Figure 35) enables you to view current target mapping and to set up persistent binding.

NOTE: Persistent binding is not supported on Solaris systems.

To view target mapping, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree, select the FC function whose target mapping information you want to view.
3. Select the **Target Mapping** tab (Figure 35).

Figure 35: Target Mapping Tab



The following Target Mapping fields are displayed:

- Current Settings area:

NOTE: For Linux and VMware ESXi, this area is N/A.

  - **Active Bind Type** – WWPN, WWNN, or a destination identifier (D_ID).
  - **Automapping Enabled** – The current state of SCSI device automapping: enabled (default) or disabled.
- Current Mappings area:
  - This table lists current mapping information for the selected FC function.
- Persistent Binding Configuration area:

NOTE: For Linux and VMware ESXi, this area is N/A.

This table lists persistent binding information for the selected FC function (not available on VMware ESXi servers being managed through the CIM interface).

NOTE: For Linux and VMware ESXi, this area is N/A.

- Display Mode area:
  - Select the method by which you want to display information in the Persistent Binding Configuration table.

  For information on changing settings, see Section 8.10.1.1, Changing Automapping Settings.

  For information on adding a binding, see Section 8.10.1.2, Adding a Persistent Binding.

  For information on binding a new target, see Section 8.10.1.3, Binding a Target that Does Not Appear in the Persistent Binding Table.

To remove a single binding, select the binding and click **Remove**.

To remove all bindings, click **Remove All Bindings**.

8.10.1 Using Automapping and Persistent Binding (Windows Only)

NOTE: This option is not available in read-only mode.

Set up persistent binding on remote and local adapters. Global automapping assigns a binding type, target ID, SCSI Bus, and SCSI ID to the device. The binding type, SCSI Bus, and SCSI ID can change when the system is rebooted. With persistent binding applied to one of these targets, the WWPN, SCSI Bus, and SCSI ID remain the same when the system is rebooted.

The driver refers to the binding information at during system boot. When you create a persistent binding, the OneCommand Manager application tries to make that binding dynamic. However, the binding must meet all of the following criteria to be dynamic:

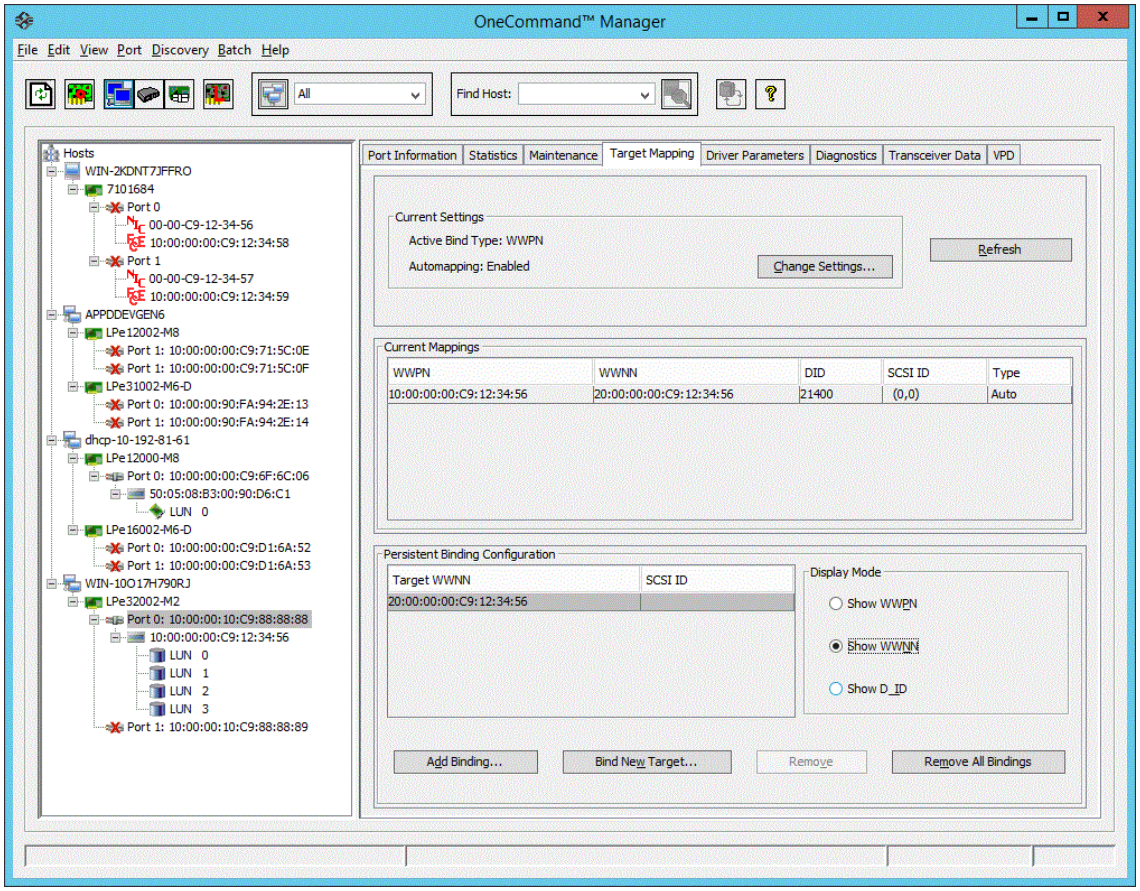
- The SCSI ID (target/bus combination) specified in the binding request must not be mapped to another target. For example, the SCSI ID must not already appear in the 'Current Mappings' table under 'SCSI ID'. If the SCSI ID is already in use, the binding cannot be made dynamic, and a reboot is required.
- The target (WWPN, WWNN, or DID) specified in the binding request must not be mapped to a SCSI ID. If the desired target is already mapped, a reboot is required.
- The bind type (WWPN, WWNN, or DID) specified in the binding request must match the currently active bind type shown in the Current Settings area of the **Target Mapping** tab. If they do not match, then the binding cannot be made active.

8.10.1.1 Changing Automapping Settings

To change automapping settings, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree, select the FC function you want to set up with persistent binding.
3. Select the **Target Mapping** tab (Figure 36). All targets are displayed.

Figure 36: Target Mapping Tab



4. Target mappings are displayed by WWPN, WWNN, or D_ID. **PB** indicates mapping from persistent binding, and **Auto** indicates an automapped target. In the Display Mode section, choose the display mode you want to use.
5. If you want to make changes, click **Change Settings**. The **Mapped Target Settings** dialog appears. You can enable or disable auto-mapping and change the active bind type. Click **OK**.
6. Reboot the system for changes to take effect.

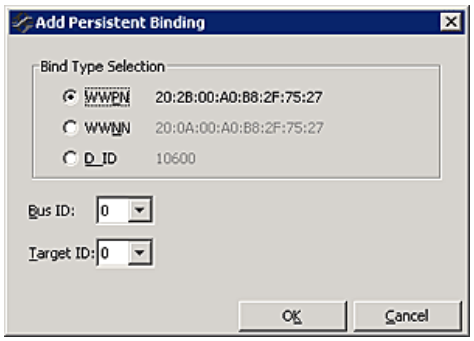
8.10.1.2 Adding a Persistent Binding

To add a persistent binding, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree (Figure 4), select the FC function you want to set up with persistent binding.

3. Select the **Target Mapping** tab (Figure 36). All targets are displayed. In the Persistent Binding Configuration table, click the target that you want to bind.
4. Click **Add Binding**. The **Add Persistent Binding** dialog (Figure 37) is displayed.

Figure 37: Add Persistent Binding Dialog



5. Select the bind type that you want to use (**WWPN**, **WWNN**, or **D_ID**).
6. Select the **Bus ID** and **target ID** that you want to bind, and click **OK.**

NOTE: Automapped targets have entries only in the second column of the Current Mappings table. Persistently bound targets have entries in the second and third columns. In this case, the third column contains the SCSI Bus and target numbers you specified in the **Add Persistent Binding** dialog. This binding takes effect only after the local machine is rebooted.

8.10.1.3 Binding a Target that Does Not Appear in the Persistent Binding Table

NOTE: It is possible to specify a SCSI bus and target that have already been used on behalf of a different FC target. Attempting to bind a target already in the Persistent Binding table on the **Target Mapping** tab results in an error message:

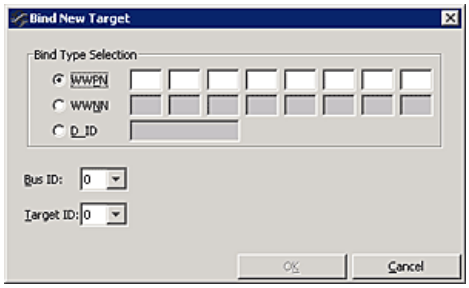
```
Target already in target list.
```

Click **Add Binding**.

To bind a target that does not appear in the Persistent Binding table on the **Target Mapping** tab, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree (Figure 4), select the FC function you want to set up with persistent binding.
3. Select the **Target Mapping** tab (Figure 35). All targets are displayed.
4. Click **Bind New Target**. The **Bind New Target** dialog is displayed (Figure 38).

Figure 38: Bind New Target Dialog



5. Select the type of binding you want to use, and type the WWPN, WWNN, or D_ID that you want to bind to the target.
6. Select the Bus ID and Target ID that you want to bind, and click **OK.**

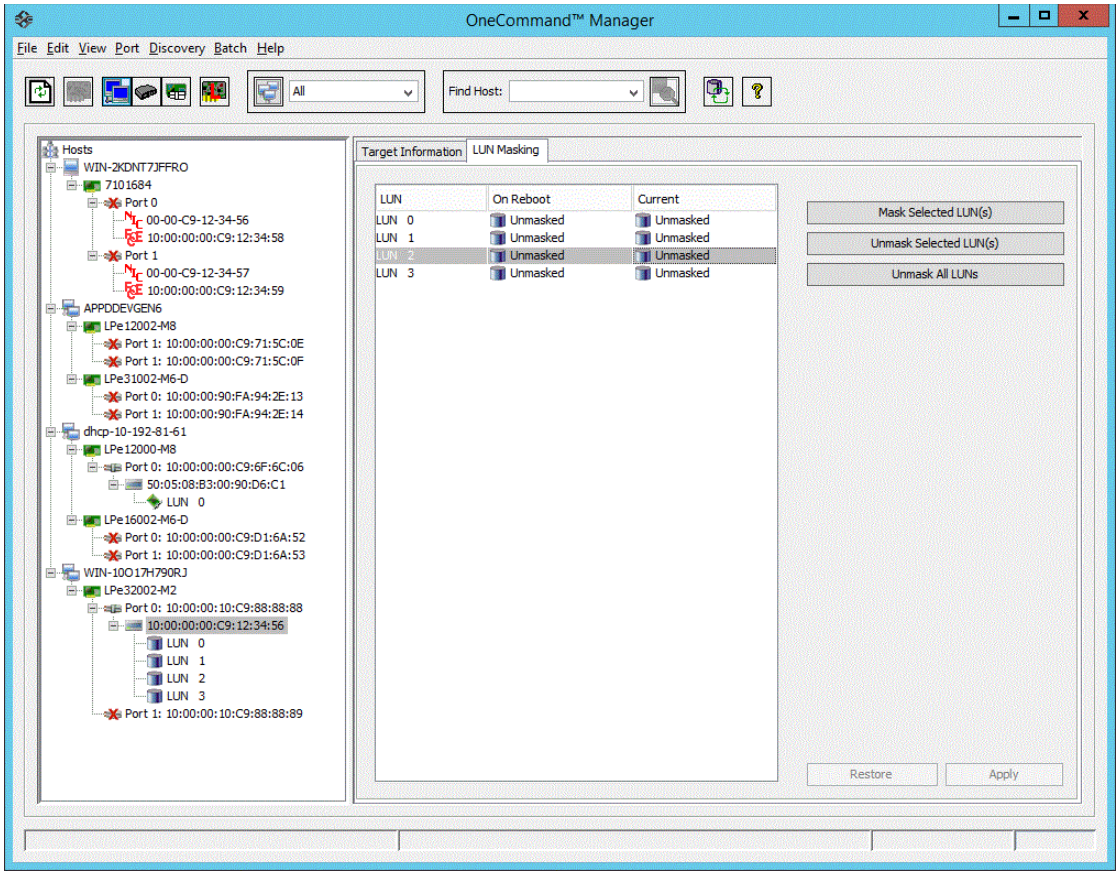
NOTE: A target does not appear on the target list if automapping is disabled and the target is not already persistently bound.

8.11 Masking and Unmasking LUNs (Windows)

LUN masking refers to whether or not a LUN is visible to the operating system. A masked LUN is not available and is not visible to the operating system. You can use the **LUN Masking** tab (Figure 39) to mask or unmask LUNs at the host level.

NOTE: The **LUN Masking** tab (Figure 39) is not shown in the Virtual Port view because LUN masking is not available for virtual ports.

Figure 39: LUN Masking Tab



8.11.1 LUN Masking Conventions and Guidelines

LUN icons in the discovery-tree (Figure 4) reflect the live mask state currently in use by the driver. Green LUN icons indicate unmasked LUNs. Gray LUN icons indicate masked LUNs. Red text indicates that a LUN mask has been changed, but not applied (saved).

The following LUN Masking information is displayed:

- **LUN** – The FC LUN number.
- **On Reboot** – The On Reboot column shows the mask configuration currently saved to the configuration file on disk (Solaris) or to the registry (Windows). Usually, for a specific LUN, the states reported in the On Reboot and Current columns are identical. However, there are times when these do not match. For example, the hbacmd utility can be used to change only the Current mask state for a LUN and not touch the On Reboot mask state contained in the configuration file.
- **Current** – The Current column displays the live mask state currently in use by the driver. When you first see the **LUN Masking** tab, the mask states displayed in the Current column are identical to the mask states for the corresponding LUNs in the discovery-tree (Figure 4).

To change the mask status of a LUN, perform these steps:

1. Select the **Host** view.
2. From the discovery-tree (Figure 4), select the target whose LUN masking state you want to change. A set of LUNs appears below the selected target.

3. Select the **LUN Masking** tab (Figure 39). This tab contains a list of the same set of LUNs that appear below the FC target in the discovery-tree (Figure 4).
4. In the LUN list of the **LUN Masking** tab, select one or more LUNs. The **Mask Selected LUNs**, **Unmask Selected LUNs**, **Unmask All LUNs**, **Restore**, and **Apply** buttons become active as appropriate. For example, if the LUN is currently unmasked, only the **Mask Selected LUN(s)** button is active.
5. Change the mask status: click **Mask Selected LUN(s)**, **Unmask Selected LUN(s)** or **Unmask All LUNs** as appropriate. Mask status changes appear in red text.

NOTE: To return all mask settings to their status before you started this procedure, click **Restore** before you click **Apply**. If you click **Apply**, changes cannot be cancelled by clicking **Restore**. To unmask all LUNs, click **Unmask All LUNs**. This button is always active. Make sure to also click **Apply** to commit the changes.

6. Click **Apply** to commit the changes. An informational message is displayed that confirms the mask status has changed and the red text changes to black.

8.11.2 Managing ExpressLane LUNs

The OneCommand Manager application allows you to set special priority queuing for selected LUNs by making them ExpressLane LUNs (Figure 40). ExpressLane LUN performance is superior to that of regular LUNs. You can enable ExpressLane LUNs attached to both physical and virtual ports.

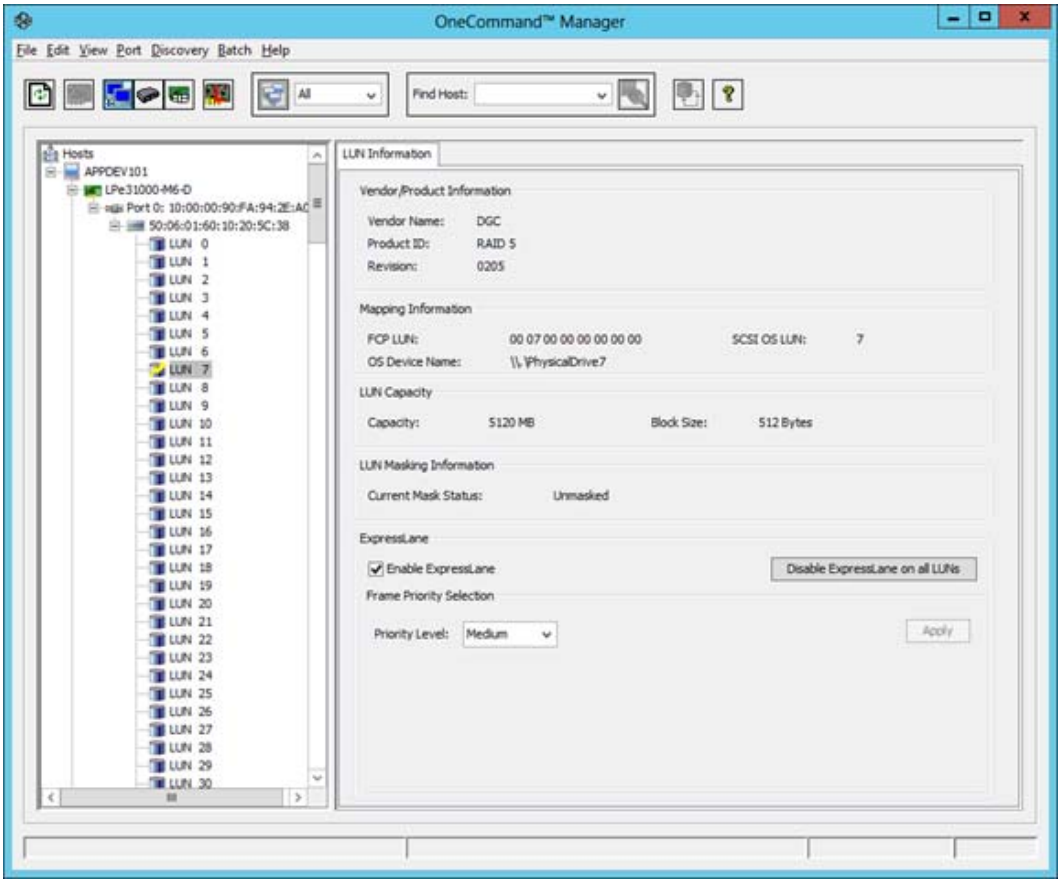
You can also assign a frame priority to an ExpressLane LUN if the adapter and the switch support it.

ExpressLane LUN assignments persist across reboots.

NOTE:

- Masked LUNs cannot be ExpressLane enabled because they are not presented to the host. Conversely, ExpressLane LUNs cannot be masked.
- For Linux operating systems, if ExpressLane LUNs are created, the VPort must be re-created after a system boot because VPorts do not persist across system reboots. If the VPort is re-created with the same WWPN to which the ExpressLane LUN was previously assigned, and the same LUN is then detected, it becomes an ExpressLane LUN again.

Figure 40: LUN Information Tab (ExpressLane LUN with Frame Priority Selection Supported)



To enable an ExpressLane LUN, perform these steps:

NOTE: ExpressLane must be enabled on the **Driver Parameters** tab to create an ExpressLane LUN. See Section 8.13, Configuring the Driver Parameters, for more information.

1. Select the **Host**, **Fabric,** or **Virtual Port** view.
2. From the discovery-tree, select a LUN under the adapter on which you want to enable ExpressLane. The **LUN Information** tab appears (Figure 40).
3. Select the **Enable ExpressLane** check box.
4. Click **Apply**. The **LUN** icon in the discovery-tree changes to the **ExpressLane LUN** icon.

To disable an ExpressLane LUN, perform these steps:

1. Select the **Host**, **Fabric,** or **Virtual Port** view.
2. From the discovery-tree, select a LUN under the adapter on which you want to disable ExpressLane. The **LUN Information** tab appears (Figure 40).
3. Clear the **Enable ExpressLane** check box to disable the selected LUN.
4. Click **Apply**.

To disable all ExpressLane LUNs, perform these steps:

1. Select the **Host**, **Fabric,** or **Virtual Port** view.
2. From the discovery-tree, select a LUN under the adapter on which you want to disable ExpressLane. The **LUN Information** tab appears (Figure 40).
3. Click **Disable ExpressLane for all LUNs on this target**.
4. A dialog appears warning you that you are about to delete all ExpressLane LUNS on this target. Click **OK**.

   All ExpressLane LUN icons in the discovery-tree (for the selected adapter port) will change to the regular **LUN** icon and any assigned frame priority is set to 0.

8.11.2.1 Selecting a Frame Priority

If the adapter and switch support it, you can assign a frame priority to the ExpressLane LUN. Switches can provide up to three priority levels; **Low**, **Medium**, and **High,** but they might provide fewer options.

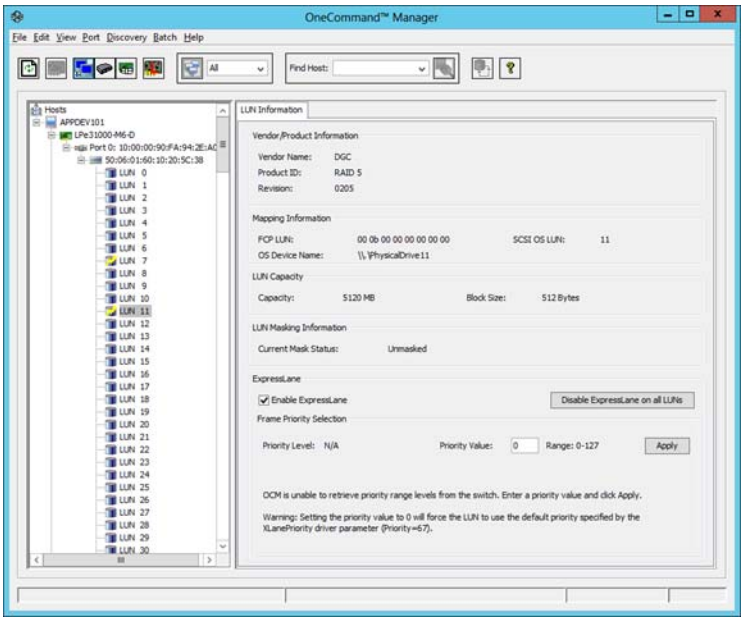
To select a frame priority, perform these steps:

NOTE: The `EnableXLane` driver parameter must be enabled on the Driver Parameters tab to set frame priorities. See Section 8.13, Configuring the Driver Parameters, for more information.

1. Select the **Host**, **Fabric,** or **Virtual Port** view.
2. From the discovery-tree, select a LUN under the adapter on which you want to enable ExpressLane. The **LUN Information** tab appears (Figure 40).
3. Select the **Enable ExpressLane** check box if it is not already selected. The **LUN** icon in the discovery-tree changes to the **ExpressLane LUN** icon.
4. Select a frame priority from the **Priority Level** drop-down list.

NOTE: If the switch connected to the FC initiator does not support LUN-specific frame priority levels using the Get Fabric Object (GFO), you must manually enter the frame priority values in the range of 0 to 127 for all ExpressLane enabled LUNs as depicted in Figure 41.

Figure 41: LUN Information Tab (Frame Priority Not Supported by the Switch)



5. Click **Apply**.

   If problems occurred when assigning the frame priority, the **LUN Information** tab displays a message with a suggested solution.

8.12 Changing the WWPN and WWNN

The **Maintenance** tab (Figure 42) enables you to change the WWPN and the WWNN of a selected FC function. For example, you can use an installed adapter as a standby in case another installed adapter fails. By changing the standby adapter's WWPN or WWNN, it can assume the identity and configuration (for example, driver parameters, persistent binding settings, and so on) of the failed adapter.

NOTE: You cannot change WWPN and WWNN when FA-PWWN is enabled on the adapter port.

Three options exist for referencing WWNs:

- Factory Default WWN – As shipped from the factory. This value cannot be changed.
- Non-volatile WWN – Values that are saved in non-volatile adapter’s flash memory that survives a reboot or a power outage.
- Volatile WWN – A temporary value that is saved in volatile memory on the flash. If volatile WWNs are set, they are used instead of the non-volatile WWNs.

NOTE: Volatile WWN changes require a warm system reboot to take effect. Volatile WWN changes are lost on systems that power-cycle the adapters during the reboot.

To avoid address conflicts, do not assign a WWPN with the same WWPN as another FC function on your SAN. The OneCommand Manager application checks the WWPN you specify against all the other detected WWPNs and, if a duplicate is found, an error is displayed and the WWPN is not changed.

CAUTION! Changing volatile WWNs takes the selected adapter offline. Make sure that this adapter is not controlling a boot device and all I/O activity on this adapter is stopped before proceeding, or unexpected behavior or data loss can result.

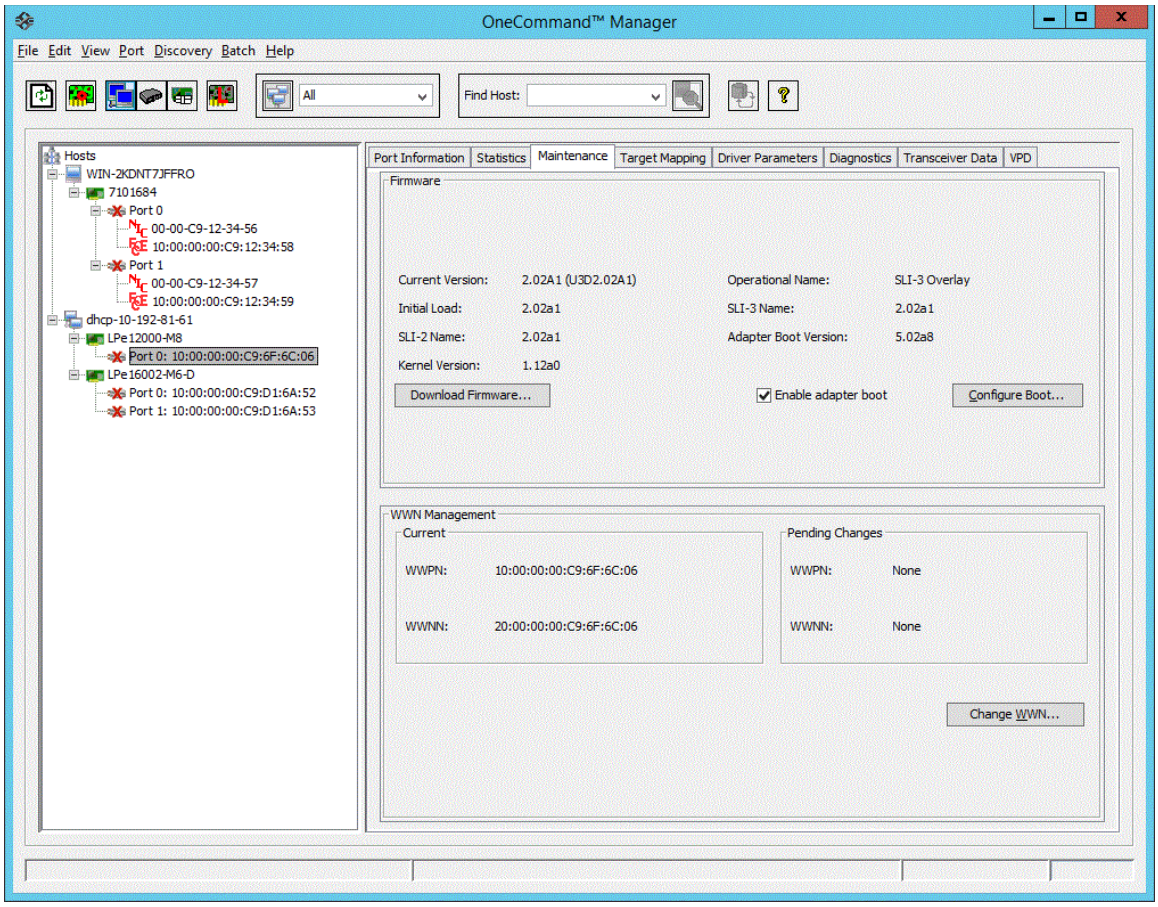
In an environment where preboot management exists, a WWPN or WWNN modified by the OneCommand Manager application can be overridden by preboot management, such as Lenovo System X BOFM and industry-standard CLP.

For example, in an environment with CLP or Blade Open Firmware Management Protocol (BOFM), the OneCommand Manager application modifies the WWNN or WWPN. The OneCommand Manager application requires a reboot to complete the change. After reboot, the CLP string is sent during system boot and rewrites the WWNN or WWPN, or EFIBoot finds the BOFM protocol and uses the default WWNN or WWPN by the command from the BOFM.

To change an FC function's WWPN or WWNN, perform these steps:

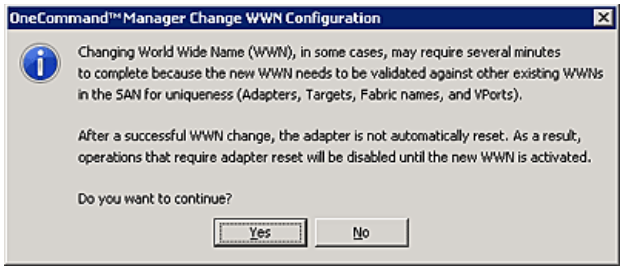
1. Perform one of the following tasks:
   – From the **View** menu, click **Group Adapters by Host Name**.
   – From the toolbar, click **Group Adapters by Host Name**.
   – From the **Host Grouping** menu, select **Group Adapter by Fabric Names**.
2. In the discovery-tree, select the FC function that you want to change.
3. Select the **Maintenance** tab (Figure 42).

Figure 42: Maintenance Tab



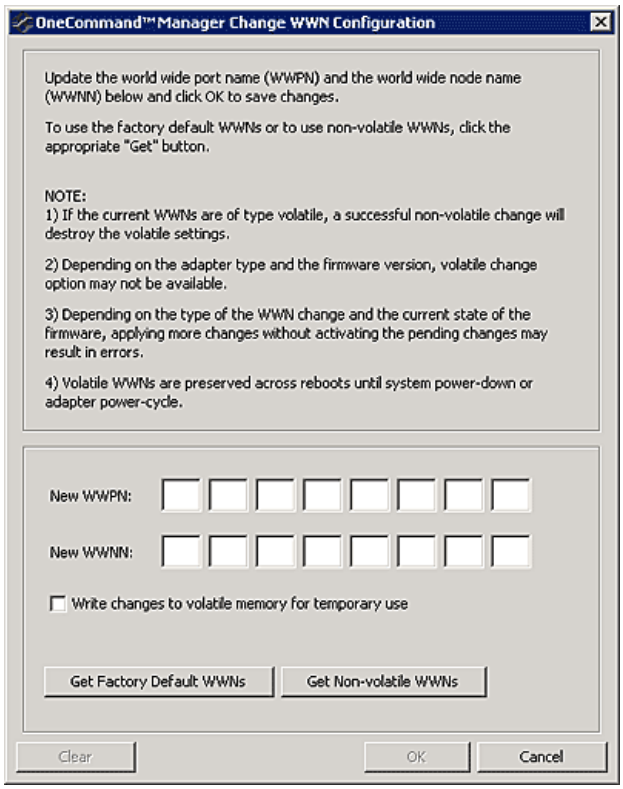
4. Click **Change WWN**. The warning in Figure 43 appears.

Figure 43: Warning About Changing WWN



5. Click **Yes**. The **OneCommand Manager Change WWN Configuration** dialog appears (Figure 44).

Figure 44: OneCommand Manager Change WWN Configuration Dialog



6. Perform one of the following tasks:
   - Enter a new WWPN and WWNN.
   - Click **Get Factory Default WWNs** to load the settings that were assigned to the FC function when the adapter was manufactured to the New WWPN and WWNN settings. These values can then be modified if desired and saved as volatile or non-volatile WWNs.
   - Click **Get Non-volatile WWNs** to load the current non-volatile WWN settings to the New WWPN and WWNN settings. These values can then be modified if desired and saved to volatile or non-volatile memory. You can edit the data returned from the button.
7. Select the **Write changes to volatile memory for temporary use** check box to save the New WWPN and New WWNN settings as volatile WWNs. If cleared, the New WWPN and New WWNN settings are saved as non-volatile WWNs.

NOTE: If the adapter or firmware does not support volatile WWNs, the **Write changes to volatile memory for temporary use** check box is disabled.

8. Click **OK**. After checking for a duplicate WWPN, the new WWPN and new WWNN values are saved for volatile or non-volatile use. The new WWPN and WWNN appear in the Pending Changes section in the WWN Management area of the **Maintenance** tab until the system is rebooted.
9. Reboot the system for the changes to take effect. After rebooting, the changes are applied and appear in the Current section of the **Maintenance** dialog.

8.12.1 Changing Port Names

NOTE: This option is not available in read-only mode.

The OneCommand Manager application allows you to change the adapter port names in the discovery-tree.

For example, you may want to identify a particular FC function with the role it supports, such as a tape drive, scanner, or some other device. Use any characters you want for names, and names can be up to 255 characters in length. You can also revert to the adapter's default name.

NOTE: Although you can change the FC function's displayed name from the default WWPN, the change occurs in the discovery-tree (Figure 4) only. The function's WWPN is still active; it is replaced for display purposes with the name you enter. For example, the **Port WWN** field of the **Port Information** tab is not changed. Also, any changes you make to the names in your discovery-tree are seen only by you; users running the OneCommand Manager application on another host do not see your name changes.

To change the name of an FC function, perform these steps:

1. From the discovery-tree (Figure 4), select the port that you want to change by performing one of the following tasks:
   – Select **Edit Name** from the **Port** menu.
   – From the discovery-tree, right-click the port that you want to change and select **Change Name**.
2. Edit the name in the discovery-tree.

To use the FC function's default name, perform these steps:

1. From the discovery-tree (Figure 4), select the FC function that you want to change.
2. Perform one of the following tasks:
   – Select **Use Default Name** from the **Port** menu.
   – From the discovery-tree, right-click the port that you want to change and select **Restore Default Name**.

8.12.2 Resetting the FC Functions

You can reset remote and local functions.

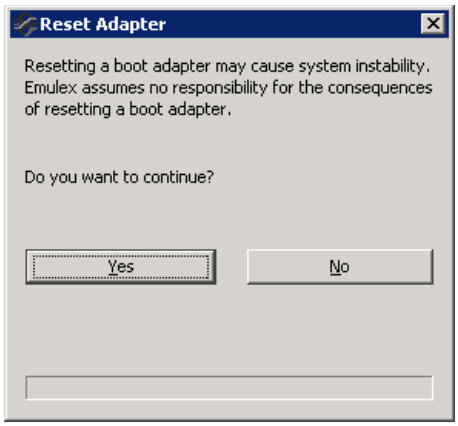
CAUTION! Do not reset functions while copying or writing files. This action could result in data loss.

To reset the FC function, perform these steps:

1. In the discovery-tree (Figure 4), select the FC function that you want to reset.
2. Perform one of the following tasks:
   – From the **Port** menu, click **Reset Port**.
   – From the toolbar, click  **Reset**.

The **Reset Adapter** warning appears (Figure 45).

Figure 45: Reset Adapter Warning



3. Click **Yes** to perform the reset.

   The reset can require several seconds to complete. While resetting, the status bar shows **Reset in progress**. When the reset is finished, the status bar shows **Reset Completed**.

8.13 Configuring the Driver Parameters

NOTE: This option is not available in read-only mode.

The OneCommand Manager application displays available driver parameters along with their defaults and maximum and minimum settings. A description of the selected parameter is also provided. This section contains information you must be aware of when working with driver parameters. For a more detailed description of specific driver parameters, refer to the appropriate Emulex driver user guide.

NOTE: In Solaris and Linux, you can also specify parameters when loading the driver manually. Refer to the appropriate driver user guide for instructions.

8.13.1 Activation Requirements

A parameter has one of the following activation requirements:

- Dynamic – The change takes effect while the system is running.
- Reset – Requires a reset from the utility before the change takes effect.
- Reboot – Requires reboot of the entire machine before the change takes effect. In this case, you are prompted to perform a reboot when you exit the utility.

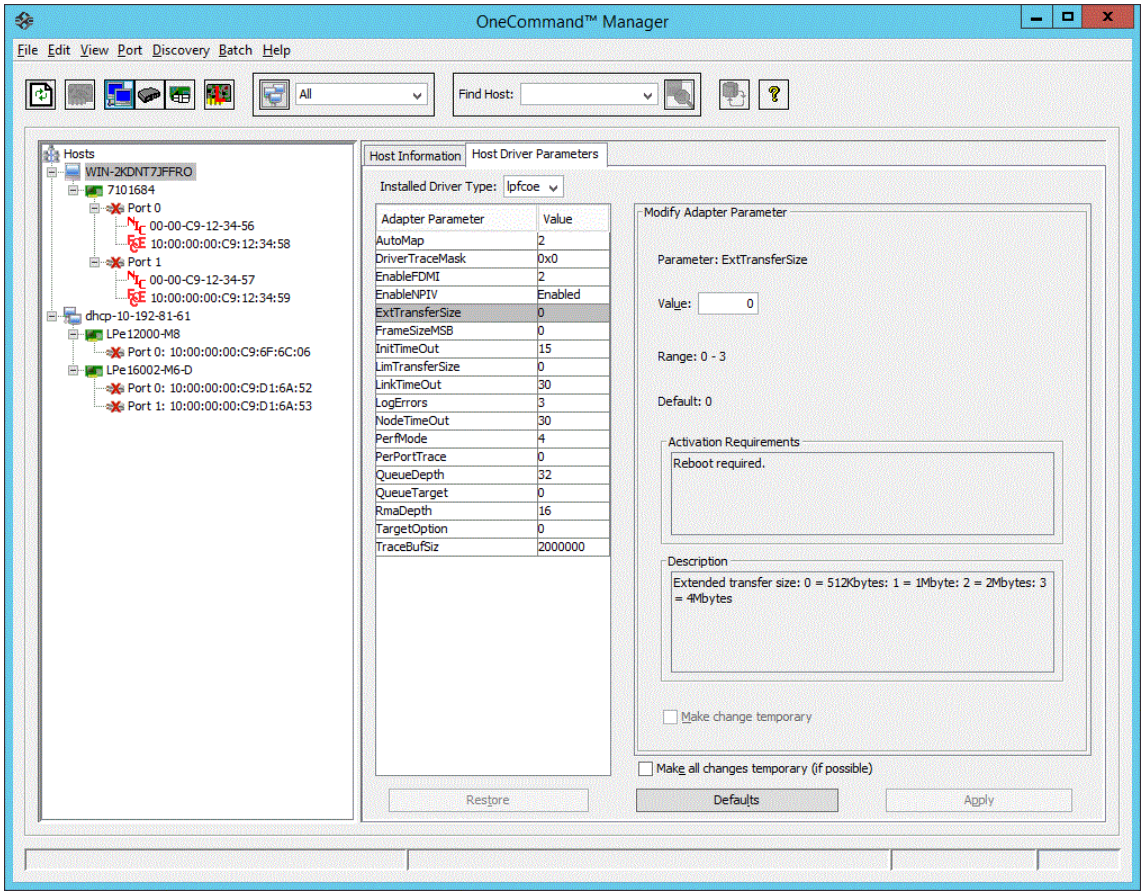
8.13.2 Host Driver Parameters Tab

The **Host Driver Parameters** tab (Figure 46) enables you to view and edit the adapter driver parameter settings contained in a specific host. The host driver parameters are global values, and apply to all adapters in that host unless they are overridden by parameters assigned to a specific adapter using the adapter **Driver Parameters** tab. For each parameter, the tab shows the current value, the range of acceptable values, the default value, and whether the parameter is dynamic. A dynamic parameter allows the change to take effect without resetting the adapter or rebooting the system.

For information on changing parameters for a single adapter, see Section 8.13.3, Setting the Driver Parameters. For information on changing parameters for the host, see Section 8.13.3.6, Setting the Driver Parameters for All FC Functions in a Host.

NOTE: If no FC functions are discovered, the entire Host **Driver Parameters** tab (Figure 46) is dimmed. This event occurs because no drivers exist to which the host driver parameters apply.

Figure 46: Host Driver Parameters Tab



The following **Host Driver Parameters** tab fields are displayed:

- **Installed Driver Type** – The current drivers installed on this host. If more than one driver type is installed, the **Installed Driver Types** drop-down list shows a list of all driver types that are installed on the adapters in the host and enables you to select the particular driver type to configure.
- **Adapter Parameter table** – A list of adapter driver parameters for the selected driver type and their current values.
- Modify Adapter Parameter area:
  - Adapter-specific information is displayed in this area, which includes value, range, default, activation requirements, and description.

8.13.3 Setting the Driver Parameters

The **Driver Parameters** tab for FC functions and hosts enables you to modify driver parameters for a specific FC function or all FC functions in a host.

For example, if you select a host in the discovery-tree (Figure 4), you can globally change the parameters for all FC functions in that host. If you select an FC function in the discovery-tree, you can change parameters for only that FC function.

For each parameter, the **Driver Parameters** tabs show the current value, the range of acceptable values, the default value, and the activation requirement. You can also restore parameters to their default settings.

You can apply driver parameters for one FC function to other FC functions in the system using the **Driver Parameters** tab, thereby simplifying multiple adapter configuration. See Section 8.13.4, Creating a Batch Mode Driver Parameters File, for more information.

NOTE: The Linux 2.6 kernel only supports setting some of the driver parameters for individual FC functions. Some driver parameters must be applied to all FC functions contained in the host. Refer to the *Emulex Driver for Linux for LightPulse Adapters User Guide* for more information.

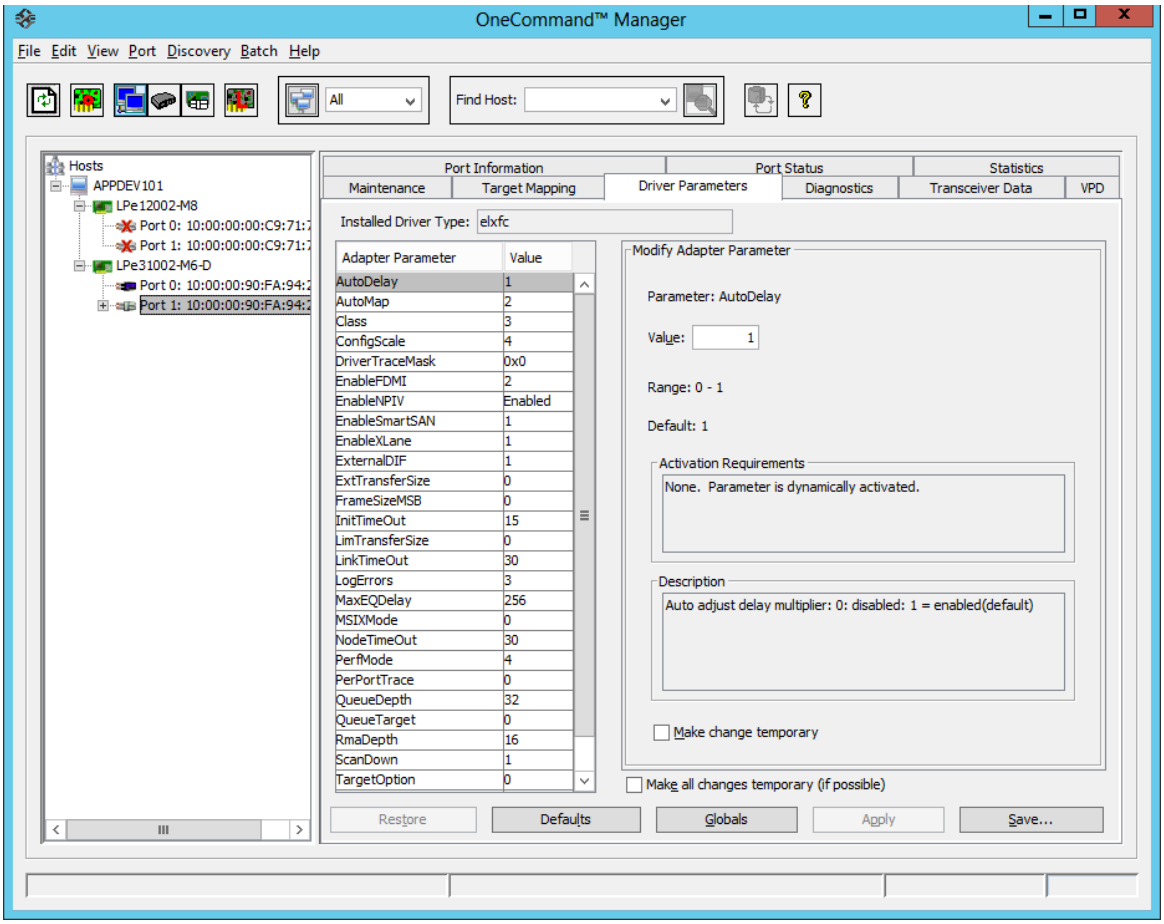
8.13.3.1 Setting the Driver Parameters for a Single FC Function

To change the driver parameters for a single FC function, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree (Figure 4), select the FC function that you want to change.
3. Select the **Driver Parameters** tab (Figure 47). The parameter values for the selected FC function are displayed.

NOTE: The LinkSpeed (Windows) or link-speed (Linux/Solaris) driver parameters are not shown if the adapter supports forced link speed. The link speed is configured using the **Firmware Parameters** tab. See Section 7.3, Viewing Firmware Parameters, for more information.

Figure 47: Driver Parameters Tab – Adapter Selected



4. Click the parameter that you want to change. A description of the parameter appears on the right side of the tab.
5. Enter a new value in the **Value** field in the same hexadecimal or decimal format as the current value or select a value from the drop-down list. If you enter a value and the current value is in hexadecimal format, it is prefaced by 0x (for example, 0x2d). You can enter a new hexadecimal value without the 0x. For example, if you enter ff10, this value is interpreted and displayed as 0xff10.
6. If you want the change to be temporary (causing the parameter to revert to its last permanent setting when the system is rebooted), select the **Make change temporary** check box. This option is available only for dynamic parameters.
7. If you are making changes to multiple parameters, and you want all the changes to be temporary, select the **Make all changes temporary** check box. This setting overrides the setting of the **Make change temporary** check box. Only dynamic parameters can be made temporary.
8. Click **Apply**.

8.13.3.2 Restoring All Parameters to Their Earlier Values

If you changed parameters, but did not click **Apply** in the **Driver Parameters** tab (Figure 47) and you want to restore the parameters to their last saved values, click **Restore**.

8.13.3.3 Resetting All Default Values

To reset all parameter values to their default (factory) values, click **Defaults** in the **Driver Parameters** tab (Figure 47).

8.13.3.4 Setting an Adapter Parameter Value to the Host Adapter Parameter Value

To set an adapter parameter value to the corresponding host parameter value, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree (Figure 4), select the adapter port.
3. Select the **Driver Parameters** tab (Figure 47).
4. Click **Globals**. All parameter values are now the same as the global, or host, values.
5. To apply the global values, click **Apply**.

8.13.3.5 Saving the Adapter Driver Parameters to a File

To save a desired adapter parameter configuration for using with the Batch Driver Parameter Update feature, click **Save** in the **Driver Parameters** tab (Figure 47). To apply your configuration changes, click **Apply**.

Each definition is saved in a comma-delimited file with the following format:
`<parameter-name>=<parameter-value>`

The file is saved in the Emulex repository directory.

- In Windows: `\Program Files\Emulex\Util\Emulex Repository`
- In Linux: `/usr/sbin/ocmanager/RMRepository`
- In VMware ESXi: `/tmp/RMRepository`
- In Solaris: `/opt/ELXocm/RMRepository`

The OneCommand Manager application then uses the Batch Driver Parameter Update function to apply these saved settings to all compatible adapters on the SAN.

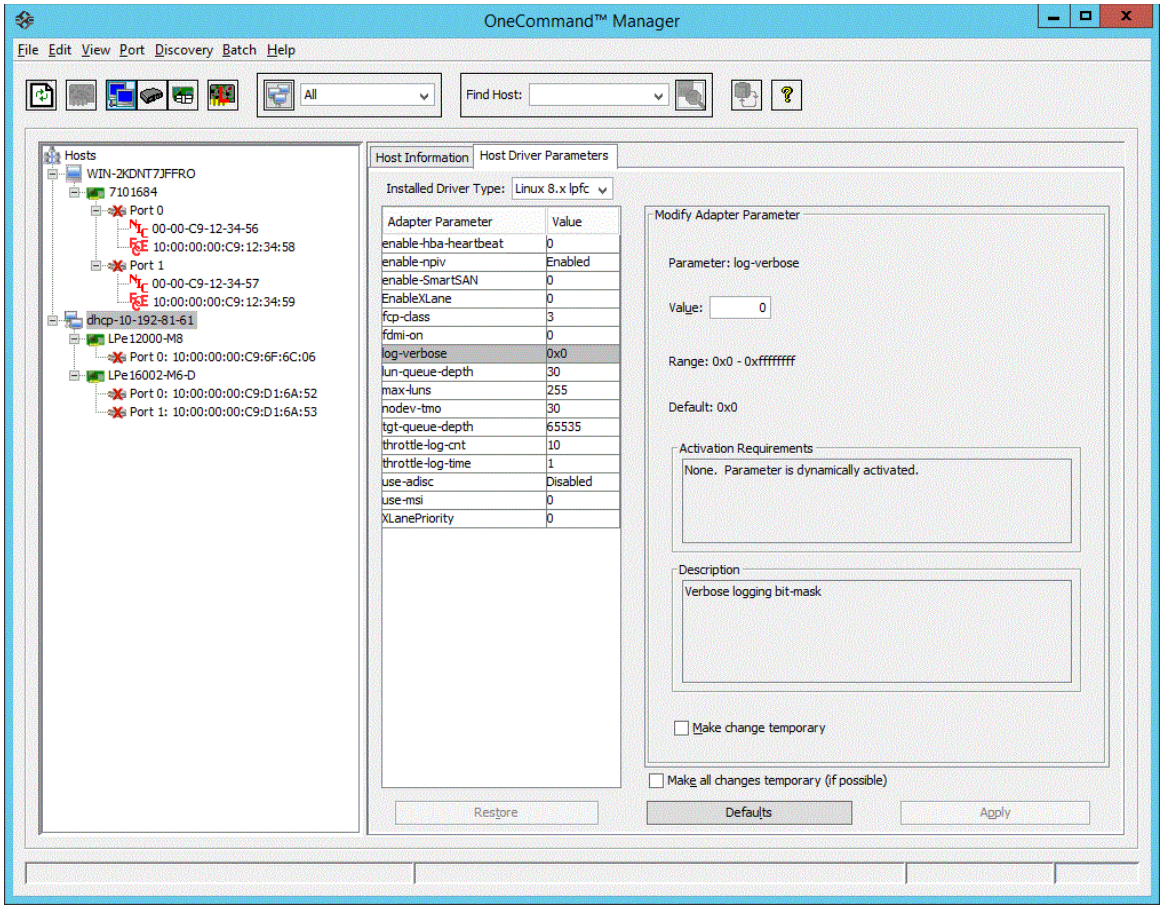
NOTE: Host driver parameters and persistent binding settings cannot be saved.

8.13.3.6 Setting the Driver Parameters for All FC Functions in a Host

To change the driver parameters for all FC functions installed in a host, perform these steps:

1. Perform one of the following tasks:
   – From the **View** menu, click **Group Adapters by Host Name**.
   – From the toolbar, click  **Group Adapters by Host Name**.
2. In the discovery-tree, click the host whose adapter driver parameters you want to change.
3. Select the **Host Driver Parameters** tab (Figure 48). If adapters with different driver types are installed, the **Installed Driver Types** menu shows a list of all driver types and driver versions that are installed. Select the driver whose parameters you want to change. This menu does not appear if all the adapters are using the same driver.
4. Click the parameter that you want to change. A description of the parameter appears on the right side of the tab.

Figure 48: Host Driver Parameters Tab – Host Selected



5. Enter a new value in the **Value** field in decimal or hexadecimal format, depending on how the current value is presented. If the value is in hexadecimal format, it is prefaced by 0x (for example, 0x2d).
6. To make a change temporary (the parameter will revert to its last permanent setting when the system is rebooted), select the **Make changes temporary** check box. This option is available only for dynamic parameters.
7. To make changes to multiple parameters, select the **Make all changes temporary (if possible)** check box. Only dynamic parameters can be made temporary.
8. Click **Apply**.

8.13.3.7 Changing Non-dynamic Parameter Values (Linux)

To change non-dynamic parameter values for Linux, perform these steps:

1. Navigate to the `/usr/sbin/ocmanager` directory, and run the scripts to stop the OneCommand Manager application processes. Type the following command:
   `./stop_ocmanager`
2. Stop all I/O to FC attached devices.
3. Unload the FC driver. Type the following command:
   `modprobe -r lpfc`

4. Reload the driver. Type the following command:
   `modprobe lpfc`
5. Start the `elxhbamgr` service (remote service). Type the following command:
   `./start_ocmanager`
   The OneCommand Manager application discovery service starts automatically when you start the application.

NOTE: For changes to persist after a reboot, you must create a new ramdisk image. Refer to the *Emulex Driver for Linux for LightPulse Adapters User Guide* for more information.

8.13.4 Creating a Batch Mode Driver Parameters File

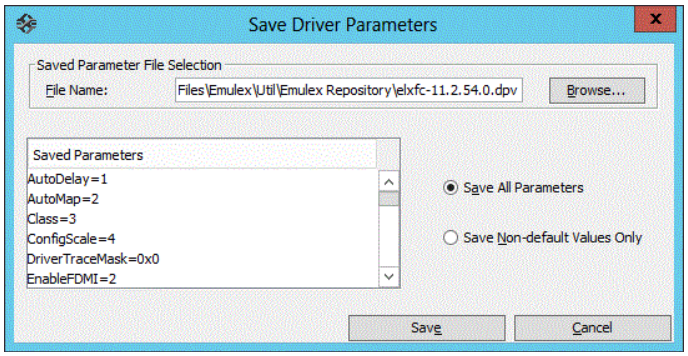
NOTE: This option is not available in read-only mode.

You can apply driver parameters for one FC function to other FC functions in the system using the **Driver Parameters** tab. When you save the driver parameters for an adapter, you create a `.dpv` file, which contains parameters for that adapter. After you create the `.dpv` file, the OneCommand Manager application enables you to assign the `.dpv` file parameters to multiple adapters in the system.

To create the `.dpv` file, perform these steps:

1. Select the **Host** or **Fabric** view.
2. Select the FC function whose parameters you want to apply to other FC functions from the discovery-tree (Figure 4).
3. Select the **Driver Parameters** tab (Figure 47).
4. Set the driver parameters.
5. After you define the parameters for the selected adapter, click **Apply**.
6. Click **Save**. The **Save Driver Parameters** dialog appears (Figure 49). You can save the file to a different directory or change its name.

Figure 49: Save Driver Parameters Dialog



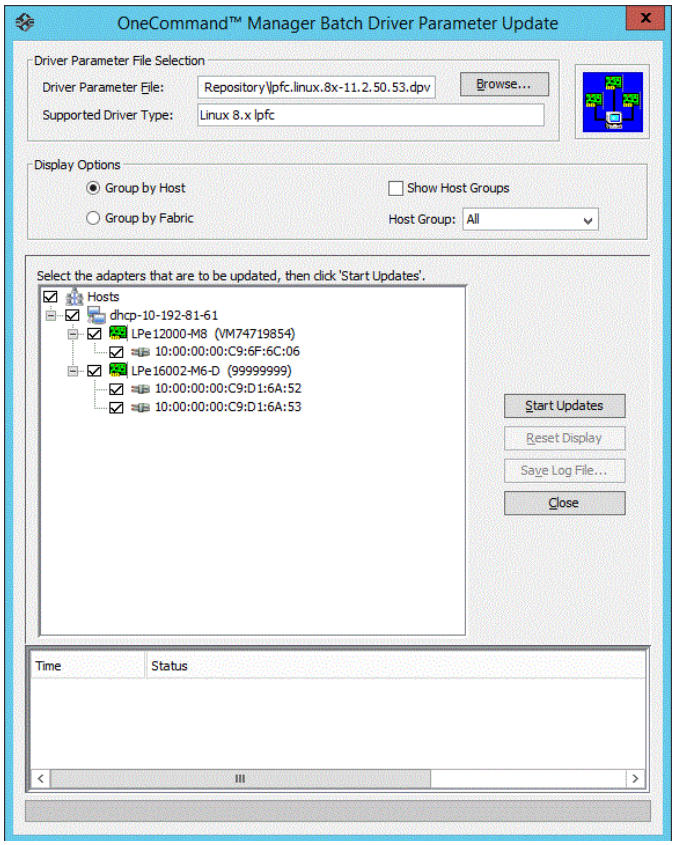
7. Use the two radio buttons to choose the type of parameters to save. You can save all parameters or only those parameters whose current values differ from their corresponding default values.
   A list of the saved parameters and their current values appear in the **Saved Parameters** list.
8. Click **Save**.

8.13.4.1 Assigning Batch Mode Parameters

To assign batch mode parameters to adapters, perform these steps:

1. From the **Batch** menu, select **Update Driver Parameters**. (You do not need to select any discovery-tree [Figure 4] elements at this time.)
2. When the **Batch Driver Parameter Update** dialog appears, click **Browse**.

Figure 50: Batch Driver Parameters Update Dialog



3. The **Driver Parameter File Selection** dialog appears (Figure 50). Select the file you want to use and click **OK**. A dialog appears notifying you that the OneCommand Manager application is searching for compatible adapters.

   After compatible FC functions are found, the **Driver Parameter File** field of the **Batch Driver Parameter Update** dialog displays the selected file's path. The **Supported Models** text field displays a list of all adapter models that are compatible with the selected file. The set of compatible adapters appears in the dialog's discovery-tree.

   Using the Display Options settings, you can choose how adapters are displayed in the discovery-tree. Selecting the **Group by Host** radio button displays adapters in a host-centric view. Selecting the **Group by Fabric** radio button shows hosts in a fabric-centric view with their fabric addresses. The WWPN and host name for each available FC function is displayed under its respective fabric.

   You can also display host groups by selecting the **Show Host Groups** check box. To display a particular host group, choose that group from the **Host Group** selection box.

   Check boxes next to the host, adapter, and FC functions entries are used to select or clear an entry. Checking an adapter selects or removes all FC functions on that adapter; checking a host removes or selects all eligible adapters for that host.

4. Make your selections, and click **Start Updates**. The OneCommand Manager application **Batch Driver Parameter Update** dialog (Figure 50) shows the current status of the update. When the update completes, a final summary shows the number of FC functions that were successfully processed, and the number of FC functions for which one or more parameter updates failed.
5. You can click **Save Log File** to save a report of the update.

8.13.5 Configuring Boot from SAN

You can use the OneCommand Manager application to configure a system to boot from an attached LUN. Boot from SAN allows servers on a storage network to boot their operating systems directly from a SAN storage device, typically identified by its WWPN and a LUN located on the device. By extending the server system BIOS, boot from SAN functionality is provided by the BootBIOS contained on a Emulex adapter in the server. When properly configured, the adapter then permanently directs the server to boot from a LUN on the SAN as if it were a local disk.

NOTE: Boot from SAN is not supported through the CIM interface.

8.13.5.1 Boot Types

Using the **Maintenance** tab, you can enable, disable, or configure boot from SAN for x86 BootBIOS, EFIBoot, and OpenBoot (also known as FCode).

- x86 BootBIOS works with the existing BIOS on x64 and x86 systems.
- OpenBoot (FCode) works with the existing system BIOS on Solaris SPARC systems using the Software Foundation Software (SFS) driver and on Linux PowerPC systems.
- EFIBoot works with x64-based systems and provides 64-bit system boot capability through the use of the EFI Shell.

Emulex provides Universal Boot and Pair Boot code images that contain multiple types of boot code. These images provide multiplatform support for boot from SAN. Universal Boot and Pair Boot transparently determine your system platform type and automatically run the proper boot code image in the adapter. These code images reside in adapter flash memory, allowing easier adapter portability and configuration between servers.

The adapters store the boot configuration data for each of these boot types.

NOTE:

- x86 and OpenBoot share the same configuration memory space. You cannot configure an adapter for both x86 and OpenBoot at the same time. If you try, a message is displayed, stating that the existing boot type configuration will be overwritten by the new configuration.
- Boot from SAN configuration does not affect current system operation. The changes only take effect upon reboot if you have configured it correctly.

8.13.5.2 Boot Device Parameters

The boot LUN for all three boot types is in the range of 0 to 255. EFIBoot and OpenBoot (FCode) also support an 8-byte LUN, which you can use instead of the single-byte LUN. You must select which LUN type to configure.

- For OpenBoot, you must also provide a Target ID parameter.
- You must boot the host to configure boot from SAN with the OneCommand Manager application.
- You must work from a running host that supports the OneCommand Manager application. Often, this host has booted from a direct-attached drive. With the OneCommand Manager application, you can configure a direct boot host to boot from a SAN. You can modify an existing boot from SAN configuration or configure boot from SAN on an adapter for installation in another host so it can boot from SAN.

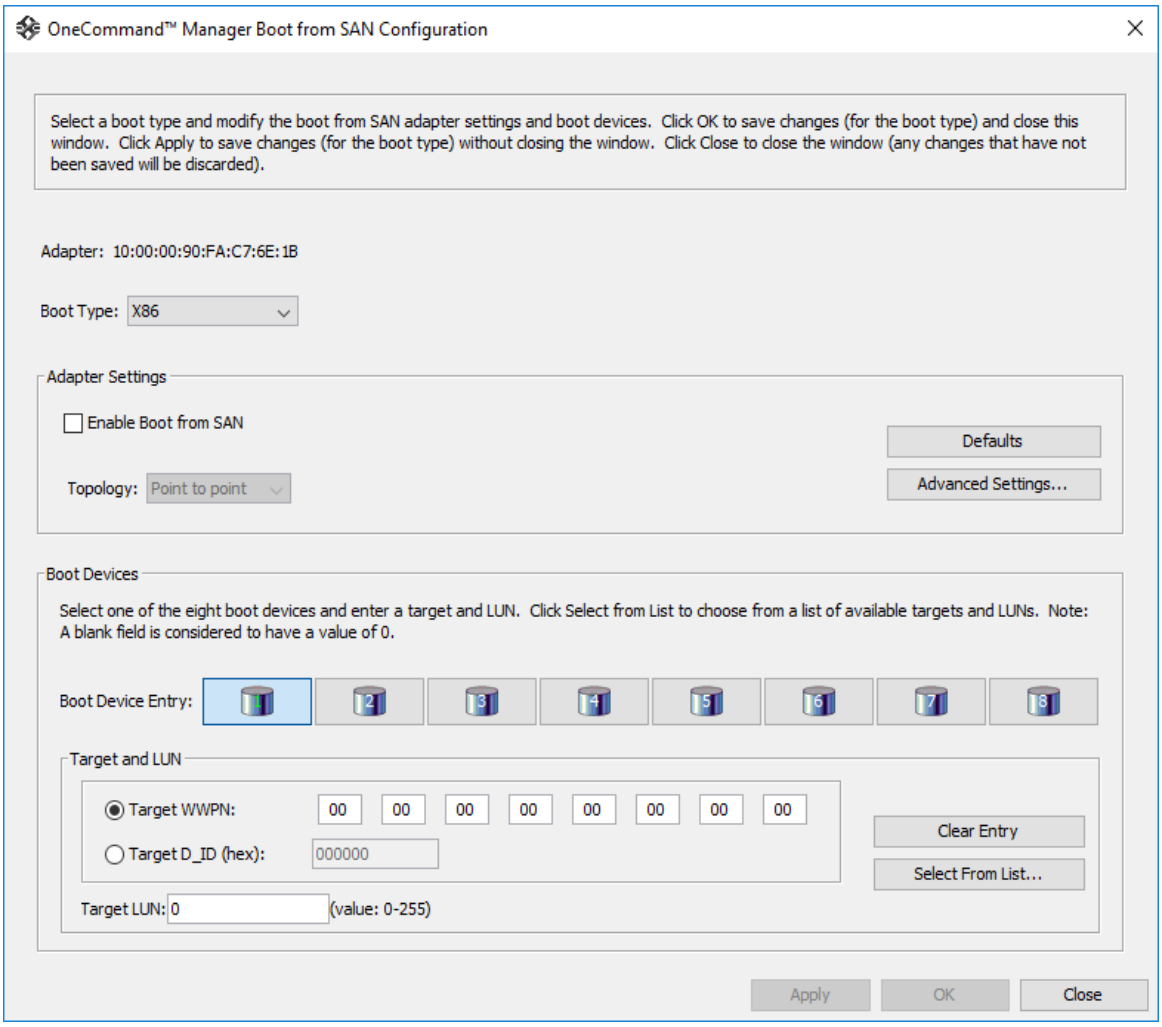
- You must know the boot code type that the adapter has; the OneCommand Manager application cannot detect this information. Without knowing this information, you could configure a boot type but not be able to boot from it because the adapter lacks the correct boot code.
- You must know the boot code type that the system supports; the OneCommand Manager application cannot detect this information. You can configure any boot type, but if the system does not support that type, it cannot boot from SAN.
- If you manage adapters on a remote host that is running a version of the OneCommand Manager application that does not support boot from SAN, the **Configure Boot** button does not appear.
- One of the following adapter drivers must be installed:
  - Windows: Storport Miniport driver
  - Linux: Emulex driver
  - Solaris: emlxs FCA Driver
  - VMware: Emulex driver

To configure boot from SAN, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree (Figure 4), click the FC adapter function on which you want to enable boot from SAN.
3. Select the **Maintenance** tab (Figure 32), select the **enable adapter boot** check box (if available), and click **Configure Boot**. The **Boot from SAN Configuration** dialog appears (Figure 51).

NOTE: The **Configure Boot** button is disabled if the **Enable Adapter Boot** check box is not selected. If boot code is not present on the adapter, the **Enable Adapter Boot** check box and **Configure Boot** button are not displayed on the **Maintenance** tab.

Figure 51: Boot from SAN Configuration Dialog



The **Boot from SAN Configuration** dialog varies for each boot type. Figure 51 depicts the boot from SAN configuration for the x86 type boot.

4. Verify that the **Adapter** field contains the WWPN of the FC function and boot BIOS version to make sure you configure the correct adapter FC function and that it has the BIOS boot code version you want.
5. From the **Boot Type** menu, select **X86**, **EFIBoot**, or **OpenBoot**.

NOTE: **X86** and **OpenBoot** share the same configuration memory space. You cannot configure an adapter for both **X86** and **OpenBoot** at the same time. When you select one of these boot types and the configuration region is configured for the other boot type, a message appears warning that making changes overwrites the other boot-type configuration.

If you modified the settings for the current boot type and then change to a new boot type, a message appears telling you to save the current settings before changing to the new boot type.

6. Select the **Enable Boot from SAN** check box, and for FC functions, set the Topology.

   Topology options are:

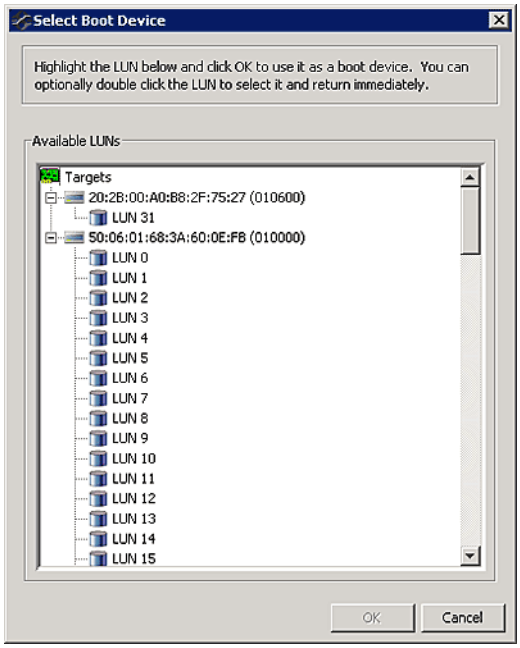
   – **Auto, Loop First** (default)

- **Auto**, **Point to Point First**
- **Loop**
- **Point to Point**

7. To configure autoscan, spinup delay, and other advanced settings, see Section 8.14, Configuring Advanced Settings (Boot from SAN).
8. For x86 and EFIBoot, select one or more boot devices. For OpenBoot, select only one boot device.
9. Perform one of the following tasks on the **Boot from SAN Configuration** dialog (Figure 51):
   - Select **Target World Wide Port Names**, type the numbers, and click **OK**.
   - Select **Target D_ID**, type the numbers, and click **OK**.
   - Select **Target LUN**, type the number, and click **OK**.

     For EFIBoot and OpenBoot, type in an 8-byte LUN (hexadecimal) and a target ID for the LUN. Also, you must enter the LUN value in big endian order (most-significant byte, or big endian first) and enter all 16 characters, including leading zeros.
   - Click **Select from List**, select the target from a list of discovered LUNs (if available), and click **OK** on the **Select Boot Device** window (Figure 52). You can manually enter the target and LUN from the **Boot from SAN Configuration** dialog; however, it is easier to select an existing LUN from this window (Figure 52.) The OneCommand Manager application attempts to update the boot parameters. If successful, a window appears with a confirmation message. Click **OK** on this confirmation window.

Figure 52: Select Boot Device Window (for x86 or EFIBoot)



10. On the **Boot from SAN Configuration** dialog (Figure 51), click **Apply** to save your changes but leave the dialog open, or click **OK** to apply the changes and close the dialog.

NOTE: Click **Close** to close the **Boot from SAN Configuration** dialog without saving your changes. A message appears to discard your changes.

11. Reboot the system for your changes to take effect.

8.14 Configuring Advanced Settings (Boot from SAN)

The OneCommand Manager application provides advanced settings for each boot type. From the **Boot from SAN Configuration** dialog (Figure 51), click **Advanced Settings**. A boot type-specific dialog allows you to enable options, such as spinup delay and autoscan. If you do not use advanced settings, the default values are used.

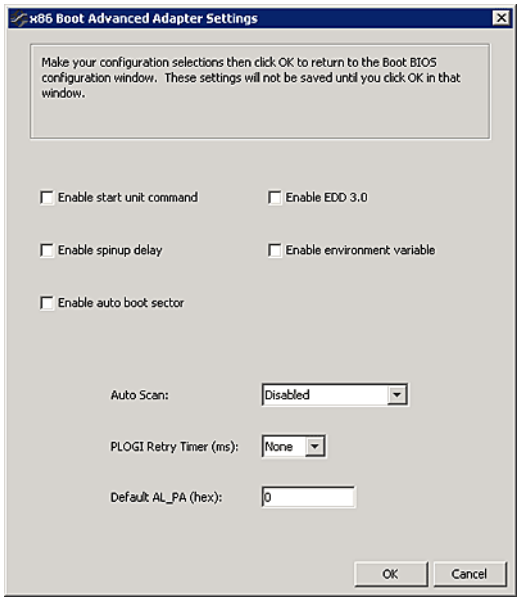
If you make changes, you must click **OK** to save the changes and close the dialog. You can click **Cancel** and close the dialog without saving the changes.

NOTE: If you do not enter the advanced settings and the configuration for the boot type is new, default values are used. The default settings are given with descriptions of the Advanced Adapter Settings dialogs in the following sections.

8.14.1 x86 Boot Advanced Adapter Settings Dialog

Use the **x86 Boot Advanced Adapter Settings** dialog (Figure 53) to configure **advanced settings** for the selected x86 adapter. All check boxes are cleared (off) by default. All changes require a reboot to activate.

Figure 53: x86 Boot Advanced Adapter Settings Dialog



x86 Boot Advanced Adapter Settings definitions follow:

- **Enable start unit command** – Issues the SCSI start unit command. You must know the specific LUN to issue.
- **Enable EDD 3.0** – Enables the EDD option showing the path to the boot device. (Available on Intel Itanium servers only.)
- **Enable spinup delay** – If at least one boot device has been defined, and the spinup delay is enabled, the BIOS searches for the first available boot device.
  - If a boot device is present, the BIOS boots from it immediately.
  - If a boot device is not ready, the BIOS waits for the spinup delay and, for up to three additional minutes, continues the boot scanning algorithm to find another multi-boot device.

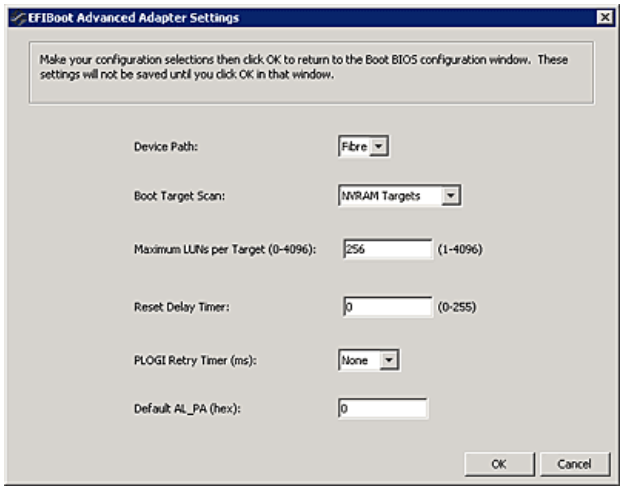
NOTE: The default topology is auto topology with loop first. Change this topology setting, if necessary, before configuring boot devices.

  - If no boot devices have been defined and auto scan is enabled, the BIOS waits for five minutes before scanning for devices.
  - In a private loop, the BIOS attempts to boot from the lowest target AL_PA it finds.
  - In an attached fabric, the BIOS attempts to boot from the first target found in the NameServer data.
- **Enable environment variable** – Sets the boot controller order if the system supports the environment variable.
- **Enable auto boot sector** – Automatically defines the boot sector of the target disk for the migration boot process, which applies only to HPE MSA1000 arrays. If no partition exists on the target, the default boot sector format is 63 sectors.
- **Auto Scan** – With auto scan enabled, the first device issues a name server inquiry. The boot device is the first DID, LUN 0, or not LUN 0 device returned, depending on the option you select. Only this device is the boot device, and it is the only device exported to the Multi-boot menu. Auto Scan is available only if none of the eight boot entries is configured to boot through DID or WWPN. Use the **Configure Boot Devices** menu to configure eight boot entries for fabric point-to-point, public loop, or private loop configurations. Set to one of the following values:
  - **Disabled** (default)
  - **Any First Device**
  - **First LUN 0 Device**
  - **First non-LUN 0 Device**
- **PLOGI Retry Timer (ms)** – Sets the interval for the PLOGI (port log in) retry timer. This option is especially useful for Tachyon-based RAID arrays. Under very rare occasions, a Tachyon-based RAID array resets itself, and the port goes offline temporarily in the loop. When the port comes back online, the PLOGI retry interval scans the loop to discover this device. The default setting is None (0 ms). Sets the PLOGI Retry Timer to one of the following values:
  - **None** (default)
  - **50 ms**
  - **100 ms**
  - **200 ms**
- **Default AL_PA number (hex)** – This number has a range of 00 to EF (the default is 0). This value changes the AL_PA of the selected adapter.

8.14.1.1 EFIBoot Advanced Adapter Settings Dialog

Use the **EFIBoot Advanced Adapter Settings** dialog (Figure 54) to configure the advanced settings for the selected EFIBoot adapter.

Figure 54: EFIBoot Advanced Adapter Settings Dialog



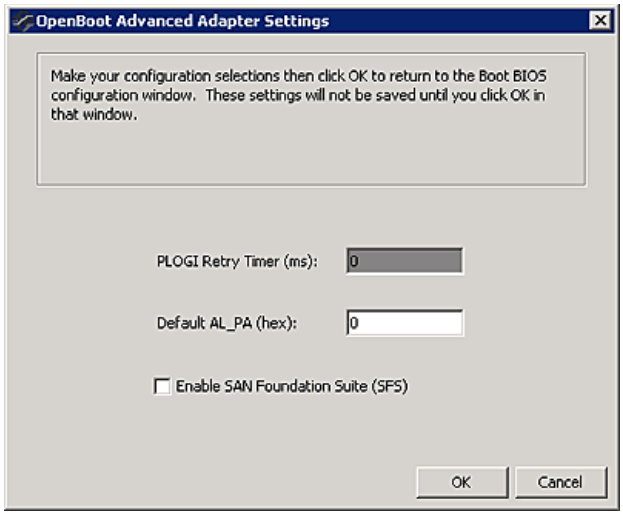
EFIBoot Advanced Adapter Settings field definitions follow:

- **Device Path** – Makes the Fibre driver appear as a SCSI driver.
  - **Fibre** (default)
  - **SCSI**
- **Boot Target Scan** – This option is available only if none of the eight boot entries are configured to boot by using DID or WWPN.
  - **NVRAM Targets** (default) – Discovers only LUNs that are saved to the adapter nonvolatile random access memory (NVRAM).
  - **Discovered Targets** – Discovers all devices that are attached to the port. Discovery can take a long time on large SANs.
  - **None.**
  - **EFIBootFCScanLevel: NVRAM Targets and EFIBootFCScanLevel: Discovered Targets –** Allows third-party software to toggle between Boot Path from NVRAM and Boot Path from Discovered Targets by manipulating an EFI system NVRAM variable.
- **Maximum LUNs per Target** – Sets the maximum number of LUNs that are polled during device discovery. The range is 1 to 4096. The default is 256.
- **Reset Delay Timer in seconds** – Sets a value for delay device discovery. The range is 0 to 255. The default is 0.
- **PLOGI Retry Timer** – Sets the interval for the PLOGI (port log in) retry timer. This option is especially useful for Tachyon-based RAID arrays. Under rare occasions, a Tachyon-based RAID array resets itself and the port goes offline temporarily in the loop. When the port comes online again, the PLOGI retry interval scans the loop to discover this device.
  - **None** (default)
  - **50 ms**
  - **100 ms**
  - **200 ms**
- **Default AL_PA number** – The range is 0x 00 to EF. The default is 0x00. This option changes the AL_PA (Arbitrated Loop Physical Address) of the selected adapter.

8.14.1.2 OpenBoot Advanced Adapter Settings Dialog

Use the **OpenBoot Advanced Adapter Settings** dialog (Figure 55) to configure the advanced adapter settings for the selected OpenBoot adapter.

Figure 55: OpenBoot Advanced Settings Dialog



OpenBoot Advanced Adapter field definitions follow:

- **PLOGI Retry Timer (ms)** – Sets the PLOGI Retry timer value. The range is 0 to 0xFF.
- **Default AL_PA (hex)** – Sets the default AL_PA. The range is 0 to 0xEF. The default is 0.
- **Enable the SAN Foundation Suite (SFS)** – Select this check box to enable the SAN Foundation Suite (SFS) driver (the emlxs driver for Solaris).

8.15 Using FC-SP DHCHAP Authentication

Use the **DHCHAP** tab to view and configure Fibre Channel Security Protocol (FC-SP) DHCHAP authentication between an adapter and a switch.

After DHCHAP has been activated and configured, manually initiate authentication per adapter by clicking **Initiate Authentication** or by inducing a fabric login (FLOGI) time in accordance with the FC-SP standard to the switch. A FLOGI can also be caused by bringing the link between the switch and adapter down and then up (not available in read-only mode).

8.15.1 DHCHAP Considerations

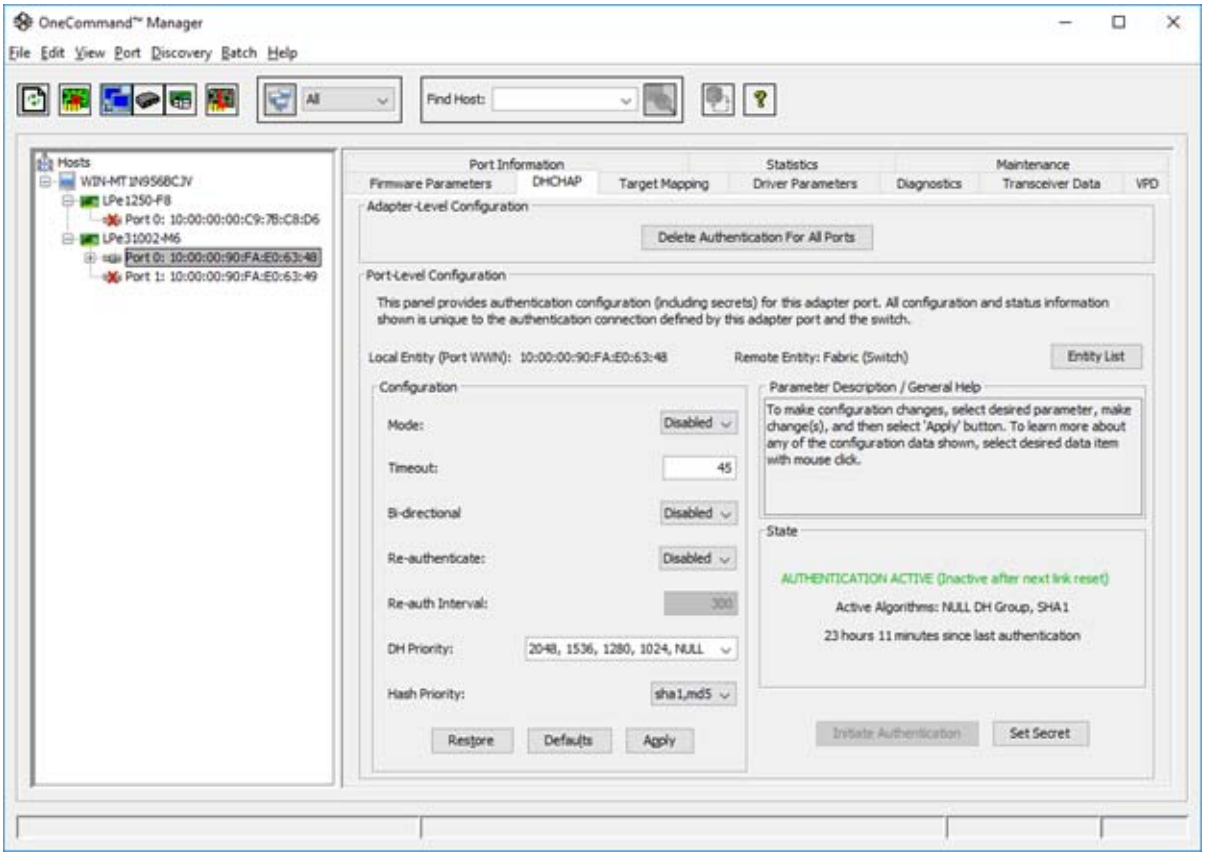
- DHCHAP is only supported on Windows and Linux operating systems.
- DHCHAP is available only for physical ports, not for virtual ports.
- The authentication driver parameters are only available on local hosts. The OneCommand Manager application GUI does not display this driver parameter for any remote hosts.
- DHCHAP not supported on FA_PWWN ports.

NOTE: Authentication must be enabled at the driver level. Enable the `enable-auth` parameter for Linux or the `EnableAuth` parameter for Windows before attempting to configure DHCHAP. See Section 8.13, Configuring the Driver Parameters, for instructions on changing driver parameters. Authentication is disabled by default.

8.15.2 DHCHAP Tab

The **DHCHAP** tab (Figure 56) enables you to configure authentication.

Figure 56: DHCHAP Tab (LPe31000-series Adapter Depicted)



The following **DHCHAP** tab fields and buttons are displayed:

- Adapter-Level Configuration area (Not supported on LPe12000-series adapters):
  - Click **Delete Authentication For All Ports** to permanently delete the entire authentication configuration for all the ports on the adapter.
- Port-Level Configuration area (Not supported on LPe12000-series adapters):
  - Click **Entity List** to see the list of entity pairs with a saved authentication configuration.
- Configuration area:
  - **Mode** – The mode of operation. Three modes are available:
    - **Enabled** – The FC function initiates authentication after issuing an FLOGI to the switch. If the connecting device does not support DHCHAP authentication, the software still continues with the rest of the initialization sequence.
    - **Passive** – The FC function does not initiate authentication, but participates in the authentication process if the connecting device initiates an authentication request.
    - **Disabled** – The FC function does not initiate authentication or participate in the authentication process when initiated by a connecting device. This mode is the default mode.
  - **Timeout** – During the DHCHAP protocol exchange, if the switch does not receive the expected DHCHAP message within a specified time interval, authentication failure is assumed (no authentication is performed). The time value ranges from 20 to 999 seconds and the default is 45 seconds.

- **Bi-directional** – If enabled, the FC driver supports authentication initiated by either the switch or the FC function. If disabled, the driver supports only FC function-initiated authentication. The remote password must be configured to enable this setting. See Section 8.15.5, Setting or Changing Secrets, for instructions.
- **Re-authenticate** – If enabled, the FC driver can periodically initiate authentication.
- **Re-auth Interval** – The value in minutes that the FC driver uses to periodically initiate authentication. Valid interval ranges are 10 to 3600 minutes. The default is 300 minutes.
- **DH Priority** – The priority of the five supported DH Groups (Null group, and groups 1, 2, 3, and 4) that the FC driver presents during the DHCHAP authentication negotiation with the switch.
- **Hash Priority** – The priority of the two supported hash algorithms (MD5 and SHA1) that the FC driver presents during the DHCHAP authentication negotiation with the switch (default is MD5 first, then SHA1, 2, 3...).
- Click **Restore**, **Defaults**, or **Apply** to restore parameters to their previous settings, return parameters to their default settings, or to apply new parameter settings.

NOTE: Clicking **Restore** removes all current configuration settings, including port secrets and this switch/target connection.

- Parameter Description/General Help area:
  - This section of the dialog contains a brief description of the selected parameter and the options available for the parameter.
- State area:
  - This section of the dialog displays the authentication state. Possible states are Not Authenticated, Authentication In Progress, Authentication Success, and Authentication Failed.
- **Initiate Authentication** – After DHCHAP has been activated and configured, click this button to perform immediate authentication.
- **Set Secret** – Click this button to set a new local or remote secret in ASCII or hexadecimal (binary). See Section 8.15.5, Setting or Changing Secrets, for instructions.

8.15.3 Deleting Authentication For All Ports

NOTE: The driver authentication parameter `enable-auth` (Linux) or `EnableAuth` (Windows) must be disabled before deleting authentication for all ports. See Section 8.13, Configuring the Driver Parameters, for instructions on changing driver parameters.

To delete authentication for all ports, perform these steps:

1. In the discovery-tree (Figure 4), select the adapter port whose authentication you want to delete.
2. Select the **DHCHAP** tab (Figure 56).
3. Click **Delete Authentication For All Ports**.

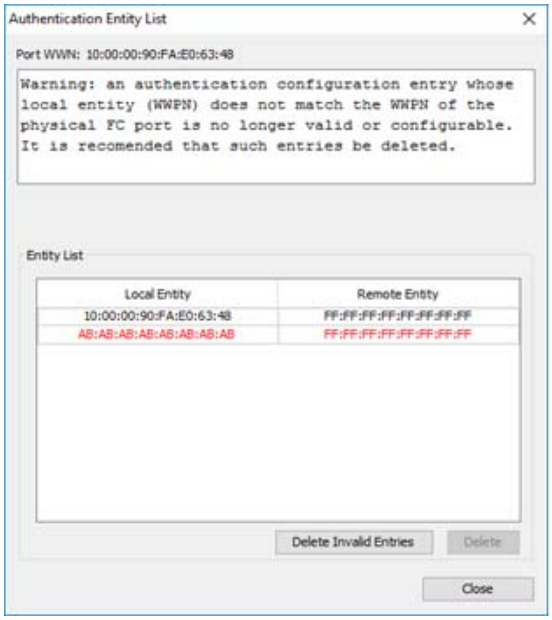
8.15.4 Viewing Saved Authentication Configuration Entities

The Entity List displays a list of entity pairs that have a saved authentication configuration. The list might include entity pairs for authentication configurations that are no longer valid or configurable. For example, the list would contain an entity pair whose configuration become obsolete and invalid after a port WWN change.

To view saved authentication configuration entities, perform these steps:

1. In the discovery-tree (Figure 4), select the adapter port whose authentication configuration entities you want to view.
2. Select the **DHCHAP** tab (Figure 56).
3. Click **Entity List**. The **Entity List** dialog appears (Figure 57).

Figure 57: Entity List Dialog



8.15.4.1 Deleting Authentication Entities

You can delete all invalid entities or particular entities.

To delete saved authentication configuration entities, perform these steps:

1. In the discovery-tree (Figure 4), select the adapter port whose authentication configuration entities you want to delete.
2. Select the **DHCHAP** tab (Figure 56).
3. Click **Entity List**. The **Entity List** dialog appears (Figure 57).
4. Click **Delete Invalid Entries** to remove all invalid entities (red), or select single or multiple entities and click **Delete**.

8.15.5 Setting or Changing Secrets

You can change or set the local or remote secret. The local secret is typically used by the driver when the adapter initiates authentication to the switch. The remote secret is used by the driver if the switch attempts to authenticate with the adapter. Bi-directional authentication requires the remote secret.

To set or change secrets, perform these steps:

1. In the discovery-tree (Figure 4), select the adapter port whose secrets you want to set or change.
2. Select the **DHCHAP** tab (Figure 56).
3. Click **Set Secret**. The **Set Secret** dialog appears (Figure 58).

Figure 58: Set Secret Dialog

4. Choose **Set Local Secret** or **Set Remote Secret**.
   – The FC driver uses the local password when the adapter initiates authentication to the switch (typical use).
   – The FC driver uses the remote password if the switch authenticates with the adapter. This situation is only possible when bi-directional is selected on the **DHCHAP** tab (Figure 56).
5. To see the password characters entered in the dialog, select the **Show Characters** check box.
6. Enter the new value. Values must contain at least 12 bytes, and local and remote values must be different.
7. Re-enter the new value.
8. Select alphanumeric or hexadecimal format.
9. Click **OK**.

CAUTION! Do not forget the password after one has been assigned. After a password is assigned to an adapter, subsequent DHCHAP configuration settings for that adapter, including the default configuration or new passwords, require you to enter the existing password to validate your request. No further changes can be made without the password.

NOTE: Click **Help** on the **Set Secret** dialog for assistance with secrets.

8.15.6 Changing Authentication Configuration

NOTE: You can only configure DHCHAP on the local host.

To view or change authentication configuration, perform these steps:

1. In the discovery-tree (Figure 4), select the adapter port whose configuration you want to view or change.
2. Select the **DHCHAP** tab (Figure 56).

NOTE: If the fields on this tab are dimmed, either authentication has not been enabled at the driver level or the local secret has not been set.

- For instructions on enabling the driver authentication parameter `enable-auth` (Linux) or `EnableAuth`

(Windows), see Section 8.13, Configuring the Driver Parameters.

- For instructions on setting the local secret, see Section 8.15.5, Setting or Changing Secrets.

3. Change the configuration values you want.
4. Click **Apply.**

NOTE: If you click **Apply**, changes cannot be canceled.

To return settings to the status before you started this procedure, click **Restore** before you click **Apply**.

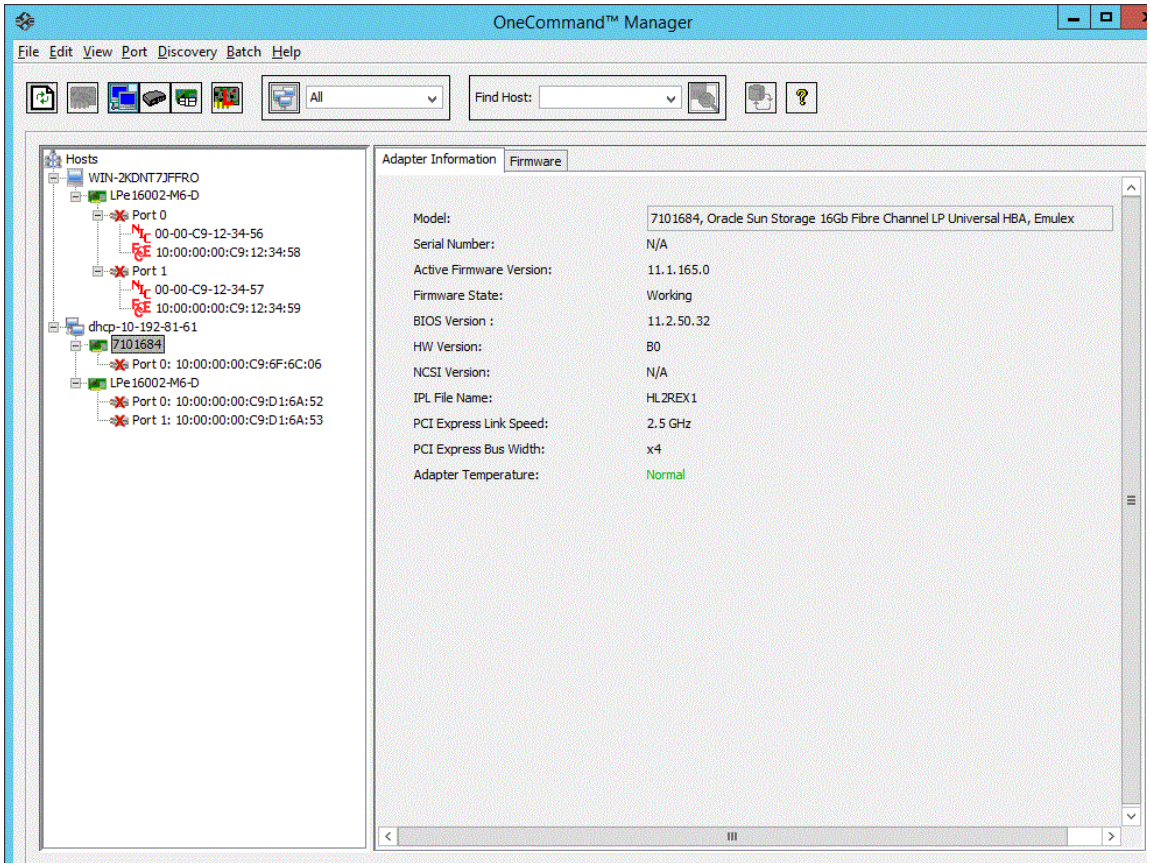
To return all settings to the default configuration, click **Defaults**.

CAUTION! This action also resets any passwords to NULL for this configuration.

8.16 Guest Operating System Discovery and Management from the Base Host Operating System

When the OneCommand Manager application is installed on a guest operating system, the guest operating system and virtual function (VF) are discovered by the OneCommand Manager application running on the host operating system. The guest operating system host appears as a remote host in the discovery-tree (Figure 59).

Figure 59: OneCommand Manager Application Running on the Base Host after Discovering the Guest Host



Chapter 9: Updating Adapter Firmware

The OneCommand Manager application enables you to update firmware for a single adapter or simultaneously for multiple adapters.

CAUTION! Updating firmware or boot code on an LPe12000-series adapter that is being used to boot from SAN may cause unpredictable behavior. After the update has completed, an adapter reset is issued, which may cause a loss of connectivity to the SAN and possible loss of data.

To update firmware on an LPe12000-series adapter, make sure that the adapter is not currently being used to boot from SAN. Do one of the following:

- Move the adapter to be updated to a non-boot from SAN host, and perform the update from that location.
- If the host with the target adapter is also hosting other boot from SAN adapters, perform a boot from SAN using one of the other boot from SAN adapters. The target adapter can now be updated.

9.1 Updating Firmware for a Single Adapter

NOTE: This option is not available in read-only mode.

Using the **Maintenance** or **Firmware** tab, you can update firmware on local and remote adapters. Before you can perform this procedure, do the following:

- Download the firmware file from www.broadcom.com to a local drive.
- Make sure that the Emulex driver is installed.
- Make sure that the OneCommand Manager application is installed.
- If the adapter is already connected to a boot device, check that the system is in a state in which this type of maintenance can be performed:
  - I/O activity on the bus has been stopped.
  - Cluster software, or any other software that relies on the adapter to be available, is stopped or paused.

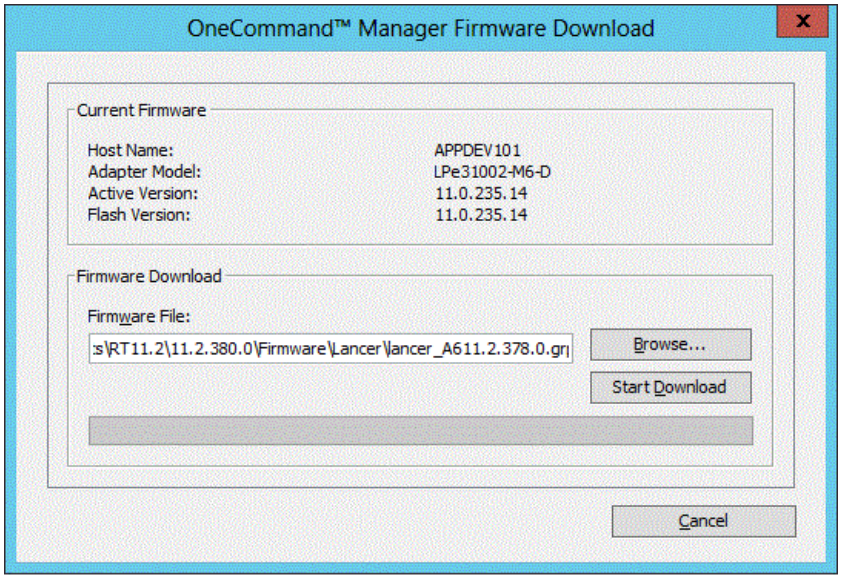
NOTE:

- For vendor-branded adapters, refer to the vendor's website or contact the vendor's technical support for the firmware files.
- You cannot update firmware with the OneCommand Manager application on an Oracle-branded adapter.
- For LPe12000-series adapters, you update the firmware and boot code on each FC port/function. The firmware and boot code are two separate binaries. You must flash both the firmware and boot binaries to update LPe12000-series adapters.
- For LPe16000-series, LPe31000-series, and LPe32000-series adapters, you update the firmware for the entire adapter.

To update firmware for a single adapter or an adapter port, perform these steps:

1. Select the **Host** or **Fabric** view.
2. In the discovery-tree (Figure 4), select the adapter or port whose firmware you want to update.
3. Select the **Maintenance** tab for LPe12000-series adapters (Figure 34) or the **Firmware** tab for all other adapters (Figure 23), and click **Download Firmware**. The **Firmware Download** dialog appears (Figure 60).

Figure 60: Firmware Download Dialog



4. Using the **Firmware Download** dialog (Figure 60), navigate to the image file you want to download. The firmware image may be specified either by entering the image file's full path name in the **Firmware File** field or by clicking **Browse**.

   If you click **Browse**, the **Firmware File Selection** dialog appears. Select the file you want to use and click **OK**. The **Firmware Download** dialog appears.

5. Click **Start Download**. A warning dialog appears.

6. Click **Yes** to continue.

   A status bar shows the progress of the download. The adapter in the discovery-tree (Figure 4) is displayed in black text when the update is complete.

NOTE: The adapter in the discovery-tree may change to blue during the download, but this is normal.

7. Click **Close**. The **Firmware** tab displays the updated firmware information for the selected adapter.

   If you are updating the firmware on a multiport adapter, repeat steps 1 through 7 to update the firmware on the second port or use the Section 9.2, Updating Firmware for Multiple Adapters, procedure.

9.2 Updating Firmware for Multiple Adapters

Use batch mode to install firmware on multiple adapters in a single step. Batch firmware loading is restricted to a single firmware file and to all accessible, compatible adapters. Batch mode is not available in read-only mode.

NOTE: Stop other OneCommand Manager application functions while batch loading is in progress.

Before you can perform a batch update, the firmware file must be downloaded from www.broadcom.com to a directory on your local drive.

NOTE: VMware ESXi hosts managed through the CIM interface lists all adapters regardless of whether the selected firmware can update the adapter. You must manually deselect the nonmatching adapters.

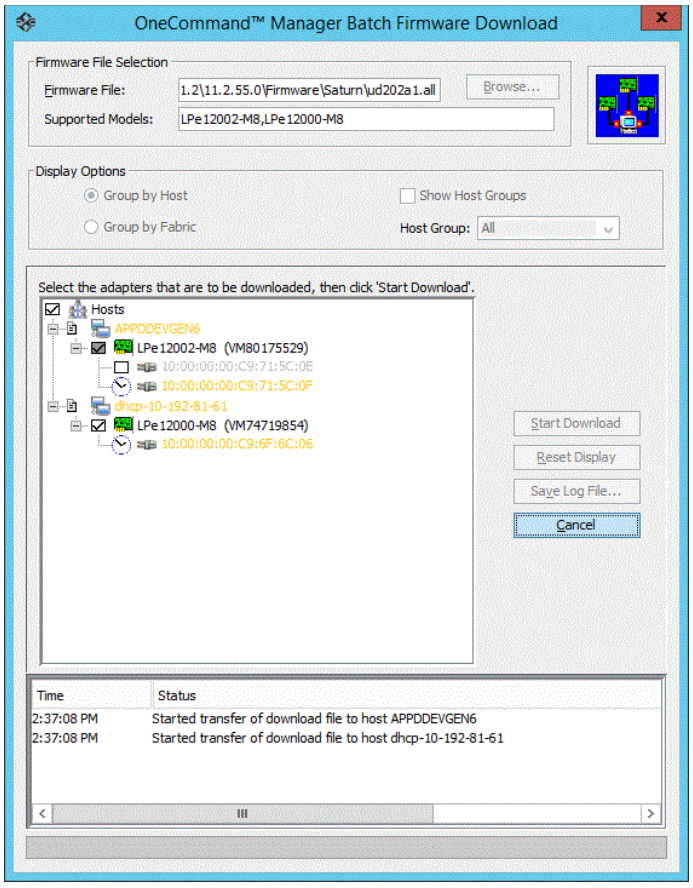
To update firmware for multiple adapters, perform these steps:

1. From the **Batch** menu, select **Download Firmware**.

   You do not need to select a particular discovery-tree element for this operation.

2. When the **Batch Firmware Download** dialog appears (Figure 61), click **Browse**.

Figure 61: Batch Firmware Download Dialog, Selecting Adapters to Update



3. The **Firmware File Selection** dialog appears. Select the file you want to use and click **OK**. A dialog appears notifying you that the OneCommand Manager application is searching for compatible adapters.

   After compatible adapters are found, the Firmware File text area of the main **Batch Download** dialog displays the selected image file's path. The **Supported Models** text field displays a list of all adapter models that are compatible with the selected image file. The set of compatible adapters appears in the dialog's discovery-tree.

   Using the Display Options settings, you can choose how adapters are displayed in the discovery-tree. Selecting the **Group by Host** radio button displays adapters in a host-centric view. Selecting the **Group by Fabric** radio button shows hosts in a fabric-centric view with their fabric addresses. The WWPN and host name for each downloadable port is displayed under its respective fabric.

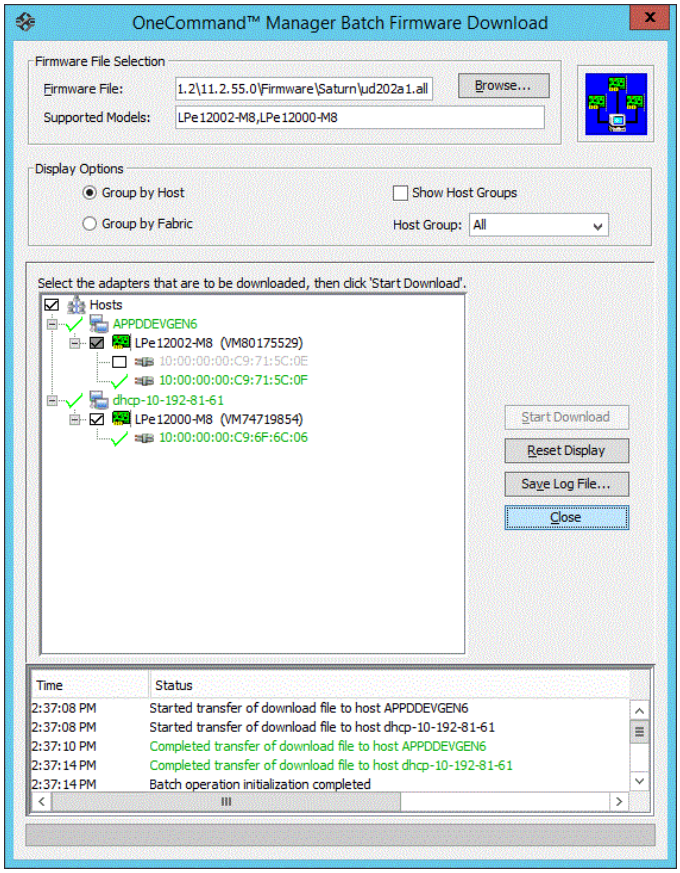
   You can also display host groups by selecting the **Show Host Groups** check box. To display a particular host group, choose that group from the **Host Group** menu.

   Check boxes next to the host and adapter entries are used to select or clear an entry. Selecting an adapter selects or removes that adapter; selecting a host removes or selects all eligible adapters for that host.

For adapters where each individual port or ASIC can have new firmware downloaded, you can select the ports or ASICs on the adapter to which you want to download firmware.

4. Make your selections, and click **Start Download**. When downloading begins, the tree-view displays the progress. As firmware for a selected adapter is being downloaded, it appears orange in the tree-view. After successful downloading is complete, the entry changes to green. If the download fails, the entry changes to red (Figure 62).

Figure 62: Batch Firmware Download Dialog, Download Complete



To save a copy of the activity log when downloading is finished, click **Save Log File**.

Chapter 10: Exporting SAN Information

10.1 Creating a SAN Report

The OneCommand Manager application enables you to create reports about discovered SAN elements. Reports are generated in `.xml` and `.csv` format and include all the SAN information that is displayed through the various OneCommand Manager application tabs.

NOTE: Creating a SAN report can take several minutes for a large SAN.

To create a SAN report, perform these steps:

1. From the **File** menu, select **Export SAN Info**.
2. Browse to a folder and enter a file name with the `.xml` or `.csv` extension.
3. Click **Save** to start the export process.

   During the export process, progress is displayed in the lower-right side of the progress bar. On Windows, you cannot change views, reset, or download firmware during the export process.

Chapter 11: Diagnostics

This section describes the diagnostic tests that can be run on LightPulse adapters.

Use the **Diagnostics** tab to perform the following tasks:

- View flash load list, PCI registers, and wakeup parameter information.
- Run the following tests on Emulex adapters installed in the system:
  - PCI Loopback
  - Internal Loopback
  - External Loopback
  - Power-on self-test (POST)
  - Echo (End-to-End)
  - Quick Test

  These tests are not available in read-only mode.
- Run a diagnostic dump and retrieve dump files from remote hosts (this option is not available in read-only mode).
- Control adapter beaconing (this option is not available in read-only mode).

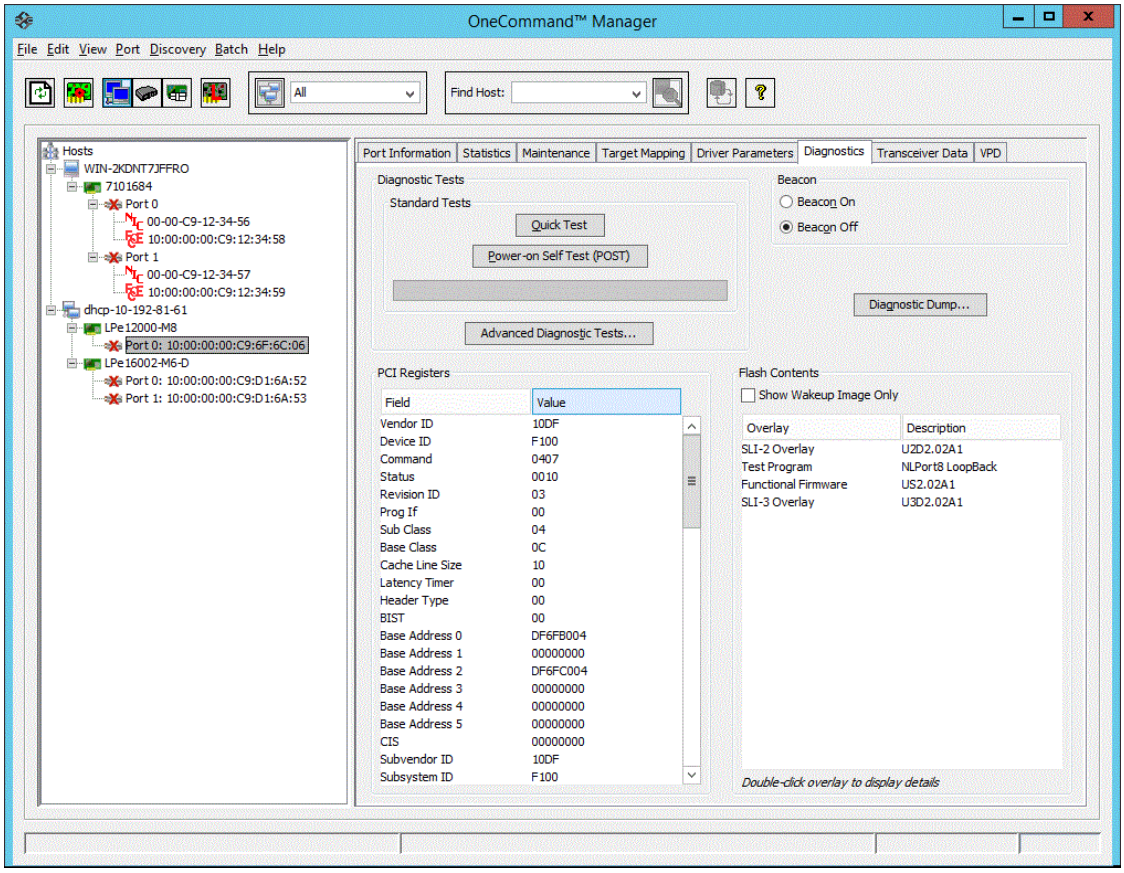
CAUTION! Running a PCI Loopback, Internal Loopback, External Loopback, or POST test on an LPe12000-series adapter (for example, LPe12000) that is being used to boot from SAN is not advisable. After the tests have completed, the system performs an adapter reset, which may cause a loss of connectivity to the SAN and possible loss of data. To perform these tests on an LPe12000-series adapter, you must make sure that the adapter is not currently being used to boot from SAN. Perform one of the following actions:

- Move the adapter to be tested to a non-boot from SAN host, and perform the tests from that location.
- If the host with the adapter that needs to be tested also host other boot from SAN adapters, perform a boot from SAN using one of the other boot from SAN adapters. The target adapter can now be tested, because it is no longer being used for boot from SAN.

11.1 Viewing Flash Contents, PCI Registers, and Wakeup Information

The **Diagnostics** tab (Figure 63) shows PCI register dump information and flash memory contents. The information is read-only and is outlined in the following section.

Figure 63: PCI Registers and Flash Contents of the Diagnostics Tab



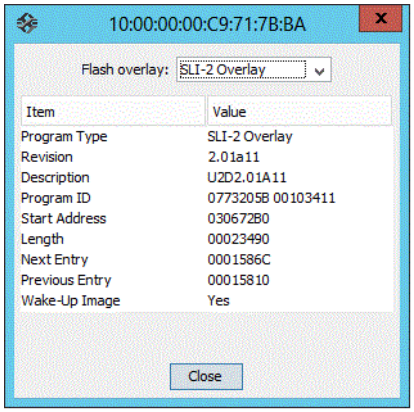
11.1.1 Viewing Flash Contents

If you select the **Show Wakeup Image Only** check box, the flash overlays that are not loaded when the system is booted no longer display. This check box defaults to not selected.

11.1.2 Viewing Overlay Details

If you double-click a flash overlay, another window appears with details about that overlay (Figure 64).

Figure 64: Overlay Detail Window



To see the details of a different flash overlay image, you can either close the details window and double-click another overlay name, or choose a different overlay name from the **Flash overlay** menu.

11.1.3 Viewing the PCI Registers

The PCI Registers appear directly on the **Diagnostics** tab (Figure 63).

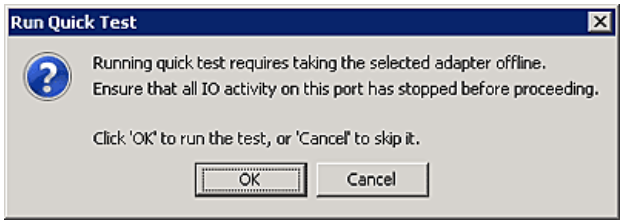
11.2 Running a Quick Test

The **Diagnostics** tab enables you to run a quick diagnostics test on a selected port. The Quick Test consists of 50 PCI Loopback test cycles and 50 Internal Loopback test cycles. This test is not available in read-only mode or on LightPulse adapters in ESXi hosts.

To use quick test, perform these steps:

1. From the discovery-tree (Figure 4), select the port on which you want to run the Quick Test.
2. Select the **Diagnostics** tab (Figure 63) and click **Quick Test**. A warning message appears (Figure 65).

Figure 65: Run Quick Test Warning



3. Click **OK** to run the test. The **Quick Diagnostic Test** window appears displaying the PCI Loopback and Internal Loopback test results.

11.3 Running a POST

NOTE: The POST is supported only on LPe12000-series adapters.

The POST is a firmware test normally performed on an adapter after a reset or restart. The POST does not require any configuration to run. This test is not available in read-only mode.

To run the POST, perform these steps:

1. From the discovery-tree (Figure 4), select the port on which you want to run the POST.
2. Select the **Diagnostics** tab (Figure 63) and click **Power-on Self Test (POST)**. A warning dialog appears.
3. Click **OK**. A **POST** window appears displaying POST information.

NOTE: After the test starts, it cannot be cancelled. It must run to completion.

11.4 Using Beaconing

The beaconing capability enables you to force a specific adapter's LEDs to blink in a particular sequence. The blinking pattern acts as a beacon, making it easier to locate a specific adapter among racks of other adapters. This option is not available in read-only mode.

If you enable beaconing, the two LEDs blink rapidly in unison for 24 seconds, after which the LEDs report the adapter health status for 8 seconds. When the 8 seconds are up, the adapter returns to Beaconing mode. This cycle repeats indefinitely until you disable beaconing or you reset the adapter.

NOTE: The beaconing buttons are disabled if the selected adapter does not support beaconing.

To enable or disable beaconing, perform these steps:

1. From the discovery-tree (Figure 4), select the port whose LEDs you want to set.
2. Select the **Diagnostics** tab (Figure 63) and click **Beacon On** or **Beacon Off**.

11.5 Running D_Port Tests

D_Port is a diagnostic mode supported by Brocade switches for 16GFC and faster. D_Port tests enable you to detect physical cabling issues that result in increased error rates and intermittent behavior. If activated, D_Port runs a series of tests including local electrical loopback, loopback to the remote optics, loopback from the remote port to the local optics, and a full device loopback test with data integrity checks. It also provides an estimate of cable length to validate that a proper buffering scheme is in place. The various loopback tests allow some level of fault isolation so you can distinguish faults from marginal cable, optics modules, and connector or optics seating.

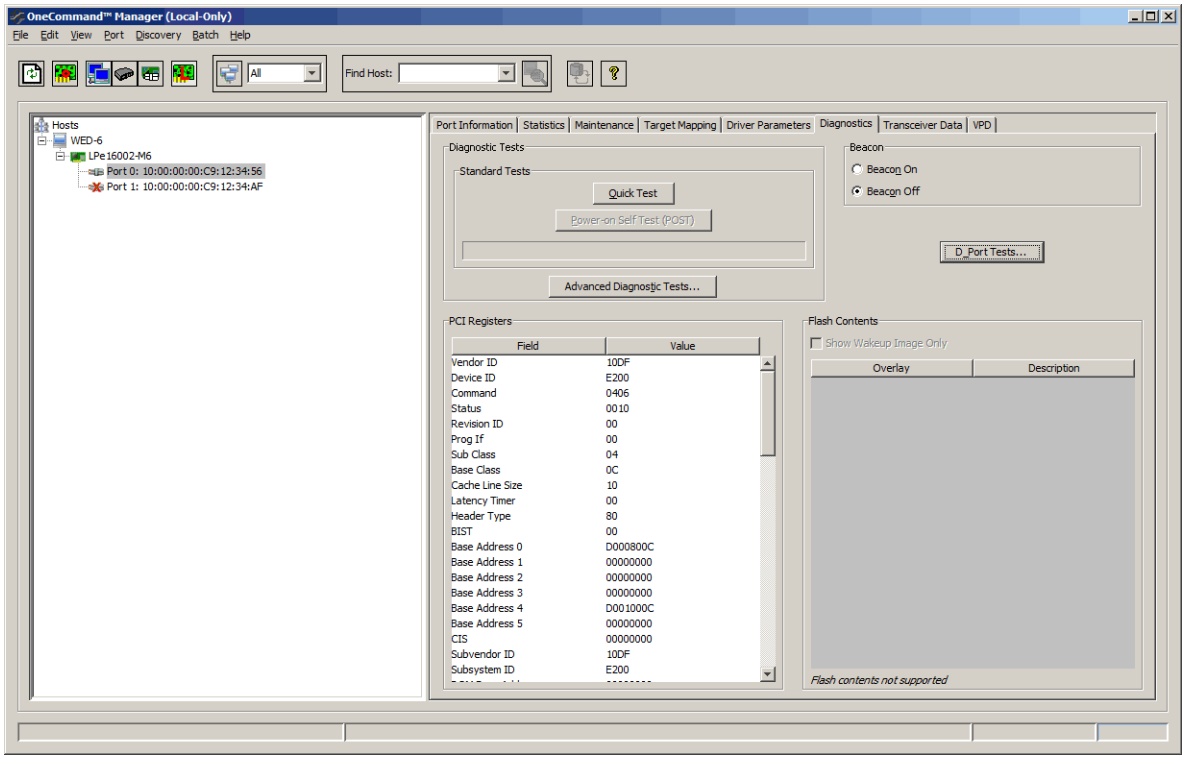
Bi-directional D_Port testing is supported. The switch or initiator can initiate D_Port testing.

11.5.1 D_Port Test Considerations

- Basic connectivity diagnostics are already supported by Emulex HBAs. The OneCommand Manager application has diagnostic modes that support validation of connection to the switch. The functionality that Brocade offers provides the ability to diagnose marginal cable conditions (for example, dust in the optics) that result in higher error rates.
- Do not enable D_Port on the switch port.
- D_Port tests run with the physical connection in an offline diagnostic state, so normal I/O cannot be sent through the physical port while the test is in progress. While the port is in D_Port mode, the link appears down on that port, similar to an unplugged cable.
- When using D_Port in a boot from SAN configuration, the configuration must have redundant paths to the boot LUN and only one of the redundant adapter ports should be set to D_Port.
- For more information about D_Port, refer to the Brocade website at www.brocade.com.
- D_Port is also referred to as ClearLink.

The **D_Port Tests** button on the **Diagnostics** tab enables you to run D_Ports tests on LPe16000-series, LPe31000-series, and LPe32000-series adapters (Figure 66).

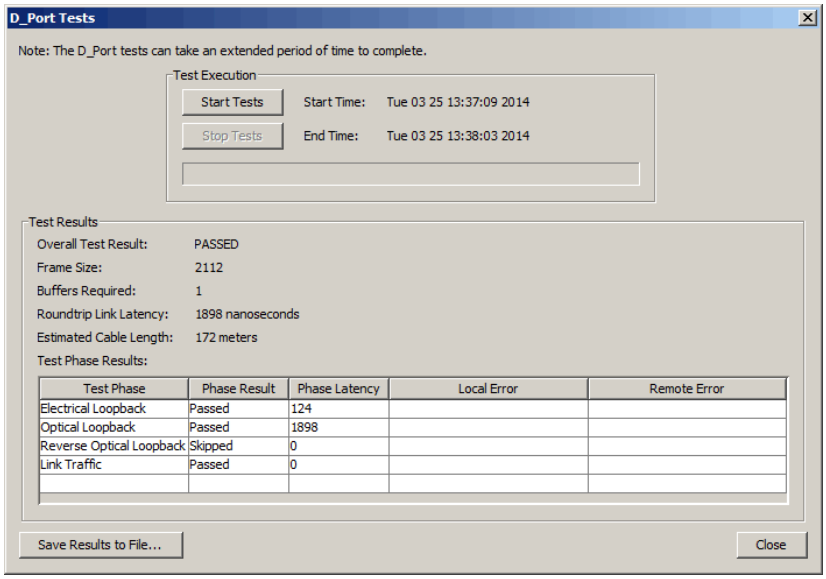
Figure 66: Diagnostics Tab for LPe16000-Series Adapters (D_Port Tests Button Depicted)



To run a D_Port test, perform these steps:

1. From the discovery-tree (Figure 4), select the port on which you want to run the D_Port test.
2. Select the **Diagnostics** tab (Figure 63) and click **D_Port Tests**. The **D_Port Tests** window appears (Figure 67).
3. Click **Start Tests**. The start time is displayed.

Figure 67: D_Port Tests Dialog



The following **D_Port Tests** dialog fields are displayed:

- Test Results area:
  - **Overall Test Result** – Displays PASSED or FAILED depending upon the outcome of all the test phases.
  - **Frame Size** – The size of the frames used in each test phase.
  - **Buffers Required** – The number of buffers required for each test phase.
  - **Roundtrip Link Latency** – Estimated roundtrip link latency calculated by switch during the execution of all tests.
  - **Estimated Cable Length** – Estimated cable length calculated by switch during the execution of all tests.
- Test Phase Results area:
  - **Test Phase** – The name of the test run.
  - **Phase Result** – The result of the test run. Possible results are Pass, Fail, or Skipped.
  - **Phase Latency** – The round trip legacy (in ns.) calculated during the execution of the test.
  - **Local Error** – The errors, if any, detected on the local side of the test.
  - **Remote Error** – The errors, if any, detected on the remote side of the test.

To stop running D_Port tests, click **Stop Tests**. The stop time is displayed.

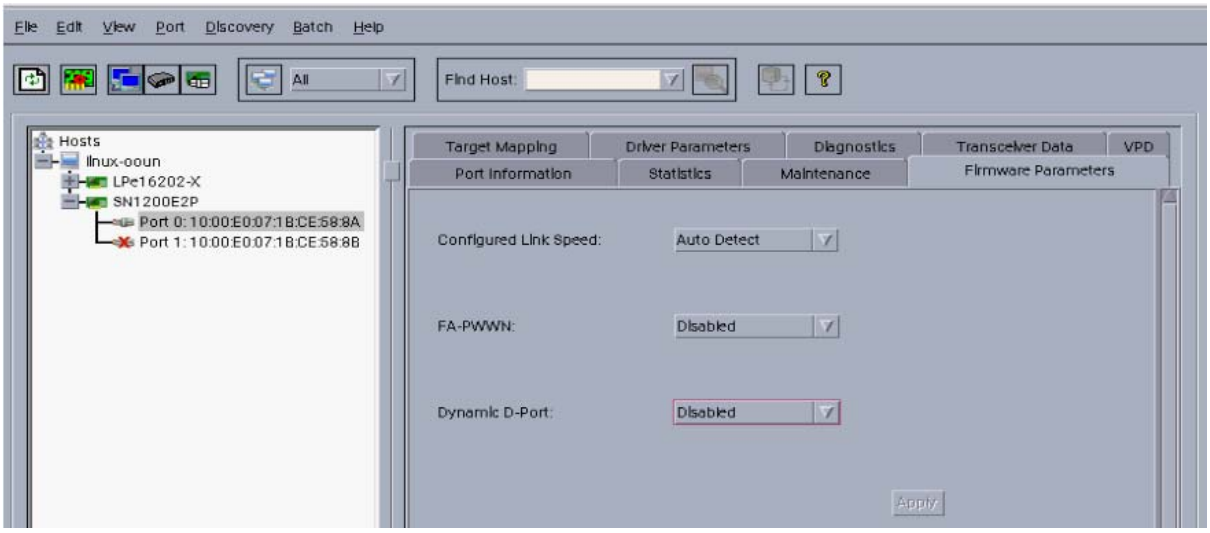
To save the test results to a file, click **Save Results to File**. You are prompted to enter the file name of the save file.

NOTE: If the SFP or adapter firmware do not support running D_Port diagnostics, clicking **Start Tests** causes an error message to be displayed, and the tests are not run.

11.5.2 Enabling Dynamic D_Port Tests

Dynamic D_Port tests are initiated from the switch to the HBA, but you must first enable Dynamic D_Port on the HBA.

Figure 68: Firmware Parameters Tab (Dynamic D_Port Test Disabled)



To enable Dynamic D_Port tests, perform these steps:

1. From the discovery-tree (Figure 4), select the port on which you want to enable the **Dynamic D_Port** test.
2. Select the **Firmware Parameters** tab (Figure 68) and choose **Enabled** from the **Dynamic D_Port** drop-down list.
3. Click **Apply**.

11.6 Using FC Trace Route

FC Trace Route allows you to trace the communication route for FC packets transmitted between an FC initiator port and an FC target port.

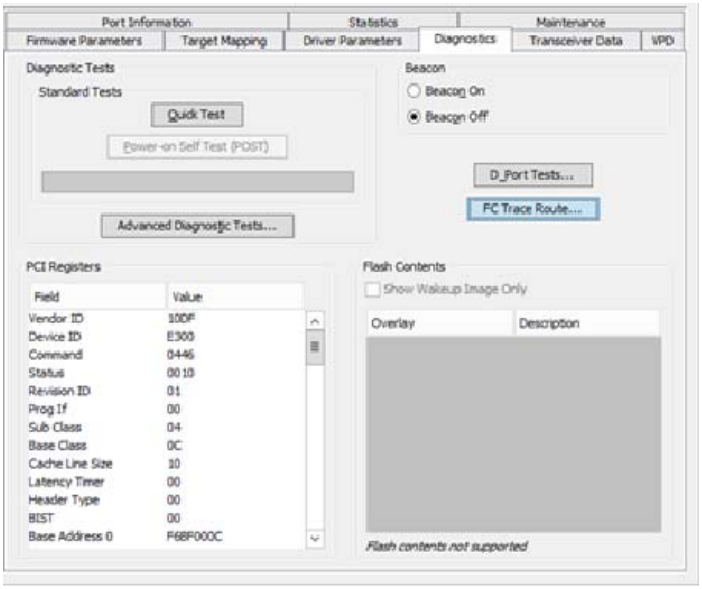
Communication route information such as the switch name, domain ID, ingress and egress port name, and ingress and egress physical port number, is accumulated for all switch ports through which packets are routed. Data for both the outward bound route from the initiator to the target, and the inbound route from the target to the initiator is collected.

The **FC Trace Route** button on the **Diagnostics** tab enables you collect FC Trace Route information on LPe15000-series, LPe16000-series, LPe31000-series, and LPe32000-series adapters. (Figure 69)

11.6.1 FC Trace Route Considerations

- FC Trace Route is not supported on LPe12000-series adapters.
- Both local and remote support for the FC Trace Route must be provided.
- FC Trace Route support must be provided on Windows, Linux and ESXi operating system platforms.

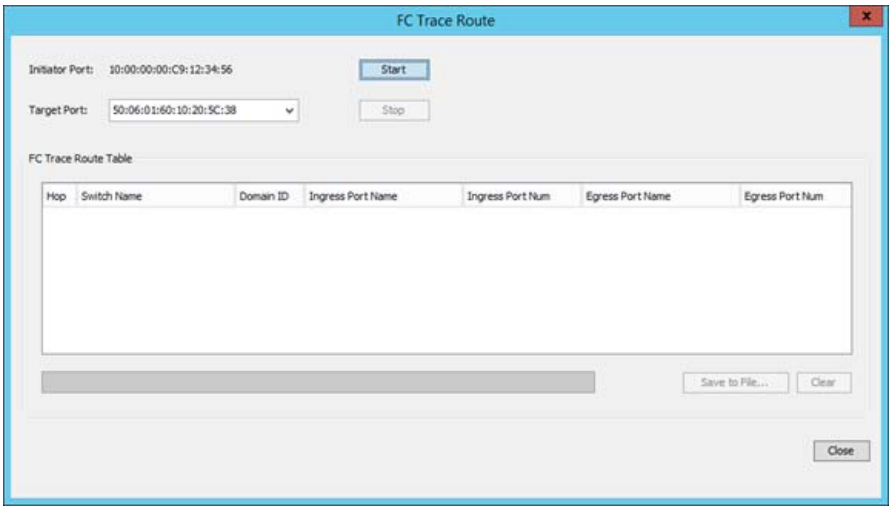
Figure 69: Diagnostics Tab (FC Trace Route Button Depicted)



To enable FC Trace Route, perform these steps:

1. From the discovery-tree (Figure 4), select the port on which you want to enable FC Trace Route.
2. Select the **Diagnostics** tab (Figure 69) and click **FC Trace Route**. The **FC Trace Route** dialog appears (Figure 70).

Figure 70: FC Trace Route Dialog



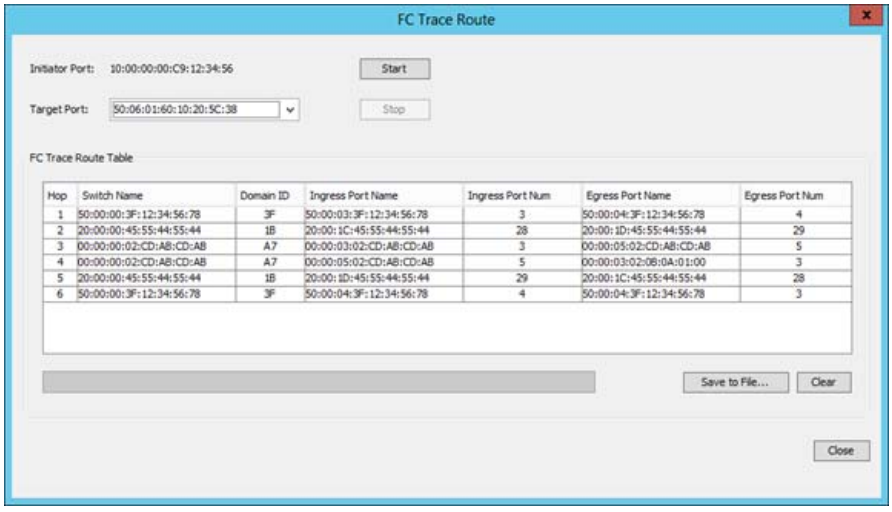
3. The **Target Port** drop-down list displays the WWPNs of all targets that are seen by the initiator port. Select a target port and Click **Start**.

   The **FC Trace Route** dialog displays trace route information for selected initiator and target ports (Figure 71).

NOTE: If an error occurs when processing the FC trace route request, a message is displayed at the bottom of the dialog.

Click **Save to File** to save the results of the most recent FC trace route operation to a log text file. The default file name for the log text file is `FCTraceRte_`*`IWWPN_TWWPN`* (where *`IWWPN`* is the initiator WWPN and *`TWWPN`* is the target WWPN. You can change the file name.

Figure 71: FC Trace Route Dialog with Route Information Displayed



The following information is collected for each trace route:

- **Switch Name** – The switch chassis WWN.
- **Domain ID** – A number used to uniquely identify a switch in a fabric. This number is assigned by a fabric administrator as part of fabric configuration. The Domain IDs is an 8-bit field whose value ranges from 0 to 255.
- **Ingress Port Name** – The port WWN of the physical port through which an FC packet enters a specific switch.

- Ingress Physical Port Number – The physical port number of the port through which an FC packet enters a specific switch.
- Egress Port Name – The port WWN of the physical port through which an FC packet exits a specific switch.
- Egress Physical Port Number – The physical port number of the port through which an FC packet exits a specific switch.

11.7 Creating Diagnostic Dumps

NOTE: This option is not available in read-only mode.

The diagnostic dump capability enables you to create a dump file for a selected port. Dump files contain various information, such as firmware version, driver version, and so on, that is particularly useful when troubleshooting an adapter. You can also retrieve dump files from remote hosts.

For LPe12000-series HBAs, see Section 11.7.1, Creating Diagnostic Dumps for LPe12000-Series Adapters. For LPe16000-series, LPe31000-series, and LPe32000-series adapters, see Section 11.7.2, Creating Diagnostic Dumps for All Other Adapters.

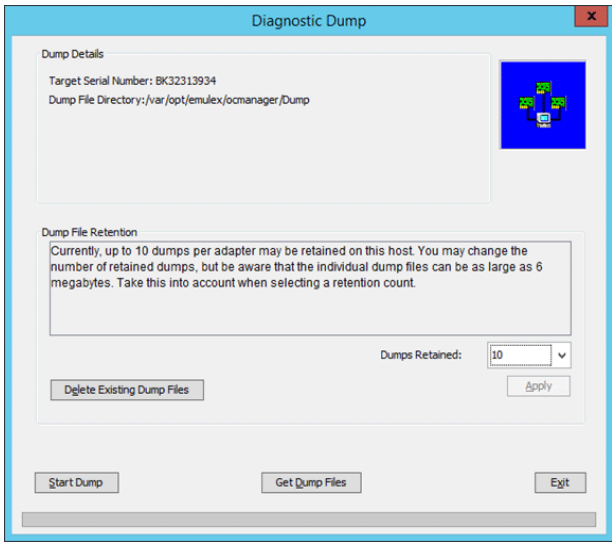
CAUTION! Disruption of service can occur if a diagnostic dump is run during I/O activity.

11.7.1 Creating Diagnostic Dumps for LPe12000-Series Adapters

To start a diagnostic dump, perform these steps:

1. From the discovery-tree (Figure 4), select a port whose diagnostic information you want to dump.
2. Select the **Diagnostics** tab (Figure 63) and click **Diagnostic Dump**. The **Diagnostic Dump** dialog appears (Figure 72). You can specify how many files you want to retain using the **Dumps Retained** counter. Click **Delete Existing Dump Files** to remove existing dump files for the selected port from your system.

Figure 72: Diagnostic Dump Dialog



3. Click **Start Dump**. A warning message about taking the adapter offline appears.

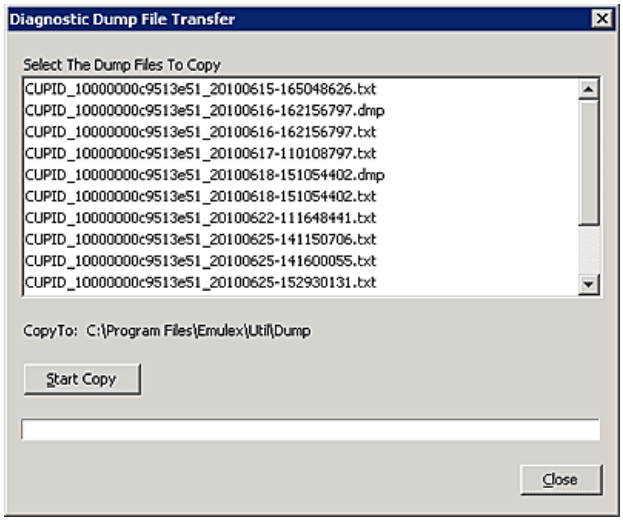
NOTE: For VMware systems, you must set a dump directory before initiating a dump. The dump directory must be a storage partition (a datastore) under the directory `/vmfs/volumes`.

4. Click **OK**. Dump files are created. The file location depends upon your operating system:
   - Windows – In the `Dump` directory under the OneCommand Manager Installation Directory `Util\Dump\`.
   - Solaris – `/opt/ELXocm/Dump`.
   - Linux – `/var/log/emulex/ocmanager/Dump`.
   - VMware – The dump directory you created under `/vmfs/volumes`.

   Two files are created:
   - *<Hostname_WWPN_Date-Time>*`.dmp`
   - *<Hostname_WWPN_Date-Time>*`.txt`
5. To list the dump files in the local system or to obtain remote host dump files and copy them to your local system, click **Get Dump Files**. The **Diagnostic Dump File Transfer** dialog appears (Figure 73).

NOTE: The **Start Copy** button is disabled when a local adapter port is selected.

Figure 73: Diagnostic Dump File Transfer Dialog



6. Select the files you want to copy (multiple selections are available), and click **Start Copy**. The remote dump files are copied to your local dump folder. The local dump folder locations are described in Step 4.

11.7.2 Creating Diagnostic Dumps for All Other Adapters

NOTE: This option is not available in read-only mode.

The diagnostic dump capability enables you to create an Enhanced FAT Dump (EFD) dump file for a selected adapter. Dump files contain various information, such as firmware version, driver version, and so on, that is particularly useful when troubleshooting an adapter. You can also retrieve dump files from remote hosts.

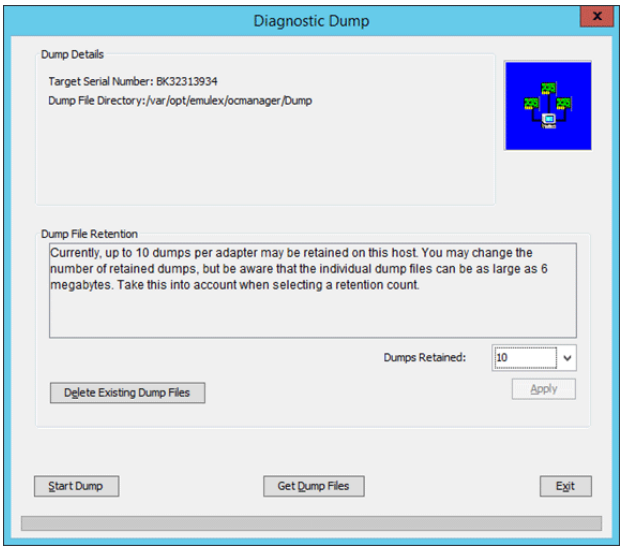
To start a diagnostic dump, perform these steps:

1. From the discovery-tree (Figure 4), select an adapter whose diagnostic information you want to dump.
2. Select the **Firmware** tab (Figure 23), and click **Diagnostic Dump**. The **Diagnostic Dump** dialog appears (Figure 74).

For hosts being managed through the CIM interface, the **Set Dump Directory** button enables you to set the dump directory for ESXi host dumps (VMware only).

3. Specify how many files you want to retain using the Files Retained counter. Click **Delete Existing Dump Files** to remove existing dump files for the selected adapter from your system.

Figure 74: Diagnostic Dump Dialog



4. Click **Start Dump**. Dump files are created. The file location depends upon your operating system:

NOTE: For VMware systems, you must set a dump directory before initiating a dump. The dump directory must be a storage partition (a datastore) under the directory `/vmfs/volumes`.

- Windows – `%ProgramFiles%Util\Dump\`.
- Solaris – `/opt/ELXocm/Dump`.
- Linux – `/var/log/emulex/ocmanager/Dump`.
- VMware – A dump directory you create under `/vmfs/volumes`.

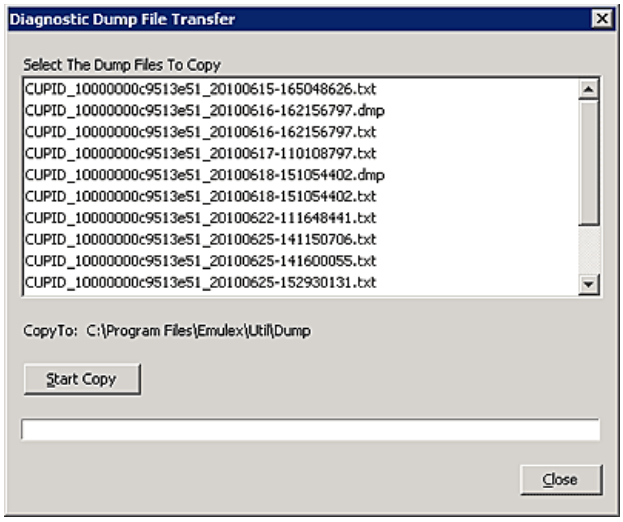
Two files are created:

- *<Hostname_WWPN_Date-Time>*`.efd`
- *<Hostname_WWPN_Date-Time>*`.txt`

5. To obtain remote host dump files and copy them to your local system, click **Get Dump Files**. The **Diagnostic Dump File Transfer** dialog appears (Figure 75).

NOTE: The **Get Dump Files** button is disabled if a local adapter port is selected.

Figure 75: Diagnostic Dump File Transfer Dialog



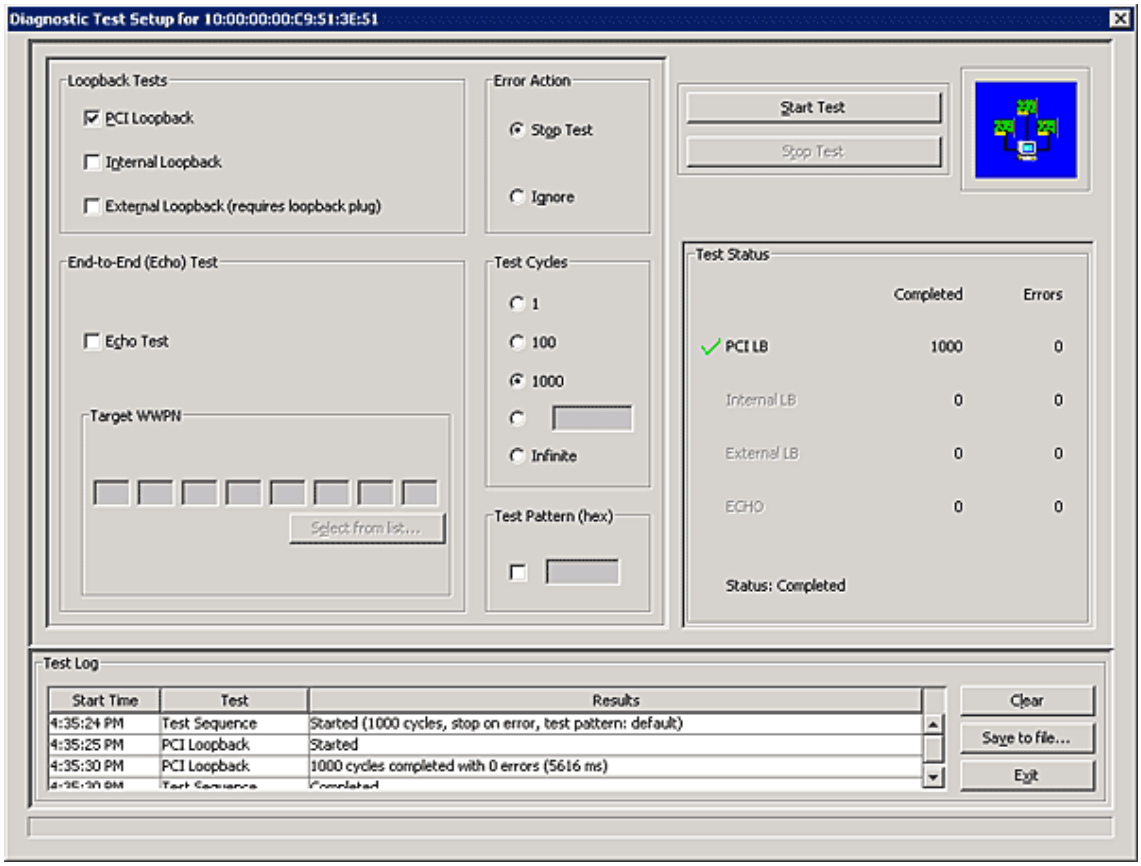
6. Select the files you want to copy (multiple selections are available), and click **Start Copy**. The remote dump files are copied to your local dump folder. The local dump folder locations are described in Step 4.

11.8 Running Advanced Diagnostic Tests

The advanced diagnostics capability gives you greater control than the quick test over the type of diagnostics tests that run. Through advanced diagnostics, you can specify which tests to run, the number of cycles to run, and actions to take in the event of a test failure. Advanced diagnostics capability is not available in read-only mode.

To run advanced diagnostics tests, click **Advanced Diagnostic Tests** on the **Diagnostics** tab (Figure 63). The **Diagnostic Test Setup** dialog appears (Figure 76).

Figure 76: Diagnostic Test Setup Dialog



The following **Diagnostic Test Setup** dialog fields are displayed:

- Loopback Tests area:
  - PCI Loopback
  - Internal Loopback
  - External Loopback

NOTE: For details about these tests, see Section 11.8.1, Running Loopback Tests.

- End-to-End (Echo) Test
  - Echo Test
  - Target WWPN

NOTE:

- For details about this test, see Section 11.8.2, Running End-to-End Tests.
- You cannot run the External Loopback test and the Echo test concurrently. If you select the **External Loopback** check box, the Echo test section is disabled, and if you select the **Echo Test** check box, the External Loopback section is disabled.

- Error Action area:

  Error Action enables you to define the actions to be performed in the event of a test failure. Two error action options exist:
  - **Stop Test** – Do not log the error and halt the test. No further tests are run.
  - **Ignore** – Log the error and proceed with the next test cycle.

- Test Cycles area:

  Test Cycles enables you to specify test cycles three ways:
  - Select an established cycle count by clicking on the corresponding radio button.
  - Enter a custom cycle count in the blank field in the Test Cycles area.
  - Set the test to run until you manually click **Stop Test**, by selecting the **Infinite** radio button.
- Test Pattern area:

  Enter a custom test pattern to be used in tests that transfer data. The test pattern can be up to 8 hexadecimal bytes.
- Test Status area:

  The Test Status area displays how many completed cycles of each test ran, in addition to the number of errors for each test.
- Test Log area:

  For details about test logs, see Section 11.8.3, Saving the Log File.

11.8.1 Running Loopback Tests

You can run the following loopback tests:

- PCI Loopback Test – A firmware controlled diagnostic test in which a random data pattern is routed through the PCI Bus without being sent to an adapter link port. The returned data is subsequently validated for integrity.
- Internal Loopback Test – A diagnostic test in which a random data pattern is sent down to an adapter link port, then is immediately returned without actually going out on the port. The returned data is subsequently validated for integrity.
- External Loopback Test – A diagnostic test in which a random data pattern is sent down to an adapter link port. The data goes out the port and immediately returns by way of a loopback connector. The returned data is subsequently validated for integrity.

NOTE: You cannot run the External Loopback test and Echo test concurrently. If you select **External Loopback**, the Echo Test section is disabled, and if you select **Echo Test**, the External Loopback section is disabled.

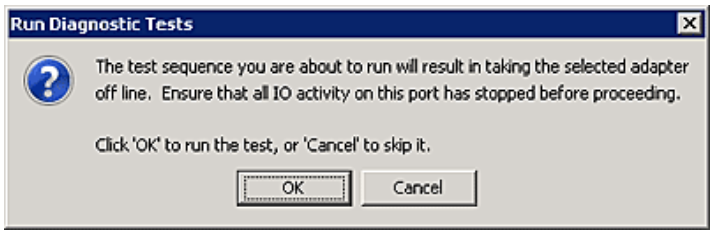
To run loopback tests, perform these steps:

1. From the **Diagnostics** tab (Figure 63), click **Advanced Diagnostics Tests** (Figure 76). From the **Loopback Test** section of the dialog, choose the type of loopback test you want to run and define the loopback test parameters.

NOTE: You must insert a loopback plug in the selected adapter before running an External Loopback test.

2. Click **Start**. The following warning appears (Figure 73).

Figure 77: Run Diagnostic Tests Warning



3. Click **OK**. If you choose to run an External Loopback test, the following window appears (Figure 78).

Figure 78: Run Diagnostic Tests Warning for External Loopback

4. Click **OK**. The progress bar indicates that the test is running.

   Periodic test feedback, consisting of the current loopback test/cycle plus the completion status of each type of test, is displayed in the **Test Log** section of the dialog. Either click **Clear** to erase the contents of the log display, or click **Save to File** to save the log file.

After starting the tests, you can click **Stop Tests** to stop the tests before they complete. Depending upon the tests being run, it may take some time before they stop.

11.8.2 Running End-to-End Tests

The End-to-End (Echo) test enables you send an `echo` command and response sequence between an adapter port and a target port.

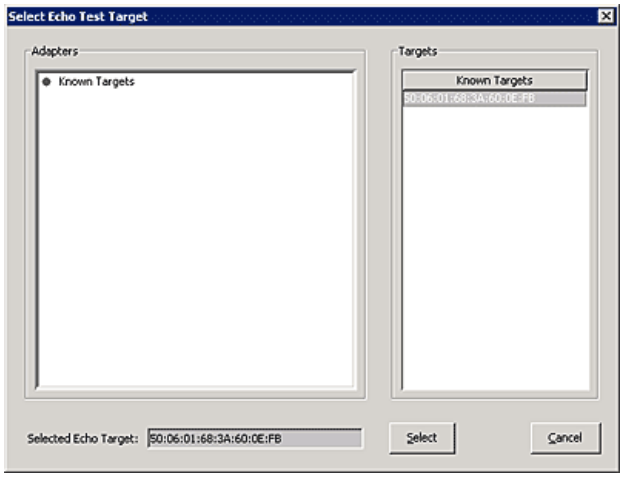
NOTE:

- Not all remote devices respond to an `echo` command.
- You cannot run the Echo test and the External Loopback test concurrently. If you select **Echo Test**, the External Loopback test is disabled.

To run Echo tests, perform these steps:

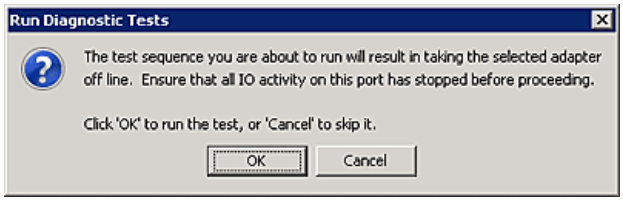
5. From the **Diagnostics** tab (Figure 63), click **Advanced Diagnostic Tests** (Figure 76).
6. Select **Echo Test**, and enter the WWPN for the target.
   a. Click **Select From List** if you do not know the actual WWPN of the test target. The **Select Echo Test Target** dialog appears (Figure 79).
   b. Select the port to test from the tree-view and click **Select**. All relevant information for the selected port is automatically added to the Target Identifier section of the **Diagnostics** dialog.

Figure 79: Select Echo Test Target Window



7. Define the other parameters you want to use and click **Start Test**. The following warning window appears (Figure 80).

Figure 80: Run Diagnostic Tests Warning Window



8. Click **OK**. A result screen appears, and the test results appear in the test log. Either click **Clear** to erase the contents of the log display, or click **Save to File** to save the log file.

11.8.3 Saving the Log File

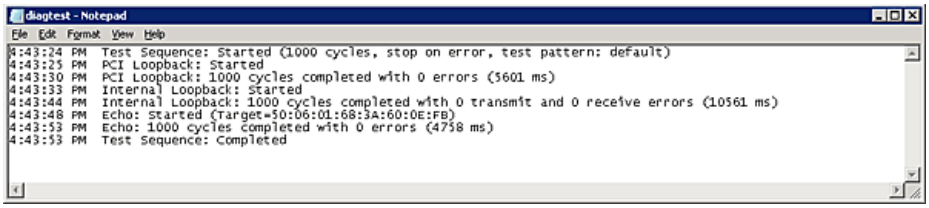
You can save the test log to a log file for later viewing or printing. When new data is written to a saved file, the data is appended to the end of the file. Each entry has a two-line header that contains the identifier of the adapter being tested and the date and time of the test. Over time, the data accumulates to form a chronological history of the diagnostics performed on the adapter.

The default location is as follows:

- In Windows: The OneCommand Manager application install directory on your local drive.
- In Solaris: `/opt/ELXocm/Dump`
- In Linux: `/var/opt/emulex/ocmanager/Dump`
- In VMware Server: A default directory does not exist for VMware.

After writing an entry into the log, you are prompted to clear the display. The default name of the saved file is `DiagTest.log`. An example of a saved log file is shown in Figure 81.

Figure 81: Example of a DiagTest.log Window



To save the log file, perform these steps:

1. After running a test from the **Diagnostic Test Setup** dialog (Figure 76), click **Save to File**. The **Select Diagnostic Log File Name** dialog appears. The default name of a saved file is `DiagTest.log`.
2. Browse to the desired directory, change the log file name if you want and click **Save** (Figure 76).

Chapter 12: Troubleshooting

Your system may operate in an unexpected manner in some circumstances. The Troubleshooting section explains many of these circumstances and offers one or more workarounds for each situation.

12.1 General Situations

Table 5 lists possible situations and their resolution.

Table 5 General Situations

Situation	Resolution
After installing and starting the OneCommand Manager application, the status bar shows `Initializing discovery engine...`, but after waiting for awhile, nothing is displayed in the discovery-tree.	It is possible the discovery server was not installed properly and therefore is not running. Try uninstalling and re-installing the OneCommand Manager application package.
The FC link fails to come up.	Verify that an 8GFC adapter is not attempting to connect to a 1GFC device, or that a 16GFC adapter is not attempting to connect to a 1GFC, or 2GFC device. Only 8GFC devices are supported on 8GFC adapters and only 16GFC devices are supported on 16GFC adapters.
The other utilities install, but the OneCommand Manager application does not.	You have attempted to install the utilities before installing the Emulex driver. Perform the installation tasks in the following order: 1. Install the Emulex driver (refer to the Installation section of the driver manual). 2. Install the utilities (refer to the Installation section of the driver manual).
An operating error occurs when attempting to run the OneCommand Manager application. When you attempt to run the utility, an operating system error may occur. The computer may freeze.	Reboot the system.

Unwanted remote servers appear in the OneCommand Manager application.	To prevent remote servers from appearing in the OneCommand Manager application, perform one of the following tasks on the remote systems:
	■ In Windows, disable the OneCommand Manager application service.
	■ In Linux, stop the elxhbamgr daemon by running the following script:
	`/usr/sbin/ocmanager/stop_ocmanager`
	■ In Solaris, stop the elxhbamgr service by issuing the following command:
	`svcadm disable elxhbamgr`
	NOTE Disabling this service or process prevents the local servers from being seen remotely.

Table 5 General Situations (Continued)

Situation	Resolution

If **Help > Contents** is selected in the OneCommand Manager application, the online help is not opened in a web browser. The `OCManager_Help.htm` file may be opened in a text editor (displaying HTML code) or by some other application.
This occurs when the operating system has associated `.html` files with an application other than a web browser.
	On Windows systems, this can be fixed using the following steps:
	1. In Windows Explorer, navigate to the `C:\Program Files\Emulex\Util\OCManager\OCManager_help\` directory.
	2. Right-click on **OCManager_Help.htm**.
	3. Select **Open With >Choose default program**.
	4. Select a web browser, such as Internet Explorer.
	5. Check **Always use the selected program to open this kind of file**.
	6. Click **OK**.
	On Linux and Solaris, the preceding steps are very similar, with the `OCManager_Help.htm` file located in
	`/usr/sbin/ocmanager/ocmanager_help/OCManager_Help.htm`
	and
	`/opt/ELXocm/ocmanager_help/OCManager_Help.htm`
	respectively.

12.2 Emulex Driver for Linux and OneCommand Manager Application Situations

Table 6 lists possible Emulex driver for Linux situations and their resolution.

Table 6 Emulex driver for Linux and OneCommand Manager Application Situations

Situation	Resolution
The OneCommand Manager application software package does install. An error message states that: `inserv Service Elxlpfc has to be enabled for service ElxDiscSrvinserv: exiting now/sbin/inserv failed exit code 1.`	Reinstall the driver with the `lpfc-install` script.
If a SAN configuration has 256 targets mapped by the FC driver, any additional added targets do not get a target ID mapping by the driver and cause target discovery to fail. Removing targets or reinitializing the link does not solve the issue.	Unload and reload the driver to reset available target IDs. Ensure that the SAN configuration is correct prior to reloading the driver. This clears the driver's consistent binding table and free target IDs for new target nodes.
In some cases, after loading a vendor-supplied combined firmware/OpenBoot image, you are not able to enable BootBIOS from the lputil **Boot BIOS Maintenance** menu.	1. Download the current OpenBoot only image for your adapter from www.broadcom.com. 2. Load the current OpenBoot only image. 3. Run `lputil`, return to the **Boot BIOS Maintenance** menu. 4. Enable BootBIOS.
`rmmod` fails to unload the FC driver module. `ERROR: Module LPFC is in use.` This message can appear when you attempt to remove the driver and there is a logical volume group dependent on the driver.	Make the logical volume group unavailable. Type the following: `lvchange -a n <xxxxxxx>` where *xxxxxx* is the volume group name.
Slow targets or extended link faults on the storage side may result in storage being marked off-line by the mid-layer and remaining off-line (not recovered) when the link faults are corrected.	If you experience off-line device issues, increase the SCSI command timeout to a value greater than or equal to sixty seconds.

Table 6 Emulex driver for Linux and OneCommand Manager Application Situations (Continued)

Situation	Resolution
The FC driver fails to recognize an adapter and logs unknown IOCB messages in the system log during driver load. The adapter is running outdated firmware.	Update the adapter firmware to the latest version.
`rmmod` of the FC driver hangs, and the module reference count is 0.	If a small race condition exists in the kernel, it is possible for an `rmmod` command to stop responding. Issue the `rmmod -w` command. If this does not help, reboot the computer.
The system stops responding when booted with a failed adapter installed.	Remove the failed adapter and reboot.

`rmmod` fails to unload the driver because the device or resource is busy. This message occurs when you attempt to remove the driver without first stopping the OneCommand Manager application, when the OneCommand Manager application is installed and running, or when FC disks connected to a LightPulse adapter are mounted.	Stop the OneCommand Manager application before attempting to unload the driver. The script is located in the `/usr/sbin/ocmanager` directory.
	1. Type the following:
	`./stop_ocmanager`
	2. Unmount any disks connected to the adapter.
	3. Unload the driver.
	4. Type the following:
	`rmmod lpfc`

The driver installation fails. The `lpfc_install` script fails to install the driver.	The install script may fail for the following reasons: ■ A previous version of the driver is installed. Run the `/usr/src/lpfc/lpfc_install --uninstall` script, and then try to install the driver. ■ The current driver is already installed. ■ The kernel source does not match the standard kernel name, or you are running a custom kernel.
■ No module lpfc found for kernel error message. When updating the kernel, the `.rpm` file generates the following error: `No module lpfc found for kernel KERNELVERSION`. ■ A recently updated kernel cannot find the ramdisk. After updating the kernel, the kernel cannot find the ramdisk that halts the system. ■ The driver is not loaded after a system reboot after updating the kernel.	These three situations may be resolved by updating the kernel. Two ways to install the driver into an updated kernel are available. The method you use depends on whether or not you are updating the driver. ■ Update the kernel using the same version of the driver. ■ Update the kernel using a new version of the driver. Refer to the Installation section of the driver manual for these procedures.
The driver uninstallation fails. The `lpfc_install --uninstall` script fails with an error.	Try the following solutions: ■ Uninstall the OneCommand Manager application by running the `/uninstall` script from the OneCommand Manager application installation directory. ■ Unmount all FC disk drives. ■ Unload the FC driver.
`lpfc_install` script exit codes.	The `lpfc-install` script contains exit codes that can be useful in diagnosing installation issue. Refer to the `lpfc-install` script for a complete listing of codes and definitions.
The OneCommand Manager application software package does not install. The following error message is displayed: `inserv Service Elxlpfc has to be enabled for service ElxDiscSrvinserv: exiting now/sbin/inserv failed exit code 1.`	Reinstall the driver with the `lpfc-install` script.

Table 6 Emulex driver for Linux and OneCommand Manager Application Situations (Continued)

Situation	Resolution
The Linux SCSI subsystem only sees eight LUNs when more are present.	Some SCSI drivers do not scan past eight LUNs when the target reports as a SCSI-2 device. Force a SCSI bus scan with `/usr/sbin/lpfc/lun_scan`. SuSE supplies `/bin/rescan-scsi-bus.sh`, which can be changed to scan everything.
The OneCommand Manager application cannot see any adapters.	Try the following solutions: ■ Perform an `lsmod` to see if the Emulex drivers are loaded. Look for an error message on the command line stating that the LPFC driver is not loaded. If this is the case, do an `lsmod` of the FC driver and restart the OneCommand Manager application. ■ Exit the OneCommand Manager application and run the following sripts in this order: 1. `/usr/sbin/ocmanager/stop_ocmanager` – Stops the OneCommand Manager application daemons. 2. `/usr/sbin/ocmanager/start_ocmanager` – Starts the OneCommand Manager application daemons. 3. `/usr/sbin/ocmanager/ocmanager` – Starts the OneCommand Manager application GUI. The adapters should be visible. If they are not visible, reboot your system.
The OneCommand Manager application cannot see new LUNs.	Try the following: 1. Click **Refresh LUNs** in the toolbar. 2. Exit the OneCommand Manager application and restart it. If new LUNs are visible, you are finished. If that does not work, try the following: 1. Exit the OneCommand Manager application. 2. Navigate to `/usr/sbin/ocmanager`. 3. Run `./stop_ocmanager` to stop both the `elxhbamgr` and `elxdiscovery` processes. 4. Run `./start_ocmanager` and `./start_elxdiscovery` to restart both processes. 5. Start the OneCommand Manager application.

12.3 VPorts and OneCommand Manager Application Situations

Table 7 lists possible VPorts situations and their resolution.

Table 7 VPorts and OneCommand Manager Application Situations

Situation	Resolution
The OneCommand Manager application failed to create vPorts.	If an error occurs during vPort creation, an error message indicates the failure. Several conditions must be met before a virtual port can be created. This may be the issue. For a detailed list of unsatisfied conditions: 1. Start the OneCommand Manager application. 2. Select **View > Group Adapters by Virtual Port** from the **Main** menu. 3. In the discovery-tree, select the FC function on which you want to create a virtual port. The **Virtual Ports** tab should contain a list of unsatisfied conditions (if any) that are preventing a virtual port from being created. 4. If there are no unsatisfied conditions, yet vPort creation still fails, contact Broadcom technical support.
The port is not ready.	The controls in the New Virtual Port area of the **Virtual Port** window are replaced by a list of reasons why VPorts cannot be created. The reasons can be one or more of the following: ■ The driver NPIV parameter is disabled. ■ SLI-3 is not being used by a port. ■ The adapter port is out of resources for additional virtual ports. ■ The port is not connected to a fabric. ■ The fabric switch does not support virtual ports. ■ The fabric switch is out of resources for additional virtual ports. ■ The port link state is down.

Appendix A: License Notices

A.1 Secure Hash Algorithm (SHA-1) Notice

A.2 OpenPegasus Licensing Notice

A.3 OpenSSL Notice

```
*
* Redistribution and use in source and binary forms, with or without
* modification, are permitted provided that the following conditions
* are met:
*
* 1. Redistributions of source code must retain the above copyright
* notice, this list of conditions and the following disclaimer.
*
* 2. Redistributions in binary form must reproduce the above copyright
* notice, this list of conditions and the following disclaimer in
* the documentation and/or other materials provided with the
* distribution.
*
* 3. All advertising materials mentioning features or use of this
* software must display the following acknowledgment:
* "This product includes software developed by the OpenSSL Project
* for use in the OpenSSL Toolkit. (http://www.openssl.org/)"
*
* 4. The names "OpenSSL Toolkit" and "OpenSSL Project" must not be used to
* endorse or promote products derived from this software without
* prior written permission. For written permission, please contact
* openssl-core@openssl.org.
*
* 5. Products derived from this software may not be called "OpenSSL"
* nor may "OpenSSL" appear in their names without prior written
* permission of the OpenSSL Project.
*
* 6. Redistributions of any form whatsoever must retain the following
* acknowledgment:
* "This product includes software developed by the OpenSSL Project
* for use in the OpenSSL Toolkit (http://www.openssl.org/)"
*
* THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT ``AS IS'' AND ANY
* EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
* PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR
* ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
* SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT
* NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES;
* LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
* HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT,
* STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE)
* ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED
* OF THE POSSIBILITY OF SUCH DAMAGE.
* ====================================================================
*
* This product includes cryptographic software written by Eric Young
* (eay@cryptsoft.com). This product includes software written by Tim
* Hudson (tjh@cryptsoft.com).
*
*/

Original SSLeay License
-----------------------

/* Copyright (C) 1995-1998 Eric Young (eay@cryptsoft.com)
* All rights reserved.
*
* This package is an SSL implementation written
* by Eric Young (eay@cryptsoft.com).
* The implementation was written so as to conform with Netscapes SSL.
*
* This library is free for commercial and non-commercial use as long as
* the following conditions are aheared to. The following conditions
* apply to all code found in this distribution, be it the RC4, RSA,
* lhash, DES, etc., code; not just the SSL code. The SSL documentation
* included with this distribution is covered by the same copyright terms
* except that the holder is Tim Hudson (tjh@cryptsoft.com).
*
* Copyright remains Eric Young's, and as such any Copyright notices in
* the code are not to be removed.
```

* If this package is used in a product, Eric Young should be given attribution
* as the author of the parts of the library used.
* This can be in the form of a textual message at program startup or
* in documentation (online or textual) provided with the package.
*
* Redistribution and use in source and binary forms, with or without
* modification, are permitted provided that the following conditions
* are met:
* 1. Redistributions of source code must retain the copyright
* notice, this list of conditions and the following disclaimer.
* 2. Redistributions in binary form must reproduce the above copyright
* notice, this list of conditions and the following disclaimer in the
* documentation and/or other materials provided with the distribution.
* 3. All advertising materials mentioning features or use of this software
* must display the following acknowledgement:
* "This product includes cryptographic software written by
* Eric Young (eay@cryptsoft.com)"
* The word 'cryptographic' can be left out if the rouines from the library
* being used are not cryptographic related :-).
* 4. If you include any Windows specific code (or a derivative thereof) from
* the apps directory (application code) you must include an acknowledgement:
* "This product includes software written by Tim Hudson (tjh@cryptsoft.com)"
*
* THIS SOFTWARE IS PROVIDED BY ERIC YOUNG ``AS IS'' AND
* ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
* ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE
* FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
* DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS
* OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
* HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
* LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY
* OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
* SUCH DAMAGE.
*
* The licence and distribution terms for any publically available version or
* derivative of this code cannot be changed. i.e. this code cannot simply be
* copied and put under another distribution licence
* [including the GNU Public Licence.]
*/

A.4 Java Notice

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

Redistribution of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

Redistribution in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

Neither the name of Sun Microsystems, Inc. or the names of contributors may be used to endorse or promote products derived from this software without specific prior written permission.

This software is provided “AS IS,” without a warranty of any kind. ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT, ARE HEREBY EXCLUDED. SUN MICROSYSTEMS, INC. ("SUN") AND ITS LICENSORS SHALL NOT BE LIABLE FOR ANY DAMAGES SUFFERED BY LICENSEE AS A RESULT OF USING, MODIFYING OR DISTRIBUTING THIS SOFTWARE OR ITS DERIVATIVES. IN NO EVENT WILL SUN OR ITS LICENSORS BE LIABLE FOR ANY LOST REVENUE, PROFIT OR DATA, OR FOR DIRECT, INDIRECT, SPECIAL, CONSEQUENTIAL, INCIDENTAL OR PUNITIVE DAMAGES, HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY, ARISING OUT OF THE USE OF OR INABILITY TO USE THIS SOFTWARE, EVEN IF SUN HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

You acknowledge that this software is not designed, licensed or intended for use in the design, construction, operation or maintenance of any nuclear facility.


BROADCOM®