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# Installation

## Introduction

AutoPilot Installer<sup>®</sup> for Emulex<sup>®</sup> Storport Miniport and Network Driver Interface Specification (NDIS) Miniport drivers provides installation options that include simple installations with a few mouse clicks to unattended installations that use predefined script files and text-only installations. AutoPilot Installer is included with Emulex drivers and utilities in Windows executable files (kit installers) that you can download from the Emulex Web site.

There are three types of driver kits. Each driver kit contains x86, x64 and IA64 drivers and installs the correct files on a per-adapter basis.

- FC+ FCoE Driver package (elxdrv-fc-fcoe-<version>.exe)
- iSCSI Driver package (elxdrv-iscsi-<version>.exe)
- NIC Driver package (elxdrv-nic-<version>.exe)

Run one of the driver kit installers to extract the software needed for the driver installation.

You can install a driver by any of the following methods:

---

**Note:** These installation methods are not mutually exclusive.

---

**Hardware-first installation.** At least one Emulex adapter is installed before you install the Emulex drivers and utilities.

**Software-first installation.** You can install drivers and utilities using AutoPilot Installer prior to the installation of any adapters. You do not need to specify the model of any adapters to be installed later. The appropriate drivers and utilities automatically load when you install the adapters.

**Text-Only installation.** Text-based installation mode is used automatically when AutoPilot Installer is run on a Server Core system.

**Network installation.** You can place the driver kit installers on a shared network drive and install them across your local area network (LAN). Network-based installation is often used in conjunction with unattended installation and scripting. This allows you to configure and install the same driver version on all the hosts in a SAN.

**Unattended installation.** You can run the driver kit installers and AutoPilot Installer with no user interaction from a command line or script. Unattended installation works for both hardware-first and software-first installations and all driver kits. An unattended installation operates in silent mode (sometimes referred to as quiet mode) and creates an extensive report file with installation status.

## Important Considerations

### New in This Release

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- This release features three types of driver installer kits (FC+ FCoE, iSCSI and NIC). Each driver kit contains x86, x64 and IA64 drivers and installs the correct files on a per-system basis.
- There are two types of utility kits: OneCommand Manager<sup>™</sup> enterprise application includes a Graphical User Interface (GUI) and a Command Line Interface (CLI) and OneCommand Manager core application includes the CLI, but not the OneCommand application GUI. See the *OneCommand Manager application version 5.1 User Manual* for more information.

## Minimum Software Requirements

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AutoPilot Installer will not allow you to install the driver if the minimum Windows service pack or Microsoft Storport driver update is not installed.

## Changing Driver Types

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If you currently use a SCSIport Miniport or FC Port driver, the driver will be replaced when you install the Emulex Storport Miniport FC driver. The FC driver will be installed for all adapters on the server. You will also lose your customized driver parameters, persistent bindings, LUN masking and LUN mapping. The default parameters set with AutoPilot Installer are usually the best options. However, you may want to note your current settings before you install the Emulex FC driver. After the installation, you can then update your customized driver parameters.

---

**Note:** This update process can leave files associated with old driver kits on your system. After running AutoPilot Installer and restarting your system, you may be required to uninstall old driver or utility program entries. Follow the procedures in “Uninstalling the AutoPilot Installer” on page 24. Ensure you delete only previous driver versions.

---

# Storport Miniport Driver Information

## FC and FCoE Driver

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### Prerequisites

- One of the following operating systems must be installed:
  - Windows Server 2003 SP2 running on an x86, x64 or Itanium<sup>1</sup> server.
  - Windows Server 2008 running on an x86, x64 or Itanium<sup>1</sup> 64-bit server.
  - Server Core installation option of Windows Server 2008 running on an x86 or x64 server.
  - Windows Server 2008 R2 running on an x64 or Itanium<sup>1</sup> 64-bit server.
  - Windows PE 2.x or 3.x<sup>2</sup>.
- Minimum 512 MB memory.

---

**Note:** Check the Emulex Web site for required updates to the Windows operating system or the Emulex drivers.

---

### Compatibility

For a list of adapters that are compatible with this driver, see the driver's Downloads page on the Emulex Web site. For compatible firmware versions, see the Downloads page for the specific adapter.

## iSCSI Driver

---

### Prerequisites

- One of the following operating systems must be installed:
  - Windows Server 2003 SP2 running on an x86 or x64 server.
  - Windows Server 2008 running on an x86 or x64 server.
  - Server Core installation option of Windows Server 2008 running on an x86 or x64 server.
  - Windows Server 2008 R2 running on an x64 server.
  - Windows PE 2.x or 3.x<sup>2</sup>.
- Minimum 512 MB memory.

---

**Note:** Check the Emulex Web site for required updates to the Windows operating system or the Emulex drivers.

---

### Compatibility

For a list of adapters that are compatible with this driver, see the driver's Downloads page on the Emulex Web site. For compatible firmware versions, see the Downloads page for the specific adapter.

---

1. Itanium support is for FC driver only.

2. AutoPilot Installer is not supported for use with Windows PE. Please Consult the Windows Automated Installation Kit (WAIK) documentation on how to include drivers with your Windows PE images.

## NDIS Miniport Ethernet (NIC) Driver

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**Note:** Although TOE is supported, It is only enabled for certain adapters on Windows Server 2008 R2.

---

### Prerequisites

- One of the following operating systems must be installed:
  - Windows Server 2003 SP2 running on an x86 or x64 server.
  - Windows Server 2008 running on an x86 or x64 server.
  - Server Core installation option of Windows Server 2008 running on an x86 or x64 server.
  - Windows Server 2008 R2 running on an x64 server.
  - Windows PE 2.x or 3.x<sup>2</sup>.
- Minimum 512 MB memory.

---

**Note:** Check the Emulex Web site for required updates to the Windows operating system or the Microsoft Storport driver.

---

### Compatibility

For a list of adapters that are compatible with this driver, see the driver's Downloads page on the Emulex Web site. For compatible firmware versions, see the Downloads page for the specific adapter.

## Driver Kit Installer Overview

The driver kit installer is an executable file that self-extracts and copies the following software onto your system:

- Protocol drivers - Manage communication and data transfer between applications and I/O devices, using Emulex adapters as agents. There are four separate drivers for Emulex adapters: one each for FC, FCoE, iSCSI, and Ethernet.
- ElxPlus driver - Supports the OneCommand Manager application, persistent binding and LUN mapping and masking.

If you are creating Windows PE disk images and/or performing boot from SAN installation, you need to select the **Unpack All Drivers** option instead of running AutoPilot Installer. See step 2 of Installing the Driver Kit in the following procedure.

After the driver kit is installed, you have two options:

- Automatically run AutoPilot Installer immediately. This is the default option. See Option 1 on page 6 for more information.
- Explicitly run AutoPilot Installer later on your system. See Option 2 on page 6 for more information.

## Installing the Driver Kit

To install the driver kit:

1. Download the driver kit installer from the Emulex Web site to your system.

---

**Note:** The name of the driver kit installer depends on the current version identifier.

---

2. If you plan to create Windows PE disk images and/or perform boot from SAN installations, unpack all drivers. On the driver kit installer Welcome page, select the **Unpack all drivers** checkbox. Checking this checkbox unpacks all the drivers into the 'My Documents' directory.

3. Choose one of two options:
  - For an automatic interactive installation, see “Option 1: Automatically Run AutoPilot Installer” on page 6.
  - For control of all interactive installation settings, see “Option 2: Run AutoPilot Installer Separately” on page 6.
  - For an unattended installation with AutoPilot Installer, see “Performing an Unattended Driver Installation” on page 8.

## Text-Only Driver Installation

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Text-based installation mode is used automatically when the driver kit installer runs on a server with the Server Core installation option of Windows Server. During text-based installations, AutoPilot Installer uses a command prompt window. The driver kit installer notifies you when the driver is installed and also gives you a chance to stop the installation.

Whether it is launched from the command line or started programmatically, Windows always starts AutoPilot Installer as a separate stand-alone task. This means that AutoPilot Installer has its own command prompt window and cannot access others.

## AutoPilot Installer Overview

AutoPilot Installer runs after the driver kit and the OneCommand Manager application are installed. It can be run by:

- Continuing the installation process after the driver kit installation completes.
- Interactive installation at a later time.
- Unattended installation.

## AutoPilot Installer Features

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- Command line functionality - Initiates an installation from a command prompt or script. Configuration settings can be specified in the command line.
- Compatibility - Verifies that the driver to be installed is compatible with the operating system and platform.
- Driver updates - Installs and updates drivers.
- Multiple adapter installation capability - Installs drivers on multiple adapters, alleviating the need to manually install the same driver on all adapters in the system.
- Driver diagnostics - Determines whether the driver is operating properly.
- Silent installation mode - Suppresses all screen output (necessary for unattended installation).

## Starting Installers from a Command Prompt or Script

When a driver kit installer or AutoPilot Installer is run from a command prompt or command script (batch file), the Windows command processor does not wait for the installer to run to completion. Thus you cannot check the exit code of the installer before the next command is executed. Emulex recommends that command line invocation always use the “start” command with the “/wait” option. This causes the command processor to wait for the installer to complete before it continues.

## Running a Software Installation Interactively

There are two options when performing an installation interactively. These options assume you have already downloaded the driver kit installer from the Emulex Web site.

### Option 1: Automatically Run AutoPilot Installer

Use this option unless you have specific configuration needs. This option allows you to complete a driver kit installation and AutoPilot installation with a few simple mouse clicks.

1. Double-click the driver kit installer or run it from a command line. See “AutoPilot Installer Command Line Parameters” on page 9 for information on the command line options. The command line parameter, APargs, lets you specify arguments that will automatically be passed to the AutoPilot Installer command. A Welcome page is displayed with driver kit version information and Emulex contact information.
2. Click **Next** to proceed to the Installation Options page.  
For each installation option, the default installation location for that option is displayed. Browse to a different location, if desired.
3. Click **Install** to continue the installation.  
The Progress dialog box is displayed. After all tasks complete, a Finish page is displayed. The Start AutoPilot Installer box is automatically selected.
4. Click **Finish**. AutoPilot Installer is run automatically.

### Option 2: Run AutoPilot Installer Separately

This option is recommended to:

- Change installation settings for a limited number of systems.
- Familiarize yourself with AutoPilot Installer configuration options.

To access these features, run AutoPilot Installer after driver kit installation is complete. This allows you to change the configuration options supplied to AutoPilot Installer (see below).

1. Perform steps 1 through 3 for Option 1.
2. Clear the **Run AutoPilot Installer** check box on the Finish page.
3. Click **Finish**. The driver kit installer exits.

After the driver kit installation is complete, change the configuration in one of the following two ways:

- Change the configuration file. See “Software Configuration Parameters” on page 11 for details.
- Supply parameters on the command line. See “The syntax of a parameter setting is” on page 10 for details.

Once you have finished this step, you can run AutoPilot Installer at a later time, using either of the following methods: (If you are supplying options via the command line, you must use the second option.)

- Select **Programs>Emulex>AutoPilot Installer** in the Start menu.
- Run AutoPilot Installer from a command line. Type:

```
C:\Program Files\Emulex\AutoPilot Installer\APInstall.exe
```

---

**Note:** The location of APInstall.exe may differ on your system, depending on your system's Program Files location. You may also specify a different location when you install the driver package.

---

## Hardware-First Installation or Driver Update

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The driver kit installer must be downloaded from the Emulex Web site and installed.

---

**Note:** Updating the NIC protocol driver may temporarily disrupt operation of any NIC teams configured on the system.

---

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**Note:** To update the Emulex protocol drivers, begin the following procedure at step 2.

---

To perform a hardware-first installation:

1. Install a new Emulex adapter and power-on the system. If the Windows Found New Hardware wizard is displayed, click **Cancel** to exit. AutoPilot Installer performs this function.  

---

**Note:** If there are multiple adapters in the system, the Windows Found New Hardware wizard appears multiple times. Click **Cancel** to exit the wizard each time it appears.

---
2. Run AutoPilot Installer using any of the options listed in the “Running a Software Installation Interactively” on page 6.
3. When the AutoPilot Installer Welcome page appears, select an adapter in the list and click **Next**. Installation continues. Specific considerations:
  - If you are replacing a SCSIport Miniport or FC Port driver, an Available Drivers list will be displayed. Click **OK** on this window.
  - If you are updating the driver, the existing port settings will be used, unless otherwise specified in the configuration file. These settings will be pre-selected but can be changed. Set or change settings, then click **Next**.
  - If you are initially installing a vendor-specific version of the Emulex driver installation program, a Driver Configuration page may be displayed. This page includes one or more windows with questions that you must answer before continuing the installation process. In this case, answer each question and click **Next** on each window to continue.
4. Click **Next**. Installation automatically continues to completion. A dialog box will be displayed if Windows requires a reboot. View the progress of the installation. Once the installation is successful, a Finish page appears.
5. View or print a report, if desired.
  - View Installation Report - The installation report is a text file with current Emulex adapter inventory, configuration information and task results.
  - Print Installation Report - The Windows print dialog is displayed to select options for printing the installation report.
6. Click **Finish** to exit AutoPilot Installer. If the system needs to be rebooted, you are prompted to do so as indicated in step 4; you must reboot before using the drivers or utilities.

## Software-First Installation

---

The driver kit installer must be downloaded from the Emulex Web site and installed.

To perform a software-first installation:

1. Run AutoPilot Installer using any of the options listed in the “Running a Software Installation Interactively” on page 6. The following message appears:

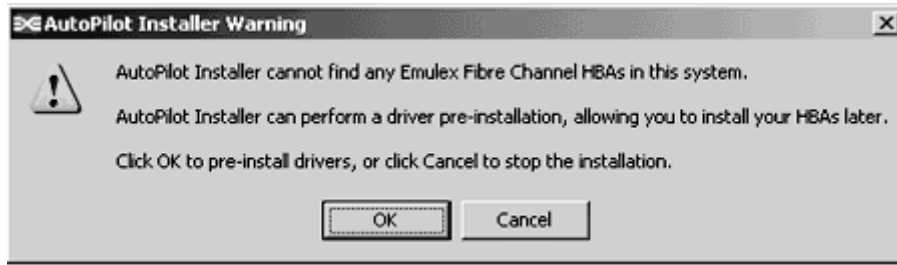


Figure 1: AutoPilot Installer Warning (Software-First Installation)

2. Click **OK**. A Welcome page appears.
3. Click **Next**. Installation automatically progresses.  
View the progress of the installation. Once the installation completes successfully, a Finish Page appears.
4. View or print a report, if desired.
  - View Installation Report - The installation report is a text file with current Emulex adapter inventory, configuration information and task results.
  - Print Installation Report - The Windows print dialog is displayed to select options for printing the installation report.
5. Click **Finish** to exit AutoPilot Installer.

## Diagnositics

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Once the AutoPilot Installer finishes, the finish screen is displayed.

If the installation fails, the Diagnostics window shows that the adapter failed. If the adapter fails:

1. Select the adapter to view the reason why the adapter failed. The reason and suggested corrective action are displayed.
2. Perform the suggested corrective action and run AutoPilot Installer again.

---

**Note:** AutoPilot Installer can be run again from the Start menu (**Programs>Emulex>AutoPilot Installer**) or APInstall.exe can be run from a command prompt.

---

## Performing an Unattended Driver Installation

An unattended driver installation, sometimes referred to as a quiet or silent installation, requires no user input. This is useful for performing an installation remotely from a command script, or when you want to make sure a custom configuration will not be changed by a user during installation. There are two ways to perform an unattended installation. These correspond to the options for running the software installation interactively.

### Option 1: Install the driver silently

Run the driver kit installer from a command prompt or script. Specify the “/q” (quiet) command line option. For example:

```
elxdrv-fc-fcoe<version>.exe /q2
```

---

**Note:** The name of the driver kit installer depends on the current version identifier. For other command line options, see “AutoPilot Installer Command Line Parameters” on page 9.

---

### Option 2: Run the driver kit installer separately

- Run the driver kit installer, but defer running AutoPilot Installer. Then choose one of the following options:
  - Run the AutoPilot Installer from a command prompt or script with the silent option:  
`APIInstall.exe /silent`
  - Edit the AutoPilot Installer configuration file before running the AutoPilot Installer. The configuration file is typically located in:  
`C:\Program Files\Emulex\AutoPilot Installer\APIInstall.cfg`

Uncomment the line that sets `SilentInstallEnable` to “True”. There are other settings in the same section of the configuration file related to unattended installations that you may also want to edit. See “Software Configuration Parameters” on page 11 for more information. After editing the file, you can run the AutoPilot Installer from the Start menu, a command prompt or a script.

When in unattended installation mode, AutoPilot Installer does the following:

1. Reads the configuration file.
2. Reads any options that may be specified on the command line, overriding the configuration file settings as appropriate.
3. Opens the installation report file.
4. Validates the operating system.
5. Discovers adapters and records the adapter inventory in the report file.
6. Verifies mandatory configuration file parameters.
7. Searches for drivers to be installed based on the `LocalDriverLocation` setting in the configuration file.
8. If appropriate, verifies that the selected driver is a different type than the currently installed driver, or more recent version of the currently installed driver.
9. Copies the driver parameters from the configuration file into the registry for the driver's coinstaller (FC and FCoE drivers only).
10. Installs/updates the driver.
11. Rediscovered adapters and records the updated adapter inventory in the report file.
12. Records the final results and closes the report file.

## AutoPilot Installer Command Line Parameters

You can pass command line parameters to the AutoPilot Installer, yet still have it run automatically by the driver kit, if you run the driver kit installer from a command prompt or script.

If you specify the “/q” switch with the driver kit installer command, the driver kit installer will run in unattended mode and it will automatically invoke the `APIInstall.exe` with its “/silent” switch. See the “Performing an Unattended Driver Installation” on page 8 for more information.

If you specify a value for the "APargs" driver kit parameter, this value will be appended to the APInstall.exe command line. See "The syntax of a parameter setting is" on page 10 for more information on the AutoPilot Installer settings that may be specified in the APargs value.

For example, assume the driver kit installer file you downloaded from the Emulex Web site is named elxdrv-fc-fcoe<version>.exe. If you execute this installer file as:

```
elxdrv-fc-fcoe<version>.exe /q APargs=SilentRebootEnable=True
```

then after installing the AutoPilot Installer, the driver kit will automatically execute it as:

```
APInstall.exe /silent SilentRebootEnable=True
```

To specify more than one parameter, separate the settings by one or more spaces and put quotes around the entire APargs expression. For example, the command line (all on one line)

```
elxdrv-fc-fcoe<version>.exe "APargs=SilentRebootEnable=True  
localDriverLocation = "d:\drivers\new\Storport"
```

results in the AutoPilot Installer being run as:

```
APInstall.exe SilentRebootEnable=True localDriverLocation =  
"d:\drivers\new\Storport"
```

Parameter values that contain spaces, such as path names, must be enclosed in quotes. To add such a setting to APargs, you must insert backslashes before the quotes around the value, and then add quotes around the entire APargs expression. For example, the command line (all on one line)

```
elxdrv-fc-fcoe<version>.exe "APargs=ReportLocation=\"C:\Documents and  
Settings\Administrator\My Documents\reports\""
```

results in AutoPilot Installer being run as:

```
APInstall.exe ReportLocation="C:\Documents and Settings\Administrator\My  
Documents\reports"
```

If you have many parameters to pass to the AutoPilot Installer, or if you want to do so repeatedly, then it may be less error prone to run the utility kit installer interactively, delay AutoPilot Installer execution, and then run the AutoPilot Installer command yourself. The procedure for doing so is described in "Option 2: Run AutoPilot Installer Separately" on page 6 and "Performing an Unattended Driver Installation" on page 8.

You can specify a non-default directory for the driver kit by specifying an 'installation folder' on the command line. For example:

```
elxdrv-fc-fcoe<version>.exe install:"C:\Emulex"
```

This option can be used in conjunction with the 'APargs' directive.

## AutoPilot Installer Command Line Parameters

---

The syntax used to run AutoPilot Installer silently from a command line or script is:

```
APInstall [/silent] [parameter setting] [parameter setting...]
```

The "silent" switch and parameter settings can occur in any order. One or more spaces must separate the switch and each parameter setting.

The syntax of a parameter setting is

```
parameter_name = ["] value ["]
```

Double quotes are required only around values that contain spaces. Spaces may separate parameters, equal signs and values. Parameter names and values are not case-sensitive.

The APInstall command may contain the settings listed below. Each setting, except ConfigFileLocation, may also be specified in the AutoPilot Configuration file. For descriptions of each parameter, see “Software Configuration Parameters” on page 11.

Settings specified in the APInstall command override those specified in the configuration file.

```
ConfigFileLocation = path-specifier
NoSoftwareFirstInstalls = { TRUE | FALSE }
SilentRebootEnable = { TRUE | FALSE }
ForceDriverUpdate = { TRUE | FALSE }
ForceDriverTypeChange = { TRUE | FALSE }
SkipDriverInstall = { TRUE | FALSE }
InstallWithoutQFE = { TRUE | FALSE }
ForceRegUpdate = { TRUE | FALSE }
LocalDriverLocation = path-specifier
ReportLocation = path-specifier
```

### Path Specifiers

Paths may be specified as

- an explicit path:  
`ReportLocation="C:\Program Files\Emulex\AutoPilot Installer\Reports"`
- a relative path:  
`LocalDriverLocation="Drivers\Storport Miniport\"`  
(assuming installation into “C:\Program Files\Emulex\AutoPilot Installer\”, this path would logically become “C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport Miniport”)
- with the %ProgramFiles% environment variable:  
`LocalDriverLocation = "%ProgramFiles%\Emulex\AutoPilot Installer\Driver"`

### Configuration File Location

The optional setting ConfigFileLocation contains the path to the configuration file that should be used. If this parameter is not specified, AutoPilot Installer will use the file named APInstall.cfg in the same folder as APInstall.exe.

The format is the same as that of the other path settings.

Example

```
APInstall /silent SkipDriverInstall=True
configFileLocation=MyConfiguration.cfg
```

### Software Configuration Parameters

#### DiagEnable (Running Diagnostics)

---

**Note:** The DiagEnable parameter cannot be specified on the command line.

---

Default: True

By default, AutoPilot Installer will run its diagnostics after all driver installation tasks have been completed. To disable this function, set this parameter to false.

## ForceDriverTypeChange (Forcing a Driver Type Change)

Default: False

When installing a driver, set this parameter to true to cause silent mode installations to update/install the Storport Miniport driver on each adapter in the system, without regard for the currently installed driver type (replacing any installation of the SCSIport Miniport or FC Port driver).

## ForceDriverUpdate (Forcing a Driver Version Update)

Default: False

By default, if the same version of the driver is already installed, an unattended installation will proceed with installing only the utilities. To force a driver update even if the same version of the driver is installed, set this parameter to true.

---

**Note:** ForceDriverUpdate applies to unattended installations only; in interactive installations this parameter is ignored. Instead you are asked if the driver should be updated.

---

## ForceRegUpdate (Forcing Updates of an Existing Driver Parameter Value)

Default: False

The ForceRegUpdate driver parameter setting determines if existing driver parameters are retained or changed when you update the driver. By default, all existing driver parameter settings are retained. The ForceRegUpdate parameter does not affect any existing persistent bindings. To set up an installation to remove the existing driver parameters from the registry and replace them with parameters specified in the AutoPilot Configuration file, set this parameter to true.

---

**Note:** You can also use this setting for attended installations with the AutoPilot Installer wizard if you modify the AutoPilot Configuration file in an AutoPilot Installer Kit.

---

## LocalDriverLocation (Specifying Location to Search for Drivers)

Default: Drivers (The default "Drivers" folder is located in the same folder as AutoPilot Installer.)

You can specify a local location that is to be searched for drivers during unattended installations. The location may be a local hard drive or a network share. Removable media are not searched. Example:  
`LocalDriverLocation = "d:\drivers\new\Storport"`

---

**Note:** On x64 and 32-bit systems, the path specified by 'LocalDriverLocation' must contain at least one instance of an FC, FCoE, iSCSI, and NIC driver. AutoPilot Installer will automatically select the most recent revisions that it finds.

For IA64 systems, only FC and FCoE drivers are supported, so no iSCSI or NIC drivers are included for installation.

---

## NoSoftwareFirstInstalls (Prohibiting Software First Installations)

Default: False

When this parameter is set to true, AutoPilot Installer prevents unattended installations from performing software-first installations. This way, you can execute an automated installation on multiple machines in your network, but only machines with Emulex adapters will actually have Emulex drivers updated or installed.

If this parameter is omitted from the configuration file or explicitly set to true, the page is not displayed. AutoPilot Installer will use configuration file parameters to determine the appropriate management mode.

### **ReportLocation (Setting Up an Installation Report Title and Location)**

The automatically generated file name for reports is

```
"report_ mm-dd-yy.txt"
```

where 'mm' is the month *number*, 'dd' is the day, and 'yy' indicates the year.

You can only change the installation report folder; the file name is auto-generated. In the following example x could be any available drive:

```
ReportLocation = "x:\autopilot\reports\installs\"
```

### **SilentInstallEnable (Enabling Unattended Installation)**

---

**Note:** Setting the SilentInstallEnable parameter to true in the configuration file is functionally equivalent to supplying the "/silent" switch on the command-line. You cannot specify the SilentInstallEnable parameter on the command line.

---

Default: False

Setting this parameter to true causes AutoPilot Installer to operate with no user interaction.

### **SilentRebootEnable (Enabling Silent Reboot)**

Default: False

If Windows must be restarted after a driver is installed, AutoPilot Installer's default behavior in unattended installations is not to restart the system. AutoPilot Installer continues with the installation and you must restart at a later time. Restarts often require you to login as part of the Windows start up process and without logging in, the installation process would hang if it restarted the system. However, Windows can be configured to start up without requiring you to login. You must make sure it is safe to restart the system during unattended installations if you are going to set this parameter to true.

### **InstallWithoutQFE (Enabling Installation if a QFE Check Fails)**

Default: False

AutoPilot Installer checks for Microsoft's Quick Fix Engineering updates (QFEs), also known as KB (Knowledge Base) updates, based upon the checks you have specified in the [STORPORT.QFES] section. By default, the installation will terminate if the QFE check should fail. To enable a driver installation to proceed even if a check for QFEs should fail, set this parameter to true.

## **AutoPilot Configuration File**

---

The AutoPilot Configuration file is organized into sections, grouped according to related commands. There are six main sections. Each section begins with a heading. The heading is required even if there are no settings in the section. The only section not required is the Installation Prompts section, which has the heading [STORPORT.CONFIGURATION]. That section cannot exist if AutoPilot Installer will be run in silent mode. You must delete or comment-out that entire section for unattended installation. The sections and their headings are:

- Configuration Identification [AUTOPILOT.ID] - This section appears at the beginning of every AutoPilot Configuration file. This section contains revision and label information. The revision entry identifies the file's version number and the date on which it was produced. The label entry is used to identify the configuration that the file supports. This section can appear only once in the AutoPilot Configuration file.
- Software Configuration [AUTOPILOT.CONFIG] - This section can contain settings that control and configure AutoPilot Installer and the OneCommand Manager application operation. This section can appear only once in the AutoPilot Configuration file.
- Installation Prompts [STORPORT.CONFIGURATION] - This section can contain questions that must be answered during the initial installation process. This section applies to attended installations only, this section must not be present in configuration files to be used with unattended installations.
- Driver Parameters [STORPORT.PARAMS] - This section can specify driver parameters. Parameters are read exactly as they are entered and are written to the registry.
- System Parameters [SYSTEM.PARAMS] - This section can adjust the operating system's global disk timeout. The timeout is stored in the registry under the key HKML\CurrentControlSet\Services\disk and specified with the following string: TimeOutValue = 0x3C (where the number is the timeout value in seconds.)
- Additional Quick Fix Engineering (QFE) Checks [STORPORT.QFES] - This section can specify additional QFE check, also known as KB (Knowledge Base) updates, during installation. This section can appear anywhere within the file as long as it is not contained within another section.

Lines that begin with a semicolon are comments. Some of the comments are sample settings. To use the setting, remove the semicolon.

### Using the Windows Environment Variable (%ProgramFiles%)

You can use the Windows ProgramFiles environment variable in the LocalDriverLocation and ReportLocation strings within the configuration file. This allows you to specify strings in a driver independent manner, allowing the same configuration file to be used on different systems where Windows may have been installed on different drives. To use this option, "%ProgramFiles%" must be the first component specified in the string. The portion of the string that follows will be appended to the contents of the ProgramFiles environment variable.

---

**Note:** The contents of the ProgramFiles environment variable is not terminated with a slash, so one must be provided in the string. Windows environment variables are not case-sensitive.

---

```
ReportLocation = "%ProgramFiles%\my company\reports"
```

### Configuration Identification [AUTOPILOT.ID]

This section contains revision and label information. The revision entry identifies the file's version number and the date on which it was produced. The label entry is used to identify the configuration that the file supports. This section may appear only once in the APInstall.cfg file.

### Software Configuration [AUTOPILOT.CONFIG]

The settings in this section affect the operation of AutoPilot Installer during installation. See "Software Configuration Parameters" on page 11 for information about settings that may be specified in this section.

## Configuration Prompts/Vendor-Specific Questions [STORPORT.CONFIGURATION]

---

**Note:** You must remove or comment out the entire [STORPORT.CONFIGURATION] section for an unattended installation.

---

A [STORPORT.CONFIGURATION] section may exist in the AutoPilot Configuration file. The first items in this section are the driver parameters to be used regardless of how the questions are answered. This is followed by a subsection that contains questions (these may be vendor-specific questions). A line containing '[QUESTIONS]' marks the start of the subsection, and the end of it is marked by a line containing '[ENDQUESTIONS]'. Within the question subsection there can be as many questions as needed. Each question uses the format:

```
question= "question?", "explanation", "answer0", "answer1", "answer2",.... ,  
"answern"
```

Where:

"*question?*" contains the text of the question to be asked.

"*explanation*" contains brief text to help explain the question. The explanation will appear below the question in a smaller font. If there is no explanatory text, empty quotes must be used in its place.

"*answer0*" contains the 1st answer to be displayed in the drop down list.

"*answer1*" contains the 2nd answer to be displayed in the drop down list.

"*answern*" contains the *n*th answer to be displayed in the drop down list.

For each question there can be as many answers as needed. For each answer there must be a corresponding "answer =" section with its corresponding driver parameters listed beneath it. The answer uses the format:

```
answer = 0  
    DriverParameter="Param1=value; Param2=value;"  
answer = 1  
    DriverParameter="Param1=value; Param2=value;"  
....  
answer = n  
    DriverParameter="Param1=value; Param2=value;"
```

Example of [STORPORT.CONFIGURATION] section:

```
[STORPORT.CONFIGURATION]  
;The first section contains the driver parameters common to all  
configurations, no matter what answers are given.  
DriverParameter="EmulexOption=0;"  
[QUESTIONS]  
question = "What is your link speed?", "Note: select 'Auto-detect' if you  
are unsure about the answer.", "4GB", "2GB", "1GB", "Auto-detect"  
ANSWER = 0  
    DriverParameter = "LinkSpeed=4;" ;4 GB  
ANSWER = 1  
    DriverParameter = "LinkSpeed=2;" ;2 GB  
ANSWER = 2  
    DriverParameter = "LinkSpeed=1;" ;1 GB
```

```

ANSWER = 3
    DriverParameter = "LinkSpeed=0;" ;Auto-detect
question = "Describe the topology of your storage network.", "Note:
Select 'Arbitrated Loop' when directly connected to the array (no fibre
switch). Select 'Point-to-Point' when connected to a SAN (fibre switch).",
"Arbitrated Loop", "Point-to-Point"
ANSWER = 0
    DriverParameter = "Topology=2;"
ANSWER = 1
    DriverParameter = "Topology=3;"
[ENDQUESTIONS]
[END.STORPORT.CONFIGURATION]

```

## QFE Checks [STORPORT.QFES]

To add a Windows Quick-Fix Engineering (QFE) check to the configuration file, edit the [STORPORT.QFES] section in the AutoPilot Configuration file. You may place this section anywhere within the file as long as it is not contained within another section. This section contains a single line for each QFE that is to be checked. Up to 10 lines will be checked, more than that may exist but they will be ignored. All parameters in each line must be specified. These lines have the format

```
qfe = "qfe name", "path and file name", "file version", "applicable OS"
```

qfe name - The name of the item being checked. For example, QFE 838896. The name should facilitate searching Microsoft's Web site for any required code updates.

path and file name - This string identifies the file to be checked and its location relative to the Windows home folder. In most cases, the file to check will be the Microsoft Storport driver, for example, "\system32\drivers\storport.sys". This string is also used in dialogs and log file messages.

file version - This is the minimum version that the file to be checked must have for the QFE to be considered installed. It is specified as a text string using the same format as is used when displaying the files property sheet. For example, "5.2.1390.176".

applicable OS - This is used to determine if the QFE applies to the operating system platform present. The acceptable values are "Win2003" and "Win2008".

Example

```

[STORPORT.QFES]
qfe = "QFE 83896", "\system32\drivers\storport.sys", "5.2.1390.176", "Win2003"

```

## Setting Up FC Driver Parameters [STORPORT.PARAMS]

To change driver parameters, modify this section of the AutoPilot Configuration file. Locate the [STORPORT.PARAMS] section in the AutoPilot Configuration file. This section follows Optional Configuration File Changes. Under the [STORPORT.PARAMS] heading, list the driver parameters and new values for the driver to use.

For example:

```
Driver Parameter = "LinkTimeout = 45"
```

See the *OneCommand Manager application version 5.1 User Manual* for a listing of driver parameters, defaults and valid values.

## Setting Up System Parameters [SYSTEM.PARAMS]

To change the system parameters, create a [SYSTEM.PARAMS] section in the APInstall.cfg file. Create this section in the Optional Configuration File Changes heading in the [AUTOPILOT.CONFIG] section of the AutoPilot Configuration file.

## AutoPilot Installer Exit Codes

AutoPilot Installer sets an exit code to indicate whether an installation was successful or an error occurred. These exit codes allow AutoPilot Installer to be used in scripts with error handling. In unattended installations, AutoPilot Installer sets the following exit codes:

**Table 1: Unattended Installation Error Codes**

Error Code	Hex	Description
0	0x00000000	No errors
2399141889	0x8F000001	Unsupported operating system detected.
2399141890	0x8F000002	The AutoPilot Configuration file is not found.
2399141891	0x8F000003	Disabled adapters detected in the system.
2399141892	0x8F000004	The selected driver is 64-bit and this system is 32-bit.
2399141893	0x8F000005	The selected driver is 32-bit and this system is 64-bit.
2399141894	0x8F000006	Installation activity is pending. AutoPilot Installer cannot run until it is resolved.
2399141895	0x8F000007	(GUI Mode only) User cancelled execution because user did not wish to perform a software-first install.
2399141896	0x8F000008	No drivers found.
2399141897	0x8F000009	One or more adapters failed diagnostics.
2399141904	0x8F000010	(GUI Mode only) User chose to install drivers even though a recommended QFE or Service Pack was not installed.
2399141920	0x8F000020	(GUI Mode only) User chose to stop installation because a recommended QFE or Service Pack was not installed.
2399141899	0x8F00000B	Unattended installation did not find any drivers of the type specified in the config file.
2399141900	0x8F00000C	A silent reboot was attempted, but according to the operating system a reboot is not possible.
2399141901	0x8F00000D	(GUI Mode only) A driver package download was cancelled.
2399141902	0x8F00000E	(Non-Enterprise) No adapters were found in the system.
2399141903	0x8F00000F	A required QFE or Service Pack was not detected on the system.
2399141836	0x8F000030	AutoPilot Installer was not invoked from an account with Administrator-level privileges.
2391419952	0x8F000040	AutoPilot Installer has detected unsupported adapters on the system.
2399141968	0x8F000050	Unattended software-first installations are disallowed.
2399141984	0x8F000060	User cancelled APInstall before any driver/utility installation occurred.
2399142000	0x8F000070	User cancelled APInstall after driver/utility installation occurred.
2399142032	0x8F000090	APInstaller encountered an error while parsing the command line (Report file contains details).
2399142048	0x8F0000A0	NIC or iSCSI adapters are installed, but are not supported on IA64 systems.

## AutoPilot Installer Installation Reports

During each installation, AutoPilot Installer produces a report describing events that occurred during the installation. This report has several sections.

The first section provides basic information including the time and date of the installation, the name of the machine that the installation was performed on, the version number of AutoPilot Installer, and the identification of the configuration file that was used.

The second section provides an inventory of the Emulex adapters as they were before AutoPilot Installer performed any actions.

The third section lists the tasks that AutoPilot will perform in the order they will be done.

The fourth section records the results of each task. When all driver installation tasks are completed, an updated adapter inventory is recorded.

---

**Note:** If you cancel AutoPilot Installer, that information is recorded along with when you cancelled the installation. The contents of any error dialogs that are displayed are also recorded.

---

## Command Script Example

Modifying the configuration file enables you to script the installation of a system's driver. The following example command script (batch file) assumes that you have made mandatory changes to the AutoPilot Configuration file, as well as any desired optional changes.

If your systems were set up with a service that supports remote execution, then you can create a command script to remotely update drivers for all of the systems on the storage net. If Microsoft's RCMD service was installed, for example, a script similar to the following would run remote execution:

```
rcmd \\server1 g:\autopilot\x86_full_kit\apinstall
if errorlevel 1 goto serverlok
echo AutoPilot reported an error upgrading Server 1.
if not errorlevel 2147483650 goto unsupported
    echo Configuration file missing.
goto serverlok
:unsupported
if not errorlevel 2147483649 goto older
echo Unsupported operating system detected.
:older
if not errorlevel 2001 goto none
    echo The driver found is the same or older than the existing driver.
    goto serverlok
:none
if not errorlevel 1248 goto noreport
    echo No Emulex adapter found.
goto serverlok
:noreport
    if not errorlevel 110 goto nocfg
        echo Could not open installation report file.
    goto serverlok
:nocfg
    if not errorlevel 87 goto badcfg
```

```
    echo Invalid configuration file parameters.
    goto serverlok
:badcfg
    if not errorlevel 2 goto serverlok
    echo No appropriate driver found.
serverlok
rcmd \\server2 g:\autopilot\ApInstall
ConfigFileLocation=g:\autopilot\mysetup\apinstall.cfg
if errorlevel 1 goto server2ok
echo AutoPilot reported an error upgrading Server 2.
if not errorlevel 2147483650 goto unsupported
    echo Configuration file missing.
goto server2ok
:unsupported
if not errorlevel 2147483649 goto older
    echo Unsupported operating system detected.
:older2
if not errorlevel 2001 goto none2
    echo The driver found is the same or older than the existing driver.
    goto server2ok
:none2
if not errorlevel 1248 goto noreport2
    echo No adapter found.
goto server2ok
:noreport
if not errorlevel 110 goto nocfg2
    echo Could not open installation report file.
goto server2ok
:nocfg2
if not errorlevel 87 goto badcfg2
    echo Invalid configuration file parameters.
    goto server2ok
:badcfg2
    if not errorlevel 2 goto server2ok
    echo No appropriate driver found.
server2ok
```

# Manual Installation and Updating Procedures

## Manually Installing or Updating the Emulex Protocol Drivers

---

### Overview

You can install or update the Emulex protocol drivers and utilities manually without using AutoPilot Installer.

The Emulex PLUS (ElxPlus) driver supports the OneCommand Manager application, persistent binding and LUN mapping and masking. The ElxPlus driver must be installed before you install the Emulex protocol drivers.

### Removing the Adjunct Driver Registry Key

The ElxPlus driver replaces the adjunct driver that was used with Storport Miniport 1.11a3 or earlier. If currently installed, the adjunct driver registry key must be removed using the deladjct.reg file before you install the ElxPlus driver. The deladjct.reg file was extracted when you installed the old driver.

### Installing the Emulex PLUS (ElxPlus) Driver for the First Time

To install the ElxPlus driver from the desktop:

---

**Note:** Only one instance of the Emulex PLUS driver should be installed, even if you have multiple adapter ports installed in your system.

---

1. Run the driver kit installer, but do not run AutoPilot Installer. See “Running a Software Installation Interactively” on page 6 for instructions on how to do this.
2. Select **Start>Settings>Control Panel>Add Hardware**. The Add Hardware Wizard window appears. Click **Next**.
3. Select **Yes, I have already connected the hardware** and click **Next**.
4. Select, **Add a new hardware device** and click **Next**.
5. Select **Install the hardware that I manually select from a list (Advanced)** and click **Next**.
6. Select **Show All Devices** and click **Next**.
7. Click **Have Disk....** Direct the Device Wizard to the location of elxplus.inf. If you have installed the driver installer kit in the default folder and C:\ is your Windows system drive, the path is:
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x86\HBA for the 32-bit driver versionor
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x64\HBA for the x64 driver versionor
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\IA64\HBA for the Itanium driver version
8. Click **OK**.
9. Select **Emulex PLUS**. Click **Next** and click **Next** again to install the driver.
10. Click **Finish**. The initial ElxPlus driver installation is complete. Continue with manual installation of the Storport Miniport Driver. See “Installing or Updating the FC Storport Miniport Driver” on page 21 for this procedure.

## Updating the Emulex PLUS (ElxPlus) Driver

To update an existing ElxPlus driver from the desktop:

---

**Note:** Only one instance of the Emulex PLUS driver should be installed, even if you have multiple adapter ports installed in your system.

---

1. Run the driver kit installer, but do not run AutoPilot Installer. See “Running a Software Installation Interactively” on page 6 for instructions on how to do this.
2. Select **Start>Settings>Control Panel>Administrative Tools>Computer Management**.
3. Click **Device Manager** (left pane).
4. Click the plus sign (+) next to the Emulex PLUS class (right pane) to show the ElxPlus driver entry.
5. Right-click the ElxPlus driver entry and select **Update Driver...** from the menu.
6. Select **No, not this time**. Click **Next** on the **Welcome to the Hardware Update Wizard** window. Click **Next**.
7. Select **Install from a list or specific location (Advanced)** and click **Next**.
8. Select **Don't Search. I will choose the driver to install**.
9. Click **Have Disk...** Direct the Device Wizard to the location of driver's distribution kit. If you have installed the driver installer kit in the default folder, the path is:
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x86 for the 32-bit driver version  
or
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x64 for the x64 driver version  
or
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\IA64 for the Itanium driver version
10. Click **OK**. Select **Emulex PLUS**.
11. Click **Next** to install the driver.
12. Click **Finish**. The ElxPlus driver update is complete. Continue with manual installation of the Storport Miniport Driver.

## Installing or Updating the FC Storport Miniport Driver

To update or install the FC Storport Miniport driver from the desktop:

1. Select **Start>Settings>Control Panel>System**.
2. Select the **Hardware** tab.
3. Click **Device Manager**.
4. Open the “SCSI and RAID Controllers” item.
5. Double-click the desired Emulex adapter.

---

**Note:** The driver will affect only the selected adapter. If there are other adapters in the system, you must repeat this process for each adapter. All DC adapter models will be displayed in Device Manager as two adapters, therefore each adapter must be updated.

---

6. Select the **Driver** tab.
7. Click **Update Driver**. The Update Driver wizard starts.
8. Select **No, not this time**. Click **Next** on the Welcome to the Hardware Update Wizard window.

9. Select **Install from a list or specific location (Advanced)** and click **Next**.
10. Select **Don't search. I will choose the driver to install** and click **Next**.

---

**Note:** Using the OEMSETUP.INF file to update Emulex's FC Storport Miniport driver overwrites customized driver settings. If you are upgrading from a previous installation, write down the settings. Following installation, use the OneCommand Manager application to restore the pre-upgrade settings.

---

11. Click **Have Disk....** Direct the Device Wizard to the location of oemsetup.inf. If you have installed the driver installer kit to the default folder, the path is:
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x86\HBA for the 32-bit driver versionor
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x64\HBA for the x64 driver versionor
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\IA64\HBA for the Itanium driver version
12. Click **OK**. Select **Emulex LightPulse LPX000, PCI Slot X, Storport Miniport Driver** (your adapter model will be displayed here).
13. Click **Next**.
14. Click **Finish**.

The driver installation is complete. The driver should start automatically. If the adapter is connected to a SAN or data storage device, a blinking yellow light on the back of the adapter will indicate a link up condition.

## Installing or Updating the iSCSI Driver

To update or install the iSCSI driver from the desktop:

1. Select **Start>Settings>Control Panel>System**.
2. Select the **Hardware** tab.
3. Click **Device Manager**.
4. Open the "SCSI and RAID Controllers" item.
5. Double-click the desired Emulex adapter.
6. Select the **Driver** tab.
7. Click **Update Driver**. The Update Driver wizard starts.
8. Select **No, not this time**. Click **Next** on the Welcome to the Hardware Update Wizard window.

---

**Note:** The driver will affect only the selected adapter. If there are other adapters in the system, you must repeat this process for each adapter. All DC adapter models will be displayed in Device Manager as two adapters, therefore each adapter must be updated.

---

9. Select **Install from a list or specific location (Advanced)** and click **Next**.
10. Select **Don't search. I will choose the driver to install** and click **Next**.
11. Click **Have Disk....** Direct the Device Wizard to the location of oemsetup.inf. If you have installed the driver installer kit to the default folder, the path is:
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x86\iSCSI\[Windows Version] for the 32-bit driver version

or

- C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x64\iSCSI\[Windows Version] for the x64 driver version

or

- C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\IA64\iSCSI\[Windows Version] for the Itanium driver version

12. Click **OK**. Select **Emulex OneConnect OCmXXXXX, iSCSI Initiator** (your adapter model will be displayed here).
13. Click **Next**.
14. Click **Finish**.

The driver installation is complete. The driver should start automatically.

## Installing or Updating the NIC Driver

---

**Note:** Although TOE is supported, it is turned off by default.

---

To update or install the NIC driver from the desktop:

1. Select **Start>Settings>Control Panel>System**.
2. Select the **Hardware** tab.
3. Click **Device Manager**.
4. Open the "Network Adapters" item.
5. Double-click the desired Emulex adapter.
6. Select the **Driver** tab.
7. Click **Update Driver**. The Update Driver wizard starts.
8. Select **No, not this time**. Click **Next** on the Welcome to the Hardware Update Wizard window.

---

**Note:** The driver will affect only the selected adapter. If there are other adapters in the system, you must repeat this process for each adapter. All DC adapter models are displayed in the Device Manager as two adapters, therefore each adapter must be updated.

---

9. Select **Install from a list or specific location (Advanced)** and click **Next**.
10. Select **Don't search. I will choose the driver to install** and click **Next**.
11. Click **Have Disk...** Direct the Device Wizard to the location of oemsetup.inf. If you have installed the driver installer kit to the default folder, the path is:
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\NDIS\x86\NIC\[Windows Version] for the 32-bit driver versionor
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\NDIS\x64\NIC\[Windows Version] for the x64 driver versionor
  - C:\Program Files\Emulex\AutoPilot Installer\Drivers\NDIS\IA64\NIC\[Windows Version] for the Itanium driver version
12. Click **OK**. Select **Emulex OneConnect OCeXXXXX, NIC/TOE** (your adapter model will be displayed here).
13. Click **Next**.

14. Click **Finish**.

The driver installation is complete. The driver should start automatically.

## Uninstallation

### Uninstalling the AutoPilot Installer

---

To uninstall AutoPilot Installer on a Windows Server 2003 system:

1. Open the **Add or Remove Programs** control panel.
2. Select **Emulex iSCSI Driver kit-2.103.160.01** in the program list and click **Remove**.
3. Click **Yes**. The application is removed from the system. Click **OK**.

To uninstall AutoPilot Installer on a Windows Server 2008 system:

1. Open the **Programs and Features** control panel.
2. Select **Emulex iSCSI Driver kit-2.103.160.01** in the program list and click the **Uninstall** icon in the tool bar above the program list. If you have User Access Control enabled, click **Continue** when asked for permission.
3. Click **Yes**. The application is removed from the system. Click **OK**.

To uninstall AutoPilot Installer on a Server Core system:

1. cd to the "Program Files" folder on an x86 system or the "Program Files (x86)" folder on a 64-bit system.
2. cd to "Emulex\AutoPilot Installer".
3. Run "uninstall\_elx\_core\_kit.bat". The installer files are removed from the system.

On all platforms, the reports folder in the "Emulex\AutoPilot Installer" folder is not removed, so you can still view installation history and see which drivers have been installed on the system. You may delete the reports folder at any time if you want.

### Uninstalling the Emulex Drivers

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The Emulex Storport Miniport and PLUS (ElxPlus) drivers are uninstalled using the Device Manager.

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**Note:** On Windows 2008, after the message: "Warning - you are about to uninstall this device from your system", is displayed. You will need to select the checkbox "Delete the software for this device" in order to uninstall the driver.

---

To uninstall the Emulex Storport Miniport driver:

1. Select **Start>All Programs>Administrative Tools>Computer Management**.
2. Click **Device Manager**.
3. Double-click the adapter from which you want to remove the Storport Miniport driver. A device-specific console window is displayed. Select the **Driver** tab.
4. Click **Uninstall** and click **OK** to uninstall.

To uninstall the ElxPlus driver (uninstall the ElxPlus driver only if all adapters and installations of Emulex miniport drivers are uninstalled):

After running Device Manager (steps 1 and 2 above):

1. Click the plus sign (+) next to the Emulex PLUS driver class.
2. Right-click the Emulex driver and click **Uninstall**.

3. Click **OK** in the Confirm Device Removal window.

To uninstall or update an earlier version of the Storport Miniport driver (prior to version 1.20), you must remove the registry settings for the adjunct driver prior to manually installing a new driver.

To remove the adjunct driver registry settings:

1. Browse to the Storport Miniport driver version 1.20 (or later) driver kit that you downloaded and extracted.
2. Double-click on the deladjct.reg file. A Registry Editor window appears to confirm that you want to execute deladjct.reg.
3. Click **Yes**. The elxadjct key is removed from the registry.

## Driver Parameters for Windows

The parameter values listed in Table 2 are applicable to Storport Miniport driver versions 2.40.005 or later. If you are using a version previous to 2.40.005, see the Storport Miniport Driver User Manual for that version's parameter information.

### Activation Requirements

A parameter has one of the following activation requirements:

- Dynamic - The change takes effect while the system is running.
- Reset - Requires an adapter 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.

The Driver Parameter table provides information such as the allowable range of values and factory defaults. Parameters can be entered in decimal or hexadecimal format.

---

**Note:** If you are creating custom unattended installation scripts, any driver parameter can be modified and included in the script.

---



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**Note:** If the Adapter/Protocol is blank it indicates that the parameter is supported on both Lightpulse as well as OneConnect adapters. "Lightpulse only" indicates parameters supported only on Lightpulse and not on OneConnect adapters. "FC only" indicates parameters supported on non-Lightpulse FC adapters.

---

Most parameters default to a setting that optimizes adapter performance.

**Table 2: Storport Miniport Driver Parameters**

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
AutoMap=n	<p>AutoMap controls the way targets are assigned SCSI IDs. Discovered targets are assigned persistent SCSI IDs according to the selected binding method. Persistent bindings do not take effect with the driver in stand-alone mode.</p> <p>If set to 0 = automap is disabled. Uses the HBAnyware utility to persistently set the SCSI address of a discovered FCP capable FC node (target).</p> <p>If set to 1 = automap by WWNN.</p> <p>If set to 2 = automap by WWPN.</p> <p>If set to 3 = automap by DID</p> <p>Value: 0 - 3 Default = 2</p>	Reboot	

**Table 2: Storport Miniport Driver Parameters (Continued)**

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
Class= <b>n</b>	<p>Class selects the class of service on FCP commands.</p> <p>If set to 2, class = 2.</p> <p>If set to 3, class = 3.</p> <p>Value: 2 - 3</p> <p>Default = 3</p>	Dynamic	FC only
CoalesceMsCnt= <b>n</b>	<p>CoalesceMsCn specifies wait time in milliseconds to generate an interrupt response if CoalesceRspCnt has not been satisfied. Zero specifies an immediate interrupt response notification. A non-zero value enables response coalescing at the specified interval in milliseconds.</p> <p>Value: 0 - 63 (decimal) or 0x0 - 0x3F (hex)</p> <p>Default = 0 (0x0)</p>	Reset	Lightpulse only
CoalesceRspCnt= <b>n</b>	<p>CoalesceRspCn specifies the number of response entries that trigger an Interrupt response.</p> <p>Value: 0 - 255 (decimal) or 0x1 - 0xFF (hex)</p> <p>Default = 8 (0x8)</p>	Reset	Lightpulse only
DiscoveryDelay= <b>n</b>	<p>DiscoveryDelay controls whether the driver waits for 'n' seconds to start port discovery after link up.</p> <p>If set to 0 = immediate discovery after link up.</p> <p>If set to 1 or 2 = the number of seconds to wait after link-up before starting port discovery.</p> <p>Value: 0 - 2 seconds (decimal)</p> <p>Default = 0.</p>	Dynamic	
DriverTraceMask	<p>The DriverTraceMask feature is only available on OS that supports extended system event logging. The value of 0 = Disabled this feature, 1 = Error events logging, 4 = Warning events logging and 8 = Informational events logging. The values can be masked to generate multi-levels of events logging.</p> <p>Values: 0, 1, 4 and 8.</p> <p>Default =0.</p>	Dynamic	

**Table 2: Storport Miniport Driver Parameters (Continued)**

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
EnableAck0=n	<p>Set to 1 to force sequence rather than frame level acknowledgement for class 2 traffic over an exchange. This applies to FCP data exchanges on IREAD and IWRITE commands.</p> <p>Value: 0 - 1 (decimal) Default = 1</p>	Reset	FC only
EnableAUTH	<p>EnableAUTH enables fabric authentication. This feature requires the authentication to be supported by the fabric. Authentication is enabled when this value is set to 1.</p> <p>Value: 0 - 1 Default = 0</p>	Reboot	
EnableFDMI=n	<p>If set to 1, enables management server login on fabric discovery. This allows Fabric-Device Management Interface (FDMI) to operate on switches that have FDMI-capable firmware. If set to 2, FDMI operates and uses the host name feature of FDMI.</p> <p>Value: 0 -2 (decimal) Default = 0</p>	Reset	
EnableNPIV=n	<p>If set to 1, enables N_Port_ID virtualization (NPIV). Requires NPIV supported firmware for the adapter.</p> <p>Value: 0 -1 Default = 0 (disabled)</p> <p><b>Note:</b> To run the driver using NPIV or SLI-3 optimization, the firmware must be version 2.72a0 or later. If an earlier version is used, the driver runs in SLI-2 mode and does not support NPIV.</p> <p><b>Note:</b> NPIV is not available on 1Gb/s and 2 Gb/s adapters.</p>	Reboot	
ExtTransferSize	<p>ExtTransferSize is an initialization-time parameter that affects the maximum SGL that the driver can handle, which determines the maximum I/O size that a port will support. At the default of 0, the maximum transfer size is 512KB. With a value of 1, the maximum transfer size is 1MB. With a value of 2, the maximum transfer size is 2MB.</p> <p>Value: 0 - 2 Default = 0 (disabled)</p>		Lightpulse only

**Table 2: Storport Miniport Driver Parameters (Continued)**

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
FrameSizeMSB= <b>n</b>	<p>FrameSizeMSB controls the upper byte of receive FrameSize if issued in PLOGI. This allows the FrameSize to be constrained on 256-byte increments from 256 (1) to 2048 (8).</p> <p>Value: 0 - 8 Default = 0</p>	Reset	
InitTimeout= <b>n</b>	<p>Determines the number of time-out seconds during driver initialization for the link to come up. If the link fails to come up by InitTimeout, driver initialization exits but is still successful. If the link comes up before InitTimeout, the driver sets double the amount for discovery to complete.</p> <p>Value: 5 -30 seconds or 0x5 - 0x1E (hex) Default = 15 seconds (0xF)</p>	Reboot	
LimTransferSize	<p>Limits maximum transfer size when non-zero to selectable values.</p> <p>Values: 0 = Port Default 1 = 64Kb 2 = 128 Kb 3 = 256Kb</p>	Reboot	
LinkSpeed= <b>n</b>	<p>LinkSpeed has significance only if the adapter supports speeds other than one Gb/s.</p> <p>Value: Auto-select, 1 Gb/s, 2 Gb/s, 4 Gb/s, 8 Gb/s Default = Auto-select</p> <p><b>Note:</b> Setting this option incorrectly can cause the adapter to fail to initialize.</p>	Reset	FC only
LinkTimeOut= <b>n</b>	<p>LinkTimeOut applies to a private loop only. A timer is started on all mapped targets using the link timeout value. If the timer expires before discovery is re-resolved, commands issued to timed out devices returns a SELECTION_TIMEOUT. The Storport driver is notified of a Bus change event which leads to the removal of all LUNs on the timed out devices.</p> <p>Value: 1 - 500 seconds or 0x0 - 0xFE (hex) Default = 30 (0x1E)</p>	Dynamic	

**Table 2: Storport Miniport Driver Parameters (Continued)**

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
LogErrors= <b>n</b>	<p>LogErrors determine the minimum severity level required to enable entry of a logged error into the system event log. Errors are classified as severe, malfunction or command level. A severe error requires user intervention to correct a firmware or adapter problem. An invalid link speed selection is an example of a severe error. A malfunction error indicates that the system has problems, but user intervention is not required. An invalid fabric command type is an example of a malfunction error. A command level error: an object allocation failure is an example of a command error.</p> <p>If set to 0, all errors are logged.            If set to 1, command level errors are logged.            If set to 2, malfunction errors are logged.            If set to 3, severe errors are logged.</p> <p>Value: 0 - 3            Default = 3</p>	Dynamic	
NodeTimeout= <b>n</b>	<p>The node timer starts when a node (i.e. discovered target or initiator) becomes unavailable. If the node fails to become available before the NodeTimeout interval expires, the OS is notified so that any associated devices (if the node is a target) can be removed. If the node becomes available before NodeTimeout expires the timer is canceled and no notification is made.</p> <p>Value: 1 - 255 seconds or 0x0 - 0xFF (hex)            Default = 30 (0x1E)</p>	Dynamic	
QueueDepth= <b>n</b>	<p>QueueDepth requests per LUN/target (see QueueTarget parameter). If you expect the number of outstanding I/Os per device to exceed 32, then you must increase to a value greater than the number of expected I/Os per device (up to a value of 254). If the QueueDepth value is set too low, a performance degradation can occur due to driver throttling of its device queue.</p> <p>Value: 1 - 254 or 0x1 - 0xFE (hex)            Default = 32 (0x20)</p>	Dynamic	

**Table 2: Storport Miniport Driver Parameters (Continued)**

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
QueueTarget= <b>n</b>	<p>QueueTarget controls I/O depth limiting on a per target or per LUN basis.</p> <p>If set to 0 = depth limitation is applied to individual LUNs.            If set to 1 = depth limitation is applied across the entire target.</p> <p>Value: 0 -1 or 0x0 - 0x1 (hex)            Default = 0 (0x0)</p>	Dynamic	
RmaDepth= <b>n</b>	<p>RmaDepth sets the remote management buffer queue depth. The greater the depth, the more concurrent management controls can be handled by the local node.</p> <p>Value: 8 - 64, or 0x8 - 0x40 (hex)            Default = 16 (0x10)</p> <p><b>Note:</b> The RmaDepth driver parameter pertains to the functionality of the HBAnyware utility.</p>	Reboot	
ScanDown= <b>n</b>	<p>If set to 0 = lowest AL_PA = lowest physical disk (ascending AL_PA order).            If set to 1 = highest AL_PA = lowest physical disk (ascending SEL_ID order).</p> <p>Value: 0 - 1            Default = 1</p> <p><b>Note:</b> This option applies to private loop only in DID mode.</p>	Reboot	FC only
SLIMode= <b>n</b>	<p>If set to 0 = autoselect firmware, use the newest firmware installed.            If set to 2 = implies running the adapter firmware in SLI-2 mode.            If set to 3 = implies running the adapter firmware in SLI-3 mode.</p> <p>Value: 0, 2 and 3            Default = 0</p>	Reboot	Lightpulse only

**Table 2: Storport Miniport Driver Parameters (Continued)**

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
Topology= <b>n</b>	<p>Topology values can be 0 to 3.            If set to 0 (0x0) = FC Arbitrated Loop (FC-AL).            If set to 1 (0x1) = PT-PT fabric.            If set to 2 (0x2) = *FC-AL first, then attempt PT-PT.            If set to 3 (0x3) = *PT-PT fabric first, then attempt FC-AL.</p> <p>* Topology fail-over requires v3.20 firmware or higher. If firmware does not support topology fail-over, options 0,2 and 1,3 are analogous.</p> <p>Value: 0 - 3            Default = 2 (0x2)</p>	Reset	FC only
TraceBufSiz= <b>n</b>	<p>TraceBufSiz sets the size in bytes for the internal driver trace buffer. The internal driver trace buffer acts as an internal log of the driver's activity.</p> <p>Value: 250,000 - 2,000,000 or 0x3D090 - 0x1E8480 (hex).            Default = 250,000 (0x3D090)</p>	Reboot	
ConfigScale	<p>ConfigScale sets the memory footprint profile in accord with the anticipated use case on a per-port basis. The default value of 1 is considered to be the typical use case.</p> <p>For all values except 0, up to 1024 targets can be discovered and mapped. For a value of 0, only 128 targets can be discovered and mapped. On a OneConnect adapter, a value of 0 limits max XRIs to 512. On a OneConnect adapter, a value of 1 limits max transfer size to 512 Kb, a value of 2 limits max transfer size to 2Mb-4K. ConfigScale supersedes ExtTransferSize for OneConnect adapters. Use ConfigScale = 0 to minimize the driver's per-port memory foot print on any adapter model. Use ConfigScale = 2 if connecting to tape devices on a OneConnect port. Use ConfigScale = 3 if running performance benchmarks in a non-production environment.</p> <p>Values: 0, 1, 2 and 3            Default = 1</p>		

**Table 2: Storport Miniport Driver Parameters (Continued)**

<b>Parameter</b>	<b>Definitions</b>	<b>Activation Requirement</b>	<b>Adapter/ Protocol</b>
SrbTimeout	<p>SrbTimeout limits the SRB timeout value to 60 seconds when set to 1: Enabled. This is a non-displayed parameter where it has to be set manually into the registry. This option alters the I/O timeout behavior where an I/O will be returned in a max timeout of 60 seconds on some long I/O timeout.</p> <p>Values: 0, 1 Default = 0</p>		

# Driver Configuration

## FC/FCoE Driver Configuration

The Emulex Storport Miniport driver has many options that you can modify to provide for different behavior. You can set Storport Miniport driver parameters using the OneCommand Manager application. Refer the *OneCommand Manager application version 5.1 User Manual* for information on using this utility to configure the driver.

## iSCSI and NIC Driver Configuration

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**Note:** Although TOE is supported, it is turned off by default.

---

### Windows Server NIC/TOE Driver Parameters

The Windows Server NIC/ TOE drivers support driver options through the Advanced Property page in Windows Device Manager.

#### Modifying Advanced Properties

Modify the Advanced Properties for the driver for Windows with the Windows Device Manager. For more information on advanced properties, see “Network Driver Performance Tuning” on page 40.

To modify the Advanced Properties:

1. Enter the Windows Device Manager by:
  - Clicking **Start> Control Panel>System** and click the **Device Manager** hyperlink,
  - or
  - Clicking **Start>Run**, then type `devmgmt.msc` and click **OK**.

The Windows Device Manager is displayed.

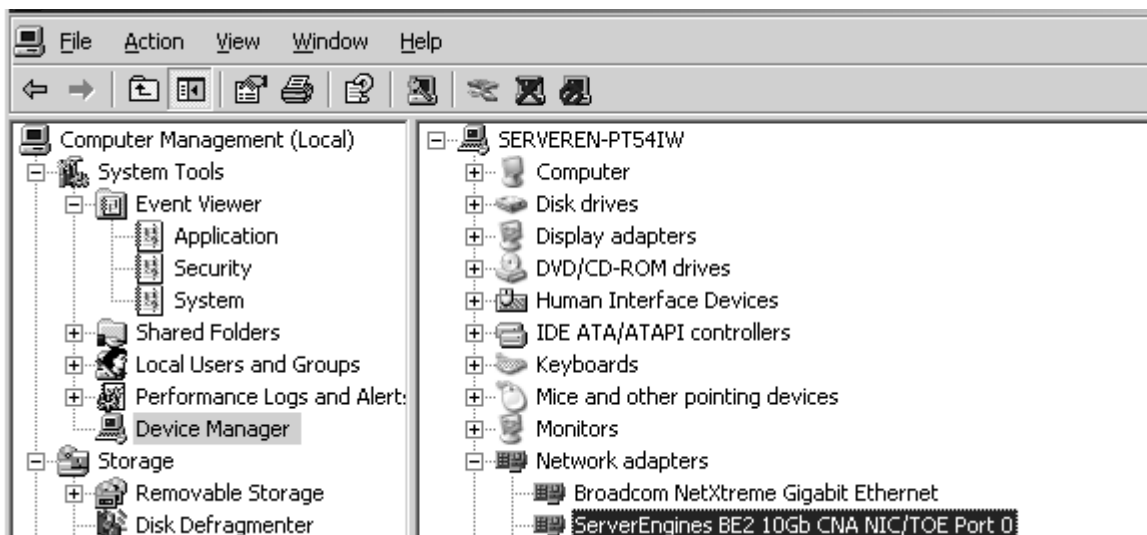


Figure 2: Partial View of Windows Device Manager

2. Right click the network adapter for which you wish to modify advanced properties.

3. Click **Properties**, then click the **Advanced** tab.
4. From the list of properties, click on the Property (parameter) you want to modify, then select the new value of the property by clicking the down arrow on the Value pull-down field.
5. Click **OK**. Figure 3 is an example of the Advanced tab.

---

**Note:** Modifying properties this way causes the network driver to reload and some TCP connections may be temporarily dropped.

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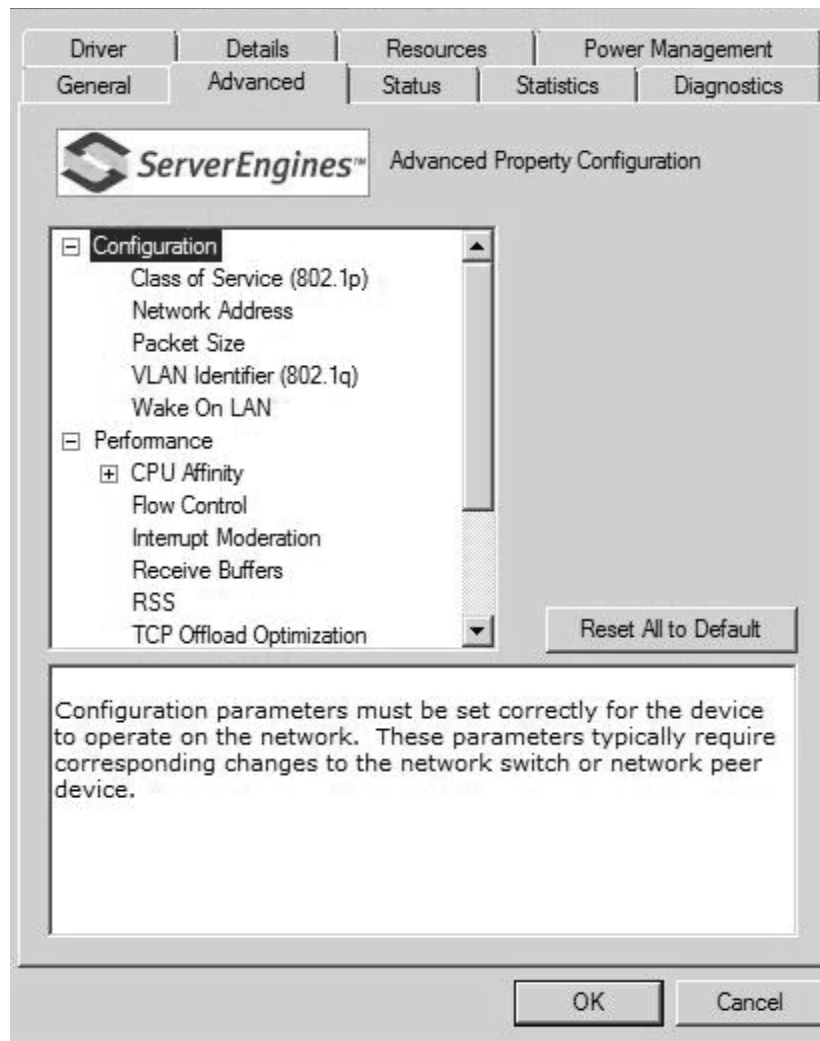


Figure 3: NIC/TOE Advanced Properties in Windows Server 2003 and Windows Server 2008

### Configuring NIC/TOE Driver Options

The Windows Server NIC/ TOE drivers support the following OneConnect configurable driver options through the Advanced Property page in Windows Device Manager. For information on how to configure the options through the Advanced Property page, see “Modifying Advanced Properties” on page 34.

For more information on the options, see “Network Driver Performance Tuning” on page 40.

**Table 3: Windows Server 2003 Driver Options**

Option Name	Default Value	Acceptable Values	Definition
Flow Control	RX and TX Enabled	Disable RX and TX Enabled Rx Enable/Tx Disable Tx Enable/Rx Disable	Flow Control settings.
Interrupt Moderation	Default Adaptive	Aggressive Adaptive Default Adaptive Minimal Adaptive Minimal Static None	Interrupt Moderation settings.
IP Checksum Offload	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	IP Checksum Offload settings.
Large Send Offload v1	Enable	Disable Enable	Enable/Disable for Large Send Offload.
Network Address	None	Valid MAC Address	Locally Administered MAC Address - System Managed. <b>Note:</b> There is no boundary checking for this field. It is the administrator's responsibility to set this field correctly.
Packet Size	1514	1514 9014	Configure packet size for OneConnect NIC only. Limit normal sized frames and one value for jumbo packet.
RSS	Enable	Disable Enable	Disable or enable for RSS Offload. Support for up to 4 RSS queues if enabled.
TCP Checksum Offload (IPv4)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	Enable/disable for TCP Offload.
TCP Connection Offload (IPv4)	Enable	Enable Disable	Enable/disable for TCP Connection Off load.
UDP Checksum Offload (IPv4)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	UDP Offload Checksum settings.

**Table 3: Windows Server 2003 Driver Options (Continued)**

Option Name	Default Value	Acceptable Values	Definition
VLAN Identifier	Not Present	Not Present or a Value from 1 to 4095	VLAN Tagging Enable/Disable - Not Present to disable. Otherwise, the VLAN identifier for the driver to use.

**Table 4: Windows Server 2008 Driver Options**

Option Name	Default Value	Acceptable Values	Definition
Flow Control	RX and TX Enabled	Disable RX and TX Enabled Rx Enable/Tx Disable Tx Enable/Rx Disable	Flow Control settings
Interrupt Moderation	Default Adaptive	Aggressive Adaptive Default Adaptive Minimal Adaptive Minimal Static None	Interrupt Moderation settings.
IP Checksum Offload	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	IP Checksum Offload settings.
Large Send Offload v1	Enable	Disable Enable	Enable/Disable for Large Send Offload.
Large Send Offload v2 (IPv4)	Enable	Disable Enable	Enable/Disable for Large Send Offload.
Large Send Offload v2 (IPv6)	Enable	Disable Enable	Enable/Disable for Large Send Offload.
Network Address	None	Valid MAC Address	Locally Administered MAC Address - System Managed. <b>Note:</b> There is no boundary checking for this field. It is the administrator's responsibility to set this field correctly.
Packet Size	1514	1514 9014	Configure packet size for OneConnect NIC only. Limit normal sized frames and one value for jumbo packet.
RSS	Enable	Disable Enable	Disable or enable for RSS Offload. Support for up to 4 RSS queues if enabled.

**Table 4: Windows Server 2008 Driver Options (Continued)**

Option Name	Default Value	Acceptable Values	Definition
TCP Checksum Offload (IPv4)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	Enable/disable for TCP Offload.
TCP Checksum Offload (IPv6)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	Enable/disable for TCP Offload.
TCP Connection Offload (IPv4)	Enable	Disable Enable	Enable/disable for TCP Connection Offload.
TCP Connection Offload (IPv6)	Enable	Disable Enable	Enable/disable for TCP Connection Offload.
UDP Checksum Offload (IPv4)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	UDP Offload Checksum settings.
UDP Checksum Offload (IPv6)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	UDP Offload Checksum settings.
VLAN Identifier	Not Present	Not Present or a Value from 1 to 4095	VLAN Tagging Enable/Disable - Not Present to disable. Otherwise, the VLAN identifier for the driver to use.

## Server Performance

### I/O Coalescing

I/O Coalescing is enabled and controlled by two driver parameters: CoalesceMsCnt and CoalesceRspCnt. The effect of I/O Coalescing will depend on the CPU resources available on the server. With I/O Coalescing turned on, interrupts are batched, reducing the number of interrupts and maximizing the number of commands processed with each interrupt. For heavily loaded systems, this will provide better throughput.

With I/O Coalescing turned off (the default), each I/O processes immediately, one CPU interrupt per I/O. For systems not heavily loaded, the default will provide better throughput. The following table shows recommendations based upon the number of I/Os per adapter.

**Table 5: Recommended Settings for I/O Coalescing**

I/Os per Second	Suggested CoalesceMsCnt	Suggested CoalesceRspCnt
I/Os < 10000	0	8

**Table 5: Recommended Settings for I/O Coalescing (Continued)**

I/Os per Second	Suggested CoalesceMsCnt	Suggested CoalesceRspCnt
10000 < I/Os < 18000	1	8
18000 < I/Os < 26000	1	16
I/Os > 26000	1	24

### CoalesceMsCnt

The CoalesceMsCnt parameter controls the maximum elapsed time in milliseconds that the adapter waits before it generates a CPU interrupt. The value range is 0 - 63 (decimal) or 0x0 - 0x3F (hex). The default is 0 and disables I/O Coalescing.

### CoalesceRspCnt

The CoalesceRspCnt parameter controls the maximum number of responses to batch before an interrupt generates. If CoalesceRspCnt expires, an interrupt generates for all responses collected up to that point. With CoalesceRspCnt set to less than 2, response coalescing is disabled and an interrupt triggers for each response. The value range for CoalesceRspCnt is 1 - 255 (decimal) or 0x1 - 0xFF (hex). The default value is 8.

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**Note:** A system restart is required to make changes to CoalesceMsCnt and/or CoalesceRspCnt.

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## Performance Testing

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There are three driver parameters that need to be considered (and perhaps changed from the default) for better performance testing: QueueDepth, CoalesceMsCnt and CoalesceRspCnt.

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**Note:** Parameter values recommended in this topic are for performance testing only and not for general operation.

---

### QueueDepth

If the number of outstanding I/Os per device is expected to exceed 32, increase this parameter to a value greater than the number of expected I/Os per device, up to a maximum of 254. The QueueDepth parameter defaults to 32. If 32 is set and not a high enough value, performance degradation may occur due to Storport throttling its device queue.

### CoalesceMsCnt

CoalesceMsCnt defaults to zero. If you are using a performance evaluation tool such as IOMETER and if you expect the I/O activity will be greater than 8000 I/Os per second, set CoalesceMsCnt to 1 and reinitialized with an adapter reset or system reboot.

### CoalesceRspCnt

CoalesceRspCnt defaults to 8. For all other values up to the maximum of 63, the adapter will not interrupt the host with a completion until either CoalesceMsCnt milliseconds has elapsed or CoalesceRspCnt responses are pending. The value of these two driver parameters reduces the number of interrupts per second which improves overall CPU utilization. However, there is a point where the number of I/Os per second is small relative to CoalesceMsCnt and this will slow down the completion process, causing performance degradation.

## Performance Testing Examples

### Test Scenario One

You execute IOMETER with an I/O depth of 1 I/O per device in a small-scale configuration (16 devices). In this case, the test does not exceed the adapter's performance limits and the number of I/Os per second are in the low thousands.

Recommendation: set CoalesceMsCnt to 0 (or leave the default value).

### Test Scenario Two

You execute IOMETER with an I/O depth of 48 I/Os per device in a small-scale configuration (16 devices).

Recommendation: set QueueDepth to be greater than 48 (e.g. 64).

## Network Driver Performance Tuning

Network driver performance tuning improves performance of the network and TCP Offload driver for the Windows Server operating system. The OneConnect UCNA is an x8, Generation 2 ("Gen 2", or Gen2) PCI-Express device and requires substantial memory bandwidth in a system to support 10 Gb/s data streams.

### Improving Performance with PCI-Express Bandwidth

---

OneConnect UCNA performance may be improved by selecting a more efficient PCI-Express packet payload size. If the system BIOS allows selection of a larger PCI-Express packet size, selecting at least a 512-byte PCIe packet payload size provides the best efficiency for PCIe data transfers.

### Improving Performance with TCP Offload

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TCP offload helps memory bandwidth significantly by eliminating the data copy of receive packets. This higher memory bandwidth leads to better network performance.

Most computers offer multiple distinct memory channels, or memory interleaves, which may not be enabled by default. Check the manufacturer's documentation and BIOS parameters for details on enabling optimal memory bandwidth features. Typically, all the DIMM slots must be populated to make use of all the memory channels. As a general rule, more DIMMs provide better performance by allowing a higher degree of memory-access interleaving to occur.

Some servers may allow memory mirroring, where the total memory is divided in half and each location is stored twice. This allows fault recovery if one memory location detects an error, but it greatly reduces the perceived memory bandwidth of the system.

Nearly any desktop or low-end server has enough memory bandwidth for OneConnect UCNA to support DMA at 20 Gb/s of data (10 Gb/s read, 10 Gb/s write). However, most of the memory demands come from the processor accessing the data for either packet copies in the non-offloaded networking stack or application accesses. All processor memory accesses use the front side bus (FSB). The clock speed of this bus is critical for allowing efficient memory bandwidth.

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**Note:** Systems with a faster Processor Front Side Bus (FSB) clock speed perform better than those with slower FSB clock speeds.

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## Windows Server Network Driver

Table 6 describes ways to use various OneConnect driver properties and Microsoft Windows properties to performance tune a system.

**Table 6: Windows Server Performance Tuning Situations**

Situation	Answer/Solution
There are a large number of short lived TCP connections such as Web Server or e-mail server.	Enable RSS, disable TCP offload.
There are large data transfers such as File Server, Web Server with file downloads, or FTP Server.	Use TCP offload.
There are large data transfers such as to a Backup Server.	Enable Jumbo Packets, use TCP offload.
There is a small server struggling to keep up with larger servers on the network.	Disable RSS, Enable TCP offload, Enable Jumbo Packets.
There is a general purpose server such as Active Directory Server, DHCP Server, or a DNS Server.	Use TCP offload, Enable RSS.

## Analyzing Performance Problems

You can use the Windows Performance Monitor (perfmon) to view statistics for each network device.

To view statistics for each network device:

1. Click **Start > Run > perfmon** to launch the Windows Performance Monitor.
2. Right-click and select **Add Counters** to add additional statistics.

Table 7 lists a few statistics to use for troubleshooting performance problems. For network performance, all the counters from the table are useful: Network Interface, TCPv4, IPv4, and Processor.

**Table 7: Statistics and Fine Tuning**

Situation	Answer/Solution
Network Interface > Packets Received Errors.	If this is incrementing even a small amount, a physical problem may exist on the network, such as a loose connection or bad cable, causing CRC errors in Ethernet packets. Find and eliminate the physical problem.
Network Interface > Packets Received Discarded.	If this is incrementing dramatically, the computer system may be receiving a lot of unsolicited traffic using network resources.
IPv4 > Fragmented Datagrams / sec.	If this is greater than 0, the computer system is sending or receiving IP fragments. This is a serious performance problem.
TCPv4 > Segments Retransmitted / sec.	TCP retransmits indicate that packets are being dropped by the receiving system (or in a network switch). Ideally, reduce retransmits to 0.
Processor >% Processor Time.	If CPU usage is high, try to enable all available offloads, such as TCP Offload, Checksum Offloads and use Jumbo Packets.

## Jumbo Packet

The jumbo packet setting in the registry determines the maximum Ethernet packet size. It includes the Ethernet frame header (typically 14 bytes) but excludes the trailing Cyclic Redundancy Check (CRC). The standard packet size is 1514 bytes plus a 4 byte trailing CRC.

Vendors use many terms that refer to this same quantity, such as packet size, frame size, or MTU. The Maximum Transmission Unit (MTU) is the Ethernet packet payload size. This does not include the Ethernet frame header or the trailing CRC. The standard MTU is 1500 bytes, corresponding to a 1514 packet size plus a 4 byte trailing CRC. Historically, any 1514 byte frame is a standard packet, while any frame larger than 1514 is called a jumbo packet. Windows Server attempts to standardize the terminology across vendors so the Jumbo Packet parameter refers to the byte size of the packet.

The Windows Server driver supports 1514 byte and 8188 byte jumbo packet values. The larger packet size provides better throughput and CPU usage. Typically, all devices on the network, including switches, must be configured for the larger size. The drawbacks of using jumbo packets are interoperability and increased memory usage on the server.

The path MTU is the maximum MTU that can be used before IP fragmentation occurs, taking into account the MTU for the endpoints and all routers between the endpoints. To verify the path MTU, ping a remote target with an increasing payload size. Eventually, the IP packet length exceeds the path MTU, and the packet fragments. This can be seen by using a packet sniffing application, such as Ethereal, Wireshark, or Microsoft Network Monitor.

IP fragmentation degrades performance dramatically, since all fragments must be received and reassembled before delivering the network packet to the upper layer protocol. In many cases, IP fragmentation may lead to a 10x performance degradation. The MTU parameter should be modified on all systems to avoid IP fragmentation for optimal network throughput.

## Typical Use Cases

Typical cases for using the MTU:

- Server interconnects are typically deployed using jumbo frames. This is the most efficient configuration for high bandwidth server-to-server communication, such as Network Attached Storage, and database transactions.
- Servers connected to client systems that run desktop operating systems typically use standard 1500 byte frames. Most desktop systems do not support jumbo packets.
- Servers that need both high performance server-to-server communication and client access may be configured with jumbo frames with Path MTU Discovery enabled. Path MTU Discovery is enabled by default in Windows Server, and it allows TCP connections to negotiate the optimal packet size that avoids IP fragmentation.

## Flow Control

The OneConnect UCNA supports IEEE 802.3x standard flow control, which uses control packets to temporarily pause the transmission of packets between two endpoints. These control messages are point-to-point, they are not forwarded by switches or routers. You must configure both endpoints for flow control. The OneConnect UCNA can either respond to flow control packets (by temporarily pausing transmits) or send flow control PAUSE packets when the transmitter is overwhelming the system's receive bandwidth.

Flow control has limited usefulness at 10Gb network speeds because it only allows the receiver to completely turn off the incoming flow of packets - it cannot just slow down the rate. Current 10Gb devices tend to cause a dip in performance because the exceedingly fast pipeline of packets will drain before the flow control can resume sending. The ideal situation is continuous pipeline of packets flowing between the endpoints, not a start-and-stop flow.

## Flow Control Examples

Flow control greatly improves the following situations:

- The OneConnect UCNA is installed in 4x PCI-Express slot or an underpowered server system.  
If the PCI-Express bus does not provide 10 Gb/s of throughput due to chipset limitations or the bus width, the OneConnect UCNA cannot maintain 10 Gb/s of incoming receive data. It starts dropping packets quickly. In this situation it may be beneficial to enable RX flow control in the OneConnect UCNA, and enable flow control in the attached switch for all devices. This helps backpressure (i.e. slow down) the transmitters.
- The OneConnect UCNA transmits to 1 Gb devices, especially non-TCP protocol.  
If the OneConnect UCNA transmits to a 10 Gb/s switch with attached 1 Gb clients, the OneConnect UCNA may overwhelm the switch. The switch is then forced to start dropping packets because although it may receive a 10 Gb/s stream, the client can only sink a 1 Gb stream. In this situation, it may be beneficial to enable TX flow control in the OneConnect UCNA, and enable flow control for the 10 Gb/s switch port.

For information on modifying the Flow Control parameter, see “Modifying Advanced Properties” on page 34.

## Checksum Offloading and Large Send Offloading (LSO)

The OneConnect UCNA supports IP, TCP, and UDP checksum offloading. All these protocols are enabled by default. You can disable offloading through the Windows Device Manager Advanced Properties. Disabling checksum offloading is only useful for packet sniffing applications, such as Ethereal or Microsoft Network Monitor, on the local system where the OneConnect UCNA is installed and monitored. When sniffing packets, transmit packets may appear to have incorrect checksums since the hardware has not calculated it yet.

The OneConnect UCNA supports transmit Large Send Offloading (LSO), which allows the TCP stack to send one large block of data and the hardware segments it into multiple TCP packets. This is recommended for performance, but it can be disabled for packet sniffing applications. LSO sends appear like giant packets in the packet sniffer, since the hardware has not segmented it yet.

For information on modifying the Large Send Offload parameter, see “Modifying Advanced Properties” on page 34.

## Receive Side Scaling (RSS) for Non-Offloaded IP/TCP Network Traffic

The OneConnect UCNA can process TCP receive packets on four processors in parallel, per port (or PCI function), for a total of eight processors in parallel. This is ideal for applications that are CPU limited. Typically, these applications have numerous client TCP connections that may be short-lived. Web Servers or Database Servers are prime examples. RSS typically increases the number of transactions per second for these applications.

## Understanding RSS

To better understand RSS, it helps to understand the interrupt mechanism used in the network driver. Without RSS a network driver receives an interrupt when a network packet arrives. This interrupt may occur on any CPU, or it may be limited to a set of CPUs for a given device depending on the server architecture. The network driver launches one deferred procedure call (DPC) that runs on the same CPU as the interrupt. Only one DPC ever runs at a given moment in time. In contrast, with RSS enabled, the OneConnect network driver launches up to four parallel DPCs on four different CPUs.

For example, if you have a four processor server that interrupts all processors, without RSS the DPC jumps from CPU to CPU, but it only runs on 1 CPU at a time. Each processor is only busy 25 percent of the time. The total reported CPU usage of the system is about 25 percent (perhaps more if other applications are also using the CPU). This is a sign that RSS may help performance. If the same four processor server uses RSS, there are four parallel executing DPCs; one on each processor. The total CPU available for networking processing is increased from 25 percent to 100 percent.

Some server machines and some network traffic profiles do not benefit from RSS. Since the non-offloaded TCP stack includes a data copy during receive processing, it is possible that memory bandwidth limits performance before the CPU. In this situation, the CPU usage is very high while all processors wait for memory accesses. To overcome this problem, you may reduce the number of RSS CPUs, or disable it entirely.

Poor RSS behavior is only typical of network performance testing applications that receive data, but perform no other processing. For other applications, RSS allows the application to scale other processing tasks across all CPUs and improves overall performance. RSS offers the most benefit for applications that create numerous, short lived connections. These applications are typically CPU limited, instead of network bandwidth limited.

For information on modifying the RSS Queues parameter, see "Modifying Advanced Properties" on page 34.

---

**Note:** Microsoft currently does not schedule RSS processing on all hyperthreaded CPUs. For example, only CPU 1 and 3 have RSS queues on a dual-core, hyperthreaded CPU. In contrast, a quad-core CPU has RSS queues on all 4 cores. The current Microsoft RSS model requires 4 consecutive CPUs for RSS queues, so a hyperthreaded system never uses all 4 RSS queues.

---

## Enabling Windows to Use Up to Eight Processors

Windows Server 2003 and Server 2008 by default use only four processors. It is possible for OneConnect UCNAs to use up to eight processors. In order for the OneConnect driver to use up to eight processors, the registry must be changed and the system restarted.

For Windows Server 2003, set the registry keyword `MaxNumRssCpus` (a DWORD type) to eight (8) at the location:

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

For Windows Server 2008, set the registry keyword `MaxNumRssCpus` (a DWORD type) to eight (8) at the location:

```
HKEY_LOCAL_MACHINE\\SYSTEM\\CurrentControlSet\\Services\\Ndis\\Parameters
```

Do not set the registry keyword to a value greater than the number of processors in the system or 8, whichever is smaller.

For more detailed information, refer the Web site <http://msdn.microsoft.com/en-us/library/bb734079.aspx>.

## TCP Offloading

TCP Offload is supported by Windows Server. To monitor TCP offloads, in a command window type:

```
netstat -t
```

By using this command, this program indicates the offload state for each TCP connection of the system.

---

**Note:** Packet sniffing applications such as Ethereal or Microsoft Network Monitor, do not see TCP offloaded packets.

---

Windows Server 2008 allows TCP offloads in more scenarios than Windows Server 2003. In particular, TCP offloads may occur with the Windows Firewall enabled.

The following table lists common reasons why TCP offloads do not occur and their suggested fixes.

**Table 8: Windows Server 2008 and No TCP Offloads**

Reasons for No TCP Offload	Solutions
Chimney is disabled on the system.	<p><b>For Windows Server 2008</b>            To determine if Chimney is enabled or disabled, use:  <code>netsh interface tcp show global</code></p> <p>To enable Chimney, use:  <code>netsh interface tcp set global chimney=enabled</code></p> <p>To disable Chimney, use:  <code>netsh interface tcp set global chimney=disabled</code></p> <p><b>For Windows Server 2003</b>            Verify if Windows Server 2003 Service Pack 2 is installed.            3. You cannot query if TCP Chimney is enabled or disabled by using netsh. Another way to do this is to use the following command (all on one line):</p> <pre>reg query HKLM\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters /v EnableTCPChimney</pre> <p>To enable TCP Chimney offload on Windows Server 2003, use:  <code>netsh in tip set chimney enabled</code></p> <p><b>For Windows Server 2003 and Windows Server 2008</b>            To verify if offloading is enabled, use:  <code>netstat -nt</code>            This command displays a list of connections and their offloading state.</p>
Offloads are disabled for specific ports or applications with netsh.	<p>Use the following commands to view any TCP ports or applications that may be configured to disable TCP offload:</p> <pre>netsh interface tcp show chimneyports netsh interface tcp show chimneyapplications</pre>
A third-party firewall is running.	<p>Windows Firewall does not affect TCP offload, but third-party firewalls may prevent TCP offloads. Uninstall third-party firewall software to allow TCP offloads.</p>
In the network properties, some intermediate drivers prevent offloading.	<p>Go to <b>Network Connections &gt; Properties</b>, and clear boxes for unused drivers. In particular, "Network Load Balancing" and some third party drivers prevent offloads.</p>
Processor >% Processor Time	<p>If CPU usage is high, try to enable all available offloads, such as TCP Offload, Checksum Offloads, and use Jumbo Packets.</p>
IPSec is enabled.	<p>Disable IPSec to use TCP offloading.</p>
IP Network Address Translation is enabled.	<p>Disable IP Network Address Translation.</p>
OneConnect driver supports an Advanced Property to disable TCP offloading.	<p>Make sure TCP offloading is enabled.</p>
The TCP connection is using IPv6.	<p>OneConnect driver only supports offloading TCP connections with IPv4.</p>

## Windows Networking Features and TOE

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**Note:** Although TOE is supported, it is turned off by default.

---

If certain Windows Server 2003 and Windows Server 2008 networking features are enabled, TOE does not operate as expected, and connections are not offloaded.

Installing or activating firewall applications causes no connections to be offloaded by the Windows Server 2003 and Windows Server 2008 network stack. By default, Windows Firewall Services is enabled at operating system installation time, and must be explicitly disabled in order to use TOE. Firewall services may be disabled through the Service Control panel, or with the following commands at the command line prompt:

- To set firewall services to load on demand (manual), use:

```
sc config MpsSvc start= demand <enter>
```

- To stop firewall services, use:

```
Net stop MpsSvc <enter>
```

or to temporarily disable firewall services, use:

```
netsh advfirewall set all state off <enter>
```

Enabling certain Windows Networking features, such as Network Bridging, VPN and Routing may cause the operating system to enable IP Network Address Translation services and the IPSEC policy agent. These services, if enabled, disallow connections from being offloaded to the OneConnect UCNA. To disable these functions, use the Services Control panel, or the following commands at the command line prompt:

```
net stop accesspolicy <enter>  
net stop sharedaccess <enter>  
net stop ipnat <enter>
```

## TCP Offload Performance

The OneConnect UCNA and drivers support TCP offload, which provides significant performance improvements. The performance improvements are:

- A zero copy receive data path exists. In contrast, all non-offloaded TCP packets are copied in the network stack. This copy dramatically increases the memory bandwidth and CPU requirements for receive data.
- Sending and receiving of ACK packets is handled entirely in hardware, reducing PCI-Express bus usage and interrupts.
- TCP timers are implemented in hardware, including delayed ACK, push, retransmit, keep alive, etc. This reduces host CPU usage.
- Retransmits are handled entirely in hardware.
- Packetizing data, including segmenting, checksums, and CRC. The network driver can receive huge send and receive buffers (>1MB) for maximum efficiency.
- OneConnect drivers provide efficient parallel processing of multiple connections TCP on multiple CPU systems.

The OneConnect UCNA receive path is zero copy for applications that prepost receive buffers, or issue a socket read before the data arrives. Ideal applications use Microsoft's Winsock2 Asynchronous Sockets API, which allows posting multiple receive buffers with asynchronous completions, and posting multiple send operations with asynchronous completions. Applications that do not prepost receive buffers may incur the penalty of the data copy, and the performance improvement is significantly less noticeable.

Applications that transmit large amounts of data show excellent CPU efficiency using TCP offload. TCP offload allows the network driver to accept large buffers of data to transmit. Each buffer is roughly the same amount of processing work as a single TCP packet for non-offloaded traffic. The entire process of packetizing the data, processing the incoming data acknowledgements, and potentially retransmitting any lost data is handled by the hardware.

## TCP Offload Exclusions

Microsoft provides a method to exclude certain applications from being offloaded to the OneConnect UCNA. There are certain types of applications that do not benefit that much from TCP offload. These include TCP connections that are short-lived, transfer small amounts of data at a time, exhibit fragmentation from end-to-end, or make use of IP options.

If an application sends data less than the Max Segment Size (MSS), the OneConnect driver, like most TCP stacks, uses a Nagling algorithm. Nagling reduces the number of TCP packets on the network by combining small application sends into one larger TCP packet. Nagling typically reduces the performance of a single connection to allow greater overall performance for a large group of connections. During Nagling, a single connection may have long pauses (200ms) between sending subsequent packets, as the OneConnect driver waits for more data from the application to append onto the packet. An application may disable Nagling using the TCP\_NO\_DELAY parameter. TCP offload does not improve the performance for connections that Nagle, since the performance is intentionally limited by the Nagling algorithm. Telnet and SSH consoles are examples of connections that typically use Nagling.

Windows Server has not optimized the connection offload path. Some applications that use numerous short lived TCP connections do not show a performance improvement using TCP offload.

Windows Server provides control over the applications and TCP ports that are eligible for TCP offload using the netsh tool. Refer to the Microsoft documentation for these netsh commands:

```
netsh interface tcp add chimneyapplication state=disabled application=<path>
netsh interface tcp add chimneyport state=disabled remoteport=23 localport=*
```

---

**Note:** The netsh commands require the Windows Firewall to be running. If the Firewall is disabled, all applications and ports added with the netsh commands may fail to connect.

---

## Windows TCP Parameters

Emulex does not recommend modifying the TCP registry parameters provided by Microsoft, such as TcpAckFrequency. The default parameters are suitable for a wide variety of situations, with or without using TCP offloading.

## Support for Selective Acknowledgement in Offloaded TCP Connections

Selective Acknowledgment (SACK) is an optional TCP feature described in RFC 2018, which is supported by Windows Server and by the OneConnect driver for offloaded connections. The use of selective acknowledgments may provide a slight throughput increase in some network use cases due to a reduction of retransmission traffic. For 10 Gb/s links this is generally less than 5 percent.

SACK offload is disabled by default. To enable this support and for information on modifying the SACK parameter, see “Modifying Advanced Properties” on page 34.

## Receive Window Auto Tuning and Compound TCP

Windows Server adds several features to the host TCP stack, such as receive window auto-tuning and Compound TCP (CTCP). These features only affect non-offloaded TCP traffic.

Some 10 Gb/s stress applications may actually suffer in performance with these features enabled. In particular, Emulex has seen some bi-directional data stream test performance degradation when the receive window auto-tuning is enabled. This is due to increased receive performance that adversely affects the same TCP connection's transmit performance.

To disable these features, use these commands:

```
netsh interface tcp set global autotuning=disabled
netsh interface tcp set global congestionprovider=none
```

## Interrupt Coalescing

The Windows Server network driver automatically performs adaptive interrupt coalescing. During periods of low network usage, the interrupt delay is set to a minimum for lower latency. As the interrupt rate increases, the delay is increased. This allows the driver to perform more work in a single interrupt, which reduces the amount of wasted cycles from additional interrupts.

The interrupt coalescing algorithm automatically tunes the system to maintain responsiveness and performance in a wide variety of situations, including RSS and TOE traffic.

## CPU Binding Considerations

Windows applications may set a processor affinity, which binds a program to a particular CPU in a multiple processor computer. However, with the recent additions to the Windows networking stack, manually configuring CPU affinity is not recommended.

The advantage of application affinity for network applications is based on choosing the ideal relationship between the DPC and application affinity to reduce processor-cache coherency cycles. The ideal mapping may require that both the DPC and application run on the same processor, different processors, or different cores of a dual core processor that share a common memory cache. Even when the best affinity relationship is determined, it is impossible to enforce this relationship since RSS or TCP offloading choose the DPC processor.

The OneConnect driver uses multiple parallel DPCs that are explicitly assigned to particular CPUs for processing both RSS and TCP offloading tasks. Each TCP connection is assigned to a particular CPU for processing. This provides the advantage of assigning CPU affinities by reducing CPU cache misses, without any user configuration. Explicit processor affinity assignments are not necessary for the OneConnect driver since the advantages of assigning processor affinities are realized by using RSS.

The only reason to experiment with application and interrupt CPU affinity is when performing isolated networking benchmarks.

## Single TCP Connection Performance Settings

One common benchmark is to run a single TCP connection between two computers as fast as possible. The following are a few suggestions to deliver the best possible performance:

- Use TCP Window Scaling with a 256k or 512k window. This may be controlled with show socket applications, such as ntttcp from Microsoft.
- Use large send and receive buffers (>=128k) with an efficient application such as ntttcp.
- Disable RSS and use an interrupt filter driver as discussed in "CPU Binding Considerations". Experiment with all relative CPU affinities to find the best combination.
- Disable timestamps and SACK since the test should run without dropping any packets.
- Unbind unused network protocols in the "Network Connections" property page.
- Disable any firewall services, IPSEC, or network address translation (NAT).

# Troubleshooting

There are several circumstances in which your system may operate in an unexpected manner. The Troubleshooting section contains reference tables on event codes and error messages and provides information regarding unusual situations.

## Troubleshooting FC/FCoE Driver

### Event Tracing (Windows Server 2003, SP1 and later only)

---

Trace messages are part of the Emulex lpfcc log messages.

Storage Event Tracing supports two types of events:

- FFInit (0x00000001) - events that occurred at HwFindAdapter and HwInitialize.
- FFIO (0x00000002) - events that occurred during I/O.

Storage Event Tracing supports four levels of events:

- DbgLvlErr (0x00000001) - error level
- DbgLvlWrn (0x00000002) - warning level
- DbgLvlInfo (0x00000004) - Information level
- DbgLvlInfo (0x00000008) - excessive information level

---

**Note:** To view trace messages, you must enable Event Tracing in the operating system. See your Microsoft operating system documentation for more information.

---

**Table 9: Event Tracing Summary Table**

LOG Message Definition	From	To	Reserved Through	Verbose Description
ELS	0100	0130	0199	ELS events
Discovery	0202	0262	0299	Link discovery events
Mailbox	0310	0326	0399	Mailbox events
INIT	0400	0463	0499	Initialization events
FCP	0701	0749	0799	FCP traffic history events
Link	1300	1306	1399	Link events
Tag	1400	1401	1499	
NPIV	1800	1804	1800	N_Port_ID virtualization events

## Event Trace Messages

---

### ELS Log Messages (0100 - 0130)

lpfc\_mes0100: 0100: FLOGI failure - ulpStatus: x%x, ulpWord[4]:x%x

DESCRIPTION: An ELS FLOGI command that was sent to the fabric failed.

SEVERITY: Error

LOG: LOG\_ELS verbose

ACTION: Check fabric connection.

SEE ALSO: lpfc\_mes0110.

lpfc\_mes0101: 0101: FLOGI completes successfully - NPortId: x%x, RaTov: x%x, EdTov: x%x

DESCRIPTION: An ELS FLOGI command that was sent to the fabric succeeded.

SEVERITY: Information

LOG: LOG\_ELS verbose

ACTION: No action needed, informational.

lpfc\_mes0102: 0102: PLOGI completes to NPortId: x%x

DESCRIPTION: The adapter performed a PLOGI into a remote NPort.

SEVERITY: Information

LOG: LOG\_ELS verbose

ACTION: No action needed, informational.

lpfc\_mes0103: 0103:PRLI completes to NPortId: x%x, TypeMask: x%x, Fcp2Recovery: x%x

DESCRIPTION: The adapter performed a PRLI into a remote NPort.

SEVERITY: Information

LOG: LOG\_ELS verbose

ACTION: No action needed, informational.

lpfc\_mes0104: 0104: ADISC completes to NPortId x%x

DESCRIPTION: The adapter performed an ADISC into a remote NPort.

SEVERITY: Information

LOG: LOG\_ELS verbose

ACTION: No action needed, informational.

lpfc\_mes0105: 0105: LOGO completes to NPortId: x%x

DESCRIPTION: The adapter performed a LOGO into a remote NPort.

SEVERITY: Information

LOG: LOG\_ELS verbose

ACTION: No action needed, informational.

lpfc\_mes0112: 0112: ELS command: x%x, received from NPortId: x%x

DESCRIPTION: Received the specific ELS command from a remote NPort.

SEVERITY: Information

LOG: LOG\_ELS verbose

ACTION: No action needed, informational.

REMARKS: lpfc\_mes0114 and lpfc\_mes0115 are also recorded for more details if the corresponding SEVERITY level is set. You can use the XRI to match the messages.

lpfc\_mes0114: 0114: PLOGI chkparm OK

DESCRIPTION: Received a PLOGI from a remote NPORT and its FC service parameters match this adapter. Request can be accepted.

SEVERITY: Information

LOG: LOG\_ELS verbose

ACTION: No action needed, informational.

SEE ALSO: lpfc\_mes0112.

lpfc\_mes0115: 0115: Unknown ELS command: x%x, received from NPortId: x%x\n

DESCRIPTION: Received an unsupported ELS command from a remote NPORT.

SEVERITY: Error

LOG: LOG\_ELS verbose

ACTION: Check remote NPORT for potential problem.

SEE ALSO: lpfc\_mes0112.

lpfc\_mes0128: 0128: Accepted ELS command: OpCode: x%x

DESCRIPTION: Accepted ELS command from a remote NPORT.

SEVERITY: Information

LOG: LOG\_ELS verbose

ACTION: No action needed, informational.

lpfc\_mes0129: 0129: Rejected ELS command: OpCode: x%x

DESCRIPTION: Rejected ELS command from a remote NPORT.

SEVERITY: Information

LOG: LOG\_ELS verbose

ACTION: No action needed, informational.

lpfc\_mes0130: 0130: ELS command error: ulpStatus: x%x, ulpWord[4]: x%x

DESCRIPTION: ELS command failure

SEVERITY: Error

LOG: LOG\_ELS verbose

ACTION: Check remote NPORT for potential problem.

## Discovery Log Messages (0202 - 0262)

lpfc\_mes0202: 0202: Start Discovery: Link Down Timeout: x%x, initial PLOGICount:%d

DESCRIPTION: Device discovery/rediscovery after FLOGI, FAN or RSCN has started. TMO is the current value of the soft link time. It is used for link discovery against the LinkDownTime set in parameters. DISC CNT is number of nodes being discovered for link discovery. RSCN CNT is number of nodes being discovered for RSCN discovery. There will be value in either DISC CNT or RSCN CNT depending which discovery is being performed.

SEVERITY: Information

LOG: LOG\_DISCOVERY verbose

ACTION: No action needed, informational.

lpfc\_mes0204: 0204: Discovered SCSI Target: WWN word 0: x%x, WWN word 1: x%x, DID: x%x:, RPI: x%x

DESCRIPTION: Device discovery found SCSI target.  
SEVERITY: Information  
LOG: LOG\_DISCOVERY verbose  
ACTION: No action needed, informational.

lpfc\_mes0214: 0214: RSCN received: Word count:%d

DESCRIPTION: Received RSCN from fabric.  
SEVERITY: Information  
LOG: LOG\_DISCOVERY verbose  
ACTION: No action needed, informational.

lpfc\_mes0215: 0215: RSCN processed: DID: x%x

DESCRIPTION: Processed RSCN from fabric.  
SEVERITY: Information  
LOG: LOG\_DISCOVERY verbose  
ACTION: No action needed, informational.

lpfc\_mes0225: 0225: Device Discovery completes

DESCRIPTION: This indicates successful completion of device (re)discovery after a link up.  
SEVERITY: Information  
LOG: LOG\_DISCOVERY verbose  
ACTION: No action needed, informational.

lpfc\_mes0229: 0229: Assign SCSIId x%x to WWN word 0: x%x, WWN word 1: x%x, NPortId x%x

DESCRIPTION: The driver assigned a SCSI ID to a discovered mapped FCP target. BindType - 0: DID 1:WWNN 2:WWPN  
SEVERITY: Information  
LOG: LOG\_DISCOVERY verbose  
ACTION: No action needed, informational.

lpfc\_mes0230: 0230: Cannot assign SCSIId to WWN word 0: x%x, WWN word 1: x%x, NPortId x%x

DESCRIPTION: SCSI ID assignment failed for discovered target.  
SEVERITY: Warning  
LOG: LOG\_ELS verbose  
ACTION: Review system configuration.

lpfc\_mes0232: 0232: Continue discovery at sequence number%d, PLOGIs remaining:%d

DESCRIPTION: NPort discovery sequence continuation.  
SEVERITY: Information  
LOG: LOG\_ELS verbose  
ACTION: No action needed, informational.

lpfc\_mes0235: 0235: New RSCN being deferred due to RSCN in process

DESCRIPTION: An RSCN was received while processing a previous RSCN.  
SEVERITY: Information  
LOG: LOG\_ELS verbose  
ACTION: No action needed, informational.

lpfc\_mes0236: 0236: Issuing command to name server" type: x%x

DESCRIPTION: The driver is issuing a nameserver request to the fabric. Also recorded if a GID\_FT is sent.  
SEVERITY: Information  
LOG: LOG\_DISCOVERY verbose  
ACTION: No action needed, informational.  
SEE ALSO: lpfc\_mes0239 or lpfc\_mes0240.

lpfc\_mes0238: 0238: NameServer response DID count:%d

DESCRIPTION: Received a response from fabric name server with N DIDs.  
SEVERITY: Information  
LOG: LOG\_ELS verbose  
ACTION: No action needed, informational.

lpfc\_mes0239: 0239: NameServer Response: next DID value: x%x

DESCRIPTION: The driver received a nameserver response. And, this message is recorded for each DID included in the response data.  
SEVERITY: Information  
LOG: LOG\_DISCOVERY verbose  
ACTION: No action needed, informational.  
SEE ALSO: lpfc\_mes0236.

lpfc\_mes0240: 0240: NameServer Response Error - CmdRsp:x%x, ReasonCode: x%x, Explanation x%x

DESCRIPTION: The driver received a nameserver response containing a status error.  
SEVERITY: Error  
LOG: LOG\_DISCOVERY verbose  
ACTION: Check Fabric configuration. The driver recovers from this and continues with device discovery.  
SEE ALSO: lpfc\_mes0236.

lpfc\_mes0256: 0256: Start node timer on NPortId: x%x, timeout value:%d

DESCRIPTION: Starting timer for disconnected target with NPort ID and timeout value.  
SEVERITY: Information  
LOG: LOG\_ELS verbose  
ACTION: No action needed, informational.

lpfc\_mes0260: 0260: Stop node timer on NPortId: x%x, SCSIId: x%x

DESCRIPTION: Discontinuing timer for reconnected target with NPort ID and SCSI ID.  
SEVERITY: Information  
LOG: LOG\_ELS verbose  
ACTION: No action needed, informational.

lpfc\_mes0262: 0262: Node timeout on NPortId: x%x, SCSIId: x%x

DESCRIPTION: Disconnected NPort ID, SCSI ID has failed to reconnect within timeout limit.  
SEVERITY: Error  
LOG: LOG\_ELS verbose  
ACTION: Review system configuration.

### **Mailbox Log Messages (0310 - 0326)**

lpfc\_mes0310: 0310: Mailbox command timeout - HBA unresponsive

DESCRIPTION: A Mailbox command was posted to the adapter and did not complete within 30 seconds.  
sync - 0: asynchronous mailbox command is issued 1: synchronous mailbox command is issued.  
SEVERITY: Error  
LOG: LOG\_MBOX verbose  
ACTION: This error could indicate a software driver or firmware problem. If no I/O is going through the adapter, reboot the system. If these problems persist, report these errors to Technical Support.

lpfc\_mes0326: 0326: Reset HBA - HostStatus: x%x

DESCRIPTION: The adapter has been reset.  
SEVERITY: Information  
LOG: LOG\_MBOX verbose  
ACTION: No action needed, informational.

### **INIT Log Messages (0400 - 0463)**

lpfc\_mes0400: 0400 Initializing discovery module: OptionFlags: x%x

DESCRIPTION: Driver discovery process is being initialized with internal flags as shown.  
SEVERITY: Information  
LOG: LOG\_ELS verbose  
ACTION: No action needed, informational.

lpfc\_mes0401: 0401: Initializing SLI module: DeviceId: x%x, NumMSI:%d

DESCRIPTION: PCI function with device id and MSI count as shown is being initialized for service level interface.  
SEVERITY: Information  
LOG: LOG\_ELS verbose  
ACTION: No action needed, informational.

lpfc\_mes0405: Service Level Interface (SLI) 2 selected\n");

DESCRIPTION: Service Level Interface level 2 is selected.  
SEVERITY: Information  
LOG: LOG\_ELS verbose  
ACTION: No action needed, informational.

lpfc\_mes0406: 0406: Service Level Interface (SLI) 3 selected\n");

DESCRIPTION: Service Level Interface level 3 is selected.  
SEVERITY: Information  
LOG: LOG\_ELS verbose  
ACTION: No action needed, informational.

lpfc\_mes0436: Adapter not ready: hostStatus: x%x

DESCRIPTION: The adapter failed during powerup diagnostics after it was reset.

SEVERITY: Error

LOG: LOG\_INIT verbose

ACTION: This error could indicate a hardware or firmware problem. If problems persist report these errors to Technical Support.

lpfc\_mes0442: 0442: Adapter failed to init, CONFIG\_PORT, mbxStatus x%x

DESCRIPTION: Adapter initialization failed when issuing CONFIG\_PORT mailbox command.

SEVERITY: Error

LOG: LOG\_INIT verbose

ACTION: This error could indicate a hardware or firmware problem. If problems persist report these errors to Technical Support.

lpfc\_mes0446: 0446: Adapter failed to init, CONFIG\_RING, mbxStatus x%x

DESCRIPTION: Adapter initialization failed when issuing CFG\_RING mailbox command.

SEVERITY:

LOG: LOG\_INIT verbose

ACTION: This error could indicate a hardware or firmware problem. If problems persist report these errors to Technical Support.

lpfc\_mes0454: 0454: Adapter failed to init, INIT\_LINK, mbxStatus x%x

DESCRIPTION: Adapter initialization failed when issuing INIT\_LINK mailbox command.

SEVERITY: Error

LOG: LOG\_INIT verbose

ACTION: This error could indicate a hardware or firmware problem. If problems persist report these errors to Technical Support.

lpfc\_mes0458: 0458: Bring Adapter online

DESCRIPTION: The FC driver has received a request to bring the adapter online. This may occur when running HBAnyware.

SEVERITY: Warning

LOG: LOG\_INIT verbose

ACTION: None required.

lpfc\_mes0460: 0460: Bring Adapter offline

DESCRIPTION: The FC driver has received a request to bring the adapter offline. This may occur when running HBAnyware.

SEVERITY: Warning

LOG: LOG\_INIT verbose

ACTION: None required.

lpfc\_mes0463: 0463: Adapter firmware error: hostStatus: x%x, Info1(0xA8): x%x, Info2 (0xAC): x%x

DESCRIPTION: The firmware has interrupted the host with a firmware trap error.

SEVERITY: Error

LOG: LOG\_INIT verbose

ACTION: Review HBAnyware diagnostic dump information.

## FCP Log Messages (0701 - 0749)

lpfc\_mes0701: 0701: Issue Abort Task Set to PathId: x%x, TargetId: x%x, Lun: x%x

DESCRIPTION: The driver has issued a task management command for the indicated SCSI device address.

SEVERITY: Warning

LOG: LOG\_INIT verbose

ACTION: Review system configuration.

lpfc\_mes0703: 0703: Issue LUN reset to PathId: x%x, TargetId: x%x, Lun: x%x, Did: x%x

DESCRIPTION: Storport is requesting a reset of the indicated LUN.

SEVERITY: Warning

LOG: LOG\_INIT verbose

ACTION: Review system configuration. Possible side-effect of cluster operations.

lpfc\_mes0713: 0713: Issued Target Reset to PathId:%d, TargetId:%d, Did: x%x

DESCRIPTION: Storport detected that it needs to abort all I/O to a specific target. This results in login reset to the target in question.

SEVERITY: Warning

LOG: LOG\_FCP verbose

ACTION: Review system configuration. Possible side-effect of cluster operations.

SEE ALSO: lpfc\_mes0714.

lpfc\_mes0714: 0714: Issued Bus Reset for PathId:%d

DESCRIPTION: Storport is requesting the driver to reset all targets on this adapter.

SEVERITY: Warning

LOG: LOG\_FCP verbose

ACTION: Review system configuration. Possible side-effect of cluster operations.

SEE ALSO: lpfc\_mes0713.

lpfc\_mes0716: 0716: FCP Read Underrun, expected%d, residual%d

DESCRIPTION: FCP device provided less data than was requested.

SEVERITY: Supplement Information

LOG: LOG\_FCP verbose

ACTION: No action needed, informational.

SEE ALSO: lpfc\_mes0730.

lpfc\_mes0729: 0729: FCP command error: ulpStatus: x%x, ulpWord[4]: x%x, XRI: x%x, ulpWord[7]: x%x

DESCRIPTION: The specified device failed an I/O FCP command.

SEVERITY: Warning

LOG: LOG\_FCP verbose

ACTION: Check the state of the target in question.

REMARKS: lpfc\_mes0730 is also recorded if it is a FCP Rsp error.

lpfc\_mes0730: 0730: FCP response error: Flags: x%x, SCSI status: x%x, Residual:%d

DESCRIPTION: The FCP command failed with a response error.

SEVERITY: Warning

LOG: LOG\_FCP verbose

ACTION: Check the state of the target in question.

remark: lpfc\_mes0716, lpfc\_mes0734, lpfc\_mes0736 or lpfc\_mes0737 is also recorded for more details if the corresponding SEVERITY level is set.

SEE ALSO: lpfc\_mes0729.

lpfc\_mes0734: 0734: Read Check: fcp\_parm: x%x, Residual x%x

DESCRIPTION: The issued FCP command returned a Read Check Error.

SEVERITY: Warning

LOG: LOG\_FCP verbose

ACTION: Check the state of the target in question.

SEE ALSO: lpfc\_mes0730.

lpfc\_mes0737: 0737: SCSI check condition, SenseKey x%x, ASC x%x, ASCQ x%x, SrbStatus: x%x

DESCRIPTION: The issued FCP command resulted in a Check Condition.

SEVERITY: Warning

LOG: LOG\_FCP verbose

ACTION: Review SCSI error code values.

SEE ALSO: lpfc\_mes0730.

0747: Target reset complete: PathId: x%x, TargetId: x%x, Did: x%x

DESCRIPTION: A target reset operation has completed.

SEVERITY: Warning

LOG: LOG\_FCP verbose

ACTION: Review system configuration. Possible side-effect of cluster operations.

REMARK: See also Message 0713.

0748: Lun reset complete: PathId: x%x, TargetId: x%x, Lun: x%x

DESCRIPTION: A LUN reset operation has completed.

SEVERITY: Warning

LOG: LOG\_FCP verbose

ACTION: Review system configuration. Possible side-effect of cluster operations.

REMARK: See also Message 0703.

0749: Abort task set complete: Did: x%x, SCSIId: x%x

DESCRIPTION: A task management has completed.

SEVERITY: Warning

LOG: LOG\_FCP verbose

ACTION: Review system configuration. Possible side-effect of cluster operations.

REMARK: See also Message 0701.

## Link Log Messages (1302 - 1306)

lpfc\_mes1302: 1302: Invalid speed for this board:%d, forced link speed to auto

DESCRIPTION: The driver is re-initializing the link speed to auto-detect.

SEVERITY: Warning

LOG: LOG\_LINK\_EVENT verbose

ACTION: None required.

lpfc\_mes1303: 1303: Link Up event: tag: x%x, link speed:%dG, topology (0 = Pt2Pt, 1 = AL):%d

DESCRIPTION: A link up event was received. It is also possible for multiple link events to be received together.

SEVERITY: Error

LOG: LOG\_LINK\_EVENT verbose

ACTION: If numerous link events are occurring, check physical connections to the FC network.

REMARKS: lpfc\_mes1304 is recorded if Map Entries > 0 and the corresponding mode and SEVERITY level is set.

lpfc\_mes1305:1305: Link down even: tag x%x

DESCRIPTION: A link down event was received.

SEVERITY: Error

LOG: LOG\_LINK\_EVENT verbose

ACTION: If numerous link events are occurring, check physical connections to the FC network.

lpfc\_mes1306: 1306: Link Down timeout

DESCRIPTION: The link was down for greater than the configuration parameter (HLinkTimeOut) seconds. All I/O associated with the devices on this link will be failed.

SEVERITY: Warning

LOG: LOG\_LINK\_EVENT verbose

ACTION: Check adapter cable/connection to SAN.

## Tag Messages (1400 - 1401)

lpfc\_mes1400 1400: Tag out of range: ContextIndex: x%x, MaxIndex: x%x, ulpCommand: x%x

DESCRIPTION: Firmware has generated an invalid response.

SEVERITY: Error

LOG: LOG\_LINK\_EVENT verbose

ACTION: Review hardware configuration. Contact Emulex Technical Support.

lpfc\_mes1401 1401: Invalid tag: ContextIndex: x%x, ulpCommand: x%x

DESCRIPTION: Firmware has generated an invalid response.

SEVERITY: Error

LOG: LOG\_LINK\_EVENT verbose

ACTION: Review hardware configuration. Contact Emulex Technical Support.

## **NPIV Messages (1800 - 1899)**

lpfc\_mes1800 1800: NPIV FDISC failure VPI: x%x Error x%x Reason x%x

DESCRIPTION: Virtual Port fails on a FDISC to the switch with the error and reason listed.

SEVERITY: Error

LOG: LOG\_NPIV verbose

ACTION: Check to ensure the switch supports NPIV.

lpfc\_mes1801 1801: Memory allocation failure for NPIV port: x%x

DESCRIPTION: Fails to allocated the block of memory for the Virtual Port.

SEVERITY: Error

LOG: LOG\_NPIV verbose

ACTION: Check to ensure system has sufficient kernel memory.

lpfc\_mes1802 1802: Exceeded the MAX NPIV port: x%x

DESCRIPTION: Exceeded the number of Virtual Port allows on the adapter.

SEVERITY: Error

LOG: LOG\_NPIV verbose

ACTION: Reduce the number of Virtual Ports.

lpfc\_mes1803 1803: Virtual Port: x%x VPI:x%x successfully created.

DESCRIPTION: Virtual Port ID is successfully created.

SEVERITY: Information

LOG: LOG\_NPIV verbose

ACTION: No action needed, informational.

lpfc\_mes1804 1804: Removing Virtual Port: x%x VPI:x%x

DESCRIPTION: Removing Virtual Port ID.

SEVERITY: Information

LOG: LOG\_NPIV verbose

ACTION: No action needed, informational.

## **ELS Messages (1900 - 1999)**

1900: x%x sends ELS\_AUTH\_CMD x%x with TID x%x

DESCRIPTION: An ELS\_AUTH\_CMD is sent.

SEVERITY: Information

LOG: LOG\_FCSP verbose

ACTION: No action needed, informational.

1901: x%x sends ELS\_AUTH\_REJECT x%x x%x to x%x

DESCRIPTION: An ELS\_AUTH\_REJECT is sent.

SEVERITY: Information

LOG: LOG\_FCSP verbose

ACTION: No action needed, informational.

1902: Receives x%x from x%x in state x%x

DESCRIPTION: Receives an ELS\_AUTH\_CMD.  
 SEVERITY: Information  
 LOG: LOG\_FCSP verbose  
 ACTION: No action needed, informational.

1903: Receives ELS\_AUTH\_RJT x%x x%x

DESCRIPTION: Receives an ELS\_AUTH\_REJECT.  
 SEVERITY: Information  
 LOG: LOG\_FCSP verbose  
 ACTION: No action needed, informational.

1904: Authentication ends for x%x with status x%x (%d %d)

DESCRIPTION: Authentication is done.  
 SEVERITY: Information  
 LOG: LOG\_FCSP verbose  
 ACTION: No action needed, informational.

1905: Authentication policy change for local x%08x x%08x remote x%08x%08x

DESCRIPTION: Authentication policy has been changed.  
 SEVERITY: Information  
 LOG: LOG\_FCSP verbose  
 ACTION: No action needed, informational.

## Troubleshooting NIC and ISCSI Drivers

### Windows Server NIC

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The following table provides troubleshooting information for the NIC OneConnect adapter.

**Table 10: Windows Server NIC**

Problem	Answer/Solution
The operating system fails to install or does not successfully install the NIC drivers.	Verify that the operating system is supported by OneConnect driver.
The firmware fails to flash.	Use the CD-ROM ISO image located on installation CD2 to flash the firmware.
Windows Device Manager displays code 10 or code 39 with a yellow or red bang on the device.	The flash image does not match the installed device drivers, or the flash has become corrupted. Reflash the OneConnect UCNA and try again.





































