# Emulex LPFC Driver for Solaris

*Version 6.30g*

*User Manual*

P003408-01A Rev A

**Critical Connectivity Solutions™**

Emulex, 3333 Susan Street
Costa Mesa, CA 92626

# Installation

## Driver Information

### Supported Features

- Supports dynamically adding and removing logical unit numbers (LUNs) and targets.
- Supports 4,096 targets on 8 Gb/s adapters (capability tested up to 512 targets).
- Supports 512 targets on 2 Gb/s and 4 Gb/s adapters.
- Target driver configuration files (sd.conf, st.conf) are no longer used.
- Topology support: FC-AL, point-to-point, fabric with auto-topology negotiation.
- Supports 1, 2, 4 and 8 Gb/s capable adapters with auto-rate negotiation. (1 Gb/s is not supported on 8 Gb/s adapters.)
- Protocols: SCSI/FCP, IP over Fibre Channel (FC) and Fibre Channel over Ethernet (FCoE).
- Dynamic persistent binding. Persistent bindings by World Wide Node Name (WWNN), World Wide Port Name (WWPN) or Destination Identifier (D_ID). You can set different methods on an adapter port basis.
- Tested for up to thirty-two adapter ports.
- Dynamic parameter setting using the HBAnyware configuration utility version 4.0 as part of a master kit: enabling GUI-based driver configuration and persistent binding management, including in-band (FC) and out-of-band (TCP/IP) remote SAN management capability, diagnostics (loopback and diagnostics dump), LUN masking and FC-SP DHCHAP (Diffie-Hellmann Challenge Handshake Authentication Protocol) Authentication.
- Supports digital diagnostics for the HBAnyware configuration utility version 4.0.
- Supports Common HBA Application Programming Interface (API).
- lpfc.conf migration script. This script enables you to convert 5.0x lpfc.conf syntax to 6.30g lpfc.conf syntax. The script, update_lpfc, is bundled with the driver kit and is installed in the /opt/EMLXlpfc directory.
- Supports Dynamic Reconfiguration (DR).
- Improved scheduler algorithm addressing potential LUN starvation in specific environments.
- Fabric-Device Management Interface (FDMI) support including “host name support extension”.

### New Features in this Release

The Emulex Driver for Solaris version 6.30g includes the following enhancements:

- Supports LP21002 and LP21001 FCoE Converged Network Adapters (CNA)(2, 4 and 8 Gb/s capable).
- Supports the LPe11004 quad-channel adapter.
- Supports HBAnyware configuration utility version 4.0. This includes support for digital diagnostics.
- Maintenance fixes.

## No-Reboot Features

The Emulex 6.30g SPARC driver enables you to do the following without rebooting:

- Discover newly provisioned targets and LUNs.
- Add new adapters to the system.
- Make persistent binding changes.
- Make other driver configuration changes.
- Turn on the log capability (log-verbose).
- Update adapter firmware.
- Load or unload the driver module.

Refer to the Configuration section of this manual for more information.

## Prerequisites

- SPARC-based system
- Solaris 8, 9 or 10 (32- and 64-bit)

## Compatibility

Emulex recommends using the latest released firmware for best reliability and performance. To support DHCHAP, you must use the recommended firmware as a minimum.

**Note:** Check the Emulex Web site for the latest firmware releases.

- LP21000 and LP21002 (FCoE 2, 4 and 8 Gb/s capable CNAs. Check the Emulex Web site for the latest firmware version.)
- LPe12000 and LPe12002 (2, 4 and 8 Gb/s capable adapters. Emulex recommends firmware version 1.00a9 or later for best performance.)
- LP11002 and LP11000 (Emulex recommends firmware version 2.72a2 or later for best performance.)
- LPe11004, LPe11002 and LPe11000 (Emulex recommends firmware version 2.72a2 or later for best performance.)
- LP10000DC and LP10000 (Emulex recommends firmware version or later 1.92a1for best performance.)
- LP9802DC (Emulex recommends firmware version 1.92a1 or later for best performance.)
- LP9802 (Emulex recommends firmware version 1.92a1 or later for best performance.)
- LP9402DC, LP9002DC, LP9002L and LP9000 (Emulex recommends firmware version 3.93a0 or later for best performance.)
- LP8000 and LP8000DC (If your adapter has a Dragonfly chip version 2.00 or greater, use firmware version 3.90a7. If your adapter has a Dragonfly chip below version 2.00, use firmware version 3.30a7. Refer to the LP8000 and LP8000DC Firmware Download page on the Emulex Web site to determine the Dragonfly chip version in use).
- Minimum OpenBoot PROM (OBP):
    - Emulex recommends that you use the latest OBP from SUN.

## Important Files

You may need to modify the following configuration files after you install the driver. You might also need to modify one or more of these files if your hardware configuration changes. For example, you may want to add additional LUNs to the FC interface. Refer to the Configuration section of this manual for more information about modifying these files.

**Table 1: Important Files**

| File | Description |
|---|---|
| lpfc.conf | Configuration file specifying tunable parameters for all LightPulse adapters attached to the host machine; this file is located where you installed the driver, for example, in /platform/<arch>/kernel/drv or in /kernel/drv. |
| /etc/hostname.lpfc<0-N> | Configuration files specifying adapters for use with IP networking. For each LightPulse adapter involved in networking, there must be a hostname.lpfc<0-N> file in /etc containing the host's name on that network.<br><br>**NOTE:** You do not need these files if you only use the driver for SCSI support. |
| /etc/system | Host-wide tunable parameters. |
| /kernel/drv/sd.conf | Options for the SCSI disk driver. |
| /kernel/drv/st.conf | Options for the SCSI tape driver. |
| /etc/sysevent/config/LPFC,sysevent.conf | Configuration file for DHCHAP related sysevent logging. |
| /opt/EMLXlpfc/lpfc_authlog32<br>/opt/EMLXlpfc/lpfc_authlog64 | These two files hold Emulex delivered binaries (32-bit and 64-bit respectively) for handling the sysevent delivered through the adapter driver during DHCHAP authentication. (See Solaris man page ddi_log_sysevent [9F] for more information.) |

## Things to Know Before You Download

- Before you download, create a temporary directory for the download package.

**Caution:** Installing version 6.30g of the driver for Solaris may be significantly different from previous releases. Follow the instructions for initial installation. Failure to follow these steps could render your system inoperable.

If you are updating the driver from version 5.x, 6.00 or later to 6.30g in any system, refer to the following update procedure: "Updating a Driver (from Version 5.x and 6.X) for Emulex LightPulse Adapters" on page 9.

After you install the driver, you must install the utility package, which includes the HBAnyware utility and HBA-API libraries. Refer to "Installing the HBAnyware Utility" on page 11.

**Caution:** As a matter of course, you should always make a full system backup prior to beginning an installation or update procedure.

- /etc/hostname.lpfc<0-N> - configuration files specifying adapters for use with IP networking. For each LightPulse adapter involved in networking, there must be a hostname.lpfc<0-N> file in /etc containing the host's name on that network.

**Note:** These files are not required if the driver is being used for SCSI support only.

## SUN SAN Foundation Software Considerations

Emulex also produces a separate Fibre Channel Adapter (FCA) driver (emlxs) that supports the SUN SAN Foundation Software (SFS). SUN distributes and supports the Emulex emlxs driver as an integral part of the operating system starting with Solaris 10 update 1. Upon installation, this driver discovers and binds all adapters it recognizes. Since Emulex LightPulse adapters are supported by both the lpfc and emlxs drivers, the driver installation scripts do not modify existing installations of the other driver type. For example, if emlxs is already installed on your system and you attempt to install the lpfc driver, then the lpfc driver does not claim any of the adapters that the emlxs driver has already claimed, although the driver is properly installed on the system.

To change the driver adapter bindings, run the emlxdrv utility. The utility enables you to choose which driver (lpfc or emlxs) controls the Emulex adapters in the system. The utility is bundled with the Emulex lpfc 6.30g driver.

To unbind the emlxs driver and bind the lpfc driver on Emulex LightPulse adapters:

1. Undo all associations of the emlxs driver to Emulex LightPulse adapters.

   ```
   # /opt/EMLXlpfc/emlxdrv clear_emlxs
   ```

2. Associate the lpfc driver to all Emulex LightPulse adapters.

   ```
   # /opt/EMLXlpfc/emlxdrv set_lpfc_nonsun
   ```

3. Reboot the system.

Consult the FCA Utilities Manual for further details about the emlxdrv utility.

**Note:** If the SUN SAN Foundation Software was installed on previous versions of Solaris, the same procedures must be followed after installing the lpfc driver.

## Known Issues

The following issues have been reported at the time of publication. These issues may not yet have been verified or confirmed and may apply to another product, such as the firmware or hardware.

### Loss of Tape Device on Reboot

On Solaris 8 and 9, a reconfiguration reboot may result in the loss of tape devices managed by the lpfc driver.

To work around this issue, perform one of the following steps.

- Force load the SCSI tape driver in the /etc/system file. This prevents the SCSI tape driver from unloading on a reconfiguration operation, and hence all the tape devices originally seen by the lpfc driver can still be managed.

  OR

- Rescan the luns managed by the lpfc driver, by running hbacmd:

  ```
  /opt/HBAnyware/hbacmd RescanLuns <hba WWPN> <target WWPN>
  ```

### Cleaning Up Dangling Devices Using devfsadm(1M)

Solaris provides a utility, devfsadm(1M), to probe for new devices added after the system boots. Run devfsadm -C, to cleanup dangling device links and acquire access to new devices.

Finally, in extreme cases, do the following, as ‘root’:

```
# touch /reconfigure
# reboot
```

A reconfiguration reboot makes Solaris rediscover all possible devices at boot time.

#### Different SCSI Target IDs on Different Hosts

A FC target is assigned its D_ID at loop initialization time; the SCSI target ID for that target is assigned by the device driver when the device is first discovered. It is possible for the D_ID to change between one loop initialization and the next. Every time a system boots or a target is added to or removed from the FC, the loop is re-initialized. After a system has booted, it maintains a constant view of the same target ID because the driver software remaps the SCSI target ID to the new D_ID automatically. However, a second system may use a different SCSI target ID for that same target. If you want to work with the same target across multiple hosts, you may find the same FC target is known by different SCSI target IDs. Use the persistent binding feature to maintain a consistent target ID on all systems.

### IP Promiscuous Mode

The Emulex driver for Solaris supports promiscuous mode. However, promiscuous mode on FC works differently than you might expect compared to promiscuous mode on Ethernet.

Promiscuous mode allows you to do things such as run tcpdump and other utilities to find out what packets are being sent from or received by a node on a network. Unlike a true Ethernet driver, the Emulex driver working in promiscuous mode does not really receive all the packets going over the wire. FC, unlike Ethernet, is not a broadcast medium. When promiscuous mode is enabled on the host machine, only the packets sent between the host machine and another machine can be seen. Packets sent between other machines cannot be seen. This restriction is a property of FC itself.

As a result of the driver's implementation, packets may not be reported in order. Sometimes a TCP acknowledgment packet can be sent back up a promiscuous STREAM before transmitted data packets are sent up that STREAM.

Networking throughput decreases and latency increases for all packets sent or received through lpfc while promiscuous mode is enabled. In promiscuous mode, a duplicate copy of the data for each incoming packet is made. This copy is used by the socket operating in promiscuous mode. Another side effect of promiscuous mode is an increase in memory use.

#### fsck Through Block Device Fails

Using fsck against the block-, instead of the character-special device, can result in error messages about unreadable blocks, messages about partially allocated inodes, unknown file types and other unusual problems. Damage to the slice can result. Using the character-special device always works correctly.

# Installing the Emulex Driver Version 6.30g for Solaris

## Introduction

The Emulex driver for Solaris download package, which you download from the Emulex Web site, includes a tar file for the driver and a tar file for the driver utilities (HBAnyware utility and HBA API files). When you install the download package, you will perform the following steps:

1. Install or upgrade the driver using one of the following procedures:
   - If you are installing the driver for the first time, see “Installing the Driver for the First Time” on page 6.
   - If you are updating the driver from version 5.x, 6.00 or later to 6.30g in any system, see “Updating a Driver (from Version 5.x and 6.X) for Emulex LightPulse Adapters” on page 9.
2. Install the driver utility, see “Installing the HBAnyware Utility” on page 11.

**Note:** The HBAnyware utility must be installed separately from the driver. Refer to the "Installing the Utility" on page 11 for more information.

## Installing the Driver for the First Time

To install the Emulex driver for Solaris for the first time:

1. Login as, or su to ‘root’.
2. Load the package from your distribution medium into a directory, referred to here as `<where-you-put-it>`.
   The driver is a regular tar file, named `lpfc-<driver version>-sparc.tar`.
3. Change to the `<where-you-put-it>` directory. Type:

   ```
   cd <where-you-put-it>
   ```
4. Extract the installation image from the tar file. Type:

   ```
   tar xvf lpfc-<driver version>-sparc.tar
   ```
5. At the shell prompt, type:

   ```
   pkgadd -d `pwd`
   ```

   If you are installing the lpfc driver on an alternate root, type:

   ```
   pkgadd -R <alt-root> -d `pwd`
   ```

   **Note:** If you are performing pkgadd on an alternate system root, you may see the following warning messages depending on your system setup.

   ```
   WARNING: unknown admin parameter <networktimeout>
   WARNING: unknown admin parameter <networkretries>
   WARNING: unknown admin parameter <authentication>
   WARNING: unknown admin parameter <keystore>
   ```

   This situation can also lead to partial installation of the lpfc driver package. The issue is mainly seen when you run pkgadd from a Solaris release that is older than the Solaris release on the alternate root. The newer updates of Solaris 9 (and 10) have new admin parameters defined in var/sadm/install/admin/default that are not recognized by the earlier Solaris releases. Use an alternate admin file, while running pkgadd in these situations. See the Solaris system administration documentation and the pkgadd(1M) and pkgrm(1M) manual pages for further details.

6. Answer the following question:

```
Select package(s) you wish to process (or 'all' to process all packages).
(default: all) [?,??,q]:
```

7. Select the number associated with lpfc for installation. If you need help, type? or ??. You may see some additional questions related to directories. Ordinarily, the defaults are sufficient. To select a default press **<Enter>**.

    a. Answer the question:

```
Rebuild manual pages database for section 7d [y,n,?]:
```

    Manual pages for lpfc are installed in section 7d of the online man pages. Normally, you can run the catman command to create preformatted versions of the on-line manual from the nroff(1) input files. Each manual page is examined and those whose preformatted versions are missing or out of date are recreated. If any changes are made, catman recreates the windex database. Depending on your system, this operation can take anywhere from 1 to 10 minutes. If you type **<n>**, the catman is skipped which allows the installation to complete quickly. The catman command skipped is output for the administrator to run at a later point in time, if desired.

    b. The next question you see is:

```
Use IP networking over Fibre Channel [y,n,?]:
```

    Answer **<y>** if you want to enable IP or **<n>** if you do not want to enable IP.

8. Continue with the installation by answering Yes to the following:

```
Do you want to continue with the installation of <lpfc> [y,n,?]:
```

9. The install package provides running commentary on the installation process. Be sure to examine the output for any errors or warnings. When the installation concludes, notice the message:

```
SCSI: If you are using the lpfc driver to access SCSI devices, please
refer to the User Manual on www.emulex.com with regards to discovering
SCSI targets and LUNs.
```

10. Finally, you are asked:

```
Select package(s) you wish to process (or 'all' to process all packages).
(default: all) [?,??,q]:
```

    This is the same question that began your session. If you do not want to install additional packages, type **<q>**. The lpfc driver installation is now complete. After you quit, you see the following message:

```
***IMPORTANT NOTICE ***
This machine must now be rebooted in order to ensure safe operation.
```

    At this point the driver is loaded and automapped targets are visible to the system and the HBAnyware utility.

11. Before you reboot the machine, consider whether you must modify any configuration files, beyond the defaults established by the installation process.

    a. View the /kernel/drv/lpfc.conf file. If necessary, change settings as you deem appropriate. However, the defaults are likely to be satisfactory. You can find lpfc.conf in the /kernel/drv if the driver is installed referencing the root directory. Refer to “The Configuration File (lpfc.conf)” on page 19 for more information on changing driver properties using the lpfc.conf file. After it is installed, you can also change driver properties using the HBAnyware utility. Refer to the HBAnyware Utility User Manual for more information.

    b. Starting with the 6.20 release of the lpfc driver, all targets and LUNs discovered by the driver are automatically reported to the OS. If you do not want to expose certain

targets/LUNs to the OS, refer to “Target / LUN Masking” on page 37 for more information.

c. You must create an address file for each adapter that you want to configure for IP networking. The installation process creates the address file `/etc/hostname.lpfc0` by default. You may need to rename this file to match the lpfc instance number.

12. Reboot the system to ensure proper operation, if networking was enabled during installation or if non-dynamic driver parameters were changed. At the shell prompt, type the following:

```
# sync
# reboot
```

The system reboots to multi-user mode and the Emulex LightPulse driver is available for use. If you are enabling IP networking, you may find after rebooting the system that FCP disk access works but host-to-host IP access does not work. This generally means you have an error in the /etc/hostname.lpfc<0-N> file(s). Make sure the lpfc instance number(s) as reported by dmesg(1M) matches the lpfc number(s) in the /etc/hostname.lpfc<0-N> file(s).

## Installing the Driver as a Loadable Kernel Module

When installing the device driver as a loadable kernel module, you must use supported versions of the hardware and software. Refer to the “Compatibility” section on page 2 of the manual and read the “Configuration” section beginning on page 16 before you start the installation.

To load the driver as a loadable module:

1. Login as or su to ‘root’.
2. Type:
```
modload /kernel/drv/lpfc (for 32-bit platforms) or
modload /kernel/drv/sparcv9/lpfc (for 64-bit platforms)
```
3. Type:
```
cfgadm
```
Identify and record the < Ap_Ids> of all the Emulex LightPulse adapters on the system.
4. Type:
```
cfgadm -c configure <Ap_Id>
```
for each of the Emulex LightPulse adapters.

To unload the driver:

1. Login as or su to ‘root’.
2. Un-mount all the filesystems that belong to the lpfc driver.
3. Un-plumb all IP interfaces that belong to the lpfc driver, if networking is enabled on the lpfc driver.
4. Stop all HBAnyware/elxhbamgr processes.
5. Type:
```
cfgadm
```
Record the <Ap_Ids> of all the Emulex LightPulse adapters on the system.
6. Type:
```
cfgadm -c unconfigure <Ap_Id>
```
for each of the Emulex LightPulse adapters.
7. Type:
```
modunload -i <module_id>
```
where <*module_id*> is the ID of the lpfc driver. You can get IDs by running modinfo.

### RCM Script

The lpfc 6.30g driver includes a rcmscript(4) named lpfc,hpdr. The driver package installs the rcmscript under /usr/lib/rcm/scripts. If a dynamic reconfiguration (DR) operation is attempted to remove an lpfc instance, the DR operation fails if the rcpscript detects the HBAnyware utility process on the system. The lpfc,hpdr script command default timeout value is 15 seconds. If necessary, you can modify it to better suit the demands of the system.

**Note:** The rcmscript does not detect the presence of any third party management applications that may be accessing the lpfc adapters via libhbapi(3LIB). Before attempting to unconfigure a lpfc instance, stop all applications that are accessing the lpfc instances.

# Updating Existing Drivers

## Updating a Driver (from Version 5.x and 6.X) for Emulex LightPulse Adapters

**Note:** If you are currently running an older version of the Emulex driver for Solaris, the update procedure includes removing the old driver.

Before upgrading the driver, you must uninstall any previously installed utilities. Refer to the "Uninstalling the Utilities" section on page 16 for instructions.

You can update the driver by saving certain driver configuration files and using pkgrm. Two files are saved when you run pkgrm.

- The /kernel/drv/lpfc.conf file is moved to /usr/tmp/lpfc.conf.pkgrm allowing you to restore any customized parameter settings after installing a new device driver.
- The file /kernel/drv/sd.conf is copied to /usr/tmp/sd.conf.pkgrm. The file could be referenced to setup target/LUN masking in lpfc.conf. Additionally any lpfc specific settings in the original file are deleted by the pkgrm process.

  **Note:** As of the 6.20j release, the lpfc driver does not rely on /kernel/drv/sd.conf for SCSI disk probing. See “Parameter Reconfiguration” on page 36 for more information.

After installing a new device driver, you can use the saved files to restore all the customized disk settings.

**WARNING:** The 6.30g driver adds a few new configuration parameters, deprecates a few, and renames a couple of old parameters. Do NOT replace the current lpfc.conf with lpfc.conf from a previous release.

To update the driver:

1. Login as or su to ‘root’.
2. At the shell prompt, type:

   ```
   pkgrm lpfc
   ```
3. Install the new driver package. Type:

   ```
   pkgadd –d ‘pwd‘
   ```

4. Update the configuration parameters in /kernel/drv/lpfc.conf with the values from the saved copy /usr/tmp/lpfc.conf.pkgrm. You can do this automatically using the tool /opt/EMLXlpfc/update_lpfc. See “update_lpfc” on page 10 for more information on the tool.
```
/opt/EMLXlpfc/update_lpfc
/usr/tmp/lpfc.conf.pkgrm /kernel/drv/lpfc.conf >
/tmp/lpfc.conf
```
5. Examine the file /tmp/lpfc.conf and make sure the tool has migrated your settings from 6.x to 6.30g correctly. Copy the file /tmp/lpf.conf back to /kernel/drv/lpfc.conf.
6. Construct the target/LUN masking entries in /kernel/drv/lpfc.conf based on the entries in /usr/tmp/sd.conf.pkgrm.
7. Reboot the system.

## update_lpfc

update_lpfc is a simple conversion tool used to upgrade the Solaris lpfc driver from versions 5.01x or 5.02x to versions 6.00g, 6.01c, 6.01f, 6.02e, 6.02f, 6.02g, 6.10g, 6.11c, 6.20j 6.21f and 6.30g. This tool converts the older lpfc.conf files to the proper 6.x syntax.

### Usage

```
/opt/EMLXlpfc/update_lpfc <lpfc.conf.5x> <lpfc.conf.6x>
```

The script extracts relevant information such as user updates from the original lpfc.conf (5x) and applies them to the new lpfc.conf (6x). The tool does not modify either of the input files. It directs the output to stdout. The tool employs sed and nawk to process the information, such as user updates, from the lpfc.conf file.

### Caveats

- The tool does not check for syntax in the original lpfc.conf file. Nor does the tool validate the values of the configuration parameters, except for the ones described in this section. It is assumed that the original lpfc.conf is a working file.
- Comments from the original lpfc.conf are ignored.
- All configuration parameter assignments should start on column 1. There should be no leading white spaces in the configuration parameter assignments in the original lpfc.conf file.
- The user defined persistent bindings should not be interspersed with comments. For example, the following persistent bindings are not translated to 6.x correctly.
```
fcp-bind-DID="0000ef:lpfc0t3",
# "0000e8:lpfc0t4;
"0000e4:lpfc0t4";
```
- The permissible values for the configuration parameter ‘automap’ have changed in the 6.x driver. The permissible values are 0 and 1. If ‘automap’ was set to 1, 2, or 3 in the original lpfc.conf file, the tool changes this value to 1.
- The ‘fcp-bind-method’ parameter is new to lpfc 6.x driver. The tool sets ‘fcp-bind-method’ based on the type of persistent bindings used in the original lpfc.conf file. If persistent bindings are not defined in the original lpfc.conf file, the tool sets ‘fcp-bind-method’ based on the automap parameter from the original lpfc.conf file.
- If ‘scan-down’ was set to 2 in the original lpfc.conf, the tool sets ‘scan-down’ to 1. The 6.x lpfc driver does not allow a ‘scan-down’ value of 2.
- The deprecated lpfc.conf parameters are not carried over.
- If the configuration parameters ‘cr-count’, ‘num-bufs’ and ‘num-iocbs’ are set to their default settings in the original lpfc.conf, the tool updates the values of these parameters to their new defaults.

## Directory Structure

After installation, the following directories are created on the system.

**Table 2: Directory Structure**

| Directory | Description |
|---|---|
| /opt/EMLXlpfc | Driver utilities (This directory is created after the driver is installed.) |
| /opt/HBAnyware | HBAnyware utility files (This directory is created after the utility is installed.) |

# Installing the HBAnyware Utility

Follow these instructions to install the HBAnyware utility on your system. Refer to the HBAnyware Utility Version 4.0 User Manual for information about the utility.

## Prerequisites

- The lpfc driver 6.30g must be installed prior to installing the utility.
- Java Runtime Environment:

  Version 5 or later of the Java Runtime Environment (JRE) must be installed. The HBAnyware utility will not run under earlier versions of the JRE. The JRE and instructions for installation can be found at http://java.sun.com/downloads/index.html.

## Procedure

To install the HBAnyware utility from the tar file:

1. Uncompress and untar the EmlxApps file.
2. Run the unpack script. Type:
   `./unpack_apps`
   to obtain correct package version.
3. Unzip the file. Type:
   `gunzip HBAnyware-<version>-sparc.tar.gz`
4. Untar the file. Type:
   `tar -xvf HBAnyware-<version>-sparc.tar`
5. Run the pkgadd utility. Type:
   `pkgadd -d .`
6. When prompted by pkadd, choose to install the HBAnyware utility.
7. When prompted by pkadd, answer the HBAnyware installation option questions.

**Note:** The utility requires the java runtime binaries and libraries, so their path must be included in the PATH environment variable. For example, if the java runtime binaries are in /opt/EMLXlpfc/usr/java/bin, then include this path in the PATH environment variable.

For example:
(<bash> export PATH="$PATH:/opt/EMLXlpfc/usr/java/bin")

# Installing the HBAnyware Utility with Web Launch

## Prerequisites

Before installing the HBAnyware utility with Web Launch, ensure your systems meet the following requirements.

- /opt/EMLXlpfc on which you are installing the Web Launch services package (the server) requires the following:
  - The HTTP server must be configured to handle the JNLP MIME file type. The following MIME file type/file extension must be added to your server configuration:

    ```
    MIME type: application/x-java-jnlp-file

    File Extension: jnlp
    ```
  - The HTTP server must be configured and running.
- The system on which you run the browser (the client) requires the following:
  - The Java Runtime Environment (JRE) 5.0 or later must be installed. Below are the specific requirements:
    - Sun 32-bit JRE 5.0 or later for Intel based systems (x86 and IA64)
    - Sun 32-bit JRE 5.0 or later x86-64

  Refer to the appropriate vendor documentation for detailed instructions about configuring MIME types, configuring and starting the HTTP server and installing the JRE.
- The HBAnyware utility must be installed before installing Web Launch.

## Procedure

To install the HBAnyware utility with Web Launch:

1. Login as or su to ‘root’.
2. Navigate to the HBAnyware directory. Type:
   `cd /opt/HBAnyware`
3. Run the install script. Type:
   `./wsinstall`
4. When prompted, enter the Web server's document root directory. For example:

   ```
   /srv/www/htdocs
   ```
5. You are provided with the IP address of the host and asked if that is the IP address that is being used by your Web server. Answer **<y>** or **<n>** as appropriate. If you answer **<n>**, you are prompted for the IP address you want to use.
6. You are asked if your web server listening on the normal default HTTP port (80)? Answer **<Y>** or **<n>** as appropriate. If you answer **<n>**, you are prompted for the port you want to use.

   You are notified the installation of the HBAnyware Web Launch package has completed.

## Installing the HBAnyware Utility Security Configurator

Follow these instructions to install the HBAnyware utility Security Configurator on your system.

### Prerequisites

- The lpfc driver 6.30g must be installed prior to installing the utility.
- The HBAnyware utility must be installed on the system.
- Java Runtime Environment:

  Version 5 of the Java Runtime Environment (JRE) must be installed. The HBAnyware utility will not run under earlier versions of the JRE.

  The JRE and instructions for installation can be found at: http://java.sun.com/downloads/index.html.

### Procedure

To install the HBAnyware utility Security Configurator from a tar file:

1. Copy the <HBAnywareSSC_version>.tar.gz file to a directory on the install machine.
2. cd to the directory to which you copied the gz file.
3. Untar the file. Type:
   `gzcat <HBAnywareSSC_version>.tar.gz | tar xvf-`
4. su to ‘root’.
5. At the shell prompt, type:
   `pkgadd -d `pwd``

# Removing an Existing Driver

The Emulex driver for Solaris can be removed by using pkgrm. All the lpfc files are removed, including the file containing the driver itself. The next time the system is rebooted, the driver is not loaded. All system resources, such as disk space and memory, are reclaimed.

Two files are saved when a pkgrm is performed:

- The /kernel/drv/lpfc.conf file is copied to /usr/tmp/lpfc.conf.pkgrm. This file is used as a reference to restore any customized parameter settings after updating a new device driver.
- The /kernel/drv/sd.conf file is copied to /usr/tmp/sd.conf.pkgrm. This file is used as a reference to restore any customized parameter settings after updating a new device driver.

To remove the driver:

1. Login as or su to ‘root’.
2. Remove the HBAnyware utility. Type:
   `pkgrm HBAnyware`
3. At the shell prompt, type:
   `pkgrm lpfc`

If you are removing the lpfc driver on an alternate root, type:
`pkgrm -R <alt-root> -d `pwd``

**Note:** If you are performing pkgrm on an alternate system root, you may see the following warning messages depending on your system setup.

WARNING: unknown admin parameter <networktimeout>
WARNING: unknown admin parameter <networkretries>
WARNING: unknown admin parameter <authentication>
WARNING: unknown admin parameter <keystore>

This situation also leads to partial removal of the lpfc driver package. The issue is mainly seen when you run pkgrm from a Solaris release that is older than the Solaris release on the alternate root. The newer updates of Solaris 9 (and 10) have new admin parameters defined in var/sadm/install/admin/default that are not recognized by the earlier Solaris releases. Use an alternate admin file, while running pkgrm in these situations. Refer to the Solaris system administration documentation and the pkgadd(1M) and pkgrm(1M) manual pages for further details.

4. Perform a reconfiguration reboot into single user mode by typing:
   `reboot -- -rs`

   For further information on installing and removing drivers, consult the Solaris system administration documentation and the pkgadd(1M) and pkgrm(1M) manual pages.

# Uninstalling the Utilities

Follow these instructions to uninstall the utilities.

**Note:** If the HBAnyware Security Configurator is installed, it must be uninstalled before uninstalling the HBAnyware utility.

## Uninstalling the HBAnyware Security Configurator

1. Login as or su to ‘root’.
2. Type:
   `pkgrm HBAnywareSSC`

## Uninstalling the HBAnyware Utility

To uninstall the HBAnyware utility:

1. Login as or su to ‘root’.
2. Type:
   `pkgrm HBAnyware`

## Uninstalling the HBAnyware Utility with Web Launch

**Note:** If you installed HBAnyware with Web Launch, you must uninstall it before uninstalling HBAnyware.

To uninstall the HBAnyware utility with Web Launch:

1. Login as or su to ‘root’.

2. Execute the following script:
   `/opt/HBAnyware/wsuninstall`

This script stops the HBAnyware Web Launch Service daemons (if they are running) and removes all Web Launch related files from the host.

# Loading Manpages

Manual pages are installed in section 7d of the online man pages. Normally the ‘catman’ command can be run to create preformatted versions of the on-line manual from the nroff(1) input files. Each manual page is examined, and those whose preformatted versions are missing or out of date are re-created. If any changes are made, catman re-creates the windex database. Depending on your system, this operation can take anywhere from 1 to 10 minutes. If you press **<n>**, the catman is skipped, which allows the installation to complete quickly. If the catman command is skipped it can be run later.

# Configuration

## Introduction

You can configure the Emulex driver for Solaris properties by:

- Editing the driver properties in the lpfc.conf file. See “Driver Properties specified in lpfc.conf” on page 20 to view the list of configurable driver properties.
- Using the Emulex HBAnyware utility. See the HBAnyware Utility version 4.0 User Manual for more information.

**Note:** The HBAnyware utility enables you to make dynamic driver property changes with any version of Solaris. However, changes made by editing the lpfc.conf file and issuing an update_drv command are only dynamic for Solaris 9 and later.

## Using lpfc.conf for Solaris 9 and 10

Typically, the Solaris device configurator obtains the driver's configuration properties by scanning driver.conf, that is, the lpfc.conf file, during the system’s first boot up. The lpfc driver obtains these configuration properties from the Solaris kernel during driver's attachment phase. However on Solaris releases 9 or later, you can force the lpfc driver re-obtain the configuration properties using the update_drv system command.

**Note:** The update_drv command does not change the driver properties for the lpfc instances that are already active in the system. The changes are applicable to any new lpfc instances that are attached afterwards. Changes made by editing the lpfc.conf file and issuing an update_drv command are only dynamic for Solaris 9 and later.

To modify the driver properties:

1. Login as or su to ‘root’.
2. Edit the configuration parameters in the file /kernel/drv/lpfc.conf. To view a table of all lpfc.conf parameters, see “Driver Properties specified in lpfc.conf” on page 20.
3. Run update_drv –f lpfc to force the Solaris system to re-read lpfc.conf.

To modify driver properties for an adapter instance that is already active:

1. Login as or su to ‘root’.
2. Run cfgadm and note down the <Ap_Id> corresponding to the lpfc instance.
3. Unconfigure the lpfc driver instance corresponding to <Ap_Id>.
4. Edit the adapter-specific driver properties in the file /kernel/drv/lpfc.conf.
5. Run update_drv –f lpfc to force the Solaris system to re-read lpfc.conf.
6. Run cfgadm and configure the adapter instance back.

To modify driver properties for an adapter that is yet to be added:

1. Login as su to ‘root’.
2. Run cfgadm and configure the new adapter instance. Write down the adapter instance (the adapter instance is printed in the driver sign-on messages).
3. Run cfgadm and unconfigure the new adapter instance.
4. Edit the adapter-specific driver properties in the file /kernel/drv/lpfc.conf.
5. Run update_drv –f lpfc to force the Solaris system to re-read lpfc.conf.
6. Run cfgadm and configure the new adapter instance.

# Updating Parameters for Solaris 8

To change driver properties or bindings in Solaris 8:

1. Quiesce all I/O on the device.
2. Unconfigure all ports with open instances to the driver.
3. Edit the adapter-specific driver properties in the file /kernel/drv/lpfc.conf.
4. Unload the driver using the modunload command. (See “Installing the Driver as a Loadable Kernel Module” on page 8.)
5. Reload the driver using the modload command. (See “Installing the Driver as a Loadable Kernel Module” on page 8.)

# Understanding Device Numbering

When you configure the driver, there are various driver properties that rely on device numbers. This section explains the two different levels of device numbering and how they apply to specific driver properties.

### The Driver Instance Number

The first level of device numbering is the driver instance number. This is the number displayed in log messages to syslog or the console, for example, lpfcX. The lpfc.conf driver properties that use lpfcXtY rely on X to be the driver instance number and Y to be the FCP target number. This format is used for configuring LUN throttles and persistent binding.

### The SCSI Controller Number

The second level of numbering is the SCSI controller number. The system assigns this number for each SCSI target driver it detects. It is typically in the special files created to access each SCSI device, for example /dev/dsk/cXt0d0s2. Once these numbers are assigned, they stay the same between reboots if there are no adapter changes to the system.

# DHCHAP Authentication and Configuration

The Emulex driver version 6.30g for Solaris supports the FC-SP/Authentication DHCHAP. To activate FC-SP/Authentication between the adapter host port and Fabric F_port using DHCHAP, modify the DHCHAP associated driver properties in the driver lpfc.conf file.

The following table describes the DHCHAP features of the Emulex driver version 6.30g for Solaris.

**Table 3: DHCHAP Features of the Emulex Driver for Solaris**

| Feature | Description |
|---|---|
| Local Authentication without using RADIUS server | Authentication verification is performed locally inside the adapter driver's context rather than through outside entity like RADIUS server. |
| Authentication Transaction between Host and Fabric only | The DHCHAP authentication only happens between the host and fabric in the SAN. If multiple Emulex adapters and target ports co-exist in the SAN, the adapters can recognize each other, but no authentication happens between these adapter ports or between adapter ports and target ports. If the target port is configured to request support for FC-SP CHAP, these target ports may not be accessible to the adapter port. |
| Per adapter port based uni-directional and bi-directional DHCHAP authentication | There is a configurable parameter to specify if the authentication initiator supports uni-directional or bi-directional DHCHAP authentication on a per adapter port, remote fabric F_Port basis. |
| Full Diffie-Hellmann group (NULL, 1, 2, 3, 4) DHCHAP support | Support of NULL DHCHAP authentication is mandatory for the adapter port and the initiator. The driver also supports DH group 1, 2, 3, 4 authentications. The same generator 2 is used and the modulus for each group is a hard coded hex value defined in FC-SP spec. (v1.8) |
| Host and Fabric initiated re-authentication heart beat support | The authentication heart beat interval is configurable on the per adapter port, remote Fabric F_Port pair basis. The authentication heartbeat is launched automatically following the first successful authentication. |
| Hash algorithms Message-Digest Algorithm (MD-5) and Secure Hash Algorithm (SHA-1) support | MD-5 and SHA-1 implementation copyrights are from RSA Data Security. The keys associated with the adapter port and remote entity pair are stored in the clear text as either the ASCII type or binary type with the maximum length of 128 bytes. |
| Support DHCHAP authentication sysevent logging for Security audit | Sysevent logging support is dependent on the syeventd daemon and syseventconfd daemon in Solaris (8 or newer) and sysevent log repository location is configurable through LPFC, sysevent.conf installed in to the system as part of the Emulex driver package. See “Sysevent Logging” on page 42 for more information. |
| libdfc.so library supporting HBAnyware version 4.0 Authentication | You can use the HBAnyware utility or hbacmd to configure the authentication properties dynamically and initiate the authentication at any time. The new parameters are stored in the driver.conf file after they are changed. See the HBAnyware Utility version 4.0 User Manual for more information. |
| Support lpfc_msgbuf mdb command for debugging | A new lpfc_msgbuf MDB command is supported to dump the DHCHAP related debugging messages stored in the kernel internal buffers.These DHCHAP debugging messages can be retrieved in the live system or in the kernel core dump. |

## DHCHAP Authentication Driver Properties

To support DHCHAP the lpfc.conf file has the following driver properties. See Table 4 for descriptions and values for these properties:

- auth-cfgparms
- auth-keys
- enable-auth

# The Configuration File (lpfc.conf)

The lpfc.conf file contains all the driver properties that control driver initialization. The file is located in the installation directory containing the binary for the driver itself, lpfc. Typically, this directory is /platform/<arch>/kernel/drv or /kernel/drv. You can get other information dynamically by probing the attached adapter.

In the lpfc.conf file, all adapter-specific driver properties have lpfcX-prefix (where X is the driver instance number); for example, setting lpfc0-lun-queue-depth= 20 makes 20 the default number of maximum commands which can be sent to a single logical unit (disk).

Table 4 on page 20 describes the lpfc.conf driver properties. The lpfc man page provides further device property details.

## Configuring Properties

Driver properties are set per adapter. For example, setting `num-iocbs` to 1000 allocates 1000 I/O control blocks for every LightPulse adapter in the host machine. If you want to have a configuration parameter apply to a specific LightPulse adapter, prepend lpfcX- to the configuration parameter (where X is the driver instance number). For example, setting `lpfc0-num-iocbs` to 2000 allocates 2000 I/O control blocks for the lpfc0 driver interface.

All properties listed as controller-specific in the Table 4 are global unless prepended with the lpfcX code. Global properties are never controller-specific; they are always global. Properties listed as “Dynamic” can be modified dynamically via the diagnostic (dfc) interface. Properties not listed as “Dynamic” cannot be modified via the dfc interface; the driver must be re-loaded for the changes to take effect. For example, a change to the network-on property, requires a system reboot for the changes to take effect.

To configure driver properties:

1. Open the lpfc.conf file in a text editor.
2. Change the properties you want.
3. Save the file.
4. If required, reboot the system for the changes to take effect.

**Note:** The fcp-bind-WWNN, fcp-bind-WWPN and fcp-bind-DID driver properties do not apply to a specific adapter. They are the global properties. These properties specify a list of persistent bindings. Each entry in this list applies to a specific instance of an adapter. You can only use one type of binding per adapter.

**Table 4: Driver Properties specified in lpfc.conf**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| ack0 | Controller Specific | 0 | 0=Off | 1=On | No | Use ACK0 for class 2. If ack0 is 1, the adapter tries to use ACK0 when running Class 2 traffic to a device. If the device does not support ACK0, then the adapter uses ACK1. If ack0 is 0, only ACK1 is used when running Class2 traffic. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| auth-cfgparms | Controller Specific | **Description and Values:** This is the DHCHAP related driver property for FC-SP support. It is only valid when driver property enable-auth is set to 1. This driver property is ignored when enable-auth is set to 0. The format of this property is (all on one line) "LWWN\|RWWN\|auth_tov\|auth_mode\|bidir\|typelist\|hashlist\|dhgplist\|reauth_intval"<br><br>LWWN: The WWPN of the local entity, that is, the adapter port. Use NNNNNNNNNNNNNNNN, where NNNNNNNNNNNNNNNN is a 16 digit representation of the host port WWPN. Or you could use 0000000000000000 to refer to local port WWPN.<br><br>RWWN: The WWPN of the remote entity, that is, the fabric controller. You should use the form of NNNNNNNNNNNNNNNN, where NNNNNNNNNNNNNNNN is a 16 digit representation of the fabric controller or FFFFFFFFFFFFFFFF as generic remote fabric port WWPN.<br><br>auth_tov: The authentication timeout value in seconds. The atov range is 20 to 999 seconds in hexidecimal. For example, 45 seconds would be entered as 002d.<br><br>auth_mod: The authentication mode. The valid modes are specified as 01 (Disabled), 02 (Enabled) and 03 (Passive). For detailed description of the mode, refer to the Emulex HBAnyware (4.0) utility help page.<br><br>bidir: The bi-directional authentication parameter. When set to 01, bi-directional authentication is enabled. When set to 00, bi-directional authentication is disabled. When bidirectional authentication is enabled, the key associated with remote entity must be specified in driver property auth-keys.<br><br>typelist: The authentication type list. Currently the Emulex lpfc driver only supports DHCHAP, tlist should always be set to 01000000.<br><br>hashlist: The authentication hash list. Currently the Emulex lpfc driver only supports MD5 and SHA1. 01 refers to MD5, 02 refers to SHA1. For example: 01020000 means MD5, SHA1 in order of preference. 01000000 means MD5 only.<br><br>dhgplist: The DHCHAP group list in order of preference. Currently the Emulex lpfc driver supports NULL DHCHAP algorithm and non-NULL DHCHAP algorithm such as DH group 1024, group 1280, group 1536 and group 2048. For example: 0102030405000000 means NULL, group 1024,1280, 1536 and 2048 in order of preference.<br><br>reauth_intval: Reauthentication heart beat interval in minutes. For example, 0000012c means the host side reauthenticates every 300 minutes. Setting reauth_intval to 00000000 disables the reauthentication heartbeat.<br><br>You can use lpfcX-auth-cfgparms to specify the per adapter instance DHCHAP authentication parameters setup. Any valid setup overwrites auth-cfgparms setup. Do note remove this default setup. | | | | | |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| auth-keys | Controller Specific | **Description and Values:** This is the DHCHAP authentication key driver property for FC-SP support. It is only valid when driver property enable-auth is set to 1. This driver property is ignored when enable-auth is set to 0. The format of this property is:<br><br>"LWWN:type:length:pwd:RWWN:type:length:pwd"<br><br>LWWN: The WWPN of the local entity, that is, the adapter port. You should use the form of NNNNNNNNNNNNNNN, where NNNNNNNNNNNNNNNN is a 16 digit representation of the Host port WorldWide Port Name. Or you could use 0000000000000000 to refer to local port WWPN.<br><br>type: The type of the key. The valid type could be ASCII text format represented by 0001, or binary format (Hexidecimal input) represented by 0002, or 0003 ignored. When 0003 is used, the corresponding klength and key are ignored. The format is 4 digits.<br><br>length: The length of the key in bits. The length is represented by hexidecimal format. For example: 32 bytes of key should be represented by 0100. The maximum size of key is 128 bytes. The minimum size of key is 16 bytes.<br><br>RWWN: The WWPN of the remote entity, that is, fabric controller. You should use the form of NNNNNNNNNNNNNNN, where NNNNNNNNNNNNNNNN is a 16 digit representation of the fabric controller or FFFFFFFFFFFFFFFF as generic remote fabric port WWPN.<br><br>pard: The key associated with local entity or remote entity. For example, 16 bytes of key with ASCII type: aabbccddeeffgghh. 16 bytes of key with binary type:6161626263636464656566666767686 8.<br><br>You can use lpfcX-auth-keys to specify the per adapter instance DHCHAP authentication keys. Any valid setup in this way overwrites the auth-keys setup. Do not remove this default setup. | | | | |
| automap | Controller Specific | 1 | 0=Off | 1=On | No | Automatically assign SCSI IDs to FCP targets detected. If automap is 1, SCSI IDs for all FCP nodes without persistent bindings are automatically generated based on the bind method of the corresponding adapter port. If FCP devices are added to or removed from the FC network when the system is down, there is no guarantee that these SCSI IDs will remain<br>the same when the system is booted again. If automap is 0, only devices with persistent bindings are recognized by the system. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| cr-count | Controller Specific | 1 | 1 | 255 | No | This value specifies a count of I/O completions after which an interrupt response is generated. If cr-delay is set to 0, this feature is disabled. |
| cr-delay | Controller Specific | 0 | 0 | 63 | No | This value specifies a count of milliseconds after which an interrupt response generated if cr-count has not been satisfied. This value is set to 0 to disable the Coalesce Response feature as default. |
| delay-rsp-err | Controller Specific | 0 | 0=Off | 1=On | Yes | (Boolean) The driver delays FCP RSP errors being returned to the upper SCSI layer based on the no-device-delay configuration driver property. |
| discovery-threads | Controller Specific | 1 | 1 | 32 | No | Number of ELS commands during discovery. This value specifies the number of threads permissible during device discovery. A value of 1 serializes the discovery process. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| dqfull-throttle-up-inc | Controller Specific | 1 | 0 | 128 | Yes | The amount to increment LUN queue depth each time. This driver property causes the lpfc driver to decrement a LUN's queue depth, if a queue full condition is received from the target. The queue depth is decremented to a minimum of 1. The variables dqfull-throttle-up-inc and dqfull-throttle-up-time restore the queue depth to the original value. The dqfull-throttle-up-time driver property defines a time, in seconds, to tell the driver when to increase current queue depth. If the current queue depth isn't equal to the lun-queue-depth, and the driver stop_send_io flag is equal to 0 for that device, increment the current queue depth by dqfull-throttle-up-inc (don't exceed the lun-queue-depth). So, if both driver properties are set to 1, the driver increments the current queue depth once per second until it hits the lun-queue-depth. The only other way to restore the queue depth (besides rebooting) to the original LUN throttle, is by running the command /usr/sbin/lpfc/resetqdepth X. This restores the LUN throttle of all LUNs for adapter X to the original value. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| dqfull-throttle-up-time | Controller Specific | 1 | 0 | 30 | Yes | Time interval (seconds) to increment LUN queue depth. Amount to increment LUN queue depth each time. This driver property causes the lpfc driver to decrement a LUN's queue depth, if a queue full condition is received from the target. The queue depth is decremented to a minimum of 1. The variables dqfull-throttle-up-inc and dqfull-throttle-up-time are used to restore the queue depth to the original. The dqfull-throttle-up-time driver property defines a time, in seconds, to tell when to increase the current queue depth. If the current queue depth isn't equal to the lun-queue-depth, and the driver stop_send_io flag is equal to 0 for that device, increment the current queue depth by dqfull-throttle-up-inc (don't exceed the lun-queue-depth). So, if both driver properties are set to 1, then driver increments the current queue depth once per second until it hits the lun-queue-depth. The only other way to restore the queue depth (besides rebooting) to the original LUN throttle, is by running the command /usr/sbin/lpfc/resetqdepth X. This restores the LUN throttle of all LUNs for adapter X to the original value. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| enable-auth | Controller Specific | 0 | 0 | 1 | Yes | This driver property specifies if the DHCHAP is enabled or not. When set to 1, you should also set up two other driver properties such as auth-cfgparms and auth-keys as previously described. When set to 0, DHCHAP support is disabled and auth-cfgparms and auth-keys are ignored. Any per adapter instance setup, for example, lpfcX-enable-auth=1,0 the value set by enable-auth. |
| extra-io-tmo | Controller Specific | 0 | 0 | 255 | Yes | Extra timeout value, in seconds, applied to each FCP command sent. When connecting through a large fabric, certain devices may require a longer timeout value. |
| fcp-bind-DID | Global | Inactive | N/A | N/A | No | Setup persistent FCP bindings based on a target device's Port ID. This binding guarantees that target assignments are preserved between reboots. The format for a bind entry is "NNNNNN:lpfcXtY" where NNNNNN is a 6 digit representation of the targets Port ID, X is the driver instance number and Y is the target assignment. Multiple entries must be separated by commas (,) with the last entry terminated with a semi-colon (;). A sample entry follows (all on one line): fcp-bind-DID="0000ef:lpfc0t0"; (all on one line.) |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| fcp-bind-method | Controller Specific | 2 | 1 | 4 | No | Specifies the method of binding to be used. This binding method is used for persistent binding and automapped binding. A value of 1 forces WWNN binding, value of 2 forces WWPN binding and value of 3 forces DID binding. A fcp-bind-method value of 4 causes target ID assignment in a private loop environment to be based on the ALPA array (hard addressed). If a binding method is not specified for a port, WWPN binding is used. Any persistent binding whose method does not match with the bind method of the port is ignored. A sample entry follows: lpfc0-fcp-bind-method=1; lpfc1-fcp-bind-method=2; |
| fcp-bind-WWNN | Global | Inactive | N/A | N/A | No | Sets up persistent FCP bindings based on a target device's WWNN. This binding guarantees that target assignments are preserved between reboots. The format for a bind entry is "NNNNNNNNNNNNNNN:lpfcXtY" (all on one line) where NNNNNNNNNNNNNNN is a 16 digit representation of the target's WWNN , X is the driver instance number and Y is the target assignment. Multiple entries must be separated by commas (,) with the last entry terminated with a semi-colon (;). A sample entry follows (all on one line): fcp-bind WWNN="20000020370c396f:lpfc1t0", "20000020370c27f7:lpfc0t2"; |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| fcp-bind-WWPN | Global | Inactive | N/A | N/A | No | Sets up persistent FCP bindings based on a target device's WWPN. This binding guarantees that target assignments are preserved between reboots. The format for a bind entry is "NNNNNNNNNNNNNNN:lpfcXtY" (all on one line) where NNNNNNNNNNNNNNN is a 16 digit representation of the targets WWPN, X is the driver instance number and Y is the target assignment. Multiple entries must be separated by commas (,) with the last entry terminated with a semi-colon (;). A sample entry follows (all on one line): fcp-bind-WWPN="21000020370cf8263:lpfc1t0"; |
| fcp-class | Controller Specific | 3 | 2 | 3 | Yes | The lpfc driver can transmit FCP data in Class2 or Class 3. The lpfc driver defaults to Class 3 transmission. |
| fdmi-on | Global | 0 | 0 | 2 | No | This driver property controls the FDMI capability of the lpfc driver. If set to 0 (default), FDMI is disabled. A value of 1 enables FDMI without registration of "host name" port attribute, while a value of 2 enables FDMI with registration of "host name" port attribute. |
| ip-class | Controller Specific | 3 | 2 | 3 | Yes | FC can transmit IP data in Class2 or Class 3. The lpfc driver defaults to Class 3 transmission. |
| link-speed | Controller Specific | 0 | 0=auto select<br>1= 1 Gb/s<br>2= 2 Gb/s<br>4= 4 Gb/s<br>8= 8 Gb/s | | No | Sets link speed. Ignored for FCoE adapters. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| linkdown-tmo | Controller Specific | 30 | 0 | 255 | Yes | This variable controls how long the driver holds I/O (0 - 255 seconds) after the link becomes inaccessible. When this timer expires, all I/O waiting to be serviced is aborted. For instance, FCP commands are returned to the target driver with a failure. The lower the value, the quicker the driver fails commands back to the upper levels. There is a trade-off here: small values risk retrying the commands when the link is bouncing; large values risk delaying the failover in a fault tolerant environment. linkdown-tmo works in conjunction with nodev-tmo. I/O fails when either of the two timers expires. |
| log-only | Controller Specific | 1 | 0 | 1 | Yes | When set to 1, log messages are only logged to syslog. When set to 0, log messages are also printed on the console. |
| log-verbose | Controller Specific | 0x0 | 0x0 | 0xffff | Yes | (bit mask) When set to non-zero this variable causes lpfc to generate additional messages concerning the state of the driver and the I/O operations it carries out. These messages may go to the system log file, /var/adm/messages and/or the system console. See Error Messages for detailed information on the bit mask. |
| lpfcXtY-lun-throttle | Controller Specific | none | 1 | 128 | No | The maximum number of outstanding commands to permit for any logical unit on a specific target. This value overrides lun-queue-depth. |
| lpfcXtY-tgt-throttle | Controller Specific | none | 1 | 10240 | No | The maximum number of outstanding commands to permit for any target, including all LUNs on that target. This value overrides tgt-queue-depth. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| lpfcXtYlZ-lun-mask | Controller Specific | none | 0 | 1 | Yes | The driver uses this value to determine whether or not to expose discovered LUNs to the OS. When set to 1, the discovered LUN is masked and not reported to the OS. When set to 0, the discovered LUN is reported to the OS. |
| lpfcX-lun-unmask | Controller Specific | none | 0 | 1 | Yes | The driver uses this value to determine whether to override the LUN masking or not at the adapter level. When set to 1, all LUNs on all targets on the specified lpfc instance are reported to the OS regardless of their respective lunmask settings. When set to 0 (default), the override is not in effect. |
| lpfcXtY-lun-unmask | Controller Specific | none | 0 | 1 | Yes | The driver uses this value to determine whether to override the LUN masking or not at the target level. When set to 1, all LUNS on a specified target are reported to the OS regardless of their respective lunmask settings. When set to 0 (default), the override is not in effect. |
| lun-queue-depth | Global | 30 | 1 | 128 | No | The driver uses this value as the default limit for the number of simultaneous commands to issue to a single logical unit on a single target on the loop. A single logical unit is never ~~be~~ sent more commands than allowed by lun-queue-depth; however, less may be sent when sd-max-throttle or tgt-queue-depth is reached for the entire target. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| msi-mode | Controller Specific | 3 | 0 | 3 | No | This variable controls whether lpfc uses MSI/MSIX-based message or legacy interrupts. If set to 3 (default), the driver tries to use multiple MSIX messages. If MSIX is not possible, then the driver attempts MSI. If MSI is not possible, then legacy interrupts are configured. If set to 2, the driver tries to configure multiple MSI messages. If MSI is not possible, then legacy interrupts are configured. If set to 1, the driver attempts to configure single message MSI. If MSI is not possible, then legacy interrupts are configured. A value of 0 disables MSI and the driver always uses legacy interrupts. |
| network-on | Controller Specific | 0 | 0 | 1 | No | This variable controls whether lpfc provides IP networking functionality over FC. This variable is a Boolean: when zero, IP networking is disabled; when non-zero, IP networking is enabled. |
| no-device-delay | Global | 1 | 0 | 30 | Yes | This variable (0 to 30 seconds) determines the length of the interval between deciding to fail an I/O because there is no way to communicate with its particular device (for example, due to device failure or device removal) and actually failing the command. A value of zero implies no delay whatever. This delay is specified in seconds. Emulex recommends a minimum value of 1 (1 second) when communicating with any Tachyon based device. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| nodev-holdio | Controller Specific | 0 | 0=Off | 1=On | Yes | This variable controls if I/O errors are held by the driver if a FCP device on the SAN disappears. If set, I/O errors are held until the device returns to the SAN (potentially indefinitely). This driver property is ignored, if SCSI commands are issued in polled mode. The upper layer may retry the command once the error is returned. |
| nodev-tmo | Controller Specific | 30 | 0 | 255 | Yes | This variable (0 to 255 seconds) controls how long I/O is held by the driver if a device on the SAN disappears. If set, I/O is held for the specified number of seconds. If the device does not appear on the SAN before nodev-tmo seconds, then the driver fails all held I/O and mark the device as unavailable. The upper layer may retry the command once the error is returned. |
| num-bufs | Controller Specific | 128 | 64 | 4096 | No | This variable specifies the number of command buffers to allocate. These buffers are used for FC Extended Link Services (ELS), and one for each FCP command issued in SLI-2 mode. If you want to queue numerous FCP commands to the adapter, increase num-bufs for better performance. These buffers consume physical memory and are also used by the device driver to process loop initialization and re-discovery activities. **Important:** The driver must always be configured with at least several dozen ELS command buffers; Emulex recommends at least 128. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| num-iocbs | Controller Specific | 256 | 128 | 10240 | No | This variable indicates the number of Input/Output Control Block (IOCB) buffers to allocate. IOCBs are internal data structures used to send and receive I/O requests to and from the LightPulse hardware. Too few IOCBs can temporarily prevent the driver from communicating with the adapter, thus lowering performance. (This condition is not fatal.) If you run heavy IP traffic, you should increase num-iocbs for better performance. |
| post-ip-buf | Controller Specific | 128 | 64 | 1024 | No | This variable specifies the number of 4K STREAMS buffers to allocate and post to the FC IP ring. Increase this setting for better IP performance under heavy loading. |
| scan-down | Controller Specific | 1 | 0=Off | 1=On | Yes | There are two scanning algorithms used to discover a node in a private loop. If scan-down is 1, devices on the private loop are scanned starting from ALPA 0x01 through ALPA 0xEF. If scan-down is 0, devices on the private loop are scanned starting from ALPA 0xEF through ALPA 0x01. Scan-down values 0 and 1 do not apply if a loop map is obtained. See the FC-AL profile for the definition of a loop map. |
| target-disk | Controller Specific | “sd” | | | No | Controls the FCP device to target driver associations. By default, FCP devices are associated to their corresponding Solaris native target drivers. FCP disks are associated with `sd`. To use a third party target driver, modify the corresponding entries. For example: target-disk="scsidisk"; |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| target-tape | Controller Specific | “st” | | | No | Controls the FCP device to target driver associations. By default, FCP devices are associated to their corresponding Solaris native target drivers. FCP tapes are associated with `st`. To use a third party target driver, modify the corresponding entries. For example (all on one line): target-tape="IBMtape"; |
| target-tapechanger | Controller Specific | “sgen” | | | No | Controls the FCP device to target driver associations. By default, FCP devices are associated to their corresponding Solaris native target drivers. FCP medium changers are associated with sgen. To use a third party target driver, modify the corresponding entries. For example (all on one line): target-tapechanger="IBMtape"; |
| tgt-queue-depth | Global | 0 | 0 | 10240 | No | The driver uses this value as the default limit for the number of simultaneous commands to issue to a single target on the loop. A value of 0 causes no target throttling to occur. A single target is never sent more commands than allowed by tgt-queue-depth; however, less may be sent when sd-max-throttle is reached for the entire target. |

**Table 4: Driver Properties specified in lpfc.conf (Continued)**

| Property Name | Scope | Default | Min | Max | Dynamic | Comments |
|---|---|---|---|---|---|---|
| topology | Controller Specific | 0x0 | 0x0=loop , then P2P<br>0x2=P2P only<br>0x4=loop only | | No | This variable controls the FC topology expected by lpfc at boot time.FC offers point-to-point, fabric, and arbitrated loop topologies.To make the adapter operate as an N_Port, select point-to-point mode (used for N_Port to F_Port, and N_Port to N_Port connections). To make the adapter operate in an FC loop as an NL_Port, select loop mode (used for private loop and public loop topologies). The driver rejects an attempt to set the topology to a value not in the above list. The auto-topology setting 0 does not work unless the adapter is using firmware version 3.20 or higher. Ignored for FCoE adapters. |
| use-adisc | Controller Specific | 0 | 0=Off | 1=On | Yes | This variable controls the ELS command used for address authentication during re-discovery upon link-up.If set, ADISC is used, otherwise, PLOGI is used. For FCP-2 devices, the driver always uses ADISC. For re-discovery due to a RSCN, the driver always uses ADISC. |
| xmt-que-size | Controller Specific | 256 | 128 | 10,240 | No | This variable specifies the number of network packets that can be queued or outstanding at any time in the driver. Increase this setting for better IP performance under heavy loading. |

# Parameter Reconfiguration

Typically, the lpfc driver reads the lpfc.conf configuration properties during driver startup. Once the configuration parameters are read, the lpfc driver does not reread them. This functionality is native to the Solaris operating system.

However, on Solaris 2.9 or later releases, you can force the lpfc driver to re-read the lpfc.conf file using the update_drv system command.

**Note:** This command does not change the parameters for the lpfc instances that are already active in the system. The changes are only applicable to any new lpfc instances that are attached later.

To modify the configuration properties:

1. Login as or su to ‘root’.
2. Edit the configuration properties in the file /kernel/drv/lpfc.conf.
3. Run `update_drv –f lpfc` to force the Solaris system to re-read lpfc.conf.

To modify parameters for a controller instance that is already active:

1. Login as or su to ‘root’.
2. Run `cfgadm` and note the <Ap_Id> corresponding to the lpfc instance.
3. Unconfigure the lpfc driver instance corresponding to <Ap_Id>.
4. Edit the controller-specific properties in the file /kernel/drv/lpfc.conf.
5. Run `update_drv –f lpfc` to force the Solaris system to re-read lpfc.conf.
6. Run `cfgadm` and configure the controller instance back.

To modify parameters for a controller that is yet to be added:

1. Login as or su to ‘root’.
2. Run `cfgadm` and configure the new controller instance.
3. Note the controller instance. The controller instance is printed in the driver sign-on messages.
4. Run `cfgadm` and unconfigure the new controller instance.
5. Edit the controller-specific properties in the file /kernel/drv/lpfc.conf.
6. Run `update_drv –f lpfc` to force the Solaris system to re-read lpfc.conf.
7. Run `cfgadm` and configure the new controller instance.

# Probing for FCP Targets

The lpfc 6.30g driver can discover and report SCSI devices dynamically without requiring a system reboot. The lpfc 6.30g driver does not rely on the target driver configuration file (sd.conf / st.conf) for SCSI LUN discovery. The lpfc driver supports up to 4096 targets, with a maximum of 256 LUNs per target.

By default, all SCSI LUNs are unmasked. Therefore, all LUNs that are discovered by the driver are reported to the OS. Changes to the lpfc driver configuration file take effect after the system is rebooted. On Solaris releases 9 and later, the lpfc driver configuration file can be updated without rebooting by running update_drv. For further information, consult the Solaris system administration documentation and the update_drv(1M) manual pages.

# Target / LUN Masking

You can prevent the lpfc driver from reporting targets and LUNs on an adapter by adapter basis. This enables you to control which targets and LUNs are seen by each initiator (Target/LUN masking).

To do this, you must find the device (driver interface) number for the desired adapter. After you boot the system, with the adapter installed, you can check the output of dmesg(1M) for a message of the following format:

```
NOTICE: lpfcX: WWPN:10:00:00:00:c9:YY:YY:YY
WWNN:20:00:00:00:c9:YY:YY:YY
```

Where lpfcX is the interface for a specific adapter.

Once you know the device number for an adapter, you can construct entries in the lpfc.conf file to mask off the desired target / LUN on a specific adapter. For example, you can mask off LUN 0 on target 0 on lpfc instance 0 by including the following line in lpfc.conf.

```
lpfc0t0l0-lun-mask=1;
```

To unmask a previously masked LUN, set the corresponding lun-mask entry to 0. For instance, you can unmask LUN 0 on target 0 on lpfc instance 0 by including the following line in lpfc.conf.

```
lpfc0t0l0-lun-mask=0;
```

**Note:** If there is a SCSI boot disk at target=0 lun=0, whose entry has been masked, the system does not boot. To guarantee the FC address to SCSI address mapping stays consistent, use persistent binding to assign FC devices SCSI target numbers.

The lpfc driver also enables you to override the LUN masking at a target level or at an adapter level. For example, you can override the LUN masking that was set up on target 0 on lpfc instance 0 by adding the following line to lpfc.conf. This results in the driver reporting all the LUNs on target 0 on lpfc instance 0 to the OS, regardless of the lun-mask entries.

```
lpfc0t0-lun-unmask=1;
```

To unmask all LUNs on lpfc instance 0, add the following line to lpfc.conf.

```
lpfc0-lun-unmask=1;
```

# Diagnostics Interface

A user library (libdfc.so and libdfc.a), which provides applications access to the Driver Diagnostic Interface, resides in /usr/lib. The library features access to driver statistical information, a pass through CT interface for Nameserver queries and HBAAPI primitives. In addition, this library supports a management interface for Emulex FCoE CNA adapters.

# Enabling IP Networking

Usually, IP networking is enabled during driver installation. Use this procedure to enable IP networking if it was not enabled during driver installation. In addition, if there is more than one adapter in the host, and both storage and IP networking functions are desired, this procedure tells the system which adapters have IP functionality. All others have storage functionality.

To enable IP networking:

1. Use any text editor (for example, vi) to update lpfc.conf and enable networking:
   `vi /kernel/drv/lpfc.conf`
2. Enter a <1> for the network-on driver property (1 = on, 0 = off).
3. Modify the /etc/hosts file to add the hostname and IP address of the Solaris host.
4. For every lpfc instance that is required to have networking support, create a /etc/hostname.lpfcX file and assign a network name.
5. Reboot the system. Upon rebooting, Solaris automatically configures and sets up the additional adapters for networking.
6. Verify the network connection by pinging a known IP address.

## Creating Hostname.lpfc# Files

### Required Hostname File

When you install the driver for the first time, the installation creates the file /etc/hostname.lpfc0 by default. This file corresponds to lpfc instance 0. If, for any reason, the device instance number changes, the file name must change accordingly. Use any text editor to edit the etc/hosts file, to associate an IP address with the adapter's network host name.

### Additional Hostname Files

You must also manually create a /etc/hostname.lpfcX file (where X is the instance number of the host adapter being configured) for each additional adapter in the system. Each hostname.lpfcX file contains the network host name of the adapter. Usually you create these additional hostnames during the installation process, however you can also add adapters to your system after you install the driver.

Use any text editor to edit the /etc/hostname.lpfcX (where X is the adapter number in decimal format). Any name given in the /etc/hostname.lpfcX files must have a valid IP address associated with it. The IP address is established through NIS, DNS or another addressing scheme.

#### Example

```
123.456.7.8 fibre1
123.456.8.9 fibre2
123.456.8.1 myhost
```

To create /etc/hostname.lpfcX files for lpfc instances 0, 1 and 2:

1. Using any text editor, create a new file with the name 'fibre1' in it. Save this file as hostname.lpfc0. This is the required hostname file.
2. Create another new file with the name 'fibre2' in it. Save this file as hostname.lpfc1.
3. Create another new file with the name 'myhost' in it. Save this file as hostname.lpfc2.

4. If you are creating additional hostname files during an installation, continue with step 13 of “Installing the Driver for the First Time” on page 6.

**Note:** If you are adding an adapter to your network after the driver is installed, a reboot is necessary to configure and set up the additional adapter for networking.

## Verifying the Network Connection

Verify the connection to the network by pinging a known IP address.

```
ping ip_address
```

At this point, you may use the host adapter or configure additional Solaris properties to increase performance or optimize driver operation in a unique environment. To perform additional configuration changes, consult your Solaris documentation.

## Configuring the System-Wide File (/etc/system)

Normally, you do not need to modify the contents of /etc/system. Most required changes for /etc/system are made automatically during the installation. All of the commonly used driver properties are in lpfc.conf and the target driver configuration file. Listed below are a few cases that may require modification of the /etc/system.

### Driver Installed in a Non-Standard Directory (moddir)

The moddir property specifies a series of directories that the kernel searches for loadable device drivers at boot time. If you specify a non-standard installation directory, the installation process creates or updates the moddir property to include the new directory. If this fails, or if you later decide to move the lpfc.conf file, you must create or update moddir.

### IP Networking Enabled (forceload)

This property loads the specified modules at boot time, just before mounting the root file system, rather than at first reference. You can find this example in /etc/system after installing the driver (assuming you enabled IP networking):

```
#forceload: drv/clone
```

The kernel locates the modules specified in forceload by consulting moddir. If you enable IP networking for the host adapter driver, the property forceload must be set to drv/clone for correct operation. The lpfn driver is dependent on the clone driver. Normally, the clone driver would load itself automatically when the driver calls it the first time. However, the lpfn driver is loaded so early in the system boot sequence that a forced loading of the clone driver is required.

# No-Reboot Features

The Emulex 6.30g driver enables you to do the following without rebooting:

- Discover newly provisioned targets and LUNs.
- Add new adapters to the system.
- Make persistent binding changes.
- Make other driver configuration changes.
- Turn on the log capability (log-verbose).
- Update adapter firmware.
- Load or unload the driver.

## Adding New Adapters, Changing Bindings and Changing Driver Properties

**For Solaris 8, 9 and 10 Users**

To add new adapters, change bindings and change driver properties:

1. Login as or su to ‘root’.
2. If you are adding an adapter not previously seen by the server:
    a. Check for the following three conditions:
        - Ensure your Solaris host supports DR.
        - Use adapter firmware that supports DR.
        - Ensure the adapters are installed in DR capable slots.
    b. Power off a DR enabled slot.
    c. Insert the adapter and power up the slot.
3. Make driver property changes using the HBAnyware utility. (Refer to the HBAnyware Utility User Manual for more information.) Be sure to make changes static. Static changes make the changes in memory and modify the lpfc.conf file so that if the host is rebooted, the driver properties retain their intended values.

    **Note:** Some driver properties are dynamic. If a reboot is necessary, the HBAnyware utility prompts you to reboot. In that case, complete steps 4 - 9. If you unconfigured the adapters in step 7, you must reconfigure them in step 11.

4. Stop the elxhbamgr. (Stop the HBAnyware utility.)
5. Run the “cfgadm” command. A list of controllers and their Ap_id numbers is displayed.
6. Unconfigure all lpfc driver instances using their Ap_id. Type: “cfgadm -d unconfigure Ap_id …”
7. Type “modinfo | grep lpfc” and note the process number at the beginning of the returned string. It may look similar to: 85 7ba44000 525d0 269 1 lpfc (Emulex Lightpulse FC SCSI/IP).
8. Type “modunload -i 85”. Replace “85” with your host's module-id number.
9. Run “cfgadm -c configure Ap_id Ap_id Ap_id”. This example shows how to configure the entire list of lpfc driver instances you unconfigured in step 7 using one command. If you unconfigured more then one lpfc instance, separate each Ap_id with a space.

## Turning on Logging Capability

The Solaris 6.30g driver enables you to turn on or off the log-verbose driver property for problem tracking using the HBAnyware utility. Refer to the HBAnyware Utility User Manual for more information.

## No-Reboot Firmware Updates

Emulex is the only vendor providing dynamic adapter firmware updates during operation without stopping I/O traffic. You can dynamically update adapter firmware using the HBAnyware utility. Refer to the "Update Firmware" topics in the HBAnyware Utility User Manual for more information about using the HBAnyware utility.

# Troubleshooting

## General Situations

If an FC link fails to come up, verify that an 8 Gb/s adapter is not attempting to connect to a 1 Gb/s device. Only 2 Gb/s, 4 Gb/s and 8 Gb/s devices are supported on 8 Gb/s adapters.

## Log Messages

Log messages are organized into logical groups based on code functionality within the FC driver. Each group consists of a block of 100 log message numbers. Most groups require a single block of 100 message numbers, however some groups (INIT, FCP) require two blocks.

The groups and the associated number ranges are defined in the Message Log table below. The preamble string shown in the Message Log table is displayed as part of the log message. The lower case 'x' of the preamble string defines the severity of the log message. The 'x' is replaced by one of five lower case letters. Those letters are defined in the Severity Code table.

Log messages are logged to the /var/adm/messages system file. Authentication log messages are logged to /var/log/lpfc/lpfc_authlog.txt.

### Sysevent Logging

The lpfc 6.30g driver includes a sysevent logging for DHCHAP related events. For details see Solaris man page ddi_log_sysevent (9F). The driver package installs two new binaries (32-bit and 64-bit respectively) as follows:

```
/opt/EMLXlpfc/lpfc_authlog32
/opt/EMLXlpfc/lpfc_authlog64
```

These two files are Emulex delivered binaries for handling the sysevent delivered through lpfc driver for anything related to DHCHAP authentication.

The required sysevent configuration file “LPFC,sysevent.conf” is automatically installed in the following location:

```
/etc/sysevent/config/LPFC,sysevent.conf
```

This configuration file is for DHCHAP sysevent log processing. By default the log file is configured to be `/var/log/lpfc/lpfc_authlog.txt`, but you can change its name and location. Other entries in the configuration file should not be modified.

The following is an example of a DHCHAP authentication sysevent log:

```
Thu Oct 11 11:54:30 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass =
ESC_lpfc_cmpl_els_auth_msg_dhchap_success_issue_wait4next
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Host-initiated-bidir-auth-success
================================================================
Thu Oct 11 11:55:01 2007
=== lpfc auth sysevent attributes ================================
instance = 14
Class = EC_lpfc
SubClass = ESC_lpfc_rcv_els_auth_msg_unmapped_node
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Remote_Port_Initiated_Auth_Neogitate
================================================================
Thu Oct 11 11:55:01 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass =
ESC_lpfc_rcv_els_auth_msg_dhchap_success_cmpl_wait4next
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Fabric-initiated-bidir-reauth-success
================================================================
Thu Oct 11 11:59:09 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass = ESC_lpfc_reauth_timeout_handler
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Host-initiated-reauth-heart-beat-begin
================================================================
Thu Oct 11 11:59:09 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass =
ESC_lpfc_cmpl_els_auth_msg_dhchap_success_issue_wait4next
lwwn = 10000000C95C2846rwwn = 2001000DEC02B880
Info = Host-initiated-bidir-auth-success
================================================================
Thu Oct 11 12:16:40 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass = ESC_lpfc_rcv_els_auth_msg_unmapped_node
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Remote_Port_Initiated_Auth_Neogitate
================================================================
```

```
Thu Oct 11 12:16:40 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass =
ESC_lpfc_rcv_els_auth_msg_dhchap_success_issue_wait4next
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Auth-Reject:ReasonCode=0x1,ReasonCodeExplanation=0x5
================================================================
Thu Oct 11 12:16:40 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass = ESC_lpfc_issue_els_auth_reject
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Auth-Reject:ReasonCode=0x1,ReasonCodeExplanation=0x5
================================================================
Thu Oct 11 12:17:10 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass =
ESC_lpfc_cmpl_els_auth_msg_dhchap_success_issue_wait4next
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Host-initiated-bidir-auth-success
================================================================
Thu Oct 11 12:18:10 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass = ESC_lpfc_rcv_els_auth_msg_unmapped_node
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Remote_Port_Initiated_Auth_Neogitate
================================================================
Thu Oct 11 12:18:11 2007
=== lpfc auth sysevent attributes================================
instance = 14
Class = EC_lpfc
SubClass =
ESC_lpfc_rcv_els_auth_msg_dhchap_success_cmpl_wait4next
lwwn = 10000000C95C2846
rwwn = 2001000DEC02B880
Info = Fabric-initiated-bidir-reauth-success
================================================================
```

## Severity Codes

Information and warning messages can be turned ON or OFF by setting/resetting the appropriate mask bit(s) in the variable 'log-verbose' located in the driver configuration file, lpfc.conf. By default, both information and warning messages are disabled. Configuration error (c), error (e), and panic (p) messages can not be disabled.

**Table 5: Severity Code Table**

| Code | Severity |
|---|---|
| i | Information |
| w | Warning |
| c | Configuration Error |
| e | Error |
| p | Panic |

## Message Group Masks

Table 6 defines the log message groups and the associated number ranges.

- The preamble string shown in this table is displayed as part of the log message.
- The lower case 'x' of the preamble string defines the severity of the log message and represents one of five lower case letters defined in the severity codes table.

**Table 6: Message Log Table**

| LOG Message Verbose Mask Definition | Preamble String | From | To | Verbose Bit | Verbose Description |
|---|---|---|---|---|---|
| ELS | ELx | 0100 | 0199 | LOG_ELS (0x1) | ELS events |
| DISCOVERY | DIx | 0200 | 0299 | LOG_DISCOVERY (0x2) | Link discovery events |
| MBOX | MBx | 0300 | 0399 | LOG_MBOX (0x4) | Mailbox events |
| SLI | SLx | 0300 | 0399 | LOG_SLI (0x800) | SLI events |
| INIT | INx | 0400<br>0500 | 0499<br>0599 | LOG_INIT (0x8) | Initialization events |
| IP | IPx | 0600 | 0699 | LOG_IP (0x20) | IP traffic history |
| FCP | FPx | 0700 | 0799 | LOG_FCP (0x40) | FCP traffic history |
| FCP_UNDER | FPx | 0700 | 0799 | LOG_RESID_UNDER (0x4000) | FCP residual underrun events |
| NODE | NDx | 0900 | 0999 | LOG_NODE (0x80) | Node table events |
| Reserved | | 1000 | 1099 | Reserved | Reserved |

**Table 6: Message Log Table (Continued)**

| LOG Message Verbose Mask Definition | Preamble String | From | To | Verbose Bit | Verbose Description |
|---|---|---|---|---|---|
| Reserved | | 1100 | 1199 | Reserved | Reserved |
| MISC | MIx | 1200 | 1299 | LOG_MISC (0x400) | Miscellaneous events |
| LINK | LKx | 1300 | 1399 | LOG_LINK_EVENT (0x10) | Link events |
| Reserved | | 1400 | 1499 | Reserved | Reserved |
| Reserved | | 1500 | 1599 | Reserved | Reserved |
| IOCTL | IOx | 1600 | 1699 | LOG_IOC (0x2000) | IOCTL events |
| All Messages | | | | LOG_ALL_MSG (0xFFFF) | Log all messages |

### Message Log Example

The following is an example of a LOG message:

```
Jul 12 16:30:26 <node> kernel: !lpfc0:0234:DIi:Device Discovery
completes
```

In the above LOG message:

- lpfc0 identifies the LOG message as coming from EMULEXHBA 0.
- 0234 identifies the LOG message number.
- DIi identifies the LOG message as a DISCOVERY (DI) INFORMATION (i) message.

**Note:** If the word 'Data:' is present in a LOG message, any information to the right of 'Data:' is intended for Emulex technical support/engineering use only.

## ELS Events (0100 - 0199)

0100 ELi: FLOGI failure

DESCRIPTION: An ELS FLOGI command that was sent to the fabric failed.
DATA: (1) ulpStatus (2) ulpWord[4] (3) ulpWord[7]
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0101 ELi: FLOGI completes successfully

DESCRIPTION: An ELS FLOGI command that was sent to the fabric succeeded.
DATA: (1) ulpWord[4] (2) e_d_tov (3) r_a_tov (4) edtovResolution
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0102 ELi: PLOGI completes to NPort <nlp_DID>

DESCRIPTION: The adapter performed a PLOGI into a remote NPort.
DATA: (1) ulpStatus (2) ulpWord[4] (3) ulpWord[7] (4) disc (5) num_disc_nodes
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0103 ELi: PRLI completes to NPort <nlp_DID>

DESCRIPTION: The adapter performed a PRLI into a remote NPort.
DATA: (1) ulpStatus (2) ulpWord[4] (3) ulpWord[7] (4) num_disc_nodes
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0104 ELi: ADISC completes to NPort <nlp_DID>

DESCRIPTION: The adapter performed a ADISC into a remote NPort.
DATA: (1) ulpStatus (2) ulpWord[4] (3) ulpWord[7] (4) disc (5) num_disc_nodes
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0105 ELi: LOGO completes to NPort <nlp_DID>

DESCRIPTION: The adapter performed a LOGO to a remote NPort.
DATA: (1) ulpStatus (2) ulpWord[4] (3) ulpWord[7] (4) num_disc_nodes
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0106 ELi: ELS cmd tag <ulpIoTag> completes

DESCRIPTION: The specific ELS command was completed by the firmware.
DATA: (1) ulpStatus (2) ulpWord[4] (3) ulpWord[7]
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0107 ELi: Retry ELS command <elsCmd> to remote NPORT <did>

DESCRIPTION: The driver is retrying the specific ELS command.
DATA: (1) retry (2) delay
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0108 ELi: No retry ELS command <elsCmd> to remote NPORT <did>

DESCRIPTION: The driver decided not to retry the specific ELS command that failed.
DATA: (1) retry (2) nlp_flag
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

### 0109 ELi: ACC to LOGO completes to NPort <nlp_DID>

DESCRIPTION: The driver received a LOGO from a remote NPort and successfully issued an ACC response.
DATA: (1) nlp_flag (2) nlp_state (3) nlp_rpi
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

### 0110 ELi: ELS response tag <ulpIoTag> completes

DESCRIPTION: The specific ELS response was completed by the firmware.
DATA: (1) ulpStatus (2) ulpWord[4] (3) ulpWord[7] (34 nlp_DID (5) nlp_flag (6) nlp_state (7) nle.nlp_rpi
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

### 0111 ELe: Dropping received ELS cmd

DESCRIP TION: The driver decided to drop an ELS Response ring entry.
DATA: (1) ulpStatus (2) ulpWord[4] (2) ulpWord[7]
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver or firmware problem. If problems persist report these errors to Technical Support.

### 0112 ELi: ELS command <elsCmd> received from NPORT <did>

DESCRIPTION: Received the specific ELS command from a remote NPort.
DATA: (1) fc_ffstate
SEVERITY: Information
LOG: LOG_ELS Verbose
MODULE: fcelsb.c
ACTION: No action needed, informational.

### 0113 ELe: An FLOGI ELS command <elsCmd> was received from DID <did> in Loop Mode

DESCRIPTION: While in Loop Mode an unknown or unsupported ELS command was received.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Check device DID

### 0114 ELi: FLOGI/PLOGI chkparm OK

DESCRIPTION: Received a FLOGI/PLOGI from a remote NPORT and its Fibre Channel service parameters match this adapter. Request can be accepted.
DATA: (1) nlp_DID (2) nlp_state (3) nlp_flag (4) nlp_Rpi
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0115 ELe: Unknown ELS command <elsCmd> received from NPORT <did>

DESCRIPTION: Received an unsupported ELS command from a remote NPORT.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Check remote NPORT for potential problem.

0116 ELi: Xmit ELS command <elsCmd> to remote NPORT <did>

DESCRIPTION: Xmit ELS command to remote NPORT.
DATA: (1) fc_ffstate
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0117 ELi: Xmit ELS response <elsCmd> to remote NPORT <did>

DESCRIPTION: Xmit ELS response to remote NPORT.
DATA: (1) size
SEVERITY: Information
LOG: LOG_ELS Verbose
MODULE: fcelsb.c
ACTION: No action needed, informational.

0118 ELi: Xmit CT response on exchange <xid>

DESCRIPTION: Xmit a CT response on the appropriate exchange.
DATA: (1) fc_ffstate
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0119 ELi: Issue GEN REQ IOCB for NPORT <did>

DESCRIPTION: Issue a GEN REQ IOCB for remote NPORT. These are typically used for CT request.
DATA: (1) ulpWord (2) fc_ffstate
SEVERITY: Information
LOG: LOG_ELS Verbose
ACTION: No action needed, informational.

0127 ELe: ELS timeout

DESCRIPTION: An ELS IOCB command was posted to a ring and did not complete within ULP timeout seconds.
DATA: (1) elscmd (2) did (3) ulpcommand (4) iotag
SEVERITY: Error
LOG: Always
ACTION: If no ELS command is going through the adapter, reboot the system; If problem persists, contact Technical Support.

## Link Discovery Events (0200 - 0299)

### 0200 DIe: CONFIG_LINK bad hba state <hba_state>

DESCRIPTION: A CONFIG_LINK mbox command completed and the driver was not in the right state.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Software driver error. If this problem persists, report these errors to Technical Support.

### 0201 DIi: Abort outstanding I/O on NPort <nlp_DID>

DESCRIPTION: All outstanding I/Os are cleaned up on the specified remote NPort.
DATA: (1) nlp_flag (2) nlp_state (3) nle.nlp_rpi
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0202 DIi: Start Discovery hba state <hba_state>

DESCRIPTION: Device discovery / rediscovery after FLOGI, FAN or RSCN has started.
DATA: (1) tmo (2) fc_plogi_cnt (3) fc_adisc_cnt
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0203 DIe: Nodev timeout on NPort <WWPN>

DESCRIPTION: A remote NPort was discovered by the driver disappeared for more than the configured nodev-tmo seconds.
DATA: (1) nlp_flag (2) nlp_state (3) nlp_rpi
SEVERITY: Error
LOG: Always
ACTION: Check connections to Fabric / HUB or remote device.

### 0204 DIi: Create SCSI Target <tgt>

DESCRIPTION: A mapped FCP target was discovered and the driver has allocated resources for it.
DATA: None
SEVERITY: Information
LOG: LOG_DISCOVERY | LOG_FCP Verbose
ACTION: No action needed, informational.

### 0205 DIi: Create SCSI LUN <lun> on Target <tgt>

DESCRIPTION: A LUN on a mapped FCP target was discovered and the driver has allocated resources for it.
DATA: None
SEVERITY: Information
LOG: LOG_DISCOVERY | LOG_FCP Verbose
ACTION: No action needed, informational.

0206 DIi: Report Lun completes on NPort <nlp_DID>

DESCRIPTION: The driver issued a REPORT_LUN SCSI command to a FCP target and it completed.
DATA: (1) ulpStatus (2) rspStatus2 (3) rspStatus3 (4) nlp_failMask
SEVERITY: Information
LOG: LOG_DISCOVERY | LOG_FCP Verbose
ACTION: No action needed, informational.

0207 DIi: Issue Report LUN on NPort <nlp_DID>

DESCRIPTION: The driver issued a REPORT_LUN SCSI command to a FCP target.
DATA: (1) nlp_failMask (2) nlp_state (3) nlp_rpi
SEVERITY: Information
LOG: LOG_DISCOVERY | LOG_FCP Verbose
No action needed, informational.

0208 DIi: Failmask change on NPort <nlp_DID>

DESCRIPTION: An event was processed that indicates the driver may not be able to communicate with the remote NPort.
DATA: (1) nlp_failMask (2) bitmask (3) flag
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

0209 DIi: RFT request completes ulpStatus <ulpStatus> CmdRsp <CmdRsp>

DESCRIPTION: A RFT request that was sent to the fabric completed.
DATA: (1) nlp_failMask (2) bitmask (3) flag
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

0210 DIi: Continue discovery with <num_disc_nodes> ADISCs to go

DESCRIPTION: A device discovery is in progress.
DATA: (1) fc_adisc_cnt (2) fc_flag (3) phba->hba_state
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

0211 DIi: DSM in event <evt> on NPort <nlp_DID> in state <cur_state>

DESCRIPTION: The driver Discovery State Machine is processing an event.
DATA: (1) nlp_flag
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

0212 DIi: DSM out state <rc> on NPort <nlp_DID>

DESCRIPTION: The driver Discovery State Machine completed processing an event.
DATA: (1) nlp_flag
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0213 DIi: Reassign scsi id <sid> to NPort <nlp_DID>

DESCRIPTION: A previously bound FCP Target has been rediscovered and reassigned a SCSI id.
DATA: (1) nlp_bind_type (2) nlp_flag (3) nlp_state (4) nlp_rpi
SEVERITY: Information
LOG: LOG_DISCOVERY | LOG_FCP Verbose
ACTION: No action needed, informational.

### 0214 DIi: RSCN received

DESCRIPTION: An RSCN ELS command was received from a fabric.
DATA: (1) fc_flag (2) i (3) *lp (4) fc_rscn_id_cnt
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0215 DIi: RSCN processed

DESCRIPTION: An RSCN ELS command was received from a fabric and processed.
DATA: (1) fc_flag (2) cnt (3) fc_rscn_id_cnt (4) fc_ffstate
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0216 DIi: Assign scandown scsi id <sid> to NPort <nlp_DID>

DESCRIPTION: A scsi id is assigned due to BIND_ALPA.
DATA: (1) nlp_bind_type (2) nlp_flag (3) nlp_state (4) nlp_rpi
SEVERITY: Information
LOG: LOG_DISCOVERY | LOG_FCP Verbose
ACTION: No action needed, informational.

### 0217 DIe: Unknown Identifier in RSCN payload

DESCRIPTION: Typically the identifier in the RSCN payload specifies a domain, area or a specific NportID. If neither of these are specified, a warning will be recorded.
DATA: (1) didp->un.word
DETAIL: (1) Illegal identifier
SEVERITY: Error
LOG: Always
ACTION: Potential problem with Fabric. Check with Fabric vendor.

### 0218 DIi: FDMI Request

DESCRIPTION: The driver is sending an FDMI request to the fabric.
DATA: (1) fc_flag (2) hba_state (3) cmdcode
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0219 DIi: Issue FDMI request failed

DESCRIPTION: Cannot issue FDMI request to HBA.
DATA: (1) cmdcode
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0220 DIi: FDMI rsp failed

DESCRIPTION: An error response was received to FDMI request.
DATA:(1) SWAP_DATA16 (fdmi_cmd)
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: The fabric does not support FDMI, check fabric configuration.

### 0221 DIw: FAN timeout

DESCRIPTION: A link up event was received without the login bit set, so the driver waits E_D_TOV for the Fabric to send a FAN. If no FAN if received, a FLOGI will be sent after the timeout.
DATA: None
SEVERITY: Warning
LOG: LOG_DISCOVERY Verbose
ACTION: None required. The driver recovers from this condition by issuing a FLOGI to the fabric.

### 0222 DIe: Initial FLOGI timeout

DESCRIPTION: The driver sent the initial FLOGI to fabric and never got a response back.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Check Fabric configuration. The driver recovers from this and continues with device discovery.

### 0223 DIe: Timeout while waiting for NameServer login

DESCRIPTION: A login request to the NameServer was not acknowledged within RATOV.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Check the fabric configuration. The driver recovers from this and continues with device discovery.

### 0224 DIe: NameServer Query timeout

DESCRIPTION: Node authentication timeout, node Discovery timeout. A NameServer Query to the Fabric or discovery of reported remote NPorts is not acknowledged within R_A_TOV.
DATA: (1) fc_ns_retry (2) fc_max_ns_retry
SEVERITY: Error
LOG: Always
ACTION: Check Fabric configuration. The driver recovers from this and continues with device discovery.

### 0225 DIi: Device Discovery completes

DESCRIPTION: This indicates successful completion of device (re)discovery after a link up.
DATA: None
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0226 DIe: Device discovery completion error

DESCRIPTION: This indicates that an uncorrectable error was encountered during device (re)discovery after a link up. Fibre Channel devices are not accessible if this message is displayed.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Reboot the system. If the problem persists, report the error to Technical Support. Run with Verbose mode on for more details.

### 0227 DIe: Node Authentication timeout

DESCRIPTION: The driver has lost track of what NPORTs are being authenticated.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: None required. The driver should recover from this event.

### 0228 DIe: CLEAR LA timeout

DESCRIPTION: The driver issued a CLEAR_LA that never completed.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: None required. The driver should recover from this event.

### 0229 DIi: Assign scsi ID <sid> to NPort <nlp_DID>

DESCRIPTION: The driver assigned a scsi id to a discovered mapped FCP target.
DATA: (1) nlp_bind_type (2) nlp_flag (3) nlp_state (4) nlp_rpi
SEVERITY: Information
LOG: LOG_DISCOVERY | LOG_FCP Verbose
ACTION: No action needed, informational.

### 0230 DIi: Cannot assign scsi ID on NPort <nlp_DID>

DESCRIPTION: The driver cannot assign a scsi id to a discovered mapped FCP target.
DATA: (1) nlp_flag (2) nlp_state (3) nlp_rpi
SEVERITY: Information
LOG: LOG_DISCOVERY | LOG_FCP Verbose
ACTION: Check persistent binding information.

### 0231 DIe: RSCN timeout

DESCRIPTION: The driver has lost track of what NPORTs have RSCNs pending.
DATA: (1) fc_ns_retry (2) fc_max_ns_retry
SEVERITY: Error
LOG: Always
ACTION: None required. The driver should recover from this event.

### 0232 DIi: Continue discovery with <num_disc_nodes> PLOGIs to go

DESCRIPTION: Device discovery is in progress.
DATA: (1) fc_plogi_cnt (2) fc_flag (3) phba->hba_state
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0234 DIi: ReDiscovery RSCN

DESCRIPTION: The number / type of RSCNs has forced the driver to go to the nameserver and rediscover all NPORTs.
DATA: (1) fc_defer_rscn.q_cnt (2) fc_flag (3) hba_state
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0235 DIi: Deferred RSCN

DESCRIPTION: The driver has received multiple RSCNs and has deferred the processing of the most recent RSCN.
DATA: (1) fc_defer_rscn.q_cnt (2) fc_flag (3) hba_state
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0236 DIi: NameServer req

DESCRIPTION: The driver is issuing a NameServer request to the fabric.
DATA: (1) cmdcode (2) fc_flag (3) fc_rscn_id_cnt
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0237 DIw: Pending Link Event during Discovery

DESCRIPTION: Received link event during discovery. Causes discovery restart.
DATA: (1) hba_state
SEVERITY: Warning
LOG: LOG_DISCOVERY Verbose
ACTION: None required unless problem persists. If problem persists, check cabling.

### 0238 DIi: NameServer Rsp

DESCRIPTION: The driver received a NameServer response.
DATA: (1) Did (2) nlp_flag (3) fc_flag (4) fc_rscn_id_cnt
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0239 DIi: NameServer Rsp

DESCRIPTION: The driver received a NameServer response.
DATA: (1) fc_flag
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0240 DIi: NameServer Rsp Error

DESCRIPTION: The driver received a NameServer response containing a status error.
DATA: (1) CommandResponse.bits.CmdRsp (2) ReasonCode (3) Explanation (4) fc_flag
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: Check the fabric configuration. The driver recovers from this and continues with device discovery.

### 0241 DIi: NameServer rsp error

DESCRIPTION: The driver received a NameServer response containing a status error.
DATA: (1) CommandResponse.bits.CmdRsp (2) ReasonCode (3) Explanation (4) fc_flag
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: Check the fabric configuration. The driver recovers from this and continues with device discovery.

### 0242 DIi: Failmask change on TGT <target_ID> LUN <lun_ID>

DESCRIPTION: An event was processed that indicates the driver may not be able to send I/O to the specified LUN.
DATA: (1) nlp_failMask (2) bitmask (3) flag
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, information.

### 0243 DIi: Issue FDMI request failed

DESCRIPTION: Cannot issue an FDMI request to HBA.
DATA: (1) cmdcode
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0244 DIi: Issue FDMI request failed

DESCRIPTION: Cannot issue an FDMI request to the HBA.
DATA: (1) cmdcode
SEVERITY: Information
LOG: LOG_Discovery Verbose
ACTION: No action needed, informational.

### 0245 DIw: ALPA based bind method used on an HBA which is in a nonloop topology

DESCRIPTION: ALPA-based bind method used on an HBA which is not in a loop topology.
DATA: (1) topology
SEVERITY: Warning
LOG: LOG_DISCOVERY Verbose
ACTION: Change the bind method configuration parameter of the adapter to 1(WWNN) or 2(WWPN) or 3(DID)

### 0246 DIe: RegLogin failed

DESCRIPTION: The firmware returned a failure for the specified RegLogin.
DATA: Did, mbxStatus, hbaState
SEVERITY: Error
LOG: Always
MODULE: fcscsib.c
ACTION: This message indicates that the firmware could not do RegLogin for the specified Did. There may be a limitation on how many nodes an adapter can see.

### 0247 DIi: Start Discovery Timer state <hba_state>

DESCRIPTION: Start the device discovery / RSCN rescue timer.
DATA: (1) tmo (2) disctmo (3) fc_plogi_cnt (4) fc_adisc_cnt
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION: No action needed, informational.

### 0248 DIi: Cancel Discovery Timer state <hba_state>

DESCRIPTION: Cancel the device discovery / RSCN rescue timer.
DATA: (1) fc_flag (2) rc (3) fc_plogi_cnt (4) fc_adisc_cnt
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION:No action needed, informational.

### 0249 DIi: Start nodev Timer

DESCRIPTION: A device disappeared form the FC network. If the device does not return within the nodev-tmo timeout, all I/O to the device will fail.
DATA: (1) nlp_DID (2) nlp_flag (3) nlp_state (4) nlp
SEVERITY: Information
LOG: LOG_DISCOVERY Verbose
ACTION:No action needed, informational.

## Mailbox Events (0300 - 0399)

### 0300 MBw: READ_LA: no buffers

DESCRIPTION: The driver attempted to issue a READ_LA mailbox command to the adapter, but there were no buffers available.
DATA: None
SEVERITY: Warning
LOG: LOG_MBOX Verbose
ACTION: This message indicates: (1) a possible lack of memory resources. Try increasing the lpfc 'num_bufs' configuration parameter to allocate more buffers. (2) A possble driver buffer management problem. If this problem persists, report the error to Technical Support.

### 0301 MBw: READ_SPARAM: no buffers

DESCRIPTION: The driver attempted to issue a READ_SPARAM mailbox command to the adapter, but there were no buffers available.
DATA: None
SEVERITY: Warning
LOG: LOG_MBOX Verbose
ACTION: This message indicates: (1) a possible lack of memory resources. Try increasing the lpfc 'num_bufs' configuration parameter to allocate more buffers. (2) A possble driver buffer management problem. If the problem persists, report the error to Technical Support.

### 0302 MBw: REG_LOGIN: no buffers

DESCRIPTION: The driver attempted to issue a REG_LOGIN mailbox command to the adapter, but there were no buffers available.
DATA: None
SEVERITY: Warning
LOG: LOG_MBOX Verbose
ACTION: This message indicates: (1) a possible lack of memory resources. Try increasing the lpfc 'num_bufs' configuration parameter to allocate more buffers. (2) A possible driver buffer management problem. If the problem persists, report the error to Technical Support.

### 0303 INe: Adapter initialization error, mbxCmd <cmd> READ_NVPARM, mbxStatus <status>

DESCRIPTION: A mailbox command failed during initialization.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0304 MBe: Stray mailbox interrupt, mbxCommand <cmd> mbxStatus <status>

DESCRIPTION: Received a mailbox completion interrupt and there are no outstanding mailbox commands.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0305 MBi: Mbox cmd cmpl error - RETRYing

DESCRIPTION: A mailbox command completed with an error status that causes the driver to reissue the mailbox command.
DATA: (1) mbxCommand (2) mbxStatus (3) word1 (4) hba_state
SEVERITY: Information
LOG: LOG_MBOX Verbose
ACTION: No action needed, informational.

### 0306 MBe: CONFIG_LINK mbxStatus error <mbxStatus> HBA state <hba_state>

DESCRIPTION: The driver issued a CONFIG_LINK mbox command to the HBA that failed.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a firmware or hardware problem. Report these errors to Technical Support.

### 0307 MBi: Mailbox Cmpl, wd0 <pmbox> wd1 <varWord> wd2 <varWord> cmpl <mbox_cmpl)

DESCRIPTION: A mailbox command completed.
DATA: None
SEVERITY: Information
LOG: LOG_MBOX Verbose
ACTION: No action needed, informational.

### 0308 MBi: Mbox cmd issue - BUSY

DESCRIPTION: The driver attempted to issue a mailbox command while the mailbox was busy processing the previous command. The processing of the new command is deferred until the mailbox becomes available.
DATA: (1) mbxCommand (2) hba_state (3) sli_flag (4) flag
SEVERITY: Information
LOG: LOG_MBOX Verbose
ACTION: No action needed, informational.

### 0309 MBi: Mailbox cmd <cmd> issue

DESCRIPTION: The driver is in the process of issuing a mailbox command.
DATA: (1) hba_state (2) sli_flag (3) flag
SEVERITY: Information
LOG: LOG_MBOX Verbose
ACTION: No action needed, informational.

### 0310 MBe: Mailbox command <cmd> timeout

DESCRIPTION: A mailbox command was posted to the adapter and did not complete within 30 seconds.
DATA: (1) hba_state (2) sli_flag (3) mbox_active
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver or firmware problem. If no I/O is going through the adapter, reboot the system. If the problem persists, report the error to Technical Support.

0311 MBi: Mailbox command <cmd> cannot issue

DESCRIPTION: The driver is in the wrong state to issue the specified command.
DATA: (1) hba_state (2) sli_flag (3) flag
SEVERITY: Information
LOG: LOG_MBOX Verbose
MODULE: fcscsib.c
ACTION: No action needed, informational.

0312 SLe: Ring <ringno> handler: portRspPut <portRspPut> is bigger then rsp ring <portRspMax>

DESCRIPTION: The port rsp ring put index is larger than the size of the rsp ring.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver, firmware or hardware problem. Report these errors to Technical Support.

0313 SLw: Ring <ringno> handler: unexpected Rctl <Rctl> Type <Type> received

DESCRIPTION:The Rctl/Type of a received frame did not match any for the configured masks for the specified ring.
DATA: (1) Ring number (2) rctl (3) type
SEVERITY: Warning
LOG: Always
ACTION: This warning could indicate a software driver, firmware or hardware problem. Report these errors to Technical Support.

0314 SLe: Ring <ringno> issue: portCmdGet <portCmdGet> is bigger then cmd ring <portCmdMax>

DESCRIPTION: The port cmd ring get index is greater than the size of cmd ring.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver, firmware or hardware problem. Report these errors to Technical Support.

0315 SLe: Ring <ringno> issue: portCmdGet <portCmdGet> is bigger then cmd ring <portCmdMax>

DESCRIPTION: The port cmd ring get index is greater than the size of cmd ring.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver, firmware or hardware problem. Report these errors to Technical Support.

0316 SLe: Cmd ring <ringno> put: iotag <iotag> greater then configured max <iotag_max> wd0 <icmd>

DESCRIPTION: The assigned I/O iotag is greater than the allowed maximum.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver, firmware or hardware problem. Report these errors to Technical Support.

0317 SLe: Rsp ring <ringno> get: iotag <iotag> greater then configured max <fast_iotag> wd0 <irsp>

DESCRIPTION: The assigned I/O iotag is greater than the maximum allowed.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver, firmware or hardware problem. Report these errors to Technical Support.

0318 SLi: Outstanding I/O count for ring <ringno> is at max <iotag_max>

DESCRIPTION: An I/O tag cannot be assigned because none are available. The maximum number of allowed I/Os are currently outstanding.
DATA: None
SEVERITY: Information
LOG:LOG_SLI Verbose
ACTION: This message indicates the HBA I/O queue is full. Typically this happens when heavy I/O is running on a low-end (3 digit) HBA. We suggest you upgrade to a high-end HBA.

0319 MBe: The driver issued a READ_SPARAM mbox command to the HBA that failed.

DESCRIPTION: The driver issued a READ_SPARAM mbox command to the HBA that failed.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a firmware or hardware problem. Report these errors to Technical Support.

0320 MBe: CLEAR_LA mbxStatus error <mbxStatus> hba state <hba_state>

DESCRIPTION: The driver issued a CLEAR_LA mbox command to the HBA that failed.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a firmware or hardware problem. Report these errors to Technical Support.

### 0321 SLe: Unknown IOCB command

DESCRIPTION: Received an unknown IOCB command completion.
DATA: (1) ulpCommand (2) ulpStatus (3) ulpIoTag (4) ulpContext)
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver or firmware problem. If these problems persist, report these errors to Technical Support.

### 0322 SLw: Ring <ringno> handler: unexpected completion IoTag <IoTag>

DESCRIPTION:The driver could not find a matching command for the completion received on the specified ring.
DATA: (1) ulpStatus (2) ulpWord[4] (3) ulpCommand (4) ulpContext
SEVERITY: Warning
LOG: LOG_SLI Verbose
ACTION: This warning could indicate a software driver or firmware problem. If the problem persists report these errors to Technical Support.

### 0323 MBe: Unknown Mailbox command <cmd> Cmpl

DESCRIPTION: A unknown mailbox command completed.
DATA: (1) Mailbox Command
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver, firmware or hardware problem. Report these errors to Technical Support.

### 0324 MBe: Adapter initialization error, mbxCmd <cmd> READ_NVPARM, mbxStatus <status>

DESCRIPTION: A read nvparams mailbox command failed during port configuration.
DATA:(1) Mailbox Command (2) Mailbox Command Status
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver, firmware or hardware problem. Report these errors to Technical Support.

### 0325 SLw: Post buffer for ring <num> failed

DESCRIPTION: The driver cannot allocate a buffer to post to the ring. This usually indicates that the host system is out of buffers.
DATA:(1) missbufcnt
SEVERITY: Warning
LOG: LOG_SLI verbose
ACTION: Report these errors to Technical Support if the problem persists.

### 0326 SLe message: Cmd ring <ringno> put:: iotag <iotag> greater than configured max <iotag_max> wd0 <icmd>

DESCRIPTION: The assigned I/O iotag exceeds the allowed maximum.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver problem. If problems persist report these errors to Technical Support.

0327 SLe message: Rsp ring <ringno> get: iotag <iotag> greater than configured max <iotag_max> wd0 <irsp>

DESCRIPTION: The assigned I/O iotag exceeds the allowed maximum.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver problem. If problems persist report these errors to Technical Support.

## Initialization Events (0400 - 0499)

0405 INi: Service Level Interface (SLI) 2 selected

DESCRIPTION: A CONFIG_PORT (SLI2) mailbox command was issued.
DATA: None
SEVERITY: Information
LOG: LOG_INIT Verbose
ACTION: No action needed, informational.

0406 INw: Memory buffer pool is below low water mark

DESCRIPTION: A driver memory buffer pool is low on buffers.
DATA: (1) seg (2) fc_lowmem (3) low
SEVERITY: Warning
LOG: LOG_INIT Verbose
ACTION: None required. The driver will recover as buffers are returned to the pool.

0407 INe: Memory Buffer Pool is at upper limit.

DESCRIPTION: A memory buffer pool cannot add more buffers because it is at its himem value.
DATA: (1) seg (2) q_cnt (3) himem
SEVERITY: Error
LOG: Always
ACTION: None required. The driver will recover as buffers are returned to the pool.

0409 INe: Memory Buffer Pool is out of buffers

DESCRIPTION: A driver memory buffer pool is exhausted.
DATA: (1) seg (2) fc_free (3) fc_mbox.q_cnt (4) fc_memhi
SEVERITY: Error
LOG: Always
ACTION: Configure more resources for that buffer pool. If the problem persists, report the error to Technical Support.

0410 INe: Cannot find virtual addr for mapped buf on ring <num>

DESCRIPTION: The driver cannot find the specified buffer in its mapping table. Thus it cannot find the virtual address needed to access the data.
DATA: (1) first (2) q_first (3) q_last (4) q_cnt
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver or firmware problem. If the problem persists report these errors to Technical Support.

### 0411 INc: fcp_bind_method is 4 with Persistent binding - ignoring fcp_bind_method

DESCRIPTION: The configuration parameter for fcp_bind_method conflicts with Persistent binding parameter.
DATA: (1) a_current (2) fcp_mapping
SEVERITY: Error config
LOG: Always
ACTION: Make neccessary changes to the lpfc configuration file.

### 0412 INe: Scan-down is out of range - ignoring scan-down

DESCRIPTION: The configuration parameter for scan-down is out of range.
DATA: (1) clp[CFG_SCAN_DOWN].a_current (2) fcp_mapping
SEVERITY: Error
LOG: Always
ACTION: Make neccessary changes to the lpfc configuration file.

### 0413 es0: Configuration parameter out of range, resetting to default value

DESCRIPTION: You are attempting to set a configuration parameter to a value not supported by the driver. Resetting the configuration parameter to the default value.
DATA: (1) a_string (2) a_low (3) a_hi (4) a_default
SEVERITY: Error config
LOG: Always
ACTION: Make neccessary changes to the lpfc configuration file.

### 0427 INc: Same node has multiple persistent WWPN binding definitions.

DESCRIPTION: You are attempting to define multiple persistent WWPN bindings to a single node. Only the first persistent binding is accepted and the rest are ignored.

DATA: (1) a_string
SEVERITY: Error config
LOG: Always
ACTION: Make necessary changes to the lpfc configuration file.

### 0428 INc: Same node has multiple persistent WWNN binding definitions.

DESCRIPTION: You are attempting to define multiple persistent WWNN bindings to a single node. Only the first persistent binding is accepted and the rest are ignored.
DATA: (1) a_string
SEVERITY: Error config
LOG: Always
ACTION: Make necessary changes to the lpfc configuration file.

### 0429 INc: Same node has multiple persistent DID binding definitions.

DESCRIPTION: You are attempting to define multiple persistent DID bindings to a single node. Only the first persistent binding is accepted and the rest are ignored.
DATA: (1) a_string
SEVERITY: Error config
LOG: Always
ACTION: Make necessary changes to the lpfc configuration file.

### 0430 INc: WWPN binding entry <num>: syntax error code <code>

DESCRIPTION: A syntax error occurred while parsing WWPN binding configuration information.
DATA: None
Detail: Binding syntax error codes
0 FC_SYNTAX_OK
1 FC_SYNTAX_OK_BUT_NOT_THIS_BRD
2 FC_SYNTAX_ERR_ASC_CONVERT
3 FC_SYNTAX_ERR_EXP_COLON
4 FC_SYNTAX_ERR_EXP_LPFC
5 FC_SYNTAX_ERR_INV_LPFC_NUM
6 FC_SYNTAX_ERR_EXP_T
7 FC_SYNTAX_ERR_INV_TARGET_NUM
8 FC_SYNTAX_ERR_EXP_D
9 FC_SYNTAX_ERR_INV_DEVICE_NUM
10 FC_SYNTAX_ERR_INV_RRATIO_NUM
11 FC_SYNTAX_ERR_EXP_NULL_TERM
SEVERITY: Error config
LOG: Always
ACTION: Make neccessary changes to the lpfc configuration file.

### 0431 INc: WWNN binding entry <num>: syntax error code <code>

DESCRIPTION: A syntax error occured while parsing WWNN binding configuration information.
DATA: None
Detail: Binding syntax error codes
0 FC_SYNTAX_OK
1 FC_SYNTAX_OK_BUT_NOT_THIS_BRD
2 FC_SYNTAX_ERR_ASC_CONVERT
3 FC_SYNTAX_ERR_EXP_COLON
4 FC_SYNTAX_ERR_EXP_LPFC
5 FC_SYNTAX_ERR_INV_LPFC_NUM
6 FC_SYNTAX_ERR_EXP_T
7 FC_SYNTAX_ERR_INV_TARGET_NUM
8 FC_SYNTAX_ERR_EXP_D
9 FC_SYNTAX_ERR_INV_DEVICE_NUM
10 FC_SYNTAX_ERR_INV_RRATIO_NUM
11 FC_SYNTAX_ERR_EXP_NULL_TERM
SEVERITY: Error config
LOG: always
ACTION: Make neccessary changes to the lpfc configuration file.

### 0432 INc: WWPN binding entry: node table full

DESCRIPTION: More bindings entries were configured than the driver can handle.
DATA: None
SEVERITY: Error config
LOG: Always
ACTION: Make neccessary changes to the lpfc configuration file so that fewer bindings are configured.

### 0433 INc: WWNN binding entry: node table full

DESCRIPTION: More bindings entries were configured than the driver can handle.
DATA: None
SEVERITY: Error config
LOG: Always
ACTION: Make neccessary changes to the lpfc configuration file so that fewer bindings are configured.

### 0434 INc: DID binding entry <num>: syntax error code <code>

DESCRIPTION: A syntax error occured while parsing DID binding configuration information.
DATA: None
Detail: Binding syntax error codes
0 FC_SYNTAX_OK
1 FC_SYNTAX_OK_BUT_NOT_THIS_BRD
2 FC_SYNTAX_ERR_ASC_CONVERT
3 FC_SYNTAX_ERR_EXP_COLON
4 FC_SYNTAX_ERR_EXP_LPFC
5 FC_SYNTAX_ERR_INV_LPFC_NUM
6 FC_SYNTAX_ERR_EXP_T
7 FC_SYNTAX_ERR_INV_TARGET_NUM
8 FC_SYNTAX_ERR_EXP_D
9 FC_SYNTAX_ERR_INV_DEVICE_NUM
10 FC_SYNTAX_ERR_INV_RRATIO_NUM
11 FC_SYNTAX_ERR_EXP_NULL_TERM
SEVERITY: Error config
LOG: Always
ACTION: Make neccessary changes to the lpfc configuration file.

### 0435 INc: DID binding entry: node table full

DESCRIPTION: More bindings entries were configured than the driver can handle.
DATA: None
SEVERITY: Error config
LOG: Always
ACTION: Make neccessary changes to the lpfc configuration file so that fewer bindings are configured.

### 0436: Adapter failed to init, timeout, status reg <status>

DESCRIPTION: The adapter failed during powerup diagnostics after it was reset.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0437 INe: Adapter failed to initialize chipset

DESCRIPTION: The adapter failed during powerup diagnostics after it was reset.
DATA: (1) status (2) status1 (3) status2
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0438 INe: Adapter failed to initialize chipset

DESCRIPTION: The adapter failed during powerup diagnostics after it was reset.
DATA: (1) status (2) status1 (3) status2
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0439 INe: Adapter failed to init, mbxCmd <cmd> READ_REV, mbxStatus <status>

DESCRIPTION: Adapter initialization failed when issuing a READ_REV mailbox command.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0440 INe: Adapter failed to init, mbxCmd <cmd> READ_REV, detected outdated firmware

DESCRIPTION: Outdated firmware was detected during initialization.
DATA: (1) read_rev_reset
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. Update the firmware. If the problem persists, report the error to Technical Support.

### 0441 INi: VPD not present on adapter, mbxCmd <cmd> DUMP VPD, mbxStatus <status>

DESCRIPTION: The DUMP_VPD mailbox command failed.
DATA: None
SEVERITY: Information
LOG: LOG_INIT Verbose
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0442 INe: Adapter failed to init, mbxCmd <cmd> CONFIG_PORT, mbxStatus <status>

DESCRIPTION: Adapter initialization failed when issuing a CONFIG_PORT mailbox command.
DATA: (1) hbainit
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0446 INe: Adapter failed to init, mbxCmd <cmd> CFG_RING, mbxStatus <status>, ring <num>

DESCRIPTION: Adapter initialization failed when issuing a CFG_RING mailbox command.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0447 INe: Adapter failed init, mbxCmd <cmd> CONFIG_LINK mbxStatus <status>

DESCRIPTION: Adapter initialization failed when issuing a CONFIG_LINK mailbox command.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0448 INe: Adapter failed to init, mbxCmd <cmd> READ_SPARM, mbxStatus <status>

DESCRIPTION: Adapter initialization failed when issuing a READ_SPARM mailbox command.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0449 INe: WorldWide PortName type <type> doesn't conform to IP Profile

DESCRIPTION: In order to run IP, the WorldWide PortName must be of type IEEE (NAA = 1). This message is displayed if the adapter WWPN doesn't conform with the standard.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Turn off the network-on configuration parameter or configure a different WWPN.

### 0450 INw: Adapter failed to init, mbxCmd <cmd> FARP, mbxStatus <status>

DESCRIPTION: Adapter initialization failed when issuing a FARP mailbox command.
DATA: None
SEVERITY: Warning
LOG: LOG_INIT Verbose
ACTION: None required.

### 0451 INe: Enable interrupt handler failed

DESCRIPTION: The driver attempted to register the adapter interrupt service routine with the host operating system, but failed.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or driver problem. If the problem persists, report the error to Technical Support.

### 0453 INe: Adapter failed to init, mbxCmd <cmd> READ_CONFIG, mbxStatus <status>

DESCRIPTION: Adapter initialization failed when issuing a READ_CONFIG mailbox command.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0454 INe: Adapter failed to init, mbxCmd <cmd> INIT_LINK, mbxStatus <status>

DESCRIPTION: Adapter initialization failed when issuing an INIT_LINK mailbox command.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0455 INi: Vital Product

DESCRIPTION: Vital product data (VPD) contained in the adapter flash.
DATA: (1) vpd[0] (2) vpd[1] (3) vpd[2] (4) vpd[3]
SEVERITY: Information
LOG: LOG_INIT Verbose
ACTION: No action needed, informational.

### 0457 INe: Adapter Hardware Error

DESCRIPTION: The driver received an interrupt indicating a possible hardware problem.
Data: (1) status (2) status1 (3) status2
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a hardware or firmware problem. If the problem persists, report the error to Technical Support.

### 0458 INw: Bring adapter online

DESCRIPTION: The FC driver has received a request to bring the adapter online. This may occur when running applications.
DATA: None
SEVERITY: Warning
LOG: LOG_INIT Verbose
ACTION: None required.

### 0460 INw: Bring adapter offline

DESCRIPTION: The FC driver has received a request to bring the adapter offline. This may occur when running applications.
DATA: None
SEVERITY: Warning
LOG: LOG_INIT Verbose
ACTION: None required.

### 0462 INe: Too many cmd / rsp ring entries in SLI2 SLIM

DESCRIPTION: The FC driver has configured too many cmd / rsp ring entries in SLI2 SLIM.
DATA: (1) totiocb (2) MAX_SLI2_IOCB
SEVERITY: Error
LOG: Always
ACTION: This is a software driver error. If this problem persists, report these errors to Technical Support.

0463 INw message: Temperature exceeded threshold

DESCRIPTION: The adapter has detected an over-heat condition.
DATA: (1) temperature
SEVERITY: Warning
LOG: LOG_INIT verbose
ACTION: Potential problem with the cooling system on the host. Check with the system vendor.

0464 INi message: Temperature dropped below threshold

DESCRIPTION: The adapter temperature dropped to safe operating conditions.
DATA: (1) temperature
SEVERITY: Information
LOG: LOG_INIT verbose
ACTION: None required

0465 INe message: Temperature exceeded critical threshold.

DESCRIPTION: The adapter temperature has exceeded critical threshold.
DATA: (1) status (2) temperature
SEVERITY: Error
LOG: Always
ACTION: Potential problem with the cooling system on the host. Check with the system vendor.

0466 INe message: Adapter heartbeat failure

DESCRIPTION: The adapter heartbeat has failed.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Reset the adapter; If problem persists, contact Technical Support.

## IP Traffic History (0600 - 0699)

0600 IPi: FARP-RSP received from DID <did>

DESCRIPTION: A FARP-ELS command response was received.
DATA: None
SEVERITY: Information
LOG: LOG_IP Verbose
ACTION: None required, informational.

0601 IPi: FARP-REQ received from DID <did>

DESCRIPTION: A FARP-ELS command response was received.
DATA: None
SEVERITY: Information
LOG: LOG_IP Verbose
ACTION: None required, informational.

### 0602 IPw: IP Response Ring <num> out of posted buffers

DESCRIPTION: The IP ring returned all posted buffers to the driver and is waiting for the driver to post new buffers. This could mean the host system is out of TCP/IP buffers.
DATA: (1) fc_missbufcnt (2) NoRcvBuf
SEVERITY: Warning
LOG: LOG_IP Verbose
ACTION: Try allocating more IP buffers (STREAMS buffers or mbufs) of size 4096 and/or increasing the post-ip-buf lpfc configuration parameter, then reboot the system.

### 0603 IPw: xmi Sequence completion error

DESCRIPTION: A XMIT_SEQUENCE command completed with a status error in the IOCB.
DATA: (1) ulpStatus (2) ulpWord[4] (3) ulpWord[7] (4)ulpIoTag (5) did
SEVERITY: Warning
LOG: LOG_IP Verbose
ACTION: If there are many errors to one device, check the state of the remote PortID. The driver attempts to recover by creating a new exchange to the remote driver.

### 0605 IPw: No room on IP xmit queue

DESCRIPTION: The system is generating the IOCB commands to be processed faster than the adapter can process them.
DATA: (1) xmitnoroom
SEVERITY: Warning
LOG: LOG_IP Verbose
ACTION: Check the state of the link. If the link is up and running, reconfigure the xmit queue size to be larger. Note, a larger queue size may require more system IP buffers. If the link is down, check the physical connections to the Fibre Channel network.

### 0606 IPi: XRI Create for IP traffic to DID <DID>

DESCRIPTION: The lpfc driver is missing an exchange resource identifier (XRI) for this node and must create one prior to the transmit operation.
DATA: None
SEVERITY: Information
LOG: LOG_IP Verbose
ACTION: None required, informational.

### 0607 IPi: XRI response from DID with XRI <xri> and status <ulpStatus>

DESCRIPTION: The driver received an XRI response from SLI with the resulting exchange resource ID and status.
DATA: None
SEVERITY: Information
LOG: LOG_IP Verbose
ACTION: None required, informational.

### 0608 IPw: IP packet timed out

DESCRIPTION: An IP IOCB command was posted to a ring and did not complete within the timeout seconds.
DATA: (1) Did
SEVERITY: Warning
LOG: LOG_IP Verbose
ACTION: If no IP packet is going through the adapter, reboot the system. If the problem persists, contact Technical Support.

### 0609 IPe: Network buffer and DMA address mismatch

DESCRIPTION: An IP buffer free operation found a mismatch between an IP buffer and its dma address.
DATA: (1) pib (2) ip buff found (3) ip buf actual (4) dma address
SEVERITY: Error
LOG: Always
ACTION: Stop traffic and reboot the system.

### 0610 IPi: FARP Request sent to remote DID

DESCRIPTION: A send to a remote IP address has no node in the driver's nodelists. Send a FARP request to obtain the node's HW address.
DATA: (1) IEEE[0] (2) IEEE[1] (3) IEEE [2] (4) IEEE [3] (5) IEEE [4] (6) IEEE [5]
SEVERITY: Information
LOG: LOG_IP Verbose
ACTION: Issue FARP and wait for PLOGI from remote node.

### 0611 IPe: Dropping received IP packet

DESCRIPTION: The driver decided to drop an IP Response ring entry.
DATA: (1) ulpStatus (2) ulpWord [4] (3) ulpWord [7]
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver or firmware problem. If the problem persists, report the error to Technical Support.

## FCP Traffic History (0700 - 0799)

### 0701 FPi: Issue Abort Task Set to TGT <num> LUN <num>

DESCRIPTION: The SCSI layer detected that it needs to abort all I/O to a specific device. This causes the FCP Task Management command to abort the I/O in progress.
DATA: (1) rpi (2) flags
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: Check the state of the device in question.

### 0702 FPi: Issue Target Reset to TGT <num>

DESCRIPTION: The SCSI layer detected that it needs to abort all I/O to a specific target. This results in an FCP Task Management command to abort the I/O in progress.
DATA: (1) rpi (2) flags
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: Check the state of the target in question.

### 0703 FPi: Issue LUN Reset to TGT <num> LUN <num>

DESCRIPTION: The SCSI layer detected that it must abort all I/O to a specific device. This results in an FCP Task Management command to abort the I/O in progress.
DATA: (1) rpi (2) flags
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: Check the state of the device in question.

### 0710 FPi: Iodone <target>/<lun> error <result> SNS <lp> <lp3>

DESCRIPTION: This error indicates that the Fibre Channel driver is returning a SCSI command to the SCSI layer in error or with sense data.
DATA: (1) retry (2) resid
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: None required, informational.

### 0712 FPe: SCSI layer issued abort device

DESCR IPTION: The SCSI layer is requesting the driver to abort I/O to a specific device.
DATA: (1) target (2) lun (3)
SEVERITY: Error
LOG: Always
ACTION: Check the state of the device in question.

### 0713 FPi: SCSI layer issued Target Reset

DESCRIPTION: The SCSI layer is requesting the driver to abort I/O to a specific target.
DATA: (1) target (2) lun
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: None required, informational.

### 0714 FPi: SCSI layer issued Bus Reset

DESCRIPTION: The SCSI layer is requesting the driver to abort all I/Os to all targets on this adapter.
DATA: None
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: None required, informational.

### 0716 FPi: FCP Read Underrun, expected <len>, residual <resid>

DESCRIPTION: An FCP device provided less data than was requested.
DATA: (1) fcpi_parm (2) cmnd[0] (3) underflow
SEVERITY: Information
LOG: LOG_RESID_UNDER Verbose
ACTION: None required, informational.

### 0721 FPi: Cmpl Inquiry SN on NPort <nlp_DID>

DESCRIPTION: An INQUIRY Serial Number (page x83) completed. This information is saved by the driver.
DATA: (1) ulpStatus (2) rspStatus2 (3) rspStatus3 (4) scsi_id (5) lun_id
SEVERITY: Information
LOG: Log_FCP Verbose
ACTION: None required, informational.

### 0722 FPi: INQUIRY SN info

DESCRIPTION: This is the serial number of the device that will be saved.
DATA: (1) *datap (2) *datap + 3 (3) datap + 7 (4) rspResId
SEVERITY: Information
LOG: Log_FCP Verbose
ACTION: None required, informational.

### 0723 FPi: Issue Inquiry SN on NPort <nlp_DID>

DESCRIPTION: Issuing an INQUIRY Serial Number (page x83) FCP command.
DATA: (1) failMask (2) scsi_id (3) lun_id
SEVERITY: Information
LOG: Log_FCP Verbose
ACTION: None required, informational.

### 0724 FPi: Issue Inquiry PO on NPort <nlp_DID>

DESCRIPTION: Issuing an INQUIRY Serial Number (page x0) FCP command.
DATA: (1) failMask (2) scsi_id (3) lun_id
SEVERITY: Information
LOG: Log_FCP Verbose
ACTION: None required, informational.

### 0725 FPe: Inquiry Serial Number: invalid length

DESCRIPTION: An INQUIRY SN command completed with an invalid serial number length.
DATA: (1) sizeSN (2) j (3) scis_id (4) lun_id
SEVERITY: Error
LOG: Always
ACTION: Check remote NPORT for potential problem.

### 0726 FPe: INQUIRY SN cmd failed

DESCRIPTION: The INQUIRY Serial Number (page x83) failed.
DATA: (1) ulpStatus (2) fcpi_parm (3) m_target (4) m_lun
SEVERITY: Error
LOG: Always
ACTION: Check if target device supports this command.

### 0727 FPi: Cmpl INQUIRY PO on NPort <nlp_DID>

DESCRIPTION: An INQUIRY (page 0) completed. This information is saved by the driver.
DATA: (1) ulpStatus (2) rspStatus2 (3) rspStatus3 (4) scsi_id (5) lun_id
SEVERITY: Information
LOG: Log_FCP Verbose
ACTION: None required, informational.

### 0728 FPe: INQUIRY Page 0 cmd failed

DESCRIPTION: The INQUIRY (page 0) failed.
DATA: (1) ulpStatus (2) fcpi_parm (3) scsi_id (4) lun_id
SEVERITY: Error
LOG: Always
ACTION: Check if target device supports this command.

### 0729 FPw: FCP cmd <cmnd> failed <target>/<lun>

DESCRIPTION: The specified device failed an FCP command.
DATA: (1) status (2) result (3) xri (4) iotag
SEVERITY: Warning
LOG: LOG_FCP Verbose
ACTION: Check the state of the target in question.

### 0730 FPw: FCP command failed: RSP

DESCRIPTION: The FCP command failed with a response error.
DATA: (1) Status2 (2) Status3 (3) ResId (4) SnsLen (5) RspLen (6) Info3
SEVERITY: Warning
LOG: LOG_FCP Verbose
ACTION: Check the state of the target in question.

### 0734 FPw: FCP Read Check Error

DESCRIPTION: The issued FCP command returned a read check error.
DATA: (1) fcpDl (2) rspResId (3) fcpi_parm (4) cdb[0]
SEVERITY: Warning
LOG: LOG_FCP Verbose
ACTION: Check the state of the target in question.

### 0735 FPw: FCP Read Check Error with Check Condition

DESCRIPTION: The issued FCP command returned a read check error and a check condition.
DATA: (1) fcpDl (2) rspResId (3) fcpi_parm (4) cdb[0]
SEVERITY: Warning
LOG: LOG_FCP Verbose
ACTION: Check the state of the target in question.

### 0736 FPi: Received Queue Full status from FCP device <tgt> <lun>

DESCRIPTION: Received a Queue Full error status from specified FCP device.
DATA: (1) qfull_retry_count (2) qfull_retries (3) currentOutstanding (4) maxOutstanding
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: None required, informational.

### 0737: <ASC ASCQ> Check condition received

DESCRIPTION: The issued FCP command resulted in a check condition.
DATA: (1) CFG_DELAY_RSP_ERR (3) *lp
SEVERITY: Information
LOG: LOG_FCP | LOG_CHK_COND Verbose
ACTION: None required, informational.

### 0747 FPi: Cmpl target reset

DESCRIPTION: A driver-initiated target reset completed.
DATA: (1) scsi_id (2) lun_id (3) Error (4)statLocalError (5) *cmd + WD7
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: None required, informational.

### 0748 FPi: Cmpl LUN reset

DESCRIPTION: A driver-initiated LUN reset completed.
DATA: (1) scsi_id (2) lun_id (3) Error (4) statLocalError (5) *cmd + WD7
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: None required, informational.

### 0749 FPi: Cmpl Abort Task Set

DESCRIPTION: A driver-initiated abort task set completed.
DATA: (1) scsi_id (2) lun_id (3) Error (4) statLocalError (5) *cmd + WD7
SEVERITY: Information
LOG: LOG_FCP Verbose
ACTION: None required.

### 0753 FPe: Inquiry Serial Number: invalid length

DESCRIPTION: An INQUIRY SN command completed with an invalid serial number length.
DATA: (1) sizeSN (2) j (3) scsi_id (4) lun_id
SEVERITY: Error
LOG: Always
ACTION: Check state of target in question.

### 0754 FPe: SCSI timeout

DESCRIPTION: An FCP IOCB command was posted to a ring and did not complete within ULP timeout seconds.
DATA:(1) did (2) sid (3) lun (4) command (5) iotag
SEVERITY: Error
LOG: Always
ACTION: If I/O is not going through the adapter, reboot the system; otherwise check the state of the target in question. If the problem persists, contact Technical Support.

### 0755 FPw: FCP cmd <cmd> failed <target>/<lun>

DESCRIPTION: The specified device failed an FCP command.
DATA:(1) status (2) result (3) errcode (4) xri (5) iotag
SEVERITY: Warning
LOG: LOG_RESID_UNDER verbose
ACTION: Check the state of the target in question.

0756 FPw: FCP command failed: RSP

DESCRIPTION: The FCP command failed with a response error.
DATA:(1) Status2 (2) Status3 (3) ResId (4) SnsLen (5) Rsplen (6) Info3
SEVERITY: Warning
LOG: LOG_RESID_UNDER verbose
ACTION: Check the state of the target in question.

## Node Table Events (0900 - 0999)

0900 NDi: Cleanup node for NPort <nlp_DID>

DESCRIPTION: The driver node table entry for a remote NPort was removed.
DATA: (1) nlp_flag (2) nlp_state (3) nlp_rpi
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

0901 NDi: FIND node WWPN mapped

DESCRIPTION: The driver is searching for a node table entry, on the mapped node list, based on the WWPN.
DATA: (1) nlp (2) WWPN (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

0902 NDi: FIND node DID mapped

DESCRIPTION: The driver is searching for a node table entry, on the mapped node list, based on DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

0903 NDi: Add scsiid <sid> to BIND list

DESCRIPTION: The driver is putting the node table entry on the binding list.
DATA: 1) bind_cnt (2) nlp_DID (3) bind_type (4) blp
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

0904 NDi: Add NPort <did> to <list> list

DESCRIPTION: The driver is moving the node table entry on the specified list.
DATA: (1) nlp_flag (2) blp
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0910 NDi: FIND node DID unmapped

DESCRIPTION: The driver is searching for a node table entry on the unmapped node list, based on DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0911 NDi: FIND node DID unmapped

DESCRIPTION: The driver is searching for a node table entry, on the unmapped node list, based on DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0917 NDi: PUT END nodelist

DESCRIPTION: The driver is freeing a node table entry buffer.
DATA: (1) bp (2) fc_free
SEVERITY: Information
LOG: LOG_NODE Verborse
ACTION: None required, informational.

### 0927 NDi: GET nodelist

DESCRIPTION: The driver is allocating a buffer to hold a node table entry.
DATA: (1) bp (2) fc_free
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0928 NDi: PUT nodelist

DESCRIPTION: The driver is freeing a node table entry buffer.
DATA: (1) bp (2) fc_free
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0929 NDi: FIND UNMAPPED node DID

DESCRIPTION: The driver is searching for a node table entry, on the unmapped node list, based on DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0930 NDi: FIND MAPPED node DID

DESCRIPTION: The driver is searching for a node table entry, on the mapped node list, based on DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0931 NDi: FIND PLOGI node DID

DESCRIPTION: The driver is searching for a node table entry, on the PLOGI node list, based on DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0932 NDi: FIND REGLOGIN node DID

DESCRIPTION: The driver was searching for a node table entry on the REGLOGIN node list, based on the DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0933 NDi: FIND PRLI node DID

DESCRIPTION: The driver was searching for a node table entry on the PRLI node list, based on the DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0934 NDi: FIND ADISC node DID

DESCRIPTION: The driver was searching for a node table entry on the ADISC list, based on the DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0935 NDi: FIND NPR node DID

DESCRIPTION: The driver was searching for a node table entry on the NPR node list, based on the DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0936 NDi: FIND UNUSED node DID

DESCRIPTION: The driver was searching for a node table entry on the UNUSED node list, based on the DID.
DATA: (1) nlp (2) nlp_DID (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0937 NDi: FIND node DID <did> NOT FOUND

DESCRIPTION: The driver was searching for a node table entry based on the DID and the entry was not found.
DATA: (1) order
SEVERITY: Information
LOG: LOG_NODE Verbose
ACTION: None required, informational.

### 0938 NDi message: FIND PLOGI node WWPN

DESCRIPTION: The driver is searching for a node table entry, on the PLOGI node list, based on WWPN.
DATA: (1) nlp (2) WWPN (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE verbose
ACTION: No action needed, informational

### 0939 NDi message: FIND REGLOGIN node WWPN

DESCRIPTION: The driver is searching for a node table entry, on the REGLOGIN node list, based on WWPN.
DATA: (1) nlp (2) WWPN (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE verbose
ACTION: No action needed, informational

### 0940 NDi message: FIND PRLI node WWPN

DESCRIPTION: The driver is searching for a node table entry, on the PRLI node list, based on WWPN.
DATA: (1) nlp (2) WWPN (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE verbose
ACTION: No action needed, informational

### 0941 NDi message: FIND ADISC node WWPN

DESCRIPTION: The driver is searching for a node table entry, on the ADISC node list, based on WWPN.
DATA: (1) nlp (2) WWPN (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE verbose
ACTION: No action needed, informational

### 0942 NDi message: FIND NPR node WWPN

DESCRIPTION: The driver is searching for a node table entry, on the NPR node list, based on WWPN.
DATA: (1) nlp (2) WWPN (3) nlp_flag (4) data1
SEVERITY: Information
LOG: LOG_NODE verbose
ACTION: No action needed, informational

0943 NDi message: FIND node WWPN <wwpn> NOT FOUND

DESCRIPTION: The driver was searching for a node table entry based on the WWPN and the entry was not found.
DATA: (1) order
SEVERITY: Information
LOG: LOG_NODE verbose
ACTION: No action needed, informational

## Miscellaneous Events (1200 - 1299)

1200: Cannot unload driver while lpfcdiag interface is active

DESCRIPTION: An attempt was made to unload the driver while the DFC interface was active.
DATA: (1) refcnt (2) instance
SEVERITY: Error
LOG: Always
ACTION: Exit any application that uses the DFC diagnostic interface before attempting to unload the driver.

1208 MIi: C_CT request error

DESCRIPTION: The CT response returned more data than the user buffer could hold.
DATA: (1) dfc_flag (2) 4096
SEVERITY: Information
LOG: LOG_MISC Verbose
ACTION: Modify the user application issuing a CT request to allow for a larger response buffer.

1210 MIe: Convert ASC to hex. Input byte cnt <1

DESCRIPTION: ASCII string to hexadecimal conversion failed. The input byte count is greater than 1.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver problem. If the problem persists, report the error to Technical Support.

1211 MIe: Convert ASC to hex. Input byte cnt > max <num>

DESCRIPTION: ASCII string to hexadecimal conversion failed. The input byte count exceeds max <num>.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver problem. If problems persist report, these errors to Technical Support.

1212 MIe: Convert ASC to hex. Output buffer to small

DESCRIPTION: ASCII string to hexadecimal conversion failed. The output buffer byte size is less than 1/2 of the input byte count. Every two input characters (bytes) require one output byte.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver problem. If the problem persists, report the error to Technical Support.

1213 MIc: Convert ASC to hex. Input char seq not ASC hex

DESCRIPTION: The ASCII hexadecimal input string contains a non-ASCII hex character.
DATA: None
SEVERITY: Error configuration
LOG: Always
ACTION: Make necessary changes to the lpfc configuration file.

1214 MIe: Cannot unload driver, IP interface still attached

DESCRIPTION: An attempt was made to unload the driver while the IP interface was active.
DATA: (1) refcnt (2) brd_no
SEVERITY: Error
LOG: Always
ACTION: Exit the IP interface before attempting to unload the driver.

## Link Events (1300 - 1399)

1300 LKe: Re-establishing Link, timer expired

DESCRIPTION: The driver detected a condition where it had to re-initialize the link.
DATA: (1) fc_flag (2) fc_ffstate
SEVERITY: Error
LOG: Always
ACTION: If numerous link events are occurring, check the physical connections to the Fibre Channel network.

1301 LKi: Re-establishing Link

DESCRIPTION: The driver detected a condition in which it had to re-initialize the link.
DATA: (1) status (2) status1 (3) status2
SEVERITY: Information
LOG: LOG_LINK_EVENT Verbose
ACTION: If numerous link events are occurring, check the physical connections to the Fibre Channel network.

1302 LKw: Invalid link speed configured, Reset link speed to auto-detect

DESCRIPTION: The driver is re initializing the link speed to auto-detect.
DATA: (1) current link speed
SEVERITY: Warning
LOG: LOG_LINK_EVENT Verbose
ACTION: None required, informational.

1303 LKe: Link Up Event <eventTag> received

DESCRIPTION: A link up event was received. It is also possible for multiple link events to be received together.
DATA:(1) fc_eventTag (2) granted_AL_PA (3) UlnkSpeed (4) alpa_map[0]
Detail: If link events received, log (1) last event number received, (2) ALPA granted, (3) Link speed (4) number of entries in the loop init LILP ALPA map. An ALPA map message is also recorded if LINK_EVENT Verbose mode is set. Each ALPA map message contains 16 ALPAs.
SEVERITY: Error
LOG: Always
ACTION: If numerous link events are occurring, check the physical connections to the FC network.

### 1304 LKw message: Link Up Event ALPA map

DESCRIPTION: A link up event was received.
DATA: (1) wd1 (2) wd2 (3) wd3 (4) wd4
SEVERITY: Warning
LOG: LOG_LINK_EVENT verbose
ACTION: If numerous link events are occurring, check the physical connections to the Fibre Channel network.

### 1305 LKe message: Link Down Event <eventTag> received

DESCRIPTION: A link down event was received.
DATA: (1) fc_eventTag (2) hba_state (3) fc_flag
SEVERITY: Error
LOG: Always
ACTION: If numerous link events are occurring, check the physical connections to the Fibre Channel network.

### 1306 LKw message: LinkDown timeout on HBA

DESCRIPTION: The link was down for more than the configured linkdown-tmo seconds.
DATA: (1) hba_state (2) fc_flag (3) fc_ns_retry
SEVERITY: Warning
LOG: LOG_LINK_EVENT | LOG_DISCOVERY verbose
ACTION: Check HBA cable/connection to the Fibre Channel network.

### 1307 LKi message: READ_LA mbox error <mbxStatus> state <hba_state>

DESCRIPTION: The driver cannot determine what type of link event occurred.
DATA: None
SEVERITY: Information
LOG: LOG_LINK_EVENT verbose
ACTION: If numerous link events are occurring, check the physical connections to the Fibre Channel network. Could indicate a possible hardware or firmware problem.

### 1308 LKe message: Out of memory; Ignoring the link attention

DESCRIPTION: The driver is unable to process the link attention due to insufficient memory.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: This error could indicate a software driver problem. If problems persist report these errors to Technical Support.

### 1309 LKe message: FCoE: Running Golden Firmware, Firmware update required

DESCRIPTION: A link up event has occurred on an FCoE adapter and indicated it was running the Golden Firmware.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Immediately initiate a firmware update on this HBA.

1310 LKe message: FCoE: Running Diagnostic Firmware, Operational adapter is suspended.

DESCRIPTION: A link up event occurred on an FCoE adapter and indicated it was running the Diagnostic Firmware.
DATA: None
SEVERITY: Error
LOG: Always
ACTION: Note that operational use of the hba is suspended until diagnostic complete.

1311 LKe message: FCoE: Entering Maintenance Mode

DESCRIPTION: A link up event was received that indicates we are entering maintenance mode for the Menlo.
DATA: (1) fc_eventTag (2) UlnkSpeed (3) topology (4) fa
SEVERITY: Error
LOG: Always
ACTION: Perform necessary Menlo Maintenance actions.

1312 LKe message: FCoE - Invalid FRU Data: Return Adapter for repair

DESCRIPTION: A firmware attention informed us the adapter has invalid FRU Data.

DATA: None
SEVERITY: Error
LOG: Always
ACTION: Return this adapter for repair.

## Log Messages - IOCTL Events (1600 - 1699)

1600 IOi: dfc_ioctl entry

DESCRIPTION: The entry point for processing diagnostic ioctl.
DATA:(1) c_cmd (2) c_arg1 (3) c_arg2 (4) c_outsz
SEVERITY: Information
LOG: LOG_IP Verbose
ACTION: None required, informational.

1601 IOi: dfc_ioctl exit

DESCRIPTION: The exit point for processing diagnostic ioctl.
DATA: (1) rc (2) c_outsz (3) c_dataout
SEVERITY: Information
LOG: LOG_IP Verbose
ACTION: None required, informational.

1602 IOi: dfc_data_alloc

DESCRIPTION: Allocating data buffer to process dfc ioct.
DATA: (1) fc_dataout (2) fc_outsz
SEVERITY: Information
LOG: LOG_IOC Verbose
ACTION: None required, informational.

1603 IOi: dfc_data_free

DESCRIPTION: The data buffer is being freed to process dfc ioct.

DATA: (1) fc_dataout (2) fc_outsz
SEVERITY: Information
LOG: LOG_IOC Verbose
ACTION: None required, informational.

### 1604 IOe: lpfc_ioctl:error

DESCRIPTION: The SCSI send request buffer size limit was exceeded.
DATA: (1) error number index
SEVERITY: Error
LOG: Always
ACTION: Reduce the application program's SCSI send request buffer size to less then 320K bytes.