ETERNUS
Disk storage systems

Server Connection Guide
(Fibre Channel)

for Oracle Solaris

Driver Settings for Emulex Fibre Channel Cards
Preface

This document briefly explains the operations that need to be performed by the user in order to connect an ETERNUS2000 model 100 or 200, ETERNUS4000 model 300, 400, 500, or 600, or ETERNUS8000 model 700, 800, 900, 1100, 1200, 2100, or 2200 Disk storage system to a server running Solaris OS and using Emulex Fibre Channel cards via a Fibre Channel interface.

This document should be used in conjunction with any other applicable user manuals, such as those for the ETERNUS2000 model 100 or 200, ETERNUS4000 model 300, 400, 500, or 600, or ETERNUS8000 model 700, 800, 900, 1100, 1200, 2100, or 2200 Disk storage system, server, OS used, Fibre Channel cards, drivers, etc.

Note that this manual refers the following documents.

• Server Support Matrix
• ETERNUS Disk storage systems Server Connection Guide (Fibre Channel) for Oracle Solaris

Also, note that in this document the ETERNUS2000 models 100 and 200, ETERNUS4000 models 300, 400, 500, and 600, and ETERNUS8000 models 700, 800, 900, 1100, 1200, 2100, and 2200 Disk storage systems are collectively referred to as ETERNUS Disk storage systems.

Fourth Edition
December 2010

The Contents and Structure of this Manual

This document is composed of the following five chapters and an appendix.

• Chapter 1 Workflow
  This describes the workflow required to establish a connection between a server with Emulex Fibre Channel cards and an ETERNUS Disk storage system.

• Chapter 2 Installing the Fibre Channel Card Driver
  This describes how to install the Fibre Channel card driver.

• Chapter 3 Setting Up the Server
  This describes how to set up the server for different connection topologies.

• Chapter 4 Logical Unit Recognition
  This describes how to make the server recognize the ETERNUS Disk storage system LUNs (logical units).

• Chapter 5 Required Driver Parameters
  This describes how to set up the Emulex Fibre Channel card driver.
An appendix contains the various management tables that are used in "Chapter 3 Setting Up the Server".

Safe Use of this Product

- Using this manual

This manual contains important information to ensure the safe use of this product. Be sure to thoroughly read and understand its contents before using the product. After reading, store this manual in a safe place for future reference. FUJITSU has made every effort to ensure the safety of the users and other personnel, and to prevent property damage. When using this product, carefully follow the instructions described in this manual.

Acknowledgments

- Oracle and Java are registered trademarks of Oracle and/or its affiliates.
- All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. in the United States and other countries.
- Emulex is a trademark of Emulex Corp.
- The company names, product names and service names mentioned in this document are registered trademarks or trademarks of their respective companies.

Naming Conventions

- Product names

  - Oracle Solaris might be described as Solaris, Solaris Operating System, or Solaris OS.

- Other names

  - "Channel Adapter" (CA) refers to the Fibre Channel interface module used in the ETERNUS Disk storage systems to connect to the server.
  - "Fibre Channel card" refers to the Fibre Channel interface module normally used by the server. A "Host Bus Adapter" (HBA) or "Channel Adapter" (CA) may be used instead, depending on the server.
  - Italics are used to show variables such as values and characters that appear in command parameters and output examples.

Copyright 2010 FUJITSU LIMITED
Contents

Chapter 1 Workflow .................................................................6

Chapter 2 Installing the Fibre Channel Card Driver ..................8
  2.1 Solaris 10 OS Update1 or Later ........................................... 8
  2.2 Solaris 10 OS, Solaris 9 OS or Solaris 8 OS ....................... 10

Chapter 3 Setting Up the Server ............................................11
  3.1 Creating a WWN Instance Management Table for the Server 12
  3.2 Creating a WWN Instance Management Table for Storage System 14
  3.3 Creating a Target Binding Table ....................................... 15
  3.4 Setting the Configuration File .......................................... 16
  3.5 Re-checking the Settings .................................................. 16

Chapter 4 Logical Unit Recognition ........................................17
  4.1 Recognizing Logical Units with the sd Driver ...................... 17
  4.1.1 Logical Unit Recognition ............................................. 17
  4.1.2 Getting the Server to Recognize the Logical Units ........... 19

Chapter 5 Required Driver Parameters ....................................21
  5.1 For Driver Versions V6.30g and Later .................................. 21
  5.1.1 lpfc.conf Parameter Values .......................................... 21
  5.1.2 /kernel/drv/lpfc.conf Example ...................................... 26
  5.2 For Driver Versions Before V6.30g .................................... 30
  5.2.1 lpfc.conf Parameter Values .......................................... 30
  5.2.2 /kernel/drv/lpfc.conf Example ...................................... 33

Appendix A Various Management Table Template .....................38
  A.1 WWN Instance Management Table for the Server ............... 38
  A.2 WWN Instance Management Table for Storage System ........ 39
  A.3 Target Binding Table ...................................................... 39
Chapter 1  Workflow

This manual is used when performing the setup procedure described in "Installing the Driver and Setting Up the Server" and "Logical Unit Recognition" of the "ETERNUS Disk storage systems Server Connection Guide (Fibre Channel) for Oracle Solaris".

Workflow

1. Fiber Channel Card Driver Installation
   Install the driver. Download the proper driver from the Emulex web-site as required.
   - "Chapter 2 Installing the Fibre Channel Card Driver” (page 8)
   - Driver (downloaded from web-site)
   - Used for driver installation
     • Manual (downloaded from web-site)

2. Management Table Creation (Various)
   Enter the necessary information in the "WWN Instance Management Table for the Server", "WWN Instance Management Table for Storage System", and "Target Binding Table".
   - "Chapter 3 Setting Up the Server” (page 11)
   - "Appendix A Various Management Table Template” (page 38)

3. Fiber Channel Card Driver Setup
   Set the driver parameters by editing the configuration file.
   - "Chapter 3 Setting Up the Server” (page 11)
   - "Chapter 5 Required Driver Parameters” (page 21)
Logical Unit (LUN) Recognition
Make the server recognize the ETERNUS Disk storage system logical units using the sd driver.

- "Chapter 4 Logical Unit Recognition" (page 17)

After completing all the required procedures in this manual, proceed to "Setting the Multi-paths" in "ETERNUS Disk storage systems Server Connection Guide (Fibre Channel) for Oracle Solaris".
Chapter 2 Installing the Fibre Channel Card Driver

Which of the following Fibre Channel card driver installation and set up procedures is used depends on whether a newer (Solaris 10 OS Update 1 or later) or older (Solaris 10 OS, Solaris 9 OS or Solaris 8 OS) version of the OS being used.

| Caution | If using Emulex Fibre Channel cards, note that while the following warning message may appear during server startup, it has no effect on the server or ETERNUS Disk storage system. Warning lpfcX:129:FCP Read Check Error. ("X" is instance number) |

2.1 Solaris 10 OS Update 1 or Later

Solaris 10 OS Update 1 and later include the SFS driver with the OS. For Emulex Fibre Channel cards, switch the driver so that the Emulex driver (lpfc driver) is used instead of the SFS driver.

Procedure

1. Apply the patch.
   Sun released patch 120222-6 or later installed.

2. Install the Emulex FCA Utility.
   Download the Emulex FCA Utility from the following web site.
   For details of installation, refer to the FCA Utility Manual in the following Emulex web-site:
   http://www.emulex.com

3. Check that Emulex lpfc driver is not installed.
   If installed, uninstall it using "pkgrm" command.
   By the following method, Emulex lpfc driver can be checked and uninstalled.
   - Check the package
     
     ```
     #pkginfo -l lpfc
     ```
   - Uninstallation method
     
     ```
     #pkgrm lpfc
     The following package is currently installed:
     lpfc Emulex LightPulse FC SCSI/IP Host Bus Adapter driver
     (sparc) Release 6.02h
     Do you want to remove this package? [y,n,?,q] y
     ```
4 Unbind the Emulex driver using the Emulex FCA Utility.
For details, refer to "Emulex FCA Utility Manual" and "Solaris 10 OS Update 1 behavior change must read before downloading driver Manual".

Perform the following procedure to unbind the Emulex driver.

4-1 Move to the Emulex FCA utility directory.

```bash
# cd /opt/EMLXemlxu/bin
```

4-2 Launch the Emulex FCA utility using the following command.

```bash
# ./emlxdrv
```

Available commands:
- `set_emlxs <Alias>` - Sets emlxs driver to bind to the specified device(s)
- `set_emlxs_sun` - Sets emlxs driver to bind to all Sun devices
- `set_emlxs_all` - Sets emlxs driver to bind to all devices
- `set_lpfc <Alias>` - Sets lpfc driver to bind to the specified device(s)
- `set_lpfc_nonsun` - Sets lpfc driver to bind to all non-Sun devices
- `clear_lpfc` - Clears all lpfc driver bindings
- `clear_emlxs` - Clears all emlxs driver bindings
- `clear_sun` - Clears driver bindings to all Sun devices
- `clear_nonsun` - Clears driver bindings to all non-Sun devices
- `clear_all` - Clears driver bindings to all devices
- `q` - Exits this program.

4-3 Unbind the Emulex driver using the following command.

```bash
emlxdrv> clear_all
```

Quit the utility using the following command.

```bash
emlxdrv> q
```

4-4 Install the driver.
Download and install the lpfc driver from the Emulex web-site.

End of procedure
2.2 Solaris 10 OS, Solaris 9 OS or Solaris 8 OS

Download and install the driver from the Emulex web-site.
Chapter 3  Setting Up the Server

The server setup will vary according to how the ETERNUS Disk storage systems and server are to be connected. Edit the server's configuration file to match the chosen topology. Configuration files may also differ depending on which Fibre Channel cards are to be used.

There are two possible connection topologies: FC-AL connection and Fabric connection.

■ For FC-AL connection

Instance name data of the Fibre Channel card is necessary. Refer to the following to set.

- "3.1 Creating a WWN Instance Management Table for the Server" (page 12)
- "3.2 Creating a WWN Instance Management Table for Storage System" (page 14)
- "3.4 Setting the Configuration File" (page 16)
- "3.5 Re-checking the Settings" (page 16)

■ For Fabric connection

The Fibre Channel card instance name, target WWN, and target ID information are necessary. Check each item and enter them in the list. Edit the configuration file according to those information and make settings. Refer to the following to set.

- "3.1 Creating a WWN Instance Management Table for the Server" (page 12)
- "3.2 Creating a WWN Instance Management Table for Storage System" (page 14)
- "3.3 Creating a Target Binding Table" (page 15)
- "3.4 Setting the Configuration File" (page 16)
- "3.5 Re-checking the Settings" (page 16)
3.1 Creating a WWN Instance Management Table for the Server

Determine the following information for each Fibre Channel card installed in the server and enter it into a copy of the "WWN instance management table for the server" (provided in "Appendix A Various Management Table Template" (page 38)).

- Physical slot name
- WWN
- Instance name
- Physical path name

### WWN Instance Management Table for the Server

<table>
<thead>
<tr>
<th>Physical slot name</th>
<th>WWN</th>
<th>Instance name</th>
<th>Physical path name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Procedure

1. Check the instance names.

"lpfc + instance number" is the format used to represent Fibre Channel card instance names.

The instance No. that corresponds to the physical path in which the Fibre Channel card is installed is stored in the "/etc/path_to_inst" file at Fibre Channel card driver installation. Extract the necessary lines using the "grep" command.

```bash
# grep "lpfc" /etc/path_to_inst
```

**Example**

```
"/pci@09,600000/lpfc@1" 0 "lpfc"
"/pci@09,600000/lpfc@2" 1 "lpfc"
```

<table>
<thead>
<tr>
<th>Physical path name</th>
<th>Instance number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**

"lpfc0" is the instance name of the "/pci@09,600000/lpfc@1" path Fibre Channel card.

"lpfc1" is the instance name of the "/pci@09,600000/lpfc@2" path Fibre Channel card.
2 Enter the results in "Instance name" and "Physical path name" columns of the "WWN instance management table for the server".

Example

<table>
<thead>
<tr>
<th>Physical slot name</th>
<th>WWN</th>
<th>Instance name</th>
<th>Physical path name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lpfc0</td>
<td>/pci@9,600000/lpfc@1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lpfc1</td>
<td>/pci@9,600000/lpfc@2</td>
</tr>
</tbody>
</table>

3 Check the Fibre Channel card WWNs.

Open the "/var/adm/messages" file to identify the WWNs.
(The "WWPN" value in the 3rd line is a WWN, with an instance name of "lpfc0").
(The "WWPN" value in the 12th line is a WWN, with an instance name of "lpfc1").

4 Add the results in the "WWN instance management table for the server".

Example

<table>
<thead>
<tr>
<th>Physical slot name</th>
<th>WWN</th>
<th>Instance name</th>
<th>Physical path name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10000000c9366046</td>
<td>lpfc0</td>
<td>/pci@9,600000/lpfc@1</td>
</tr>
<tr>
<td></td>
<td>10000000c93659de</td>
<td>lpfc1</td>
<td>/pci@9,600000/lpfc@2</td>
</tr>
</tbody>
</table>

End of procedure
3.2 Creating a WWN Instance Management Table for Storage System

Create a "WWN instance management table for storage system" that summarizes information relating to CA in the ETERNUS Disk storage systems.

WWN Instance Management Table for Storage System

<table>
<thead>
<tr>
<th>Channel Adapter</th>
<th>WWN</th>
<th>T_ID</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Check the following items and enter them in the WWN instance management table for storage system.

- **Channel Adapter**
  CA name in the ETERNUS Disk storage systems

- **WWN**
  The WWN for each CA in the ETERNUS Disk storage system (check using ETERNUSmgr)

- **T_ID**
  The SCSI target ID (decimal value) that is to be defined for each CA
  In a Fabric topology, the SCSI target ID is irrelevant to the physical protocol, however it must be defined as a Solaris OS SCSI driver setting. Values matched to the server environment and connection state of the devices must be set beforehand.
  It is recommended to set the same target ID to CAs that configure a multipath.

**Example** When there are two ports on the ETERNUS Disk storage systems:

<table>
<thead>
<tr>
<th>Channel Adapter</th>
<th>WWN</th>
<th>Alias name</th>
<th>T_ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM0CA0Port0</td>
<td>202000e000cb0001</td>
<td>E4000_CM0CA0P0</td>
<td>16</td>
</tr>
<tr>
<td>CM1CA0Port0</td>
<td>203000e000cb0001</td>
<td>E4000_CM1CA0P0</td>
<td>16</td>
</tr>
</tbody>
</table>
3.3 Creating a Target Binding Table

This procedure is not necessary for FC-AL connection.
Target binding logically binds the Fibre Channel card installed in the server, and the CA on the ETERNUS Disk storage systems to be connected to the server.

Target binding binds the instance name of the Fibre Channel card, channel adapter name, WWN, and target ID.

Enter the required information for target binding in the "target binding table". "Target binding tables" are created for each server to be connected.

Enter the following information in the target binding table.

- Name of target server
- Channel Adapter names and their SCSI target IDs
  The "channel adapter names" and "target IDs" entered in the "WWN instance management table for storage system"
- RAID-WWN
  The WWN entered in the "WWN instance management table for storage system"

**Procedure**

1. Enter the target information to be set for the server.
   Reflect the information from the "WWN instance management table for storage system" in the "target binding table".

   **Target Binding Table**

<table>
<thead>
<tr>
<th>Channel Adapter</th>
<th>SCSI T-ID</th>
<th>RAID-WWN</th>
<th>Instance name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM0CA0</td>
<td>16</td>
<td>2020000c000cb0001</td>
<td></td>
</tr>
<tr>
<td>CM1CA0</td>
<td>16</td>
<td>2030000c000cb0001</td>
<td></td>
</tr>
</tbody>
</table>

2. Confirm the connection path(s) in the system.

   **Example**

   Physical slots on Server#0 and CAs on the ETERNUS Disk storage systems are connected in the following paths.
   - Server#0 SLOT0 – CM0CA0
   - Server#0 SLOT1 – CM1CA0
3. Based on the connection path(s) confirmed in Step 2 and the information in the "WWN instance management table for the server", enter the instance names corresponding to the physical slot names on the server into the "target binding table".

---

### 3.4 Setting the Configuration File

Edit the configuration file according to the "WWN instance management table for the server", "WWN instance management table for storage system", and "target binding table". For how to set to the configuration file and the setting example, refer to “5.1 For Driver Versions V6.30g and Later" (page 21) and “5.2 For Driver Versions Before V6.30g" (page 30).

---

**Caution**
Check the WWN instance management table for the server, WWN instance management table for storage system, and target binding table for any omissions.

---

### 3.5 Re-checking the Settings

After setting is complete, check for incorrect settings in the configuration file.

---

**Caution**
Check the target binding values before rebooting the server. If the server boots with a setting error, it may recognize a different storage system from that set in the system configuration, without generating a connection error.
Chapter 4   Logical Unit Recognition

The sd driver or hddv driver needs to be set to allow the server to recognize the ETERNUS Disk storage systems' logical units.

---

**Caution**  
Skip this chapter if using the ETERNUS Multipath Driver or GR Multipath Driver "grmpdautoconf" command.

---

### 4.1 Recognizing Logical Units with the sd Driver

The sd driver needs to be set to allow the server to recognize the ETERNUS Disk storage systems' logical units.  
First, confirm that the logical unit settings on the ETERNUS Disk storage systems are correct.  
Next, check that Fibre Channel card IDs are described in the sd driver's configuration file (/kernel/drv/sd.conf).  
Then reboot the server to get it to recognize the logical units.

---

**Note**  
When the Fibre Channel card driver version is V6.30g or later, skip this setting.

---

### 4.1.1 Logical Unit Recognition

The Emulex Fibre Channel card driver requires different settings, depending on the connection method (topology).

- For FC-AL connection  
Add the descriptions of the logical units in the sd driver configuration file (/kernel/drv/sd.conf) using a text editor, such as "vi".

---

**Caution**  
Do not delete the lun=0 description for the system disk target ID.
Example

```
# Copyright (c) 1992, by Sun Microsystems, Inc.
#
#ident  "(#)sd.conf  1.9  98/01/11 SMI"

name="sd" class="scsi" class_prop="atapi"
    target=0 lun=0;
name="sd" class="scsi" class_prop="atapi"
    target=1 lun=0;
name="sd" class="scsi" class_prop="atapi"
    target=2 lun=0;
name="sd" class="scsi" class_prop="atapi"
    target=3 lun=0;
name="sd" class="scsi"
    target=4 lun=0;

name="sd" parent="lpfc" target=16 lun=0;
name="sd" parent="lpfc" target=16 lun=1;
# End lpfc auto-generated configuration -- do NOT alter or delete this line
```

- Use the "lun=" format to list all the LUNs that are to be connected.
- Set the "target=" value the same as the Loop-ID set in the [Set CA Details] window of ETERNUSmgr.

Note

The ETERNUSmgr Loop-ID is natively set as a hexadecimal value, which must be converted to a decimal value for this setting.

- For Fabric connection
  Add the descriptions of the logical units in the sd driver configuration file (/kernel/drv/sd.conf) using a text editor, such as "vi".

Caution

Do not delete the lun=0 description for the system disk target ID.
Example

```c
# Copyright (c) 1992, by Sun Microsystems, Inc.
# ident "%(sd.conf 1.9 98/01/11 SMI"

name="sd" class="scsi" class_prop="atapi"
    target=0 lun=0;
name="sd" class="scsi" class_prop="atapi"
    target=1 lun=0;
name="sd" class="scsi" class_prop="atapi"
    target=2 lun=0;
name="sd" class="scsi" class_prop="atapi"
    target=3 lun=0;
name="sd" class="scsi"
    target=4 lun=0;

name="sd" parent="lpfc" target=16 lun=0;
name="sd" parent="lpfc" target=16 lun=1;
# End lpfc auto-generated configuration -- do NOT alter or delete this line
```

- Use the "lun=" format to list all the LUNs that are to be connected.
- For "target=", specify the target ID of the "fcp-bind-WWPN" parameter described in the configuration file in "5.2 For Driver Versions Before V6.30g" (page 30).

---

**Note**

The ETERNUSmgr Loop-ID is natively set as a hexadecimal value, which must be converted to a decimal value for this setting.

---

### 4.1.2 Getting the Server to Recognize the Logical Units

The server now needs to use the new sd driver settings to recognize the logical units.

**Procedure**

1. Reconfigure and reboot the server to get it to recognize the listed logical units. Execute the following command.

   ```bash
   # touch /reconfigure
   # /usr/sbin/shutdown -y -g0 -i6
   ``

2. After the server has booted up, log in as a superuser, and use the "format" command to assign labels and to confirm that the storage system and all logical units have been correctly recognized.

   ```bash
   # format
   ```
4.1 Recognizing Logical Units with the sd Driver

Example 1  VTOC disk labels

- Target ID=16, lun=0 and 1 of ETERNUS4000 are connected to the physical path "/pci@9,600000/lpfc@1", and c4t16d0 and c4t16d1 are assigned to each of these LUNs.
- Target ID=16, lun=0 and 1 of ETERNUS4000 are connected to the physical path "/pci@9,600000/lpfc@2", and c5t16d0 and c5t16d1 are assigned to each of these LUNs.

```
Example 2  EFI disk labels

EFI labels are automatically assigned to 1TB and larger disks. However, even if the disk capacity is less than 1TB, EFI labels can still be assigned using the "format -e" command, as shown in the following example.

```

End of procedure

---

Example 2  EFI disk labels

EFI labels are automatically assigned to 1TB and larger disks. However, even if the disk capacity is less than 1TB, EFI labels can still be assigned using the "format -e" command, as shown in the following example.
Chapter 5 Required Driver Parameters

The parameters in the "/kernel/drv/lpfc.conf" configuration file need to be edited as described below.
Required parameters and values vary depending on the version of Fibre Channel card driver being used.

Caution The old configuration file should always be backed up before editing:

Example

```
cp /kernel/drv/lpfc.conf .lpfc.conf.backup
```

- These settings are common for all Solaris 10 OS, Solaris 9 OS, and Solaris 8 OS versions.
- Comment out any items that are not required by putting a "#" at the beginning of the line.
- Instance names are specified for some items, but not for others.
  Check the "WWN instance management table for the server" for the actual "X" instance numbers to use in the "lpfcX" below.

5.1 For Driver Versions V6.30g and Later

Edit the configuration file according to the following parameter list.

5.1.1 lpfc.conf Parameter Values

### ETERNUS2000

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for FC-AL connection)</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>log-verbose</td>
<td>0x0</td>
<td>0x0</td>
<td>0x0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>log-only</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>enable-auth</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>auth-cfgparms</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>auth-keys</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcX-fcp-bind-method</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>fcp-bind-WWNN</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
## Chapter 5  Required Driver Parameters

### 5.1 For Driver Versions V6.30g and Later

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for FC-AL connection)</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>lpfcX-fcp-bind-WWPN</td>
<td>Not necessary</td>
<td>(*1)</td>
<td>N/A</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>fcp-bind-DID</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcX-automap</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Yes</td>
<td>fcp-bind-WWPN is set using &quot;0&quot;, and unset using &quot;1&quot;</td>
</tr>
<tr>
<td>lun-queue-depth</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>30</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>tgt-queue-depth</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcNtM-lun-throttle</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcNtM-tgt-throttle</td>
<td>40</td>
<td>Refer to &quot;Remarks&quot;.</td>
<td>N/A</td>
<td>—</td>
<td>Value = 40 / (No. of Server-side Fibre Channel ports connected to each ETERNUS-side CA port) (Round the result down) Use the value of &quot;8&quot; if the actual result is lower.</td>
</tr>
<tr>
<td>no-device-delay</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>network-on</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>xmt-que-size</td>
<td>256</td>
<td>256</td>
<td>256</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcX-scan-down</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>linkdown-tmo</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>nodelv-holdio</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>nodelv-tmo</td>
<td>40</td>
<td>40</td>
<td>30</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>delay-rsp-err</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>num-iocbs</td>
<td>256</td>
<td>256</td>
<td>256</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>num-bufs</td>
<td>128</td>
<td>128</td>
<td>128</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcX-topology</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>ip-class</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>fcp-class</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>use-adisc</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>extra-io-tmo</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>post-ip-buf</td>
<td>128</td>
<td>128</td>
<td>128</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>dqfull-throttle-up-time</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>dqfull-throttle-up-inc</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>ack0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>cr-delay</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
### 5.1 For Driver Versions V6.30g and Later

*1: For Fabric configuration, set as follows:

```
fcp-bind-WWPN="<Storage WWPN>:<HBA instance name>t<SCSI ID>", ....
```

Check the target binding table for the fcp-bind-WWPN setting.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for FC-AL connection)</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>IpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>cr-count</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>discovery-threads</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcX-link-speed</td>
<td>2, 4 or 8 (*2)</td>
<td>2, 4, or 8 (*2)</td>
<td>0</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>fdmi-on</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>msi-mode</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>target-disk</td>
<td>sd</td>
<td>sd</td>
<td>sd</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>target-tape</td>
<td>st</td>
<td>st</td>
<td>st</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>target-tapechanger</td>
<td>sgen</td>
<td>sgen</td>
<td>sgen</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

*2: "lpfcX-link-speed" setting value

<table>
<thead>
<tr>
<th>Fibre Channel card transfer speed</th>
<th>Fabric connection Fibre Channel switch transfer speed</th>
<th>FC-AL connection CA transfer speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>8Gbps</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4Gbps</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2Gbps</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

■ ETERNUS4000 and ETERNUS8000

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for FC-AL connection)</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>IpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>log-verbose</td>
<td>0x0</td>
<td>0x0</td>
<td>0x0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>log-only</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>enable-auth</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>auth-cfgparms</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>auth-keys</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcX-fcp-bind-method</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>fcp-bind-WWPN</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcX-fcp-bind-WWPN</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

*1: For Fabric configuration, set as follows:

```
fcp-bind-WWPN="<Storage WWPN>:<HBA instance name>t<SCSI ID>", ....
```

*2: For Fabric configuration, set as follows:

```
fcp-bind-WWPN="<Storage WWPN>:<HBA instance name>t<SCSI ID>", ....
```

Check the target binding table for the fcp-bind-WWPN setting.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for FC-AL connection)</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>fcp-bind-DID</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>lpfcX-automap</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Yes</td>
<td>fcp-bind-DDP is set using “0”, and unset using “1”</td>
</tr>
<tr>
<td>lun-queue-depth</td>
<td>20</td>
<td>20</td>
<td>30</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>tgt-queue-depth</td>
<td>512</td>
<td>512</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>lpfcNtM-lun-throttle</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>N/A</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>lpfcNtM-tgt-throttle</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>N/A</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>no-device-delay</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>network-on</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>xmt-que-size</td>
<td>256</td>
<td>256</td>
<td>256</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>lpfcX-scan-down</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>linkdown-tmo</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>nodelv-holdio</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>nodelv-tmo</td>
<td>40</td>
<td>40</td>
<td>30</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>delay-rsp-err</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>num-iocbs</td>
<td>256</td>
<td>256</td>
<td>256</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>num-bufs</td>
<td>128</td>
<td>128</td>
<td>128</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>lpfcX-topology</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>ip-class</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>fcp-class</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>use-adisc</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>extra-io-tmo</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>post-ip-buf</td>
<td>128</td>
<td>128</td>
<td>128</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>dqfull-throttle-uptime</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>dqfull-throttle-up-inc</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>ack0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>cr-delay</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>cr-count</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>discovery-threads</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>lpfcX-link-speed</td>
<td>2, 4, or 8 (*2)</td>
<td>2, 4, or 8 (*2)</td>
<td>0</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>fdmi-on</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>msi-mode</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>target-disk</td>
<td>sd</td>
<td>sd</td>
<td>sd</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>target-tape</td>
<td>st</td>
<td>st</td>
<td>st</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>target-tapechanger</td>
<td>sgen</td>
<td>sgen</td>
<td>sgen</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

---

1. fcp-bind-DID is not necessary in FC-AL connection.
2. lpfcX-automap sets fcp-bind-DDP using “0”, and it is unset using “1”.
3. No specific remarks are provided for the remaining parameters.
*1: For Fabric configuration, set as follows:
fcp-bind-WWN="<Storage WWPN>:<HBA instance name>:<SCSI ID>", ....
Check the target binding table for the fcp-bind-WWN setting.

<table>
<thead>
<tr>
<th>Channel Adapter name</th>
<th>SCSI T-ID</th>
<th>RAID-WWN</th>
<th>Instance name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM0CA0Port0</td>
<td>16</td>
<td>202000e000cb0001</td>
<td>lpfc0</td>
</tr>
<tr>
<td>CM1CA0Port0</td>
<td>16</td>
<td>203000e000cb0001</td>
<td>lpfc1</td>
</tr>
</tbody>
</table>

fcp-bind-WWN="202000e000cb0001:lpfc0t16","203000e000cb0001:lpfc1t16";

*2: "lpfX-link-speed" setting value

<table>
<thead>
<tr>
<th>Fibre Channel card speed</th>
<th>Fabric connection</th>
<th>FC-AL connection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8Gbps</td>
<td>4Gbps</td>
</tr>
<tr>
<td>8Gbps</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>4Gbps</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2Gbps</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
5.1.2 /kernel/drv/lpfc.conf Example

The following is a Fabric connection example.

```
# Copyright (c) 2003-2007 Emulex. All rights reserved.
#
# Solaris LightPulse lpfc (SCSI) / lpfn (IP) driver: global initialized data.
#
# lpfc.conf 1.54 2007/11/21 12:00:49PST
#
# Verbosity: only turn this flag on if you are willing to risk being
# deluged with LOTS of information.
# You can set a bit mask to record specific types of verbose messages:
#
# 0x1    ELS events
# 0x2    Device Discovery events
# 0x4    Mailbox Command events
# 0x8    Initialization events
# 0x10   Link Attention events
# 0x20   IP events
# 0x40   FCP events
# 0x80   Node table events
# 0x400  Miscellaneous events
# 0x800  SLI events
# 0x2000 IOCTL events
# 0x4000 FCP Residual Underrun events
# 0xffff Log All Events
log-verbose=0x0;
#
# Setting log-only to 0 causes log messages to be printed on the
# console and to be logged to syslog (which may send them to the
# console again if it's configured to do so).
# Setting log-only to 1 causes log messages to go to syslog only.
log-only=1;
#
# standalone parameters for fc-sp are used globally.
#
# enable-auth=0;
#
LWNN|WWNN|auth_tov|auth_mode|bi-dir|typelist|hashlist|dhgplist|reauth_intval
# typelist=dhcpap:fcap:fcpap:kerberos
# hashlist=shal:md5
# dhgplist=1536:null:1024:1280:2048
# For example:
# The first entry is for host-to-fabric, the second entry is for end-to-end
auth-cfgparams="0000000000000000|FFFFFFFFFFFFFFFF|002d|02|01|01000000|02010000|04010203050000000000012c*
#
LWNN:type:length:pwd:WWNN:type:length:pwd
# type: 0001 ASCII 0002 Binary
# length: length of password in hex
# For example:
# auth-keys="20000000C9365947:0001:0100:11233445567788|12345678901|010000000000012c*";
#
# +++ Variables relating to FCP (SCSI) support. +++
#
# specifies the method of binding to be used. For
# binding method is used for persistent binding and automap
# binding. A value of 1 will force WWNN binding, value
# of 2 will force WPNN binding, value of 3 will force
# DID binding and value of 4 will force the driver to derive
# binding from ALPA (hard addressed) in a private loop environment.
# Any persistent binding whose type does not match with the
# bind method
# If fc-bind-user is set to 4, for FC-AL connection, lpfc0-fcp-bind-method=4;
lpfc0-fcp-bind-method=2;
lpfc1-fcp-bind-method=2;
```

Chapter 5  Required Driver Parameters

5.1  For Driver Versions V6.30g and Later

ETERNUS Disk storage systems Server Connection Guide for Oracle Solaris

Copyright 2010 FUJITSU LIMITED

P3AM-2702-04ENZ0  ETERNUS Disk storage systems Server Connection Guide for Oracle Solaris

27
Chapter 5  Required Driver Parameters

5.1  For Driver Versions V6.30g and Later

### Variables relating to SCSI (FCP) support

- **lpfc0t17-lun-throttle=48;**
  - says that each LUN on target 17, interface lpfc0 should be allowed up to 48 simultaneously outstanding commands.
- **lpfc1t39-lun-throttle=10;**
- **lpfc0t40-lun-throttle=30;**

### Variables relating to FCP target support

- **lpfc0t17-tgt-throttle=48;**
  - says that target 17, interface lpfc0 should be allowed up to 48 simultaneously outstanding commands.
- **lpfc1t39-tgt-throttle=10;**
- **lpfc0t40-tgt-throttle=30;**

### Variables relating to IP networking support

- **network-on=0;**
- **xmt-que-size=256;**

### Variables common to both SCSI (FCP) and IP networking support

- **scan-down=0;**
  - for FC-AL connection, lpfc0-scan-down=1;
Chapter 5  Required Driver Parameters

5.1  For Driver Versions V6.30g and Later

# If set, nodev-holdio will hold all I/O errors on FCP devices that disappear
# until they come back. Default is 0, return errors with no-device-delay.
# This parameter is ignored, if scsi commands are issued in polled mode.
nodev-holdio=0;

# If set, nodev-tmo will hold all I/O errors on devices that disappear
# until the timer [0 to 255 secs] expires. Default is 30, return errors
# with no-device-delay.
nodev-tmo=40;

# Use no-device-delay to delay FCP RSP errors and certain check conditions.
delay-rsp-err=0;

# num-locbs [128 to 10240] - number of locb buffers to allocate
num-locbs=256;

# num-bufs [64 to 4096] - number of buffers to allocate
# Buffers are needed to support Fibre channel Extended Link Services.
# Also used for SLI-2 FCP buffers, one per FCP command, and Mailbox commands.
num-bufs=128;

topology:  link topology for initializing the Fibre Channel connection.
# 0 = attempt loop mode, if it fails attempt point-to-point mode
# 2 = attempt point-to-point mode only
# 4 = attempt loop mode only
# Set point-to-point mode if you want to run as an N_Port.
# Set loop mode if you want to run as an NL_Port.
topology=0;

lpfc0-topology=2,
lpfc1-topology=2;

# Set a preferred ALPA for the adapter, only valid if topology is loop.
lpfc0-assign-alpa=2;  Request ALPA 2 for lpfc0
lpfc1-assign-alpa=2;

# ip-class:  FC class (2 or 3) to use for the IP protocol.
ip-class=3;

# fcp-class:  FC class (2 or 3) to use for the FCP protocol.
fcp-class=3;

# Use ADISC for FCP rediscovery instead of PLOGI.
use-adisc=0;

# Extra IO timeout [0 to 255 secs] for fabrics
extra-io-tmo=0;

# Number of 4k STREAMS buffers [64 to 1024] to post to IP ring.
post-ip-buf=128;

# Use dqfull-throttle-up-time [0 to 30 secs] to specify when to increment
# the current Q depth.
dqfull-throttle-up-time=1;

# Increment the current Q depth by dqfull-throttle-up-inc [0 to 128]
dqfull-throttle-up-inc=1;

# Use ACK0, instead of ACK1 for class 2 acknowledgement.
ack0=0;

# cr-delay: Coalesce Response Delay
# This value specifies a count of milliseconds [0 to 63] after which an
# interrupt response is generated if cr-count has not been satisfied.
# This value is set to 0 to disable the Coalesce Response feature.
cr-delay=0;
5.2 For Driver Versions Before V6.30g

Set up the parameters according to the following table.

### 5.2.1 Ipfc.conf Parameter Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for FC-AL connection)</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>IpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>log-verbose</td>
<td>0x0</td>
<td>0x0</td>
<td>0x0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>log-only</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
| lpfcX-fcp-bind-method      | 4                            | 2                             | 2                       | Yes                   | An instance name is specified for each instance.
| fcp-bind-WWNN              | Not necessary                | Not necessary                 | N/A                     | —                     | —       |
| fcp-bind-WWPN              | Not necessary                | N/A                           | N/A                     | —                     | —       |

5.2.1.1 lpfc.conf Parameter Values

- **cr-count**: Coalesce Response Count
  - This value specifies a count of I/O completions [1 to 255] after which an interrupt response is generated. This feature is disabled if `cr-delay` is set to 0.
  - `cr-count=1;`

- **discovery-threads**: This value specifies the maximum number of ELS commands during discovery.
  - `discovery-threads=1;`

- **link-speed**: Link speed selection for initializing the Fibre Channel connection.
  - `0 = auto select (default)`
  - `1 = 1 Gigabaud`
  - `2 = 2 Gigabaud`
  - `4 = 4 Gigabaud`
  - `8 = 8 Gigabaud`
  - `lpfc0-link-speed=8;`
  - `lpfc1-link-speed=8;`
  - `lpfc0-link-speed=8;`
  - `lpfc1-link-speed=8;`

- **fdmi-on**: 0 = disable fdmi
  - 1 = enable fdmi without registration of "host name" port attribute
  - 2 = enable fdmi and "host name" port attribute
  - `fdmi-on=0;`

- **msi-mode**: 0 = disable msi; use legacy interrupts
  - 1 = enable single message MSI
  - 2 = enable multiple message MSI
  - 3 = auto select (default)
  - `msi-mode=3;`

Add these settings for both FC-AL and Fabric connections.

- `lpfc0-link-speed=8;`
- `lpfc1-link-speed=8;`

- `lpfc0-link-speed=8;`
- `lpfc1-link-speed=8;`

- `lpfc0-link-speed=8;`
- `lpfc1-link-speed=8;`
### Chapter 5  Required Driver Parameters

#### 5.2 For Driver Versions Before V6.30g

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for FC-AL connection)</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>fcp-bind-DID</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcX-automap</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Yes</td>
<td>An instance name is specified for each instance.</td>
</tr>
<tr>
<td>lun-queue-depth</td>
<td>For the ETERNUS2000: Not necessary</td>
<td>For the ETERNUS4000 and ETERNUS8000: 20</td>
<td>30</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>tgt-queue-depth</td>
<td>For the ETERNUS2000: Not necessary</td>
<td>For the ETERNUS4000 and ETERNUS8000: 512</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcNtM-lun-throttle</td>
<td>Not necessary</td>
<td>Not necessary</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcNtM-tgt-throttle</td>
<td>For the ETERNUS2000: 40</td>
<td>For the ETERNUS4000 and ETERNUS8000: Not necessary</td>
<td>N/A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>no-device-delay</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>network-on</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>xmt-que-size</td>
<td>256</td>
<td>256</td>
<td>256</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>lpfcX-scan-down</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Yes</td>
<td>An instance name is specified for each instance.</td>
</tr>
<tr>
<td>linkdown-tmo</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
### Chapter 5  Required Driver Parameters

#### 5.2  For Driver Versions Before V6.30g

**ETERNUS Disk storage systems Server Connection Guide for Oracle Solaris**

**Copyright 2010 FUJITSU LIMITED**

---

**Parameter** | Value (for FC-AL connection) | Value (for Fabric connection) | Initial value (default) | lpfcX (Instance name) | Remarks
--- | --- | --- | --- | --- | ---
nodev-holdio | 0 | 0 | 0 | — | —
nodev-tmo | 40 | 40 | 30 | — | —
delay-rsp-err | 0 | 0 | 0 | — | —
num-iocbs | 256 | 256 | 256 | — | —
num-bufs | 128 | 128 | 128 | — | —
lpfcX-topology | 4 | 2 | 0 | Yes | An instance name is specified for each instance.

| *1: For Fabric configuration, set as follows: fcp-bind-WWPN="<Storage WWPN>:<HBA instance name>t<SCSI ID>",* ... Check the target binding table for the fcp-bind-WWPN setting. |
| --- | --- | --- | --- | --- | --- |

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for FC-AL connection)</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
</table>

---

---

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
</table>

---

---

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
</table>

---

---

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value (for Fabric connection)</th>
<th>Initial value (default)</th>
<th>lpfcX (Instance name)</th>
<th>Remarks</th>
</tr>
</thead>
</table>

---

---

*1: For Fabric configuration, set as follows: fcp-bind-WWPN="<Storage WWPN>:<HBA instance name>t<SCSI ID>",* ... Check the target binding table for the fcp-bind-WWPN setting.

*2: "lpfcX-link-speed" setting value

<table>
<thead>
<tr>
<th>Fibre Channel switch speed</th>
<th>Fabric connection</th>
<th>FC-AL connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>8Gbps</td>
<td>4Gbps</td>
<td>2Gbps</td>
</tr>
<tr>
<td>4Gbps</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>2Gbps</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
5.2.2 /kernel/drv/lpfc.conf Example

The following is a Fabric connection example.

```
# Copyright (c) 2005, Emulex
# 3333 Susan Street, Costa Mesa, CA 92626
#
# All rights reserved. This computer program and related documentation
# is protected by copyright and distributed under licenses restricting
# its use, copying, distribution and decompilation. This computer
# program and its documentation are CONFIDENTIAL and a TRADE SECRET
# of Emulex Design & Manufacturing Corporation. The receipt or possession
# of this program or its documentation does not convey rights to reproduce
# or disclose its contents, or to manufacture, use, or sell anything that
# it may describe, in whole or in part, without the specific written consent
# of Emulex Design & Manufacturing Corporation. Any reproduction of this
# program without the express written consent of Emulex Design & Manufacturing
# Corporation is a violation of the copyright laws and may subject you to
# criminal prosecution.
#
# Solaris LightPulse lpfc (SCSI) / lpfn (IP) driver: global initialized data.
# lpfc.conf 1.29.1.2 2005/10/21 11:06:55PDT
#
# Verbosity: only turn this flag on if you are willing to risk being
# deluged with LOTS of information.
# You can set a bit mask to record specific types of verbose messages:
# 0x1    ELS events
# 0x2    Device Discovery events
# 0x4    Mailbox Command events
# 0x8    Initialization events
# 0x10   Link Attention events
# 0x20   IP events
# 0x40   FCP events
# 0x80   Node table events
# 0x400  Miscellaneous events
# 0x800  SLI events
# 0x2000 IOCtI events
# 0xffff Log All Events
log-verbose=0x0;

# Setting log-only to 0 causes log messages to be printed on the
# console and to be logged to syslog (which may send them to the
# console again if it's configured to do so).
# Setting log-only to 1 causes log messages to go to syslog only.
log-only=1;

# +++ Variables relating to FCP (SCSI) support. +++
#
# specifies the method of binding to be used. This
# binding method is used for persistent binding and automap
# binding. A value of 1 will force WWNN binding, value
# of 2 will force WWPN binding, value of 3 will force
# DID binding and value of 4 will force the driver to derive
# binding from ALPA (hard addressed) in a private loop environment.
# Any persistent
# bind method
lpfc0-fcp-bind-method=2;
lpfc1-fcp-bind-method=2;
```

For FC-AL connection, lpfc0-fcp-bind-method=4;
# Setup FCP persistent bindings,
# fcp-bind-WWPN binds a specific WorldWide PortName to a target id,
# fcp-bind-WWNN binds a specific WorldWide NodeName to a target id,
# fcp-bind-DID binds a specific DID to a target id.
# Binding method must match with the bind method of that HBA, else the
# binding will be ignored.
# fcp-bind-method should NOT be set to 4 when one of these binding methods
# is used.
# WWNN, WWPN and DID are hexadecimal values.
# WWNN must be 16 digit BCD with leading 0s.
# WWPN must be 16 digit BCD with leading 0s.
# DID must be 6 digit BCD with leading 0s.
# The SCSI ID to bind to consists of two parts, the lpfc interface
# to bind to, and the target number for that interface.
# Thus lpfc0t2 specifies target 2 on interface lpfc0.
# NOTI: Target ids, with all luns supported, must also be in sd.conf.

# Here are some examples:

# WWNN             SCSI ID
lpfc-bind-WWNN="2000123456789abc:lpfc1t0",
"20000020370c27f7:lpfc0t2";

# WWPN             SCSI ID
lpfc-bind-WWPN="2100123456789abc:lpfc0t0",
"21000020370c2855:lpfc0t1",
"2100122222222222:lpfc2t2";

# DID   SCSI ID
lpfc-bind-DID="0000ef:lpfc0t3";

# BEGIN: LPUTIL-managed Persistent Bindings
lpfc-bind-WWPN="2141000b5d6a0109:lpfc0t16",
"2140000b5d6a0109:lpfc1t16";

# If automap is set, SCSI IDs for all FCP nodes without
# persistent bindings will be automatically generated.
# If new FCP devices are added to the network when the system is down,
# there is no guarantee that these SCSI IDs will remain the same
# when the system is booted again.

lpfc0-automap=0;
lpcl-automap=0;

# lun-queue-depth [1 to 128] - The default value lpfc will use to
# limit the number of outstanding commands per FCP LUN. This value
# is global, affecting each LUN recognized by the driver, but may be
# overridden or to be configured on a per-LUN basis (see below). RAID arrays want
# to be configured to a power of 2. This setting is not required for the ETERNUS2000.
lun-queue-depth=20;

tgt-queue-depth=0;

tgt-queue-depth=512;

lpfcmn-lun-throttle: the maximum number of outstanding commands to
permit for each LUN of an FCP target that supports multiple LUNs.
The default throttle for the number of commands outstanding to a single
LUN of a multiple-LUN target is lun-queue-depth. For a target that

# can support multiple LUNs, it may be useful to specify a LUN throttle
# that differs from the default.
# Example: lpfc0t17-lun-throttle=48;
# says that each LUN on target 17, interface lpfc0 should be allowed
# up to 48 simultaneously outstanding commands.
#lpfc0t39-lun-throttle=10;
#lpfc0t40-lun-throttle=30;

# lpfcNtM-tgt-throttle: the maximum number of outstanding commands to
# permit for a FCP target.
# By default, target throttle is disabled.
# Example: lpfc0t17-tgt-throttle=48;
# says that target 17, interface lpfc0 should be allowed
# up to 48 simultaneously outstanding commands.
#lpfc1t39-tgt-throttle=10;
#lpfc0t40-tgt-throttle=30;

# no-device-delay [0 to 30] - determines the length of
# the interval between deciding to fail back an I/O because there is no way
# to communicate with its particular FCP device (e.g., due to device failure)
# and the actual fail back. A value of zero implies no delay whatsoever.
# Cautions: (1) This value is in seconds.
# (2) Setting a long delay value may permit I/O to build up,
# each with a pending timeout, which could result in the exhaustion of
# critical Solaris kernel resources. In this case, you may see a fatal
# message such as
#            PANIC: Timeout table overflow
#
# Note that this value can have an impact on the speed with which a
# system can shut down with I/Os pending and with the HBA not able to
# communicate.
#network-on=0;

# +++ Variables relating to IP networking support. +++
#
# network-on: true (1) if networking is enabled, false (0) if not
# This variable will be set during the installation of the driver
# via pkgadd.
#network-on=0;

# xmt-que-size [128 to 10240] - size of the transmit queue for mbufs
#xmt-que-size=256;

# +++ Variables common to both SCSI (FCP) and IP networking support. +++
#
#lpfc0-scan-down=0;

lpfc1-scan-down=0;

# Determine how long the driver will wait [0 - 255] to begin linkdown
# processing when the hba link has become inaccessible. Linkdown processing
# includes failing back commands that have been waiting for the link to
# come back up. Units are in seconds. linkdown-tmo works in conjunction
# with nodev-tmo. I/O will fail when either of the two expires.
linkdown-tmo=30;

# For FC-AL connection, lpfc0-scan-down=1;
#lpfc0-scan-down=0;
#lpfc1-scan-down=0;
# If set, nodev-holdio will hold all I/O errors on FCP devices that disappear
# until they come back. Default is 0, return errors with no-device-delay.
# This parameter is ignored, if scsi commands are issued in polled mode.
nodev-holdio=0;

# If set, nodev-tmo will hold all I/O errors on devices that disappear
# until the timer [0 to 255 secs] expires. Default is 30, return errors
# with no-device-delay.
nodev-tmo=40;

# Use no-device-delay to delay FCP RSP errors and certain check conditions.
delay-rsp-err=0;

# num-locbs [128 to 10240] - number of locb buffers to allocate
num-locbs=256;

# num-bufs [64 to 4096] - number of buffers to allocate
# Buffers are needed to support Fibre channel Extended Link Services.
# Also used for SLI-2 FCP buffers, one per FCP command, and Mailbox commands.
um-bufs=128;

# topology:  link topology for initializing the Fibre Channel connection.
#          0 = attempt loop mode, if it fails attempt point-to-point mode
#          2 = attempt point-to-point mode only
#          4 = attempt loop mode only
#          6 = attempt point-to-point mode, if it fails attempt loop mode
# Set point-to-point mode if you want to run as an N_Port.
# Set loop mode if you want to run as an NL_Port.
lpfc0-topology=2;
lpfc1-topology=2;

# Set a preferred ALPA for the adapter, only valid if topology is loop.
# lpfc0-assign-alpa=2;  Request ALPA 2 for lpfc0

# ip-class:  FC class (2 or 3) to use for the IP protocol.
ip-class=3;

# fcp-class:  FC class (2 or 3) to use for the FCP protocol.
fcp-class=3;

# Use ADISC for FCP rediscovery instead of PLOGI.
use-adisc=0;

# Extra IO timeout [0 to 255 secs] for fabrics
extra-io-tmo=0;

# Number of 4k STREAMS buffers [64 to 1024] to post to IP ring.
post-ip-buf=128;

# Use dqfull-throttle-up-time [0 to 30 secs] to specify when to increment
# the current Q depth.
dqfull-throttle-up-time=1;

# Increment the current Q depth by dqfull-throttle-up-inc [0 to 128]
dqfull-throttle-up-inc=1;

# Use ADISC for FCP rediscovery instead of PLOGI.
use-adisc=0;

# Extra IO timeout [0 to 255 secs] for fabrics
extra-io-tmo=0;

# Number of 4k STREAMS buffers [64 to 1024] to post to IP ring.
post-ip-buf=128;
# Use dqfull-throttle-up-time [0 to 30 secs] to specify when to increment
# the current Q depth.
 dqfull-throttle-up-time=1;

# Increment the current Q depth by dqfull-throttle-up-inc [0 to 128]
 dqfull-throttle-up-inc=1;

# Use ACK0, instead of ACK1 for class 2 acknowledgement.
 ack0=0;

# cr-delay: Coalesce Response Delay
# This value specifies a count of milliseconds [0 to 63] after which an
# interrupt response is generated if cr-count has not been satisfied.
# This value is set to 0 to disable the Coalesce Response feature.
 cr-delay=0;

# cr-count: Coalesce Response Count
# This value specifies a count of I/O completions [1 to 255] after which an
# interrupt response is generated. This feature is disabled if cr-delay is
# set to 0.
 cr-count=1;

# discovery-threads [1 to 32] - This value specifies the maximum number of
# ELS commands during discovery
 discovery-threads=1;

# link-speed: link speed selection for initializing the Fibre Channel connection.
 # 0 = auto select (default)
 # 1 = 1 Gigabaud
 # 2 = 2
 # 4 = 4
 Add these settings for both FC-AL and Fabric connections.

lpfc0-link-speed=2;
lpfc1-link-speed=2;

# fdmi-on: 0 = disable fdmi
# 1 = enable fdmi without registration of "host name" port attribute
# 2 = enable fdmi and "host name" port attribute
 fdmi-on=0;

# Used only by i386 FCP (SCSI)
# flow_control="duplx" queue="qfifo" disk="scdk" tape="sctp";
#
### A.1 WWN Instance Management Table for the Server

The following various management tables are required in "Chapter 3 Setting Up the Server" (page 11). Use them as required.

<table>
<thead>
<tr>
<th>Physical slot name</th>
<th>WWN</th>
<th>Controller number</th>
<th>Instance name</th>
<th>Physical path name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### A.2 WWN Instance Management Table for Storage System

<table>
<thead>
<tr>
<th>Channel Adapter</th>
<th>WWN</th>
<th>T_ID</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### A.3 Target Binding Table

<table>
<thead>
<tr>
<th>Channel Adapter name</th>
<th>SCSI T_ID</th>
<th>RAID-WWN</th>
<th>Instance name</th>
<th>Controller number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ETERNUS Disk storage systems
Server Connection Guide (Fibre Channel) for Oracle Solaris
Driver Settings for Emulex Fibre Channel Cards

P3AM-2702-04ENZ0

Date of issuance: December 2010
Issuance responsibility: FUJITSU LIMITED

- The contents of this manual are liable to being updated without notice.
- While the contents of this manual are the product of all due care and diligence, no responsibility can be accepted for operational problems arising from any errors or missing information, or other use of the information contained in this manual.
- Fujitsu assumes no liability for damages to third party copyrights or other rights arising from the use of any information in this manual.
- Contents of this manual are not to be reproduced without permission from Fujitsu.