Host Adapter

Product Training

EMULEX
NETWORK
SYSTEMS

Agenda

- Section 1 - Use in Win NT Environment
  - LP7000E Overview
  - LP8000 Overview
  - LP850 Overview
  - HBA Installation and Setup
  - Win NT Mini-Port Driver
  - Win NT Port Driver
  - Firmware and Diagnostics
  - Boot BIOS
  - Troubleshooting
  - Contacting Emulex

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Agenda

- Section 2 - Unix and Netware Drivers
  - Netware Driver
  - Solaris Driver
  - AIX Driver

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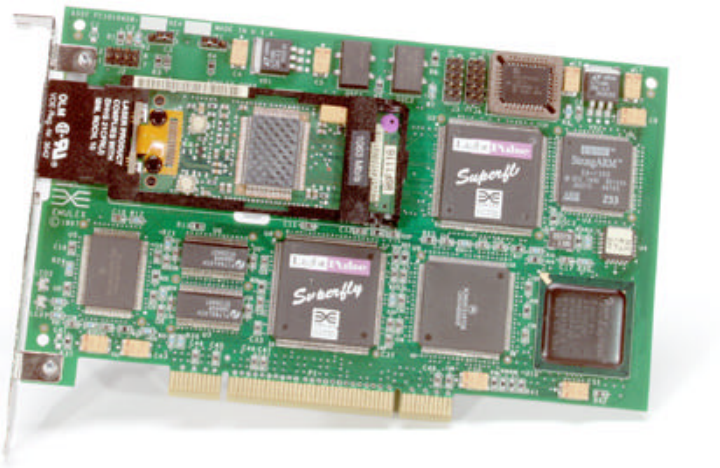
LP7000E Host Bus Adapter

- 32-bit 33MHz PCI 2.1 compliant bus interface
- Standard short form factor PCI Card
- 1.0625 Gbit GLM based Fibre Channel interface
- 3 Models Available
  - LP7000E-T1 (Copper DB9 Interface)
  - LP7000E-N1 (Multi-Mode Optical Interface)
  - LP7000E-L1 (Single-Mode Optical Interface)



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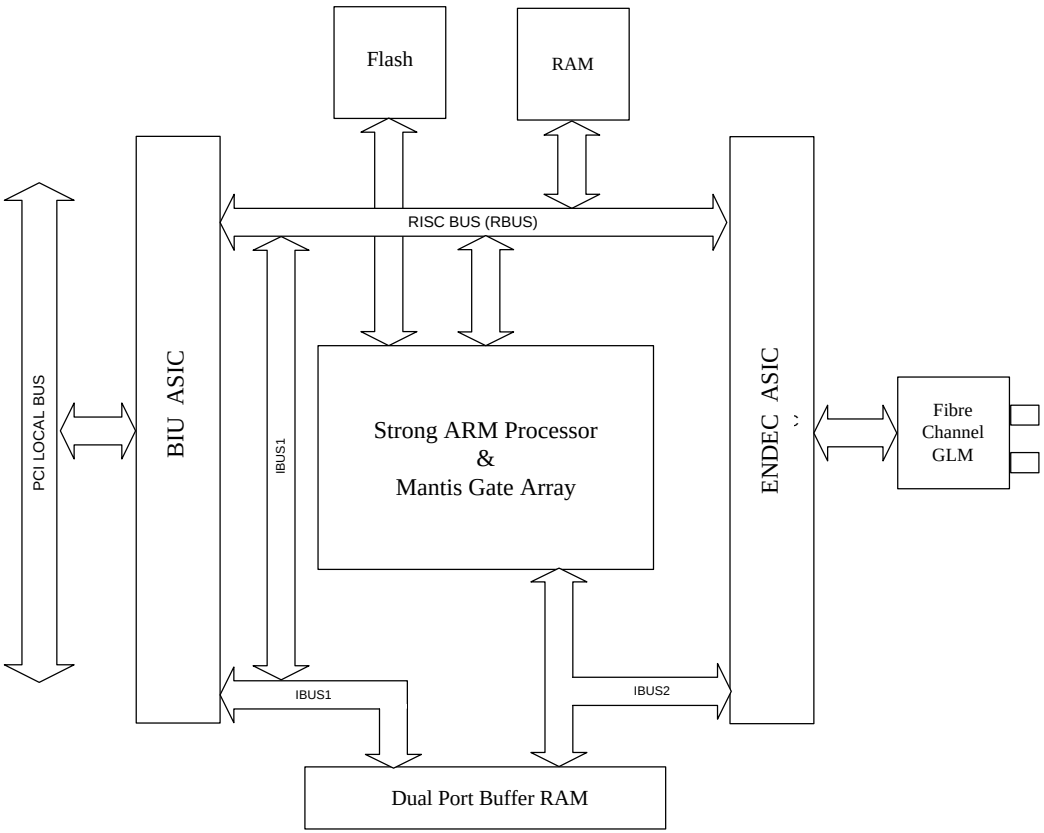
LP7000E Architecture



- 260MIPS on-board ARM Processor
- Very fast on-board dual ported memory
  - Supports 64 end to end buffer credits
- Built in multi-protocol support
  - up to 4 concurrent protocols
- 3 years field experience with basic architecture

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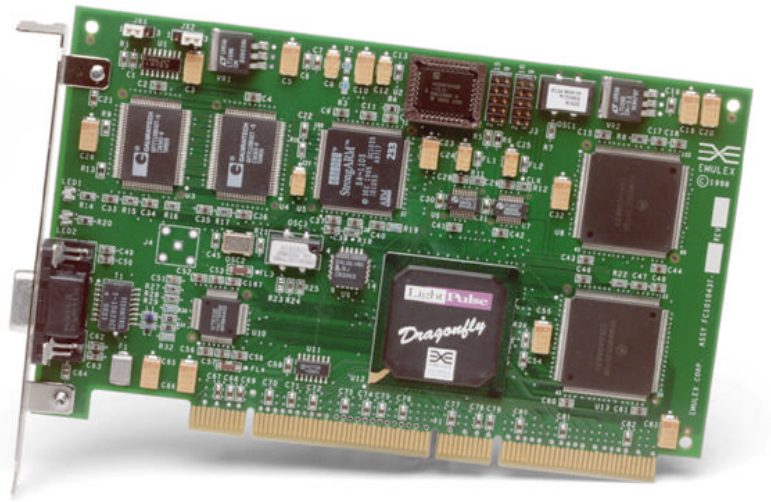
LP8000 Host Bus Adapter

- 64-bit 33MHz PCI 2.1 compliant bus interface
- Standard short form factor PCI Card
- 1.0625 Gbit GBIC or embedded Fibre Channel interface



- 5 Models Available
  - LP8000-D1 (Copper DB9 Embedded Interface)
  - LP8000-F1 (Multi-Mode Optical Embedded Interface)
  - LP8000-T1 (Copper DB9 GBIC Interface)
  - LP8000-N1 (Multi-Mode Optical GBIC Interface)
  - LP8000-L1 (Single-Mode Optical GBIC Interface)

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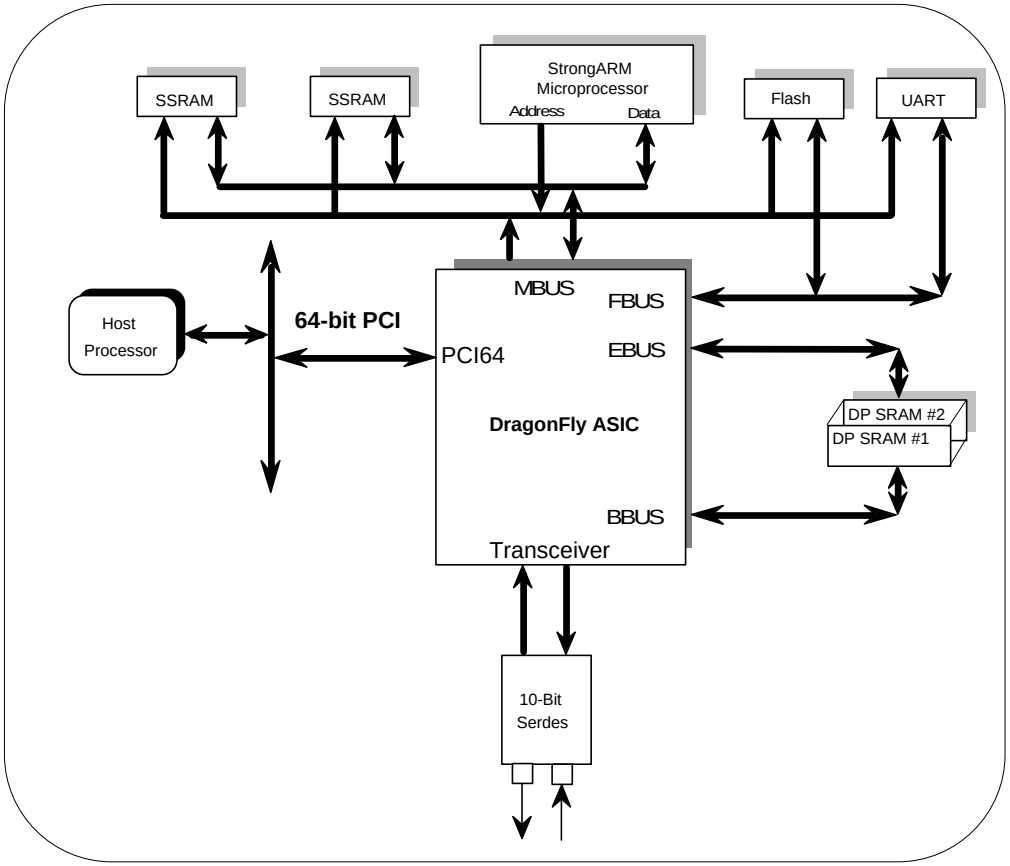
LP8000 Architecture



- 260MIPS on-board ARM Processor
- Very fast on-board dual ported memory
  - Supports 64 end to end buffer credits
- Built in multi-protocol support
  - up to 4 concurrent protocols
- 3 years field experience with basic architecture

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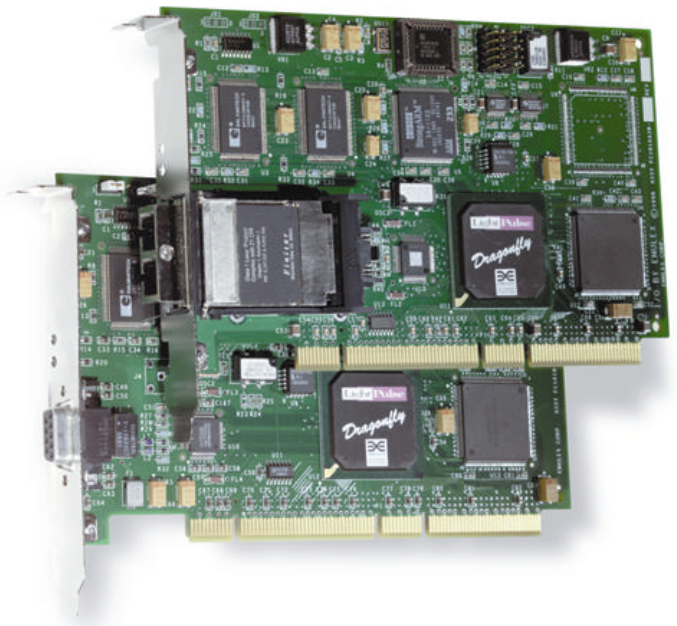
LP850 Host Bus Adapter

- 64-bit 33MHz PCI 2.1 compliant bus interface
- Standard short form factor PCI Card
- 1.0625 Gbit GBIC or embedded Fibre Channel interface
- Win NT and Netware Only
- 4 Models Available
  - LP850-D1 (Copper DB9 Embedded Interface)
  - LP850-F1 (Multi-Mode Optical Embedded Interface)
  - LP850-T1 (Copper DB9 GBIC Interface)
  - LP850-N1 (Multi-Mode Optical GBIC Interface)



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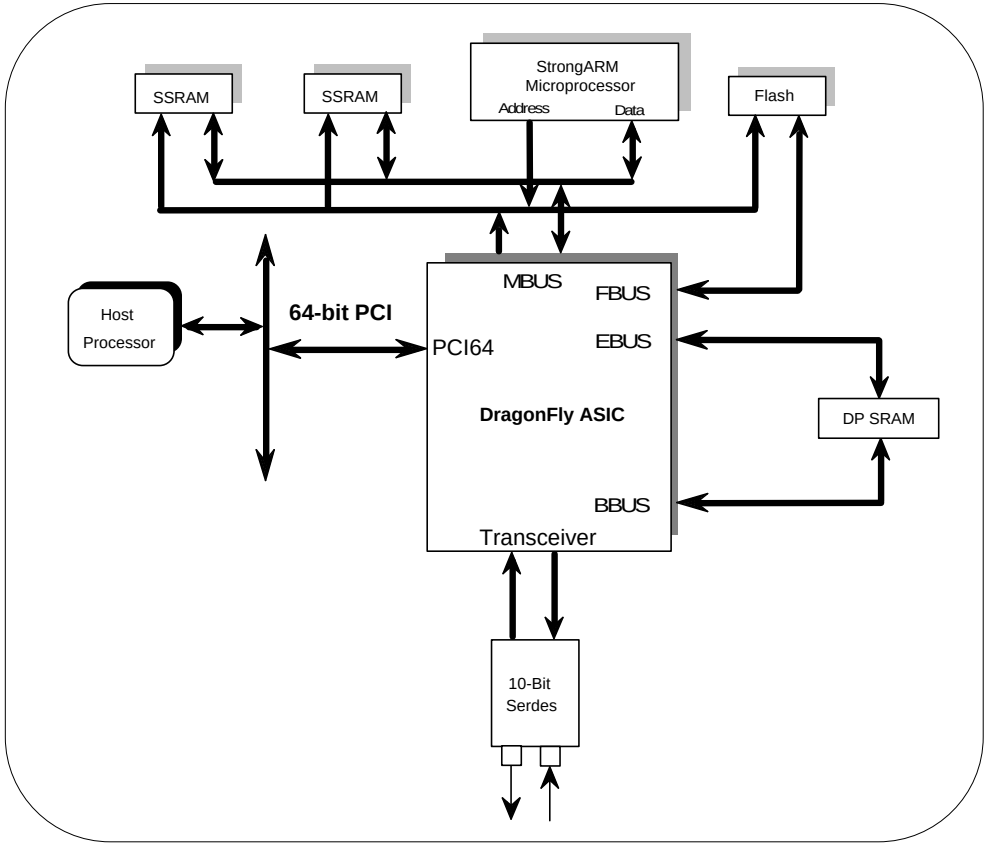
LP850 Architecture



- 260MIPS on-board ARM Processor
- Very fast on-board dual ported memory
  - Supports 32 end to end buffer credits
- Built in multi-protocol support
  - up to 4 concurrent protocols
- 3 years field experience with basic architecture

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Current Driver Support

Emulex Device Driver	Emulex Revision	Supported OS Revisions	Supported Protocols	Supported Topologies	LUN & ID Masking
Windows NT - Mini-Port	4.31	Win NT 4.0 SP3 or Later	SCSI	Loop & Fabric	No
Windows NT - Port	1.23	Win NT 4.0 SP3 or Later	SCSI	Loop & Fabric	Yes
Windows NT - LAN	1.10	Win NT 4.0 SP3 or Later	IP	Loop & Fabric	No
Solaris	4.00	Solaris 2.6 or 7 (64&32-bit)	SCSI & IP	Loop & Fabric	Yes
AIX	3.3.0.8	AIX 4.1.3, 4.2, 4.3 (32-bit only)	SCSI & IP	Loop & Fabric	Yes
Netware	1.10	Netware 4.11, 4.2, 5.0	SCSI	Loop	No
Unixware 2.1	1.30	Unixware 2.1	SCSI	Loop	No
Unixware 7	2.00	Unixware 7	SCSI	Loop	No

**** For Latest Released Drivers See www.emulex.com**

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Performance Comparison

- **All tests were done using Intel's IOMeter benchmarking package, the latest obtainable drivers and firmware, and on the following system:**
  - **Dell 6300 Server**
    - Four 400Mhz Pentium II Xeon Processors
    - 256MB RAM / 512KB Cache
    - 450NX Chipset
    - Windows NT Server 4.0 (Service Pack 3)
    - 32 and 64 bit adapters were measured in a 64 bit PCI slot
  - **16 Seagate Cheetah II Drives**
    - 9GB
    - Four 4-disk JMR JBODs Connected through 5-port analog hub
  - **All tests were 100% sequential 100% reads**

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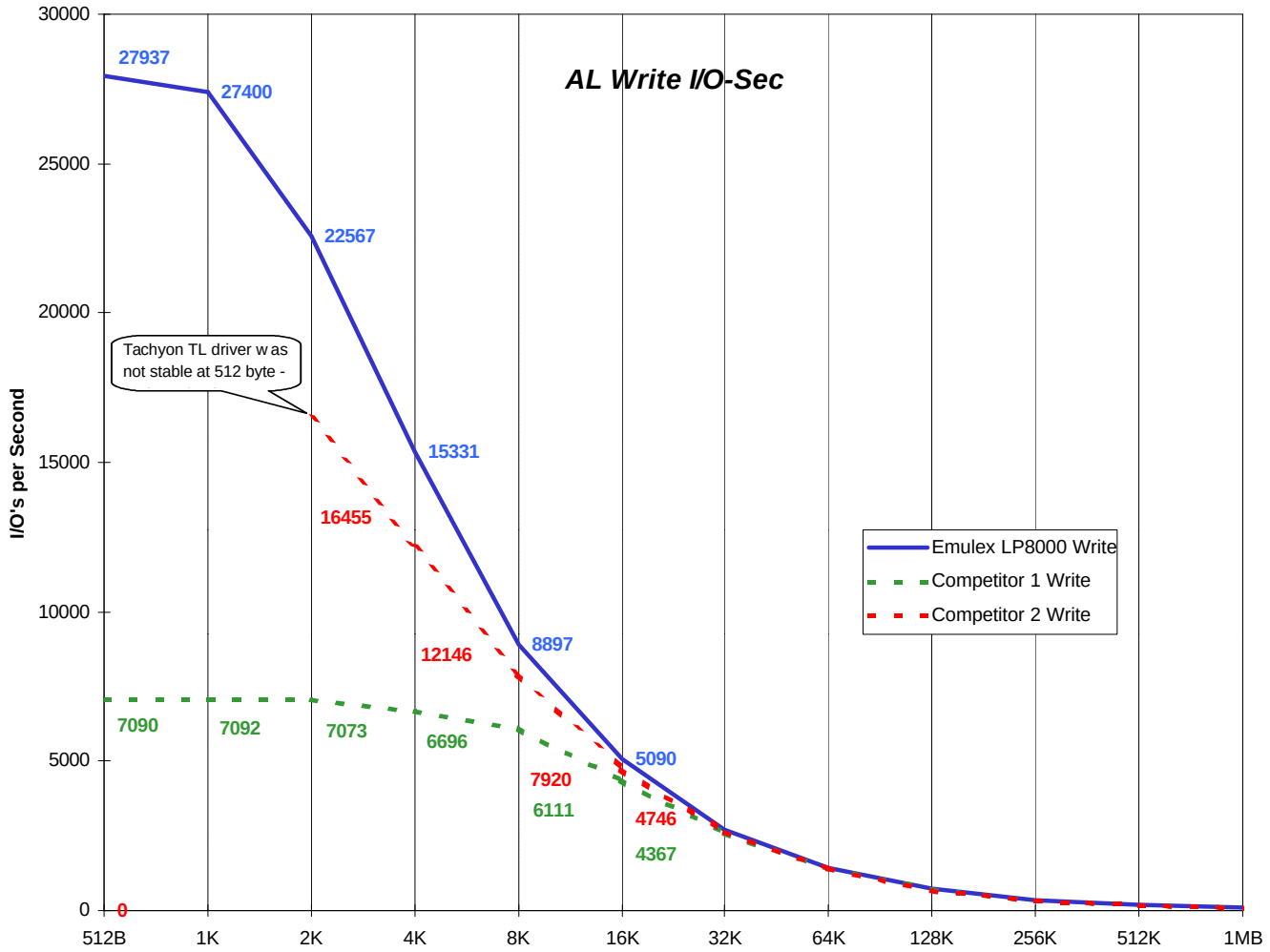
Performance Comparison



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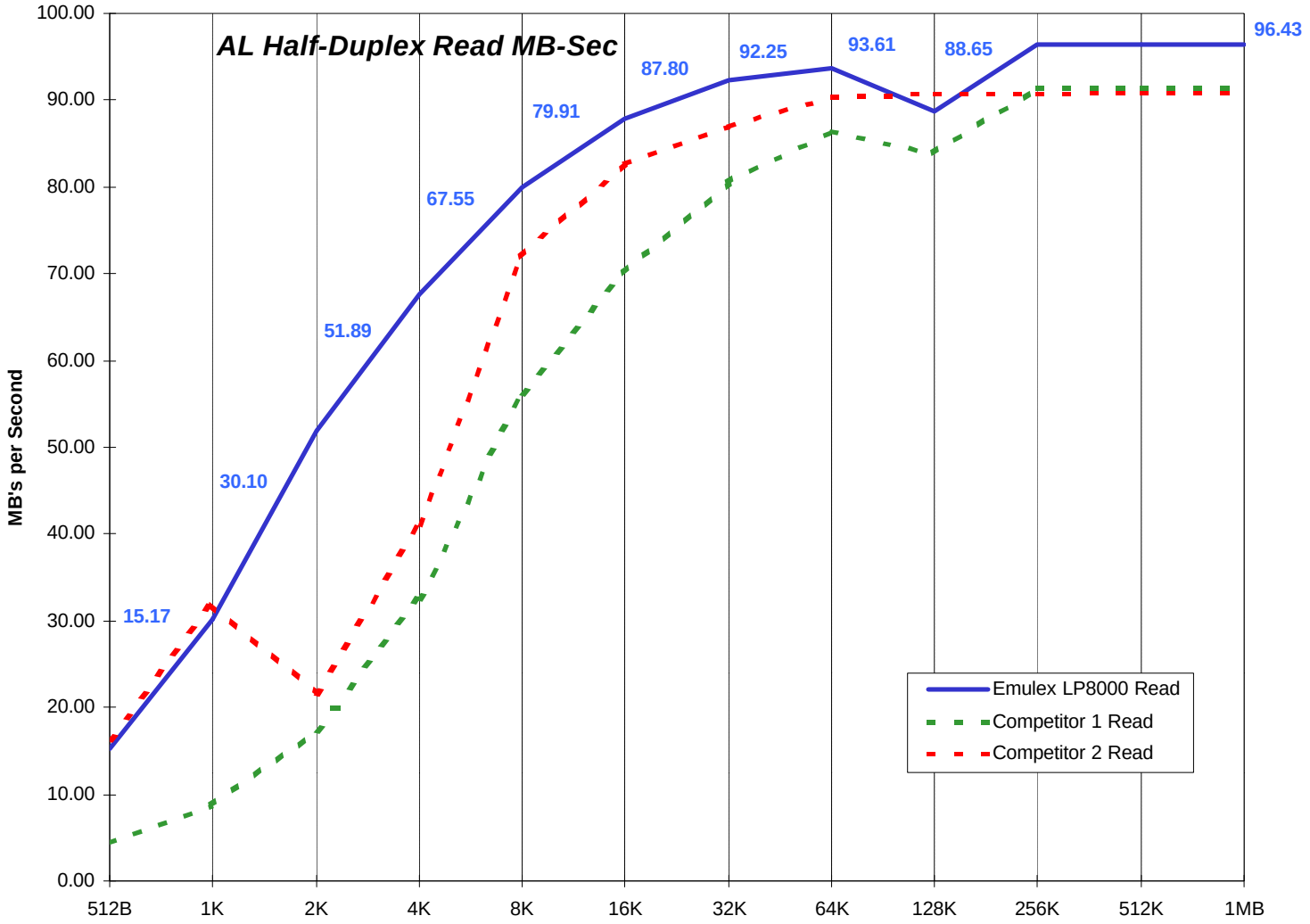
Performance Comparison



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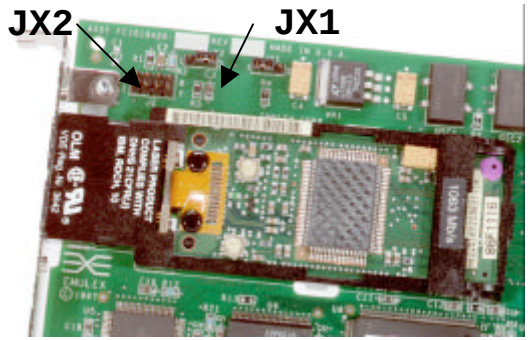
Hardware Installation

- Installs just like any standard PCI adapter card
- Jumpers select PCI Device ID (not normally changed)

```
JX1
1-2 (default) Jumpers Disabled   Device ID = 0xF700
2-3  Jumpers Enabled    Device ID = see JX2

JX2
1-2  Device ID = 0xF701
2-3 (default) Device ID = 0x1AE5
```



- 32 and 64 bit slot compatible

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PCI Device ID Considerations

- How we use PCI Device ID
  - Distinguishes between different adapters so drivers can identify Emulex adapters in the PCI configuration
- Software interface is the same
  - Emulex drivers work with LP6000/LP7000/LP8000 through a common interface and do not act different based on a particular adapter
- Why Change
  - To use Win NT Lan Driver Change jumper settings to F701 or F801
  - To use with old device driver, change jumper settings to look like LP6000 (1AE5)

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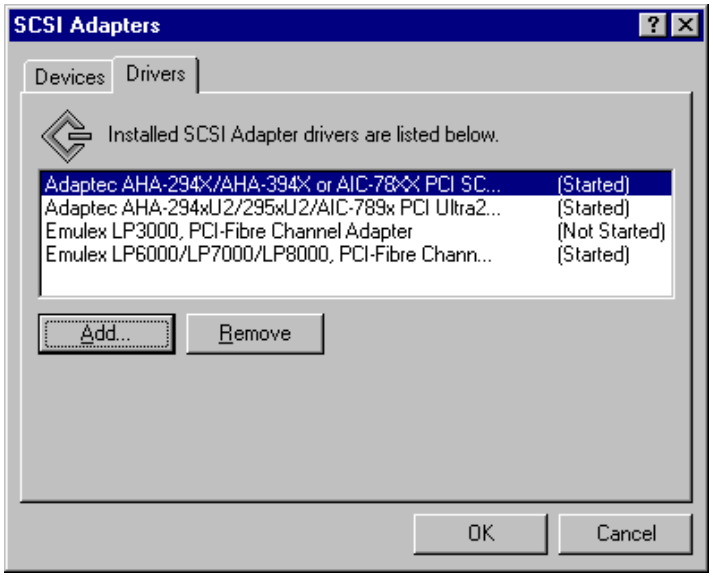
Software Installation in NT

- Miniport driver vs. Port driver
  - Miniport driver uses standard Microsoft driver interface but is limited in performance and features
  - Port driver can be higher in performance and is feature rich but uses non-standard Windows NT version specific techniques

- Installs with standard "Add SCSI Devices" applet under SCSI Devices Control Panel



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Emulex Name Conventions

Revision	Designation	DVT
1.00N*n*	Internal Development Build	Engineering test only
1.00A*n*	Alpha Release	In progress
1.00	Production Release	Complete
1.00X*n*	Customer Specific Feature or Bug Fix	No

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Introduction to the Miniport Driver

- Why the Miniport Driver?
  - Uses standard Microsoft driver interface
  - Supported by Microsoft -- Will be included with NT 2000
  - Survives Service Pack upgrades and is easy to port to different versions of NT
  - Has full fabric support with F-Port, FL-Port Public Loop and Name Server support
  - Can address 256 LUNs with Miniport Driver version 4.20 and NT Service Pack 4 installed

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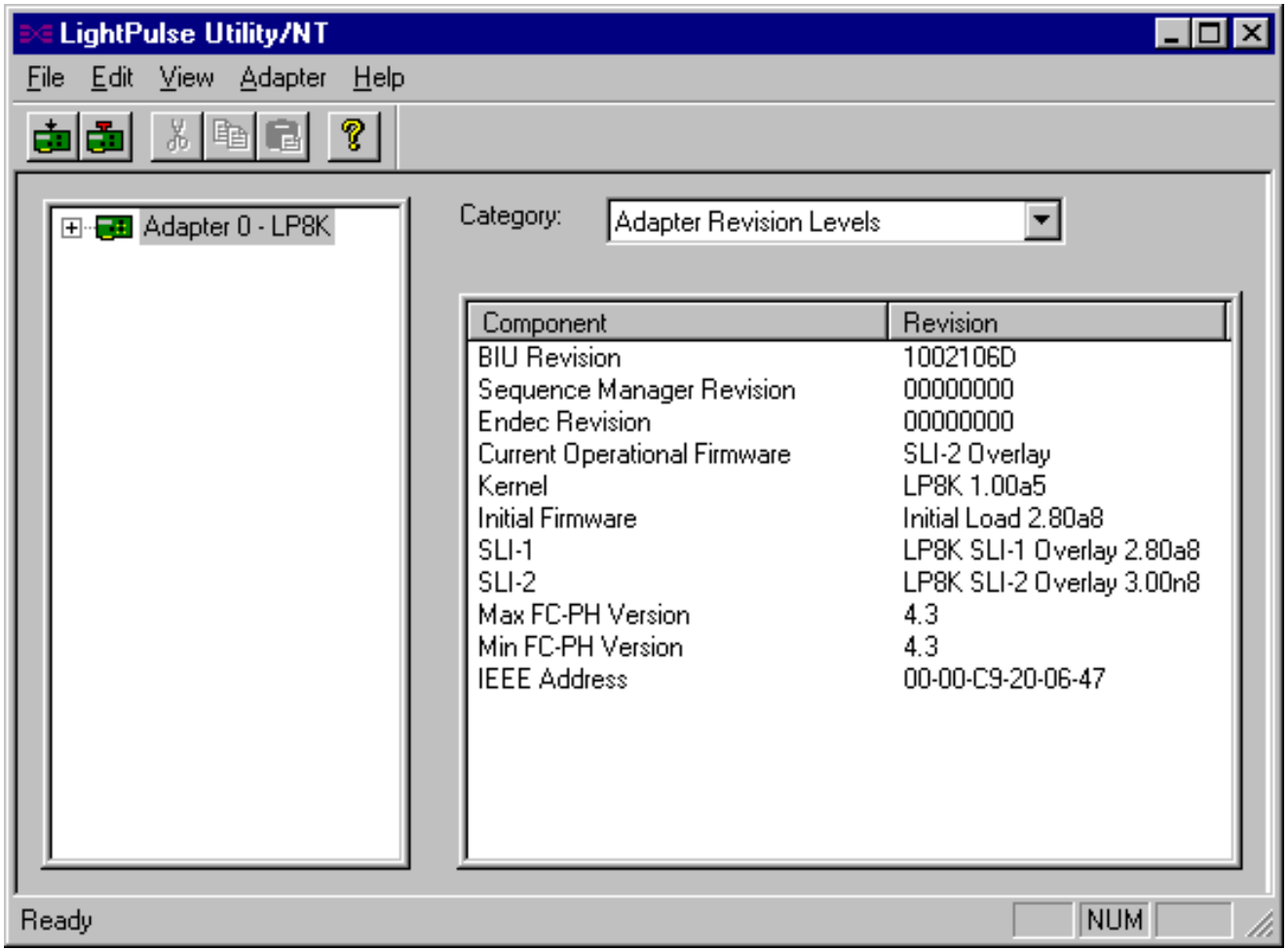
Miniport GUI Utility



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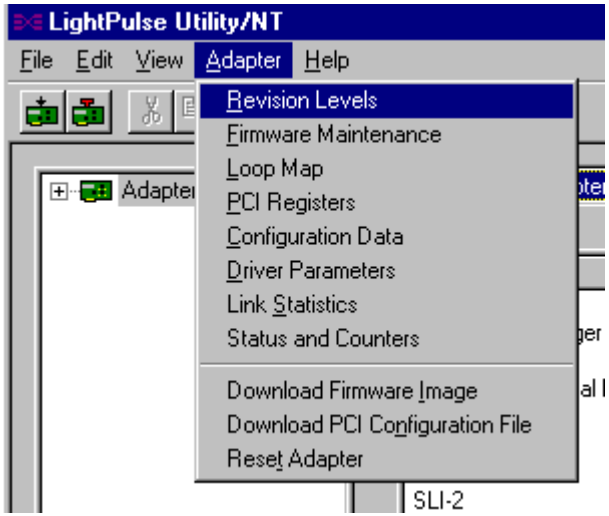
Miniport GUI Features



- Easily see statistics about a currently installed adapter and nodes connected to it
- Easily perform firmware downloads and maintenance without rebooting machine
- Examine and adjust registry parameters
- Must be used with Miniport driver version 4.10 or later

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Introduction to the Port Driver

- **Why the Port Driver?**
  - **Can utilize multiprocessor machines efficiently for potentially higher performance**
  - **Can have features like persistent LUN binding, configurable LUN mapping and smart SCSI multipathing**
  - **Can Map up to 256 LUNs from a large pool of available remote LUN numbers**
  - **Will allow future multi-protocol support**

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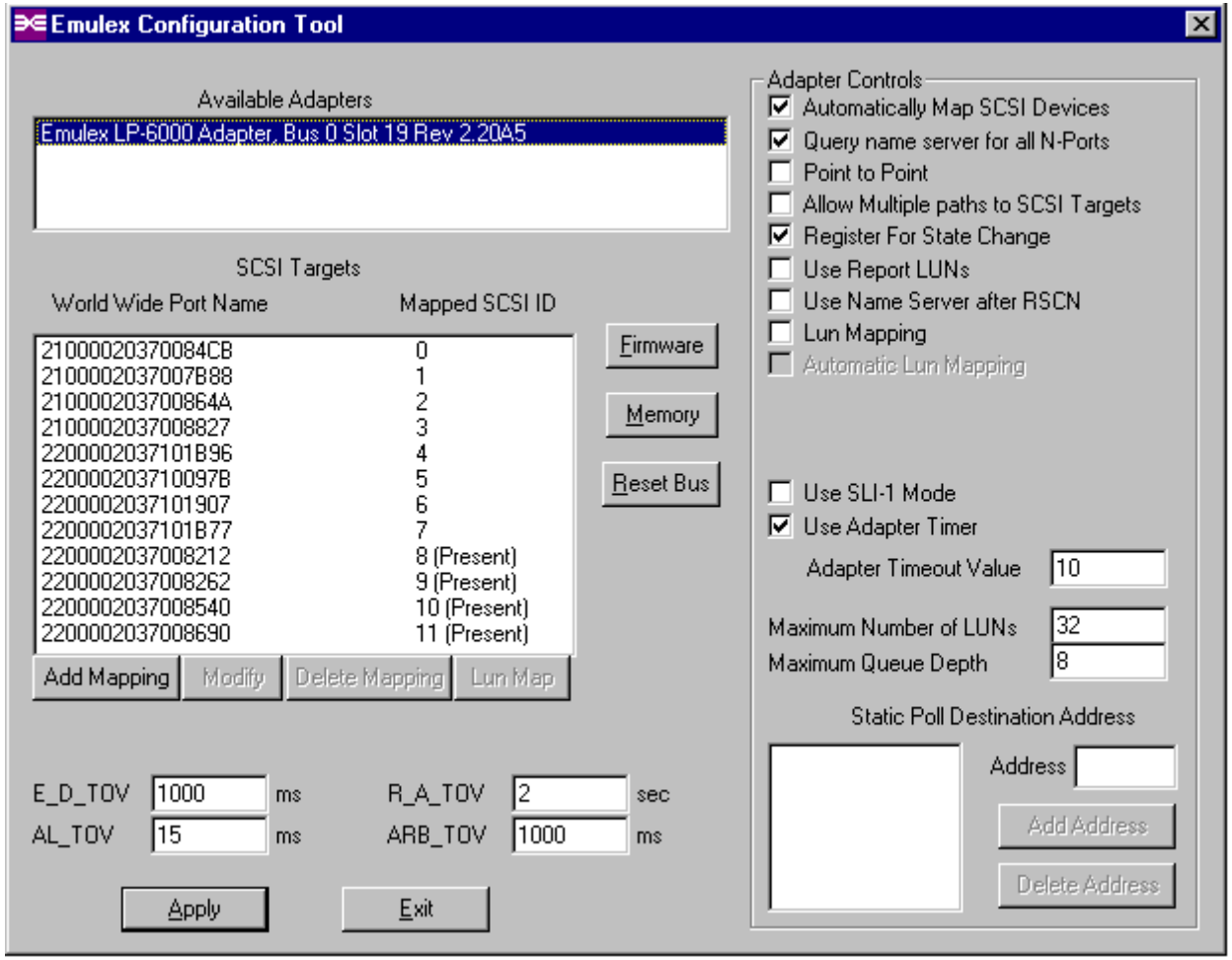
Port Driver Configuration Utility



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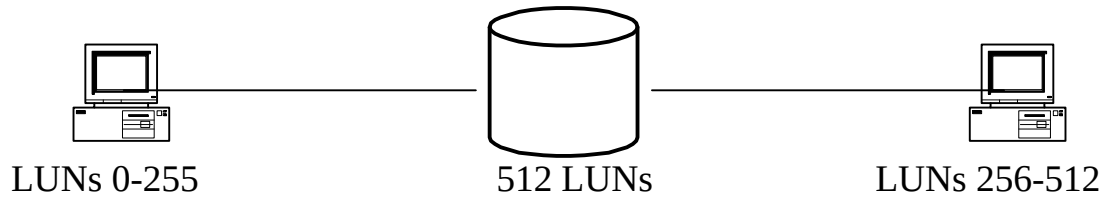
Port Driver Special Features

- **Persistent Binding**
  - **Allows a subset of discovered targets to be bound to the host system. Keyed by World Wide Name**
  - **Binding to host system is permanent. Configuration changes survive reboots or hardware configuration changes**
- **LUN Mapping**
  - **Allows LUNs that are beyond NT's LUN range to be bound permanently to an NT LUN number**



- **Automatic mode can discover and map at boot time with no user intervention**

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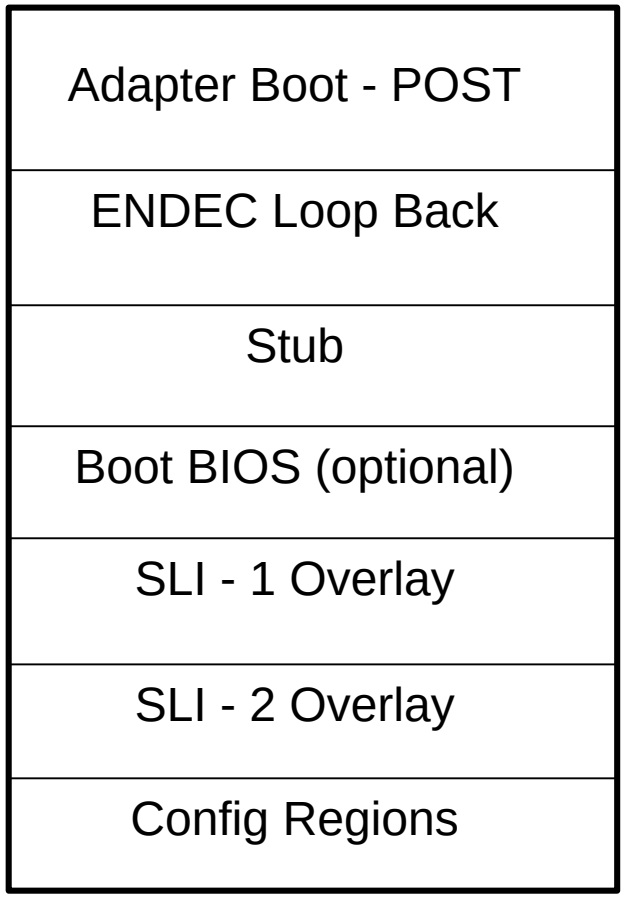
Firmware Structure



Contains Kernel. Essential for normal operation

POST code for internal ENDEC Loop Back

Loads either SLI-1 or SLI-2 functional firmware

Optional INT13 boot BIOS

SLI-1 Functional Firmware

SLI-2 Functional Firmware

Non-volatile configuration parameters

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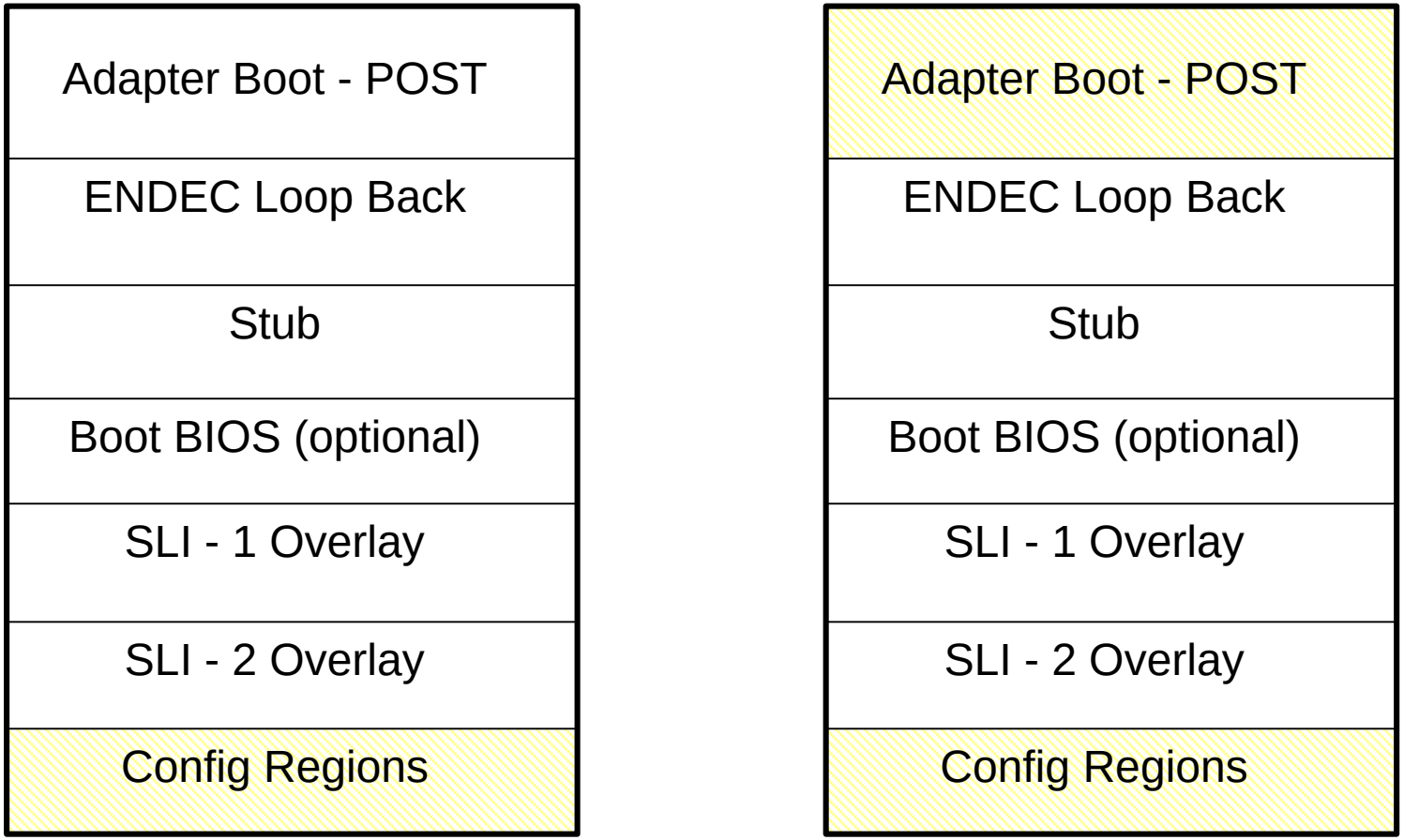
AWC vs. DWC



= Not included in file

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Firmware Files

DFnnn**.AWC**	Full flash image
DFBnnn**.AWC**	Full flash image with boot BIOS
DFnnn**.DWC**	Flash image without adapter boot code and POST
DFBnnn**.DWC**	Flash image without adapter boot code and POST but with boot BIOS

- **BIOS is completely disabled by default in SFB files**
- **All current Emulex utilities check the board type and will not allow incorrect firmware to be loaded**

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Boot BIOS

- Allows booting from Fibre Channel drives or RAID arrays
- Supports Phoenix Multi-Boot Specification
- Supports INT13 (Intel) architectures only

- Completely disabled by default -- No banner at boot time
  - Must be enabled with LP6DUTIL or GUI utility

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Emulex Fibre Channel HBA Boot BIOS

- Current Boot BIOS supports
  - Up to 8 Fibre Channel HBAs per computer
  - Multi-Initiators on different systems (connect by hubs)
  - Multi disk arrays and Multi-LUN support (up to 8 LUNs per ALPA)
  - Detects up to 99 devices per adapter
  - Display a maximum of 16 devices during the boot process

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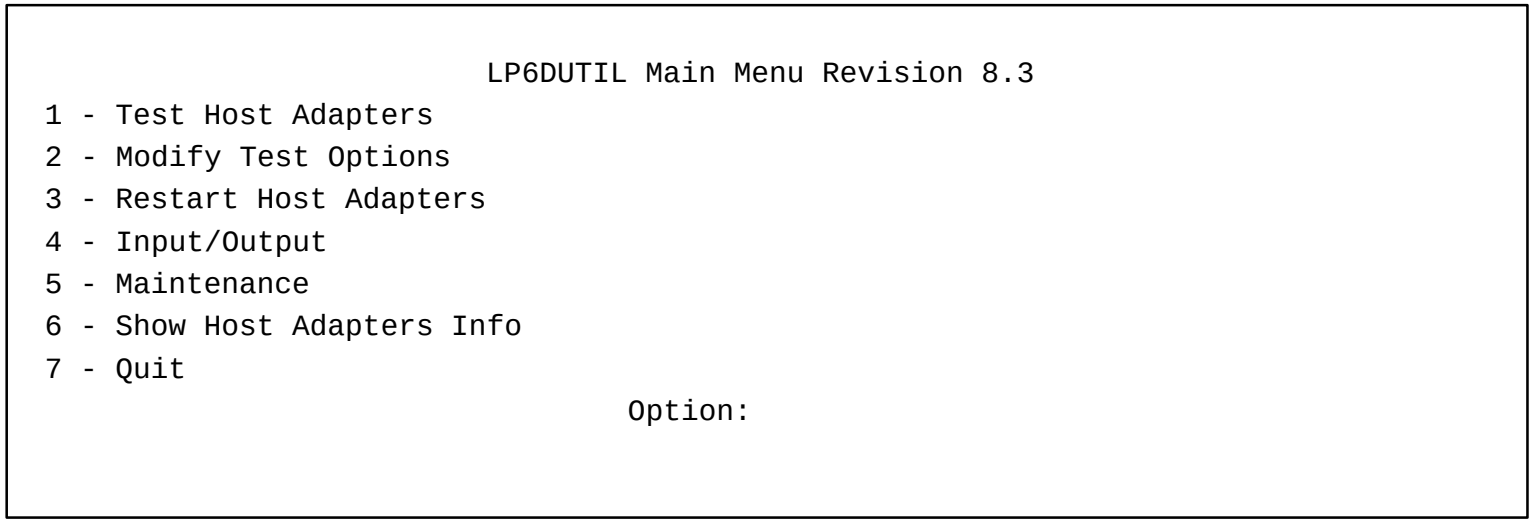
LP6DUTIL.EXE



- Extensive testing of multiple host adapters
  - Full range of testing including PCI path and external loop back
- Full firmware maintenance and downloading
- DOS based -- does not require a driver

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Troubleshooting

- LED Operation
- The NT Event Log
- Optional driver Registry settings
- Isolating common physical layer problems

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LED Operation

Green LED	Yellow LED	State
ON	Slow Blink	Link up
Slow Blink	OFF	Link down or adapter not yet configured
OFF	Flickering	Power up or adapter reset
OFF	Fast Blink	POST Failure
Slow Blink	Fast Blink	Download in progress or no functional firmware found

- A properly functioning adapter always has at least one LED flashing. If at least one LED is not flashing, the board is hung or dead

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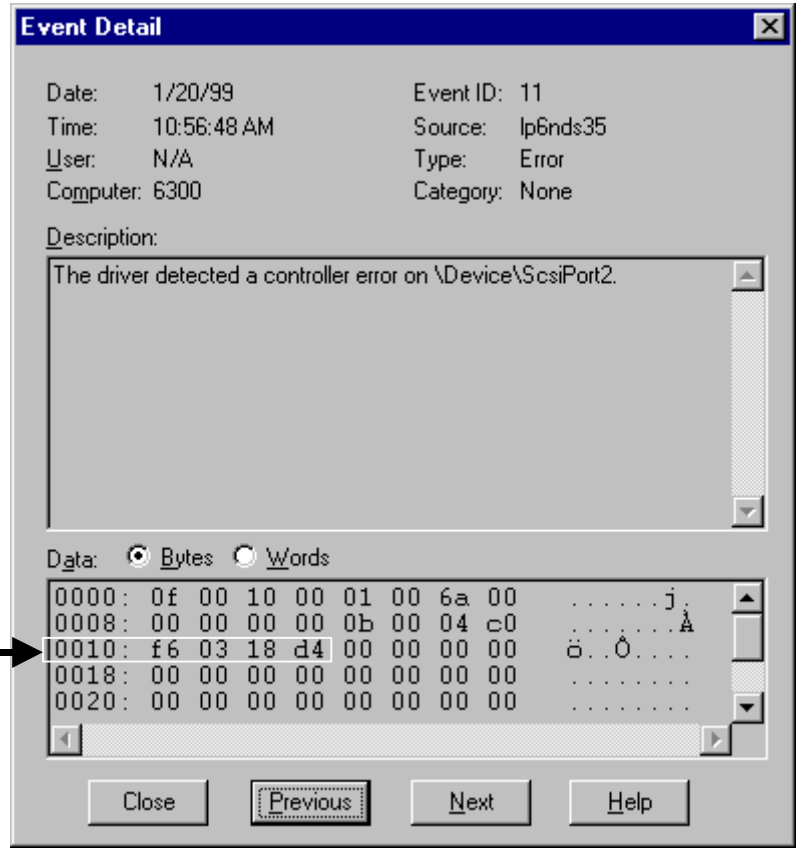
The NT Event Log (Miniport)

- Miniport driver only logs events under lp6nds35 Event ID 11
- Codes are placed at offset 0x10 in Event Detail
- The Miniport driver readme contains the codes and their meanings
- Event ID 9 and 15 are from the Microsoft SCSI Port driver and cannot be decoded with readme



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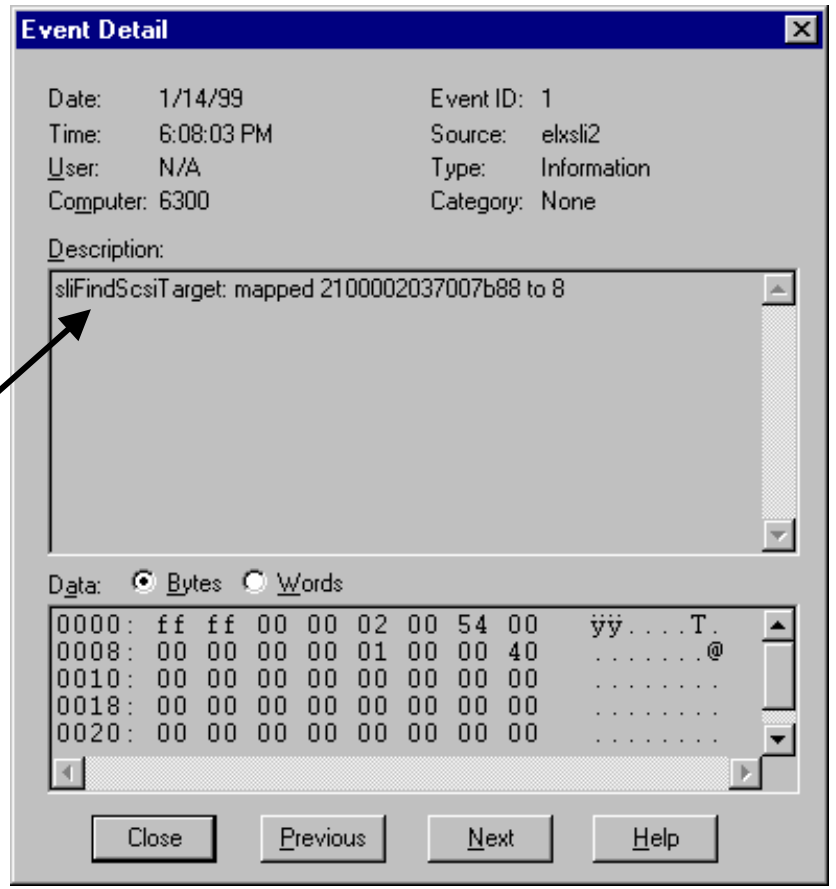
The NT Event Log (Port)

- Port driver logs events under elxsli2 Event ID 1
- Text message is placed in the Description box in Event Detail



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Optional Driver Registry Settings

- Miniport Driver
  - Add the following to the Miniport Registry key

    `HKEY_LOCAL_MACHINE->SYSTEM->CurrentControlSet`

    `->Services->lp6nds35`

    Add `LogErrors=1;` to the `DriverParameter` value

- Port Driver
  - Add the following to the Port Registry key

    `HKEY_LOCAL_MACHINE->SYSTEM->CurrentControlSet`

    `->Services->elxsli2`

    Add `REG_DWORD` value `DriverTraceMask=0x83B2`

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Common Physical Layer Problems

- Bad cable
  - Many I/O timeouts
  - Slow performance
  - Unstable link -- many LIPs
- Loose GLM
  - Symptoms similar to bad cable
  - May happen when the cable is disconnected and reconnected many times
- Driver set for incorrect topology
  - Driver configured for point to point but cable is connected to an FL_Port or other FC_AL only device

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Emulex Web and ftp Sites

- www.emulex.com
  - See Support Section for:
    - Driver and Firmware Updates
    - Most Current Documentation
    - Knowledge Base
    - Returns Information
- ftp.emulex.com
  - Username: anonymous
  - Dir: fibrechannel

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Emulex Technical Support

- How to contact us
  - Phone(24 hr): (714) 662-5600 or (800) 854-7112
  - Fax: (714) 513-8269
  - e-mail: tech_support@emulex.com
- What to prepare before you call
  - Versions of all Emulex software and firmware
  - LED activity
  - NT Event log -- be prepared to save and e-mail to Emulex

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Netware SCSI Driver

- Current Driver Supports
  - Novell Netware 4.11 and 5.0
  - Fibre Channel FC-PH rev. 4.3 ANSI Standard
  - Fibre Channel FC_AL Topology
  - Optimized for SCSI Protocol (FCP)
  - Multi-LUN Support up to 256 LUNs
- Support Emulex Fibre Channel HBAs
  - LP6000
  - LP7000
  - LP8000
  - LP850

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Netware SCSI Driver Installation

- **Under Netware 4.11, Run** “LOAD INSTALL”
- **Under Netware 5.0, Run** “LOAD NWCONFIG”
  - **Insert the floppy disk with netware driver on the floppy disk**
  - **Select “**Driver Options**”**
  - **Select “**Configure disk and storage device drivers**”**
  - **Select “**Select an additional driver**”**
  - **To install a new driver from floppy disk,**
    Press <Insert>
    Then press <Return>

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Netware SCSI Driver Installation

- **Select** **“**LP6000.HAM Emulex Light Pulse Fibre Channel Adapter HAM Driver**” from screen**
- **Screen shows**
  “Do you want to copy driver LP6000.HAM?”
- **Select** **“**Yes**”**
- **Screen shows**
  Specify a server boot path (where SERVER.EXE will be):
  >C:\NWSERVER
- **Press** <Return> **to OK**

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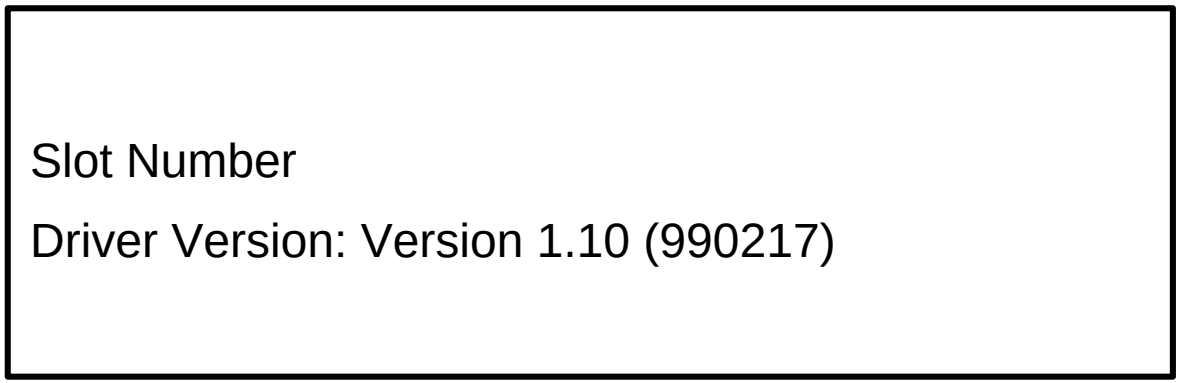
Netware SCSI Driver Installation

- **Screen shows**
  "Save existing file
  C:\NWSERVER\LP6000.HAM
  No / Yes"
- **Press "Y" to save the netware server directory**
- **Screen shows**



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Netware SCSI Driver Installation

- **Type the PCI slot number where the host adapter is installed and press** <Enter>
- **Press** <F10> **or** <Esc> **to save the parameter**
- **Select “**Save parameters and load driver**”**
- **Select “**No**” when prompted to select an additional device drover**
- **Select “**Discover and load additional drivers**” and press** <Enter>

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Netware SCSI Driver Installation

- **The OS scans and binds new devices to proper Custom Device Module (CDM)**
- **Press** <Esc> **to complete the driver installation process**

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AIX SCSI/IP Driver Installation

- Minimum Requirements
  - 32 MB system RAM
  - AIX 4.11 Operating System (minimum)
- Emulex Host Adapter Board
  - LP6000
  - LP7000
  - LP8000

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AIX SCSI/IP Driver Installation

- **Use Application Manager GUI Interface to Install AIX SCSI/IP Driver**
  - **Login as root**
  - **Open Application Manager**
  - **Double click System_Admin**
  - **Double click Install Manager**
  - **Select source or download directory**
  - **Select Device in Work Area to view available driver package(s)**

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AIX SCSI/IP Driver Installation

- **Select Fibre Channel driver**
- **In Actions area, click Install/Update and Yes to begin installation**
- **When installation is completed, click OK**
- **Select Exit to leave Install & Update Software Manager, and Yes to Confirm**
- **Open terminal window and enter these commands to reboot the system**
  - # sync
  - # reboot

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AIX SCSI/IP Driver Installation

- **Verify Driver Installation from Application Manager**
  - **Select System_Admin, Device Manager**
  - **Scroll Devices in Work Area to see the AIX device just installed**

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Solaris SCSI/IP Driver Installation

- Minimum Requirements
  - Solaris 2.6
  - 16MB system RAM
- Emulex Host Adapter Board
  - LP6000
  - LP7000
  - LP8000

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Solaris SCSI/IP Driver Installation

- **Installation Procedures**
  - **Login as root**
  - **Create a temporary directory (i.e. emlxtmp)**
  - **> cd emlxtmp**
  - **Shut down volume management daemon**
    > /etc/init.d/volmgt stop
  - **From the directory, untar the file**
    > tar xvf lpfc -sparc-*x.x.x*-tar
    where *x.x.x* is the Solaris version

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Solaris SCSI/IP Driver Installation

- **Installation Script**
  - **Specify the desired package number or press <Enter> to accept all**
    Select package(s) you wish to process (or 'all' to process all packages). (default: all) [?,??,q]:
  - **Type the system type and directory or press <Enter> to accept default**
    Lpfc driver directory (default /kernel/drv) [?]:
  - **Specify the manpage directory or press <Enter> to accept the default**
    Lpfc manpage directory (default /usr/share/man/man7d) [?]:

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Solaris SCSI/IP Driver Installation

- **Type <y> or <n> to select IP networking support**
  Use IP networking over Fibre Channel [y,n,?]:
- **Type the adapter's network host name to enable networking or <q> to quit (This question does not appear if you answered "No" to the previous question**
  Network name (for first adapter) [?,q]:
- **Type <y> to continue or <n> to exit installion**
  Do you want to continue with the installation of <lpfc> [y,n,?]:

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Solaris SCSI/IP Driver Installation

- **Type <q> to quit if you do not want to install additional packages**
  Select package(s) you wish to process {or ‘all’ to process all packages). (default: all) [?,??,q]:
- **When prompted, type the shut down command to restart the system**
  The machine must be rebooted in order to ensure operation
  shutdown -y -i6 -g0

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Solaris SCSI/IP Driver Installation

- **Partition the Fibre Channel Disk**
  - **Type this command to enter the format utility**
    > format
  - **Partition the disk**
    format> fdisk
    format> partition
  - **Write partition map and label to the disk**
    partition> label
  - **Press <Esc> twice to return to # Prompt**

EMULEX NETWORK SYSTEMS

Solaris SCSI/IP Driver Installation

- **After labeling the disk, enter this command to display drive device ID**
  # ls /dev/dsk
  After partition the disk, the device ID displays like this
  c1t14d0s3 — c1 - controller number
  t14d0 - drive number (made up of target number [t14] & LUN number [d0]
  s3 - slice (partition) number

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Solaris SCSI/IP Driver Installation

- **Create a new filesystem on the partition**
  > newfs /dev/rdisk/device_id
  device_id i.e. c1t14d0s3
- **Create a directory to be used as a mount point:**
  > mkdir directory_name
- **Mount the filesystem**
  > mount /dev/dsk/device_id/directory_name
- **Edit this file to make the disk mount upon boot**
  > vi /etc/vfstab

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