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Sun™ GigaSwift Ethernet Adapter Installation and User's Guide

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- Voluntary Control Council for Interference (VCCI) — Japan
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Shielded Cables: Connections between the workstation and peripherals must be made using shielded cables to comply with FCC radio frequency emission limits. Networking connections can be made using unshielded twisted-pair (UTP) cables.

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- Increase the separation between the equipment and receiver.
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- Consult the dealer or an experienced radio/television technician for help.

Shielded Cables: Connections between the workstation and peripherals must be made using shielded cables in order to maintain compliance with FCC radio frequency emission limits. Networking connections can be made using unshielded twisted pair (UTP) cables.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

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Declaration of Conformity

Compliance Model Number: GCC PCI
Product Family Name: Sun GigaSwift Ethernet UTP Adapter (X1150A)

EMC

European Union

This equipment complies with the following requirements of the EMC Directive 89/336/EEC:

EN55022:1998/CISPR22:1997		Class A
EN55024:1998	Required Limits (as applicable):	
	EN61000-4-2	4 kV (Direct), 8 kV (Air)
	EN61000-4-3	3 V/m
	EN61000-4-4	1 kV AC Power Lines, 0.5 kV Signal and DC Power Lines
	EN61000-4-5	1 kV AC Line-Line and Outdoor Signal Lines
		2 kV AC Line-Gnd, 0.5 kV DC Power Lines
	EN61000-4-6	3 V
	EN61000-4-8	1 A/m
	EN61000-4-11	Pass
EN61000-3-2:1995 + A1, A2, A14		Pass
EN61000-3-3:1995		Pass

Safety

This equipment complies with the following requirements of the Low Voltage Directive 73/23/EEC:

EC Type Examination Certificates:

EN60950:1992, 2nd Edition, Amendments 1, 2, 3, 4, 11

Supplementary Information

This product was tested and complies with all the requirements for the CE Mark.

/S/

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Declaration of Conformity

Compliance Model Number: GFC PCI
Product Family Name: Sun GigaSwift Ethernet MMF Adapter (X1151A)

EMC

European Union

This equipment complies with the following requirements of the EMC Directive 89/336/EEC:

EN55022:1998/CISPR22:1997		Class A
EN55024:1998	Required Limits (as applicable):	
	EN61000-4-2	4 kV (Direct), 8 kV (Air)
	EN61000-4-3	3 V/m
	EN61000-4-4	1 kV AC Power Lines, 0.5 kV Signal and DC Power Lines
	EN61000-4-5	1 kV AC Line-Line and Outdoor Signal Lines
		2 kV AC Line-Gnd, 0.5 kV DC Power Lines
	EN61000-4-6	3 V
	EN61000-4-8	1 A/m
	EN61000-4-11	Pass
EN61000-3-2:1995 + A1, A2, A14		Pass
EN61000-3-3:1995		Pass

Safety

This equipment complies with the following requirements of the Low Voltage Directive 73/23/EEC:

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Supplementary Information

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Contents

1. Product Overview 1

Hardware Overview 1

Sun GigaSwift Ethernet MMF Adapter 2

LED Displays 2

Sun GigaSwift Ethernet UTP Adapter 3

LED Displays 3

Hardware and Software Requirements 5

Patch Requirements 5

Product Features 6

Key Protocols and Interfaces 6

Diagnostic Support 7

2. Installing the Adapter 9

Installing the Driver Software 9

▼ To Install Driver Software for Solaris 2.6 Operating Environments 12

Verifying Patches 12

Installing the Adapter Without Dynamic Reconfiguration 14

▼ To Install the Adapter 14

▼ To Verify the Installation 16

Setting the `local-mac-address` Property 19

Downloaded from www.Manualslib.com manuals search engine

Rebooting the System 20

Installing the Adapter With Dynamic Reconfiguration 21

▼ To Install an Adapter in a Dynamic Reconfiguration System 21

3. Network Configuration 25

Configuring the Network Host Files 25

Setting Up a GigaSwift Ethernet Network on a Diskless Client System 27

▼ To Set Up a GigaSwift Ethernet Port on a Diskless Client 27

Installing the Solaris Operating Environment Over a GigaSwift Ethernet Network 29

▼ To Install the Solaris Environment Over a GigaSwift Ethernet Network 29

Booting Over the GigaSwift Ethernet Network 33

4. Configuring Driver Parameters 37

GigaSwift Ethernet Device Driver Parameters 37

Driver Parameter V 38

Operational Mode Parameters 39

Flow Control Parameters 40

Gigabit Link Clock Mastership Controls 42

Interpacket Gap Parameters 42

Interrupt Parameters 44

Random Early Drop Parameters 45

PCI Bus Interface Parameters 46

Setting `ce` Driver Parameters 47

Setting Parameters Using the `ndd` Utility 47

▼ To Specify Device Instances for the `ndd` Utility 48

Setting Parameters Using the `ce.conf` File 51

▼ To Set Driver Parameters Using a `ce.conf` File 52

Usability Enhancements to the Driver 53

Downloaded from www.Manualslib.com manuals search engine

GigaSwift Ethernet Driver Operating Statistics 54

Reporting the Link Partner Capabilities 55

5. Configuring VLANs 63

An Overview of VLANs 63

Configuring VLANs 65

▼ To Configure Static VLANs 66

A. Specifications 69

Connectors 69

Performance Specifications 70

Physical Characteristics 71

Power Requirements 71

B. Diagnostic Software and Troubleshooting Issues 73

SunVTS Diagnostic Software 73

Using the OpenBoot PROM FCode Self-Test 74

▼ Running the Ethernet FCode Self-Test Diagnostic 74

Troubleshooting Issues 76

Known Incompatibilities with Pre-IEEE 802.3z Network Switches 76

▼ To Set Autonegotiation to `off` for a SunSwitch or an Alteon ACE 110 Switch 76

▼ To Set Autonegotiation to `off` for Other Noncompliant Network Equipment 77

Failure to Configure GigaSwift Ethernet Instance 78

Non-Specific Issues 78

Problem with DR Attach on Sun Enterprise Platforms 79

Index 81

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Figures

FIGURE 1-1 Sun GigaSwift Ethernet MMF Adapter 2

FIGURE 1-2 Sun GigaSwift Ethernet UTP Adapter 3

FIGURE 2-1 Connecting the Fiber Optic Cable 15

FIGURE 2-2 Cat-5 Twisted-Pair Cable 16

FIGURE 5-1 Example of Servers Supporting Multiple VLANs with Tagging Adapters 64

FIGURE 5-2 Ethernet Tag Header Format 66

FIGURE A-1 Sun GigaSwift Ethernet MMF Adapter Connector 69

FIGURE A-2 Sun GigaSwift Ethernet UTP Adapter Connector 70

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Tables

TABLE 1-1 Front Panel Display LEDs for the MMF Adapter 2

TABLE 1-2 Front Panel Display LEDs for the UTP Adapter 4

TABLE 2-1 Files and Directories on the CD-ROM 10

TABLE 3-1 Device Link Parameters 34

TABLE 3-2 `link-clock` Capabilities for Link Up 34

TABLE 4-1 `ce` Driver Parameter, Status, and Descriptions 38

TABLE 4-2 Operational Mode Parameters 39

TABLE 4-3 Read-Write Flow Control Keyword Descriptions 41

TABLE 4-4 Forced Mode Parameter 42

TABLE 4-5 Parameters Defining `enable-ipg0` and `ipg0` 43

TABLE 4-6 Read-Write Interpacket Gap Parameter Values and Descriptions 43

TABLE 4-7 RX Blanking Register for Alias Read 44

TABLE 4-8 RX Random Early Detecting 8-Bit Vectors 45

TABLE 4-9 PCI Bus Interface Parameters 46

TABLE 4-10 Read-Only `ce` Device Capabilities 54

TABLE 4-11 Read-Only Link Partner Capabilities 55

TABLE 4-12 Transmit and Receive Parameters 56

TABLE A-1 SC Connector Link Characteristics (IEEE P802.3z) 69

TABLE A-2 Cat-5 Connector Link Characteristics 70

Downloaded from www.Manualslib.com manuals search engine

TABLE A-3 Performance Sepcifications 70

TABLE A-4 Physical Characteristics 71

TABLE A-5 Power Requirements 71

TABLE B-1 Troubleshooting the GigaSwift Ethernet Adapter 78

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Preface

The *Sun GigaSwift Ethernet Adapter Installation and User's Guide* provides installation instructions for both the Sun GigaSwift Ethernet UTP adapter and the Sun GigaSwift Ethernet MMF adapter. This manual also describes how to configure the driver software.

These instructions are designed for enterprise system administrators with experience installing network hardware and software.

How This Book Is Organized

Chapter 1, provides a description of the adapter, including hardware and software.

Chapter 2, describes how to install the adapter in your system and how to verify that it has been installed correctly.

Chapter 3, describes how to edit the network host files after the adapter has been installed on your system.

Chapter 4, describes how to configure the driver parameters used by the Sun GigaSwift Ethernet adapter.

Chapter 5, explains VLANs in detail and provides configuration instructions and examples.

Appendix A, lists the specifications for the Sun GigaSwift Ethernet adapter.

Appendix B, provides an overview of the SunVTS diagnostic application and instructions for testing the adapter using the onboard FCode selftest. There is also a section outlining some common troubleshooting issues.

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Using UNIX Commands

This document may not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook2™ online documentation for the Solaris™ operating environment
- Other software documentation that you received with your system

Typographic Conventions

Typeface	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
`AaBbCc123`	What you type, when contrasted with on-screen computer output	`% su` `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the *User's Guide.* These are called *class* options. You *must* be superuser to do this.
	Command-line variable; replace with a real name or value	To delete a file, type `rm` *filename.*

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Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Related Documentation

Application	Title
PCI Adapter Installation	Your system installation or service manual
Storage Device Installation	Your storage device installation or service manual
Dynamic Reconfiguration Installation	*Sun Enterprise 6x00, 5x00, 4x00, and 3x00 Systems Dynamic Reconfiguration User's Guide*
Diagnostic Software	*SunVTS User's Guide* *SunVTS Test Reference Manual*
OpenBoot™ Commands	*OpenBoot 3.x Command Reference Manual*

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CHAPTER 1

Product Overview

This chapter provides a description of the Sun GigaSwift Ethernet adapter hardware and software. This chapter includes the following sections:

- “Hardware Overview” on page 1
- “Hardware and Software Requirements” on page 5
- “Patch Requirements” on page 5
- “Product Features” on page 6

Hardware Overview

The adapter relieves congestion experienced at the backbone and server levels by today’s networks, while providing a future upgrade path for high-end workstations that require more bandwidth than fast Ethernet can provide.

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Sun GigaSwift Ethernet MMF Adapter

The Sun GigaSwift Ethernet MMF adapter is a single-port gigabit Ethernet fiber optics PCI Bus card. It operates in 1000 Mbps Ethernet networks only.

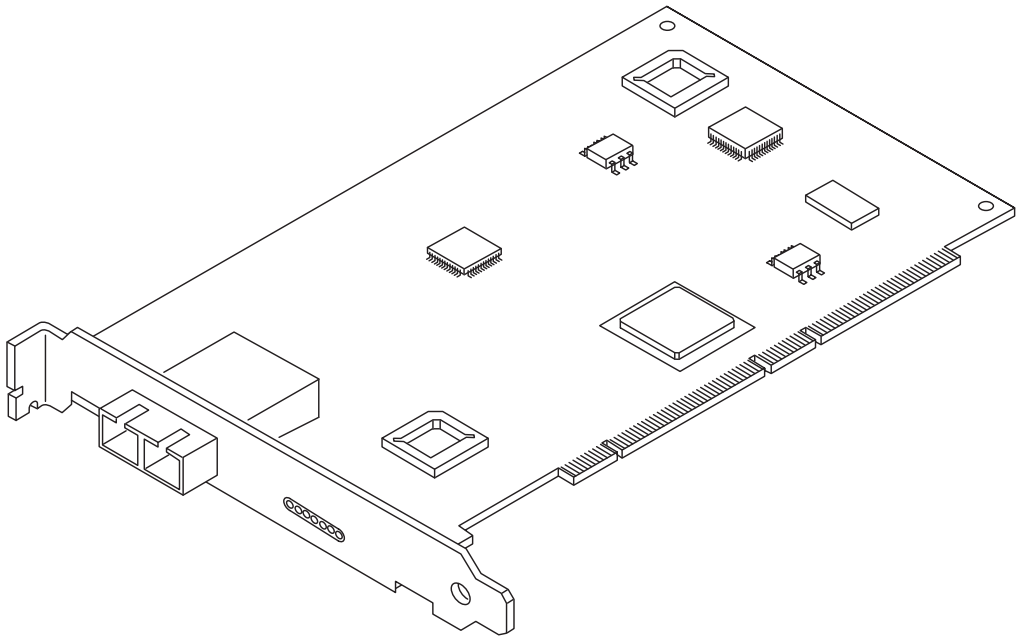


FIGURE 1-1 Sun GigaSwift Ethernet MMF Adapter

LED Displays

Four LEDs are displayed on the front panel of Sun GigaSwift Ethernet MMF adapter. They are labeled on the front panel as shown in TABLE 1-1.

TABLE 1-1 Front Panel Display LEDs for the MMF Adapter

Label	Meaning if Lit	Color
Link	Link is up	Green
FDX	Link is in Full Duplex mode.	Green
TX	Link is transmitting	Green
RX	Link is receiving	Green

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Sun GigaSwift Ethernet UTP Adapter

The Sun GigaSwift Ethernet UTP adapter is a single-port gigabit Ethernet copper-based PCI Bus card. It can be configured to operate in 10, 100, or 1000 Mbps Ethernet networks.

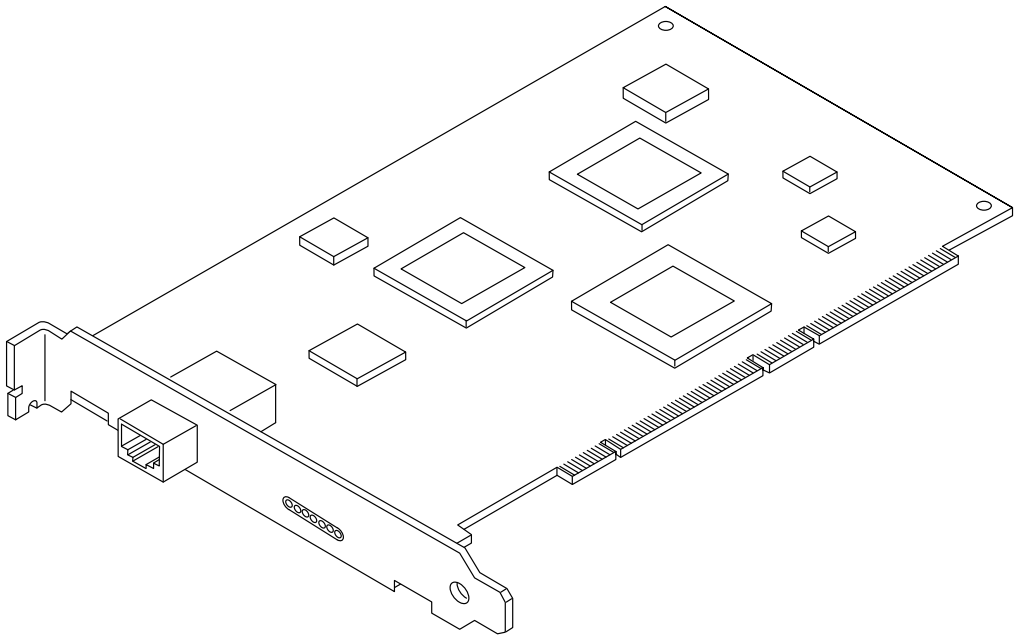


FIGURE 1-2 Sun GigaSwift Ethernet UTP Adapter

LED Displays

A total of nine LEDs are displayed on the front panel of the Sun GigaSwift Ethernet UTP adapter. They are labeled on the front panel as shown in TABLE 1-2.

The nine LEDs consist of a single purple LED and two sets of four green LEDs. Note that all LEDs are sourced by the gigabit PHY except the last two LEDs. TXM and RXM are sourced by the Sun GigaSwift Ethernet MAC ASIC. These LEDs are

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equivalent to TX and RX of the PHY except that they indicate the state of the MAC instead and can be used for diagnostic purposes to isolate a PHY or a MAC failure on the board.

TABLE 1-2 Front Panel Display LEDs for the UTP Adapter

Label	Meaning if On/Active	Color	Source
Link quality	Gigabit link quality good	Purple	PHY
1000X	Gigabit link is up	Green	PHY
100X	100Mbt link is up	Green	PHY
10X	10Mbt link is up	Green	PHY
FDX	Full Duplex Mode	Green	PHY
TX	PHY Transmitting data	Green	PHY
RX	PHY Receiving data	Green	PHY
TXM	MAC transmitting data	Green	MAC
RXM	MAC receiving data	Green	MAC

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Hardware and Software Requirements

Before using the Sun GigaSwift Ethernet adapter, make sure your system meets the following hardware and software requirements:

Hardware and Software	Requirements
Hardware	Sun Ultra™ 5, 10, 60, 80 Sun Enterprise™ 220R, 250, 450, 3000/3500, 4000/4500, 5000/5500, 6000/6500/6800, 10000, 15000 Sun Fire™ 280R, V480, V880 Sun Blade™ 1000
OpenBoot PROM	Revision 3.x
Operating environment	Solaris 2.6, 7, 8, and 9 releases

Enterprise 3000, 4000, 5000, and 6000 series systems using the Sun GigaSwift Ethernet adapter require a shielded twisted pair Ethernet cable.



Caution – Installing the Sun GigaSwift Ethernet adapter on the Enterprise 3000, 4000, 5000, and 6000 series systems is prohibited if option (X)1080A Sun Enterprise Systems Interface card is already installed on the 2632A PCI I/O board for these platforms. Install the Sun GigaSwift Ethernet adapter on the next available 2632A PCI I/O card.

Patch Requirements

The software driver package provided on the CD ROM has the following patches preinstalled.

- Solaris™ 2.6 and 7 operating environments Patch-ID Number 112327-02
- Solaris 8 operating environments Patch-ID Number 111883-07

The Solaris 8 2/02 release includes Patch-ID Number 111883-05. Subsequent versions of the Solaris operating environment may include the correct version.

- Solaris 9 operating environements Patch-ID 112817-05

Following are the current driver patch versions (at the time this document was created):

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- Patch-ID Number 112327-07 for Solaris 2.6 and 7 operating environments
- Patch-ID Number 111883-13 for Solaris 8 operating environments

Install the *latest* version of the Patch-ID Number for example, the dash number -07 becomes higher with each new version of the patch.

If you install Solaris 8 2/02 or any previous version of the Solaris operating environment after installing the Sun GigaSwift Ethernet driver software, you must install the latest version of the patch from the following web site:

`http://sunsolve.sun.com`

If the patch is not available on SunSolve, contact your local sales or service representative.

Product Features

You can install or replace the Sun GigaSwift Ethernet adapter. You can also diagnose a failure using the built-in diagnostic tools.

Key Protocols and Interfaces

The Sun GigaSwift Ethernet adapter is interoperable with existing Ethernet equipment assuming standard Ethernet minimum and maximum frame size (64 to 1518 bytes), frame format, and compliance with the following standards and protocols:

- SNMP (limited MIB)
- Full-duplex gigabit Ethernet interface
- Low CPU utilization—Frees up server system resource and bandwidth
- Dynamic reconfiguration (DR) and redundancy/failover support
- Full flow control support
- Duplex SC fiber connector (850 nm, SX)
- 33/66-MHz, 32- or 64-bit bus master
- Universal dual voltage signaling (3.3V and 5V)
- PCI Local Bus Rev 2.2-compliant (6.8-inch x 4.2-inch short card)
- IPv4 and IPv6 support
- Load balancing for RX packets among multiple CPUs
- IEEE 802.1Q VLAN
- IEEE 802.1P/802.1D Priority Tagging/Quality Of Service
- RAS support
- Energy Star® support

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Diagnostic Support

- User-executable self-test using OpenBoot™ PROM
- SunVTS diagnostic tool

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CHAPTER 2

Installing the Adapter

This chapter describes how to install the adapter in your system and how to verify that it has been installed correctly. This chapter contains the following sections:

- "Verifying Patches" on page 12
- "Installing the Driver Software" on page 9
- "Installing the Adapter Without Dynamic Reconfiguration" on page 14
  - "To Verify the Installation" on page 16
  - "Setting the `local-mac-address` Property" on page 19
  - "Rebooting the System" on page 20
- "Installing the Adapter With Dynamic Reconfiguration" on page 21

Note – If you have a Sun Enterprise system that supports dynamic reconfiguration (DR), refer to the *Sun Enterprise Dynamic Reconfiguration User's Guide* and your system's documentation for further information about dynamic reconfiguration.

Installing the Driver Software

The *Sun GigaSwift Ethernet Driver 1.0 Update 1* CD contains the driver software required to operate the adapter. The Solaris 8 10/01 operating environment and subsequent compatible releases include the Sun GigaSwift Ethernet driver software. Refer to the documentation that shipped with the *Solaris Supplement* CD-ROM for a listing of the available network drivers. Be sure to install the Sun GigaSwift Ethernet driver for your version of the Solaris operating environment.

1. **Become superuser.**

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2. **Insert the** *Sun GigaSwift Ethernet Driver 1.0 Update 1* **CD into a CD-ROM drive that is connected to your system.**

   - If your system is running Sun Enterprise Volume Manager™, it should automatically mount the CD-ROM to the `/cdrom/cdrom0` directory.
   - If your system is not running Volume Manager, mount the CD-ROM as follows:

```
# mkdir /cdrom
# mkdir /cdrom/cdrom0
# mount -F hsfs -o ro /dev/dsk/c0t6d0s2 /cdrom/cdrom0
```

You will see the following files and directories in the `/cdrom/sun_gigaswift_ethernet` directory or the `/cdrom/cdrom0` directory, depending on how you mounted the CD-ROM.

TABLE 2-1 Files and Directories on the CD-ROM

File or Directory	Contents
`Copyright`	U.S. copyright file
`FR_Copyright`	French copyright file
`Docs/`	Contains PDF copy of the user manual
`GigaSwiftEthernet/Solaris_`*OS-VER*`/Packages/`	Contains the Sun GigaSwift Ethernet software packages applicable to your version (*OS-VER)* of the Solaris software • SUNWcea—32-bit adb macros • SUNWceax—64-bit adb macros • SUNWced.u—32-bit adapter driver • SUNWced.u1—32-bit adapter driver for Solaris 2.6 Sun Enterprise 10000 • SUNWcedx.u—64-bit adapter driver • SUNWcedu—adapter driver headers • SUNWcem—man pages (optional) The optional VLAN packages for Solaris 8 only • SUNWvld—VLAN utility routines • SUNWvldx—VLAN utility routines (64-bit) • SUNWvldu—VLAN utility headers

Note – If you intend to use VLAN, you must install VLAN packages when you install the GigaSwift Ethernet software packages.

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3. **Install the software packages by typing the following at the command line, replacing the *OS_VER* with your version (2.6, 7, or 8) of the Solaris Operating Environment:**

```
# /usr/sbin/pkgadd -d /cdrom/cdrom0/GigaSwiftEthernet/Solaris_OS_VER/Packages/
```

For example, if your system is running the Solaris 8 Operating Environment, you would type the following:

```
# /usr/sbin/pkgadd -d /cdrom/cdrom0/GigaSwiftEthernet/Solaris_8/Packages/
```

A menu similar to the following displays:

```
The following packages are available:
  1  SUNWcea        Sun GigaSwift Ethernet Adapter Driver 32 bit adb Macros
                    (sparc) 1.0,REV=2001.05.04
  2  SUNWceax       Sun GigaSwift Ethernet Adapter Driver 64 bit adb Macros
                    (sparc) 1.0,REV=2001.05.04
  3  SUNWced.u      Sun GigaSwift Ethernet Adapter (32-bit Driver)
                    (sparc.sun4u) 1.0,REV=2001.05.04
  4  SUNWcedu       Sun GigaSwift Ethernet Adapter Driver Headers
                    (sparc) 1.0,REV=2001.05.04
  5  SUNWcedx.u     Sun GigaSwift Ethernet Adapter (64-bit Driver)
                    (sparc.sun4u) 1.0,REV=2001.05.04
  6  SUNWcem        Sun GigaSwift Ethernet Adapter Driver Man Pages
                    (sparc) 1.0,REV=2001.05.04
  7  SUNWvld        Sun Ethernet Vlan Utility Routines
                    (sparc) 1.0,REV=2001.05.04
  8  SUNWvldu       Sun Ethernet Vlan Utility Headers
                    (sparc) 1.0,REV=2001.05.04
  9  SUNWvldx       Sun Ethernet Vlan Utility Routines (64-bit)
                    (sparc) 1.0,REV=2001.05.04

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

4. **Select the packages you want to install:**

   - Press Return or type `all` to accept the default and install all packages.
   - Type the number of all but the optional packages if you prefer not to install them.

     See TABLE 2-1 to identify the optional packages.

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▼ To Install Driver Software for Solaris 2.6 Operating Environments

1. **Become superuser.**
2. **Insert the** *Sun GigaSwift Ethernet Driver 1.0* **CD into a CD-ROM drive that is connected to your system.**
   - If your system is running Sun Enterprise Volume Manager™, it should automatically mount the CD-ROM to the `/cdrom/cdrom0` directory.
   - If your system is not running Volume Manager, mount the CD-ROM as follows:

```
# mkdir /cdrom
# mkdir /cdrom/cdrom0
# mount -F hsfs -o ro /dev/dsk/c0t6d0s2  /cdrom/cdrom0
```

3. **Install the software packages by typing the following at the command line.**

```
# cd /cdrom/cdrom0/GigaSwiftEthernet/Solaris_2.6
# /usr/sbin/pkgadd -d sparc_arch/Packages all
```

Where *sparc_arch is* either `sparc.sun4u` or `sparc.sun4u1` for Sun Enterprise™ 10000 systems.

Note – The `sparc.sun4u1` contains the Solaris 2.6 packages only for Enterprise 10000 systems.

Verifying Patches

Verify whether your system has the needed patches for your version of the Solaris operating environment to ensure that you do not need to add patches.

- **To verify patches for Solaris 2.6 and 7 operating environments, type the following.**

```
# showrev -p | grep 112327
```

The patch version should be -07 or greater.

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- **To verify patches for Solaris 8 operating environments, type the following.**

```
# showrev -p | grep 111883
```

The patch version should be -13 or greater.

- **To verify patches for Solaris 9 operating environments, type the following.**

```
# showrev -p | grep 112817
```

The patch version should be -05 or greater.

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Installing the Adapter Without Dynamic Reconfiguration

▼ To Install the Adapter

Note – The following instructions describe the basic tasks required to install the adapter. Refer to your system installation or service manual for detailed PCI adapter installation instructions.

1. **Halt and power off your system.**
2. **Power off all of the peripherals connected to your system.**
3. **Open the system unit.**
4. **Attach the adhesive copper strip of the antistatic wrist strap to the metal casing of the power supply. Wrap the other end twice around your wrist, with the adhesive side against your skin.**
5. **Holding the PCI adapter by the edges, unpack it and place it on an antistatic surface.**
6. **Using a No. 1 Phillips screwdriver, remove the PCI filler panel from the slot in which you want to insert the PCI adapter.**

   Save the filler panel screw for Step 9.
7. **Holding the PCI adapter by the edges, align the adapter edge connector with the PCI slot. Slide the adapter face plate into the small slot at the end of the PCI opening.**

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8. **Applying even pressure at both corners of the adapter, push the PCI adapter until it is firmly seated in the slot.**



Caution – Do not use excessive force when installing the adapter into the PCI slot. You may damage the adapter's PCI connector. If the adapter does not seat properly when you apply even pressure, remove the adapter and carefully reinstall it again.

9. **Secure the adapter to the PCI slot using the screw you removed in Step 6.**
10. **Detach the wrist strap and close the system unit.**
11. **Connect the cables.**
    - For the Sun GigaSwift Ethernet MMF PCI Bus card, connect the fiber optic cable (850nm, SC) to the PCI adapter and to a fiber optic Ethernet network.

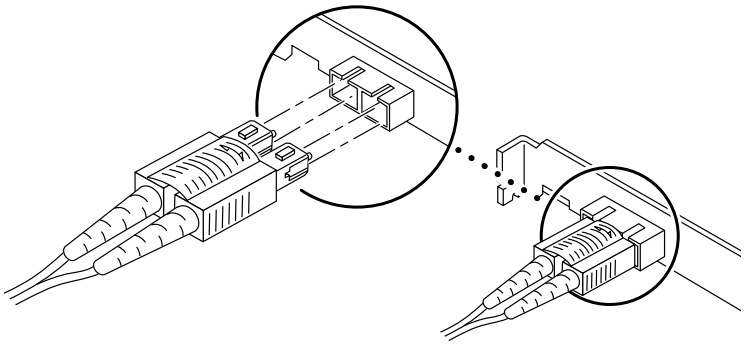


FIGURE 2-1 Connecting the Fiber Optic Cable

    - For the Sun GigaSwift Ethernet UTP PCI Bus card, connect a Cat-5 twisted-pair cable.

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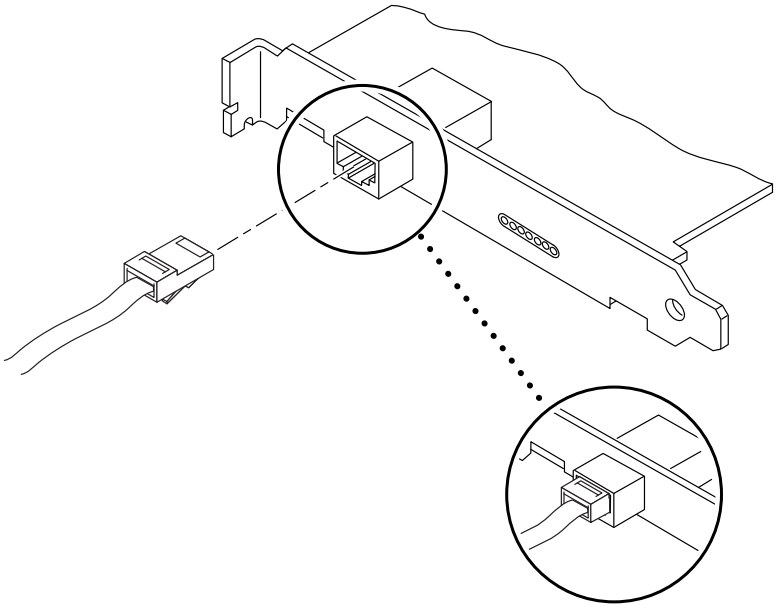


FIGURE 2-2 Cat-5 Twisted-Pair Cable

▼ To Verify the Installation

After you have installed the Sun GigaSwift Ethernet adapter, but *before* you boot your system, perform the following tasks to verify the installation. Refer to the *Solaris Handbook for Sun Peripherals* manual or your Solaris documentation for the detailed instructions.

Note – Verification is not required if your system supports dynamic reconfiguration (DR).

---

1. **Power on the system, and when the banner appears, press the Stop-A key sequence to interrupt the boot process and display the OpenBoot (**ok**) prompt.**

   If the card is properly installed and the cables are properly connected to a compatible network, you will see the following message:

```
xcvr addr:0x00 - link up 1000 Mbps full duplex
```


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2. **List the network devices on your system.**

```
ok show-nets
```

Use the `show-nets` command to list the system devices. You should see the full path name of the `network` devices, similar to the Ultra 30 system example below. In this example, the `network@4` device is the Sun GigaSwift Ethernet adapter and the `network@1,1` is the onboard Ethernet device.

```
ok show-nets
a) /pci@1f,2000/pci@1/network@4
b) /pci@1f,4000/network@1,1
q) NO SELECTION
Enter Selection, q to quit: q
```

Note – If you do not see the device listed, check that the adapter is properly seated and, if necessary, reinstall the adapter.

---

3. **View the device that you installed.**

Using the previous example, type:

```
ok cd /pci@1f,0/pci@1/network@4
```

Be sure to write down your device path, which in the example is `/pci@1f,0/pci@1/network@4`. While your device path may be different, it will be similar. You will need this information to make changes to the `ce.conf` file. See “Setting Parameters Using the `ce.conf` File” on page 51.

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4. **View the** `.properties` **file for a list of device properties.**

   It might be difficult to tell if the devices on your network are GigaSwift Ethernet devices or other network interface cards. The `.properties` command displays the specific information about the installed adapter.

   At the `ok` prompt, use the `.properties` command to make sure that the device you just installed is connected to the network. Your output may look different from the following example:

```
ok .properties
assigned-addresses       82002010 00000000 01000000 00000000 00200000
                         82002030 00000000 01200000 00000000 00100000
d-fru-len                00 00 00 00
d-fru-off                00 00 e8 00
d-fru-dev                eeprom
s-fru-len                00 00 08 00
s-fru-off                00 00 e0 00
s-fru-dev                eeprom
compatible               70 63 69 31 30 38 65 2c 61 62 62 61 2e 31 31 00
reg                      00002000 00000000 00000000 00000000 00000000
                         02002010 00000000 00000000 00000000 00200000
                         02002030 00000000 00000000 00000000 00100000
address-bits             00 00 00 30
max-frame-size           00 00 40 00
network-interface-type   ethernet
device_type              network
name                     network
local-mac-address        08 00 20 aa bb cc
version                  Sun PCI Gigaswift 1000Base-T FCode 2.11 02/09/23
phy-type                 mif
board-model              501-5525
model                    SUNW,pci-ce
fcode-rom-offset         00000000
66mhz-capable
fast-back-to-back
devsel-speed             00000002
class-code               00020000
interrupts               00000001
                         00000002
                         00000003
                         00000004
max-latency              00000040
min-grant                00000040
revision-id              00000011
device-id                0000abba
vendor-id                0000108e
```


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The phy-type will have its value assigned as follows:

Media type	phy-type
Fiber	pcs
Copper	mif

Note – If you are going to set the local-mac-address property, note the local-mac-address of your device at this time. See “Setting the local-mac-address Property” on page 19 for more information.

Setting the local-mac-address Property

Note – Setting the local-mac-address property is only required if you will be booting from the network.

The network interface of the Sun GigaSwift Ethernet adapter has been assigned a unique media access control (MAC) address that represents the 48-bit Ethernet address for that interface. The OpenBoot firmware reports this MAC address via the local-mac-address property in the device nodes corresponding to the network interface.

A system is not obligated to use this assigned MAC address if it has a system-wide MAC address. In such cases, the system-wide MAC address applies to all network interfaces on the system.

The device driver, or any other adapter utility, can use the network device’s MAC address (local-mac-address) while configuring it. In the Solaris operating environment, you can use the MAC address when booting over the network.

The mac-address property of the network device specifies the network address (system-wide or local-mac-address) used for booting the system. To start using the MAC address assigned to the network interface of the Sun GigaSwift Ethernet adapter, set the NVRAM configuration variable local-mac-address? to true.

```
ok setenv local-mac-address? true
```


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▼ To Set the GigaSwift Ethernet Device Primary Boot Device

Use this procedure *only* if you want the GigaSwift Ethernet device to be your primary boot device.

1. **List the network devices on your system.**

```
ok show-nets
a) /pci@1f,2000/pci@1/network@4
b) /pci@1f,4000/network@1,1
q) NO SELECTION
Enter Selection, q to quit: q
```

2. **Set the Sun GigaSwift Ethernet device to be your default boot device, type:**

```
ok setenv boot-device /pci@1f,2000/pci@1/network@4
```

Note that the correct command has a space rather than = between `boot-device` and `/pci@1f,2000/pci@1/network@4`.

Rebooting the System

After verifying the adapter installation, use the `boot -r` command to perform a reconfiguration boot on your system.

```
ok boot -r
```


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Installing the Adapter With Dynamic Reconfiguration

If you have a Sun Enterprise system that supports dynamic reconfiguration (DR), you do not have to reboot your system after installing the adapter.

The process of adding and configuring an adapter with DR involves (1) connecting the attachment point and (2) configuring its occupant. In most cases, the `cfgadm`(1M) command can perform both steps at once.

▼ To Install an Adapter in a Dynamic Reconfiguration System

1. **Verify that the selected board slot is ready for the adapter.**

```
# cfgadm
```

The states and conditions should be:

```
Receptacle state—Empty
Occupant state—Unconfigured
Condition—Unknown
```

Or:

```
Receptacle state—Disconnected
Occupant state—Unconfigured
Condition—Unknown
```


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2. **If the status of the slot is not “empty” or “disconnected”, type:**

```
# cfgadm -c disconnect sysctrl#:slot#
```

where the *sysctrl#* = `0` for the Enterprise 10000 and *slot#*= the slot available for the adapter. For example, if you were installing the adapter into slot #3 on an Enterprise 10000, you would type the following:

```
# cfgadm -c disconnect sysctrl0:3
```

3. **Physically insert the adapter into the slot and look for an acknowledgement on the console, such as, “***name* `board inserted into slot3`**.”**

After the adapter is inserted, the states and conditions should become:

```
Receptacle state—Disconnected
Occupant state—Unconfigured
Condition—Unknown
```

Any other states or conditions should be considered an error.

4. **Connect any peripheral cables and interface modules to the adapter.**
5. **Connect the cables to the card and to an Ethernet network.**
6. **Configure the adapter with the following command:**

```
# cfgadm -v -c configure sysctrl#:slot#
```

This command should both connect and configure the receptacle. Verify with the `cfgadm` command.

The states and conditions for a connected and configured attachment point should be:

```
Receptacle state—Connected
Occupant state—Configured
Condition—OK
```


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Now the system is also aware of the usable devices which reside on the adapter and all devices may be mounted or configured to be used.

If the command fails to connect and configure the adapter and slot (the status should be shown as “configured” and “ok”), do the connection and configuration as separate steps:

a. Connect the adapter and slot:

```
# cfgadm -v -c connect sysctrl#:slot#
```

The states and conditions for a connected attachment point should be:

```
Receptacle state—Connected
Occupant state—Unconfigured
Condition—OK
```

Now the system is aware of the adapter, but not the usable devices which reside on the adapter. Temperature is monitored and power and cooling affect the attachment point condition.

b. Configure the adapter and slot:

```
# cfgadm -v -c configure sysctrl#:slot#
```

The states and conditions for a configured attachment point should be:

```
Receptacle state—Connected
Occupant state—Configured
Condition—OK
```

Now the system is also aware of the usable devices which reside on the adapter and all devices may be mounted or configured to be used.

7. Reconfigure the devices on the adapter

```
# drvconfig; devlinks; disks; ports; tapes;
```

The console should now display a list of devices and their addresses.

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CHAPTER 3

Network Configuration

This chapter describes how to edit the network host files after the adapter has been installed on your system. The chapter contains the following sections:

- "Configuring the Network Host Files" on page 25
- "Setting Up a GigaSwift Ethernet Network on a Diskless Client System" on page 27
- "Installing the Solaris Operating Environment Over a GigaSwift Ethernet Network" on page 29

Configuring the Network Host Files

After installing the driver software, you must create a `hostname.ce`*number* file for the adapter's Ethernet interface. You must also create both an IP address and a host name for its Ethernet interface in the `/etc/hosts` file.

1. **At the command line, use the `grep` command to search the `/etc/path_to_inst` file for `ce` interfaces.**

```
# grep ce /etc/path_to_inst
"/pci@1f,4000/network@4" 0 "ce"
```

In the example above, the device instance is from a Sun GigaSwift Ethernet adapter installed in slot 1. For clarity, the instance number is in bold italics.

Be sure to write down your device path and instance, which in the example is `"/pci@1f,0/pci@1/network@4" 0`. While your device path and instance may be different, it will be similar. You will need this information to make changes to the `ce.conf` file. See "Setting Parameters Using the `ce.conf` File" on page 51.

2. **Use the `ifconfig` command to setup the adapter's `ce` interface.**

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Use the `ifconfig` command to assign an IP address to the network interface. Type the following at the command line, replacing *ip_address* with the adapter's IP address:

```
# ifconfig ce0 plumb ip_address up
```

Refer to the `ifconfig`(1M) man page and the Solaris documentation for more information.

- If you want a set-up that will remain the same after you reboot, create an `/etc/hostname.ce`*number* file, where *number* corresponds to the instance number of the `ce` interface you plan to use.

  To use the adapter's `ce` interface in the Step 1 example, create an `/etc/hostname.ce0` file, where `0` is the number of the `ce` interface. If the instance number were *1*, the filename would be `/etc/hostname.ce1`.
- Do not create an `/etc/hostname.ce`*number* file for a Sun GigaSwift Ethernet adapter interface you plan to leave unused.
- The `/etc/hostname.ce`*number* file must contain the hostname for the appropriate `ce` interface.
- The host name should have an IP address and should be listed in the `/etc/hosts` file.
- The host name should be different from any other host name of any other interface, for example: `/etc/hostname.ce0` and `/etc/hostname.ce1` cannot share the same host name.

The following example shows the `/etc/hostname.ce`*number* file required for a system called `zardoz` that has a Sun GigaSwift Ethernet adapter (`zardoz-11`).

```
# cat /etc/hostname.hme0
zardoz
# cat /etc/hostname.ce0
zardoz-11
```


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3. **Create an appropriate entry in the `/etc/hosts` file for each active `ce` interface.**

   For example:

```
# cat /etc/hosts
#
# Internet host table
#
127.0.0.1     localhost
129.144.10.57 zardoz    loghost
129.144.11.83 zardoz-11
```

Setting Up a GigaSwift Ethernet Network on a Diskless Client System

Before you can boot and operate a diskless client system across a gigabit Ethernet network, you must first install the GigaSwift Ethernet software packages into the root directory of the diskless client. You can find the GigaSwift Ethernet software packages on the *Sun GigaSwift Ethernet Driver 1.0 Update 1* CD. Refer to the *Solaris Advanced Installation Guide* and the *System Administration Guide* for more information about installing and administering diskless client systems.

Note – The Solaris 8 operating environment does not support diskless clients.

▼ To Set Up a GigaSwift Ethernet Port on a Diskless Client

1. **Locate the root directory of the diskless client on the host server.**

   The root directory of diskless client system is commonly installed in the host server's `/export/root/`*client_name* directory, where *client_name* is the diskless client's host name. In this procedure, the root directory will be:

```
/export/root/client_name
```


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2. **Insert the** *Sun GigaSwift Ethernet Driver 1.0 Update 1* **CD into the server's CD-ROM drive.**

   The CD should automatically mount to the `/cdrom/cdrom0` directory. If the CD did not get mounted to this directory, refer to "Installing the Driver Software" on page 9 for mounting instructions.

3. **Use the** `pkgadd -R` **command to install the three GigaSwift Ethernet software packages to the diskless client's root directory on the server.**

   You will need to install the `SUNWced.u`, `SUNWcedm`, and `SUNWcedu` software packages to the client's root directory.

```
# cd /cdrom/cdrom0/GigaSwiftEthernet/Packages
# pkgadd -R /export/root/client_name -d . SUNWced.u SUNWcem SUNWcedu
# cd /
```

4. **Eject the** *Sun GigaSwift Ethernet Driver 1.0 Update 1* **CD from the CD-ROM drive.**

5. **Create a** `hostname.ce`*number* **file in the diskless client's root directory.**

   You will need to create an `/export/root/`*client_name*`/etc/hostname.ce`*number* file for the GigaSwift Ethernet interface. See "Configuring the Network Host Files" on page 25 for instructions.

6. **Edit the** `hosts` **in the diskless client's root directory.**

   You will need to edit the `/export/root/`*client_name*`/etc/hosts` file to include the IP address of the GigaSwift Ethernet interface. See "Configuring the Network Host Files" on page 25 for instructions.

7. **Be sure to set the MAC address on the server side and rebuild the device tree if you want to boot from the GigaSwift Ethernet port.**

8. **To boot the diskless client from the GigaSwift Ethernet port, type the following boot command:**

```
ok boot path-to-device:link-param, -v
```


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Installing the Solaris Operating Environment Over a GigaSwift Ethernet Network

The *Solaris Advanced Installation Guide* describes the full procedure for installing the Solaris operating environment over the network. The procedure below assumes that you have created an install server, which contains the image of the Solaris CD, and that you have set up the client system to be installed over the network.

Before you can install the Solaris operating environment on a client system with a GigaSwift Ethernet adapter, you must first add the GigaSwift Ethernet software packages to the install server. These software packages are on *Sun GigaSwift Ethernet Driver 1.0 Update 1* CD.

Note – Refer to the *Solaris Advanced Installation Guide* for more information about installing the Solaris operating environment over the network.

▼ To Install the Solaris Environment Over a GigaSwift Ethernet Network

1. **Prepare the install server and client system to install the Solaris operating environment over the network.**

   The *Solaris Advanced Installation Guide* describes how to create the install server and set up the client systems.

Note – If you want to install the client system over a network that is not part of the same subnet, you must also create a boot server. The *Solaris Advanced Installation Guide* describes how to create a boot server.

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2. **Find the root directory of the client system.**

   The client system's root directory can be found in the install server's `/etc/bootparams` file. Use the `grep` command to search this file for the root directory.

```
# grep client_name /etc/bootparams
client_name root=server_name:/netinstall/Solaris_2.7/Tools/Boot
install=server_name:/netinstall boottype=:in rootopts=:rsize=32768
```

   In the example above, the root directory for the Solaris 7 client is `/netinstall`. In Step 4, you would replace *root_directory* with `/netinstall`.

Note – If the root directory is not found in the `/etc/bootparams` file, refer to the *Solaris Advanced Installation Guide* for configuration instructions.

---

3. **Insert the** *Sun GigaSwift Ethernet Driver 1.0 Update 1* **CD into the install server's CD-ROM drive.**

   The CD should automatically mount to the `/cdrom/cdrom0` directory. If the CD did not get mounted to this directory, refer to "Installing the Driver Software" on page 9 for mounting instructions.

4. **On the install server, install the GigaSwift Ethernet software to the client's root directory, as determined in Step 2.**

   Replace *root_directory* with the location of the client's root directory.

```
# cd /cdrom/cdrom0/GigaSwiftEthernet/Packages
# ls SUNWce*
SUNWcea SUNWceax SUNWced SUNWcedu SUNWcem
# pkgadd -R root_directory/Solaris_2.7/Tools/Boot -d . SUNWced SUNWcem SUNWcedu
# cd /
```

Note – The directory paths for these files might change in future Solaris releases. If the commands above do not work correctly, refer to the documentation that shipped with your version of the Solaris operating environment.

---

5. **Eject the** *Sun GigaSwift Ethernet Driver 1.0 Update 1* **CD from the CD-ROM drive.**

Note – Perform the following steps on the client system.

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6. **Shut down and halt the client system.**

   Use the `shutdown` command to display the OpenBoot (`ok`) prompt.

```
# shutdown -i0 -g0 -y
. . .
(shutdown command messages omitted)
. . .
ok
```

7. **At the `ok` prompt, use the `show-nets` command to find the device path of the GigaSwift Ethernet device.**

   The `show-nets` command lists the system devices. You should see the full path name of the network device, similar to the example below. In this example, the `network@4` device is the Sun GigaSwift Ethernet adapter.

```
ok show-nets
a) /pci@1f,2000/pci@1/network@4
b) /pci@1f,4000/network@1,1
q) NO SELECTION
Enter Selection, q to quit: q
```

8. **At the `ok` prompt, boot the client system using the full device path of the Gigabit Ethernet device.**

   Following are several examples, which show the different options available:

   - Booting in Auto-Negotiated mode:

```
ok boot:link-param, -v
```

   - Booting in Auto-Negotiated verbose mode at 1000 Mbps half duplex:

```
ok boot /pci@1f,4000/network@4:speed=1000,duplex=half,link-clock=auto
```

Note – `link-clock` must be set to auto.

For this configuration the highest capability is limited to 1000 Mbps half duplex and the lowest is 10 Mbps half duplex, hence the link will be established within this range of capabilities, depending on the configuration of the link partner.

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- Booting in non-Auto-Negotiated verbose mode at 100 Mbps full duplex:

```
ok boot /pci@1f,4000/network@4:speed=100,duplex=full, -v
```

- Booting in non-Auto-Negotiated verbose mode at 1000 Mbps half duplex link-clock master:

```
ok boot /pci@1f,4000/network@4:speed=1000,duplex=half,link-clock=master
```

Note – For link to be successfully established the link partner must be configured to 1000 Mbps half duplex `link-clock` slave.

---

9. **Proceed with the Solaris operating environment installation.**

   Refer to the *Solaris Advanced Installation Guide* for more information about installing the Solaris operating environment over the network.

10. **After installing the Solaris operating environment, install the Sun GigaSwift Ethernet software on the client system.**

    The software installed in Step 4 was required to boot the client system over the GigaSwift Ethernet interface. You now need to install the software in order for the operating system to use the client's GigaSwift Ethernet interfaces in normal operation.

    Before installing the Sun GigaSwift Ethernet software, make sure that the client system does not already have the software installed. Use the `pkginfo` command to see if the Sun GigaSwift Ethernet software packages are installed on the client system.

```
# pkginfo | grep SUNWce
system  SUNWced   Sun Gigabit Ethernet Adapter Driver
system  SUNWcem   Sun Gigabit Ethernet Adapter Driver Man Pages
system  SUNWcedu  Sun Gigabit Ethernet Adapter Driver Headers
```

- If the software is installed (as shown in the example above), skip to Step 11.
- If the software is not installed, install the software from *Solaris Supplement* CD.

  Refer to "Installing the Driver Software" on page 9 for instructions on installing the required software packages.

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11. **Confirm that the network host files have been configured correctly during the Solaris installation.**

    Although the Solaris software installation creates the client's network configuration files, you may need to edit these files to match your specific networking environment. See "Configuring the Network Host Files" on page 25 for more information about editing these files.

Booting Over the GigaSwift Ethernet Network

The Sun GigaSwift Ethernet adapter can be linked up either with Auto-Negotiation enabled or disabled. When link-up is attempted with Auto-Negotiation enabled (the default), the link parameter capabilities (such as speed in megabits/second, duplex and link-clock mastership only for 1000 Mbps) are automatically negotiated between the device and its link partner. Attempting to link-up with Auto-Negotiation disabled requires knowledge of the current capabilities at which both the device and its link partner are configured.

The structure of the boot net command line that includes device parameters is as follows:

```
ok boot device-path:speed=s,duplex=d,link-clock=c,promiscuous,
```

where,

s = 1000, 100, 10, auto
d = half, full, auto
c = master, slave, auto

Note – Refer to the IEEE 802.3 (G)MII register specification for the details on Auto-Negotiated and non-Auto-Negotiated modes of operation. (To establish the link successfully so that traffic is transfered without collisions caused by duplex mismatch between the local and remote devices both the local and remote link capabilities must be matched.)

TABLE 3-1 depicts the device link parameters you can specify on the boot net command line to establish a link between the local and remote device. TABLE 3-2 shows the speed, duplex and `link-clock` capabilities at which a link-up will be attempted:

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TABLE 3-1 Device Link Parameters

Device Parameters			Device Link Capability						
speed	**duplex**	**link-clock**	**autoneg**	**1000fdx**	**1000hdx**	**100fdx**	**100hdx**	**10fdx**	**10hdx**
1000	full	master/slave	0	0	0	0	0	0	0
1000	half	master/slave	0	1	0	0	0	0	0
1000	full	auto	1	1	1	1	1	1	1
1000	half	auto	1	0	1	1	1	1	1
1000	auto		1	1	1	1	1	1	1
1000			1	1	1	1	1	1	1
1000		auto	1	1	1	1	1	1	1
100	full	N/A		0	0	0	1	0	0
100	half	N/A		0	0	0	0	1	0
100	auto	N/A		1	0	0	1	1	1
100				1	0	0	1	1	1
10	full	N/A	0	0	0	0	0	0	1
10	half	N/A		0	0	0	0	0	0
10	auto	N/A		1	0	0	0	0	1
10				1	0	0	0	0	1
auto	full			1	1	0	1	0	1
auto	half			1	0	1	0	1	0
auto	auto			1	1	1	1	1	1
auto				1	1	1	1	1	1
	auto	auto		1	1	1	1	1	1

TABLE 3-2 `link-clock` Capabilities for Link Up

link-clock	**master-cfg-enable**	**master-cfg-value**	**Description**
slave	1	0	link clock slave
master	1	1	link clock master
auto	0	0	default link clock auto

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Following are examples showing the usage of the boot net command line with device parameters specified:

To attempt to force the link-up while advertising 100 Mbps full duplex capability to the link partner:

```
# boot net:speed=100,duplex=full,
```

To attempt to force link-up while advertising 1000 Mbps full duplex link-clock master capibility to the link partner:

```
# boot net:speed=1000,duplex=full,link-clock=master,
```

Note – The link partner must be configured as link-clock slave.

To attempt to Auto-Negotiate the link while advertising 1000 Mbps full and half duplex and link-clock auto capability to the link partner:

```
# boot net:speed=1000,duplex=auto,link-clock=auto,
```

Note – Link partner must Auto-Negotiate in order to link-up at 1000 Mbps.

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CHAPTER 4

Configuring Driver Parameters

This chapter describes how to configure the driver parameters used by the Sun GigaSwift Ethernet adapter. This chapter contains the following sections:

- "GigaSwift Ethernet Device Driver Parameters" on page 37
- "Setting `ce` Driver Parameters" on page 47
- "Usability Enhancements to the Driver" on page 53
- "GigaSwift Ethernet Driver Operating Statistics" on page 54

GigaSwift Ethernet Device Driver Parameters

The `ce` device driver controls the GigaSwift Ethernet devices. The `ce` driver is attached to the UNIX `pci` name property `pci108e,abba` for the Sun GigaSwift Ethernet adapter (`108e` is the vendor ID and `abba` is the PCI device ID).

You can manually configure the `ce` device driver parameters to customize each Sun GigaSwift Ethernet adapter device in your system. This section provides an overview of the capabilities of the GigaSwift Ethernet device used in the adapter, lists the available `ce` device driver parameters, and describes how to configure these parameters.

The Sun GigaSwift Ethernet UTP PCI adapter is capable of all the operating speeds and modes listed in "Setting the Autonegotiation Mode" on page 50. The ce device performs autonegotiation with the remote end of the link (link partner) to select a common mode of operation. The ce device also supports a forced mode of operation.

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Note – The syntax for the Sun GigaSwift Ethernet driver parameters has changed. The syntax for parameters formerly included an underscore, for example, `adv_autoneg_cap`. The current syntax uses a dash instead, for example, `adv-autoneg-cap`. During the transition phase, either format is acceptable. However, be sure to check the *Platform Notes: Sun GigaSwift Ethernet Device Driver* in your version of the Solaris operating environment.

Driver Parameter Values and Definitions

TABLE 4-1 describes the parameters and settings for the `ce` device driver.

TABLE 4-1 `ce` Driver Parameter, Status, and Descriptions

Parameter	Status	Description
`instance`	Read and write	Device instance
`adv-autoneg-cap`	Read and write	Operational mode parameter
`adv-1000fdx-cap`	Read and write	Operational mode parameter
`adv-1000hdx-cap`	Read and write	Operational mode parameter
`adv-100T4-cap`	Read and write	Operational mode parameter
`adv-100fdx-cap`	Read and write	Operational mode parameter
`adv-100hdx-cap`	Read and write	Operational mode parameter
`adv-10fdx-cap`	Read and write	Operational mode parameter
`adv-10hdx-cap`	Read and write	Operational mode parameter
`adv-asmpause-cap`	Read and write	Flow control parameter
`adv-pause-cap`	Read and write	Flow control parameter
`master-cfg-enable`	Read and write	Gigabit link clock mastership controls
`master-cfg-value`	Read and write	Gigabit link clock mastership controls
`use-int-xcvr`	Read and write	
`enable-ipg0`	Read and write	Enable additional delay before transmitting a packet
`ipg0`	Read and write	Additional delay before transmitting a packet
`ipg1`	Read and write	Interpacket Gap parameter
`ipg2`	Read and write	Interpacket Gap parameter
`rx-intr-pkts`	Read and write	Receive interrupt blanking values
`rx-intr-time`	Read and write	Receive interrupt blanking values

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TABLE 4-1 ce Driver Parameter, Status, and Descriptions *(Continued)*

Parameter	Status	Description
red-dv4to6k	Read and write	Random early detection and packet drop vectors
red-dv6to8k	Read and write	Random early detection and packet drop vectors
red-dv8to10k	Read and write	Random early detection and packet drop vectors
red-dv10to12k	Read and write	Random early detection and packet drop vectors
tx-dma-weight	Read and write	PCI Interface parameter
rx-dma-weight	Read and write	PCI Interface parameter
infinite-burst	Read and write	PCI Interface parameter
disable-64bit	Read and write	PCI Interface parameter

Operational Mode Parameters

The following parameters determine the transmit and receive speed and duplex. TABLE 4-2 describes the operational mode parameters and their default values.

TABLE 4-2 Operational Mode Parameters

Parameter	Description
adv-autoneg-cap	Local interface capability advertised by the hardware 0 = Forced mode 1 = Autonegotiation (default)
adv-1000fdx-cap	Local interface capability advertised by the hardware 0 = Not 1000 Mbit/sec full-duplex capable 1 = 1000 Mbit/sec full-duplex capable (default)
adv-1000hdx-cap	Local interface capability advertised by the hardware 0 = Not 1000 Mbit/sec half-duplex capable 1 = 1000 Mbit/sec half-duplex capable (default)
adv-100T4-cap	Local interface capability advertised by the hardware 0 = Not 100T4 capable (default) 1 = 100T4 capable
adv-100fdx-cap	Local interface capability advertised by the hardware 0 = Not 100 Mbit/sec full-duplex capable 1 = 100 Mbit/sec full-duplex capable (default)

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TABLE 4-2 Operational Mode Parameters *(Continued)*

Parameter	Description
`adv-100hdx-cap`	Local interface capability advertised by the hardware 0 = Not 100 Mbit/sec half-duplex capable 1 = 100 Mbit/sec half-duplex capable (default)
`adv-10fdx-cap`	Local interface capability advertised by the hardware 0 = Not 10 Mbit/sec full-duplex capable 1 = 10 Mbit/sec full-duplex capable (default)
`adv-10hdx-cap`	Local interface capability advertised by the hardware 0 = Not 10 Mbit/sec half-duplex capable 1 = 10 Mbit/sec half-duplex capable (default)

Note – If a parameter's initial setting is 0, it cannot be changed. If you try to change it, it will revert back to 0.

If all these parameters are set to 1, autonegotiation will use the highest speed possible. If all these parameters are set to 0, you will receive the following error message:

```
NOTICE: Last setting will leave ce1 with no link capabilities.
WARNING: ce1: Restoring previous setting.
```

Flow Control Parameters

The `ce` device is capable of sourcing (transmitting) and terminating (receiving) pause frames conforming to the IEEE 802.3x Frame Based Link Level Flow Control Protocol. In response to received flow control frames, the `ce` device can slow down its transmit rate. On the other hand, the `ce` device is capable of sourcing flow control frames, requesting the link partner to slow down, provided that the link partner supports this feature. By default, the driver advertises both transmit and receive pause capability during autonegotiation.

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TABLE 4-3 provides flow control keywords and describes their function.

TABLE 4-3 Read-Write Flow Control Keyword Descriptions

Keyword	Description
`adv-asmpause-cap`	The adapter supports asymmetric pause, which means it can pause only in one direction. 0=Off (default) 1=On
`adv-pause-cap`	This parameter has two meanings depending on the value of `adv-asmpause-cap`. (Default=0) If `adv-asmpause-cap` = 1 while a`dv-pause-cap` = 1 pauses are received. If `adv-asmpause-cap` = 1 while a`dv-pause-cap` = 0 pauses are transmitted. If `adv-asmpause-cap` = 0 while a`dv-pause-cap` = 1 pauses are sent and received. If `adv-asmpause-cap` = 0 then a`dv-pause-cap` determines whether Pause capability is on or off.

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Gigabit Link Clock Mastership Controls

The concept of link clock mastership introduced with one gigabit twisted-pair technology. This concept requires one side of the link to be the master that provides the link clock and the other to be the slave that uses the link clock. Once this relationship is established the link is up, and data can be communicated. Two Physical layer parameters control whether your side is the master or the slave or whether mastership is negotiated with the link partner. Those parameters are as follows.

TABLE 4-4 Forced Mode Parameter

Parameter	Description
`master-cfg-enable`	Determines whether or not during the auto-negotiation process the link clock mastership is setup automatically.
`master-cfg-value`	If the `master-cfg-enable` parameter is set then the mastership is not setup automatically but is dependant on the value of `master-cfg-value`. If the `master-cfg-value` is set then the physical layer expects the local device to be the link master. If it is not set then it expects the link partner to be the master. If Auto-negotiation is not enabled then the value of `master-cfg-enable` is ignored and the value of `master-cfg-value` is key to the link clock mastership. If the `master-cfg-value` is set then the physical layer expects the local device to be the link master. If it's not set then it expects the link partner to the master.

Caution – Do not adjust the link clock mastership parameters unless you clearly understand the settings of the link partner. Incorrect link clock mastership configuration results in link up failure.

Interpacket Gap Parameters

The `ce` device supports a programmable mode called `enable-ipg0`.

When a driver receives a packet with `enable-ipg0` set (the default), it adds an additional time delay before transmitting the packet. This delay, set by the `ipg0` parameter, is in addition to the delay set by the `ipg1` and `ipg2` parameters. The additional `ipg0` delay helps to reduce collisions.

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If `enable-ipg0` is disabled, the value of `ipg0` is ignored and no additional delay is set. Only the delays set by `ipg1` and `ipg2` will be used. Disable `enable-ipg0` if other systems keep sending a large number of back-to-back packets. Systems that have `enable-ipg0` set might not have enough time on the network.

You can add the additional delay by setting the `ipg0` parameter from 0 to 255, which is the media byte time delay.

TABLE 4-5 defines the `enable-ipg0` and `ipg0` parameters.

TABLE 4-5 Parameters Defining `enable-ipg0` and `ipg0`

Parameter	Values	Description
`enable-ipg0`	0 1	`enable-ipg0` reset `enable-ipg0` set (Default=8)
`ipg0`	0 to 255	The additional time delay (or gap) before transmitting a packet (after receiving the packet) (Default=8)

The `ce` device supports the programmable Interpacket Gap (IPG) parameters `ipg1` and `ipg2`. The total IPG is the sum of `ipg1` and `ipg2`. The total IPG is 0.096 microseconds for the link speed of 1000 Mbps.

TABLE 4-6 lists the default values and allowable values for the IPG parameters.

TABLE 4-6 Read-Write Interpacket Gap Parameter Values and Descriptions

Parameter	Values (Byte-time)	Description
`ipg1`	0 to 255	Interpacket gap 1 (Default = 8)
`ipg2`	0 to 255	Interpacket gap 2 (Default = 4)

By default, the driver sets `ipg1` to 8-byte time and `ipg2` to 4-byte time, which are the standard values. (Byte time is the time it takes to transmit one byte on the link, with a link speed of 1000 Mbps.)

If your network has systems that use longer IPG (the sum of `ipg1` and `ipg2`), and if those machines seem to be slow in accessing the network, increase the values of `ipg1` and `ipg2` to match the longer IPGs of other machines.

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Interrupt Parameters

TABLE 4-7 describes the receive interrupt blanking values.

TABLE 4-7 RX Blanking Register for Alias Read

Field Name	Values	Description
`rx-intr-pkts`	0 to 511	Interrupt after this number of packets have arrived since the last packet was serviced. A value of zero indicates no packet blanking. (Default=8)
`rx-intr-time`	0 to 524287	Interrupt after 4.5 microseconds ticks have elapsed since the last packet was serviced. A value of zero indicates no time blanking. (Default=3)

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Random Early Drop Parameters

TABLE 4-8 describes the RX random early detection 8-bit vectors, which allows you to enable random early drop (RED) thresholds. When received packets reach the RED range packets are dropped according to the preset probability. The probability should increase when the FIFO level increases. Control packets are never dropped and are not counted in the statistics.

TABLE 4-8 RX Random Early Detecting 8-Bit Vectors

Field Name	Values	Description
`red-dv4to6k`	0 to 255	Random early detection and packet drop vectors for when FIFO threshold is greater than 4096 bytes and less than 6,144 bytes. Probability of drop can be programmed on a 12.5 percent granularity. For example, if bit 0 is set the first packet out of every eight will be dropped in this region. (Default=0)
`red-dv6to8k`	0 to 255	Random early detection and packet drop vectors for when FIFO threshold is greater than 6,144 bytes and less than 8,192 bytes. Probability of drop can be programmed on a 12.5 percent granularity. For example, if bit 0 is set the first packet out of every eight will be dropped in this region. (Default=0)
`red-dv8to10k`	0 to 255	Random early detection and packet drop vectors for when FIFO threshold is greater than 8,192 bytes and less than 10,240 bytes. Probability of drop can be programmed on a 12.5 percent granularity. For example, if bit 1 and 6 are set the second and seventh packets out of every eight will be dropped in this region. (Default=0)
`red-dv10to12k`	0 to 255	Random early detection and packet drop vectors for when FIFO threshold is greater than 10,240 bytes and less than 12,288 bytes. Probability of drop can be programmed on a 12.5 percent granularity. If bit 2, 4 and 6 are set then the third, fifth and seventh packets out of every eight will be dropped in this region. (Default=0)

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PCI Bus Interface Parameters

These parameters allow you to modify PCI interface features to gain better PCI performance for a given application.

TABLE 4-9 PCI Bus Interface Parameters

Parameter	Description
`tx-dma-weight`	Determine the multiplication factor for granting credit to the TX side during a weighted round robin arbitration. Values are 0 to 3. (Default=0) Zero means no extra weighting. The other values are power of 2 extra weighting, on that traffic. For example of tx-dma-weight = 0 and rx-dma-weight = 3 then as long as RX traffic is continuously arriving its priority will be 8 times greater than TX to access the PCI
`rx-dma-weight`	Determine the multiplication factor for granting credit to the RX side during a weighted round robin arbitration. Values are 0 to 3. (Default=0)
`infinite-burst`	Allows the infinite burst capability to be utilized. When this is in effect and the system supports infinite burst, the adapter will not free the bus until complete packets are transferred across the bus. Values are 0 or 1. (Default=0)
`disable-64bit`	Switches off 64 bit capability of the adapter. In some cases, it is useful to switch off this feature. Values are 0 or 1. (Default=0, which enables 64 bit capability)

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Setting ce Driver Parameters

You can set the ce device driver parameters in two ways:

- Using the ndd utility
- Using the ce.conf file

If you use the ndd utility, the parameters are valid only until you reboot the system. This method is good for testing parameter settings.

To set parameters so they remain in effect after you reboot the system, create a /platform/sun4u/kernel/drv/ce.conf file and add parameter values to this file when you need to set a particular parameter for a device in the system.

Setting Parameters Using the ndd Utility

Use the ndd utility to configure parameters that are valid until you reboot the system. The ndd utility supports any networking driver, which implements the Data Link Provider Interface (DLPI).

The following sections describe how you can use the ce driver and the ndd utility to modify (with the -set option) or display (without the -set option) the parameters for each ce device.

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▼ To Specify Device Instances for the ndd Utility

Before you use the ndd utility to get or set a parameter for a ce device, you must specify the device instance for the utility.

1. **Check the** /etc/path_to_inst **file to identify the instance associated with a particular device.**

```
# grep ce /etc/path_to_inst
"/pci@1f,2000/pci@1/network@0" 2 "ce"
"/pci@1f,2000/pci@2/network@0" 1 "ce"
"/pci@1f,2000/pci@4/network@0" 0 "ce"
```

In the example above, the three GigaSwift Ethernet instances are from the installed adapters. The instance numbers are in bold italics for clarity.

2. **Use the instance number to select the device.**

```
# ndd -set /dev/ce instance instance#
```

The device remains selected until you change the selection.

Noninteractive and Interactive Modes

You can use the ndd utility in two modes:

- Noninteractive
- Interactive

In noninteractive mode, you invoke the utility to execute a specific command. Once the command is executed, you exit the utility. In interactive mode, you can use the utility to get or set more than one parameter value. (Refer to the ndd(1M) man page for more information.)

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Using the ndd *Utility in Noninteractive Mode*

This section describes how to modify and display parameter values.

- **To modify a parameter value, use the** `-set` **option.**

  If you invoke the ndd utility with the `-set` option, the utility passes *value*, which must be specified, down to the named `/dev/ce` driver instance, and assigns it to the parameter:

```
# ndd -set /dev/ce parameter value
```

  When you change any adv parameter, a message similar to the following appears:

```
xcvr addr: 0x00 - link up 1000 Mbps full duplex
```

- **To display the value of a parameter, specify the parameter name and omit the value.**

  When you omit the `-set` option, a query operation is assumed and the utility queries the named driver instance, retrieves the value associated with the specified parameter, and prints it:

```
# ndd /dev/ce parameter
```

Using the ndd *Utility in Interactive Mode*

- **To modify a parameter value in interactive mode, specify** `ndd /dev/ce`**, as shown below.**

  The ndd utility then prompts you for the name of the parameter:

```
# ndd /dev/ce
name to get/set? (Enter the parameter name or ? to view all
parameters)
```

  After typing the parameter name, the ndd utility prompts you for the parameter value (see TABLE 4-1 through TABLE 4-11).

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- **To list all the parameters supported by the** `ce` **driver, type** `ndd /dev/ce`**.**

  (See TABLE 4-1 through TABLE 4-11 for parameter descriptions.)

```
# ndd /dev/ce
name to get/set ? ?
?                               (read only)
instance                        (read and write)
adv_autoneg_cap                 (read and write)
adv_1000fdx_cap                 (read and write)
adv_1000hdx_cap                 (read and write)
adv_100T4_cap                   (read and write)
adv_100fdx_cap                  (read and write)
adv_100hdx_cap                  (read and write)
adv_10fdx_cap                   (read and write)
adv_10hdx_cap                   (read and write)
adv_asmpause_cap                (read and write)
adv_pause_cap                   (read and write)
master_cfg_enable               (read and write)
master_cfg_value                (read and write)
use_int_xcvr                    (read and write)
enable_ipg0                     (read and write)
ipg0                            (read and write)
ipg1                            (read and write)
ipg2                            (read and write)
rx_intr_pkts                    (read and write)
rx_intr_time                    (read and write)
red_dv4to6k                     (read and write)
red_dv6to8k                     (read and write)
red_dv8to10k                    (read and write)
red_dv10to12k                   (read and write)
tx_dma_weight                   (read and write)
rx_dma_weight                   (read and write)
infinite_burst                  (read and write)
disable_64bit                   (read and write)
name to get/set ?
#
```

Setting the Autonegotiation Mode

By default, autonegotiation is set to on. This means that the adapter communicates with its link partner to determine a compatible network speed, duplex mode, and flow control capability.

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▼ To Disable Autonegotiation Mode

If your network equipment does not support autonegotiation, or if you want to specify your network speed, you can set autonegotiation to `off` on the `ce` device.

Note – Disabling autonegotiation mode can cause collisions.

---

1. **Set the following driver parameters to the values that are described in the documentation that shipped with your link partner (for example, a switch):**
   - `adv-1000fdx-cap`
   - `adv-1000hdx-cap`
   - `adv-100fdx-cap`
   - `adv-100hdx-cap`
   - `adv-10fdx-cap`
   - `adv-10hdx-cap`
   - `adv-asmpause-cap`
   - `adv-pause-cap`

   See TABLE 4-2 for the descriptions and possible values of these parameters.

2. **Set the** `adv-autoneg-cap` **parameter to** `0`**.**

```
# ndd -set /dev/ce adv-autoneg-cap 0
```

When you change any `ndd` link parameter, a message similar to the following appears:

```
xcvr addr:0x00 - link up 100 Mbps full duplex
```

Setting Parameters Using the `ce.conf` File

Specify the driver parameter properties on a per-device basis by creating a `ce.conf` file in the `/platform/sun4u/kernel/drv` directory. Use a `ce.conf` file when you need to set a particular parameter for a device in the system. The parameters you set are read and write parameters that are listed in “Driver Parameter Values and Definitions” on page 38.

Note – Configuring the parameters by putting `ndd` commands in `rcX.d` scripts is not supported.

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The man pages for `prtconf`(1M) and `driver.conf`(4) include additional details. The next procedure shows an example of setting parameters in a `ce.conf` file.

▼ To Set Driver Parameters Using a `ce.conf` File

1. **Obtain the hardware path names for the `ce` devices in the device tree.**

   a. **Check the `/etc/driver_aliases` file to identify the name associated with a particular device:**

```
# grep ce /etc/driver_aliases
ce "pci108e,abba"
```

   b. **Locate the path names and the associated instance numbers are in the `/etc/path_to_inst` file.**

```
# grep ce /etc/path_to_inst
"/pci@9,700000/network@2" 0 "ce"
"/pci@8,700000/pci@5/network@0" 3 "ce"
"/pci@8,700000/pci@5/network@1" 4 "ce"
```

   - In the previous example:
     - The first part within the double quotes specifies the hardware node name in the device tree.
     - The number not enclosed in quotes is the instance number (shown in bold italics).
     - The last part in double quotes is the driver name.
   - In the device path name, the last component after the last `/` character and before the `@` character is the device name.
   - The path name before the last component is the parent name.
   - The number after the final `@` character within quotes is referred to as unit-address.

   To identify a PCI device unambiguously in the `ce.conf` file, use the name, parent name, and the unit-address for the device. Refer to the `pci`(4) man page for more information about the PCI device specification.

   In the first line in the previous example:
   - `parent` = “`pci@9`”
   - `unit-address` = “`2`”

   In the second line in the previous example:
   - `parent` = “`pci@5`”

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- `unit-address` = “0”

In the third line in the previous example:

- `parent` = “pci@5”
- `unit-address` = “1”

2. **Set the parameters for the above devices in the `/platform/sun4u/kernel/drv/ce.conf` file.**

   In the following example, the `adv_autoneg_cap` and `adv_1000fdx_cap` parameters are set for all Sun GigaSwift Ethernet devices. (See the `driver.conf(4)` man page for more information.)

```
adv-autoneg-cap=0 adv-1000fdx-cap=0;
```

   In the following example, the `adv-autoneg-cap` and `adv-1000fdx-cap` parameters are set for a single instance of the Sun GigaSwift Ethernet device.

```
name="pci108e,abba" parent="pci@9,600000" unit-address="2"
adv-autoneg-cap=0 adv-100hdx-cap=0 adv-100fdx-cap=1 adv-1000fdx-cap=0 adv-
10hdx-cap=0 adv-10fdx-cap=0 adv-1000hdx-cap=0 adv-100T4-cap=0;
```

Note – The difference between setting parameters for all Sun GigaSwift Ethernet devices and setting parameters for a single instance of the device depends on whether you include the `name=`, `parent=`, and `unit-address=`. If you omit these definitions, the settings become global to all Sun GigaSwift Ethernet instances.

3. **Save the `ce.conf` file.**

Usability Enhancements to the Driver

In older Ethernet device drivers, determining the link status for a driver required a two-step process:

- First, you had to set the instance:

```
# ndd -set /dev/hme instance 2
```


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- Then you had to get the link status:

```
# ndd -get /dev/hme link-status
1
```

Starting with the Sun GigaSwift Ethernet adapter in the Solarlis 9 operating environment this method of determining the link status is discouraged, and in some cases, it is removed completely as a driver feature.

The new improved approach moves all read-only parameters from the `ndd` options into `kstat`. This simplifies getting link status information by allowing you to do it with one simple command.

- **To get the link status of a driver, type the following command:**

```
# kstat ce:n | grep link_up
link_up                         0
```

where *n*=instance.

For more information about the `kstat` command, refer the `kstat` man page

GigaSwift Ethernet Driver Operating Statistics

These statistics are part of the statistics presented by the `netstat -k` command.

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TABLE 4-10 describes the read-only Media Independent Interface (MII) capabilities. These parameters define the capabilities of the hardware. The Gigabit Media Independent Interface (GMII) supports all of the following capabilities.

TABLE 4-10 Read-Only ce Device Capabilities

Parameter	Description (Local interface Capabilities)
`cap_autoneg`	0 = Not capable of autonegotiation 1 = Autonegotiation capable
`cap_1000fdx`	Local interface full-duplex capability 0 = Not 1000 Mbit/sec full-duplex capable 1 = 1000 Mbit/sec full-duplex capable
`cap_1000hdx`	Local interface half-duplex capability 0 = Not 1000 Mbit/sec half-duplex capable 1 = 1000 Mbit/sec half-duplex capable
`cap_100fdx`	Local interface full-duplex capability 0 = Not 100 Mbit/sec full-duplex capable 1 = 100 Mbit/sec full-duplex capable
`cap_100hdx`	Local interface half-duplex capability 0 = Not 100 Mbit/sec half-duplex capable 1 = 100 Mbit/sec half-duplex capable
`cap_10fdx`	Local interface full-duplex capability 0 = Not 10 Mbit/sec full-duplex capable 1 = 10 Mbit/sec full-duplex capable
`cap_10hdx`	Local interface half-duplex capability 0 = Not 10 Mbit/sec half-duplex capable 1 = 10 Mbit/sec half-duplex capable
`cap_asm_pause`	Local interface flow control capability 0 = Not asymmetric pause capable 1 = Asymmetric pause (from the local device) capable
`cap_pause`	Local interface flow control capability 0 = Not Symmetric pause capable 1 = Symmetric pause capable

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Reporting the Link Partner Capabilities

TABLE 4-11 describes the read-only link partner capabilities.

TABLE 4-11 Read-Only Link Partner Capabilities

Parameter	Description
`lp_cap_autoneg`	0 = No autonegotiation 1 = Autonegotiation
`lp_cap_1000fdx`	0 = No 1000 Mbit/sec full-duplex transmission 1 = 1000 Mbit/sec full-duplex
`lp_cap_1000hdx`	0 = No 1000 Mbit/sec half-duplex transmission 1 = 1000 Mbit/sec half-duplex
`lp_cap_100fdx`	0 = No 100 Mbit/sec full-duplex transmission 1 = 100 Mbit/sec full-duplex
`lp_cap_100hdx`	0 = No 100 Mbit/sec half-duplex transmission 1 = 1000 Mbit/sec half-duplex
`lp_cap_10fdx`	0 = No 10 Mbit/sec full-duplex transmission 1 = 10 Mbit/sec full-duplex
`lp_cap_10hdx`	0 = No 10 Mbit/sec half-duplex transmission 1 = 10 Mbit/sec half-duplex
`lp_cap_asm_pause`	0 = Not asymmetric pause capable 1 = Asymmetric pause towards link partner capability
`lp_cap_pause`	0 = Not symmetric pause capable 1 = Symmetric pause capable

If the link partner is *not* capable of autonegotiation (when `lp_cap_autoneg` is 0), the remaining information described in TABLE 4-11 is not relevant and the parameter value = 0.

If the link partner *is* capable of autonegotiation (when `lp_cap_autoneg` is 1), then the speed and mode information is displayed when you use autonegotiation and the link partner capabilities.

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TABLE 4-12 describes the netstat -k transmit and receive parameters:

TABLE 4-12 Transmit and Receive Parameters

Parameter	Description
xcvr_inits	Number of Physical layer re-initializations every time you change link parameters using NDD this increments.
rev_id	Revision ID of the GigaSwift Ethernet device useful for recognition of device being used in the field.
xcvr_addr	GMII/MII Physical layer device address for management interface.
xcvr_id	GMII/MII Physical layer device Identification Decimal copy of MII registers 2 and 3.
lb_mode	Copy of the Loopback mode the device is in, if any.
qos_mode	When zero, the TX queues operate in a simple round robin queueing scheme, based on TCP/UDP destination port number. If set the TX queues operate in a scheme designed to provide VLAN priorities.
tx_starts	Number of times that the driver attempted to transmit a packet.
tx_dma_bind_fail	Number of times a page table entry was not available to allow the driver to map the kernel memory to device accessible memory for transmission.
tx_queue0	Number of packets queued for transmission on the first hardware transmit queue.
tx_queue1	Number of packets queued for transmission on the second hardware transmit queue.
tx_queue2	Number of packets queued for Transmission on the third hardware transmit queue.
tx_queue3	Number of packets queued for Transmission on the fourth hardware transmit queue.
tx_max_pend	Maximum number of transmits pending on any of the four queues.
rx_hdr_pkts	Number of packets received that were less than 256 bytes.
rx_mtu_pkts	Number of packets received that were greater than 256 bytes and less than 1514 bytes.
rx_split_pkts	Number of packets that were split across two pages.
rx_no_comp_wb	Number of times the hardware cannot post completion entries for received data.
rx_no_buf	Number of times the hardware cannot receive data because there is no more receive buffer space.
rx_new_pages	Number of pages that got replaced during reception.

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TABLE 4-12 Transmit and Receive Parameters

Parameter	Description
`rx_new_hdr_pgs`	Number of pages that were filled with packets less than 256 bytes that got replaced during reception.
`rx_new_mtu_pgs`	Number of pages that were filled with packets greater than 256 bytes and less than 1514 that got replaced during reception.
`rx_new_nxt_pgs`	Number of pages that contained packets that were split across pages that got replaced during reception.
`rx_hdr_drops`	Number of times a whole page of packets less than 256 bytes was dropped because the driver was unable to map a new one to replace it.
`rx_mtu_drops`	Number of times a whole page of packets greater than 256 bytes and less than 1514 was dropped because the driver was unable to map a new one to replace it.
`rx_nxt_drops`	Number of times a page with a split packet was dropped because the driver was unable to map a new one to replace it.
`rx_rel_flow`	Number of times the driver was told to release a flow.

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▼ To Check Link Partner Settings

- **If you are running Solaris 2.6, 7 or 8 operating evironment, type the** `netstat -k` **command as superuser:**

```
# netstat -k ce:0
ce0:
ipackets 0 ipackets64 0 ierrors 0 opackets 0 opackets64 0
oerrors 0 collisions 0 rbytes 0 rbytes64 0 obytes 0 obytes64 0
multircv 0 multixmt 0 brdcstrcv 0 brdcstxmt 0 norcvbuf 0
noxmtbuf 0 first_collision 0 excessive_collisions 0 late_collisions 0
peak_attempts 0 length_err 0 alignment_err 0 crc_err 0 code_violations 0
ifspeed 0 rev_id 1 xcvr_inits 1 xcvr_inuse 3 xcvr_addr 0
xcvr_id 0 cap_autoneg 1 cap_1000fdx 1 cap_1000hdx 0 cap_100T4 0
cap_100fdx 0 cap_100hdx 0 cap_10fdx 0 cap_10hdx 0 cap_asmpause 0
cap_pause 1 lp_cap_autoneg 0 lp_cap_1000fdx 0 lp_cap_1000hdx 0
lp_cap_100T4 0 lp_cap_100fdx 0 lp_cap_100hdx 0 lp_cap_10fdx 0
lp_cap_10hdx 0 lp_cap_asmpause 0 lp_cap_pause 0 link_T4 0
link_speed 0 link_duplex 0 link_asmpause 0 link_pause 0
link_up 0 lb_mode 0 qos_mode 0 tx_inits 0 tx_starts 0 tx_nocanput 0
tx_msgdup_fail 0 tx_allocb_fail 0 tx_no_desc 0 tx_dma_bind_fail 0
tx_uflo 0 tx_queue0 0 tx_queue1 0 tx_queue2 0 tx_queue3 0
tx_max_pend 0 rx_inits 0 rx_hdr_pkts 0 rx_mtu_pkts 0 rx_split_pkts 0
rx_no_buf 0 rx_no_comp_wb 0 rx_ov_flow 0 rx_len_mm 0 rx_bad_descs 0
rx_nocanput 0 rx_msgdup_fail 0 rx_allocb_fail 0 rx_new_pages 0
rx_new_hdr_pgs 0 rx_new_mtu_pgs 0 rx_new_nxt_pgs 0 rx_hdr_drops 0
rx_mtu_drops 0 rx_nxt_drops 0 rx_rel_flow 0 rx_pkts_dropped 0
pci_err 0 pci_rta_err 0 pci_rma_err 0 pci_parity_err 0 pci_bad_ack_err 0
pci_drto_err 0 ipackets_cpu00 0 ipackets_cpu01 0 ipackets_cpu02 0
ipackets_cpu03 0
```

- **If you are running Solaris 9 operating environment, type the** `kstat` **command as superuser:**

CODE EXAMPLE 4-1 Output from `kstat` Command

```
# kstat ce0
module: ce                              instance: 0
name:   ce0                     class:    net
        alignment_err                   0
        brdcstrcv                       0
        brdcstxmt                       0
        cap_1000fdx                     1
        cap_1000hdx                     1
        cap_100T4                       0
        cap_100fdx                      1
        cap_100hdx                      1
```


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CODE EXAMPLE 4-1 Output from `kstat` Command *(Continued)*

```
# kstat ce0
        cap_10fdx                       1
        cap_10hdx                       1
        cap_asmpause                    0
        cap_autoneg                     1
        cap_pause                       0
        code_violations                 0
        collisions                      0
        crc_err                         0
        crtime                          2345.407585961
        excessive_collisions            0
        first_collision                 0
        ierrors                         0
        ifspeed                         0
        ipackets                        0
        ipackets64                      0
        ipackets_cpu00                  0
        ipackets_cpu01                  0
        ipackets_cpu02                  0
        ipackets_cpu03                  0
        late_collisions                 0
        lb_mode                         0
        length_err                      0
        link_T4                         0
        link_asmpause                   0
        link_duplex                     0
        link_pause                      0
        link_speed                      0
        link_up                         0
        lp_cap_1000fdx                  0
        lp_cap_1000hdx                  0
        lp_cap_100T4                    0
        lp_cap_100fdx                   0
        lp_cap_100hdx                   0
        lp_cap_10fdx                    0
        lp_cap_10hdx                    0
        lp_cap_asmpause                 0
        lp_cap_autoneg                  0
        lp_cap_pause                    0
        multircv                        0
        multixmt                        0
        norcvbuf                        0
        noxmtbuf                        0
        obytes                          0
        obytes64                        0
        oerrors                         0
        opackets                        0
```


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CODE EXAMPLE 4-1 Output from `kstat` Command *(Continued)*

```
# kstat ce0
        opackets64                      0
        pci_bad_ack_err                 0
        pci_dmarz_err                   0
        pci_dmawz_err                   0
        pci_drto_err                    0
        pci_err                         0
        pci_parity_err                  0
        pci_rma_err                     0
        pci_rta_err                     0
        peak_attempts                   0
        promisc                         off
        qos_mode                        0
        rbytes                          0
        rbytes64                        0
        rev_id                          1
        rx_allocb_fail                  0
        rx_hdr_drops                    0
        rx_hdr_pkts                     0
        rx_inits                        0
        rx_len_mm                       0
        rx_msgdup_fail                  0
        rx_mtu_drops                    0
        rx_mtu_pkts                     0
        rx_new_hdr_pgs                  0
        rx_new_mtu_pgs                  0
        rx_new_nxt_pgs                  0
        rx_new_pages                    0
        rx_no_buf                       0
        rx_no_comp_wb                   0
        rx_nocanput                     0
        rx_nxt_drops                    0
        rx_ov_flow                      0
        rx_pkts_dropped                 0
        rx_rel_bit                      0
        rx_rel_flow                     0
        rx_split_pkts                   0
        rx_tag_err                      0
        rx_taskq_waits                  0
        snaptime                        2352.506837979
        tx_allocb_fail                  0
        tx_ddi_pkts                     0
        tx_dma_bind_fail                0
        tx_dma_hdr_bind_fail            0
        tx_dma_pld_bind_fail            0
        tx_dvma_pkts                    0
        tx_hdr_pkts                     0
```


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CODE EXAMPLE 4-1 Output from `kstat` Command *(Continued)*

```
# kstat ce0
        tx_inits                        0
        tx_max_desc                     0
        tx_max_pend                     0
        tx_msgdup_fail                  0
        tx_no_desc                      0
        tx_nocanput                     0
        tx_queue0                       3
        tx_queue1                       0
        tx_queue2                       0
        tx_queue3                       0
        tx_starts                       0
        tx_uflo                         0
        xcvr_addr                       1
        xcvr_id                         2121809
        xcvr_inits                      1
        xcvr_inuse                      1
```

Additional Uses for the `kstat` *Command*

- **Use the `kstat` command to discover link partner capabilities.**

```
# kstat ce:0 | grep lp_
         lp_cap_1000fdx                 1
         lp_cap_1000hdx                 1
        lp_cap_100T4                    0
        lp_cap_100fdx                   0
        lp_cap_100hdx                   0
        lp_cap_10fdx                    0
        lp_cap_10hdx                    0
        lp_cap_asmpause                 0
        lp_cap_autoneg                  1
        lp_cap_pause                    0
```


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- **Use the** `kstat` **command to discover link settings.**

```
# kstat ce:0 | grep link
            link_T4                         0
            link_asmpause                   0
            link_duplex                     2
            link_pause                      0
            link_speed                      1000
            link_up                         1
```


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CHAPTER 5

Configuring VLANs

This chapter explains VLANs in detail and provides configuration instructions and examples.

- VLANs: Virtual Local Area Networks (VLANs) are commonly used to split up groups of network users into manageable broadcast domains, to create logical segmentation of workgroups, and to enforce security policies among each logical segment. With multiple VLANs on an adapter, a server with a single adapter can have a logical presence on multiple IP subnets. By default, 128 VLANs can be defined for each VLAN-aware adapter on your server. However, this number can be increased by changing the system parameters.

If your network does not require multiple VLANs, you can use the default configuration, in which case no further configuration is necessary.

Note – If you change any of the VLAN configuration parameters, you must reboot the system before the changes will take effect. If you make changes and do not reboot, you may experience configuration problems.

An Overview of VLANs

VLANs allow you to split your physical LAN into logical subparts, providing an essential tool for increasing the efficiency and flexibility of your network.

VLANs are commonly used to separate groups of network users into manageable broadcast domains, to create logical segmentation of workgroups, and to enforce security policies among each logical segment. Each defined VLAN behaves as its own separate network, with its traffic and broadcasts isolated from the others, increasing the bandwidth efficiency within each logical group.

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Although VLANs are commonly used to create individual broadcast domains and/or separate IP subnets, it is sometimes useful for a server to have a presence on more than one VLAN simultaneously. Several Sun products support multiple VLANs on a per port or per interface basis, allowing very flexible network configurations.

FIGURE 5-1 shows an example network that uses VLANs

.

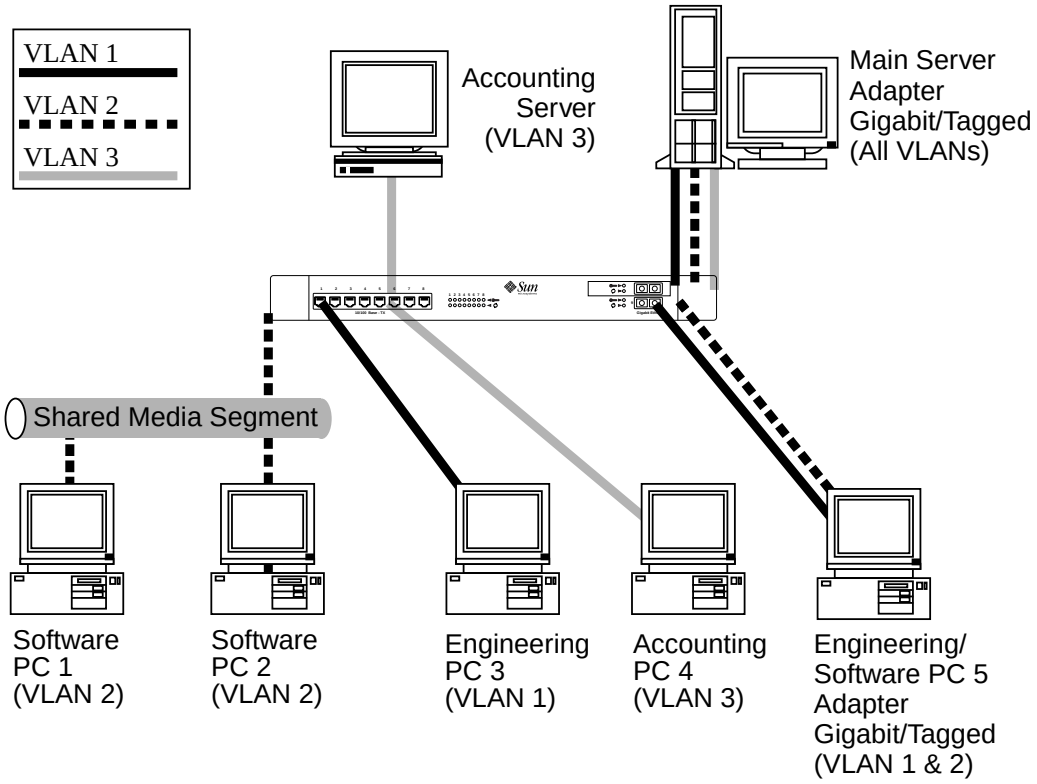


FIGURE 5-1 Example of Servers Supporting Multiple VLANs with Tagging Adapters

The example network has the following features:

- The physical LAN network consists of a switch, two servers, and five clients.
- The LAN is logically organized into three different VLANs, each representing a different IP subnet.
- VLAN 1 is an IP subnet consisting of the Main Server, Client 3, and Client 5. This represents an engineering group.
- VLAN 2 includes the Main Server, Clients 1 and 2 via shared media segment, and Client 5. This is a software development group.
- VLAN 3 includes the Main Server, the Accounting Server and Client 4. This is an accounting group.

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- The Main Server is a high-use server that needs to be accessed from all VLANs and IP subnets. The server has an Sun GigaSwift Ethernet adapter installed. All three IP subnets are accessed via the single physical adapter interface. The server is attached to one of the SunSwitch's Gigabit Ethernet ports, which is configured for VLANs 1, 2, and 3. Both the adapter and the connected SunSwitch port have tagging turned on. Because of the tagging VLAN capabilities of both devices, the sever is able to communicate on all three IP subnets in this network, but continues to maintain broadcast separation between all of them.
- The Accounting Server is available to VLAN 3 only. It is isolated from all traffic on VLANs 1 and 2. The switch port connected to the server has tagging turned off.
- Clients 1 and 2 are attached to a shared media hub that is then connected to the switch. They belong to VLAN 2 only, and are logically in the same IP subnet as the Main Server and Client 5. The switch port connected to this segment has tagging turned off.
- Client 3 is a member of VLAN 1, and can communicate only with the Main Server and Client 5. Tagging is not enabled on Client 3's switch port.
- Client 4 is a member of VLAN 3, and can communicate only with the servers. Tagging is not enabled on Client 4's switch port.
- Client 5 is a member of both VLANs 1 and 2, and has a Sun GigaSwift Ethernet adapter installed. It is connected to switch port 10. Both the adapter and the switch port are configured for VLANs 1 and 2 and have tagging enabled.

VLAN tagging is only required to be enabled on switch ports that create trunk links to other VLAN-aware Ethernet switches, or on ports connected to tag-capable end-stations, such as servers or workstations with VLAN-aware adapters.

Configuring VLANs

VLANs can be created according to various criteria, but each VLAN must be assigned a VLAN tag or VLAN ID (VID). The VID is a 12-bit identifier between 1 and 4094 that identifies a unique VLAN. For each network interface (`ce0`, `ce1`, `ce2` and so on), 4094 possible VLAN IDs can be selected. Only 512 unique IDs can be used simultaneously. Because IP subnets are commonly used, it is best to use IP subnets when setting up a VLAN network interface. This means that each VID assigned to a VLAN interface of a physical network interface will belong to different subnets.

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Tagging an Ethernet frame requires the addition of a tag header to the frame. The header is inserted immediately following the Destination MAC address and the Source MAC address. The tag header consists of two bytes of Ethernet Tag Protocol Identifier (TPID, 0x8100) and two bytes of Tag Control Information (TCI). FIGURE 5-2 shows the Ethernet Tag Header format.

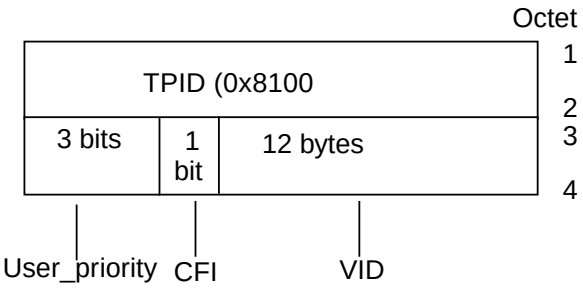


FIGURE 5-2 Ethernet Tag Header Format

By default, a single VLAN is configured for every port, which groups all ports into the same broadcast domain, just as if there were no VLANs at all, VLAN tagging for the switch port turned off.

Note – If you configure a VLAN virtual device for an adapter, all traffic sent or received by that adapter must be in VLAN-tagged format.

▼ To Configure Static VLANs

1. **Create one hostname6.ce*num* file for each VLAN which will be configured for each adapter on the server, using the following naming format that includes both the VID and the physical point of attachment (PPA):**

   VLAN logical PPA = <1000 * VID> + <Device PPA>
   `ce123000 = 1000*123 + ce`

   This format limits the maximum number of PPAs (instances) you can configure to 1000 in the `/etc/path_to_inst` file.

   For example, on a server with the Sun GigaSwift Ethernet adapter having an instance of 0, that belongs to a member of two VLANs, with VID 123 and 224, you would use `ce123000` and `ce224000`, respectively, as the two VLAN PPAs.

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2. **Use the `ifconfig(1M)` to configure a VLAN virtual device, for example:**

```
# ifconfig ce123000 plumb up
# ifconfig ce224000 plumb up
```

The output of `ifconfig -a` on a system having VLAN devices `ce123000` and `ce224000`:

```
# ifconfig -a
lo0: flags=1000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4> mtu 8232 index 1
        inet 127.0.0.1 netmask ff000000
hme0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 2
        inet 129.144.131.91 netmask ffffff00 broadcast 129.144.131.255
        ether 8:0:20:a4:4f:b8
ce123000: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
        inet 199.199.123.3 netmask ffffff00 broadcast 199.199.123.255
        ether 8:0:20:a4:4f:b8
ce224000: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 4
        inet 199.199.224.3 netmask ffffff00 broadcast 199.199.224.225
        ether 8:0:20:a4:4f:b8
```

3. **On the switch, set VLAN tagging and set VLAN ports to coincide with the VLANs you've set up on the server. Using the examples in Step 2, you would set up VLAN ports 123 and 224 on the switch.**

Refer to the documentation that came with your switch for specific instructions for setting VLAN tagging and ports.

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APPENDIX **A**

Specifications

This appendix lists the specifications for the Sun GigaSwift Ethernet adapter. It contains the following sections:

- "Connectors" on page 69
- "Performance Specifications" on page 70
- "Physical Characteristics" on page 71
- "Power Requirements" on page 71

Connectors

FIGURE A-1 shows the connector for the Sun GigaSwift Ethernet MMF adapter.

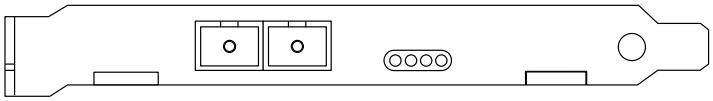


FIGURE A-1 Sun GigaSwift Ethernet MMF Adapter Connector

TABLE A-1 lists the characteristics of the SC connector (850 nm).

TABLE A-1 SC Connector Link Characteristics (IEEE P802.3z)

Description	62.5 Micron MMF	50 Micron MMF
Operating range	Up to 260 meters	Up to 550 meters

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FIGURE A-2 shows the connector for the Sun GigaSwift Ethernet UTP adapter.

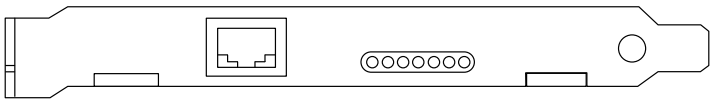


FIGURE A-2 Sun GigaSwift Ethernet UTP Adapter Connector

Table A-2 lists the characteristics of the Cat-5 Connector used by the Sun GigaSwift Ethernet UTP adapter.

TABLE A-2 Cat-5 Connector Link Characteristics

Description	
Operating range	Up 100 meters

Performance Specifications

TABLE A-3 Performance Sepcifications

Feature	Specification
PCI clock	33/66 MHz max
PCI data burst transfer rate	up to 64-byte bursts
PCI data/address width	32/64 -bit
PCI modes	Master/slave
1 GBit/s, 850 nm	1000 Mbps (full duplex)

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Physical Characteristics

TABLE A-4 Physical Characteristics

Dimension	Measurement
Length	6.8 inches
Width	4.2 inches

Power Requirements

TABLE A-5 Power Requirements

Specification	Measurement
Maximum power consumption	12 watts (MMF) 15 watts (UTP)
Voltage	3.3V and 5V

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APPENDIX **B**

Diagnostic Software and Troubleshooting Issues

This appendix provides an overview of the SunVTS diagnostic application and instructions for testing the adapter using the onboard FCode self-test. There is also a section outlining some common troubleshooting issues. This appendix contains the following sections:

- "SunVTS Diagnostic Software" on page 73
- "Using the OpenBoot PROM FCode Self-Test" on page 74
- "Troubleshooting Issues" on page 76

SunVTS Diagnostic Software

The SunVTS software executes multiple diagnostic hardware tests from a single user interface and is used to verify the configuration and functionality of most hardware controllers and devices. The SunVTS software operates primarily from a graphical user interface, enabling test parameters to be set quickly and easily while a diagnostic test operation is being performed.

The `nettest` and the `netlbtest` check all the networking interfaces on a system, including the Sun GigaSwift Ethernet adapter. Refer to the *SunVTS User's Guide* for more information on how to run the `nettest` diagnostic test.

Note – To use the `nettest` or `netlbtest` diagnostic, you must have the SunVTS software installed on your system. Refer to the *Solaris Sun Hardware Platform Guide*, which was shipped with the *Solaris Supplement* CD, for instructions on how to install the SunVTS software.

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Using the OpenBoot PROM FCode Self-Test

The following tests are available to help identify problems with the adapter if the system does not boot.

You can invoke the FCode self-test diagnostics by using the OpenBoot user interface `test` or `test-all` commands. If you encounter an error while running diagnostics, appropriate messages will be displayed. Refer to the appropriate *OpenBoot Command Reference Manual* for more information on the `test` and `test-all` commands.

The FCode self-test exercises most functionality sub-section by sub-section and ensures the following:

- Connectivity during adapter card installation
- Verification that all components required for a system boot are functional

▼ Running the Ethernet FCode Self-Test Diagnostic

To run the Ethernet diagnostics, you must first bring the system to a stop at the OpenBoot prompt after issuing a reset. If you do not reset the system, the diagnostic tests might cause the system to hang.

For more information about the OpenBoot commands in this section, refer to the appropriate *OpenBoot Command Reference Manual*.

1. **Shut down the system.**

   Use the standard shutdown procedures described in the *Solaris Handbook for Sun Peripherals*.

2. **At the `ok` prompt, set the `auto-boot?` configuration variable to `false`.**

```
ok setenv auto-boot? false
```

3. **Reset the system.**

```
ok reset-all
```


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4. **Type** `show-nets` **to display the list of devices.**

   You should see a list of devices, similar to the example below, specific to the adapter:

```
ok show-nets
a) /pci@1f,0/pci@1/network@4
b) /pci@1f,0/pci@1,1/network@1,1
q) NO SELECTION
Enter Selection, q to quit:
```

5. **Type the following to run the self-test using the** `test` **command:**

```
ok test device path
```

   The following tests are run when the `test` command is executed:

   - `ce` register test (happens only when `diag-switch?` is true)
   - internal loopback test
   - link up / down test

   If the `test` passes, you see these messages:

```
ok test /pci@1f,0/pci@1/network@4
ce register test --- succeeded.
Internal loopback test -- succeeded.
Link is  -- up
```

   If the card is not connected to a network, you see the following messages:

```
ok test /pci@1f,0/pci@1/network@4
ce register test --- succeeded.
Internal loopback test -- succeeded.
Link is  -- down
ok
```

6. **After testing the adapter, type the following to return the OpenBoot PROM to standard operating mode:**

```
ok setenv diag-switch? false
```


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7. **Set the** `auto-boot?` **configuration parameter to** `true`**.**

```
ok setenv auto-boot? true
```

8. **Reset and reboot the system.**

   Refer to the appropriate *OpenBoot Command Reference Manual* for more information.

Troubleshooting Issues

Known Incompatibilities with Pre-IEEE 802.3z Network Switches

You might experience interoperability issues when using the Sun GigaSwift Ethernet adapter with the SunSwitch switch, the Alteon ACE 110 switch, or other pre- or non-IEEE 802.3z standard compliant network equipment. If you experience difficulties with noncompliant equipment, set the adapter and switch autonegotiation properties to `off` and try to configure the interface manually.

▼ To Set Autonegotiation to `off` for a SunSwitch or an Alteon ACE 110 Switch

You can set autonegotiation to `off` for SunSwitch and Alteon ACE 110 switches using those switches' configuration program (`cgf`). Refer to your switch documentation for instructions on how to access and use the `cgf` program.

The following procedure describes how to turn autonegotiation off for one SunSwitch port.

1. **Establish a connection to the switch using either a serial connection or a Telnet connection.**

   Refer to the *SunSwitch 1.1 Installation and Configuration Guide* (805-3743-10) for more information. After connecting to the switch, the Main menu prompt (`Main#`) is displayed.

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2. **At the** `Main#` **prompt, type** `cfg` **to display the Configuration menu and prompt (**`Configuration#`**).**

```
>> Main# cfg
[Configuration Menu]
        sys   -  System-wide parameter menu
        port  -  Port configuration menu
        ip    -  IP addressing menu
        vlan  -  VLAN configuration menu
        stp   -  Spanning Tree menu
        snmp  -  SNMP menu
        setup -  Step by step configuration set up
        dump  -  Dump current configuration to script file

>> Configuration#
```

3. **Type the following to disable autonegotiation on a GigaSwift Ethernet port.**

   Replace *portnumber* with the Ethernet port used by the adapter.

```
>> Configuration# /port portnumber/auto off
```

4. **Type the following to apply and save your changes.**

```
>> Configuration# apply
>> Configuration# save
```

   Refer to the switch documentation for further configuration instructions.

▼ To Set Autonegotiation to `off` for Other Noncompliant Network Equipment

If your network equipment does not support autonegotiation, you can set autonegotiation to `off` on the GigaSwift Ethernet (`ce`) device.

1. **Set the following GigaSwift Ethernet driver parameters to values according to the documentation that shipped with your switch:**
   - `adv-1000fdx-cap`
   - `adv-1000hdx-cap`
   - `adv-ampause-cap`
   - `adv-pause-cap`

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2. **Set the** `adv-autoneg-cap` **parameter to** `0`**.**

Note – See Chapter 4 for the default values of these parameters and for instructions on how to set these parameters.

Failure to Configure GigaSwift Ethernet Instance

If your machine fails to configure a GigaSwift Ethernet instance, yet `prtconf` indicates the adapter is present, the problem may be due to residue adapter instances in the `path_to_inst` file.

To solve this problem, open the `path_to_inst` file for editing and remove the lines containing `ce` device path.

Reboot the machine and try to configure it again.

Non-Specific Issues

TABLE B-1 describes the problems you may encounter in using the GigaSwift Ethernet adapter as well as a solution for them:

TABLE B-1 Troubleshooting the GigaSwift Ethernet Adapter

Problem	Description	Solution
`prtdiag` does not recognize the NIC in slot 0.	If a PCI I/O board of an UltraSPARC III system is filled with network adapters with an internal bridge (for example, GigaSwift Ethernet or Quad FastEthernet), `prtdiag` displays the card on slot 0. Although the card in slot 1 is not recognized by `prtdiag`, the card is fully operational and appears in the `/etc/path_to_inst` file.	Use `prtconf -pv` instead of `prtdiag`
VLAN appears to accept VID 0 as end user input.	`ce000000`, `ce00000`, or `ce0000` configured as VID `0` is actually the regular `ce0` interface not VID `0` of the `ce0` interface. VID `0` is not supported as an end user device.	This is normal behavior.

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TABLE B-1 Troubleshooting the GigaSwift Ethernet Adapter *(Continued)*

Problem	Description	Solution
System panics in Solaris 7 11/99 environment when CPR attempts to suspend a non-suspendable thread	The GigaSwift Ethernet driver uses certain not suspendable kernel threads. When CPR attempts to suspend the driver, the system panics. Currently, CPR is supported only in Sun desktop systems (for example, Ultra 10 and Ultra 60).	• Turn off CPR. • A CPR fix is incorporated in Solaris 8.
`Inetboot` may require several retries to complete with OBP 4.x	Systems with OBP 4.x (for example, Sun Blade 1000) may automatically retry several times before completing. The message below is displayed for each retry: Retrying ... Check TFTP server and network setup	Ignore these console messages until booting is complete

Problem with DR Attach on Sun Enterprise Platforms

DR attach does not configure `ce` interfaces on Sun Enterprise™ 10000 platforms running the Solaris 2.6 operating environment. To add DR support for ce interfaces on such systems, make the following changes:

1. **Add the following lines to the `/etc/system` file:**

```
set dr:detach_safe_list1="ce"
set hswp:suspend_safe_list1="ce"
```

2. **Reboot system.**

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Index

SYMBOLS

.properties command, 18
.properties file, 18
/etc/hostname.cenumber file, 26

A

assigning an IP address, 26
autonegotiation
  setting
    disabling, 50

C

CAT-5 twisted-pair cable, 15
ce driver parameter, status, and descriptions, 38
configuring device driver parameters, 37
configuring the driver parameters, 37
configuring the network host files, 25
configuring VLANs, 65

D

device properties, 18
diagnostic support, 7
diskless clients, 27
Dynamic Reconfiguration, 14
dynamic reconfiguration, 9
Dynamic Reconfiguration (DR), 21

E

editing the network host files, 25

F

FCode selftest diagnostics, 74
fiber optic cable connection, 15
files and directories on the CD-ROM, 10
flow control keywords, 41

H

hardware and software requirements, 5

I

ifconfig -a, 67
ifconfig command, 26
installing driver software, 9
installing the adapter with DR, 21
installing the adapter without DR, 14
installing the Solaris operating environment over the network, 29

L

link partner, 37
link partner settings

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checking, 58
local-mac-address property, 19

M

MAC address, 19
mac-address property, 19
Media Access Control (MAC), 19

N

ndd utility, 48
nettest diagnostic, 73
NVRAM configuration, 19

O

operational mode parameters, 39

P

parameter values
how to modify and display, 49
parameters and settings, 38

R

random early detection register, 45
receive interrupt blanking values, 39, 44

S

setting ce driver parameters
using ndd
using ce.conf, 47
standard Ethernet frame sizes, 6
standards and protocols, 6
SunVTS diagnostic application, 73

T

to set, 19

V

verify the installation, 16
virtual device, 67
VLAN ID, 65
VLAN naming format, 66
VLANs, 63

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