



# Sun™ 10-Gigabit Ethernet PCI-X Adapter Installation and User's Guide

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Sun Microsystems, Inc.  
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# Contents

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<b>Preface</b>	<b>xiii</b>
<b>1. Product Overview</b>	<b>1</b>
Product Description	1
Hardware and Software Requirements	2
Features	3
<b>2. Installing the Adapter</b>	<b>5</b>
Installing the Adapter Without Dynamic Reconfiguration	5
▼ To Install the Adapter	6
▼ To Install the Optical Transceiver	7
▼ To Verify the Hardware Installation	9
Rebooting the System	10
Installing the Adapter With Dynamic Reconfiguration	11
Using the Installation Script	11
▼ To Install the Software Using the Installation Script	11
Verifying the Software Installation	14
Configuring the Network Host Files	15
<b>3. Configuring Driver Parameters</b>	<b>19</b>
10-Gigabit Ethernet Device Driver Parameters	19

10-Gigabit Ethernet Driver Parameter Values and Definitions	20
Flow Control Parameters	20
Interrupt Parameters	21
Jumbo Frames	22
▼ To Configure Jumbo Frames Using <code>ndd</code>	22
▼ To Configure Jumbo Frames in a Linux Environment	23
Setting <code>ixge</code> Driver Parameters	23
Setting Parameters Using the <code>ndd</code> Utility	23
▼ To Specify Device Instances for the <code>ndd</code> Utility	24
Noninteractive and Interactive Modes	24
▼ To Use the <code>ndd</code> Utility in Noninteractive Mode	24
▼ To Use the <code>ndd</code> Utility in Interactive Mode	25
Setting Parameters Using the <code>ixge.conf</code> File	26
▼ To Set Driver Parameters Using a <code>ixge.conf</code> File	27
10-Gigabit Ethernet Driver Operating Statistics	29
▼ To Check Link Partner Settings	32
▼ To Discover Device Capabilities	34
▼ To Discover Link Settings	35
Configuration Checking	35
<b>4. Configuring VLANs</b>	<b>37</b>
Overview of VLANs	37
Configuring VLANs	39
▼ To Configure Static VLANs	40
<b>A. Specifications</b>	<b>43</b>
Performance Specifications	43
Physical Characteristics	44
Power Requirements	44

<b>B. Diagnostic Software</b>	<b>45</b>
SunVTS Diagnostic Software	45
Updating SunVTS to Recognize the Adapter	46
▼ To Update SunVTS to Recognize the Adapter	46
Using the SunVTS net1btest	47
▼ To Use the net1btest	47
<b>C. Installing the Software Manually</b>	<b>49</b>
▼ To Install the Driver Software Manually	49
<b>D. Installing the Sun 10-Gigabit Ethernet Device Driver on Linux Platforms</b>	<b>53</b>
Setting Up the Driver in a Linux Platform	53
▼ To Set Up the Driver in a Linux Platform	53
Tuning for Maximum Performance	57
Setting Driver Parameters in a Linux Environment	58
▼ To Set ixge Parameters in a Linux Environment	59
▼ To Configure VLANs in a Linux Environment	61
▼ To Configure Bonding for Multiple ixge Interfaces	62
<b>Index</b>	<b>63</b>



# Tables

---

TABLE 1-1	Hardware and Software Requirements for Sun SPARC Servers	2
TABLE 3-1	<code>ixge</code> Driver Parameter, Status, and Descriptions	20
TABLE 3-2	Read-Write Flow Control Keyword Descriptions	21
TABLE 3-3	RX Blanking Register for Alias Read	21
TABLE 3-4	<code>accept-jumbo</code> Parameters	22
TABLE 3-5	Read-Only <code>ixge</code> Device Capabilities	29
TABLE 3-6	Receive and Transmit Parameters	30
TABLE A-1	Performance Specifications	43
TABLE A-2	Physical Characteristics	44
TABLE A-3	Power Requirements	44
TABLE B-1	SunVTS Documentation	46
TABLE C-1	Files and Directories on the CD-ROM	50
TABLE D-1	Tunable <code>ixge</code> Driver Parameters for Linux Operating Systems	60





# Figures

---

FIGURE 1-1	Sun 10-Gigabit Ethernet PCI-X Adapter with Optical Transceiver Installed	2
FIGURE 1-2	Sun 10-Gigabit Ethernet PCI-X Adapter Fiber Optic Channels	3
FIGURE 4-1	Example of Servers Supporting Multiple VLANs With Tagging Adapters	38
FIGURE 4-2	Ethernet Tag Header Format	40



# Declaration of Conformity

Compliance Model Number: Kirkwood  
Product Family Name: Sun 10-GB Ethernet PCIX (X5558A)

## EMC

### USA—FCC Class A

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This equipment may not cause harmful interference.
2. This equipment must accept any interference that may cause undesired operation.

### European Union

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

*As Telecommunication Network Equipment (TNE) in Both Telecom Centers and Other Than Telecom Centers per (as applicable):*

EN300-386 V.1.3.1 (09-2001) Required Limits:

EN55022/CISPR22	Class A
EN61000-3-2	Pass
EN61000-3-3	Pass
EN61000-4-2	6 kV (Direct), 8 kV (Air)
EN61000-4-3	3 V/m 80-1000MHz, 10 V/m 800-960 MHz, and 1400-2000 MHz
EN61000-4-4	1 kV AC and DC Power Lines, 0.5 kV Signal Lines
EN61000-4-5	2 kV AC Line-Gnd, 1 kV AC Line-Line and Outdoor Signal Lines, 0.5 kV Indoor signal Lines > 10m
EN61000-4-6	3 V
EN61000-4-11	Pass

*As Information Technology Equipment (ITE) Class A per (as applicable):*

EN55022:1998/CISPR22:1997 Class A

EN55024:1998 Required Limits:

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

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EC Type Examination Certificates:

EN60950:2000, 3rd Edition	TÜV Rheinland Certificate No. xxxxxxxxxxxx
IEC 60950:2000, 3rd Edition	CB Scheme Certificate No. xxxxxxxxxxxx
Evaluated to all CB Countries	
UL 60950, 3rd Edition, CSA C22.2 No. 60950-00	File: Vol. Sec.
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FDA DHHS Accession Number (Monitors Only)	

**Supplementary Information:** This product was tested and complies with all the requirements for the CE Mark.

/S/

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# Preface

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The *Sun 10-Gigabit Ethernet PCI-X Adapter Installation and User's Guide* provides installation instructions for the Sun 10-Gigabit Ethernet PCI-X adapter. This document 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, verify that it is correctly installed, and install the driver software using the automated script.

Chapter 3 describes how to configure the driver parameters used by the Sun 10-Gigabit Ethernet PCI-X adapter.

Chapter 4 explains VLANs in detail, and provides configuration instructions and examples.

Appendix A provides specifications for the Sun 10-Gigabit Ethernet PCI-X adapter.

Appendix B provides an overview of the SunVTS diagnostic application and instructions for updating the SunVTS software to recognize the adapter.

Appendix C describes how to install the driver software manually.

Appendix D explains how to install and configure the Sun 10-Gigabit Ethernet PCI-X device driver in a Linux environment.

---

# Using UNIX Commands

This document might not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices. Refer to the following for this information:

- Software documentation that you received with your system
- Solaris™ Operating System documentation, which is at:

<http://docs.sun.com>

---

# Shell Prompts

Shell	Prompt
C shell	<i>machine-name%</i>
C shell superuser	<i>machine-name#</i>
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

---

# Typographic Conventions

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

\* The settings on your browser might differ from these settings.

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*Sun 10-Gigabit Ethernet PCI-X Adapter Installation and User's Guide*, part number 819-0938-11



## Product Overview

---

This chapter contains an overview of the Sun 10-Gigabit Ethernet PCI-X adapter, including:

- “Product Description” on page 1
- “Hardware and Software Requirements” on page 2
- “Features” on page 3

---

## Product Description

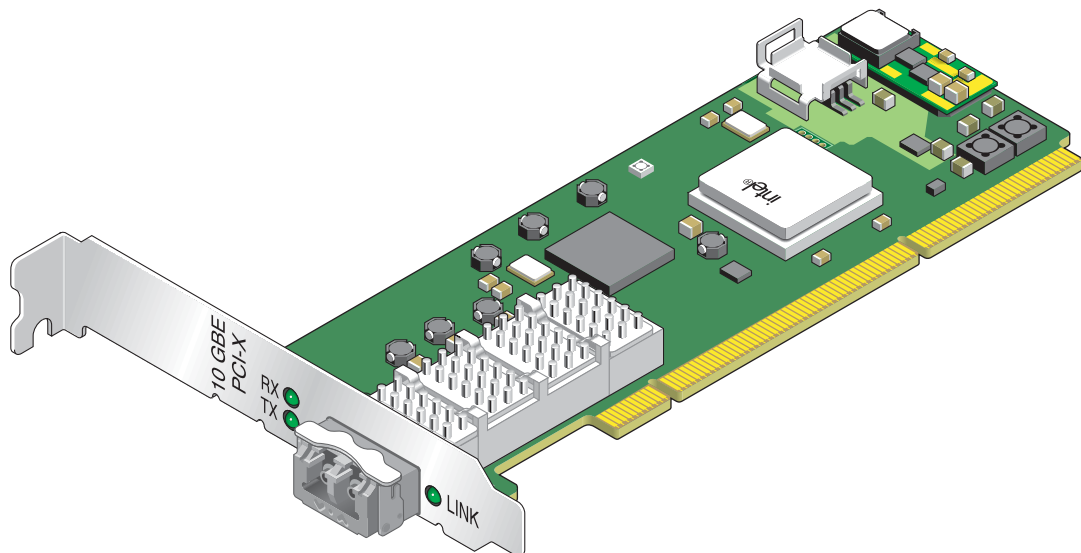
The Sun 10-Gigabit Ethernet PCI-X adapter is a low profile 133 MHz 10 gigabit Ethernet card utilizing the Intel 82597EX PCI-X MAC controller with XFP-based 10-gigabit Ethernet optics.

FIGURE 1-1 shows the adapter with the optical transceiver inserted.

---

**Note** – The adapter must be inserted into the system *first*. Then insert the optical transceiver into the adapter.

---



**FIGURE 1-1** Sun 10-Gigabit Ethernet PCI-X Adapter with Optical Transceiver Installed

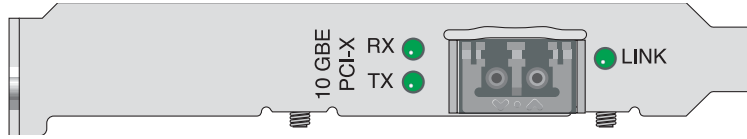
## Hardware and Software Requirements

Before installing the adapter, make sure your system meets the required hardware and software. TABLE 1-1 lists the supported hardware and software for Sun SPARC® systems.

**TABLE 1-1** Hardware and Software Requirements for Sun SPARC Servers

Requirements	Hardware or Software
Hardware	Sun Fire™ V440, 490, 880, 890, Sun Fire V40z
Operating System	Solaris 9 9/04 and 10 SPARC Operating System RedHat Enterprise Linux 3.0

**Note** – The preceding information is up-to-date as of the printing of this manual. Visit Sun on the World Wide Web at <http://www.sun.com/> for the latest information.



**FIGURE 1-2** Sun 10-Gigabit Ethernet PCI-X Adapter Fiber Optic Channels

---

## Features

The Sun 10-Gigabit Ethernet PCI-X adapter addresses the following requirements and provides additional features and benefits:

- One full-duplex 10 gigabit Ethernet interface that uses a small form factor pluggable (XFP) optical transceiver duplex LC fiber connector
- PCI-X -133MHz compatible and PCI-66 MHz compliant
- Uses the Intel 82597EX PCI-X MAC controller
- Uses XAUI to XFI Serdes
- Dynamic reconfiguration (DR) and redundancy/failover support
- kstat and snoop support
- Support for promiscuous and multicast modes
- Jumbo frames support up to 8170 bytes
- Low profile 64-bit PCI-X plug-in card
- PCI Local Bus Rev 2.3-compliant (6.6-inch x 2.536-inch short card)
- Implements PCI-X addendum to PCI Local Bus specifications, Revision 1.0A
- IPv4, IPv6, and IPMP support
- TCP, UDP, and IP hardware checksum offload
- 802.1Q VLAN support
- IEEE 802.3ad link aggregation (trunking)
- NDD physical layer management configuration capability



---

## Installing the Adapter

---

This chapter describes how to install the Sun 10-Gigabit Ethernet PCI-X adapter in your system and verify that it has been installed correctly. The chapter then describes how to install the driver software using the automated script. Finally, this chapter describes how to edit the network host files after installing the adapter on your system.

This chapter contains the following sections:

- “Installing the Adapter Without Dynamic Reconfiguration” on page 5
- “Installing the Adapter With Dynamic Reconfiguration” on page 11
- “Using the Installation Script” on page 11
- “Verifying the Software Installation” on page 14
- “Configuring the Network Host Files” on page 15

---

**Note** – If you are installing the Sun 10-Gigabit Ethernet PCI-X adapter in a machine running the Solaris x86 Operating System Dynamic Reconfiguration (DR) is *not* supported.

---

---

## Installing the Adapter Without Dynamic Reconfiguration



---

**Caution** – If you are installing the Sun 10-Gigabit Ethernet PCI-X adapter into a machine running Solaris 10, you *must* install the software *before* you install the hardware. Failure to install the software before installing the hardware will allow the Sun 10-Gigabit Ethernet PCI-X adapter to attach to an older version of the software. See “Using the Installation Script” on page 11.

---

## ▼ To Install the Adapter

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 antistatic wrist strap to yourself and to the system.**

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. 2 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. **Insert the adapter into the PCI opening.**

Holding the PCI adapter by the edges, align the adapter edge connector with a 66 MHz PCI slot or a PCI-X slot. Slide the adapter face plate into the small slot at the end of the PCI opening.
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 might 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.

---

9. **Secure the adapter to the PCI slot using the screw you removed in Step 6.**
10. **Close the system.**

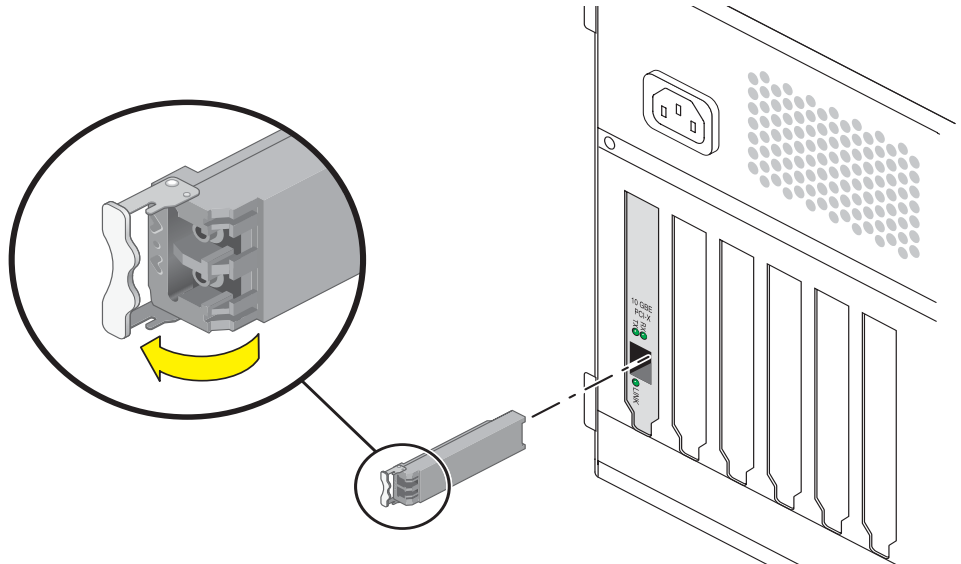
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**Note** – Green LEDs do not light until the correct driver is installed.

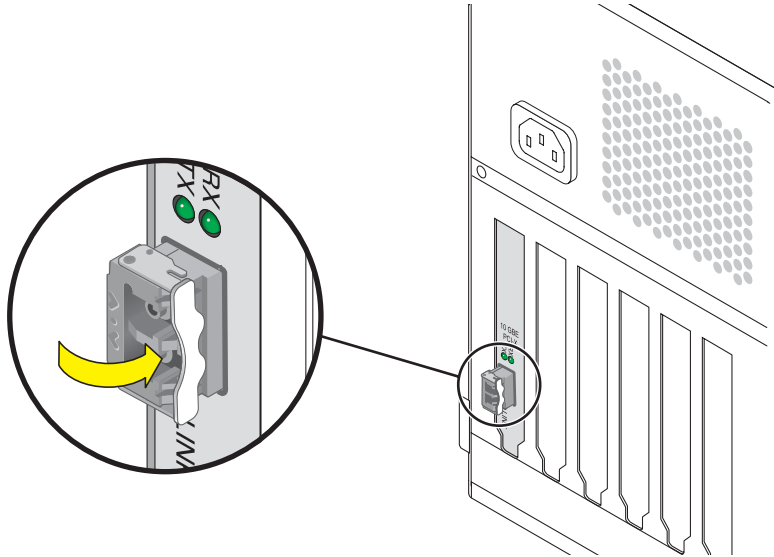
---

## ▼ To Install the Optical Transceiver

The Sun 10-Gigabit Ethernet PCI-Adapter requires an optical transceiver to create an Ethernet connection. The optical transceiver Part Number: 135-1172-01 is available from Sun Microsystems.



- 1. Pull the white locking handle into the full horizontal position.**  
You will feel the handle click into position when it is fully opened.
- 2. Holding the optical transceiver by the edges, align the transceiver with the slot in the Sun 10-Gigabit Ethernet PCI-Adapter and slide it into the opening.**
- 3. Applying even pressure at both corners of the transceiver, push the transceiver until it is firmly seated in the slot.**



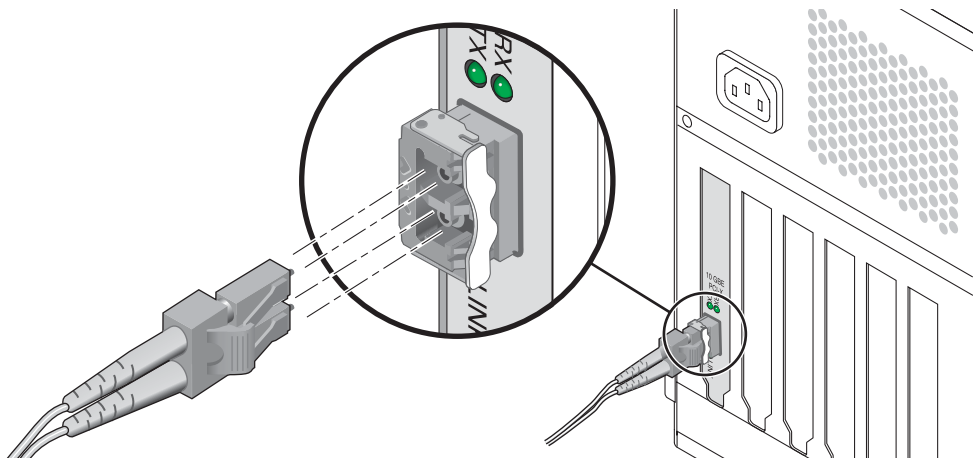
4. Push the handle closed to lock the optical transceiver in place.
5. Detach the wrist strap.



---

**Caution** – If you pull the locking handle down when the optical transceiver is installed, remove the optical transceiver entirely and reinstall it. The handle operates an internal lock. Pulling the handle down can disconnect the optical transceiver, even though it might appear to be connected.

---



6. Connect the Ethernet cable.



## ▼ To Verify the Hardware Installation

After you have installed the Sun 10-Gigabit Ethernet adapter, but *before* you boot your system, perform the following tasks to verify the installation. Refer to the your Solaris documentation for the detailed instructions.

---

**Note** – Verification is not required if your system supports dynamic reconfiguration (DR). Verification is not supported if your system is running Solaris x86 software.

---

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.
2. List the network devices on your system.

```
ok show-devs
```

The output from this command is extensive. Look for ethernet@ and network@ to see the network devices. In this example, the ethernet@1 device is the Sun 10-Gigabit Ethernet adapter, shown in *bold italics* for ease of use.

```
ok show-devs
.....
/packages
/pci@9,600000/pci@2
//pci@9,600000/ethernet@1
/pci@9,600000/pci@2/network@3
/pci@9,600000/pci@2/network@2
/pci@9,600000/pci@2/network@1
/pci@9,600000/pci@2/network@0
/pci@9,700000/usb@1,3
.....
```

/pci@9,600000/ethernet@1 identifies the 10-gigabit Ethernet port.

---

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

---

3. View the device that you installed.

Using the previous example, type:

```
cd /pci@9,600000/ethernet@1
```

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

The `.properties` command displays the specific information about the installed adapter. If you are using the Sun 10-Gigabit Ethernet adapter, your output will be similar to the following:

```
ok cd /pci@9,600000/ethernet@1
ok .properties
assigned-addresses      83000810 00000000 00100000 00000000 00008000
                        81000820 00000000 00000300 00000000 00000020
reg                     00000800 00000000 00000000 00000000 00000000
                        03000810 00000000 00000000 00000000 00008000
                        01000820 00000000 00000000 00000000 00000020
compatible              70 63 69 38 30 38 36 2c 31 30 34 38 2e 38 30 38
name                    ethernet
66mhz-capable
devsel-speed            00000001
class-code              00020000
interrupts              00000001
latency-timer          00000040
cache-line-size        00000010
max-latency             00000000
min-grant               000000ff
subsystem-id            00007036
subsystem-vendor-id    0000108e
revision-id             00000002
device-id               00001048
vendor-id               00008086
ok
```

#### 5. Type the following when you finish looking at the `.properties` values:

```
ok device-end
```

## Rebooting the System

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

```
ok boot -r
```

---

# 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 connecting the attachment point and configuring its occupant. In most cases, the `cfgadm(1M)` command can perform both steps at once.

---

**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. DR is not supported in the Solaris x86 operating system.

---

---

## Using the Installation Script

The Sun 10-Gigabit Ethernet CD provides automated installation for the Sun 10-Gigabit Ethernet PCI-X driver software. In most cases, you can use the following procedure and execute the installation script. If you have any problems, see Appendix C for manual installation procedures.

The script first checks to ensure that the software driver package has already been installed. If the package is installed, the script verifies the patch level and updates the driver with the updated patch if necessary. If the packages are not installed on Solaris 9 or 10 software, the installation script installs the latest prepatched packages. If the system does not require updating because the patch level is at or beyond the current installed version, the script exits with an appropriate message.

### ▼ To Install the Software Using the Installation Script

1. At the system console, become superuser (root).
2. Insert the Sun 10-Gigabit Ethernet Adapter 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 Sun Enterprise Volume Manager, mount the CD-ROM as follows:

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

---

**Note** – If you are installing the software from the download site, follow the online download instructions.

---

### 3. Change to the directory where the installation script resides:

```
# cd /media-path/
```

where:

- *media-path* = /cdrom/cdrom0, if you are installing from the CD-ROM.
- *unzipped 10-Gigabit-path/Sun\_10-Gigabit\_Ethernet\_Driver*, if you downloaded the driver from the Sun download center.

### 4. Execute the installation script:

```
# ./install
```

---

**Note** – After the installation script runs, you see a summary of the software package or patch that was installed. You can also find a log of the installation in /var/tmp. The log file information is displayed when the installation completes unless the software meets or exceeds the required package or patch level.

---

You'll see the following output:

#### CODE EXAMPLE 2-1 Typical Install Script Output

```
# ./install

10-Gigabit Ethernet Adapter Driver for sparc Installation.

Copyright 2004 Sun Microsystems, Inc. All rights reserved.
Use is subject to license terms.
```

**CODE EXAMPLE 2-1** Typical Install Script Output (Continued)

```
*** Checking for correct version of 10-Gigabit Ethernet Driver
Packages...

*** Checking for correct version of VLAN Utility Driver Packages..
*** Checking for correct version of VLAN Utility Driver Patches...

The following optional supporting driver(s) can be used with 10-
Gigabit Ethernet Adapter Driver:

    VLAN Utility Driver software (Installed)

This script is about to take the following actions:
- Install 10-Gigabit Ethernet Adapter Driver packages.
- Install VLAN Ethernet Utility Patch: 114600-04.

Press return to continue, or 'Q' followed by a return to quit:

*** Installing patch 114600-04 for Solaris 9...

Checking installed patches...
Verifying sufficient filesystem capacity (dry run method)...
Installing patch packages...

Patch number 114600-04 has been successfully installed.
See /var/sadm/patch/114600-04/log for details

Patch packages installed:
    SUNWvld
    SUNWvldu
    SUNWvldx

*** Installing Sun 10-Gigabit Ethernet packages...
Copyright 2004 Sun Microsystems, Inc. All rights reserved.
Use is subject to license terms.
System configuration files modified but ixge driver not loaded or
attached.

Installation of <SUNWixged> was successful.
Copyright 2004 Sun Microsystems, Inc. All rights reserved.
Use is subject to license terms.

Installation of <SUNWixgedu> was successful.
Copyright 2004 Sun Microsystems, Inc. All rights reserved.
Use is subject to license terms.

Installation of <SUNWixgea> was successful.
```

**CODE EXAMPLE 2-1** Typical Install Script Output (*Continued*)

```
Installation completed.

 10-Gigabit Ethernet Driver packages have been installed.

Optional VLAN Utility has been updated using 114600-04. It
may be necessary to reboot the system to reload the updated
driver.

A log of this Install can be found at:
  /var/tmp/10_Gigabit.install.2004.12.10.1029
```

**5. Reboot the system to load the driver:**

```
# reboot -r
```

**6. Verify the installation to ensure that the driver installed and loaded properly.**

---

## Verifying the Software Installation

Unless you have the latest version of the driver software installed, the green LEDs on the adapter will not go on. Be sure that you have version 1.30 or later installed.

- **Use the `modinfo` command to verify that you have the current driver (v1.30 or later) installed.**

If you type `grep IXGE`, using uppercase letters, you will get only the specific driver information:

```
# modinfo | grep IXGE
267 1331c11 11e0e 271 1 ixge (IXGE 10Gb Ethernet Driver v1.30)
```

---

# Configuring the Network Host Files

After installing the driver software, you must create a `hostname.ixgenumber` file where *number* = the instance number of the `ixge` interface.) 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.



---

**Caution** – Ensure that the optical transceiver is correctly seated *before* configuring the interface.

---

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

```
# grep ixge /etc/path_to_inst
"/pci@9,600000/ethernet@1" 0 "ixge"
```

In the example above, the device instance is from a Sun 10-Gigabit Ethernet PCI-X adapter. For clarity, the instance number is in bold italics.

2. Use the `ifconfig` command to set up the adapter's `ixge` interface.

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 ixge0 plumb ip-address up
```



---

**Caution** – If the optical transceiver is unplugged after the interface has been configured using the `ifconfig` command, you *must* unconfigure and reconfigure the interface.

---

On Solaris operating systems, use the following commands to unconfigure and reconfigure the interface:

```
# ifconfig ixge0 down
# ifconfig ixge0 unplumb
# ifconfig ixge0 plumb ip-address up
```

On Linux operating systems, use the following commands:

```
ifconfig ethnumber down
ifconfig ethnumber up
```

Where *number* corresponds to the device instance of the Sun 10-Gigabit Ethernet PCI-X adapter you plan to configure.

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

- If you want a setup that remains the same after you reboot, create an `/etc/hostname.ixgnumber` file, where *number* corresponds to the instance number of the `ixge` interface you plan to use.

To use the adapter's `ixge` interface in the Step 1 example, create an `/etc/hostname.ixge0` file, where 0 is the number of the `ixge` interface. If the instance number were 1, the filename would be `/etc/hostname.ixge1`.

- Do not create an `/etc/hostname.ixgnumber` file for a Sun 10-Gigabit Ethernet adapter interface you plan to leave unused.
- The `/etc/hostname.ixgnumber` file must contain the hostname and IP address for the appropriate `ixge` interface.
- The host name and IP address must be listed in the `/etc/hosts` file.
- The host name must be different from any other host name of any other interface, for example: `/etc/hostname.ixge0` and `/etc/hostname.ixge1` cannot share the same host name.

The following example shows the `/etc/hostname.ixgnumber` file required for a system called `zardoz` that has a Sun 10-Gigabit Ethernet adapter (`zardoz-11`).

```
# cat /etc/hostname.hme0
zardoz
# cat /etc/hostname.ixge0
zardoz-11
```



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



## Configuring Driver Parameters

---

This chapter describes how to configure the driver parameters used by the Sun 10-Gigabit Ethernet PCI-Xadapter. This chapter contains the following sections:

- “10-Gigabit Ethernet Device Driver Parameters” on page 19
- “Setting `ixge` Driver Parameters” on page 23
- “10-Gigabit Ethernet Driver Operating Statistics” on page 29

---

### 10-Gigabit Ethernet Device Driver Parameters

The `ixge` device driver controls the Sun 10-Gigabit Ethernet PCI-X adapter. The `ixge` driver is attached to the UNIX `pci` name property `pci8086,1048` for the Sun 10-Gigabit Ethernet PCI-X adapter (8086 is the vendor ID and 1048 is the PCI device ID).

You can manually configure the `ixge` device driver parameters to customize each Sun 10-Gigabit Ethernet adapter device in your system. This section provides an overview of the capabilities of the 10-Gigabit Ethernet driver used in the adapter, lists the available `ixge` device driver parameters, and describes how to configure these parameters.

# 10-Gigabit Ethernet Driver Parameter Values and Definitions

TABLE 3-1 describes the parameters and settings for the `ixge` device driver.

**TABLE 3-1** `ixge` Driver Parameter, Status, and Descriptions

Parameter	Status	Description
<code>instance</code>	Read and write	Device instance
<code>adv-asm-pause-cap</code>	Read and write	Flow control parameter
<code>adv-pause-cap</code>	Read and write	Flow control parameter
<code>rx-intr-pkts</code>	Read and write	Receive interrupt blanking values
<code>rx-intr-time</code>	Read and write	Receive interrupt blanking values
<code>accept-jumbo</code>	Read and write	Enable jumbo frames

## Flow Control Parameters

The `ixge` device sources (transmits) and terminates (receives) pause frames conforming to the IEEE 802.3x Frame Based Link Level Flow Control Protocol. In response to received flow control frames, the `ixge` device can slow down its transmit rate. The `ixge` device is capable of sourcing flow control frames by 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.

TABLE 3-2 provides flow control keywords and describes their function.

**TABLE 3-2** 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, each depending on the value of adv_asmpause_cap. (Default=0) <ul style="list-style-type: none"><li>• If adv_asmpause_cap = 1 while adv_pause_cap = 1, pauses are received.</li><li>• If adv_asmpause_cap = 1 while adv_pause_cap = 0, pauses are transmitted.</li><li>• If adv_asmpause_cap = 0 while adv_pause_cap = 1, pauses are sent and received.</li><li>• If adv_asmpause_cap = 0, then adv_pause_cap determines whether Pause capability is on or off.</li></ul>

## Interrupt Parameters

TABLE 3-3 describes the receive interrupt blanking values.

**TABLE 3-3** 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=3)
rx_intr_time	0 to 32768	Interrupt after 4.5 US ticks have elapsed since the last packet was serviced. A value of zero indicates no time blanking. (Default=0)

# Jumbo Frames

The variable `accept-jumbo` enables the driver to instruct the upper layers that the driver is operating in Jumbo-frame mode.

**TABLE 3-4** `accept-jumbo` Parameters

Parameter	Values	Description
<code>accept-jumbo</code>	1	Enables Jumbo-frame mode and sets MTU to greater than 1500.
	0	Jumbo frames is not enabled. MTU is at 1500.

Refer to the documentation that came with your switch for exact commands to configure jumbo frames support.

## ▼ To Configure Jumbo Frames Using `ndd`

1. **Unplumb the interface you want to configure Jumbo Frames on.**
2. **Kill any `snoop` or `netstat` processes running over the interface to be configured.**
3. **Set the instance number:**

```
% ndd -set /dev/ixge instance 0
```

In this example, the instance number set is 0.

4. **Set the instance to accept jumbo frames:**

```
% ndd -set /dev/ixge accept-jumbo 1
```

5. **Plumb the interface up:**

```
% ifconfig ixge0 plumb xxx.xxx.xx.xxx up
```

where `xxx.xxx.xx.xxx` = the IP address of the interface.

## ▼ To Configure Jumbo Frames in a Linux Environment

1. Ensure that the `ixge` software is installed.
2. Plumb the Sun 10-Gigabit Ethernet PCI-X interface:

```
# modprobe ixge
# ifconfig eth2 xxx.xxx.xx.xxx up
# ifconfig eth2 mtu 8170
```

where `xxx.xxx.xx.xxx` = the IP address of the interface.

---

## Setting `ixge` Driver Parameters

You can set the `ixge` device driver parameters in two ways:

- Using the `ndd` utility
- Using the `ixge.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/ixge.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 that implements the Data Link Provider Interface (DLPI).

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

## ▼ To Specify Device Instances for the ndd Utility

Before you use the `ndd` utility to get or set a parameter for a `ixge` 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 ixge /etc/path_to_inst
"/pci@9,600000/ethernet@1" 0 "ixge"
```

In this example, the 10-Gigabit Ethernet instance is from the installed adapter. The instance number is in bold italics for clarity.

2. Use the instance number to select the device.

```
# ndd -set /dev/ixge instance number
```

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.

## ▼ To Use 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/ixge` driver instance, and assigns the value to the parameter:

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

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

```
ixge0: xcvr addr:0x01 - link up 10000 Mbps full duplex
```

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

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

```
# ndd /dev/ixge parameter
```

## ▼ To Use the `ndd` Utility in Interactive Mode

- **To modify a parameter value in interactive mode, specify `ndd /dev/ixge`:**

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

After you enter the parameter name, the `ndd` utility prompts you for the parameter value (see TABLE 3-1 through TABLE 3-6).

- To list all the parameters supported by the ixge driver, type ?.

See TABLE 3-1 through TABLE 3-6 for parameter descriptions.

```
# ndd -get /dev/ixge \?  
?  
instance (read and write)  
adv_asmpause_cap (read and write)  
adv_pause_cap (read and write)  
rx_intr_pkts (read and write)  
rx_intr_time (read and write)  
accept_jumbo (read and write)  
laggr_multistream (read and write)#
```

---

**Note** – By default, autonegotiation is set to off. This adapter operates only at full-duplex.

---

## Setting Parameters Using the ixge.conf File

Specify the driver parameter properties for each device by creating a ixge.conf file in the /platform/sun4u/kernel/drv directory. Use a ixge.conf file when you need to set a particular parameter for a device in the system. The parameters you can set are the read and write parameters listed in “10-Gigabit Ethernet Driver Parameter Values and Definitions” on page 20.

---

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

---

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

- To access any man page, type the man command plus the name of the man page. For example, to access man pages for prtconf(1M), type:

```
% man prtconf
```

## ▼ To Set Driver Parameters Using a `ixge.conf` File

1. Obtain the hardware path names for the `ixge` devices in the device tree.
  - a. Check the `/etc/driver_aliases` file to identify the name associated with a particular device:

```
# grep ixge /etc/driver_aliases
ixge "pci8086,1048.108e.7036"
```

---

**Note** – `ixge "pci8086,1048.108e.7036"` is used by the Sun 10-Gigabit Ethernet adapter.

---

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

```
# grep ixge /etc/path_to_inst
"/pci@9,600000/ethernet@1" 0 "ixge"
```

In this 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 hardware node 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 the unit-address.

To identify a PCI device unambiguously in the `ixge.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.

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

In the following example, the `accept-jumbo` parameter is set to enable jumbo frames for all Sun 10-Gigabit Ethernet devices. See the `driver.conf(4)` man page for more information.

```
accept-jumbo=1;
```

In the following example, the `accept-jumbo` parameter is set to enable jumbo frames is set for a single instance of the Sun 10-Gigabit Ethernet device.

In this example:

- `parent = "/pci@8,600000"`
- `unit-address = "0"`

```
name="pci8086,1048.108e.7036" parent="pci@8,600000" unit-address="0" accept-jumbo=1;
```

---

**Note** – If you omit the `name=`, `parent=`, and `unit-address=` definitions, the settings become global to all Sun 10-Gigabit Ethernet instances.

---

## 3. Save the `ixge.conf` file.

---

# 10-Gigabit Ethernet Driver Operating Statistics

These statistics are part of the statistics presented by the `kstat` command.

TABLE 3-5 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 3-5** Read-Only `ixge` Device Capabilities

Parameter	Description (Local interface Capabilities)
<code>cap_autoneg</code>	0 = Not capable of autonegotiation 1 = Autonegotiation capable
<code>cap_10gfdx</code>	Local interface full-duplex capability 0 = Not 10000 Mbit/sec full-duplex capable 1 = 10000 Mbit/sec full-duplex capable
<code>cap_10ghdx</code>	Local interface half-duplex capability 0 = Not 10000 Mbit/sec half-duplex capable 1 = 10000 Mbit/sec half-duplex capable
<code>cap_1000fdx</code>	Local interface full-duplex capability 0 = Not 1000 Mbit/sec full-duplex capable 1 = 1000 Mbit/sec full-duplex capable
<code>cap_1000hdx</code>	Local interface half-duplex capability 0 = Not 1000 Mbit/sec half-duplex capable 1 = 1000 Mbit/sec half-duplex capable
<code>cap_100fdx</code>	Local interface full-duplex capability 0 = Not 100 Mbit/sec full-duplex capable 1 = 100 Mbit/sec full-duplex capable
<code>cap_100hdx</code>	Local interface half-duplex capability 0 = Not 100 Mbit/sec half-duplex capable 1 = 100 Mbit/sec half-duplex capable
<code>cap_10fdx</code>	Local interface full-duplex capability 0 = Not 10 Mbit/sec full-duplex capable 1 = 10 Mbit/sec full-duplex capable

**TABLE 3-5** Read-Only ixge Device Capabilities (*Continued*)

Parameter	Description (Local interface Capabilities)
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

*Table describes the read-only ixge device capabilities.*

TABLE 3-6 describes the `kstat ixge:1` receive and transmit parameters:

**TABLE 3-6** Receive and Transmit Parameters

Parameter	Description
lb_mode	Copy of the Loopback mode the device is in, if any.
rev_id	Revision ID of the 10-Gigabit Ethernet device useful for recognition of device being used in the field.
rx_allocb_fail	Number of times the driver failed to allocate OS receive buffer.
rx_hdr_drops	Number of times an entire page of packets less than 256 bytes each was dropped because the driver was unable to map a new page to replace it.
rx_hdr_pkts	Number of packets received that were less than 256 bytes.
rx_inits	Number of packets received
rx_jumbo_pkts	Number of jumbo packets received.
rx_len_err	Receive length error count.
rx_msgdup_fail	Number of times driver failed to duplicate a packet on receipt.
rx_mtu_drops	Number of times an entire page of packets greater than 256 bytes and less than 1514 each was dropped because the driver was unable to map a new page to replace it.
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.

**TABLE 3-6** Receive and Transmit Parameters

<b>Parameter</b>	<b>Description</b>
<code>rx_new_pages</code>	Number of pages that got replaced during reception.
<code>rx_no_buf</code>	Number of times the hardware cannot receive data because there is no more receive buffer space.
<code>rx_nocanput</code>	Number of packets dropped due to full STREAMS message queue.
<code>rx_no_comp_wb</code>	Number of times the hardware cannot post completion entries for received data.
<code>rx_nxt_drops</code>	Number of times a page with a split packet was dropped because the driver was unable to map a new one to replace it.
<code>rx_ov_flow</code>	Number of packets dropped due to full h/w FIFO.
<code>rx_pkts_dropped</code>	Number of packets dropped due to service FIFO.
<code>rx_reused_pgs</code>	Number of times driver able to reuse a system page.
<code>rx_split_pkts</code>	Number of packets that were split across two pages.
<code>snaptime</code>	System snapshot time in seconds.
<code>trunk_mode</code>	A value of 1 indicates that a link is aggregated.
<code>tx_allocb_fail</code>	Number of times driver failed to duplicate a packet on transmit.
<code>tx_ddi_pkts</code>	Number of packets that used DDI_DMA.
<code>tx_dma_bind_fail</code>	Number of times a page table entry was not available to enable the driver to map the kernel memory to device-accessible memory for transmission.
<code>tx_dvma_pkts</code>	Number of packets that used dvma.
<code>tx_hdr_pkts</code>	Number of packets that used bcopy (buffer copy).
<code>tx_jumbo_pkts</code>	Number of packets greater than Ethernet MTU of 1522.
<code>tx_max_pend</code>	Maximum number of transmits pending on any of the four queues.
<code>tx_msgdup_fail</code>	Number of times driver failed to duplicate a packet for promiscuous stream.
<code>tx_no_desc</code>	Number of tx packets dropped due to full descriptor ring.
<code>tx_starts</code>	Number of times that the driver attempted to transmit a packet.
<code>xcvr_addr</code>	GMII/MII physical layer device address for management interface.

**TABLE 3-6** Receive and Transmit Parameters

Parameter	Description
<code>xcvr_id</code>	GMII/MII physical layer device Identification Decimal copy of MII registers 2 and 3.
<code>xcvr_inits</code>	Number of physical layer re-initializations incremented each time link parameters are changed using NDD.
<code>xcvr_inuse</code>	Type of Transceiver/SERDES which is always PCS (3).

## ▼ To Check Link Partner Settings

Type the `kstat` command as superuser:

**CODE EXAMPLE 3-1** Output from `kstat` Command

```
# kstat ixge:1
module: ixge                instance: 1
name:   ixge1               class:   net
        brdcstrcv           0
        brdcstxmt           0
        cap_1000fdx         0
        cap_1000hdx         0
        cap_100fdx          0
        cap_100hdx          0
        cap_100T4           0
        cap_10fdx           0
        cap_10gfdx          1
        cap_10ghdx          0
        cap_10hdx           0
        cap_asmpause        0
        cap_autoneg         0
        cap_pause           0
        crc_err             0
        crtime              147.15892392
        ierrors             2
        ifspeed             10000000000
        ipackets            0
        ipackets64          0
        lb_mode             0
        link_asmpause       0
        link_duplex         2
        link_pause          0
        link_speed          10000
        link_T4             0
        link_up             1
        local_faults        1
        mac_mtu             0
```



**CODE EXAMPLE 3-1** Output from kstat Command (Continued)

multircv	0
multixmt	0
norcvbuf	0
noxmtbuf	0
obytes	0
obytes64	0
oerrors	0
opackets	0
opackets64	0
pci_bad_ack_err	0
pci_bus_speed	100
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
pcix_bus_mode	1
promisc	off
qos_mode	0
rbytes	0
rbytes64	0
remote_faults	1
rev_id	28726
rx_allocb_fail	0
rx_hdr_drops	0
rx_hdr_pkts	0
rx_inits	0
rx_jumbo_pkts	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_nocanput	0
rx_no_comp_wb	0
rx_nxt_drops	0
rx_ov_flow	0
rx_pkts_dropped	0
rx_reused_pgs	0
rx_split_pkts	0
rx_tag_err	0

**CODE EXAMPLE 3-1** Output from kstat Command (Continued)

```
rx_taskq_waits      0
snaptime            7883.09014984
trunk_mode          0
tx_allocb_fail      0
tx_ddi_pkts         0
tx_dma_bind_fail    0
tx_dvma_pkts        0
tx_hdr_pkts         0
tx_inits            0
tx_jumbo_pkts       0
tx_max_pend         0
tx_msgdup_fail      0
tx_nocanput         0
tx_no_desc          0
tx_starts           0
tx_uflo             0
xcvr_addr           0
xcvr_id             0
xcvr_inits          1
xcvr_inuse          3
```

▼ To Discover Device Capabilities

- Use the `kstat` command to discover device capabilities.

```
# kstat ixge:1 | grep cap_
cap_1000fdx         0
cap_1000hdx         0
cap_100fdx          0
cap_100hdx          0
cap_100T4           0
cap_10fdx           0
cap_10gfdx          1
cap_10ghdx          0
cap_10hdx           0
cap_asmpause        0
cap_autoneg         0
cap_pause           0
```

## ▼ To Discover Link Settings

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

```
# kstat ixge:1 | grep link
link_asmpause          0
link_duplex            2
link_pause             0
link_speed             10000
link_T4                0
link_up                1
```

## Configuration Checking

The jumbo frame configuration checking occurs at Layer 2 or Layer 3, depending on the configuration method.

### *Layer 2 Configuration Checking*

You can view the MTU configuration of a `ixge` instance at any time using the `kstat` command. The `kstat mac_mtu` variable represents the complete size of the Ethernet frame, which includes the Ethernet header, maximum payload, and `crc`. This value is consistent with the definition of MTU presented by switch vendors.

Use the following command to get the information:

```
# kstat ixge:0 | grep mac_mtu
mac_mtu                8192
```

### *Layer 3 Configuration Checking*

You can check the Layer 3 configuration by invoking the `ifconfig` command on a preconfigured interface as shown in the previous examples:

```
# ifconfig ixge138000
ixge138000: flags=
201000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4,CoS> mtu
8170 index 5
inet 192.12.38.69 netmask ffffffff broadcast 192.12.38.255
ether 0:3:ba:c4:f7:1d
```



## Configuring VLANs

---

This chapter explains Virtual Local Area Networks (VLANs) in detail and provides configuration instructions and examples. It contains the following sections:

- “Overview of VLANs” on page 37
- “Configuring VLANs” on page 39

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 take effect. If you make changes and do not reboot, you may experience configuration problems.

---

---

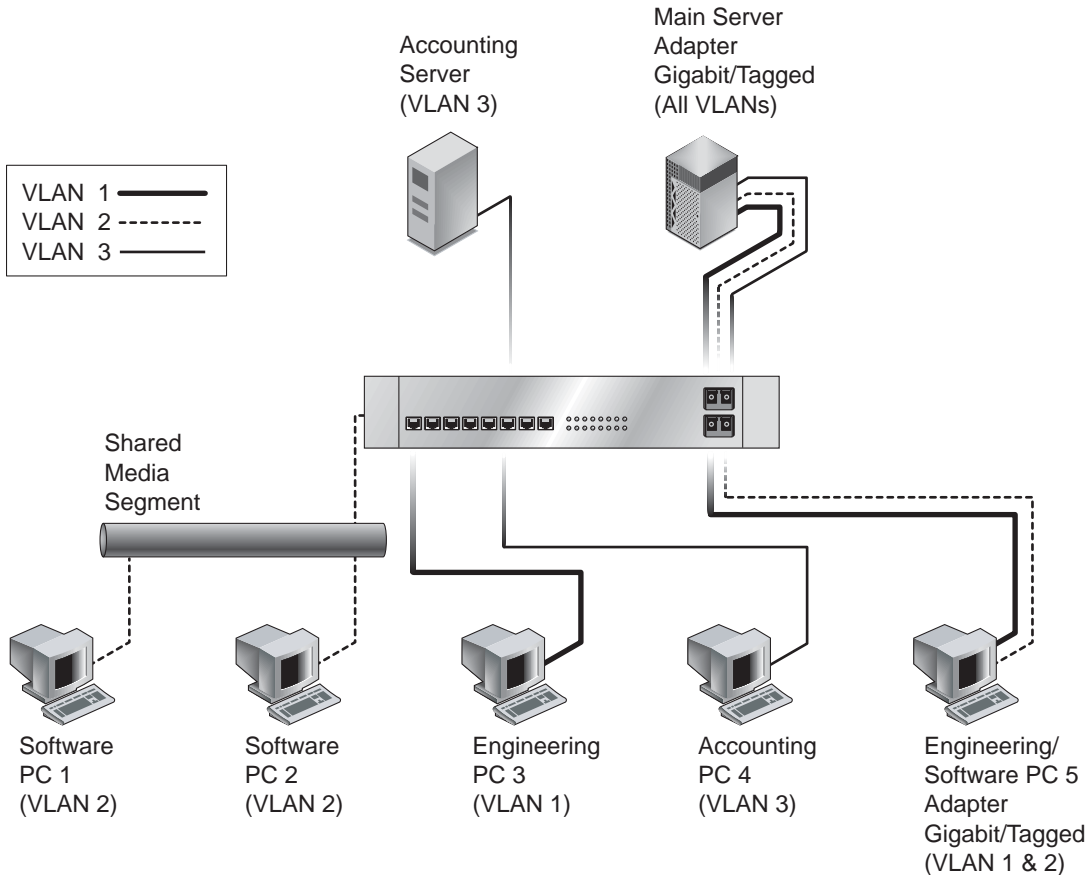
## Overview of VLANs

VLANs enable 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.

Although VLANs are commonly used to create individual broadcast domains and/or separate IP subnets, it can be 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 4-1 shows an example network that uses VLANs.



**FIGURE 4-1** 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 by means of a 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.

The Main Server is a high-use server that needs to be accessed from all VLANs and IP subnets. The server has a Sun 10-Gigabit Ethernet adapter installed. All three IP subnets are accessed by means of the single physical adapter interface. The server is attached to one of the switch's Gigabit Ethernet ports, which is configured for VLANs 1, 2, and 3. Both the adapter and the connected switch 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 following list describes the components of this network:

- 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 10-Gigabit 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.

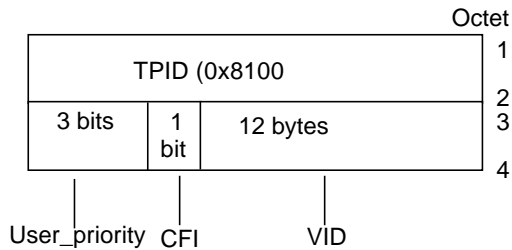
---

## 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 (`ixge0`, `ixge1`, `ixge2` 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.

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 4-2 shows the Ethernet Tag Header format.



**FIGURE 4-2** 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.ixgenumber` file for each VLAN that will be configured for each adapter on the server.**

Use the following naming format, which includes both the VID and the physical point of attachment (PPA):

VLAN logical PPA =  $1000 * VID + Device PPA$   
`ixge123000 = 1000*123 + ixge`

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 10-Gigabit Ethernet adapter having an instance of 0, belonging to a member of two VLANs, with VID 123 and 224, you would use `ixge123000` and `ixge224000`, respectively, as the two VLAN PPAs.



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

```
# ifconfig ixge123000 plumb up
# ifconfig ixge4000 plumb up
```

The output of `ifconfig -a` on a system having VLAN devices `ixge123000` and `ixge224000`:

```
# 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 ffffffff broadcast 129.144.131.255
    ether 8:0:20:a4:4f:b8
ixge123000: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 3
    inet 199.199.123.3 netmask ffffffff broadcast 199.199.123.255
    ether 8:0:20:a4:4f:b8
ixgee224000: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index
4
    inet 199.199.224.3 netmask ffffffff 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.



# Specifications

---

This appendix provides specifications for the Sun 10-Gigabit Ethernet PCI-X adapter.

- “Performance Specifications” on page 43
  - “Physical Characteristics” on page 44
  - “Power Requirements” on page 44
- 

## Performance Specifications

**TABLE A-1** Performance Specifications

<b>Feature</b>	<b>Specification</b>
PCI-X clock	66 to 133 MHz max
PCI clock	66 MHz
PCI I/O voltage	3.3V
PCI data burst transfer rate	Up to 64-byte bursts
PCI data/address width	64 bit
PCI modes	Master/slave
Maximum Ethernet transfer rate	10 Gbps Ethernet
Optics	XG-Base-SR, XG-Base-LR and IEEE 802.ae, 2002 compliant

---

# Physical Characteristics

**TABLE A-2** Physical Characteristics

<b>Dimension</b>	<b>Measurement</b>
Length	6.6 inches (167.64 mm)
Width	2.536 inches (64.61 mm)
Height	Height on component side: 0.57 inches (14.48 mm) Height on back side :0.105 inches (2.67 mm)

---

# Power Requirements

**TABLE A-3** Power Requirements

<b>Specification</b>	<b>Measurement</b>
Maximum power consumption	11 Watts
Voltage	3.3V and 5V

## Diagnostic Software

---

This appendix provides an overview of the SunVTS diagnostic application and instructions for updating the SunVTS software to recognize the adapter. This appendix contains the following sections:

- “SunVTS Diagnostic Software” on page 45
- “Updating SunVTS to Recognize the Adapter” on page 46
- “Using the SunVTS `net1btest`” on page 47

---

## 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.

---

**Note** – SunVTS diagnostic software is not currently available for Solaris x86 Operating Systems.

---

The SunVTS `nettest` diagnostic can be used to test all of the networking interfaces on the system, including the interfaces on the adapter.

To use the `nettest` diagnostic, you must have the SunVTS software installed on your system. Refer to your Solaris documentation for installation instructions.

Refer to the SunVTS documentation (listed in TABLE B-1) for instructions on how to run and monitor the `nettest` diagnostic. These SunVTS documents are available online at the following URL:

[http://www.sun.com/products-n-solutions/hardware/docs/Software/system\\_administration/tools/testing\\_valid/sunvts/index.html](http://www.sun.com/products-n-solutions/hardware/docs/Software/system_administration/tools/testing_valid/sunvts/index.html)

Select the document for the Solaris release on your system.

**TABLE B-1** SunVTS Documentation

Title	Description
<i>SunVTS User's Guide</i>	Describes the SunVTS diagnostic environment
<i>SunVTS Test Reference Manual</i>	Describes each SunVTS test (including the <code>nettest</code> ) and describes the various test options and command-line arguments
<i>SunVTS Quick Reference</i>	Provides an overview of the user interface

## Updating SunVTS to Recognize the Adapter

Current versions of SunVTS do not recognize the Sun 10-Gigabit Ethernet PCI-X adapter. You will need to update the SunVTS configuration.

### ▼ To Update SunVTS to Recognize the Adapter

1. Plug in a loopback cable.
2. Ensure that the SunVTS software and the `ixge` driver are installed on your system.
3. Add the following lines to the `/opt/SUNWvts/lib/conf/netlbttest.conf` and `/opt/SUNWvts/lib/conf/nettest.conf` files:

```
ixge    ixge    10GbE
```

---

## Using the SunVTS netlbttest

You must have the Ethernet card and the device driver installed, a loopback connector in place, and Intervention mode enabled before running `netlbttest`. `netlbttest` cannot run if the network interface is connected to a live network, and requires that the Ethernet device be configured offline before running the test. Use the `ifconfig(1M)` command to bring the Ethernet device down before running `netlbttest`.

### ▼ To Use the netlbttest

1. Ensure that the SunVTS software and the `ixge` driver are installed on your system.
2. Plug in a loopback cable.
3. Unplumb the interface from the system, using the `ifconfig` command:

```
# ifconfig ixgeinstance down
# ifconfig ixgeinstance unplumb
```

Where *instance* is the instance number of the interface.

Refer to SunVTS documentation for instructions on how to run `netlbttest`.





## Installing the Software Manually

---

This appendix describes how to install the driver software manually.

The *Sun 10-Gigabit Ethernet Adapter* CD contains the driver software required to operate the adapter. When you update your Solaris operating system, refer to the documentation that shipped with the *Solaris Supplement* CD-ROM for a listing of the available network drivers. Install the Sun 10-Gigabit Ethernet driver for your updated version of the Solaris Operating System.

### ▼ To Install the Driver Software Manually

1. **Become superuser.**
2. **Insert the Sun 10-Gigabit Ethernet Adapter CD into a CD-ROM drive that is connected to your system.**
  - If your system is running Sun Enterprise Volume Manager™, the system 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\_10-gigabit\_ethernet\_driver directory or the /cdrom/cdrom0 directory, depending on how you mounted the CD-ROM.

**TABLE C-1** Files and Directories on the CD-ROM

File or Directory	Contents
Copyright	U.S. copyright file
FR_Copyright	French copyright file
10_GigabitEthernet/Linux/SRPM/	Contains the Sun 10-Gigabit Ethernet software source rpm applicable to Linux operating systems: <ul style="list-style-type: none"> <li>• sun-10-gigabit-kernel-1.0.version-1.src.rpm</li> </ul>
10_GigabitEthernet/Solaris_OS-VER/ARCH/Packages/	Contains the Sun 10-Gigabit Ethernet software packages applicable to SPARC architecture software: <ul style="list-style-type: none"> <li>• SUNWixgea—adb macros</li> <li>• SUNWixged.u—adapter driver</li> <li>• SUNWixgedu—adapter driver header files</li> </ul> The optional VLAN packages: <ul style="list-style-type: none"> <li>• SUNWvld—VLAN utility routines</li> <li>• SUNWvldx—VLAN utility routines (64-bit, s9)</li> <li>• SUNWvldu—VLAN utility headers</li> </ul>

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

3. To use the optional VLAN Utility with the 10-Gigabit Ethernet driver on the Solaris 9 Operating System, verify the proper patch revision using the following command:

```
# showrev -p | grep 114600
```

If the patch version is less than 114600-04, update the VLAN Utility software by installing the 114600-04 patch.

#### 4. Install the patch:

```
# patchadd 10_GigabitEthernet/Solaris_9/sparc/Patches/114600-04
```

#### 5. Check to see if v`lan` drivers are installed on the system:

- If you are using a Solaris SPARC system:

```
# /usr/bin/pkginfo SUNWvld SUNWvldx
system      SUNWvld      Sun Ethernet Vlan Utility Routines
system      SUNWvldx    Sun Ethernet Vlan Utility Routines (64-bit)
```

- If you do *not* see the previous output, the VLAN Utility software is *not* installed on your system. You may install the optional VLAN packages if desired in the following step.
- If you *do* see the previous output, do *not* reinstall the VLAN Utility software. Select only the Sun 10 Gigabit Ethernet Driver packages.

#### 6. Install the software packages by typing the following at the command line, replacing the `OS_VER` with your version of the Solaris operating system:

- If your system is running Solaris 9 or 10 software type the following:

```
# /usr/sbin/pkgadd -d
/cdrom/cdrom0/10_GigabitEthernet/Solaris_OS_VER/ARCH/Packages/
```

where `OS_VER` is 9 or 10 and `ARCH` is `sparc`.

For example, if your system is running the Solaris 9 SPARC operating system, you would type the following:

```
# /usr/sbin/pkgadd -d
/cdrom/cdrom0/10_GigabitEthernet/Solaris_9/sparc/Packages/
```

- If your system is running Solaris 9 x86 software type the following:

```
# pkgadd -d /Solaris_9/i386/Packages/
```

A menu similar to the following displays:

The following packages are available:

- 1 SUNWixgea Sun 10 Gigabit Ethernet Adapter Driver adb Macros  
(sparc) 1.0,REV=2004.12.01.
- 2 SUNWixged.u Sun 10 Gigabit Ethernet Adapter Driver  
(sparc.sun4u) 1.0,REV=2004.12.01.
- 3 SUNWixgedu Sun 10 Gigabit Ethernet Adapter Driver Headers  
(sparc) 1.0,REV=2004.12.01.
- 4 SUNWvld Sun Ethernet Vlan Utility Routines  
(sparc) 1.0,REV=2001.09.19.9.0
- 5 SUNWvldu Sun Ethernet Vlan Utility Headers  
(sparc) 1.0,REV=2001.09.19.9.0
- 6 SUNWvldx Sun Ethernet Vlan Utility Routines (64-bit)  
(sparc) 1.0,REV=2001.09.19.9.0

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

## 7. Select the packages you want to install:

- Press Return or type **a11** to accept the default and install all packages (if neither the 10-Gigabit Ethernet Driver nor VLAN Utility packages are installed).
- Type the numbers of all but the optional packages if you prefer not to install them.

---

**Note** – Do *not* install VLAN packages if you previously determined that they are already present on your system.

---

See TABLE C-1 to identify the optional packages.

# Installing the Sun 10-Gigabit Ethernet Device Driver on Linux Platforms

---

This appendix explains how to install the Sun 10-Gigabit Ethernet PCI-X device driver in a Linux environment. This appendix contains the following sections:

- “Setting Up the Driver in a Linux Platform” on page 53
- “Tuning for Maximum Performance” on page 57
- “Setting Driver Parameters in a Linux Environment” on page 58

---

## Setting Up the Driver in a Linux Platform

If your system uses the Linux operating system you will need to perform the following procedure to be sure the Sun 10-Gigabit Ethernet device driver is properly installed and loaded.

### ▼ To Set Up the Driver in a Linux Platform

1. **Build the 10-Gigabit Ethernet driver:**

- For RedHat, use the following command:

```
# rpmbuild --rebuild sun-10-gigabit-kernel-1.0.version.src.rpm
```

where the *version* is the minor version number such as:  
sun-10-gigabit-kernel-1.0.82.6-1.src.rpm

## 2. Build the man pages (optional):

- For RedHat, use the following command:

```
# rpmbuild --rebuild sun-10-gigabit-1.0.version.src.rpm
```

## 3. Change to the rpm directory:

- For RedHat, use the following command:

```
# cd /usr/src/redhat/RPMS/arch
```

## 4. Install the 10-Gigabit Ethernet rpms, using the same command for both RedHat and Suse:

```
# rpm -ivh sun-10-gigabit-kernel-1.0.version.arch.rpm
```

## 5. Use the depmod command to register the Sun 10-Gigabit Ethernet module:

```
# depmod
```

## 6. Load ixge driver for all instances:

```
# modprobe ixge
```

## 7. Verify that the driver is loaded.

In the following example, the `ixge` driver is shown in ***bold italic***. On your system the driver will be indistinguishable from the other modules.

```
# lsmod
Module                Size  Used by    Not tainted
ixge                 53592  0 (unused)
ide-cd                 36616  0 (autoclean)
ipv6                   285176 -1 (autoclean)
key                    78344  0 (autoclean) [ipv6]
st                     31380  0 (autoclean) (unused)
sr_mod                 16812  0 (autoclean) (unused)
cdrom                  34664  0 (autoclean) [ide-cd sr_mod]
sg                     40384  0 (autoclean)
joydev                 7136  0 (unused)
evdev                  6496  0 (unused)
input                  7488  0 [joydev evdev]
usb-ohci               23728  0 (unused)
usbcore                87648  1 [usb-ohci]
bcm5700                194456 1
lvm-mod                81248  0 (autoclean)
reiserfs               248344 1
mptscsih               44144  2
mptbase                46400  3 [mptscsih]
sd_mod                 16192  4
scsi_mod               133028 5 [st sr_mod sg mptscsih sd_mod]
```

## 8. Run the `dmesg` command to see which devices the `ixge` driver was mapped to:

```
# dmesg
Sun(R) 10GE StreamStor River - version 1.0.82.5
Copyright (c) 1999-2004 Intel Corp., Sun Corp.
divert: allocating divert_blk for eth2
eth2: Sun(R) 10GE StreamStor River Network Connection
divert: allocating divert_blk for eth3
```

## 9. Add the `ixge` interfaces to the `/etc/modules.conf` file.

```
alias eth2 ixge
alias eth3 ixge
```

10. Use the `ethtool` command to check the parameter configurations that apply to the `ixge` driver.

```
# ethtool eth3

Settings for eth3:
Supported ports: [ FIBRE ]
Supported link modes:  10000baseT/Full
Supports auto-negotiation: Yes
Advertised link modes: 10000baseT/Full
Advertised auto-negotiation: Yes
Speed: 10000Mb/s
Duplex: Full
Port: FIBRE
PHYAD: 0
Transceiver: internal
Auto-negotiation: on
Current message level: 0x000000ff (255)
Link detected: yes
```



---

# Tuning for Maximum Performance

The following tunings will improve the performance of the Sun 10-Gigabit Ethernet device driver on a system running the Linux operating system.

1. **Create a performance tuning script (for example, `ixge_perf.sh`), and edit this file to add the interface or device ID of Sun 10-Gigabit Ethernet adapter.**

```
#!/bin/bash
echo "configuring network performance"
# set mmrbc to 4k reads, modify only Sun 10-Gigabit Ethernet device
IDs

# replace 1a48 with appropriate Sun 10-Gigabit Ethernet device's ID
# installed on the system, if needed.
setpci -d 8086:1048 e6.b=2e

# set the MTU (max transmission unit) - it requires your switch and
# clients to change too and should support the value you provide
here.
# Also set the txqueuelen on your Sun 10-Gigabit Ethernet adapter.
# If your adapter was configured as eth2, you would the following:
ifconfig eth2 mtu 16110 txqueuelen 1000 up

# call the sysctl utility to modify /proc/sys entries; update the
# location of the sysctl_ixge.conf file as appropriate
sysctl -p ./sysctl_ixge.conf
```

2. Create the conf file (for example, `sysctl_ixge.conf`) that will be called by the `sysctl` utility.

```
### IPV4 specific settings
# turns TCP timestamp support off, default 1, reduces CPU use
net.ipv4.tcp_timestamps = 0
# turn SACK support off, default on systems with a VERY fast bus ->
# memory interface this is the big gainer
net.ipv4.tcp_sack = 0
# sets min/default/max TCP read buffer, default 4096 87380 174760
net.ipv4.tcp_rmem = 1000000 1000000 1000000
# sets min/pressure/max TCP write buffer, default 4096 16384 131072
net.ipv4.tcp_wmem = 1000000 1000000 1000000
# sets min/pressure/max TCP buffer space, default 31744 32256 32768
net.ipv4.tcp_mem = 1000000 1000000 1000000

### CORE settings (mostly for socket and UDP effect)
# maximum receive socket buffer size, default 131071
net.core.rmem_max = 524287
# maximum send socket buffer size, default 131071
net.core.wmem_max = 524287
# default receive socket buffer size, default 65535
net.core.rmem_default = 524287
# default send socket buffer size, default 65535
net.core.wmem_default = 524287
# maximum amount of option memory buffers, default 10240
net.core.optmem_max = 524287
# number of unprocessed input packets before kernel starts dropping
# them, default 300
net.core.netdev_max_backlog = 300000
```

---

## Setting Driver Parameters in a Linux Environment

In a Linux operating system, the driver parameters can only be set at the time the driver is loaded. If you have already loaded the driver and have not set the parameters at the same time. Remove the driver and reinstall it.

## ▼ To Set ixge Parameters in a Linux Environment

1. Remove the Sun 10-Gigabit Ethernet PCI-X device driver, if it is already loaded.

```
# rmmmod ixge
```

2. Load the Sun 10-Gigabit Ethernet PCI-X device driver:

```
# modprobe ixge option=VAL1, VAL2, ...
```

or you can use the insmod command:

```
# insmod ixge option=VAL1, VAL2, ...
```

where *VAL1* applies to the first *ixge* interface and *VAL2* to the next interface and so on.

TABLE D-1 lists the tunable ixge driver parameters for Linux operating systems, and describes their function.

**TABLE D-1** Tunable ixge Driver Parameters for Linux Operating Systems

<b>Keyword</b>	<b>Description</b>
FlowControl	<p>Valid Range: 0-3 (0=none, 1=Rx only, 2=Tx only, 3=Rx&amp;Tx)            Default: Read from the EEPROM            If EEPROM is not detected, default is 3.            This parameter controls the automatic generation (Tx) and response (Rx) to Ethernet PAUSE frames.</p>
RxDescriptors	<p>Valid Range: 64-4096            Default Value: 1024            This value is the number of receive descriptors allocated by the driver. Increasing this value allows the driver to buffer more incoming packets. Each descriptor is 16 bytes. A receive buffer is also allocated for each descriptor and can be either 2048, 4056, 8192, or 16384 bytes, depending on the MTU setting. When the MTU size is 1500 or less, the receive buffer size is 2048 bytes. When the MTU is greater than 1500 the receive buffer size will be either 4056, 8192, or 16384 bytes. The maximum MTU size is 16114.</p>
RxIntDelay	<p>Valid Range: 0-65535 (0=off)            Default Value: 72            This value delays the generation of receive interrupts in units of 0.8192 microseconds. Receive interrupt reduction can improve CPU efficiency if properly tuned for specific network traffic. Increasing this value adds extra latency to frame reception and can end up decreasing the throughput of TCP traffic. If the system is reporting dropped receives, this value may be set too high, causing the driver to run out of available receive descriptors.</p>
TxDescriptors	<p>Valid Range: 64-4096            Default Value: 256            This value is the number of transmit descriptors allocated by the driver. Increasing this value allows the driver to queue more transmits. Each descriptor is 16 bytes.</p>
XsumRX	<p>Valid Range: 0-1            Default Value: 1            A value of 1 indicates that the driver should enable IP checksum offload for received packets (both UDP and TCP) to the adapter hardware.</p>

## ▼ To Configure VLANs in a Linux Environment

1. Ensure that the `ixge` module is loaded:

```
# modprobe ixge
```

2. Plumb the Sun 10-Gigabit Ethernet PCI-X interface:

```
# ifconfig eth2 xxx.xxx.xx.xxx up
```

where `xxx.xxx.xx.xxx` = the IP address of the interface.

3. Insert the `vlan` module:

```
# /sbin/insmod 8021q
```

4. Add `vlan` instance (VID):

```
# sbin/vconfig add eth2 5
```

5. Configure `ixge` `vlan` (`eth2` in this example):

```
# ifconfig eth2.5 xxx.xxx.xx.xxx up
```

where `xxx.xxx.xx.xxx` = the IP address of the interface.

## ▼ To Configure Bonding for Multiple ixge Interfaces

1. **Modify /etc/modules.conf file by adding these lines:**

```
alias bond0 bonding
options bonding max_bonds=2 mode=4 miimon=1000
```

Where:

bond0 is the bonding device.

max\_bonds is the number of bond interfaces to be created.

mode specifies the bonding policies.

miimon is the frequency in milliseconds that MII link monitoring will occur.

Refer to Linux documentation for more information.

2. **Load the bonding driver:**

```
# modprobe bonding
```

3. **Configure bond0 interface.**

In this example, bond0 is the master of the two interfaces eth2 and eth3.

```
# ip addr add 192.12.38.64/24 brd + dev bond0
# ip link set dev bond0 up
# ifenslave bond0 eth2 eth3
```

# Index

---

## Symbols

/etc/hostname.ixgenumber file 16

## A

assigning an IP address 15

autonegotiation

    setting

        disabling 26

## C

configuring device driver parameters 19

configuring the driver parameters 19

configuring the network host files 15

configuring VLANs 39

## D

documentation

    SunVTS 46

Dynamic Reconfiguration 5

dynamic reconfiguration 11

Dynamic Reconfiguration (DR) 11

## E

editing the network host files 5

## F

files and directories on the CD-ROM 50

flow control keywords 21

## H

hardware

    requirements 2

## I

ifconfig -a 41

ifconfig command 15

installing the adapter with DR 11

installing the adapter without DR 6

ixge driver parameter, status, and descriptions 20

## L

link partner settings

    checking 32

## N

ndd utility 24

## P

parameter values

    how to modify and display 24

parameters and settings 20

physical dimensions 44

## R

receive interrupt blanking values 20, 21

## S

setting ixge driver parameters

    using ndd

        using ixge.conf 23

software

    requirements 2

SunVTS

    documentation 45

SunVTS diagnostic application 45

## V

verify the installation 9

virtual device 41

VLAN ID 39

VLAN naming format 40

VLANs 37

