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SGI® 10-Gigabit Ethernet Network
Adapter User's Guide

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Contents

About this Guide

This guide describes the SGI 10-Gigabit (Gbit) Ethernet network adapter, shows you how to connect the adapter to an Ethernet network, and explains how to operate the adapter.

The SGI 10-Gbit Ethernet network adapter operates under the following:

- IRIX 6.5.23 plus required patches

- IRIX 6.5.24 plus required patches

- SGI ProPack 3 for Linux

You can use the SGI 10-Gbit Ethernet network adapter in addition to your current adapter.

This guide assumes that you have general knowledge of Ethernet networks and the system in which the adapter is installed.

Important Information

Warning: Never look into the end of a fiber optic cable to confirm that light is being emitted (or for any other reason).

Do not use any type of magnifying device, such as a microscope, eye loupe, or magnifying glass. Such activity causes cause a permanent burn on the retina of the eye. Optical signal cannot be determined by looking into the fiber end.

Most fiber optic laser wavelengths (1300 nm and 1550 nm) are invisible to the eye and cause permanent eye damage. Shorter wavelength lasers (for example, 780 nm) are visible and can cause significant eye damage.

Use only an optical power meter to verify light output.

Scope of this Guide

This guide is written to facilitate installation of the adapter and does not cover detailed points of network configuration. It contains the following chapters:

- Chapter 1, "Features and Capabilities of the SGI 10-Gbit Ethernet Network Adapter", summarizes features, cabling, configuration limits, and tools.

- Chapter 2, "Connecting the Adapter to a Network", shows you how to connect the adapter to your network.

- Chapter 3, "Operating the Adapter", explains how to verify installation of the adapter and software, how to reset the adapter, how to set parameters to improve performance, and how to set configuration parameters.

Related Publications

This guide is part of a document set that fully supports the installation, operation, and service of the adapter. For more information about installing and servicing the adapter, see the user's guide for the system in which the adapter is installed.

Also see the following:

- *IRIX Admin: Networking and Mail*

- *Linux Configuration and Operations Guide*

- *The Network Administrators' Guide*

- The following man pages:

  – xg(7M)

  – xgcmd(1M)

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- See the SGI Technical Publications Library at http://docs.sgi.com. Various formats are available. This library contains the most recent and most comprehensive set of online books, release notes, man pages, and other information.

- If it is installed on your SGI system, you can use InfoSearch, an online tool that provides a more limited set of online books, release notes, and man pages. With an IRIX system, enter `infosearch` at a command line or select **Help > InfoSearch** from the Toolchest.

- On IRIX systems, you can view release notes by entering either `grelnotes` or `relnotes` at a command line.

- On Linux systems, you can view release notes on your system by accessing the `README.txt` file for the product. This is usually located in the `/usr/share/doc/`*productname* directory, although file locations may vary.

- You can view man pages by typing `man` *title* at a command line.

Conventions

The following conventions are used throughout this document:

Convention	Meaning
`command`	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
variable	Italic typeface denotes variable entries and words or concepts being defined.
user input	This bold, fixed-space font denotes literal items that the user enters in interactive sessions. (Output is shown in nonbold, fixed-space font.)

| [ ] | Brackets enclose optional portions of a command or directive line. |
| ... | Ellipses indicate that a preceding element can be repeated. |

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Features and Capabilities of the SGI 10-Gbit Ethernet Network Adapter

The 10-Gbit Ethernet technology is an extension of Gigabit Ethernet (1000-Base-T) technology that allows over-the-wire speeds up to 10 Gbits per second (Gbps), which is theoretically ten times the rate of existing technology. Given the limitations of the bus and the CPUs, realistic performance with the SGI 10-Gbit Ethernet network adapter will not exceed 4.5–6 Gbps.

The 10-Gbit Ethernet technology is targeted at backbone networks and interserver connectivity. It provides an upgrade path for high-end workstations that require more bandwidth than Gigabit Ethernet can provide.

The adapter is supported in the following systems:

- SGI Altix 3000

- SGI Altix 350

- SGI Origin 350

- Silicon Graphics Onyx 4

- Silicon Graphics Onyx 350

- SGI Origin 3000 with IX brick or PX brick

- Silicon Graphics Onyx 3000 with IX brick or PX brick

- Silicon Graphics Tezro

This chapter includes the following sections:

- "Features" on page 2

- "Cabling" on page 2

- "Configuration Limits" on page 3

- "Tools" on page 3

Features

The adapter includes the following features:

- Full-duplex Gigabit Ethernet interface as defined in the IEEE P802.3ae approved standard

- Support for Ethernet frame sizes up to 9600 bytes

- 16 DMA channels (8 for reading, 8 for writing)

- Single LC fiber connection

- Support for PCI 64-bit 66-MHz and PCIX 66/100/133-MHz

- Universal dual-voltage signaling (3.3 V and 5 V)

- Compliance with PCI Local Bus Specification (Revision 2.3) and PCI-X Addendum to the PCI Local Bus Specification (Revision 1.0a) standards

Cabling

The adapter is connected to the network using multimode fiber (MMF) cable. The cable, which is not included in the shipment, must be a 50-micron cable that is 2000 MHz*Km with at least one LC connector. This cable will support distances up to 300M.

Table 1-1 lists operating ranges for 10-Gb cables. Fiber type is MMR.

Table 1-1 10-Gbit Cable Standards

Diameter (Microns)	Modal Bandwidth (MHz * km)	Range (Meters)
50	400	2 to 66
50	500	2 to 82
50	2000	2 to 300

Configuration Limits

The number of the 10-Gbit Ethernet network adapters supported varies by system. Consult with your SGI representative to determine the currently supported maximum for your configuration.

Tools

The SGI 10-Gbit Ethernet network adapter product contains the following tools:

- xg(7F) driver

- xgcmd(1M) diagnostic tool to interrogate and control both the driver itself and the interfaces under its control

For more information, see the man page associated with each tool.

Connecting the Adapter to a Network

This chapter discusses the following:

- "Installing the Adapter"

- "Connecting to the Network"

For information about configuring the interfaces, see *IRIX Admin: Networking and Mail* and *The Network Administrators' Guide*.

Installing the Adapter

The installation instructions for the SGI 10-Gbit Ethernet network adapter are different for different systems. Refer to the following sources for installation instructions:

- Altix 3000, Onyx 3000, or Origin 3000: The adapter must be installed by an SGI certified service provider.

- Origin 350, Onyx 350, and Altix 350: See the instructions for installing a PCI card in the user's or owner's guide that came with the system.

- Silicon Graphics Tezro: See the instructions for installing a PCI card in the user's or owner's guide that came with the workstation.

Connecting to the Network

To connect the adapter to a network, do the following:

1. Remove the protective end caps and **save them**.

   ⚠️ **Caution:** 10-Gbit optics are very sensitive. If you plan on leaving them disconnected for any length of time, you must replace the end caps. The optics on the SGI 10-Gbit Ethernet network adapter cannot be cleaned.

2. Insert the LC connector on one end of the fiber-optic cable into the adapter, as shown in Figure 2-1. Ensure that the connector is inserted completely into the jack.

Note: If the network connects to an Ethernet switch, consult the operating manual for the switch to ensure that the switch port is enabled and configured correctly.

3. Insert the connector on the other end of the fiber-optic cable into the connector on the Ethernet switch, or another computer system (as appropriate).

Figure 2-1 shows the connector.

Fiber-optic connector
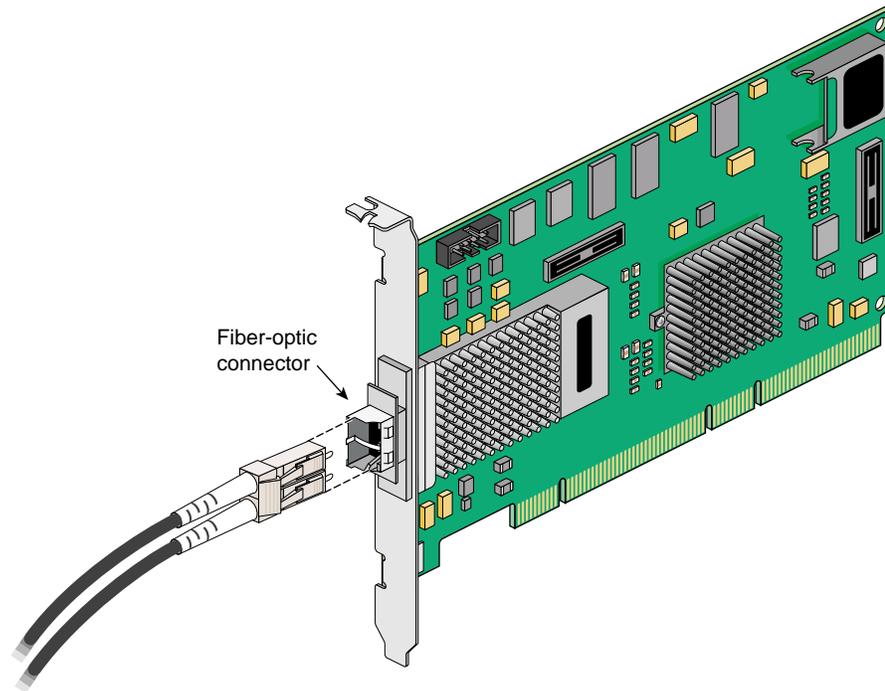
Figure 2-1 Fibre Optic Connections

Operating the Adapter

This chapter describes various issues that may occur when using the SGI 10-Gbit Ethernet network adapter in a 10-Gbit Ethernet network. It includes the following sections:

- "Verifying Functionality"

- "Resetting the Adapter" on page 11

- "Configuration Parameters" on page 11

- "MTU Size Settings" on page 11

Verifying Functionality

This section explains the following:

- "Using LEDs to Determine Functionality"

- "Verifying Adapter Recognition" on page 8

- "Enabling the Adapter" on page 10

- "Verifying that the Adapter is Properly Configured and Enabled" on page 10

Using LEDs to Determine Functionality

The SGI 10-Gbit Ethernet network adapter has light-emitting diodes (LEDs) that indicate whether the adapter is configured correctly and connected to an active Ethernet. Table 3-1 describes the functions of the LEDs.

Table 3-1 LEDs on the SGI 10-Gbit Ethernet Network Adapter

LED	State	Purpose
ACT	Blinking Off	Data detected No data detected
LINK	On Off	Good link No link: faulty cable, faulty connector, or communication mismatch

During normal operation, the link LED is on; the data LED blinks whenever the adapter is receiving traffic.

Note: At the time of release, a bug in the driver prevents the link light from behaving correctly. The link light may be on or off due to this bug. This problem will be corrected in a future release.

Verifying Adapter Recognition

IRIX Verification

Under IRIX, the network interface name for the SGI 10-Gbit Ethernet network adapter is xg*N*, where *N* is the number of the adapter: 1 for the first adapter, 2 for the second adapter (if installed), and so on. Use the commands in the examples below to display the network interface names.

Note: IRIX uses /etc/ioconfig.conf to keep adapters and unit numbers consistent between reboots and new hardware installs. As a result, if a adapter is removed, it's interface name will be reserved until it is removed from /etc/ioconfig.conf. As a result, if you move adapters around the system or remove adapters, you may see some interface numbers get skipped.

To verify that the operating system has located the adapter, enter the following:

irix% **/bin/hinv**

A line similar to the following should appear, where *N* is the number of the adapter:

Gigabit Ethernet: xg*N*, module 001c10, PCI bus 0 slot 1

For example, the first adapter would appear as xg1:

```
Gigabit Ethernet: xg1, module 001c10, PCI bus 0 slot 1
```

Linux Verification

Under Linux, the network interface name for the SGI 10-Gbit Ethernet network adapter is eth*N*, where *N* is the number of the adapter: 1 for the first adapter, 1 for the second adapter (if installed), and so on.

To verify that the adapter has been recognized, do the following:

1. To verify that the operating system has located the adapter, view the contents of the /proc/net/dev file. For example, the following shows the first adapter, eth1 (output truncated on the right side):

```
linux# cat /proc/net/dev
Inter-|   Receive                                                |  Transmit
 face |bytes    packets errs drop fifo frame compressed multicast|bytes     packets ...
    lo:   7000      119   0    0    0     0          0         0     7000       119 ...
  eth1: 7874776   35815   0    0    0     0          0         0 10800759    16412 ...
```

2. Load the s2io module:

   ```
   linux# insmod s2io
   ```

   To make this module load at system boot time, enter the following line into the modules.conf file:

   ```
   alias eth1 s2io
   ```

3. Use the ifconfig command to show the new eth*N* interface. For example:

   ```
   linux# ifconfig -a
   eth1      Link encap:Ethernet  HWaddr 00:0C:FC:00:01:24
             inet addr:10.2.2.2  Bcast:10.2.2.255  Mask:255.255.255.0
             UP BROADCAST RUNNING MULTICAST  MTU:9600  Metric:1
             RX packets:5 errors:0 dropped:0 overruns:0 frame:0
             TX packets:5 errors:0 dropped:0 overruns:0 carrier:0
             collisions:0 txqueuelen:100
             RX bytes:414 (414.0 b)  TX bytes:322 (322.0 b)
             Interrupt:59
   ```

Enabling the Adapter

To enable the adapter, enter the following:

ifconfig *IPaddress* **broadcast** *broadcastaddress* **netmask** *netmaskvalue*

For other systems to see the new address, you must enter the new hosts addresses in DNS or in host files or NIS as required for your system.

For details, see the operating-system specific documentation about networking.

Verifying that the Adapter is Properly Configured and Enabled

To verify that the network interface is configured properly and is enabled on, enter the following:

% **/usr/etc/netstat -ia**

Columns with the following headings should appear:

Name Mtu Network Address

In the Name column, the xg number should appear. If it is followed by an asterisk (*), the interface is disabled.

In the Mtu column, the size of the current maximum transmission unit (MTU) should appear. The MTU size is set via the -mtu switch of the ifconfig command. If no size is specified by the -mtu switch, the adapter defaults to an MTU size of 1500.

In the Network column, the IP network address should appear.

In the Address column, the canonical MAC address of the adapter should appear, which looks similar to the following:

08:00:69:0b:e0:41

In this address, the organizationally unique identifier (OUI) of the adapter vendor is represented by the first three sets of numbers (for example, 08:00:69). The last three sets vary, depending on the system.

See the netstat man page for more details.

Resetting the Adapter

In the unlikely event that you need to reset the adapter, enter the following, where *N* is the adapter number:

- IRIX:

  ```
  # ifconfig xgN down
  # ifconfig xgN up
  ```

- Linux:

  ```
  # ifconfig ethN down
  # ifconfig ethN up
  ```

Configuration Parameters

The configuration of the adapter is controlled by a number of parameters, which are discussed in the `/etc/config/xgcmd.options` file.

To change the configuration of your adapter, use the `xgcmd` command. For more information, see the `xgcmd` man page.

MTU Size Settings

The maximum transmission unit (MTU) size is controlled by the `mtu` *mtu_size* switch of the `ifconfig` command. The most common MTU sizes are 1500 bytes (standard-size Ethernet frames) and 9000 (jumbo Ethernet frames). The adapter supports an MTU size of up to 9600 bytes. Configuring the adapter to use jumbo frames will increase network bandwidth and reduce CPU load, but only if the network supports jumbo frames.

To configure the MTU size, follow these steps:

1. At the command prompt, enter the following command:

   ```
   netstat -i
   ```

   The output will display information about the network adapters currently installed in the system, as follows:

   ```
   Name Mtu   Network  Address     Ipkts Ierrs Opkts Oerrs Coll
   xg1  1500  10.50.1  system.name 0     0     1     0     0
   ```

2. To bring down the adapter, enter the following command, where *N* is the number of the adapter:

   ifconfig xg*N* down

3. To change the MTU size of the 10-Gbit Ethernet adapter, enter the following command, where *N*is the number of the adapter:

   ifconfig xg*N* mtu 9600

4. To restart the adapter, enter the following:

   ifconfig xg*N* up

5. Enter the following command to verify that the MTU size has been changed:

   netstat -i

   The output should look similar to the following:

   ```
   Name Mtu    Network  Address     Ipkts Ierrs Opkts Oerrs Coll
   xg1  9600   10.50.1  system.name 0     0     3     0     0
   ```

Glossary

CD-ROM (CD)

A flat metallic disk that contains information that you can view and copy onto your own hard disk; you cannot change or add to the disk. CD-ROM is an abbreviation for compact disc read-only memory.

Ethernet

A communication network used to connect computers.

gigabit (Gbit)

A communication rate of 2^{30} bits per second.

host

Any system connected to the network.

hostname

The name that uniquely identifies each host (system) on the network.

IP address

A number that uniquely identifies each host (system) on a TCP/IP network.

LED

Light-emitting diode, a light on a piece of hardware that indicates status or error conditions.

MAC

Medium access control, also called the physical layer.

MAC address

The physical address of the SGI 10-Gbit Ethernet Network adapter, which is distinct from the IP address.

MTU

Maximum Transmission Unit is a configuration parameter that controls the size of the Ethernet frames that the SGI 10-Gigabit Ethernet network adapter can transmit and receive.

man (manual) page

An online document that describes how to use a particular IRIX command. Also called reference page.

NIS

Network Information Service, a distributed database mechanism for user accounts, host names, mail aliases, and so on.

PCI

Peripheral Component Interconnect, a bus specification. The PCI bus is a high-performance local bus used to connect peripherals to memory and a microprocessor. Many vendors offer devices that plug into the PCI bus.

reference page

See *man (manual)* page.

TCP/IP

A standard networking protocol that is included in the IRIX software.

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