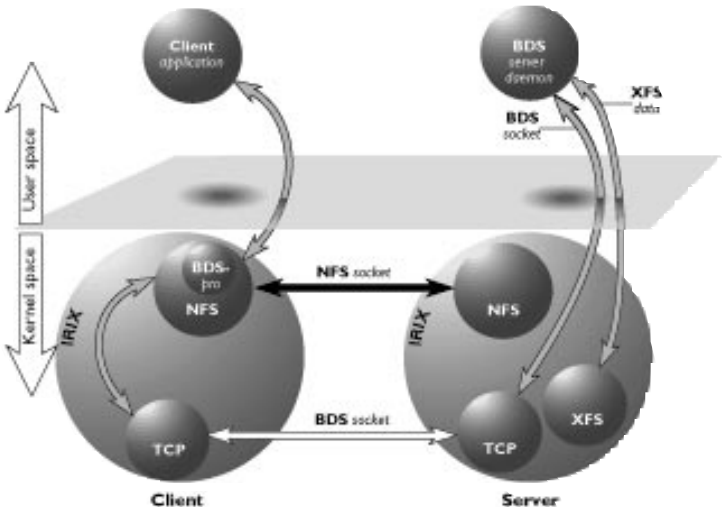
Networking



Bulk Data Service is an extension to NFS.

Bulk Data Service Moves Large Files Efficiently on Gigabit Networks

High-Performance Networking Solutions

Silicon Graphics offers a complete networking product family that sets the pace for high-performance network computing, both local and wide area, with the fastest IP connectivity in the industry. Ultra-high-performance tuning and optimization for Silicon Graphics® platforms, plus compliance with Internet standards, add up to the fastest, most flexible networking solutions available today.

HIPPI

When large volumes of data need to be moved in technical or commercial computing environments, HIPPI is the best gigabit technology available. Silicon Graphics is the leading provider of HIPPI connectivity solutions.

IRIS® HIPPI-Serial*, a single-port network interface that conforms to the ANSI High-Performance Parallel Interface-Serial (HIPPI-Serial) Specification, Revision 2.3, implements short-wavelength, fiber-optic-based HIPPI-Serial to provide 800Mb per second in each direction simultaneously. IRIS HIPPI-Serial leads the industry with TTCP rates exceeding 720Mb per second using TCP/IP over a HIPPI network.

** XIO networking adapters can be used standard in our high-performance XIO bus in Origin2000™, Onyx2™, and OCTANE, and with the expansion box in Origin200™. PCI networking adapters can be used standard on O2™ and in all other new generation Silicon Graphics workstations and servers with the PCI expansion box.*

The IRIS HIPPI-Serial network adapter is a single slot (half-size) XIO board. All communication with the host is DMA-based using the scatter/gather model. Multiple descriptor rings drastically reduce system interrupts.

The IRIS HIPPI-Serial network adapter features:

- Four MIPS® RISC processors
- 8.5MB of onboard memory
- Onboard IP checksum calculation
- Independent hardware support for each direction
- Capability to generate up to 128 READY credits
- Self-testing loopback mode

HIPPI-Bypass, a proprietary, low-latency, high-bandwidth protocol, enables very low-latency communication between hosts. The protocol bypasses the conventional network processing overhead, allowing any user-level process to send and directly receive messages to and from the network adapter while preserving page-based protection mechanisms.

ATM

The IRIS Multiport ATM OC3c network adapter is an excellent solution for applications that require constant or nearly constant data rates, such as video-on-demand or multiple, simultaneous streams with guaranteed bandwidth.

The IRIS Multiport ATM OC3c network adapter includes two onboard RISC processors and four independent SONET OC3c ports (155.52Mb per second). The XIO ATM network adapter can also provide full-duplex throughput on all ports simultaneously. The ports support multimode fiber-optic SC connectors.

The IRIS Multiport ATM OC3c network adapter is designed specifically for the new Scalable Shared-memory MultiProcessing (S2MP™) and OCTANE™ architectures from Silicon Graphics. Depending on the applications, the network adapter can support up to 256 virtual channels (VCs) per port. It has 4MB of local memory per port shared between receive and transmit functions, and 512KB of local control memory per port for VC tables, cell scheduling tables, and received cell buffers.

The IRIS Multiport ATM OC3c network adapter also includes:

- A character device API for environments that require CBR traffic or other custom applications
- A VC management program (atmarp) for IP over PVC configurations
- An ILMI management daemon, with SNMP MIB accessible through either ATM ports or other IP networking interfaces

The IRIS Multiport ATM OC3c network adapter fully complies with industry standards, such as versions 3.0 and 3.1 of the ATM Forum's ATM User-Network Interface standard. It supports ATM adaptation layer 5 (AAL5) over Constant Bit Rate (CBR), and best-effort traffic (UBR), and all standard IP applications (through SVCs and/or PVCs), using best-effort traffic contracts in compliance with RFC 1577 (Classical IP over ATM).

I00Base-T (Fast Ethernet™)

One 100Base-T port comes standard with all of our new generation systems. Silicon Graphics 100Base-T products support the TX interface and can autosense 100Base-T or 10Base-T for backward compatibility with existing networks.

100Base-T is the most popular low-cost solution for increased desktop bandwidth. Because 100Base-T and Ethernet use the same CSMA/CD method, packet size, and format, you can easily integrate 100Base-T into your existing networks. The ease of upgrading existing networks to 100Base-T makes it the most attractive technology when existing networks become saturated or new stations are added.

For optimal performance the optional four-port 100Base-T XIO network adapter is tuned for high-performance multiprocessing systems and features:

- Onboard local memory with store-and-forward architecture minimizing overhead and packet delivery latency
- Interrupt batching techniques minimizing interrupts, PIOs per packet, and CPU load
- Buffer and descriptor formats designed to minimize copying, and IP checksumming performed in the hardware, reducing the need for the operating system and driver to touch data

FDDI

The IRIS PCI FDDI network adapter from Silicon Graphics is a single-port board available in single- or dual-attach fiber and single-attach copper configurations. The dual-attach fiber network adapter supports an optional optical bypass switch. FDDI is an excellent backbone technology and client/server solution for compute or file server applications.

The PCI FDDI network adapter minimizes host load and optimizes system throughput and PCI utilization with:

- Separate transmit and receive descriptor rings maintained and managed locally, each supporting multiple buffers per frame
- An intelligent DMA controller that supports chaining
- Scatter/gather for optimizing data transfers
- Automatic byte alignment for data transmission, eliminating data copies on the receiving host
- Programmable, partitioned 8KB local buffer memory
- Programmable, 64-entry, 48-bit Content Addressable Memory (CAM) that handles fast detection/matching destination of source, individual, or multicast addresses
- FIFO buffering that supports simultaneous, full-speed, zero-wait-state PCI and FDDI data transfers
- Time-critical functionality implemented in hardware to greatly reduce the SMT processing load, while link-level driver software supports SNMP with MIB-2 and other extensions

Synchronous Serial Communications

With two high-speed serial ports capable of T1/E1 synchronous serial communications, the new Silicon Graphics synchronous serial network adapter is a powerful engine that frees the host to perform other system tasks. It features an interrupter and bidirectional FIFOs for each DMA channel. Ports can be configured independently as either DTE or DCE for EIA-232D, V.35, or X.21.

The synchronous serial network adapter supports the same higher-level protocols as previous synchronous serial network adapters: X.25/HDLC, SNA/SDLC, TCP/IP, PPP, and Frame Relay. It does not contain an integral CSU/DSU for connection to the telephone network.

ISDN–BRI

Silicon Graphics provides a standard option for accessing ISDN networks. The single Basic Rate Interface card provides an S/T connection and will work with other ISDN equipment on the same S/T bus. This interface adapter is one half-length PCI adapter and is currently in use on the O2 platforms under IRIX™ 6.3. Support for IRIX 6.4 on OCTANE workstations is planned.

Silicon Graphics is in the process of homologating this adapter and the accompanying software in each of the major world geographies. Currently, the adapter has been tested and shown to work with DMS-100, 5ESS, and NET3 protocols.

NFS™

The Silicon Graphics high-performance implementations of Network File System™ (NFS) include Versions 2 and 3, CacheFS, and AutoFS. NFS scalability has been demonstrated with industry-leading LADDIS numbers, complemented by proven performance on everything from Ethernet to HIPPI interfaces.

NFS lets users access file hierarchies across a network and treat them as though they were local. Hierarchies can be entire filesystems or individual directories. Systems participating in the NFS service can be heterogeneous; they may be manufactured by different vendors, use different operating systems, and be connected to networks with different architectures. These differences are transparent to the NFS application.

As a network service, NFS can be used on any network running the Transmission Control Protocol (TCP) or User Datagram Protocol (UDP). It relies on Remote Procedure Calls (RPC) for session layer services and eXternal Data Representation (XDR) for presentation layer services.

- NFS V3 protocol enables Silicon Graphics servers to obtain superior data transfer rates over today's high-speed networks while maintaining seamless compatibility with the installed base of V2 clients
- CacheFS, a local disk caching mechanism, reduces network traffic, increases performance of repeated operations on data read over the network, and simplifies system administration
- AutoFS replaces the earlier automounter and allows flexible administration of filename spaces across a distributed client/server network
- XFS™ with NFS V3 allows very large files and filesystems to be transparently accessed via the network
- NFS is fully multithreaded for high performance on multiprocessor systems

Bulk Data Service

Bulk Data Service is an extension of the NFS protocol that makes it possible to move large sequential files across a network 10- to 20-times faster than NFS on today's HIPPI connections. It is designed specifically for data-intensive environments where high-speed data transfers are critical for time-to-market or efficient use of expensive resources.

The IRIS BDSpro implementation of Bulk Data Service provides optimum performance by extending NFS with separate high-speed pipes for control and read/write operations, without the limitation of a fixed block size. Its high-speed networking performance takes advantage of the Silicon Graphics XFS™ advanced filesystem, which is capable of delivering more than 400MB per second of sustained throughput.

With up to four HIPPI channels at 50MB per second per channel, IRIS BDSpro delivers an aggregate data transfer rate of up to 200MB per second. This powerful new software technology expedites access to critical data and dramatically increases productivity in research, supercomputing, animation, oil and gas exploration, GIS, and prepress environments.

Dynamic Host Configuration Protocol (DHCP)

DHCP is an innovative TCP/IP enhancement that provides a way to dynamically assign IP network addresses and other TCP/IP stack parameters. DHCP relieves the network administrator from having to assign an IP address to each participating computer by hand.

DHCP includes an address reservation scheme so unused IP addresses can be reassigned automatically, and DHCP can be used to hand out local network parameters such as subnet mask and default router addresses.

In addition to full compliance with all appropriate protocols, the Silicon Graphics implementation of the DHCP provides dynamic addressing on multiple subnets. It allows client machines to specify their own host names, if permitted by the server, and allows the server to assign IP addresses dynamically on multiple networking interfaces. The result is a plug-and-play TCP/IP for the desktop.

SUPPORTED NETWORKING OPTIONS ON SILICON GRAPHICS PLATFORMS:

PCI Networking Options	**O2**	**OCTANE**	**Origin200/Origin2000**	**Onyx2**
FDDI single- or dual-attach fiber, single-attach copper	✓	✓	✓	✓
10 Base-T/100 Base-TX (Second Fast Ethernet)	✓	✓	✓	✓
Synchronous Serial	✓	✓	✓	✓
ISDN (BRI)	✓	✓	N/A	N/A
ATM	third party	third party	third party	third party
HIPPI	third party	third party	third party	third party
Fibre Channel	third party	third party	third party	third party
Token Ring*	third party	third party	third party	third party
XIO Networking Options	**O2**	**OCTANE**	**Origin200/Origin2000**	**Onyx2**
HIPPI (single port)	N/A	N/A	✓	✓
ATM (4 ports)	N/A	N/A	✓	✓
10 Base-T/100 Base-TX (4 Ethernet ports, 6 serial ports)	N/A	✓	✓	✓

*Driver supported by Silicon Graphics

Networking

IRIX Networking Standards

IRIX implements the following Internet Request for Comment (RFC) standards:

RFC	Protocol	Name
678		Standard File Format
768	UDP	User Datagram Protocol
791	IP	Internet Protocol
792	ICMP	Internet Control Message Protocol
793	TCP	Transmission Control Protocol
821	SMTP	Simple Mail Transfer Protocol
822	MAIL	Format of Electronic Mail Messages
826	ARP	Address Resolution Protocol
854	TELNET	Telnet Protocol
959	FTP	File Transfer Protocol
1014	XDR	External Data Representation
1042	IP-IEEE	Internet Protocol for IEEE 802
1055	SLIP	Serial Line Internet Protocol
1057	RPC	Remote Procedure Call V2
1058	RIP	Routing Information Protocol
1094	NFS	Network File System Protocol
1122		Internet Hosts Communication Layers
		(Interoperability to Mandatory Level Only)
1123		Internet Hosts Communication Layers
		(Interoperability to Mandatory Level Only)
1157	SNMP	SNMP
1213	MIB-II	Management Information Base II
1323	TCP	TCP Extensions for High Performance
1533	DHCP	DHCP Options and BOOTP
1534	DHCP	Dynamic Host Configuration Protocol
1541	DHCP	Dynamic Host Configuration Protocol
1542	BOOTP	BOOTP Protocol
1577	ATM	Classical IP and ARP over ATM
1723	RIP V2	RIP Version 2
1813	NFS V3	NFS V3 Protocol
1945	HTTP 1.0	Hypertext Transfer Protocol

IRIX also implements the following non-RFC standards:

Non-RFC		Name
r-commands		4.3 r-commands (rsh, rlogin, rcp, rexec)
ONC/ONC+		Sun ONC+ 1.2 and Sun ONC 4.2 (but not NIS+)
HIPPI		HIPPI-PH (X3.183-1991)
HIPPI		HIPPI-SC (X3.222-1983)
HIPPI		HIPPI-FP (X3.210-1992)
HIPPI		HIPPI-LE (X3.218-1993)
ATM		UNI 3.0 ATM and 3.1 ATM
DCE		OSF/DCE 1.1 Core Services (DCE 1.1 with DFS)
AFS		AFS 3.4 via Transarc Corporation

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