SunSwift™ PCI Bus Adapter

Just the Facts

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SunSwift™ Positioning

Why a Combination Fast Ethernet/SCSI Product?

The growing importance of LANs and the increasing complexity of user applications are fueling the need for high-speed networks. A number of high-speed LAN technologies have been proposed to provide greater bandwidth to satisfy this need. Among them is 100BASE-T Fast Ethernet, a technology designed to provide a smooth transition from 10BASE-T Ethernet—currently the dominant 10-Mbps network type—to high-speed 100-Mbps performance.

Fast Ethernet is a natural extension of the existing 10-Mbps Ethernet technology that has an installed base of more than 170 million nodes. It is compatible with the existing application base, networking protocols, media, and standards. It is also cost-effective and easy to deploy, offering ten times the speed of 10BASE-T Ethernet at less than twice the cost. Fast Ethernet's backward compatibility allows customers to protect their investment in Ethernet expertise while delivering higher-bandwidth performance.

With the increase in system performance, a faster SCSI interface is now needed. SCSI, an integral part of the Sun™ Workstation™ platform, is an intelligent bus which allows for easy connection of peripheral devices. The Fast/Wide SCSI-2 interface operates at 20 MB per second and utilizes 16-bit addressing, providing high I/O throughput per slot.

As a result, there is a need for an adapter that supports both Fast Ethernet and SCSI connections. The SunSwift™ SBus adapter currently meets this need for Sun SBus platforms. As Sun introduces new platforms utilizing a PCI bus, the SunSwift PCI Adapter will be available to support both 10 and 100 Mbps Ethernet and Fast/Wide SCSI-2 connections on a single, low-cost PCI bus card.

Sun and Fast Ethernet

Fast Ethernet, 100BASE-T, is an extension of the existing 10 Mbps 10BASE-T standard. It supports existing 10BASE-T networking protocols, media, and standards, making it cost effective and easy to deploy, and offering backward compatibility to the more than 170 million nodes in the Ethernet installed base. Providing a tenfold increase in performance at less than half the cost makes Fast Ethernet a valuable resource to departments eager to protect their investment in Ethernet, while delivering the performance required by power users and applications.

Sun has led the industry in the development and evangelism of Fast Ethernet technology. As a founding member of the Fast Ethernet Alliance, Sun has worked with other industry leaders to define Fast Ethernet specifications and standards and increase user awareness of the technology. Sun Microsystems Computer Company’s Networking Computing Group chaired the IEEE 802.3u 100BASE-T group in writing the standard. It was approved in June 199,5 and is now part of the IEEE 802.3 standard.

SunSwift Product Overview

The SunSwift PCI Bus Adapter is a half-size PCI adapter, offering both dual speed 10/100 Mbps Ethernet and 20 MB per second Fast/Wide SCSI capabilities. It is the first high-performance Fast Ethernet/SCSI combination PCI adapter in the industry.

SunSwift is ideal for customers who wish to use as few PCI Bus slots as possible and require both Fast Ethernet and SCSI-2 connections. Deployment of the SunSwift Adapter offers customers higher performance and investment protection at a minimal cost.

Key Messages

The key messages to remember about the SunSwift PCI adapter are:

- Low cost. Fast Ethernet is a low cost alternative to more expensive high-performance networking technologies such as ATM, FDDI and Gigabit Ethernet.
- Conserves PCI slots. Both 10/100 Mbps Ethernet and SCSI-2 connections are available on a single PCI card, conserving system PCI slots.
- Network flexibility. The 10/100 Mbps auto-negotiating port of SunSwift supports both 10 Mbps and 100 Mbps networks, providing compatibility with existing 10 Mbps networks and easy migration to 100 Mbps networks.
- Investment protection. Existing 10BASE-T wiring infrastructure can be used, reducing overall costs.

Availability

- The SunSwift PCI Bus Adapter will be orderable starting on July 15, 1997.
- The product will be available in volume in August, 1997.

Target Users

Both new and installed-base customers benefit from SunSwift adapter.

Customers require Fast Ethernet connections in a number of situations:

- users who need a second Ethernet connection
- users who need a low cost alternative to FDDI, ATM and Gigabit Ethernet

Fast Ethernet offers a logical migration path for users because it supports customers' existing cabling plant, leverages their prior experience with Ethernet, and offers a cost-effective solution compared to the expense of migration to ATM and FDDI.

Customers require Fast/Wide SCSI-2 connections for:

- users who need expandability with larger disk capability
- users who need flexibility to connect to other SCSI peripheral devices
- users who need multiple SCSI-2 connections on the same platform

Positioning *(cont.)*

Product Family Placement

Sun offers three Fast Ethernet options for PCI-based Sun systems:

- SunSwift PCI Adapter

  Supports one 10/100 Mbps full/half duplex Ethernet connection and one Fast/Wide SCSI-2 connection. SunSwift is ideal for customers who wish to use as few PCI Bus slots as possible and require both Fast Ethernet and SCSI-2 connections.

- SunFastEthernet™ PCI Adapter

  Supports one 10/100 Mbps full/half duplex Ethernet connection. Sun FastEthernet PCI adapter is a low cost alternative that provides a single Fast Ethernet connection.

- Sun Quad FastEthernet™ PCI Adapter

  Supports four 10/100 Mbps full/half duplex Ethernet connections on a single PCI card. The Sun Quad FastEthernet product is best suited for customers who need multiple network connections or who require the higher aggregate network bandwidth provided by four ports.

Networking at Sun

Sun understands the importance of making every computer network aware. LAN/WAN interfaces such as Ethernet and ISDN have already been built into Sun systems. In addition, Sun FastEthernet and Fast/Wide SCSI-2 are included in the UltraSPARC™ platforms to reduce cost of ownership. ONC+™ and NFS™ are part of Solaris™, and available on every system. Federated Services, Common Open Software Environment (COSE), Distributed Computing Environment (DCE), and future NEO™ services will continue to add strength to the Solaris distributed computing environment.

With computer processing power advancing exponentially, and new I/O technology providing an affordable, high-speed interconnection for computers and peripherals, the network can become the constraint for computing performance. Advanced applications users are demanding that this constraint be eliminated.

The higher bandwidth of Fast Ethernet removes the constraint for most Ethernet users, and provides a low-risk interim upgrade for customers requiring even more bandwidth in the future, such as that provided by ATM or Gigabit Ethernet. Fast Ethernet and ATM are complementary technologies, and are expected to coexist in virtually all organizations for many years to come.

Peripheral Component Interconnect (PCI)

As a leading supplier of powerful hardware systems for technical and commercial computing, Sun Microsystems™ is continually searching for innovative, reliable technologies which complement its high-performance platform designs. In looking to the future, and anticipating increased demands from users for more performance as well as more choice of system peripherals, Sun recognized the benefits of the emerging system bus option known as the Peripheral Component Interconnect (PCI) bus. While still committed to supporting SBus platforms and peripherals, Sun believes that the new PCI specification, version 2.1, is robust and powerful enough to increase the potential of Sun's desktop products, while adhering to important industry standards.

Why PCI?

PCI offers many of the same characteristics as SBus, and is an open standard that Sun has chosen to support for a variety of reasons:

- Open, economical, architecture-independent bus

  Because PCI is open, it is being adopted more quickly by both consumers and producers of computer hardware. As a result, the potential exists for a large number of platform-independent peripherals to be quickly supported, along with the resultant economies that come from a more competitive marketplace.
- PCI is fast

  The PCI bus architecture is designed to provide high performance, with its I/O performance a key differentiator from other bus architectures. Running at 33 MHz and 66 MHz, PCI offers configurations that meet a variety of developer and user needs.
- PCI is standardized

  PCI is a standard bus architecture that has been adopted by the volume personal computer industry. Because of its wide acceptance, PCI promises that compliant adapter cards will be available from more sources than ever before.

Sun believes the PCI bus design offers its customers the best of both worlds: a high-performance bus and an industry-standard design which promotes interoperability and widespread adoption.

Peripheral Component Interconnect (PCI) *(cont.)*

What is PCI?

PCI is a high-performance bus that is used as an interconnect between highly integrated components and subsystems, such as peripherals, add-on boards, and memory systems. On Sun™ systems, the processor, main memory, and graphics are connected through the high-performance Ultra™ Port Architecture (UPA) bus. The PCI host bridge is also connected to the UPA (see Figure 1.). This design gives the I/O subsystems (such as network connections and I/O data transfers) independent paths to the system CPU and memory through the UPA bus, allowing for faster overall performance. A single Sun platform can support multiple PCI buses simultaneously, allowing for even greater expansion of the I/O subsystem and sustained data throughput.

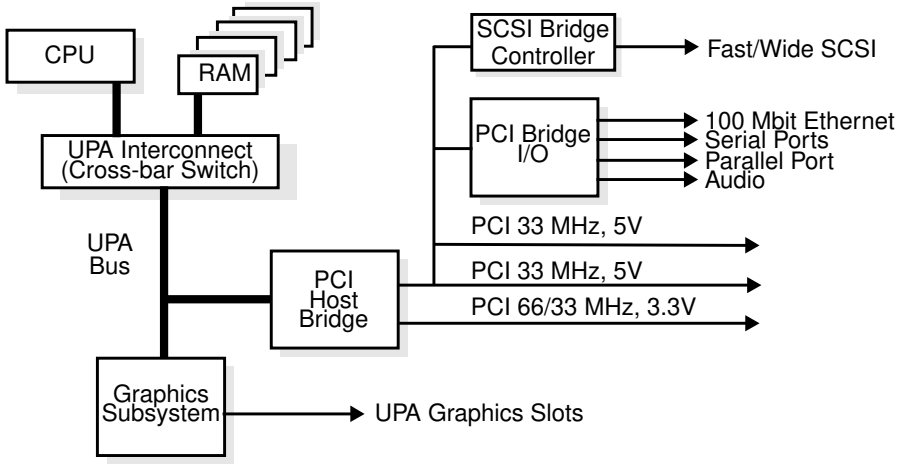

Figure 1. Typical PCI bus architecture implementation for a Sun workstation

The PCI bus design emerged from the PC industry due to the need for greater performance for high-end graphics and I/O operations. It is a widely-available industry standard bus design that meets Sun's requirements for delivering sustained, balanced performance to all parts of the computing system.

Unlike traditional bus architectures, PCI is not designed for a single system architecture. Rather, it can be adapted to run on architecturally different machines, such as Intel, PowerPC, and SPARC™. This platform independence helps maximize the number of readily available PCI peripherals and encourages the widespread adoption of the PCI design. Because of this, Sun believes PCI will become the predominant industry standard for high-end PCs and workstations in the coming years. Thus, future innovations in peripherals for multimedia, networking, and other applications will evolve on PCI-based I/O designs.

Peripheral Component Interconnect (PCI) *(cont.)*

Sun's PCI Hardware Implementation

The PCI bus is based on the industry standard PCI specification version 2.1. Unlike many standards, the PCI specification is very broad, and covers everything from multiple form factors and voltages to connector types. Sun has chosen to implement some of the most popular options:

- Bus speeds/widths:
  - 33 MHz @ 32 or 64 bit
  - 66 MHZ @ 64 bit—the industry's first 66-MHz PCI bus
- Voltage:
  - 5V for PCI 33 MHz
  - 3.3V for PCI 66 MHz
- Form factor:
  - Short cards (7-inches)
  - Long cards (up to 12-inches)
- Low power operation, Energy Star℠ compliance

Transition from SBus to PCI

The SBus architecture continues to play an important role in Sun's desktop product strategy, and Sun will offer both SBus and PCI-based systems and I/O options. As a result, current users of SBus systems and developers of SBus products can continue to rely on the technology that best suits their requirements.

For those new systems supporting the PCI bus, Sun has developed a line of PCI networking and I/O cards, and is working with third-party vendors to make available additional PCI products, ensuring that customers have a wide choice of platforms and I/O expansion options.

Fast Ethernet

With an existing installed base of more than 170 million Ethernet nodes world-wide, Ethernet is the world's most popular method of networking computers. However, the growing importance of LANs and increasing demand for data are fueling the need for higher bandwidth networks.

Increasing numbers of users combined with bandwidth-hungry applications are making network bottlenecks all too common. This need for higher bandwidth has spawned an intense interest in defining the next generation of networking technology. Fast Ethernet, a natural extension of the existing IEEE 802.3 Ethernet standard, stands out as the logical choice.

Fast Ethernet Technology

100 BASE-T Fast Ethernet consists of five component specifications: the Media Access Control (MAC) Layer, the Media Independent Interface (MII), and the three physical layers supporting the most widely used cabling types. Each of these components was designed to preserve compatibility with 10 Mbps Ethernet and existing installations.

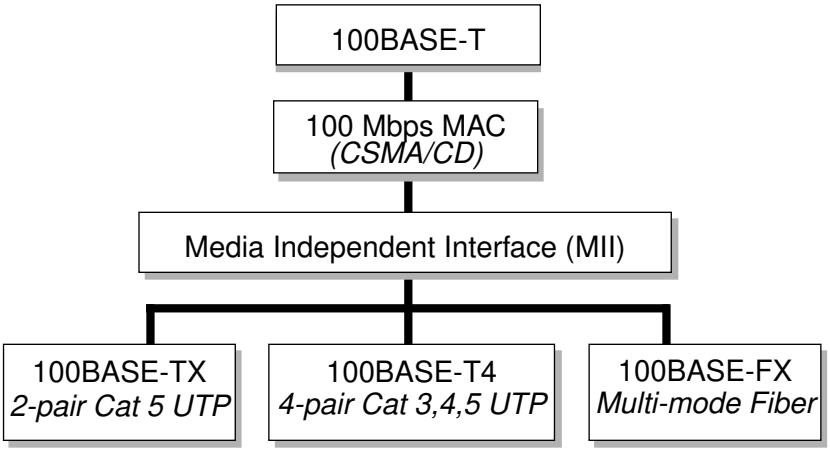

Figure 2. The Fast Ethernet architecture allows scalable performance up to 100 Mbps

Fast Ethernet Features and Benefits

Fast Ethernet provides the following features and benefits:

- **Features**
  - 100-Mbps network bandwidth
  - Cost-effective migration to higher speed
  - ANSI 802.3u standard
  - Extension of existing Ethernet standards
- **Benefits**
  - Provides ten times the capacity of Ethernet
  - Minimizes cost of change, compared to ATM or FDDI
  - Ensures high level of interoperability with other vendors' products
  - Minimizes disruption and risk
  - Maximizes investment protection in expertise, existing applications, and wiring infrastructure

Fast Ethernet Key Facts

- Fast Ethernet is Ethernet, only faster
- A high-speed networking technology offering speeds of 100 Mbps
- Low cost alternative to FDDI and ATM
- Backward-compatible protocols, media, and standards
- Easy migration to higher bandwidth

Fast Ethernet Tech Facts

- ANSI 802.3u compliant
- 100-Mbps network bandwidth
- 2-pair Category 5 UTP wiring

SCSI-2

The Small Computer Systems Interface (SCSI) is an intelligent, parallel I/O bus on which various peripheral devices and controllers can exchange information. Designed over 15 years ago, SCSI is the oldest peripheral interconnect that is still in widespread use.

Because of its longevity in the marketplace, the parallel SCSI interface enjoys a depth and breadth of products that exceeds that of any other I/O interface: SCSI disk drives, tape drives, optical disk drives, removable media disk drives, RAID subsystems, scanners, printers, and plotters are available from multiple sources. The large volume of the market and numerous vendors have created economies of scale that make SCSI one of the most affordable peripheral interconnect technologies.

The first SCSI standard, now known as SCSI-1, was adopted in 1986, and was originally designed to accommodate up to eight devices at speeds of 5 MB per second Since that time, SCSI has been refined and extended numerous times, with the introduction of Fast SCSI at 10 MB per second and Fast/Wide SCSI running at 20 MB per second, and accommodating up to sixteen devices on a single bus.

Overall, SCSI performance has doubled approximately every five years since the original standard was released in 1986, and the number of devices permitted on a single bus has increased from eight to sixteen. At the same time, a large measure of backward compatibility has been achieved, enabling newer devices to coexist on a bus with older devices.

SCSI-2 Features and Benefits

SCSI-2 provides the following features and benefits:

- **Features**
  - Standard interface
  - 20 MB per second transfer rate
  - 16 devices on a single bus
- **Benefits**
  - Compatible with a wide range of peripherals
  - High I/O performance for workstations and servers
  - Provides capacity for additional SCSI devices

Overview

The SunSwift™ PCI Adapter is a half-size PCI card with 10/100 Mbps Ethernet and Fast/Wide SCSI capabilities. It contains a UTP RJ-45 connector for 10/100 Mbps Ethernet, and a 68-pin connector for 20 MB per second SCSI (see Figure 1.).

Fast/Wide SCSI capability is provided by the ISP 1040A Intelligent SCSI processor, which has an on-board RISC processor to maximize I/O throughput and improve host and SCSI bus utilization. A PCI-to-PCI bridging chip provides the interface between the system PCI bus and the Cheerio-Lite/ISP 1040A devices on the secondary PCI bus.

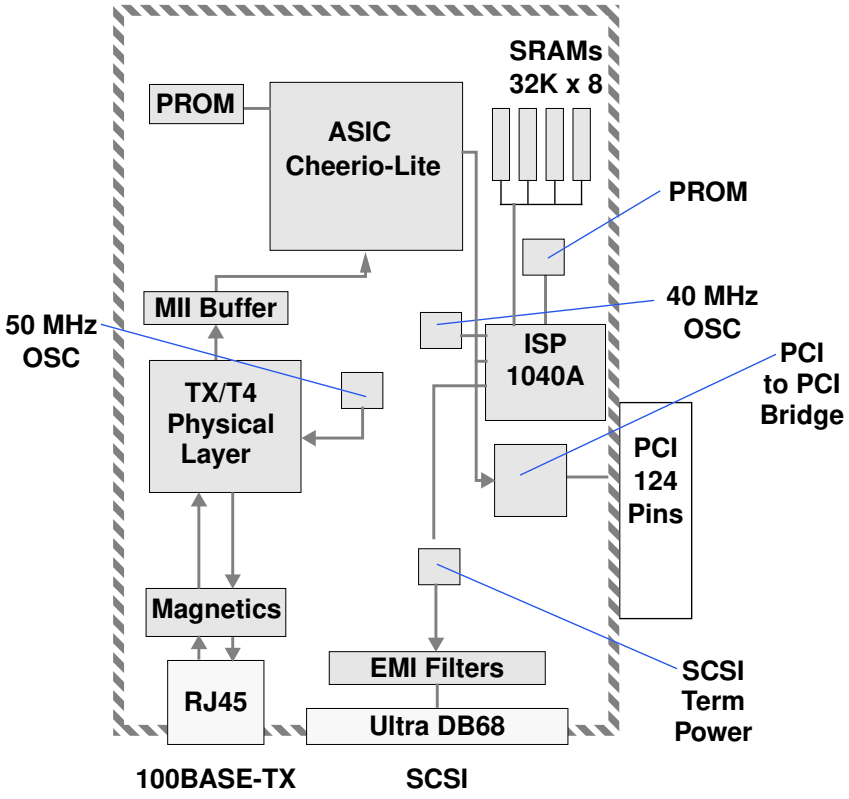

Figure 1. Overall architecture of the SunSwift PCI adapter card

Integrating SunSwift™ Adapter into the Network

Fast Ethernet can be implemented in the shared or switched environment by connecting to a 100BASE-T Fast Ethernet hub or switch. There are three primary hubs/switches in the marketplace:

- A 10/100 switch provides numerous dedicated 10-Mbps ports for connecting to desktops. It also has a few 100-Mbps ports for connecting to servers or to other hubs/switches.
- A 100BASE-T repeater hub enables all connected systems to share 100Mbps.
- A 100BASE-T switch provides dedicated 10- or 100-Mbps bandwidth to every port.

The SunSwift Adapter interoperates with all hubs/switches that comply with IEEE 802.3u 100BASE-T standard. In addition, SunSwift will meet the customer requirements of supporting both 100BASE-T Fast Ethernet and Fast/Wide SCSI-2 on a single, low-cost PCI Bus card.

Features and Benefits

10/100 Mbps Ethernet

- **Features**
  - 100 Mbps Ethernet interface
  - Supports both 10 and 100 Mbps Ethernet full/half duplex
  - Auto negotiating capability (automatic switching from 10 to 100 Mbps)
  - Supports 802.3 (10BASE-T) and 802.3u (100BASE-T) IEEE standards
- **Benefits**
  - Delivers high performance network throughput
  - Provides easy integration into existing 10 Mbps networks, plus simple migration to 100 Mbps
  - Simplifies installation and administration; no changes in adapter or software driver required
  - Ensures interoperability in heterogeneous networks

Fast/Wide SCSI-2

- **Features**
  - 20 MB per second transfer rate
  - Supports ANSI X3T9.2 SCSI-2 standard
- **Benefits**
  - Provides high I/O performance
  - Ensures compatibility with a wide range of peripherals

Single PCI Bus Card

- **Features**
  - Single PCI Bus adapter card
- **Benefits**
  - Conserves PCI Bus slots

Tech Facts

- Supports 10-Mbps (10BASE-T) or 100-Mbps (100BASE-T) Ethernet via a common RJ45 connector
- Supports Media Independent Interface (MII)
- Supports full- or half-duplex
- For 10 Mbps, category 3 or better UTP is supported; for 100 Mbps, 2-pair category 5 UTP is required
- Automatic speed sensing capability to switch between 10 and 100 Mbps Ethernet
- Supports 20 MB per second Fast/Wide SCSI-2 capability through a 68 pin connector
- Fast/Wide SCSI with single-ended interface (SCSI-2)
- Integrated RISC processor in ISP 1040A for maximizing and improving host and SCSI bus utilization
- Supports 32/64-bit PCI at 33 MHz and 64-byte burst size
- PCI universal card (5V for 33 MHz, 3.3V for 66 MHz)
- Protocol enhancement for TCP/UDP by checksum in hardware

Hardware support by on-chip buffer memory to implement zero copy TCP

System Requirements

- Hardware requirements
  - Available PCI Bus slot
- Software requirements
  - Supported on Solaris™ 2.5, Solaris 2.5.1 SHWP, and later releases
- Supported platforms
  - Ultra™ 30 workstation
  - Ultra 450 workstation
  - Ultra™ Enterprise™ 450 workgroup server

Note: *Check Configtool for the latest information on supported platforms.*

Interconnect

The SunSwift PCI adapter conforms to the following standards:

- 100-Mbps Ethernet conforms to 100BASE-TX IEEE 802.3u standard
- 10-Mbps Ethernet conforms to 10BASE-T IEEE 802.3 standard
- Supports ANSI X3T9.2 SCSI-2 standard

Ordering Information

SunSwift™ PCI Adapter Card

Order Number	Description
X1032A	SunSwift™ PCI bus networking adapter card

Service and Support

SunSpectrum℠ is an innovative and flexible service offering that allows customers to choose the level of service best suited to their needs — ranging from mission-critical support for maximum solution availability to backup assistance for self-support customers. SunSpectrum provides a simple pricing structure in which a single fee covers support for an entire system, including related hardware and peripherals, the Solaris™ operating system software, and telephone support for Sun™ software packages. The majority of Sun's customers today take advantage of the SunSpectrum program, underscoring the value it represents. Customers should check with their local SunService™ representative for program/feature variance and availability in their area.

FEATURE	SUNSPECTRUM℠ PLATINUM℠ Mission-Critical Support	SUNSPECTRUM℠ GOLD℠ Business-Critical Support	SUNSPECTRUM℠ SILVER℠ Systems Support	SUNSPECTRUM℠ BRONZE℠ Self Support
Systems Features				
Systems approach coverage	Yes	Yes	Yes	Yes
System availability guarantee	Customized	No	No	No
Account Support Features				
Service account management team	Yes	No	No	No
Personal technical account support	Yes	Yes	No	No
Account support plan	Yes	Yes	No	No
Software release planning	Yes	No	No	No
On-site account reviews	Monthly	Semi-annual	No	No
Site activity log	Yes	Yes	No	No
Coverage / Response Time				
Standard telephone coverage hours	7 day/24 hour	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday
Standard on-site coverage hours	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday	N/A
7 day/24 hour telephone coverage	Yes	Yes	Option	No
7 day/24 hour on-site coverage	Yes	Option	Option	N/A
Customer-defined priority setting	Yes	Yes	Yes	No
– Urgent (phone/on-site)	Live transfer/ 2 hour	Live transfer/ 4 hour	Live transfer/ 4 hour	4 hour / N/A
– Serious (phone/on-site)	Live transfer/ 4 hour	2 hour/next day	2 hour/next day	4 hour / N/A
– Not critical (phone/on-site)	Live transfer/ customer convenience	4 hour/ customer convenience	4 hour/ customer convenience	4 hour / N/A
Additional contacts	Option	Option	Option	Option

Service and Support *(cont.)*

FEATURE	SUNSPECTRUM PLATINUM Mission-Critical Support	SUNSPECTRUM GOLD Business-Critical Support	SUNSPECTRUM SILVER Systems Support	SUNSPECTRUM BRONZE Self Support
Enhanced Support Features				
Mission-critical support team	Yes	Yes	No	No
Sun Vendor Integration Program (SunVIP™)	Yes	Yes	No	No
Software patch management assistance	Yes	No	No	No
Field change order (FCO) management assistance	Yes	No	No	No
Remote Systems Diagnostics				
Remote dial-in analysis	Yes	Yes	Yes	Yes
Remote systems monitoring	Yes	Yes	No	No
Remote predictive failure reporting	Yes	Yes	No	No
Software Enhancements and Maintenance Releases				
Solaris enhancement releases	Yes	Yes	Yes	Yes
Patches and maintenance releases	Yes	Yes	Yes	Yes
Sun unbundled software enhancements	Option	Option	Option	Option
Internet and CD-ROM Support Tools				
SunSolve™ license	Yes	Yes	Yes	Yes
SunSolve EarlyNotifier℠ service	Yes	Yes	Yes	Yes

Glossary

10BASE-T	10-Mbps Ethernet.
100BASE-T	100-Mbps Ethernet. See Fast Ethernet.
ANSI	American National Standards Institute.
ATM	Asynchronous Transfer Mode. A new high speed networking protocol.
COSE	Common Open Software Environment.
CSMA/CD	Carrier Sense Multiple Access with Collision Detection.
DCE	Distributed Computing Environment.
Fast Ethernet	IEEE standard for 100 Mbps Ethernet.
FDDI	Fiber Distributed Data Interface. A 100 Mbps fiber-optic LAN technology.
IEEE	Institute for Electrical and Electronic Engineers.
LAN	Local area network.
MAC	Media Access Control.
MII	Media Independent Interface.
NFS™	Sun's distributed computing file system.
ONC+™	Open Network Computing.
PCI	Peripheral Component Interconnect.
QFE	Sun™ Quad FastEthernet™. Sun's 4-port 10/100 Mbps networking interface card.
SCSI	Small Computer System Interface for peripheral interconnect.
UPA	Ultra™ Port Architecture.
UTP	Unshielded Twisted Pair.
WAN	Wide area network.