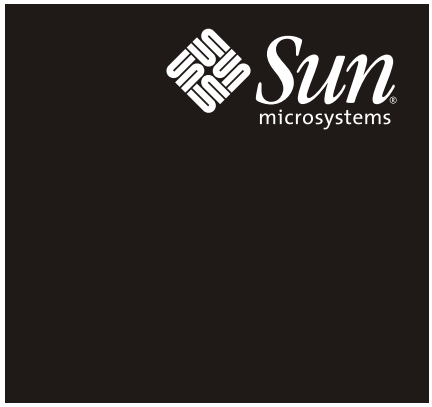
Netra™ 240 Server Architecture



A Technical White Paper
January 2004

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Chapter 1
Introduction

Over the past few years, deregulation and privatization have created intense competition in the worldwide telecommunications market. The marketplace has continued to evolve as voice and data solutions become more integrated and next-generation wireless, video, and messaging technologies emerge. The growing demand for scalable and available services, coupled with modern economic realities, is re-shaping the design of the telecommunications infrastructure. Now more than ever, availability of key services—with stringent service-level agreements increasingly common—dictates success or failure. At the same time, today's challenging economic climate means that successful organizations must continue to consider total cost of ownership (TCO).

Sun understands that Telecom companies have critical performance, reliability, stability, security, scalability, and manageability requirements. To meet these needs, Sun offers the Netra™ 240 server. NEBS Level 3-certified (DC version) and ETSI-compliant, Netra 240 servers are designed to be affordable, yet retain high-performance functionality. Netra 240 servers run the proven Solaris™ Operating System and are compatible with the rest of Sun's high-performance UltraSPARC® server family—providing the performance, scalability, and expandability necessary to help organizations respond to rapidly changing requirements. With dual processor support in a compact, rackmount enclosure, the Netra 240 server also addresses increasing demands for increased network bandwidth, more secure network transactions, and easier manageability.

Ultimately, high availability is the key consideration for many Telecom companies. The Netra 240 server incorporates a comprehensive approach that considers people, processes, and technology. This white paper describes the Netra 240 server's system architecture, along with key software components for enabling high availability through remote management and resource management, and key services that further enhance Telecom application availability.

Target Audience

The Sun Netra product line, which includes the Netra 240 server, is ideal for a wide range of applications and users in the telecommunications industry as shown in Figure 1-1 on the following page. In addition to the telecommunications industry, Netra 240 servers (both AC and DC versions) are ideal for industries including defense/military, manufacturing, utilities, financial services, and service providers.

Network Equipment Providers (NEPs)

NEPs look for simple, reliable, rack-efficient systems based on open standards that allow them to take advantage of Java technology, which eases new application development. Rugged NEBS Level 3-certified Netra products (DC

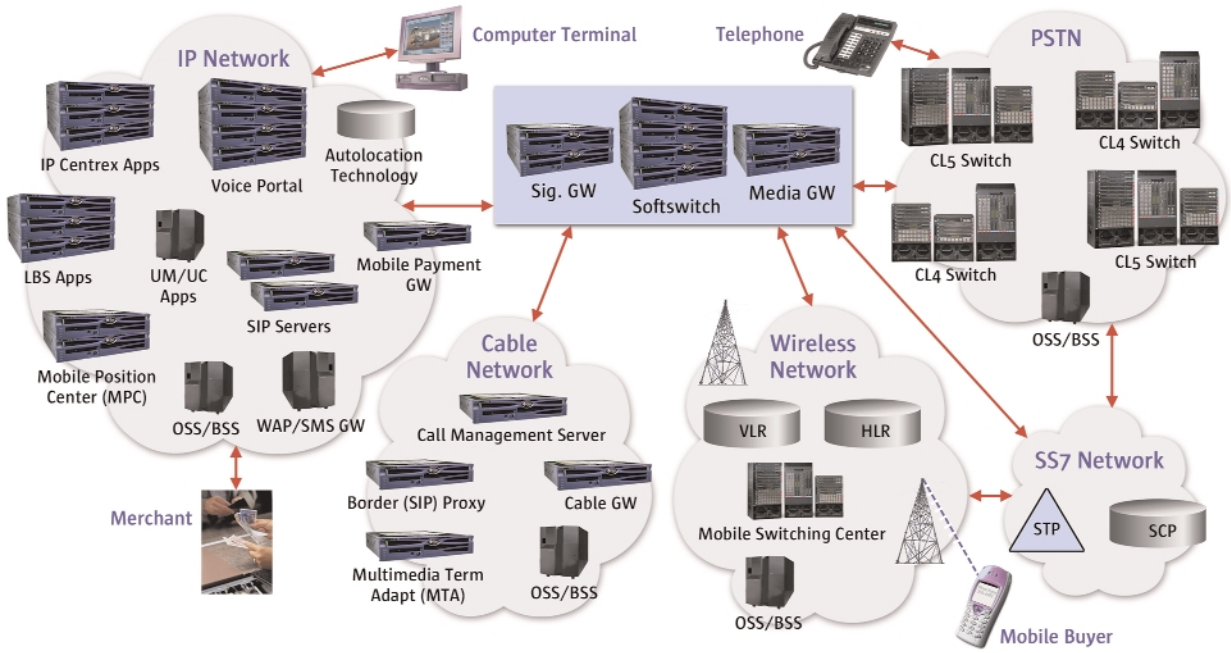

Figure 1-1: The Netra 240 server is ideal for a wide range of applications and users.

versions) offer features that make them ideal for use in rack-intensive deployments in less-than-ideal environments. With consistent, small-footprints, Netra servers allow for easy deployment in industry-standard racks.

Wireless Operators

Communication Service Providers (CSPs) are converting their cellular infrastructures from analog to digital in developed areas, and are beginning to build digital cellular infrastructures to reach remote, developing areas. Third-generation wireless services offer enhancements to current applications, including greater data speeds, increased capacity for voice and data and the advent of packet data networks (versus today's switched networks). Vast markets for data and voice services continue to open in Europe and the United States, while Eastern Europe, Latin America, China, and India offer completely new opportunities. Sun offers CSPs the tools they need to succeed in the competitive wireless marketplace. Sun plays a leading role in open computing and open networks, the basic requirements for entrance into global seamless wireless connectivity.

Wireline Service Providers

CSPs are also expanding their offerings to include long distance, DSL, data services, and e-business and Internet services. Sun and iForce™ partners are pioneering products, technologies, and services that take advantage of the convergence of voice and data to increase functionality, improve efficiency, and lower costs. For example, Enhanced Business Services (EBS) works in conjunction with telephony systems to deliver an extensive set of IP-enhanced business productivity applications via a Web-based graphical user interface (GUI). To help companies retain and attract customers and seize new business opportunities, Sun has developed offerings designed for easy integration into their existing infrastructure.

Cable/Broadband

Government agencies are deregulating bandwidth, making hundreds of megahertz of bandwidth available for the emerging technologies and systems providing broadband wireless access. A wide variety of technologies and system implementations are being put into place to provide many different service offerings—cable, satellite, and DSL, for instance. Flexible, reliable, available, scalable Sun products can help increase the return on investment, and decrease the risk, of providing these services.

Service Providers (SPs)

Offering reliability, security, and flexibility, Sun is one of the leading vendors in the service provider industry, with innovative programs and services targeted specifically at helping SPs drive their services into the enterprise community. Sun provides solutions that can help SPs reduce operating costs, streamline business processes, differentiate their services in the marketplace, and increase demand. Sun has strong partnerships with many of the leading companies in the SP industry. In addition, SunTone and iForce programs are examples of how Sun works with key partners to solve business issues for the industry.

Netra 240 Server

The Netra 240 server is designed for high-performance, high-density environments and provides significant expandability. Occupying only two rack units (2 RU) of vertical space, the Netra 240 server is configured with high-performance, 64-bit, SPARC® Version 9-compliant UltraSPARC IIIi processors.

Figure 1-2: The Netra 240 server is designed for high-performance, high-density environments.

Like other Sun servers, Netra 240 servers run the Solaris Operating System, Sun's benchmark implementation of System V Release 4 (SVR4) of the UNIX® operating system. Netra 240 servers enjoy full binary compatibility with other SPARC-based systems—including the 106-processor Sun Fire 15K server. With scalability and carefully-balanced performance, a full complement of remote management features, and data center design, these SPARC systems allow organizations to leverage their expertise with Sun's proven SPARC architecture and Solaris Operating System into the telecommunications environment.

Sun designed the Netra 240 server from the ground up to meet NEBS and ETSI equipment standards. Certified to meet NEBS Level 3 requirements (DC version), it is an ideal candidate for applications that need to operate in harsh environments and require verified ruggedness, such as those found in telecommunication central offices, government, and industrial applications.

The Netra 240 server includes integrated high-bandwidth networking, supported by the Solaris Operating System. A wide range of middleware applications is also available to reduce implementation and deployment time. Standard advanced manageability features allow for efficient, remote system administration, and high reliability to enable ease of integration with centralized management services.

The Netra 240 server also includes features for maximized uptime as well as high performance due to its large memory capacity and excellent expandability. All of these features are delivered in a high-performance, multi-processor server at a competitive price.

Key Features

The Netra 240 server provides additional features that improve serviceability and ultimately availability for delivering applications and services:

- Advanced Lights Out Management (ALOM): A standard on-board System Management Controller module provides remote monitoring and management. System alarms, including Critical, Major, Minor, and User indicators and dry contacts, contribute to centralized system state monitoring through standard central office management systems.
- Automatic server restart: Netra 240 servers can be configured to automatically reboot in the event that the operating system becomes unresponsive—simplifying serviceability and reducing downtime.
- System Configuration Card: A removable system configuration card contains system-specific information—accelerating system upgrades or replacement.
- Accelerated encryption: An optional Sun™ Crypto Accelerator 500 daughter card that frees PCI slots and works with popular Web server software to provide hardware and software acceleration for authentication and encryption of secure Web transactions.
- Front-accessible, hot-pluggable UltraSCSI disks: Front-accessible disk drives provide convenient access for service via a bezel—easing maintenance and reducing downtime.
- Dual-redundant power supplies: Two hot-swappable power supplies on the Netra 240 server enhance availability and reliability.
- Rack-centric design: Compact (2U) packaging and front-to-back cooling allow very dense configurations with environmental characteristics that are certified to central office standards.

Table 1-1: Netra 240 server specifications.

Features	Description
Height	2 RU
PCI expansion	1 x 64-bit 33/66-MHz 3.3V full-length PCI slot 2 x 64-bit 33/66-MHz 5V half-length PCI slots
Hard disk drive bays	2 Ultra160 SCSI
Power supply units	Dual redundant AC/DC
Rotary switch	Accessible behind front bezel

Expandability and Management Interfaces

The Netra 240 server also allows a wide range of peripheral expansion. Standard expansion ports include:

- Gigabit Ethernet: Four auto-negotiating 10/100/1000BaseT (Gigabit Ethernet) ports provide high-speed, high-bandwidth networking and enhanced availability.
- Ethernet Management: A separate 10BaseT Ethernet port provides a network interface for out-of-band management.
- Serial: A DB9 serial port allows connection to terminal servers or other devices.

- Serial Management: An RJ-45 serial port provides a console port as well as an out-of-band serial management interface.
- USB: Two USB ports support ZIP drives and other peripherals.
- SCSI: An external Ultra160 SCSI port enables connection of disk arrays and other high-speed storage devices.
- PCI: One full-length PCI slot and two half-length PCI slots are available for individual PCI cards.
- Alarm contacts: Critical, Major, Minor, and User dry contacts provide centralized management systems with standardized system state information.

Target Applications for the Netra 240 Server

Ideal applications for the Netra 240 server include:

- Wireless - HLR/VLR, 3G - UMTS/GGCN/SSGN
- Unified Messaging
- Short Messaging Services (SMS)
- Multimedia Messaging Services (MMS)
- Streaming Video Services
- Intelligent Network (IN)
- VOIP - Softswitch, Signalling Gateway, Media Server, Application Server
- OA&M OSS/BSS application areas
- Web application services, LDAP, AAA, mailstore
- Security
- Defense/military applications such as command and control, mobile system management, and classified intelligence systems
- Embedded OEM applications such as industrial process control, semiconductor testing equipment, and network imaging systems

Chapter 2

Netra 240 Server Architecture

Sun designed the Netra 240 servers to deliver multiprocessor performance, scalability, and flexibility in convenient 2 RU enclosures. To this end, high-volume components and application specific integrated circuits (ASICs) have enabled a greatly reduced part count while providing high reliability and low cost without compromising access to expansion options through high-performance, standardized interfaces.

This chapter describes the Netra 240 server architecture in detail, including the UltraSPARC IIIi processor, memory subsystem, network and I/O system, system configuration card, and other optional components. Subsequent chapters will discuss remote management capabilities along with other software and services that help the Netra 240 server deliver on the promise of high availability.

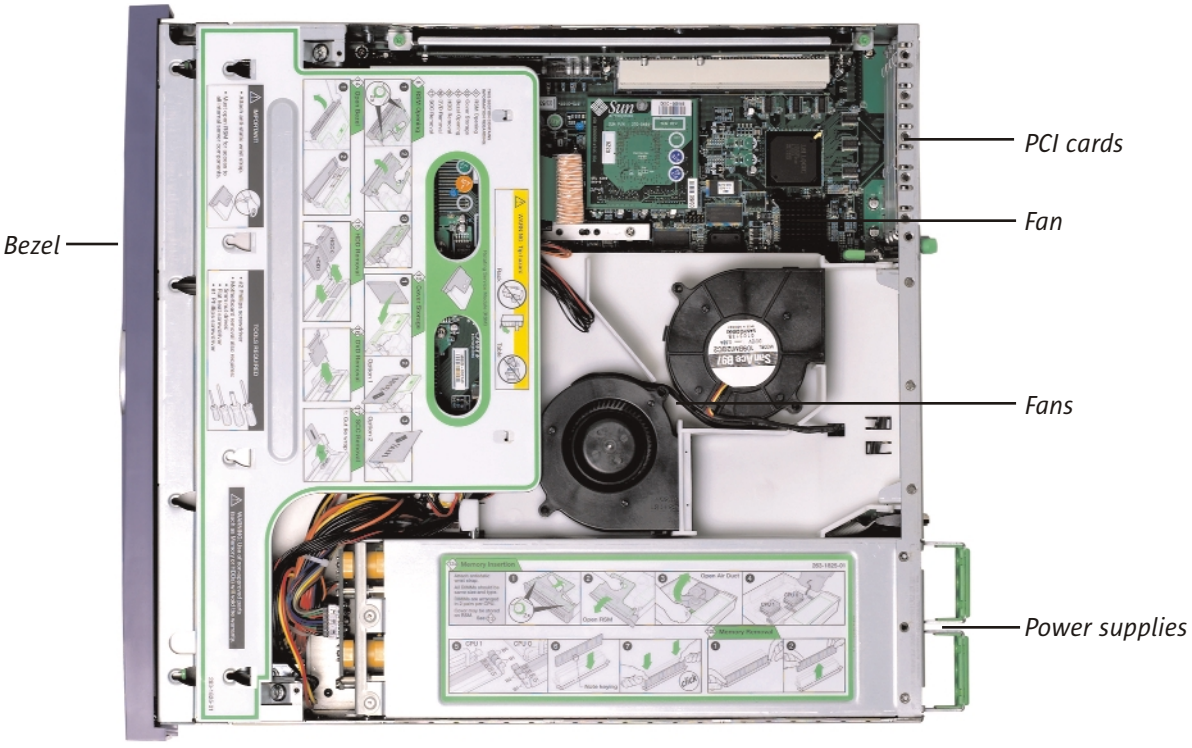

Figure 2-1: Inside view of the Netra 240 server.

Front Access

Normal operations in a deployed environment typically involve, at some point, tasks such as putting a server in standby mode, swapping a hard disk drive, or re-configuring the system. With the Netra 240 server, administrators can accomplish such tasks through a push button switch, a rotary switch, and a System Configuration card—all accessible behind the front bezel. Administrators can access these simple-to-use features by opening the front of the server and flipping open the front bezel, which stays down in place.

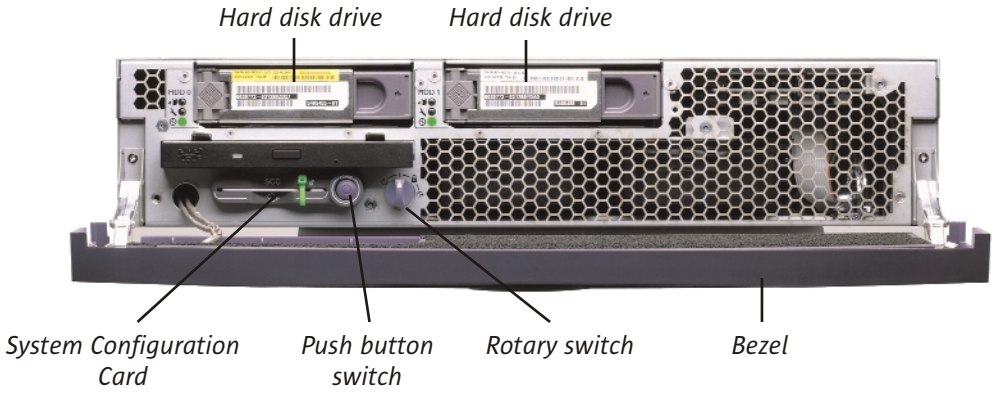

Figure 2-2: The front bezel flips down to open. Hard disk drives and the System Configuration Card are accessible from the front.

The push button switch is normally used to power on the server. Administrators can also use the switch to put the server in a power-standby mode (the rotary switch must be set to enable standby mode). In standby mode, the server is not functional but ALOM continues to run.

The rotary switch on the Netra 240 server provides added control over the system power state and security for server operation as well as a level of diagnostics. Administrators can use the rotary switch to:

- Disable power control through the push button switch and/or remote power control
- Force the system into the standby state
- Write-protect internal PROMs (OBP, POST, and System Management Controller PROMs)
- Force diagnostics tests (such as power-on self-tests [POST]) during system boot
- Disable suspension to the boot PROM or kernel debuggers (such as Kadb)

Motherboard

The Netra 240 server utilizes a state-of-the-art, compact motherboard. Features integrated into, or supported by, the motherboard include:

- Up to two UltraSPARC IIIi processors, each with 1 MB of L2 cache
- Flash PROM housing the system firmware, internal diagnostics, and POST
- Eight Sun DDR-1 SDRAM PC2100 DIMM slots (four per processor)
- Four 10/100/1000BaseT Ethernet ports
- Internal Ultra160 SCSI connector for internal hard disks
- External Ultra160 SCSI connector for optional mass storage devices
- Two asynchronous serial ports (one general purpose, one for server management)
- One 10BaseT server management port

- Two USB ports
- One full-length PCI slots and two half-length PCI slots
- Daughter-board connector for the optional Sun Crypto Accelerator 500 board
- System management controller service processor for remote management (ALOM)

Figure 2-3 is a block-level diagram of the motherboard in the Netra 240 server and illustrates the components that provide key functionality. The following sections discuss these key components.

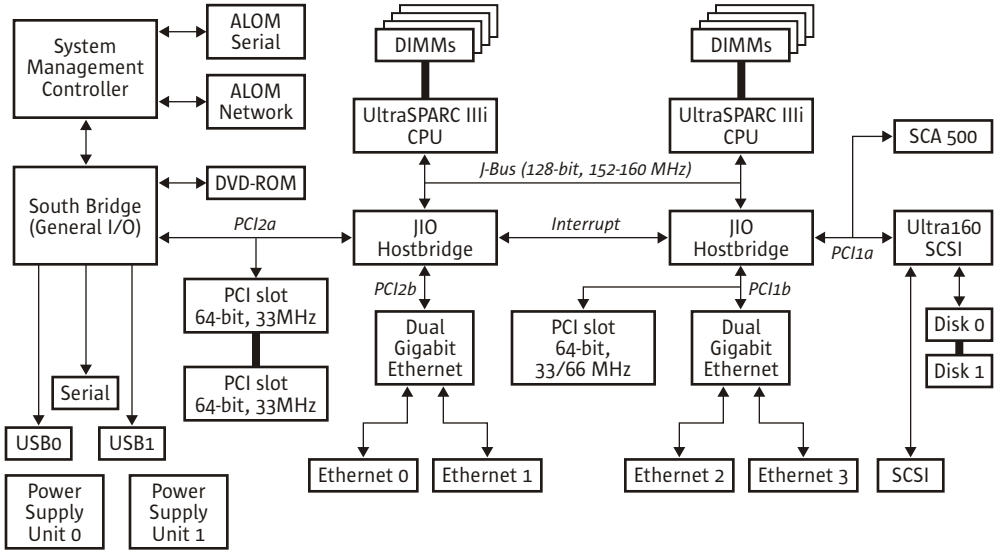

Figure 2-3: Block diagram of the Netra 240 motherboard.

UltraSPARC IIIi Processor

Based on Sun's flagship UltraSPARC III processor, the UltraSPARC IIIi processor in the Netra 240 server combines high performance with a full feature set. The highly-integrated UltraSPARC IIIi offers low power consumption, making it ideal for small compact servers and high-density server environments. The UltraSPARC IIIi processor, packaged in a 959-pin ceramic uPGA, is fabricated with a seven-layer 0.13 micron copper process that results in less than 50 watts consumption at 1.28 GHz.

The Netra 240 server's UltraSPARC IIIi processor runs at 1.28 GHz, incorporating on-chip memory management and bus interfaces to facilitate easy and economical integration of cost-effective systems. The UltraSPARC IIIi processor also provides the following features for smaller multiprocessor systems:

- The 64-bit, 4-way superscalar SPARC V9 pipeline provides high performance in a low-power consumption package.
- The Memory Controller/System Interface unit manages virtual to physical memory address mappings with reduced memory latency and large memory support for up to 4 GB of memory per CPU.
- A 32-KB, 4-way associative instruction cache (I-cache) and a 64-KB, 4-way associative data cache (D-cache) help ensure low-latency access to instructions and data.
- A 1-MB, 4-way associative on-chip L2 cache running at half the CPU core frequency provides increased reliability and high throughput that scales with processor technology improvements.
- The 128-bit (152 MHz or 160 MHz) J-Bus system interface provides a simple, lightweight system interconnect optimized for small multiprocessor systems.

- Dual DTLBs with programmable page size support offer performance improvements for floating point-intensive applications.
- A 128-bit DDR1 SDRAM memory interface operating at 133 MHz/266 MHz leverages commodity memory to provide exceptional price/performance and high main memory throughput.
- ECC (memory) or parity (J-Bus) protection on all interconnects helps ensure highly-reliable and available systems.

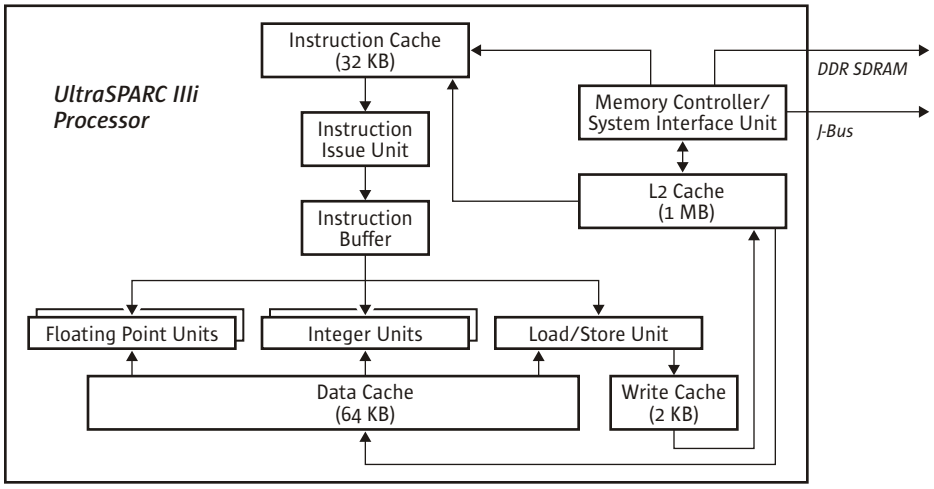

Figure 2-4: Block-level diagram of an UltraSPARC IIIi processor.

Memory Subsystem

The Netra 240 server's memory system, which uses standard memory for easy expandability and lower total cost of ownership, leverages the integrated memory controller in the UltraSPARC IIIi processor. The on-board memory controller negotiates each CPU-memory transaction with minimal latency and the system provides minimal overhead for data transactions that access memory controlled by the other CPU.

Each UltraSPARC IIIi processor supports up to four 72-bit DDR1 registered DIMMs, allowing memory capacity and bandwidth to scale with the number of processors installed. The system supports 256-MB, 512-MB, and 1-GB DDR1 DIMMS (installed in groups of two) for a maximum system memory capacity of 8 GB. (The Netra 240 server will support 2-GB DDR1 DIMMs in the future to yield up to 16 GB maximum memory configurations.) The memory data path is 128 bits of data with 9 bits allocated for error correction code (ECC). The Netra 240 server features a 1 MB secondary (L2) cache internal to the UltraSPARC IIIi processor. This approach, beyond providing increased reliability and reduced system cost, provides a high-throughput cache interface with a peak bandwidth of 19.2 GB/sec.

J-Bus Interconnect and JIO Hostbridge ASICs

The J-Bus interconnect in the Netra 240 system offers superior bandwidth and low latency memory access coupled with reduced chip-count and cost. The J-Bus interconnect provides high throughput paths to memory at up to 160 MHz with a 128-bit wide data path (parity protected). In the Netra 240 server, the J-Bus links the UltraSPARC IIIi processors with specialized JIO Hostbridge ASICs that function as J-Bus to I/O bridges. These ASICs provide a total aggregate bandwidth of up to 2.05 GB/sec. peak throughput via a shared data/address bus.

The JIO Hostbridge ASIC provides a high-performance PCI implementation and a J-Bus interface operating at up to 160 MHz. An integral I/O cache unit operating at 133 MHz serves as a prefetch buffer that is fully coherent

with main memory, improving sequential PCI DMA performance. This approach minimizes J-Bus transactions for I/O and enhances performance for I/O access to main memory. In addition, the JIO Hostbridge ASICs support PCI DMA write and read bursts of 1 KB (32-bit PCI) and 2 KB (64-bit PCI) with no disconnect. 64-bit PCI DMA writes execute at peak PCI bus throughput.

Each of the two JIO Hostbridge ASICs provides two 64-bit interfaces (one at 33 MHz, the other at 66 MHz) that are compliant with the PCI 2.2 industry standard. Each J-Bus/PCI controller provides two PCI buses for a total of four system PCI buses for internal and external controllers and devices. In turn, these PCI buses, depending on the system, can support the following:

- Ultra160 SCSI controller (for internal disk drives) and external Ultra160 SCSI port (for arrays)
- Optional Sun Crypto Accelerator 500 module
- Two auto-negotiating Gigabit Ethernet controllers
- South Bridge general I/O ASIC
- One 64-bit, 33-MHz/66-MHz full-length PCI card slot
- Two 64-bit, 33-MHz half-length PCI card slots

South Bridge ASIC

The South Bridge ASIC, connecting to one of the JIO Hostbridge ASICs via one of its PCI interfaces, provides serial and general I/O functionality which includes:

- An internal ATA (EIDE) connector to support the optional internal DVD-ROM/DVD-RW
- A standard EIA/TIA-574 (DB9) asynchronous serial interface using RS-232 levels
- Two USB v1.1 interfaces

The South Bridge ASIC also connects the System Management Controller ASIC that serves as a service processor for the system's ALOM remote management capabilities. ALOM remote system management can be accessed via either the RJ-45 serial or 10BaseT Ethernet interfaces provided by the System Management Controller ASIC. Chapter 3 provides more information on ALOM.

Internal Mass Storage

The Netra 240 server provides internal support for 160 MB/sec. Ultra160 SCSI devices. The internal disk drives are hot-pluggable and accessed from the front, behind the front bezel of the system. The Netra 240 server supports up to two 73-GB disks running at 15,000 rpm for a total internal capacity of 146 GB.

Networking and I/O Expansion

The Netra 240 server provides a full complement of networking and I/O expansion options through connectors on the back panel.

Ethernet Ports

The Netra 240 server provides four standard 10/100/1000 Mbps (Gigabit) Ethernet connectors to support increasing demands for both high bandwidth and multiple network connectivity. Gigabit Ethernet technology from Sun is backwards compatible with 10 Mbps and 100 Mbps Ethernet, with the interface auto-negotiating the speed. All four Ethernet interfaces on the Netra 240 server support access through an RJ-45 connector. An additional 10 Mbps Ethernet connection provides access to the System Management Controller ASIC and ALOM via a separate RJ-45 connector.

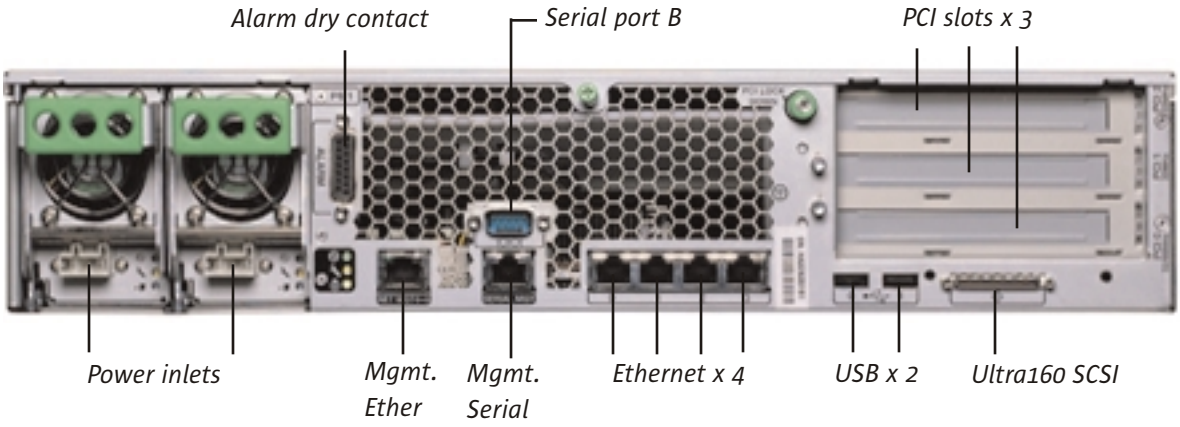

Figure 2-5: The rear view of the Netra 240 server shows a wide range of networking and I/O options.

Serial Ports

Serial ports provide a convenient way to connect Netra 240 servers to terminal and other serial devices using two asynchronous serial ports. The serial A port (RJ-45 connector) is used as a console and serial interface to the System Management Controller ASIC and ALOM. The serial B port (DB-9 connector) can be used for general serial connectivity and supports asynchronous transfers at up to 460 Kbaud.

USB Ports

Two USB ports provide convenient connectivity to a keyboard and mouse as well as hand-held devices for configuration management. In addition, third-party, USB-based peripheral devices, such as ZIP drives, printers, and external CD-ROM and DVD-ROM drives can be attached using the USB ports.

UltraSCSI Port

An external Ultra160 SCSI connector is available for attaching additional UltraSCSI devices such as Sun StorEdge™ disk arrays.

PCI Card Slots

The Netra 240 server provides one full-length, 64-bit, 33/66-MHz PCI slot and two half-length, 64-bit, 33-MHz PCI slots—enabling a total of three PCI cards to be added to the system. These additional PCI cards allow special-purpose functionality supported by Sun or Telecom-industry vendors such as external connectivity to other types of networks, including ATM, Sonet, Fibre channel, T3, and others.

Power Supplies

Power connection to the Netra 240 server is also located on the back panel. The Netra 240 server features hot-swappable, dual-redundant power supply units, each with separate power connections for enhanced reliability and availability. In the absence of one power supply unit, the other unit can adequately supply required power to the Netra 240 server.

Sun Crypto Accelerator 500 Board

The Netra 240 server supports the Sun Crypto Accelerator 500 (SCA 500) daughter card, an optional hardware cryptographic accelerator module that installs in the system without occupying an additional PCI slot. Ideal for e-commerce or other applications that benefit from SSL (Secure Socket Layer) acceleration, the SCA 500 board, with no external interfaces, functions as a cryptographic co-processor to accelerate public key and symmetric cryptography.

Based on the Broadcom BCM5822 co-processor, the SCA 500 board accelerates a variety of computation-intensive cryptographic algorithms for security protocols in e-commerce applications. The SCA 500 daughter board offloads SSL functionality normally performed by system CPUs. Using 3DES, it accelerates various operations such as authentication and bulk encryption. The SCA 500 board further speeds SSL processing by optimizing the complex mathematical operations involved in SSL operations.

Since acceleration performance/cost is not uniform across all algorithms and because some cryptographic algorithms are designed specifically to be implemented through hardware while others are designed to implemented through software, the SCA 500 board provides cryptographic algorithms through both hardware and software. The SCA 500 daughter card examines each cryptographic request and determines the best location for acceleration (the host processor or the SCA 500 board) to achieve maximum throughput. Load distribution is based on cryptographic algorithm, current job loading, and data size. Table 2-1 lists the accelerated software and hardware algorithms that the SCA 500 provides for Sun Java™ System Web Server and Apache Web server software.

Table 2-1: The Sun Crypto Accelerator 500 module supports SSL algorithms through both hardware and software.

Algorithm	**Sun Java System Web Server**		**Apache Web Server**	
	Hardware	**Software**	**Hardware**	**Software**
RSA	X	X	X	X
DSA	X	X	X	X
Diffie-Hellman	–	–	X	X
DES	X	X	X	X
3DES	–	–	X	X
Arcfour	–	–	–	X

The SCA 500 daughter card interfaces with specific drivers based on the Web server software deployed on the server and selects appropriate authentication and encryption modules. For example, the SCA 500 module uses Network Secure Server (NSS) via the PKCS 11 public interface for Java System Web Server and OpenSSL via the mod_ssl libraries for Apache Web server software (Figure 2-6).

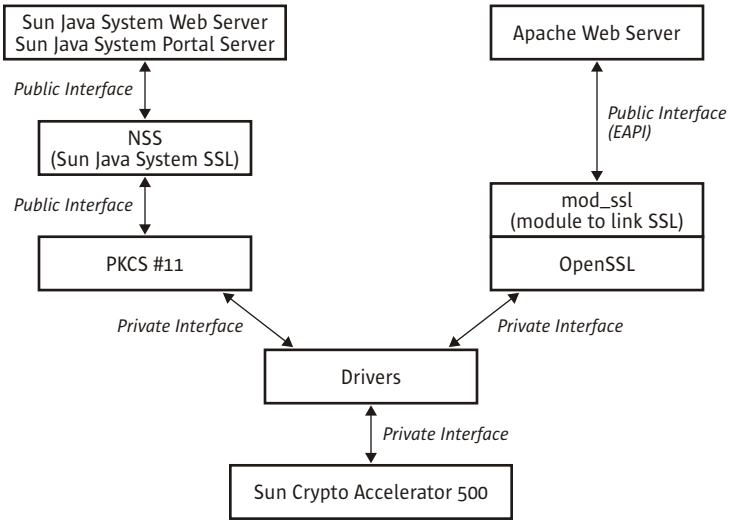

Figure 2-6: The Sun Crypto Accelerator 500 module accelerates Sun Java System Web Server and Apache Web server authentication as well as bulk encryption via appropriate protocols and methods.

System Configuration Card

System administrators often need to replace or upgrade a server with minimal downtime. To facilitate faster upgrades and repairs, the System Configuration Card (SCC) stores the Netra 240 server's system configuration, including the host ID, MAC address, and NVRAM settings.

With the SCC, administrators can easily replace a Netra 240 server with minimal reconfiguration by transferring the identity from one system to another. Administrators can simply remove the SCC from one server and insert it into another, along with the boot disk from the original system.

Diagnostics

Designed for easy diagnosis and problem repair, the Netra 240 server includes several PROM-resident and UNIX platform-based diagnostic programs that service personnel can use.

Power-On Self-Test

Under user control, a power-on self-test (POST) can automatically execute to test the system board, NVRAM, on-board I/O devices, and memory system each time power is applied to the system. While not intended to be a comprehensive diagnostic, POST can quickly establish that no severe problems exist with the system. Administrators can monitor POST tests via a serial port connection to a terminal server, another desktop system, or an ASCII terminal.

SunVTS™ Software

Used to determine if the system is functioning properly, the SunVTS system exerciser is a graphically-oriented UNIX application that permits the continuous exercising of system resources and internal and external peripheral equipment. SunVTS software incorporates a multifunctional stress test of the system through operating system calls and allows the addition of new tests as they become available.

Rackmount Enclosure and Power

The Netra 240 server is designed to provide reliable and scalable performance while reducing operating expenses through lower real estate costs. The small form factor of the Netra 240 server enables multiple systems to be densely packed into rackmounted systems. All internal components and field-replaceable units (FRUs)—including UltraSPARC IIIi CPUs—are easily accessible from the top of the enclosure. A hinged front bezel allows administrators to easily insert or remove components such as the hot-pluggable disk drives and the System Configuration Card from the front of the system.

Each Netra 240 server ships with a Sun 4 post 19-in. rackmount kit. In addition, the following options are also available:

- Rackmount kit for 19-in. 2 post
- Rackmount kit for 23-in. 2 post
- Slide mount kit for 19-in. 4 post

Each of the two slide assemblies has a detachable inner glide which allows the server to telescope in and out of the rack and to enable toolless removal from the rack.

The following table summarizes the Netra 240 server's enclosure and power specifications.

Table 2-2: Enclosure and power specifications of the Netra 240 server.

Configuration	Netra 240 Server
Dimensions	Height: 87.4 mm (3.44 in.) – 2 RU Width: 425 mm (16.73 in.) without bezel 442 mm (17.4 in.) including bezel Depth: 483 mm (19 in.) to rear connectors 508 mm (20.0 in.) overall max.
Weight	16.3 kg (36 lbs.) 18.6 kg (41 lbs.) fully configured with rackmount kit
Power	90–264 V AC (47-63 Hz) / -48 V DC or -60 V DC nom (-40 to -75 V DC range) 6.1 amps maximum (at 90 V AC) and 15 amps maximum (DC) Dual, redundant 400 Watt power supplies

Environmental and Safety Specifications

As summarized in the following table, the Netra 240 server meets all relevant domestic and international agency safety, ergonomics, EMI, and environmental requirements.

Table 2-3: Environmental and safety specifications of the Netra 240 server.

Specification	Operating	Nonoperating
Ambient temperature	AC: 0° C (32° F) to 40° C (104° F) DC: -5° C (23° F) to 45° C (113° F)	AC: -40° C (-40° F) to 70° C (158° F) DC: -40° C (-40° F) to 70° C (158° F)
Relative humidity	AC: 10% to 90% (noncondensing), 40° C max wet bulb DC: 5% to 93% (noncondensing)	AC: Up to 93% (noncondensing) DC: Up to 93% (noncondensing)
Altitude	Up to 3000 m	Up to 12,000 m
Acoustic noise (ISO 9296)	Operating: 7.0 B Idling: 7.0 B	—
ETSI	EN 300 019-2-1,2,3, Table 3.1 & 3.1 E	
Seismic	GR-63-Core requirements for earthquake Zone 4	
Safety	IEC60950, UL/CSA60950, EN60950	
RFI/EMI compatibility	FCC Class A, Part 14 47 CFR, EN55022, CISPR 22, EN 300-386:2001 V1.3.1, ICES-003	
Immunity	EN55024	
Certifications		
Safety	cULus Mark, TUV GS Mark, CE Mark, CCC, GOST R	
EMC	CE Mark (93/68/EEC), FCC authorized Class A, VCCI, BSMI, C-Tick, MIC	
Telecommunication	Telcordia GR-63 CORE, GR-1089-CORE, SR 3580 NEBS Level 3	

Chapter 3

Software for Deploying Highly-Available Services

The need for continuous operation in mission- and business-critical environments demands not only well-designed hardware but sophisticated software capabilities as well. The Netra 240 server comes pre-installed with the Solaris Operating System (Solaris 8 HW 7/03) and integrated support for remote management software. Support for the Solaris 9 OS will be available with the Solaris 9 OS (HW 4/04) release.

Solaris Operating System

The Solaris Operating System is designed to deliver the power, flexibility, availability, and compatibility to support computing needs in the Telecom industry. It combines key computing elements—operating system, networking, and user environments—into a stable, high-quality foundation that organizations can depend on to develop, deliver, and manage mission- and business-critical computing solutions. The strengths of the Solaris Operating System lies with its carrier-grade reliability, scalability, and performance.

The following features and functionality of the Solaris OS help support operators who require constant and consistent delivery of applications and services to customers 24x7:

- High performance through a complete 64-bit computing environment, enabling the delivery of applications and services to large numbers of users.
- Extended security features through authentication, data integrity, data privacy, and single sign-on capabilities so that tampering, snooping, and eavesdropping do not compromise data or associated transactions.
- Enhanced scalability with a 64-bit kernel that enables access to more system resources and the ability to consolidate applications onto a single server.
- Superior reliability and availability for maximum data and application accessibility, with features such as on-line patch installations without the need for system downtime.
- Complete binary compatibility for software investment protection.
- Additional options, such as Solaris™ Resource Manager and Solaris™ Bandwidth Manager software, build upon the reliability and scalability of the Solaris Operating System to help deliver a comprehensive platform infrastructure.

Included with the Solaris Operating System are tools to enable easy installation, provisioning, and upgrades.

Solaris JumpStart™ Software

With potentially hundreds or thousands of systems to manage, automation is key. Reducing TCO depends on enabling a small administrative staff to manage a large number of systems. The Solaris Operating System provides

many of the key elements that enable efficient, centralized administration and automation. For example, administrators can boot Sun systems remotely over the network and can install operating systems from remote system administration servers. Solaris JumpStart software, a standard component of the Solaris Operating System, enables fully automatic and remote operating system installation based on custom profiles and scripts.

Solaris Flash Software

Solaris Flash software provides provisioning functionality that allows administrators to capture a snapshot image of a complete server—including the Solaris Operating System, the applications stack, and the system configuration—into a new Flash Archive format. Using this system image, administrators can then rapidly replicate a reference server configuration onto many target servers. Solaris Flash images can be deployed via standard media or over the network via HTTP and NFS protocols. Solaris Flash images can be installed using custom Solaris JumpStart scripts, the Solaris Web Start graphical interface, or through interactive installation of the Solaris Operating System.

Solaris Live Upgrade Software

Solaris Live Upgrade software allows the creation, management, upgrade, comparison, and activation of multiple boot environments on systems running the Solaris Operating System. In particular, Solaris Live Upgrade software enables systems to run uninterrupted while a system administrator installs a Solaris Flash archive or upgrades to a new version of the Solaris Operating System. As a result, downtime for upgrades can be reduced to the time needed for a simple reboot.

Remote Management Software

In the past, the remote networking capabilities of the Solaris Operating System enabled administrators to log into and remotely manage Sun systems. Administrators could perform basic administrative tasks or access system consoles through network terminal servers.

However, true lights out management—with its need for remote event notification and problem diagnosis—requires remote access at a level that makes few assumptions about the correct operation of an operating system or other critical system components. As a result, remote system administration capabilities for geographically distributed or physically inaccessible systems require a fundamental system design that includes an independent or out-of-band control channel. This channel plays an essential role when the operating system on a remote system is not able to respond due to software, hardware, or network connectivity problems or power outages.

Now, the Netra 240 server extends basic remote management capabilities through the use of sophisticated system management and monitoring tools.

Advanced Lights Out Management (ALOM)

To address the need for out-of-band control, the Netra 240 server features Advanced Lights Out Management. Available through an embedded System Management Controller integrated into the Netra 240 server motherboard, ALOM gives system administrators the ability to locate and resolve problems quickly, independent of the operating state of the system.

The autonomous System Management Controller ASIC provides remote system console capabilities through both serial and Ethernet interfaces on the back panel. Administrators can access ALOM service through a serial connection from a modem, terminal server, personal computer, or other devices supporting terminal emulation. Ethernet access to ALOM management capabilities is available from any network-attached administrative resource such as a Sun workstation.

ALOM supports the following remote system management capabilities:

- Host status monitoring and automatic server restart: ALOM monitors environmental conditions, as well as the status of the power supply and fans in the Netra 240 server. It provides a service indicator and event or failure notice to administrators. The service processor also provides an automatic server restart (ASR) function triggered by a system alarm. When properly configured, ASR can restart the server if it becomes unresponsive (a watchdog reset).
- Power control: ALOM gives administrators full control of the server, including remote power-on and power-off of the system. The System Management Controller ASIC utilizes auxiliary power, enabling continuous monitoring and control functionality even when the server is powered off or the operating system is not running. When the system is operational, the service processor performs event reporting via the serial port or Ethernet ports that it controls.
- Software accessible alarms: Four user-configurable alarms are available for specialized applications that require them. For example, an application can set an alarm to be triggered if an important server process is not responding. If this condition occurs, remote management software—possibly custom-developed code—notices that the alarm condition has been set and takes appropriate action.

Resource Management Software

Automation is also key for effectively managing resources among numerous servers in Telecommunications operation centers. Sun provides the tools administrators need to model and automatically maintain resource levels to keep servers within healthy operational constraints and maintain service level agreements.

Solaris Resource Manager Software

Driven by the increasing popularity of applications and network service providers, customers are demanding service level agreements to ensure processing and that storage and throughput resources will be available during periods of peak usage. At the same time, administrators must strive to ensure that meeting the demands of one user does not unfairly impact another.

Solaris Resource Manager software, integrated into the Solaris Operating System, allows system managers to allocate resources among individual tasks and users in a structured, policy-driven fashion. With Solaris Resource Manager software, administrators can proactively allocate, control, and monitor system resources, such as CPU time, processes, virtual memory, connect time, and logins within a system or domain. This fine-grained control enables the system manager to better predict and guarantee the level of service available to a particular task. When additional resources are required to meet urgent demands, allocations can be easily shifted to provide needed levels of service. As a result, users and applications receive more consistent levels of service, enabling even higher application availability.

Solaris Bandwidth Manager Software

Solaris Bandwidth Manager software enables administrators to control the network bandwidth assigned to particular applications, users, and departments that share the same intranet or Internet link. By installing Solaris Bandwidth Manager software on a network's major links and application servers and setting consistent policies, administrators can evenly distribute bandwidth throughout the organization. Traffic can also be prioritized, preventing a small number of applications or users from consuming all available bandwidth.

Solaris Bandwidth Manager software enables organizations to:

- Provide differentiated classes of service to users and bill accordingly
- Guarantee bandwidth to high-priority users, applications, or servers

- Reduce traffic congestion and increase network efficiency
- Control user and application access to network resources
- Gather detailed network use statistics and accounting data for usage-based billing and trend analysis

Storage Management Tools

To manage the growing volumes of mass storage in today's networked environments, Sun provides the advanced Sun StorEdge line of redundant storage arrays along with a variety of powerful management tools. Volume managers are available both as hardware-based options that are an integral part of disk subsystems and as host-based managers that run on the host.

Redundant storage area network (SAN) solutions, in addition to individual volume management tools, are available from Sun to connect storage devices via a switch to deliver high-speed, high-bandwidth access to data. Sun's economical portfolio of SAN solutions is a customer-ready, network-ready answer that is easy to install and simple to manage. Sun also provides several software suites that help ease storage management tasks:

- Sun StorEdge Utilization Suite software provides protection and rapid access to large volumes of enterprise data.
- Sun StorEdge Performance Suite software optimizes storage resources for speed and continuous data availability, even for very large files.
- Sun StorEdge Availability Suite software provides a comprehensive solution that minimizes disruption, maintains productivity, protects data, recovers from disaster, and ensures continuity in business planning and integration
- Sun StorEdge Resource Management Suite software enables administrators to analyze storage usage, understand consumption, identify bottlenecks, forecast growth, and plan efficiently for new storage networks.

Web Services Software

A wide range of Sun Java™ Enterprise System software is also available for the Netra 240 server to help lower the total cost of ownership and speed server deployment. Sun Java Enterprise System software is available in DVD and CD media that can be installed onsite. The software modules in the Sun Java Enterprise System portfolio includes:

- Sun Java System Web Server
- Sun Java System Messaging Server
- Sun Java System Directory Server
- Sun Java System Application Server
- Sun Java System Portal Server
- Sun Java System Active Server Pages
- Apache Web server

Netra High Availability (HA) Suite Software

Sun's Netra High Availability Suite 2.1 Foundation Services software is a reliable and scalable high-availability software package that organizations can easily and rapidly embed into their platforms and integrate with their applications to provide highly available solutions. Netra HA Suite Foundation Services can:

- Reduce development time and cost by providing an embeddable HA software that can increase overall availability of solutions based on the Sun computing platform
- Leverage open standards to ensure ease of integration and interoperability in existing infrastructure and multi-vendor environments
- Limit operating system and hardware integration costs with pre-integrated, Netra-based platforms

For more information about Netra HA Suite Foundation Services, go to www.sun.com/software/netrahasuite.

Chapter 4
Service Solutions

Qualified system administrative talent is increasingly expensive and hard to find in the Telecom industry. As an organization continues to grow, it must extend the expertise of its valuable system administrative staff—asking it to manage larger and larger numbers of systems.

In addition, maintaining high availability means relying on people and processes even more than products. Sun can provide the experts that can help integrate the methodologies, expertise, products, and services needed to craft high availability environments that make service grids work more smoothly. Sun's extensive portfolio of services—based on field-proven methodologies, best practices, and experience implementing thousands of servers into telecommunications centers worldwide—delivers the "how to" architecture, implementation, and operations management services for the Netra 240 server. Key services include:

- Consulting expertise to help design and implement solutions that can handle rapid growth without sacrificing performance and availability
- Workforce development solutions that provide staff with the skills to assess, architect, build, and manage scalable data centers through a specially designed curriculum
- Comprehensive, flexible support services developed to address the unique needs of the data center and complement the business model and operational support strategy of individual enterprises

Professional Services

Sun Professional Services teams can help organizations create the right infrastructure based on Netra 240 systems through several services:

- The Application Readiness Service program provides implementation and project management.
- The Data Center Readiness Service program addresses configuration, design and testing, change management and process, and documentation issues.
- The SunReady[SM] Availability Assessment Service program identifies and assesses the gaps and risks in an architecture or operational environment, as well as evaluating the organizational structure or personnel skill levels in a particular application environment that may affect availability.
- The Mainframe Migration Services program helps an organization with a growing computing environment prepare to take advantage of the latest hardware, software, and middleware technologies.

Workforce Development Solutions

A properly trained staff can help ensure high levels of availability, fast and accurate deployment of new products and services, quick identification of problems, and rapid response to system failures and interruptions. Sun Educational Services, as a leading supplier of training solutions around the world, can help organizations take full advantage of their hardware and software investment by giving their personnel the right training.

Proactive System Management

Managing a large number of servers requires obtaining the right level of support to help improve operational efficiency and increase mission- and business-critical system reliability. Sun Support Services offers proactive support, monitoring, and sustaining services to help manage system availability. Support services include:

- SunSpectrum℠ Support Programs enable enterprises to choose a service level based on their specific need. Levels of service range from mission-critical support for maximum solution availability to backup assistance for self-support organizations.
- SunSpectrum Platinum℠ is Sun's most comprehensive high-availability system support solution, designed to provide services to support around-the-clock, mission-critical computing environments. SunSpectrum Platinum's many support services include a mission-critical account team, support planning, 24x7 telephone assistance, customer-defined service priorities, and 24x7 on-site hardware service.
- Sun℠ RAS Profile enables enterprises to identify those areas where operational efficiency and mission- and business-critical system reliability can be improved.

Sun℠ Remote Services Event Monitoring Program

The Sun Remote Services Event Monitoring program is a set of tools, technologies, and expertise designed to improve mission-critical support and increase the overall availability of the environments of organizations with SunSpectrum Gold℠ or SunSpectrum Platinum support. Sun Remote Services methodologies allow Sun experts to detect and manage Sun system events faster and more proactively—resolving potential problems before they impact Sun environments and business operations.

SunTone℠ Certification and Branding Program

In a market fraught with time-to-market pressures, ensuring the quality and reliability of applications can be a time consuming task. To help this effort, Sun created the SunTone Certification and Branding program to recognize and promote service provider investments in process, methodology, and infrastructure—elements that enable the delivery of secure, reliable, and predictable Internet services. The SunTone Certification and Branding Program provides customers of Web-based services, applications, and integrator services with a means for identifying suppliers who meet highly-defined standards for delivering quality service over the Internet. The program also gives the companies that provide these quality services a means to differentiate themselves in an ever more competitive and expanding market.

Using the SunTone Certified logos as a guide, organizations can quickly and confidently choose service providers who have met high quality standards aimed at making Webtone as reliable as dialtone. All SunTone Certified services meet established requirements for hardware infrastructure, security, and operational processes. Additionally, service providers, when deploying SunTone Certified services, follow a recommended methodology for building services, providing security, and ensuring reliability and scalability. SunTone Certified applications conform to requirements addressing scalability, availability, security and management practices, and are optimized and tuned to run on the Sun platform.

Chapter 5
Conclusion

Today's organizations are facing many challenges. Telecommunications operators must be on-line 24 hours a day and systems must be managed to handle peak loads without disruption or service degradation. Computing infrastructures must scale both horizontally and vertically—without downtime or unnecessary system complexity. Organizations must find ways to deal with server sprawl and management of thousands of servers in heterogeneous environments spread across the globe while keeping corporate and user information secure. As if all these requirements were not challenging enough, organizations must deploy solutions at lower costs.

The Netra 240 server sets a new standard for cost-effective, expandable, high-density, multiprocessor, server-based computing. Designed for carrier-grade environments, the Netra 240 server offers sophisticated functionality in a compact package. Enhanced networking capacity and bandwidth, along with security acceleration, make the Netra 240 system ideal for applications where network throughput is key. The Netra 240 server's high-performance, multiprocessor capabilities make it ideal for network service deployments as well.

The Netra 240 server combines standard advanced system management techniques, remote management tools, and advanced lights out management (ALOM) capabilities in a highly-manageable, compact, affordable package—providing a robust foundation to help organizations deliver highly available services.

Sun has been developing high-performance, robust computing technology for over twenty years. In a world where technology advances at breakneck speeds, companies are looking to forge alliances that enable them to capitalize on each other's strengths. The combination of Sun systems, the Solaris Operating System, remote management tools, and key technologies such as advanced lights out management in the Netra 240 server enables organizations to capitalize on the power of low-cost, carrier-grade server computing.

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Printed in USA 12/03 XX0000-0/#K