Sun Ray™ Appliance Family

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Positioning

Figure 1: Sun Ray™ 1, 100, and 150 appliances

Introduction

Enterprises face the conflicting goals of controlling expenditures while delivering better support to users. As the total cost of ownership (TCO) for desktop systems escalates, managers are seeking ways to reduce purchase and upgrade costs and to cut the larger expenses of administration and maintenance. Despite this need for greater economy, savings cannot be traded for a loss of functionality, performance or availability. Unrestricted access to high-performance enterprise applications remains a critical requirement.

The Sun Ray™ appliance family is a group of simple, low-cost desktop devices, based on Sun's Sun Ray Hot Desk architecture, which require no desktop administration and are targeted at workgroup or campus environments. These appliances are centrally managed by, and draw their computing resources from, Sun™ servers running the Sun Ray server software.

The Sun Ray Hot Desk architecture is a computing implementation initially targeted at the workgroup, where all user state is centralized on the server and linked by a dedicated interconnect to a simple, zero-administration appliance on the desktop. Underlying this architecture is the Hot Desk technology, which enables "Hot Desking," the ability for users to instantly access their sessions from any Sun Ray appliance in the server group.

The Sun Ray Hot Desk architecture is composed of:

- The Sun Ray appliance
- The Sun Ray server software
- The Hot Desk technology

The Sun Ray Hot Desk architecture not only delivers the advantages of a centralized model of computing, but it also delivers a true zero-administration appliance along with a rich user experience in a truly low-cost desktop appliance.

New Features

- The Sun Ray server software running on each server
- The components of the interconnect (Ethernet switch, Cat 5 wiring)

Hot Desk Technology

- The technology underlying the Sun Ray Hot Desk architecture
- "Hot Desk" or "Hot Desking" refers to the ability of the user to access their sessions instantly from any Hot Desk-enabled appliance in the server group. Hot Desking is enabled by Hot Desk technology.
- Key elements:
  - A fast and efficient interface used to communicate between server and appliance
  - Smart card technology
  - Server software which instantly maps users' sessions to appliances

The Interconnect

- The dedicated connection between the Sun Ray server and any Sun Ray appliance
- The first generation requires Cat 5 wiring and 10/100 BASE-T switched Ethernet

Connectivity Software

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Connectivity Software

- The following software can be used to link the Sun Ray appliance to multiple platforms/environments (these are purchased separately from the Sun Ray server software):
  - Tarantella Enterprise
  - Citrix MetaFrame for Windows
  - HOB HOBLink products
  - Third-party mainframe connectivity products

Product Family Placement

Product Requirement	Solution Type	Applications	Suggested Platform
• Accelerated 3-D graphics (MCAD/MCAE) • Exceptional performance • Can stand alone	Workstation		Ultra™ workstation
• Excellent performance • RAS • Cat5 10/100BASE-T Ethernet	Technical Appliance		Sun Ray appliance
• Low TCO and administration cost • RAS • Cat5 10/100BASE-T Ethernet	Appliance		Sun Ray appliance

Sun Ultra Workstations

The power desktop is optimized to provide solutions for the technical desktop such as CASE, MCAD, and technical/scientific applications for standalone environments. Ultra workstations are designed to provide exceptional application performance, even in environments with demanding applications such as 3-D graphics that require hardware acceleration.

Unlike the Sun Ray appliance, Sun workstations require local system administration.

Product History and Availability

- The Sun Ray 1 appliance and the Sun Ray server software, version 1.0, were released in August 1999.
- The Sun Ray server software version 1.1 was released in April 2000. This release of the Sun Ray server software provides additional functionality for Sun Ray systems. This includes:
  - Support for Sun Ray server groups, which enable load distribution and automated failover.
  - Support for the integration of third-party ISO 7816-compatible smart cards into the Hot Desk environment.
  - A new look and feel for the administration tools, and support for SSL-enabled remote administration (using 40-bit or 128-bit encryption).
  - Support for the Sun Ray server software 1.1 on the Sun Enterprise™ 10000 server.

  Note that these features are implemented in the server software only, and do not require any changes to the Sun Ray appliances on the desktop.
- The Sun Ray 1 appliance workgroup bundles were released in May 2000. New pricing for the Sun Ray 1 appliance also took effect at that time.

  Workgroup bundles include a fully configured Sun Ray server for workgroups of 25, 50, 200, 200, and 300 Sun Ray 1 appliances. In addition, these bundles provide a lower price for the Sun Ray 1 appliances purchased as part of a bundle, compared to the price of a Sun Ray appliance purchased individually.
- Two new members of the Sun Ray appliance family were introduced in July, 2000:
  - The Sun Ray 100 appliance, an "all-in-one" product with the Sun Ray technology embedded in a 17-inch CRT
  - The Sun Ray 150 appliance, with the Sun Ray technology embedded into an LCD flat panel (15-inch TFT) display
- Educational pricing for the Sun Ray 1 appliance workgroup bundles and Sun Ray 100 appliance workgroup bundles was announced in November 2000.

Target Markets

The Sun Ray appliance is designed for users who require simplified deployment and low-cost administration, high performance, low TCO, and convenient RAS features. The Sun Ray Hot Desk architecture is well suited for enterprise workgroup environments, including:

- Customer management solutions/call centers
- Education
- Government

- Financial services
- Enterprise resource planning (ERP)

Target Users

The Sun Ray appliance is designed for users who require simplified deployment and low-cost administration, high performance, low TCO, and convenient RAS features. Although the Sun Ray appliance will have a broad applicability within a wide variety of enterprise environments over time, the product intro was focused on the following markets:

Key Markets and Uses	Key Selling Points
Customer Management Solutions • Call centers • Help desks • Sales support	• Based on Solaris Operating Environment—helps minimize downtime, which is critical to this 24x7 environment • Centrally managed—zero client administration • Users tied to sessions, not desktops—shifts can share desktops • Multimedia capable—allows for video training during operator downtime • A simple, low-cost, appliance—an excellent fit for budget-constrained organizations
Education • K-12 education • Library automation • University academic/research • Campus automation	• Zero client administration—teachers and librarians do not need to become system administrators • Centrally managed—lowers administration costs for this resource-constrained industry • No fan—quiet for libraries • Users tied to sessions, not desktops—allows desktops to be shared by multiple users, while at the same time providing instant access to individual sessions • Applications deployed on server—well-positioned for service provider-based educational portals
ERP • Financial • Manufacturing • Human resources	• A "plug and work" appliance—desktop maintenance is eliminated; appliances can simply be replaced • Centrally managed—allows more effective sharing of under-utilized computing resources (memory and CPU) • No state or data on desktop—allows centralized control, quality, and backup of data; no local data to lose or to keep "in sync" with the central repository • Users tied to sessions, not desktops—gives supervisors the ability to be mobile within the workgroup • User state maintained on server—provides protected, dedicated environment for ERP; users cannot introduce viruses, change session configuration settings, or run unauthorized software
Finance • Back office • Administration • Trading operations	• Supports multiple environments—allows access to multiple platforms without needing more than one system in the work space • Based on Solaris Operating Environment—delivers the power and reliability that financial institutions demand • Applications deployed on server—allows for more frequent upgrades without disturbing the desktop; users can stay up with the latest technology • Small footprint—saves desk space in this market, where desk space is at a premium

Key Markets and Uses	Key Selling Points
Government • Command and control desktops • Administrative desktops	• User tied to a session, not to a desktop—allows user mobility among command and control stations within a workgroup; allows for high desktop-system utilization; one appliance can be used for multiple shifts • No desktop administration—perfect for administrative desktops • A simple, "plug and work" appliance—devices are easily torn down and set up, only the server is configured; perfect for field mobility units • Centrally managed—reduces desktop upgrade and management costs/issues • Utilizes strengths of the Solaris Operating Environment—provides the RAS features required for tactical situations • Inexpensive appliance—well-suited for government to use as an upgrade for older terminal-based networks

Target users for the Sun Ray appliance include the following:

- **The call center desktop**

  The call center market is close to three million seats in 2000 and is expanding at a rate greater than 25 percent per year. Businesses are expanding and modifying their call centers to improve customer service and sell new services. This expansion has put more focus on reducing the cost of the desktop of the call center operator. Typically, these operators would like the multiservice access that the Sun Ray appliance system provides, in addition to zero desktop maintenance costs. This along with the ability to share desktops and still preserve the user session make the Sun Ray appliance a compelling solution. The ability to leverage existing applications reduces the sales cycle for the Sun Ray appliance system and Sun has a large installed base of servers in the Telco call center which is the initial target.

- **Education**

  The educational market finds the following Sun Ray appliance features especially compelling:

  - Low TCO—low purchase cost and zero administration on the desktop
  - Smart card capability
  - Multimedia presentation of instructional content—video (television) capability
  - Access to instructional content on multiple platforms
  - Reliability and scalability

  The Sun Ray appliance is appropriate for all levels of educational and library services including university and academic research, K-12 education, and library automation.

  University academic/research

  This is a traditional Sun market. As student access to the Internet increases, the need for a low-cost, low-maintenance access device that can be shared by multiple users, and provides the individuality of a traditional PC is very important. The Sun Ray appliance provides both of these features. The university market is 5 million units and is increasing 20 percent a year.

  K-12 education

  The education market offers a breakout opportunity for Sun Ray appliances. Today there is no satisfactory client solution for the K-12 market—PC and Macintosh systems are used by default. Sun Ray appliance solves two problems: it is more economical than PCs, and it removes the need to train teachers in PC administration and repair.

  In addition, in the K-12 educational market, content delivery is moving to an Internet service provider (ISP) model. The service provider delivers services over the Internet through portals to the schools.

Because its Solaris Operating Environment underpinnings provide browser and Java technology capability, the Sun Ray appliance can become a key element in the next wave of educational computing which will be based on service providers on the Internet.

- **The ERP desktop**

  Sun has an increasing presence on the server side in this rapidly expanding market (2 million seats increasing at 33 percent according to AMR). Strategically, Sun Ray appliance has the potential to be very important in these accounts by populating the desktop, which is now dominated by Microsoft Windows and Intel PCs. With Sun Ray appliance, Sun has the ability to extend its reach from the server room to the desktop in a aggressive way.

Selling Highlights

Market Value Proposition

Sun Ray™ appliances provide the following value for Sun's customers:

- The centralization of administration of all desktop applications and resources on the Sun Ray server enables a significant reduction in administration effort and application cost for the enterprise.
- The zero-administration desktop significantly reduces the total cost of ownership and increases employee productivity by reducing downtime. If a Sun Ray appliance fails, it can be easily replaced by another appliance without the user losing his or her computational state (applications and data).
- The Hot Desk technology brings Sun's core strengths of highly reliable, scalable, and available servers to the desktop, thereby increasing employee productivity.
- The Hot Desk architecture allows for a more efficient allocation of network resources such as CPU, memory and storage, ultimately lowering the total cost of ownership per capita in the enterprise.
- The Sun Ray appliance offers a rich user experience including Hot Desking, the power of the server on your desktop, and access to all your applications (UNIX®, Microsoft Windows NT, 3270/5250), plus multimedia
- The all-in-one appliance form factor saves valuable desktop space. The Sun Ray 150 appliance offers alternative (VESA-compliant) mounting possibilities, such as on a wall, swivel arm, or mount.

Applications and Solutions

Sun is working with a number of ISVs to test compatibility with important applications. While all applications running on the server should work without any modification for the Sun Ray appliance system, having the support of key ISVs in a target market helps ensure that the applications take advantage of some of the Sun Ray appliance's unique features.

Sun's Hot Desk Technology

Sun Ray™ appliances implements the Sun Ray Hot Desk architecture, the next logical step in an evolutionary process toward more economical and secure computing environments. This new approach removes everything from the desktop except the resources needed for the human interface—input from the keyboard, mouse, and voice; and output to the display and audio (see the figure below). All computing is performed on one or more centralized, shared machines. Everything that previously ran on the user's own desktop—window system, user applications, mail clients, and so on—runs in a session on the server. The Sun Ray appliance display provides a composite view of all currently active applications, with input/output between the user and the servers carried over a simple, dedicated, interconnection fabric.

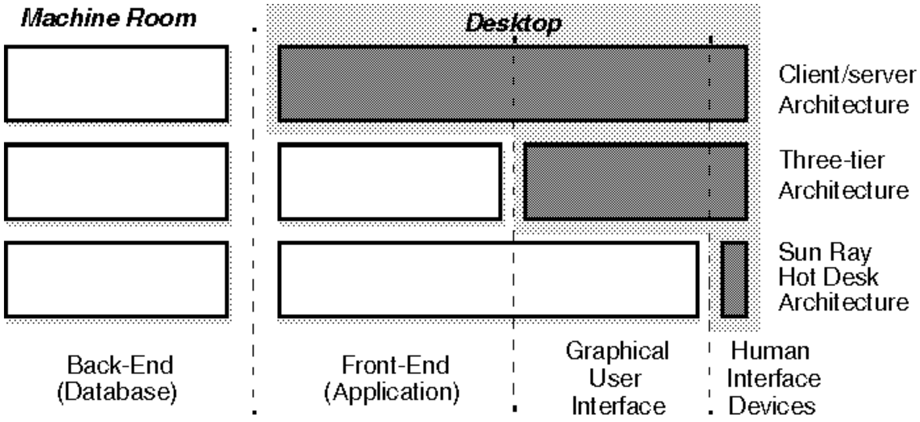

Figure 2: Sun's Hot Desk technology repartitions the functionality between the desktop and the machine room, leaving only the human interface appliance on the client desktop

Because applications execute independently, this architecture allows a user to access his/her unique session from any Sun Ray appliance within the server group. By redirecting input and output, a user's session environment can be moved from one Sun Ray desktop to another instantaneously.

The Hot Desk architecture provides substantial new opportunities for the creation of advanced applications based on Java™ technology, Internet, or collaboration technologies; however, this architecture can be realized without making changes to most existing applications. The vast majority of applications that run on the Solaris™ Operating Environment today will run unchanged on the Sun Ray appliance. The Sun Ray appliance is able to do this through virtual device drivers for X11, which emulate the usual target devices (such as a frame buffer) and send/receive low-level commands to and from the desktop devices in support of the desired user interaction.

This new system architecture offers many advantages, perhaps the greatest of which is the ability to take advantage of the statistical multiplexing opportunities provided by the highly bursty and low duty-cycle resource demands of the majority of users. By centralizing and sharing the system's computational resources, significant cost savings can be achieved, which typically provides users with higher levels of performance. Given the nature of the gains that can be obtained through sharing of resources, it becomes possible to add redundancy back into the computational facility for high reliability (for example, through mirroring and hot-standby techniques) at a lower overall cost.

The Hot Desk architecture focuses on the delivery of services to users, and decouples the delivery of these services from the application component. This architecture shifts the focal point from the desktop to the machine room computing complex. This server-centric world view plays to Sun's existing strengths: the ability to support large numbers of independent users over a high-performance network connection. All of the server technology being developed today in support of the RAS objectives can be used to provide a more robust system based on the principles of the Hot Desk architecture.

To the greatest extent possible, the Hot Desk architecture attempts to eliminate the need for appliance administration, as opposed to creating new administration tools or simply centralizing the tasks. The Sun Ray appliance consists of little more than a keyboard, mouse, and display. There are no user-accessible or alterable resources on the desktop. Also, as the appliance is not a network peer, the network administration stops at the Sun Ray server. The "last mile" of interconnect is substantially administration free.

The fact that no user state exists on the desktop means that the Sun Ray appliances are completely interchangeable and that the failure modes of user computations are independent of the desktop. Also, for this reason, there will be virtually no reason to modify or upgrade the Sun Ray appliance, regardless of what kind of application a user might wish to perform. Once the Sun Ray appliance is capable of meeting the input/output requirements set by the limits of human perception, a faster processor or more memory will not provide any perceptible benefit to the user.

The lack of hard drive user state on the desktop has the additional benefit of allowing an impressive degree of mobility within the workgroup. This feature allows users to gain complete and total access to the computational services being executed on their behalf by the server complex, without regard to the exact physical location of the user.

Smart Card Technology

The Sun Ray desktop unit includes a built-in smart card reader that conforms to the ISO-7816 standard. The size of an ID badge or credit card, smart cards provide strong security by enabling the easy and instant authentication of users. Sites using compatible smart cards are able to deploy and integrate them, if desired, with the Sun Ray appliance security system. The Sun Ray appliance's default authentication policy does not require a smart card, however, and smart cards are not shipped with the product. Smart cards are available separately from Sun in packs of 25, either with Sun artwork or as blank white cards suitable for overprinting.

Sun Enterprise™ Servers and Solaris Operating Environment

Because computation takes place on servers, Sun Ray performance is a function of server performance. And with Sun Enterprise™ servers running the Solaris Operating Environment, Sun Ray appliance users can get all of the performance and scalability they need.

Sun's Enterprise servers lead the industry in offering some of the most powerful, scalable, and reliable systems available today. Sun's family of servers provide scalable, symmetric multiprocessing capabilities, featuring from one to 64 high-performance UltraSPARC™ processors, up to 64 GB of physical memory, and up to 20 TB of disk storage, ensuring performance for peak demands as well as virtually unlimited growth. For the highest levels of availability, Sun servers also support clustering technology that can raise availability to levels over 99.99 percent.

The power of Sun's servers is further enhanced by the Solaris Operating Environment, a premiere environment for enterprise network computing. The Solaris Operating Environment has significant enhancements to support multi-user environments, and is uniquely suited to Sun Ray's new generation of time sharing.

Low-Cost, High-Bandwidth Switched Networking

The Sun Ray appliance protocol assumes a dedicated connection between the desktop and server, ensuring a defined quality of service will be provided in terms of latency, bandwidth, and congestion-induced loss on the link. Such an unmanaged, dedicated interconnect also reduces costs and maintenance. No higher level services such as NIS, NFS, LDAP or SMTP are required and no complex network management is necessary.

Related Software

Sun™ Management Center software may be very helpful to administrators who need to monitor and maintain the health of a Sun Ray server.

Sun Management Center Software

For enterprise computing environments where ease of management, application availability, optimal performance, and scalability are crucial, Sun Management Center software provides all the system management capabilities an administrator could ask for, including the ability to:

- Manage hundreds of Sun systems from any platform with an easy-to-use Java technology interface
- Simplify management of Sun environment to lower service-level costs
- Provide remote online control and "no-cease" management to streamline deployment of new features and reconfiguration of existing ones
- Provide predictive failure analysis warns of problems before they occur
- Monitor application health through comprehensive process monitoring and log file scanning features
- Control management for remote dynamic reconfiguration and auditing securely
- Perform real-time performance monitoring and optional centralized data storage and performance analysis, including historical trend analysis

Sun Ray™ Appliance System Overview

The Sun Ray™ 1, 100, and 150 appliances are the first members of a family of appliances based on the Hot Desk technology. The Sun Ray appliance system consists of three components: the Sun Ray appliance, the Sun Ray server software, and the Sun Ray interconnect. The Sun Ray interconnect fabric is an unmanaged, dedicated, point-to-point connection over a switched Ethernet network.

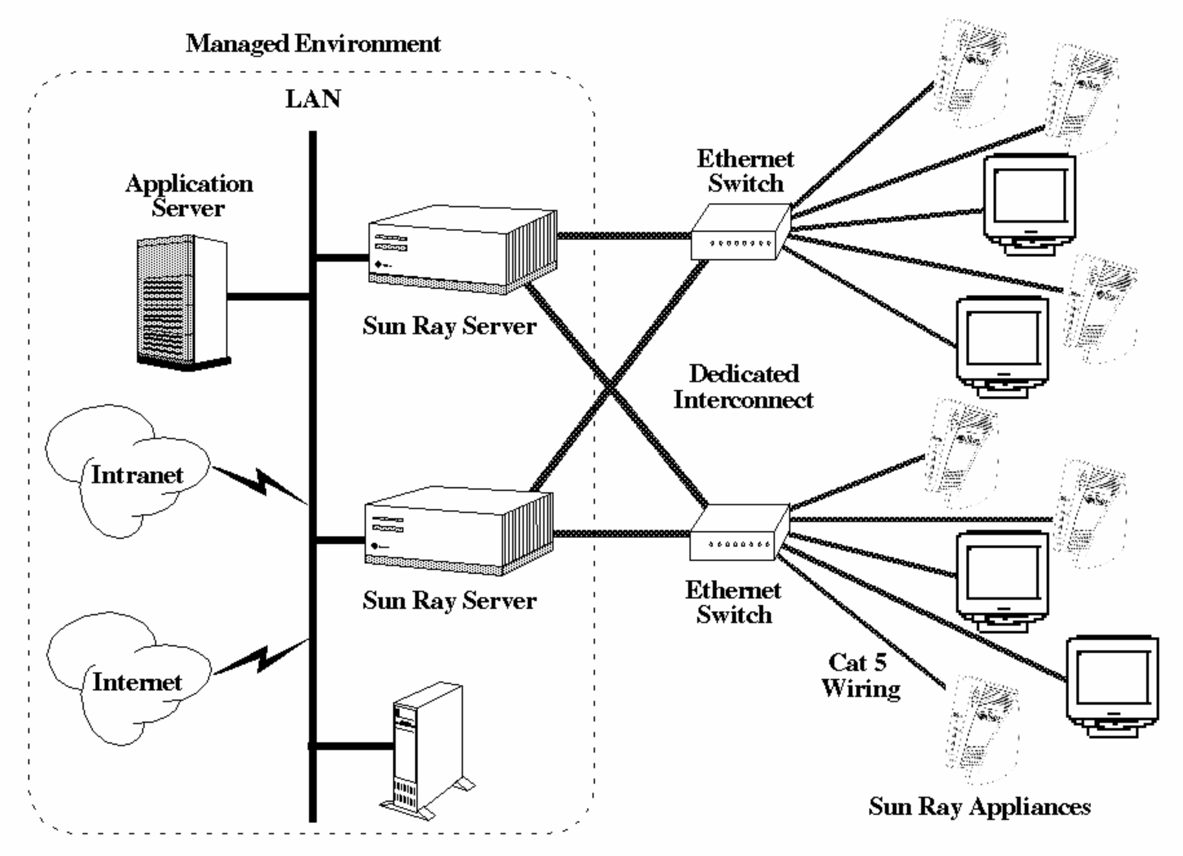

Figure 3: High-level diagram of Sun Ray appliance architecture in a server grouping configuration enabling load distribution and failover (Sun Ray 1 appliances shown here)

Note: *The Sun Ray appliances must be connected to the Sun Ray server using a dedicated, point-to-point connection. The appliances must not be connected to a LAN segment that is shared by any non-Sun Ray appliance devices.*

Features	Benefits
No computation performed on the Sun Ray appliance—all processing is done on the server	No application or performance limitations due to lack of desktop resources The Sun Ray appliance never needs upgrading
No state on the Sun Ray appliance	No loss of work if desktop dies User sessions and environments not tied to physical hardware units.
Stateless, "plug-and-work" appliance	Virtually eliminates time and cost required to install and maintain the desktop No desktop upgrades are required to take advantage of new applications
Platform independent	Can run Solaris™ Operating Environment software, Java™ software, and multimedia applications Can access Microsoft Windows NT 4.0 or Windows 2000 using a variety of third-party products Existing applications can run without porting or rewriting
Optional smart card allows "Hot Desking"	Users who have to move around or share desktops can still get instant access to their own unique session Users access their sessions instantly and securely from any Sun Ray appliance in the server group
No administration or maintenance needed on the desktop	Significantly lowers cost and complexity of adding resources, upgrading, or adding new software
Leverages shared server resources	Every user gets server-class performance, at a significantly lower cost than putting comparable resources on every desktop
Leverages Sun's server RAS strengths	Helps reduce likelihood of system failure or lost productivity
High-speed, dedicated interconnect between server and appliances	Reduces the number of managed network nodes Delivers excellent quality of service
Minimal footprint	Saves desktop space
VESA mount compliant (Sun Ray 150 appliances only)	Allows various mounting options, including: wall and arm

The Sun Ray 1 Appliance

The Sun Ray 1 appliance is a simple, low-cost appliance for workgroup environments. The appliance requires a USB keyboard and USB mouse, and connects to any of a number of Sun monitors or standard SVGA monitors (see "Supported Monitors/Video Output" in the section on "Installation Data" for more specific information). The appliance includes a total of four USB ports.

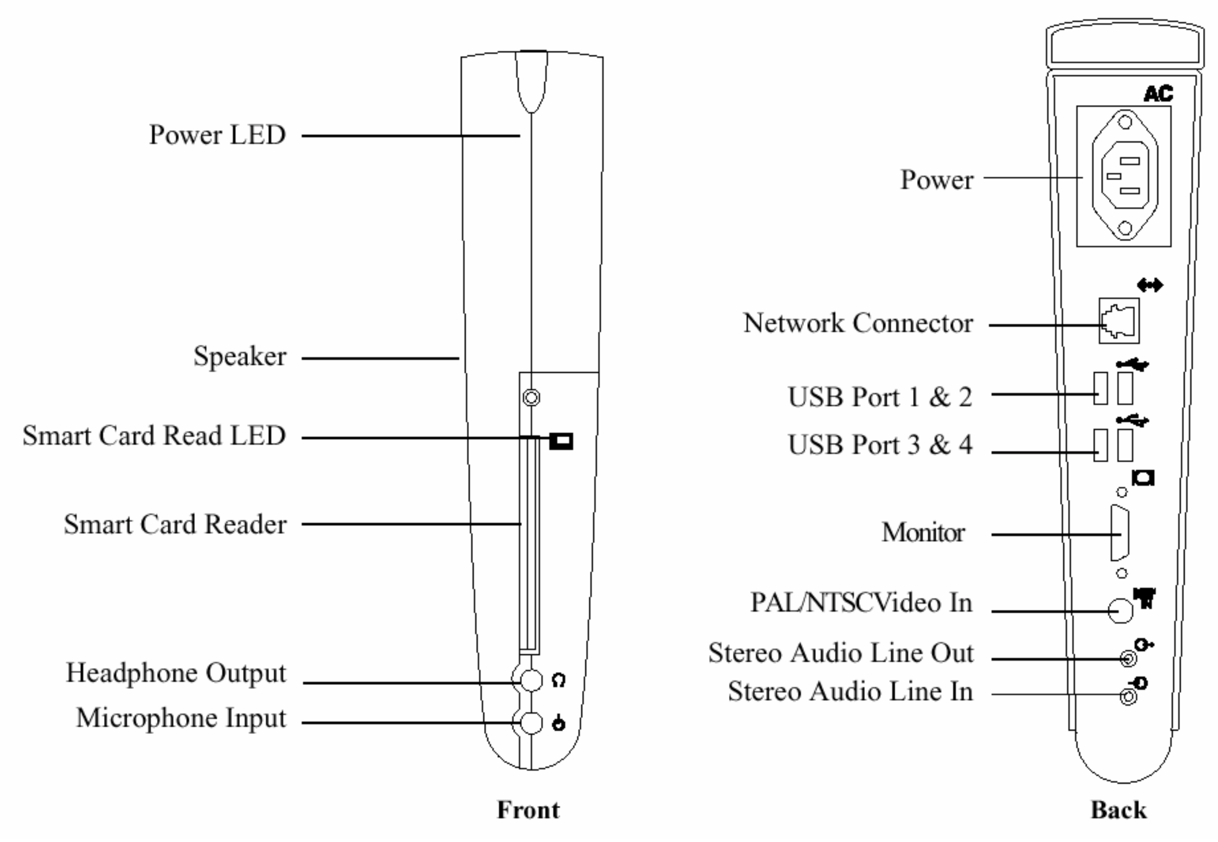

Figure 4: Front and back views of the Sun Ray 1 appliance

The Sun Ray 100 Appliance

The Sun Ray 100 appliance is an "all-in-one" desktop appliance for workgroup environments, the embeds the Sun Ray appliance features into a 17-inch CRT monitor format. The appliance requires a USB keyboard and USB mouse.

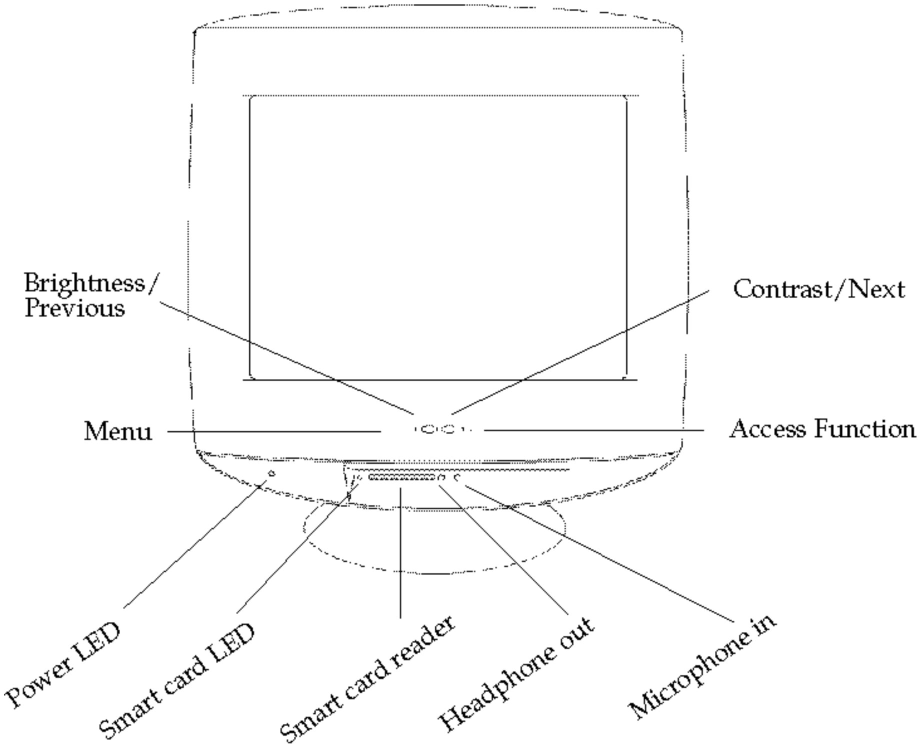

Figure 5: Front view of the Sun Ray 100 appliance

1. Menu button—Opens the Display menu
2. Brightness/Previous button—Can be used to adjust brightness, or to move to the previous selection in the Display menu
3. Contrast/Next button—Can be used to adjust the contrast, or to move to the next selection in the Display menu
4. Access function button—Accesses functions and submenus in the Display menu
5. Power LED—Illuminates when the appliance is powered on
6. Smart card LED—Illuminates when a smart card is inserted
7. Smart card reader—Accepts a valid smart card
8. Headphone outlet—Designed to work with low impedance stereo headphones
9. Microphone input—Adjust microphone volume through software

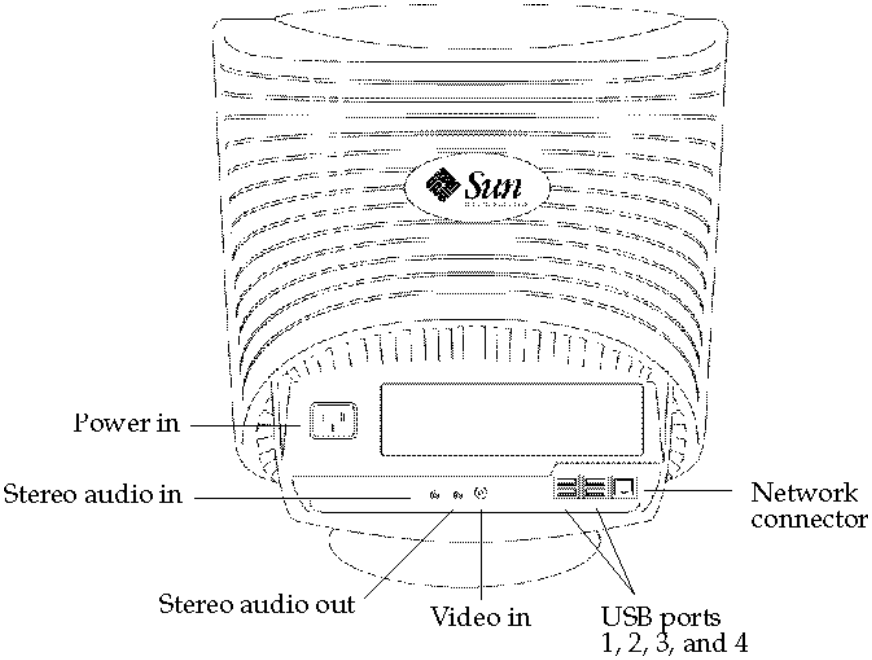

Figure 6: Back view of the Sun Ray 100 appliance

1. Power In—Connect the power cord to this receptacle
2. Stereo audio signal line-in 1/8-inch (3.5-mm) stereo mini-plug—Input from an audio input device
3. Stereo audio signal line-out 1/8-inch (3.5-mm) stereo mini-plug—Output to an audio device
4. Video in—Input for a device that provides a composite video signal
5. USB ports 1, 2, 3, and 4—Standard USB ports for peripherals
6. Network connector—100BASE-T Ethernet cable receptacle (RJ-45)

The Sun Ray 150 appliance

The Sun Ray 150 appliance is an "all-in-one" desktop appliance for workgroup environments, that embeds the Sun Ray appliance features into a 15-inch TFT flat-panel display format. The appliance requires a USB keyboard and USB mouse.

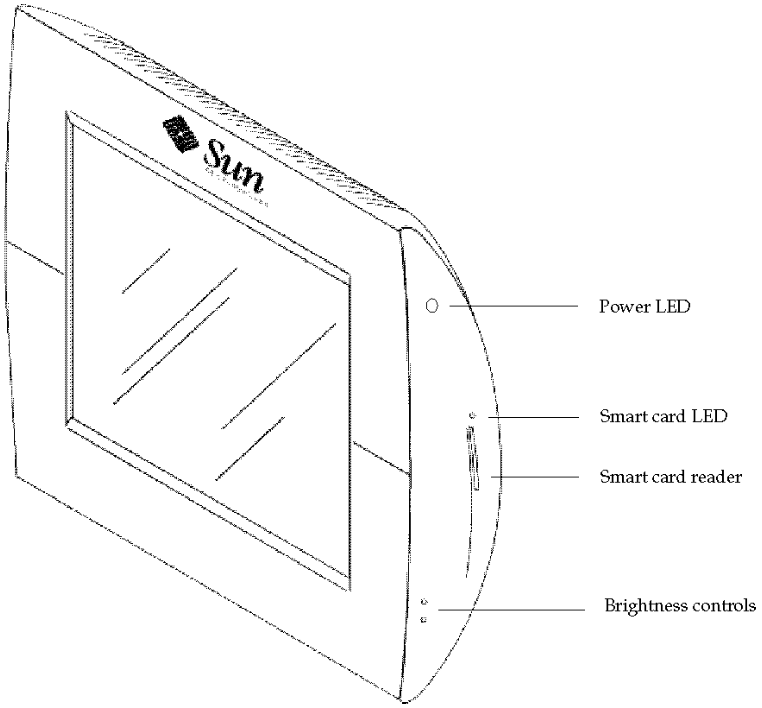

Figure 7: Front view of the Sun Ray 150 appliance

1. Power LED—Illuminates when the appliance is powered on
2. Smart card LED—Illuminates when a smart card is inserted
3. Smart card reader—Accepts a valid smart card
4. Brightness controls—Adjust screen brightness up or down

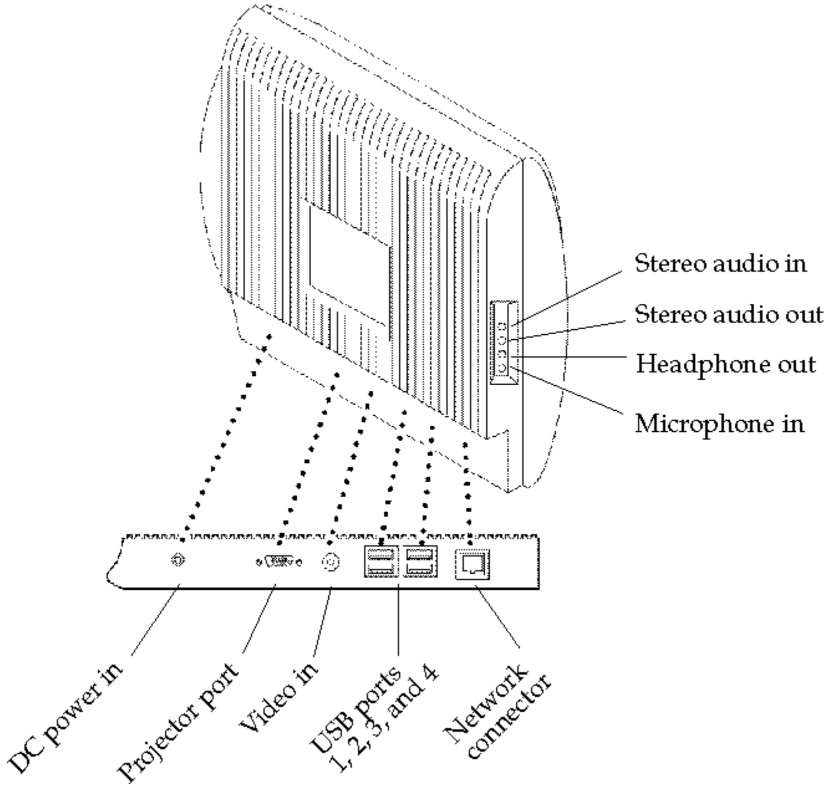

Figure 8: Back view of the Sun Ray 150 appliance

1. Power (DC power in)—Connect the power cord to this receptacle
2. Projector port—Connect an external projection display device to this port for conferences or demos

   Note: *The projector port is not for attaching an additional monitor to create a "dual head" Sun Ray appliance. If a standard CRT monitor is attached to this port, the CRT screen image may be corrupted due to incompatible display modes.*

3. Video in—Input for a device that provides a composite video signal
4. USB ports 1, 2, 3, and 4—Standard USB ports for peripherals
5. Network connector—100BASE-T Ethernet cable receptacle (RJ-45)
6. Stereo audio signal line-in 1/8-inch (3.5-mm) stereo mini-plug—Input from an audio input device
7. Stereo audio signal line-out 1/8-inch (3.5-mm) stereo mini-plug—Output to an audio device
8. Headphone output—Designed to work with low-impedance stereo headphones
9. Microphone input—Adjust microphone volume through software

This appliance offers the customer the opportunity to attach a Kensington-type security device on the panel cabinet. The Kensington slot is located on the back (vertical) surface of the LCD

Sun Ray Server Software

The server associated with Sun Ray appliances provides all the computation, software, state information, and administration. The Sun Ray server software provides the software packages that communicate with and manage the Sun Ray appliances. Users can access other services on the network through the server running the Sun Ray server software.

The Sun Ray appliance system provides high performance and full functionality on the desktop. Possible exceptions to this may occur when users run applications that require intimate connection to the processor/memory subsystem (such as some high-performance graphics applications) or that continuously consume all of a system's processing resources (such as long-running simulations).

How many Sun Ray appliance system users can a server support? The critical resources are CPU, network, and physical memory, including swap memory. The limits of a system's scalability will depend on the capacity of each resource in isolation, the demand on those resources made by the applications, the platform providing the services, and the number of active users on the system at one time.

Dedicated Interconnect

Sun Ray appliances require a high-quality (low-latency, high-bandwidth) interconnection fabric to enable excellent performance, such as 100BASE-T. This fabric leverages commodity network components and standard existing communications technology including Cat 5 wiring, 100BASE-T switches, and Gigabit Ethernet. No special networking hardware is required. A user can access different service providers through the Sun Ray server.

The technology is based on the assumption that the interconnect between the Sun Ray appliances and the Sun Ray servers will be a communications channel implemented as a dedicated, switched network. A dedicated interconnect is important in reducing both the initial purchase cost and the cost of maintaining the interconnect. This is because there is no need to provide higher level services (such as NIS, NFS, LDAP, SMB, and SMTP), or to provide the type of complex network management commonly employed on LANs.

Installation Data

Sun Ray™ 1 Appliance

Enclosure Features

The Sun Ray™ 1 appliance design includes a free-standing, vertical enclosure optimized for desktop use. Its features include the following:

- The processor board and power supply are enclosed together in a non-serviceable unit
- Convection cooling—no fan requirements

Dimensions and Weight (Unit with Base)

Specification	U.S.	Metric
Height	12.0 +/- 0.2 inches	306 +/- 5 mm
Width	4.0 +/- 0.2 inches	102 +/- 5 mm
Depth	11.0 +/- 0.2 inches	280 +/- 5 mm
Weight	3.9 +/- 0.5 lb.	1.8 +/- 0.2 kg

Power Requirements

AC Power	• 100 to 240 V (autoranging power supply) • 50 to 60 Hz • 0.5 A • 30 Watts max. (<20 typical)

Acoustic Noise

Acoustic Noise Emissions (declared in accordance with ISO 9296)	
• Declared Sound Power, L_{WAd} (1B = 10 dB)	• 3.0 B (operating and idling)
• Declared Sound Pressure, Operator Position L_{pAm}	• 25 dBA (operating and idling)

Environment

Temperature (in accordance with IEC-60068-2-1, 68-2-2)	
• Operating	• 32 to 104° F (0 to 40° C)
• Nonoperating	• -4 to 140° F (-20 to 60° C)
Humidity (noncondensing, in accordance with IEC-60068-2-3, 68-2-56)	
• Operating	• 5 to 93% RH, 35 C (95 F) wet bulb max.
• Nonoperating	• 93% RH, 35 C (95 F) wet bulb max.
Altitude (in accordance with IEC-60068-2-13)	
• Operating	• 3,200 meters (10,500 feet) max.
• Nonoperating	• 12,500 meters (41,000 feet) max.
Shock (in accordance with IEC-60068-2-27)	
• Operating	• 5G maximum, 11 msec. half-sine
• Nonoperating	• 30G maximum, 11 msec. half-sine
Vibration (in accordance with IEC-60068-2-64)	
• Operating	• 0.0001 G^2/Hz maximum random, 5 to 500 Hz (0.22 Grms)
• Nonoperating	• 0.001 G^2/Hz maximum random, 5 to 500 Hz (0.70 Grms)

Compliance

System Regulation	**Specifications**
Safety	Complies with the Low Voltage Directive 73/23/EEC based upon type examination certification to the following standards: • EN60950/IEC950 • EN60950 with all countries deviations
FCC Class B	• Part 15 compliance, operation subject to the following two conditions: – This device may not cause harmful interference – This device must accept any interference received, including interference that may cause undesired operation
EMC Directive 89/336/EEC	• EN55022/CISPR22 (1985), Class B • EN55024 – IEC801-2 (1991), 4 kV (Direct), 8 kV (Air) – IEC801-3 (1984), 3 V/m – IEC801-4 (1988), 1.0 kV Power Lines, 0.5 kV Signal Lines • EN61000-3-2/IEC1000-3-2 (1994), Pass
Industry Canada Class B Notice (Avis Industrie Canada, Classe B)	• Complies with Canadian ICES-003 (NMB-003)
Product Label	• CE Mark: Complies with all requirements

Display Modes

- HD-15 standard PC connector
- Scan rates supported
  - 640 x 480 @ 85 Hz
  - 800 x 600 @ 85 Hz
  - 1024 x 768 @ 60 Hz or 75 Hz
  - 1152 x 900 @ 66 Hz* or 76 Hz*
  - 1280 x 1024 @ 60 Hz, 66 Hz, 75 Hz, 76 Hz, or 85 Hz*

    * These scan rates force composite sync. All others use VESA sync.
- DDC-2B support
- No support for sense pins

See the Ordering section of this document, or `http://www.sun.com/sunray1` for a list of currently supported Sun monitors. Third-party monitors will be available through the Solaris™ Ready program. See `http://www.sun.com/SolarisReady/vendors.html`.

Sun Ray 100 Appliance

Enclosure Features

The Sun Ray 100 appliance design includes the Sun Ray processor board built into a 17-inch CRT monitor, optimized for desktop use. Its features include the following:

- Smart card reader and audio I/O ports are built into front of the monitor
- Display, processor board, and power supply are enclosed together in a single, all-in-one unit
- Free-convection cooling—quiet, reliable operation

Dimensions and Weight (Unit with Base)

Specification	**U.S.**	**Metric**
Height	18.4 inches	467 mm
Width	16.4 inches	417 mm
Depth	17.7 inches	450 mm
Weight	38 lb.	17.2 kg

Power Requirements

AC Input	• 100 to 240 V (autoranging power supply) • 50 to 60 Hz • 1.6 A • 110 Watts maximum, 95 Watts typical, 35 Watts power-saving

Acoustic Noise

Acoustic Noise Emissions (declared in accordance with ISO 9296)	
• Sound Power, L_{WAd} (1B = 10 dB)	• 3.0 B (operating and idling)
• Sound Pressure, L_{pAm}, Operator Position	• 25 dBA (operating and idling)

Environment

Temperature (in accordance with IEC-60068-2-1, 68-2-2)	
• Operating	• 32° to 104° F (0° to 40° C)
• Nonoperating	• -4° to 140° F (-20° to 60°)
Humidity (noncondensing, in accordance with IEC-60068-2-3, 68-2-56)	
• Operating	• 5 to 93% RH, 35 C (95 F) wet bulb max.
• Nonoperating	• 93% RH, 35 C (95 F) wet bulb max.
Altitude (in accordance with IEC-60068-2-13)	
• Operating	• 3,200 meters (10,500 feet) max.
• Nonoperating	• 12,500 meters (41,000 feet) max.
Shock (in accordance with IEC-60068-2-27)	
• Operating	• 5G maximum, 11 msec. half-sine
• Nonoperating	• 30G maximum, 11 msec. half-sine
Vibration (in accordance with IEC-60068-2-64)	
• Operating	• 0.0001 G^2/Hz maximum random, 5 to 500 Hz (0.22 Grms)
• Nonoperating	• 0.001 G^2/Hz maximum random, 5 to 500 Hz (0.70 Grms)

Compliance

System Regulation	**Specifications**
Safety	Complies with the Low Voltage Directive 73/72/EEC based upon type examination certification to the following standards: • EN60950/IEC950 • EN60950 with Nordic deviations
FCC Class B	• Part 15 compliance, operation subject to the following two conditions: – This device may not cause harmful interference – This device must accept any interference received, including interference that may cause undesired operation

System Regulation	Specifications
EMC Directive 89/336/EEC	• EN55022/CISPR22 (1985), Class B • EN50082-1 – IEC801-2 (1991), 4 kV (Direct), 8 kV (Air) – IEC801-3 (1984), 3 V/m – IEC801-4 (1988), 1.0 kV Power Lines, 0.5 kV Signal Lines • EN61000-3-2/IEC1000-3-2 (1994), Pass
Industry Canada Class B Notice (Avis Industrie Canada, Classe B)	• Complies with Canadian ICES-003 (NMB-003)
Product Label	• CE Mark: Complies with all requirements

Display Modes

- 1280 x 1024 @ 75 Hz (default)
- 1152 x 900 @ 76 Hz
- 1024 x 768 @ 85 Hz
- 800 x 600 @85 Hz

Sun Ray 150 Appliance

Enclosure Features

The Sun Ray 150 appliance design includes the Sun Ray processor board and external "brick" power supply built into a 15-inch TFT flat panel display, optimized for desktop use. Its features include the following:

- Smart card reader and audio I/O ports are built into either side of the display
- Display, processor board, and power supply are enclosed together in a single, all-in-one unit
- Free-convection cooling—quiet, reliable operation
- Standard mounting features for kiosk, cabinet, wall, and arm
- VESA mount

Dimensions and Weight (Unit with Base)

	U.S.	Metric
Dimensions—Unit with Base		
• Height	17.3 ± 1.0 inches	439.0± 26.0 mm
• Width	16.9± 0.2 inches	429.0± 5.0 mm
• Depth	9.4± 0.2 inches	240.0± 5.0mm
Dimensions—Display Only		
• Height	13.3 ± 0.2 inches	339.0± 5.0 mm
• Width	16.9± .02 inches	429.0± 5.0 mm
• Depth	2.7± 0.2 inches	69.7± 5.0mm
Weight		
• Display Head (maximum)	9.0 lb.	4.1 kg
• Stand (maximum)	4.0 lb.	1.8 kg
• Total (maximum)	12.6 lb.	5.7 kg

Power Requirements

AC Power	• 100 to 240 V (autoranging power supply) • 50 to 60 Hz • 1.0 A • 45 Watts maximum, 30 Watts typical, 15 Watts power-saving

Acoustic Noise

Acoustic Noise Emissions (declared in accordance with ISO 9296)	
• Sound Power, L_{WAd} (1B = 10 dB)	• 3.0 B (operating and idling)
• Sound Pressure, L_{pAm}, Operator Position	• 25 dBA (operating and idling)

Environment

Temperature (in accordance with IEC-60068-2-1, 68-2-2)	**Fahrenheit**
• Operating	• 32° to 104° F (0° to 40° C)
• Nonoperating	• -4° to 140° F (-20° to 60° C)
Humidity (noncondensing, in accordance with IEC-60068-2-3, 68-2-56)	
• Operating	• 5 to 93% RH, 35 C (95 F) wet bulb max.
• Nonoperating	• 93% RH, 35 C (95 F) wet bulb max.
Altitude (in accordance with IEC-60068-2-13)	
• Operating	• 3,200 meters (10,500 feet) max.
• Nonoperating	• 12,500 meters (41,000 feet) max.
Shock (in accordance with IEC-60068-2-27)	
• Operating	• 5G maximum, 11 msec. half-sine
• Nonoperating	• 30G maximum, 11 msec. half-sine
Vibration (in accordance with IEC-60068-2-64)	
• Operating	• 0.0001 G^2/Hz maximum random, 5 to 500 Hz (0.22 Grms)
• Nonoperating	• 0.001 G^2/Hz maximum random, 5 to 500 Hz (0.70 Grms)

Compliance

System Regulation	**Specifications**
Safety	Complies with the Low Voltage Directive 73/23/EEC based upon type examination certification to the following standards: • EN60950/IEC950 • EN60950 with all countries Deviations
FCC Class B	• Part 15 compliance, operation subject to the following two conditions: – This device may not cause harmful interference – This device must accept any interference received, including interference that may cause undesired operation
EMC Directive 89/336/EEC	• EN55022/CISPR22 (1985), Class B • EN61000-3-2/IEC1000-3-2 (1994), Pass • EN61000-3-3 (330V/50Hz), Pass • EN55024/C15PR24 (1998) • EN61000-4-2 (1991), 4 kV (Direct), 8 kV (Air) • EN61000-4-3, 3 V/m • EN61000-4-4, 1.0 kV Power Lines, 0.5 kV Signal Lines • EN61000-4-5, 2kV Line-Ground, 1kV Line-Line • EN61000-4-6, 3V • EN61000-4-11, 0.5 cycle Auto Restart

System Regulation	Specifications
Industry Canada Class B Notice (Avis Industrie Canada, Classe B)	• Complies with Canadian ICES-003 Class B
Product Label	• CE Mark: Complies with all requirements

Display Modes/Video Output

- LCD 1024 x 768 @ 60 Hz
- External projector port 1024 x 768 @ 60 Hz

For More Information

These documents provide additional information on the Sun Ray appliance and its architecture. Additional collateral is listed in the materials abstract section of this document.

- Sun Ray 1 Appliance Overview and Technical Brief— SunWIN #106618
- Deploying the Sun Ray Appliance— SunWIN # 106621
- Integrating Sun Ray Appliance and Microsoft Windows NT— SunWIN# 106776
- Using Smart Cards with Sun Ray Appliances: A Customer Brief— SunWIN #106772
- Smart Card FAQ for Sales Reps— SunWIN #106774
- Network Computing Quick Reference Card— SunWIN #64351
- Network Computing Competitive Quick Reference Card— SunWIN #75631

Requirements and Configuration

System Requirements

All Sun Ray™ appliances must be connected to a Sun SPARC™/Solaris™ Operating Environment server running the Solaris 2.6, or 7 Operating Environment (server edition) and the Sun Ray server software.

Sun Ray server software 1.1 is supported on the following platforms:

- **Sun Enterprise™ servers**
  - Sun Enterprise Ultra™ 10S
  - Sun Enterprise 2
  - Sun Enterprise 220R
  - Sun Enterprise 250
  - Sun Enterprise 420R
  - Sun Enterprise 450
  - Sun Enterprise 3500
  - Sun Enterprise 4500
  - Sun Enterprise 5500
  - Sun Enterprise 6500
  - Sun Enterprise 10000
- **Carrier-grade servers**
  - Netra™ t1
  - Netra t1 model 100
  - Netra t 1120
  - Netra t 1125
  - Netra t 1400
  - Netra t 1405
- **UltraSPARC™ workstations (with Solaris Operating Environment server edition license)**
  - Ultra™ 2
  - Ultra 10
  - Ultra 60
  - Ultra 80

This Solaris Operating Environment server must have at least two network connections: one to connect to the LAN, and the other for use by the dedicated interconnect over which the Sun Ray appliances communicate. The Sun Ray appliances require a 10- or 100-Mbit Ethernet connection to the server via a dedicated interconnect.

Sun Ray 1 Appliance Configuration

Sun Ray 1 appliances require a Sun Type 6 USB keyboard and USB mouse. There is only one configuration of the desktop unit. There are no CPU, memory, storage, or any other options. The product provides hardware support for audio and video, and four USB ports for connection of local peripherals. Implementation of these capabilities is provided through the Sun Ray server software and downloadable firmware. Additional peripheral support will be added in future Sun Ray server software releases.

Monitors must be purchased separately. The Sun Ray 1 appliance is compatible with the currently shipping 17-inch and 19-inch Sun monitors. The 18-inch flat panel display, 21-inch monitor, and a limited number of Sun legacy monitors will also be qualified. Specifications for compatible PC monitors will be published. See the list of supported monitors in the Ordering section of this document.

The Sun Ray 1 appliance system as shipped is smart card ready. Customers who have compatible smart cards will be able to use them (smart cards are not included with the Sun Ray 1 appliance). However, the default authentication for the Sun Ray 1 appliance system does not require a smart card, and smart cards are currently not included with the Sun Ray 1 appliance. Specifications for compatible smart cards, and information on where to obtain them can be found on the Sun Ray appliances web page at `http://www.sun.com/sunray`.

Feature	**Sun Ray 1 Appliance Specification**
Enclosure	• Slimline desktop box
CPU	• 100-MHz SPARC IIep
Memory	• 8 MB on board
Graphics	• 24 bit, 2-D accelerated
– Graphics/resolution	• Up to 1280 x 1024, and up to 85 Hz
Input/Output	• 4 USB, powered
– Ethernet	• 100BASE-T, 10BASE-T
– Input Devices	• Type 6 USB keyboard • "Crossbow" USB mouse • SunMicrophone™ II (optional) • SunCamera™ (optional, no I/O card required)
– Audio	• 16-bit stereo audio in/out, microphone, headphone
– Composite Video In	• NTSC/PAL
EnergyStar	• Compliant
Smart Card Reader	• ISO-7816-1 compliant

Sun Ray 100 Appliance Configuration

The Sun Ray 100 appliance requires a Sun Type 6 USB keyboard and USB mouse. There is only one configuration of the desktop unit. There are no CPU, memory, storage, or any other options. The product provides hardware support for audio and video, and four USB ports for connection of local peripherals. Implementation of these capabilities is provided through the Sun Ray server software and downloadable firmware. Additional peripheral support may be added in future Sun Ray server software releases.

The Sun Ray 100 appliance system as shipped is smart card ready. Customers who have compatible smart cards will be able to use them (smart cards are not included with the Sun Ray 100 appliance). However, the default authentication for the Sun Ray 100 appliance system does not require a smart card, and smart cards are currently not included with the Sun Ray 100 appliance. Specifications for compatible smart cards, and information on where to obtain them can be found on the Sun Ray appliances web page at `http://www.sun.com/sunray`.

Feature	Sun Ray 100 Appliance Specification
Display	• 17-inch (43 cm) full-square picture tube • 16-inch (40.6 cm) viewable • 0.26 mm dot pitch • 1280 x 1024 @ 75 Hz maximum resolution • 1152 x 900 @ 70 Hz • 1024 x 768 @ 85 Hz • 800 x 600 @ 85 Hz • Unlimited colors • Silica-coated with antistatic properties (TCO: multilayer coating) • Medium-short persistence phosphor
Enclosure	• All-in-one design
CPU	• 100-MHz SPARC IIep
Memory	• 8 MB on board
Graphics	• 24 bit, 2-D accelerated
– Graphics/resolution	• Up to 1280 x 1024, up to 76 Hz
Input/Output	• 4 USB, powered
– Ethernet	• 100BASE-T (RJ-45)
– Input Devices	• Type 6 USB keyboard • "Crossbow" USB mouse • SunMicrophone II (optional) • SunCamera (optional, no I/O card required)
– Audio	• 16-bit stereo audio in/out, microphone, headphone
– Composite Video In	• NTSC/PAL
EnergyStar	• Compliant
Smart Card Reader	• ISO-7816-1 compliant

Sun Ray 150 Appliance Configuration

The Sun Ray 150 appliance requires a Sun Type 6 USB keyboard and USB mouse. There is only one configuration of the desktop unit. There are no CPU, memory, storage, or any other options. The product provides hardware support for audio and video, and four USB ports for connection of local peripherals. Implementation of these capabilities is provided through the Sun Ray server software and downloadable firmware. Additional peripheral support will be added in future Sun Ray server software releases.

The Sun Ray 150 appliance system as shipped is smart card ready. Customers who have compatible smart cards will be able to use them (smart cards are not included with the Sun Ray 150 appliance). However, the default authentication for the Sun Ray 150 appliance system does not require a smart card, and smart cards are currently not included with the Sun Ray 150 appliance. Specifications for compatible smart cards, and information on where to obtain them can be found on the Sun Ray appliances web page at `http://www.sun.com/sunray`.

Feature	**Sun Ray 150 Appliance Specification**
Display	• 15.0-inch (38.1 cm) AM-TFT-LCD flat panel • 1024x768 maximum resolution • 0.31 mm full pixel pitch
Enclosure	• All-in-one design • Standard mounting features for kiosk, cabinet, wall, and arm (VESA 100 mm)
CPU	• 100-MHz SPARC IIep
Memory	• 8 MB on board
Graphics	• 24 bit, 2-D accelerated
– Graphics/resolution	• 1024 x 768 at 60 Hz
Input/Output	• 4 USB, powered
– Ethernet	• 100BASE-T (RJ-45)
– Input Devices	• Type 6 USB keyboard • "Crossbow" USB mouse • SunMicrophone II (optional) • SunCamera (optional, no I/O card required)
– Audio	• 16-bit stereo audio in/out, microphone, headphone
– Composite Video In	• NTSC/PAL
EnergyStar	• Compliant
Smart Card Reader	• ISO-7816-1 compliant

Interconnect

The Sun Ray appliance requires a dedicated 10- or 100-Mbit Ethernet connection to the Sun Ray server. It leverages existing level 2 switches, and the Cat 5 wiring already available in many installations today. The Sun Ray appliance typically does not require any rewiring; just a reassignment of the existing wiring from the desktop into a dedicated switch rather than into a shared LAN switch or router. Typically this reassignment takes place in a wiring closet or the machine room.

The interconnect required for the Sun Ray appliance system is easy to construct using simple, switched local area network technology. However, because of the high quality of service required by the Sun Ray appliances, no other network devices may share the interconnect between the Sun Ray server and the appliances. Furthermore, Sun Ray appliances must not be placed directly on a shared LAN. The Sun Ray server will connect to a shared LAN; the individual Sun Ray appliances must access the shared LAN via the dedicated interconnect and the Sun Ray server. For this reason, two network interface cards (NICs) are required—one to connect to the shared LAN, and one to connect to the dedicated interconnect.

Interconnect approaches include the following:

- Crossover cables from interfaces on server units
  - Appropriate for small configurations (1 to 8)
- Server to small (8-port) 100-Mbps switches
  - Good for very low cost workgroup (8 to 32 Sun Ray appliances/server)
- Server gigabit link to 100-Mbps switch

  - Excellent performance and reliability
  - Gigabit fiber gives greater distance from switch to Sun Ray appliances

When selecting switches, consider the following factors:

- Look for:
  - Autonegotiation capabilities
  - Full duplex, 100 Mbit
  - Non-blocking
  - Full bisectional bandwidth
- Avoid:
  - Non-negotiating
  - Strict cut-through
  - Unbuffered
  - Half-duplex

See `http://www.sun.com/sunray` for more details on the Sun Ray interconnect requirements.

Licensing/Usage

Sun Ray appliances must be connected to a server running the Sun Ray server software.

- The Sun Ray server software comes with a license to use the software on a single server. For the Sun Enterprise 10000 server, the license allows one copy of the Sun Ray server software (version 1.1 only) to be run per domain.
- Solaris Operating Environment server software is not included. New customers must also purchase this software.
- There are no licensing limitations regarding the number of Sun Ray appliances that may be connected to a single server.

Server Sizing and Configuration

This section covers the issues involved in determining the configuration of the server that will host the Sun Ray server software. These sizing recommendations are intended to provide workstation class performance to the Sun Ray appliance user under normal, not peak, operating conditions, with less than 100-ms response times for most operations.

The sizing and configuration guidelines provided here also apply to servers that are members of a Sun Ray server group. However, the sizing must take into consideration the potential number of uses each server may need to support when one server in the group fails, and the sessions it was supporting are restarted on the remaining servers.

A general rule is that each server in a Sun Ray server group must be able to support its own portion of the total set of Sun Ray appliance users, plus some portion of the users from the largest server among the other members of the Sun Ray server group.

Example 3 Sun Ray servers in a server group, supporting 150 users:

- Server A normally supports about 25 users
- Server B normally supports about 75 users
- Server C normally supports about 50 users
- Server A should be configured to support 50 users (its own normal load plus 1/3 of Server B's load)
- Server B should be configured to support 115 users (its own normal load plus 3/4 of Server C's load)
- Server C should be configured to support 100 users (its own normal load plus 2/3 of Server B's load)

Server Requirements

- SPARC server running the Solaris 2.6 or Solaris 7 Operating Environment.
- At least 2 NICs—one is required for the dedicated interconnect between the server and the Sun Ray appliances, the other is required to connect to the managed network (LAN).

Recommended Minimum Configuration

- At least two CPUs (see note)
- At least two disk spindles for swap space
- 256-MB RAM
- 1 Gbit/second NIC (for future capacity/functionality) for use by the interconnect

Note: *The single-CPU Sun Enterprise Ultra 5S or Sun Enterprise Ultra 10S server is acceptable under most conditions for very small server groups: 5 to 10 active users. However, be careful about sizing for peak loads with single CPU servers, since there's only one CPU to service the run queues which grow during peak load periods.*

CPU Sizing

Most applications use an average of 2 to 5 percent of a 300-MHz CPU per active user excluding heavy applications (large Java™ applications, CAD, simulations, and so on) and high rate graphics applications (video, games, large animated .gif files, and so on).

A conservative calculation to determine the number of CPUs required to support average loads is:

- 10% (kernel and daemons) + (number of active users x 5%)

Example

- 50 users with 50% activity levels = 25 active users
- 25 active users x 5% = 125% + 10% for OS = 135%
- Round up to next integer
- Use two CPUs for 25 active users

Memory Sizing

The following are the general memory sizing rules for most applications, excluding applications with large memory footprints or resident data requirements (such as CAD)

- Allot 64 MB for kernel, system shared libraries, and shared application memory
- Add 40 MB per active user.

Example

- 25 active users x 40 MB + 64 MB (OS and shared) = 1064 MB

Swap Sizing

Virtual memory should be sized large enough to hold the entire X session for every Sun Ray appliance user (not just currently active users). In addition, provide space for anonymous memory and temporary storage required by the operating environment and many applications.

- A typical application suite footprint will be 40 to 100 MB
- Size virtual memory for all users, not just active users
- Determine the amount of swap by subtracting the amount of RAM configured on the system from the virtual memory requirement
- Add 500 MB to 1 GB of swap space for core dumps and temporary storage
- Spread swap over as many spindles as possible, with a general rule of one swap spindle per CPU configured in the server

Swap is used extensively by the Sun Ray server software to effectively share physical memory among users. Active users get their sessions paged into memory when they restart their sessions, and inactive users are paged out as memory is required to support other active users. To maintain the levels of performance expected by most users, it is important to have sufficient I/O bandwidth to the disk subsystem to make the paging in and out of user sessions occur quickly.

Example

- 50 users with 50% activity levels = 50 users x 50 MB = 2.5-GB virtual memory
- 2.5-GB virtual memory—1064-MB RAM = 1.5-GB swap
- 1.5-GB swap + 500 MB (tmp) = 2-GB swap
- 2 CPU system needs swap spread across two disk spindles

Sun Ray Appliance Interconnect Sizing

Typical applications (excluding video, games, and so on) use less than 1 Mbps of bandwidth on the dedicated Sun Ray appliance interconnect. To calculate a conservative estimate for network bandwidth requirements:

- Calculate the bandwidth required = number of active users x 1 Mbps
- Determine the number of 100-Mbps NICs required by dividing the network bandwidth requirement by 70 Mbps (assumes 30 percent protocol overhead)

Example

- 25 active users x 1 Mbps = 25 Mbps
- 25 Mbps / 70 Mbps/NIC = .35 100 Mbps NICs

Remember to include at least two NICs—one for the LAN connection in addition to the number required for the Sun Ray appliance interconnect.

Other Services

Be sure to add in resource requirements for any additional services and applications that will be running on the same server that is hosting the Sun Ray server software.

Load Balancing and Failover

With the Sun Ray server software version 1.1, users have the option of dividing up their Sun Ray appliances among several servers in a Sun Ray server group. This expands the number of Sun Ray appliances that can participate in a single Hot Desking environment. With Sun Ray server grouping, a user can insert their smart card into a Sun Ray appliance connected to any one of the servers in the server group, and the group manager can locate a user's session if it exists on any of the servers in the group.

Multiple servers can improve the availability for a workgroup by providing an automated failover capability. If one Sun Ray server fails, sessions can automatically be started on the remaining servers in the Sun Ray server group. The only disadvantages of multiple servers is that they increase the administration load over a single server.

The Sun Ray enterprise software load balancing feature can help normalizing peak loads, because loads can be spread and balanced over more resources. However, the Sun Ray load balancing feature provides static load balancing, so that once a session is created on a given server, it will never be automatically moved to another server. The session must be shut down (either by explicit user action or by a server failure) before it can be re-established on another server.

If loads are split across multiple servers, use servers with multiple processors. According to queuing theory, having a single run queue with multiple processors to service the queue is much more effective at reducing queue time (and response time) than having more queues with one CPU serving each queue. Aim for at least two to four CPUs per server when splitting loads across multiple servers.

Server Selection

When selecting a server to host the Sun Ray server software, do not pick a server that requires 80 percent or more of its maximum capacity just to support the average load for the intended workgroup. Pick a server that has capacity for expansion of system resources to accommodate tuning the system for higher than expected peak loads, failover of sessions from other servers in a Sun Ray server group, adding users, or adding applications.

Sizing Tool

A sizing tool is available that will help characterize user activity profiles, and will use resource load characteristics for typical classes of applications to more accurately determine the server size required to support average loads. This tool is available on the Sun Ray appliance web site at `http://www.sun.com/sunray`.

Sun Ray™ Server Software

Sun Ray™ server software is the set of software packages that are required to allow a SPARC™ server running the Solaris™ Operating Environment to manage a set of Sun Ray appliances.

There are two unique system services which are central to the function of a Sun Ray server. The first of these is the Authentication Manager, which is responsible for identifying and authenticating an individual who accesses a Sun Ray appliance. The other service is the Session Manager. The Session Manager's primary function is mapping of users (as identified by the Authentication Manager) to user sessions running on the Sun Ray server, and the binding and unbinding of related services to and from specific Sun Ray appliances.

Sun Ray server software includes:

- Solaris Operating Environment window system code
  - Virtual device driver integration into Sun X server
  - Support for 8-bit visuals
  - Cut and paste between subsessions
- Sun Ray server software
  - Authentication Manager
  - Group Manager
  - Session Manager
  - System administration tools

Authentication Manager

The Authentication Manager's principal duty is to implement the chosen policies for authenticating users' desktop units. When a user is successfully authenticated, this software maps the individual to a specific abstraction maintained by the system and notifies the Session Manager of the new connection. Similarly, the Authentication Manager notifies the Session Manager of disconnection events as they occur.

The Sun Ray system invokes the Authentication Manager each time a user at a Sun Ray desktop attempts to access the system. The Authentication Manager can be replicated on multiple servers, providing the increased performance and reliability needed by larger workgroups.

The Authentication Manager provides an extensible framework that permits the creation of arbitrary authentication policies, without requiring any modification to the desktop unit. Administrators may modify these policies or create new ones, providing a flexible security solution that can be tailored to meet an organization's specific needs. Two authentication policies are defined with the Sun Ray system:

- **Zero administration (default policy)**

  The default policy, in effect when a Sun Ray system is initially installed, requires no administration. Smart cards are optional, but fully supported. If smart cards are used, the serial number from the card is used as a unique, identifying token number, otherwise the MAC address of the desktop unit is used as the default.

The first time a token number is sent (that is, the first time a smart card is inserted or a desktop unit is powered on), the Sun Ray system will prompt for a Solaris Operating Environment login name and password. When a user successfully logs in, the Authentication Manager notifies the Session Manager and creates a new session associated with this token.

Although smart cards are optional, they act as a "bookmark" for a particular session and enable easy mobility. During an active session, a smart card can be removed from one desktop and inserted into a different desktop. The Authentication Manager uses the token number of the smart card to map the user to their currently active session, and work can continue uninterrupted; all applications are still running and the user environment is recreated exactly as it was left. If smart cards are not used, a user needs to log out of one desktop and then log in to another (which is identical to workstation environments today). Sun Ray appliance users can still use any desktop, but a smart card is required to automatically reconnect to an active session.

- **Registered**

  The registered authentication policy affords a higher level of security, as all tokens must be registered before they can be used to create a Sun Ray session. Specific users (smart cards) or desktops may be assigned specific sessions, and may be denied access through the Administration Tools. For example, administrators may assign known smart cards to CDE desktop sessions, while other users logging in from a Sun Ray desktop may be assigned a session with a limited web browser instead.

  Administrators can choose a distributed or a centralized registration policy. With a distributed policy, users accessing the system with a new token number are sent to a registration screen to complete self-registration before being authenticated. A centralized policy provides greater security, as the registration program runs only at a single location, such as a badging station or site security officer’s station. As with the zero administration policy, any user would also need a Solaris Operating Environment login and password to complete the Sun Ray authentication process.

Additional authentication policies may be included in later releases, and administrators will be able to extend the provided authentication policies. For example, if increased security is needed, a challenge/response policy can be combined with the registered authentication policy. In addition to requiring a Solaris Operating Environment login name and password, users would need to enter a valid, registered smart card and complete a full challenge/response transaction to be successfully authenticated.

Session Manager

The Session Manager manages all running user sessions. A user session consists of one or more subsessions, with each subsession encompassing one or more applications running on a particular server (see the figure below). For example, one subsession may contain a word processor and a spreadsheet application running on a Microsoft Windows NT server. Another subsession may contain software development tools, a document editor, and a custom application running on a Solaris Operating Environment server.

Although a user may have multiple subsessions, only one is active at any given time. Users can switch between subsessions, create new subsessions, and delete existing subsessions. Cut and paste between subsessions—including those running on different platforms—is also supported.

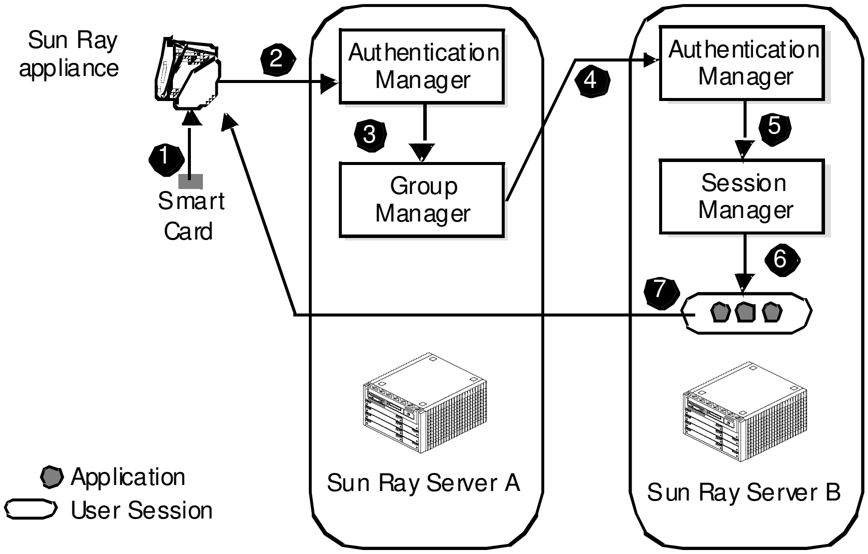

Figure 9: A user session consists of one or more subsessions, each encompassing one or more applications running on one or more host systems

When the Session Manager is informed of a user connection event by the Authentication Manager, it notifies the applications within the currently active subsession to perform all input/output operations with the indicated Sun Ray desktop unit. Similarly, when a disconnect event occurs, the Session Manager signals all applications in the currently active subsession to cease I/O with the desktop unit and enter a quiescent state.

As with the Authentication Manager, the Session Manager must be active at all times for the Sun Ray system to function properly. Like the Authentication Manager, the Session Manager can be distributed to multiple servers for load-balancing and higher availability.

Administration Tools

Every effort has been made to reduce the administrative burden for Sun Ray systems. For example, reasonable defaults are provided so that most systems will function correctly after system installation without additional configuration. However, some administration is still required. Sun Ray appliance administration software includes tools for managing the chosen authentication policy, modifying user privileges, altering desktop device settings, and monitoring the state of the service producing machines.

All Sun Ray administration tools are accessible through browser-based graphical user interfaces (GUIs) and command line interfaces. C-language interfaces are also available for use in automating routine administration tasks with scripts.

Administrative data is stored in the Sun Directory Service (LDAP) and Sun WebServer™ software is used to provide GUI access.

Peripheral Device Support

Sun Ray appliance users have two ways to access peripherals: they can access network peripherals that are accessible through the Sun Ray servers (just like any other Solaris Operating Environment user), or they can use local peripherals connected directly to a desktop unit. Local peripherals attach through either the universal serial bus (USB) ports on the desktop unit. The device driver for these peripherals residing on the servers. From the Sun Ray appliance initial release, Sun has provided USB drivers for the keyboard and mouse.

Merely plugging a peripheral into a desktop unit does not automatically imply that it will be available for use— the administrator must first set a policy that enables its use by that desktop. This approach provides system administrators with a high degree of control over which types of devices can be added to particular desktops.

Legacy Solaris Operating Environment devices that are accessed directly through the `/dev` name space (like `/dev/audio/*` and `/dev/term/*`) are supported through device emulation. When a new session is created, pseudo devices are dynamically created for those devices which the user has permission to access. To the services that use them, these dynamically created pseudo devices behave just like the devices they emulate.

Ordering Information

Sun Ray™ 1 Appliance Part Numbers

The Sun Ray™ 1 appliance product includes the appliance (a free-standing, vertical unit), plastic base, documentation, and country kit. The country kit includes the keyboard, mouse, and power cords. One copy of the Sun Ray server software must be purchased for every server to which Sun Ray appliances will be connected. The software license allows an unlimited number of Sun Ray appliances to be connected to a single server.

Order Number	Title and Description
BAE-100-00	Sun Ray 1 appliance, keyboardless
BAE-100-01	Sun Ray 1 appliance with North American country kit
BAE-100-07	Sun Ray 1 appliance with United Kingdom country kit
BAE-100-40	Sun Ray 1 appliance with North American UNIX® country kit
BAE-100-42	Sun Ray 1 appliance with Japanese UNIX country kit
BAE-100-46	Sun Ray 1 appliance with Japanese country kit
BAE-100-72	Sun Ray 1 appliance with Spanish country kit
BAE-100-78	Sun Ray 1 appliance with European universal country kit

Sun Ray 100 Appliance Part Numbers

The Sun Ray 100 appliance product includes the appliance (all-in-one with 17-inch monitor), plastic base, documentation, and country kit. The country kit includes the keyboard, mouse, and power cords. One copy of the Sun Ray server software must be purchased for every server to which Sun Ray 100 appliances will be connected. The software license allows an unlimited number of Sun Ray 100 appliances to be connected to a single server.

Order Number	Title and Description
BAE-200-00	Sun Ray 100 appliance, all-in-one 17-inch CRT, keyboardless
BAE-200-01	Sun Ray 100 appliance, all-in-one 17-inch CRT with North American country kit
BAE-200-07	Sun Ray 100 appliance, all-in-one 17-inch CRT with United Kingdom country kit
BAE-200-40	Sun Ray 100 appliance, all-in-one 17-inch CRT with North American UNIX country kit
BAE-200-42	Sun Ray 100 appliance, all-in-one 17-inch CRT with Japanese UNIX country kit
BAE-200-46	Sun Ray 100 appliance, all-in-one 17-inch CRT with Japanese country kit

Order Number	Title and Description
BAE-200-72	Sun Ray 100 appliance, all-in-one 17-inch CRT with Spanish country kit
BAE-200-78	Sun Ray 100 appliance, all-in-one 17-inch CRT with European universal country kit

Sun Ray 150 Appliance Part Numbers

The Sun Ray 150 appliance product includes the appliance (all-in-one with 15-inch flat panel), plastic base, documentation, and country kit. The country kit includes the keyboard, mouse, and power cords. One copy of the Sun Ray server software must be purchased for every server to which Sun Ray 150 appliances will be connected. The software license allows an unlimited number of Sun Ray 150 appliances to be connected to a single server.

Order Number	Title and Description
BAE-300-00	Sun Ray 150 appliance, all-in-one 15-inch flat panel, keyboardless
BAE-300-01	Sun Ray 150 appliance, all-in-one 15-inch flat panel with North American country kit
BAE-300-07	Sun Ray 150 appliance, all-in-one 15-inch flat panel with United Kingdom country kit
BAE-300-40	Sun Ray 150 appliance, all-in-one 15-inch flat panel with North American UNIX country kit
BAE-300-42	Sun Ray 150 appliance, all-in-one 15-inch flat panel with Japanese UNIX country kit
BAE-300-46	Sun Ray 150 appliance, all-in-one 15-inch flat panel with Japanese country kit
BAE-300-72	Sun Ray 150 appliance, all-in-one 15-inch flat panel with Spanish country kit
BAE-300-78	Sun Ray 150 appliance, all-in-one 15-inch flat panel with European universal country kit

Sun Ray Enterprise Server Software 1.1 Part Numbers

The Sun Ray enterprise server software kit includes CD, Installation Guide and Product Notes. It includes the right to use the software on a single SPARC™ processor/Solaris™ Operating Environment server. The license has no limitations on the number of Sun Ray appliances that may be connected to a single server.

Order Number	Title and Description
CECMS-110AI99M	Sun Ray server software 1.1 for single-CPU systems. Documentation localized in English, French, Japanese, Korean, Simplified Chinese, and Traditional Chinese. Provides authentication and session management services for Sun Ray appliances. 40-bit encryption. Requires Solaris 2.6 or 7 Operating Environment.

Order Number	Title and Description
CECMS-110CI99M	Sun Ray server software 1.1 for single-CPU systems. Documentation localized in English, French, Japanese, Korean, Simplified Chinese, and Traditional Chinese. Provides authentication and session management services for Sun Ray appliances. 128-bit encryption. Requires Solaris 2.6 or 7 Operating Environment.
CECMS-110AW99M	Sun Ray server software 1.1 for workgroup servers (Sun Enterprise™ 2, 250, 450). Documentation localized in English, French, Japanese, Korean, Simplified Chinese, and Traditional Chinese. Provides authentication and session management services for Sun Ray appliances. 40-bit encryption. Requires Solaris 2.6 or 7 Operating Environment.
CECMS-110CW99M	Sun Ray server software 1.1 for workgroup servers (Sun Enterprise 2, 250, 450). Documentation localized in English, French, Japanese, Korean, Simplified Chinese, and Traditional Chinese. Provides authentication and session management services for Sun Ray appliances. 128-bit encryption. Requires Solaris 2.6 or 7 Operating Environment.
CECMS-110AE99M	Sun Ray server software 1.1 for enterprise servers (Sun Enterprise 3X00, 4X00, 5X00, 6X00). Documentation localized in English, French, Japanese, Korean, Simplified Chinese, and Traditional Chinese. Provides authentication and session management services for Sun Ray appliances. 40-bit encryption. Requires Solaris 2.6 or 7 Operating Environment.
CECMS-110CE99M	Sun Ray server software 1.1 for enterprise servers (Sun Enterprise 3X00, 4X00, 5X00, 6X00). Documentation localized in English, French, Japanese, Korean, Simplified Chinese, and Traditional Chinese. Provides authentication and session management services for Sun Ray appliances. 128-bit encryption. Requires Solaris 2.6 or 7 Operating Environment.
CECMS-110AS99M	Sun Ray server software 1.1 for Sun Enterprise 10000 server. Documentation localized in English, French, Japanese, Korean, Simplified Chinese, and Traditional Chinese. Provides authentication and session management services for Sun Ray appliances. 40-bit encryption. Requires Solaris 2.6 or 7 Operating Environment. (License allows installation in multiple domains.)
CECMS-110CS99M	Sun Ray server software 1.1 for Sun Enterprise 10000 server. Documentation localized in English, French, Japanese, Korean, Simplified Chinese, and Traditional Chinese. Provides authentication and session management services for Sun Ray appliances. 128-bit encryption. Requires Solaris 2.6 or 7 Operating Environment. (License allows installation in multiple domains.)

Sun Ray 1 Appliance Workgroup Bundle Part Numbers

Sun Ray 1 appliances may be purchased in workgroup bundles that include Sun Ray server appliances and a fully configured Sun server for workgroups of 25, 50, 100, 200, and 300 Sun Ray 1 appliances.

For Education markets, use the Edu part numbers (BAE-WGxx-00**E**-1).

A country kit option (USB keyboard and mouse) must be ordered for each Sun Ray 1 appliance included in the bundle. Monitors, the Sun Ray server software, the Solaris Operating Environment media kit, and localized server power cord must be ordered separately.

Order Number	**Title and Description**
BAE-WG25-00-01 **or** **BAE-WG25-00E-1** **(Edu market only)**	• 25-seat Sun Ray 1 appliance workgroup bundle. Includes: – Sun Enterprise 250 server – One 400-MHz CPU – 1-GB memory – One 18-GB hot-swap disk drive – Two 10/100BASE-T Fast Ethernet network interface card – 25 Sun Ray 1 appliances
BAE-WG50-00-1 **or** **BAE-WG50-00E-1** **(Edu market only)**	• 50-seat Sun Ray 1 appliance workgroup bundle. Includes: – Sun Enterprise 250 server – Two 400-MHz CPU – 2-GB memory – Two 36-GB hot-swap disk drive – Two 10/100BASE-T Fast Ethernet network interface card – 50 Sun Ray 1 appliances
BAE-WG100-00-1 **or** **BAE-WG100-00E-1** **(Edu market only)**	• 100-seat Sun Ray 1 appliance workgroup bundle. Includes: – Sun Enterprise 450 server – Four 480-MHz CPU – 4-GB memory – Four 36-GB hot-swap disk drive – One 10/100BASE-T Fast Ethernet network interface card – One Gigabit Ethernet network interface card – 100 Sun Ray 1 appliances
BAE-WG200-00-1 **or** **BAE-WG200-00E-1** **(Edu market only)**	• 200-seat Sun Ray 1 appliance workgroup bundle. Includes: – Sun Enterprise 3500 server – Eight 400-MHz CPUs – 8-GB memory – Four 18.2-GB 10000-rpm disk drives – One 10/100BASE-T Fast Ethernet network interface card – One Gigabit Ethernet network interface card – 200 Sun Ray 1 appliances

Order Number	**Title and Description**
BAE-WG300-00-1 **or** **BAE-WG300-00E-1** **(Edu market only)**	• 300-seat Sun Ray 1 appliance workgroup bundle. Includes: – Sun Enterprise 4500 server – Twelve 400-MHz CPU – Eight 1-GB memory – Six 2-GB memory – 218-GB Sun StorEdge™ D1000 array – Two Gigabit Ethernet network interface cards – 300 Sun Ray 1 appliances

Sun Ray 100 Appliance Workgroup Bundle Part Numbers

Sun Ray 100 appliances may be purchased in workgroup bundles that include Sun Ray server appliances and a fully configured Sun server for workgroups of 25, 50, and 100 Sun Ray 100 appliances.

For Education markets, use the Edu part numbers (BAE-WGxx-01**E**-1).

A country kit option (USB keyboard and mouse) must be ordered for each Sun Ray 100 appliance included in the bundle. The Sun Ray server software, the Solaris Operating Environment media kit, and localized server power cord must be ordered separately.

Order Number	**Title and Description**
BAE-WG25-01-1 **or** **BAE-WG25-01E-1** **(Edu market only)**	• 25-seat Sun Ray 100 appliance workgroup bundle. Includes: – Sun Enterprise 250 server – One 400-MHz CPU – 1-GB memory – One 18-GB hot-swap disk drive – Two 10/100BASE-T Fast Ethernet network interface card – 25 Sun Ray 100 appliances
BAE-WG50-01-1 **or** **BAE-WG50-01E-1** **(Edu market only)**	• 50-seat Sun Ray 100 appliance workgroup bundle. Includes: – Sun Enterprise 250 server – Two 400-MHz CPU – 2-GB memory – Two 36-GB hot-swap disk drive – Two 10/100BASE-T Fast Ethernet network interface card – 50 Sun Ray 100 appliances

Order Number	Title and Description
BAE-WG100-01-1 **or** **BAE-WG100-01E-1** **(Edu market only)**	• 100-seat Sun Ray 100 appliance workgroup bundle. Includes: – Sun Enterprise 450 server – Four 480-MHz CPU – 4-GB memory – Four 36-GB hot-swap disk drive – One 10/100BASE-T Fast Ethernet network interface card – One Gigabit Ethernet network interface card – 100 Sun Ray 100 appliances

Sun Ray 150 Appliance Workgroup Bundle Part Numbers

Sun Ray 150 appliances may be purchased in workgroup bundles that include Sun Ray server appliances and a fully configured Sun server for workgroups of 25, 50 and 100 Sun Ray 150 appliances.

Special educational pricing is not available for the Sun Ray 150 workgroup bundles.

A country kit option (USB keyboard and mouse) must be ordered for each Sun Ray 150 appliance included in the bundle. The Sun Ray server software, the Solaris Operating Environment media kit, and localized server power cord must be ordered separately.

Order Number	Title and Description
BAE-WG25-02-1	• 25-seat Sun Ray 150 appliance workgroup bundle. Includes: – Sun Enterprise 250 server – One 400-MHz CPU – 1-GB memory – One 18-GB hot-swap disk drive – Two 10/100BASE-T Fast Ethernet network interface card – 25 Sun Ray 150 appliances
BAE-WG50-02-1	• 50-seat Sun Ray 150 appliance workgroup bundle. Includes: – Sun Enterprise 250 server – Two 400-MHz CPU – 2-GB memory – Two 36-GB hot-swap disk drive – Two 10/100BASE-T Fast Ethernet network interface card – 50 Sun Ray 150 appliances

Order Number	Title and Description
BAE-WG100-02-1	• 100-seat Sun Ray 150 appliance workgroup bundle. Includes: – Sun Enterprise 450 server – Four 480-MHz CPU – 4-GB memory – Four 36-GB hot-swap disk drive – One 100BASE-T Fast Ethernet network interface card – One Gigabit Ethernet network interface card – 100 Sun Ray 150 appliances

Required Options

One country kit is required for each Sun Ray appliance included in a Sun Ray appliance workgroup bundle.

Order Number	Title and Description
X3531A	Type 6 country kit for U.S./Universal/Canada with USB interface
X3532A	International Type 6 country kit French with USB interface
X3533A	International Type 6 country kit German with USB interface
X3534A	International Type 6 country kit Swiss-French with USB interface
X3535A	International Type 6 country kit Swiss-German with USB interface
X3536A	International Type 6 country kit Swedish with USB interface
X3537A	International Type 6 country kit U.K. with USB interface
X3538A	Type 6 country kit for U.S. UNIX/UNIX Universal/European UNIX Power cordless with USB interface
X3539A	Japanese UNIX Type 6 country kit with USB interface
X3554A	International Type 6 country kit Taiwanese with USB interface
X3555A	International Type 6 country kit Korean with USB interface
X3558A	International Type 6 country kit U.K. UNIX with USB interface
X3559A	International Type 6 country kit European UNIX with USB interface
X3560A	International Type 6 country kit Norwegian with USB interface
X3561A	International Type 6 country kit Portuguese with USB interface
X3562A	International Type 6 country kit Spanish with USB interface
X3563A	International Type 6 country kit Danish with USB interface
X3564A	International Type 6 country kit Italian with USB interface

Order Number	Title and Description
X3565A	International Type 6 country kit Dutch with USB interface
X3566A	International Type 6 country kit Australian with USB interface
X3567A	International Type 6 country kit Finnish with USB interface
X3568A	European Universal Type 6 country kit with USB interface
X3582A	International Type 6 country kit Chinese with USB interface
X3583A	International Type 6 country kit European UNIX with USB interface (power cordless)

Sun Ray Smart Cards

Smart cards from MicroPayflex are now available through Sun in sets of 25, either with or without artwork.

Order Number	Title and Description
X1400A	MicroPayflex smart cards with Sun artwork, pack of 25
X1401A	MicroPayflex smart cards, white, no artwork, pack of 25

Leasing Sun Ray 1 Appliances

A leasing plan is available for the Sun Ray 1 appliance. The appliance is available for US$9.99 per month, or lease the total solution including appliance, switch, server, software for US$29.99 per month. Prices are on a per user basis and based on a 5-year lease agreement. Prices are subject to change.

Monitor Options

Order Number	Option Description
365-1343	17-inch FCS monitor, 1996, "Poppy"
365-1354	17-inch FCS monitor, 1997, "Ivy"
X7143A	17-inch EL color monitor
X7119	19-inch monitor
365-1324	20-inch FCS monitor, 1994, "P4"
365-1335	21-inch FCS monitor, 1996, "N2"
X7121A	21-inch monitor

Note: *Many PC monitors work with the Sun Ray 1 appliance but there will be no certification.*

Additional third-party monitors will be available through the Solaris Ready program at the following web site: `http://www.sun.com/solarisready/vendors.html`

Upgrades

There are no upgrades available for any of the Sun Ray appliances. The Sun Ray 1, 100, and 150 appliance models all coexist and are forward and backward compatible.

The Sun Ray enterprise server software version 1.1 replaced the Sun Ray enterprise server software version 1.0.

- Customers who purchased a SunSpectrum℠ contract for the Sun Ray enterprise server software 1.0 should have been sent Sun Ray enterprise server software 1.1 automatically, at no charge.
- Customers who did not purchase a SunSpectrum contract must purchase the Sun Ray enterprise server software 1.1, either on-line or through their sales representative or reseller.

Service and Support

SunService^{SM} Program Offerings

The SunService^{SM} program provides two service offerings: the SunClient^{SM} program for low-level, low-cost support and SunSpectrum^{SM} for high-level support and mission-critical response.

SunClient Program

The SunClient program is a way to reduce hardware and software support costs for the Sun Ray™ appliances. The SunClient support program is a suite of offerings that is separate, yet complementary to the SunSpectrum program. SunClient support provides:

- A new choice for optimizing low-cost workstation support
- Flexibility to select only the services needed
- Administrative simplicity, saving time and money
- Access to world-class UNIX® platform networking experts

Feature	**SunClient Maintenance**	**SunClient Central Maintenance**	**SunClient SW Tech Support Option***
Systems approach coverage	*	*	
Solaris™ Operating Environment and unbundled software technical support			*
9 a.m.-5 p.m., M-F telephone coverage	*	*	*
8 a.m.-5 p.m., M-F on-site coverage	*†‡	*‡	
Response times (phone/onsite)	4 hr. callback/next business day response	4 hr. callback/second business day response	4 hr. callback
Centralized on-site repair of multiple units		*	Not Applicable
Patches	Not Applicable	Not Applicable	*
SunSolve^{SM} license	Not Applicable	Not Applicable	*
SunSolve EarlyNotifier^{SM} Service	Not Applicable	Not Applicable	*
Software Updates	Not Applicable	Not Applicable	Not Applicable

* Can only be sold as an option to SunClient Maintenance or SunClient Central Maintenance.
† Next-business-day on-site response requires that the request for service be received by 3 p.m. If the call is received after 3 p.m., service will be provided on the second business day.
‡ Customers located more than 50 miles from an authorized service provider or reseller will be charged an additional fee for service activity.

Features and Benefits of the SunClient Program

Features	Benefits
• Unbundled hardware and software support	• **Flexibility**: Select the type and amount of coverage needed for systems, so service dollars are targeted where they are needed most. • **Cost savings**: Pay only for the support services needed.
• Next business day (SunClient Maintenance) or second business day (SunClient Central Maintenance) on-site response	• **Cost efficiency**: Since Sun can more efficiently manage spare inventory and labor scheduling, the savings can be passed on to the customer.
• Single contract with choice of automatic warranty upgrade	• **Simplicity**: One contract covers a predefined number of systems at one low price. New systems acquired can be upgraded to the SunClient service level.
• SunClient Central Maintenance	• **Cost savings**: Sun realizes an economy of scale by repairing multiple systems with one visit and leverages existing support infrastructures, so cost efficiency is maximized while duplication of effort is eliminated.
• Service delivery by Sun experts	• **Consistency**: Selected desktops can be deployed anywhere with assurance of cost-effective, quality service and support.

For more information, visit the SunClient Support (external) web site at
`http://www.sun.com/service/support/sunclient`

SunSpectrum Program

The SunSpectrum program 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. The SunSpectrum program provides a simple pricing structure in which a single fee covers support for an entire system, including related hardware and peripherals, the Solaris Operating Environment software, and telephone support for Sun software packages. The majority of Sun's customers today take advantage of the SunSpectrum program, underscoring the value that it represents. Customers should check with their local Sun Enterprise Services representatives for program and feature availability in their areas.

FEATURE	SUNSPECTRUM PLATINUM^{SM} Mission-critical Support	SUNSPECTRUM GOLD^{SM} Business-critical Support	SUNSPECTRUM SILVER^{SM} Systems Support	SUNSPECTRUM BRONZE^{SM} 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
Local customer support management	No	Yes	No	No
Personal technical account support	Yes	Yes	Option	No
SunStart^{SM} installation service	Yes	No	No	No
Account support plan	Yes	Yes	No	No
Software release planning	Yes	No	No	No
On-site account reviews	Monthly	Semiannual	No	No
Skills assessment	Yes	No	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	Option
7-day/24-hour on-site coverage	Yes	Option	Option	N/A
7-day/12-hour on-site coverage	No	Option	No	No
5-day/24-hour on-site coverage	No	Option	No	No

FEATURE	SUNSPECTRUM PLATINUM Mission-critical Support	SUNSPECTRUM GOLD Business-critical Support	SUNSPECTRUM SILVER Systems Support	SUNSPECTRUM BRONZE Self Support
Coverage / Response Time (cont.)				
Customer-defined priority setting	Yes	Yes	Yes	Option
• 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
2-hour on-site response	Yes	Option	Option	N/A
Additional contacts	Option	Option	Option	Option
Premier Support Features				
Mission-critical support team	Yes	For urgent problems	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
Hardware Support Delivery				
Replacement hardware parts	On-site technician	On-site technician	On-site technician	Courier
Two day parts delivery	N/A	N/A	N/A	Yes
Overnight parts delivery	N/A	N/A	N/A	Option
Same-day parts delivery	Yes	Yes	Yes	Option
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 Operating Environment 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

Warranty

The Sun Ray 1 appliance has a 5-year return-to-Sun warranty.

The Sun Ray 100 and Sun Ray 150 appliances come with a three-year, return-to-Sun warranty, which includes complete unit repair or replacement within 15 days, worldwide.

No warranty is available on smart cards.

Glossary

100BASE-T	Also known as Fast Ethernet, the IEEE standard for 100-Mbit Ethernet.
Hot Desk architecture	A computing implementation initially targeted at the workgroup, where all user state is centralized on the server and linked by a dedicated interconnect to a simple, zero-administration appliance on the desktop. The main elements of this architecture are: – The Sun Ray™ appliance – The Sun Ray server software – Hot Desk technology (it can also include connectivity software and additional tools)
Hot Desk technology	The technology underlying the Sun Ray Hot Desk architecture. "Hot Desk" or "Hot Desking" refers to the ability of the user to access their sessions instantly from any Hot Desk-enabled appliance in the server group. Hot Desking is enabled by Hot Desk technology. Key elements: – A fast and efficient interface used to communicate between server and appliance – Smart card technology – Server software which instantly maps users' sessions to appliances
Interconnect	The dedicated connection between the Sun Ray server and any Sun Ray appliance. The first generation requires Cat 5 wiring and 10/100-Mb switched Ethernet.
ISO7816	International standard for smart cards.
PCI	Peripheral component interconnect. A industry-standard for connecting peripherals such as disk drives, tapes drives, and other devices used in the PCs.
Sun Ray appliance	A stateless, zero-administration, "plug-and-work" device that is centrally managed by, and is dedicated to display user sessions from a server running Sun Ray server software.
Sun Ray server software	The server-based software used to manage, administer, and provide the screen display for any Sun Ray appliance on the network. Its main components are: – Authentication Manager – Group Manager – Session Manager – Administration Tool

Sun Ray system	The components of the Sun Ray Hot Desk architecture which are actually deployed: – The Sun Ray appliance – A SPARC™ server running the Solaris™ 2.6 or 7 Operating Environment (or later) – The Sun Ray server software The components of the interconnect (Ethernet switch, Cat 5 wiring)
TCO	Total cost of ownership. A term used to describe all the entire cost of owning and running computers, including purchase price, maintenance contracts, system administration support, need for upgrades, downtime, and inability to integrate with legacy hardware and software.
Thin client	A trimmed-down system, running only very basic software with applications residing on the network server. Low-administration.
USB	Universal serial bus. A bus that provides support for a number of different types of peripherals such as keyboards and mice.

Materials Abstract

All materials will be available on SunWIN except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Product Literature				
– *Sun Ray™ Appliance Family: Just the Facts*	Reference Guide (this document)	Training Sales Tool	SunWIN, Reseller Web	107515
– *Sun Enterprise™ 3500–6500 Servers: Just the Facts*	Reference Guide	Training Sales Tool	SunWIN, Reseller Web	83501
– *Information Appliances Quick Reference Card*	Summary of Sun Ray Appliance Features	Training Sales Tool	SunWIN, Reseller Web	64351 121661
Presentations				
– *Sun Ray 1 Appliance Elevator Pitch*	Presentation	Sales Tool	SunWIN, Reseller Web	122062
– *Sun Ray 100 and Sun Ray 150 Appliance Elevator Pitch*	Presentation	Sales Tool	SunWIN, Reseller Web	121896
– *Sun Ray 1 Appliance Golden Pitch*	Presentation	Sales Tool	SunWIN, Reseller Web	108014
– *Sun Ray 1 Appliance Technical Markets*	Presentation	Sales Tool	SunWIN, Reseller Web	117557
– *Technical Markets Elevator Pitch*	Presentation	Sales Tool	SunWIN, Reseller Web	117553
– *Dot-com Your Legacy Desktop—VT Terminals*	Presentation	Sales Tool	SunWIN, Reseller Web	120058
– *Dot-com Your Legacy Desktop—X-terminals*	Presentation	Sales Tool	SunWIN, Reseller Web	119993
– *Dot-com Your Legacy Desktop—5250*	Presentation	Sales Tool	SunWIN, Reseller Web	119976
– *Dot-com Your Legacy Desktop—3270*	Presentation	Sales Tool	SunWIN, Reseller Web	119987
– *Dot-com Your Legacy Desktop—PCs*	Presentation	Sales Tool	SunWIN, Reseller Web	120065

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
White Papers and Technical Briefs				
– *Sun Ray Appliance Overview and Technical Brief*	Technical Overview	Training Sales Tool	SunWIN, Reseller Web	106618
– *Interoperability and the Sun Ray Appliance*	Technical Brief	Training Sales Tool	SunWIN, Reseller Web	123181
– *Server Grouping for the Sun Ray 1 Appliance*	Technical Brief	Training Sales Tool	SunWIN, Reseller Web	117204
– *Sizing Sun Ray Enterprise Servers*	Technical Brief	Training Sales Tool	SunWIN, Reseller Web	117150
– *Digital Media on the Sun Ray 1 Appliance*	Technical Brief	Training Sales Tool	SunWIN, Reseller Web	115754
– *Assessing Scalability of the Sun Ray Appliance*	Information About Selecting the Right Size Server to use with the Product	Training Sales Tool	SunWIN, Reseller Web	106293
– *Integrating Sun Ray Appliances and IBM Mainframe Legacy Business Systems*	Integration Details	Training	SunWIN, Reseller Web	106775
– *Using Smart Cards with the Sun Ray 1 Appliance*	Introduction to the Use of Smart Cards with This Product	Sales Tool	SunWIN, Reseller Web	106772
– *Deploying the Sun Ray Hot Desk Architecture*	Deploying Information	Training	SunWIN, Reseller Web	106621
– *Sun Ray at Infineon Technologies—Test of Sun Ray Technology in a CAD Environment*	Technical Brief	Training Sales Tool	SunWIN, Reseller Web	121652
– *Chip Design at Sun Using Sun Ray Appliances*	Technical Brief	Training Sales Tool	SunWIN, Reseller Web	120467
– *Sun Ray 1 Appliance Sales Guide to Education and Library Markets*	Technical Brief	Training Sales Tool	SunWIN, Reseller Web	117798
– *Sun Ray 1 Appliance Deployment in the University, School, and Library—Customer Guidelines and Case Studies*	Technical Brief	Training Sales Tool	SunWIN, Reseller Web	118313 FE1252-0
– *Integrating Sun Ray 1 Appliances and Microsoft NT*	Interoperability Information	Training	SunWIN, Reseller Web	106776

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Data Sheets				
– *Sun Ray Appliance Full Line Brochure*	Data Sheet	Sales Tool	SunWIN, Reseller Web	123516 BE1016-0
– *Sun Ray 1 Appliance in Technical Markets*	Data Sheet	Sales Tool	SunWIN, Reseller Web	119568, DE1187-1
– *Sun Ray Appliances in Customer Relationship Management*	Data Sheet	Sales Tool	SunWIN, Reseller Web	108588, DE1075-0
– *Sun Ray 1 Appliance in Financial Services*	Data Sheet	Sales Tool	SunWIN, Reseller Web	108596, DE1079-0
– *Sun Ray 1 Appliance in Higher Education*	Data Sheet	Sales Tool	SunWIN, Reseller Web	108590, DE1076-0
– *Sun Ray 1 Appliance in Schools*	Data Sheet	Sales Tool	SunWIN, Reseller Web	108592, DE1077-0
– *Sun Ray 1 Appliance in Libraries*	Data Sheet	Sales Tool	SunWIN, Reseller Web	108594, DE1078-0
– *Dot-Com Your Legacy Data Sheet*	Data Sheet	Sales Tool	SunWIN, Reseller Web	119570, DE1188-0
Case Studies				
– *Bank of Nova Scotia (Scotiabank)—Pilot Project, Sun Sun Ray 1 Appliance*	Case Study	Sales Tool	SunWIN, Reseller Web	125198
– *Sun Technology an Important Educational Tool in Georgia Schools*	Case Study	Sales Tool	SunWIN, Reseller Web	116188, FE1191-0
– *Sun Helps University Educate New Generations of Engineers*	Case Study	Sales Tool	SunWIN, Reseller Web	116201 FE1192-0
– *Sun Ray 1 Appliance Links Pennsylvania Libraries*	Case Study	Sales Tool	SunWIN, Reseller Web	116203, FE1193-0
– *Bledsoe Community Medical Center Success Story*	Case Study	Sales Tool	SunWIN, Reseller Web	124760
– *National Australia Bank Gets Thin*	Case Study	Sales Tool	SunWIN, Reseller Web	120195, HE372-0
– *University of California at Berkeley—Sun Ray in computer Science Labs*	Case Study	Sales Tool	SunWIN, Reseller Web	122896, FE1379-0

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
Miscellaneous Collateral				
– *Sun Ray Appliances and Smart Cards: Future Directions*	Information About Smart Cards and Their Future Use	Training	SunWIN, Reseller Web	106773
– *Aberdeen Group: Sun Ray Hot Desk Architecture: A New Appliance Model Ushers In the Services-Driven Network*	Analyst Report	Sales Tool	SunWIN, Reseller Web	125209, FE1405-0
– *Competitive Analysis for Sun Ray Appliances*	Competitive Analysis	Sales Tool	SunWIN, Reseller Web	125062, 125079
– *PC Week—Thin is Back*	Competitive Analysis	Sales Tool	SunWIN, Reseller Web	118542, HE367-0
– *Smart Cards FAQ for Sales Reps*	Basic Information About Smart Cards for Sales Reps	Training	SunWIN, Reseller Web	106774
– *Sun Ray CD Demo/Customer Card*	Demonstration	Sales Tool	SunWIN, Reseller Web	PE295-0
– *Sun Ray 1 Appliance Demo Kit*	Demonstration	Sales Tool	SunWIN, Reseller Web	108559, SE699-0
– *Network Appliance FASTFacts*	Brief Description of Markets and How to Sell the Product	Training	SunWIN, Reseller Web	107516
– *Information Appliances Product Overview*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web	64531
– *Information Appliances Competitive Summary*	Quick Reference Card	Sales Tool	SunWIN, Reseller Web	75631
Videos				
– *Sun Ray 1 Appliance Customer Success Story Video*	Video Success Story	Sales Tool	SunWIN, Reseller Web	111194, ME2169-0 (video) WE249-0 (CD)
– *Sun Ray 1 Appliance Customer Success Story Video Transcript*	Video Success Story Transcript	Sales Tool	SunWIN, Reseller Web	110412
External Web Sites				
– *Sun Ray Appliance Site*	`http://www.sun.com/sunray`			
– *Solaris™ Ready Web Site*	`www.sun.com/solarisready/vendors.html`			

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Smart Card Reference Sites				
– *Java™ Smart Card Framework*	`http://www.opencard.org/`			
– *Docs Available for Purchase*	`http://www.iso.ch/cate/3524015.html`			
– *Microsoft PC/SC Platform*	`http://www.smartcardsys.com/`			