

# *Integrating Sun Ray™ 1 Enterprise Appliance and IBM Mainframe Legacy Business Systems*

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*Technical White Paper*



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# *Introduction*

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Businesses, over time, make significant investments in diverse computing technologies. This often results in enterprise networks which contain a heterogeneous mix of computer systems and operating environments.

Today's enterprise challenges IT management with providing users greater levels of functionality and unrestricted access to high performance enterprise applications and services while, at the same time, finding ways to reduce the total cost of ownership of desktop systems.

As the total cost of ownership for desktop systems escalates, IT managers are seeking ways to reduce purchase and upgrade costs and cut the larger expenses of administration and maintenance. The answer is Sun Ray™ 1 enterprise appliance from Sun Microsystems™. It is the newest solution for the low-cost enterprise desktop.

This technical brief presents the Sun Ray 1 enterprise appliance and various aspects of integration with IBM mainframe LBS.

Chapter two provides an overview of the Sun Ray 1 enterprise appliance, Hot Desk architecture, and Sun Enterprise™ computing. Chapter three defines facets of IBM LBS interoperability, shows how IBM LBS interoperability works, provides interoperability software installation directions, and gives methods for launching an IBM mainframe LBS session from a Sun Ray 1 enterprise appliance. Chapter four provides scalability and performance guidelines. Chapter five gives a future direction for interoperability with IBM mainframe LBS. Chapter six lists frequently asked questions.



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“Integrating Sun Ray 1 Enterprise Appliance and IBM Mainframe Legacy Business Systems” is an addendum to the “Sun Ray 1 Enterprise Appliance Overview and Technical Brief” white paper. The intended audience for this paper includes all individuals involved in the implementation process and anyone interested in understanding various aspects of integrating Sun Ray 1 enterprise appliance and IBM mainframe LBS.

This document provides the necessary information and guidance for, and should be used as a primary source of information when, integrating Sun Ray 1 enterprise appliance and IBM mainframe LBS.

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**Note** – This technical brief supports the 1.0 version of Sun Ray enterprise server software, and will be modified appropriately with subsequent versions of Sun Ray enterprise server software.

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# *Sun Ray 1 Enterprise Appliance, Hot Desk Architecture, and Sun Enterprise Computing*

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## *Sun Ray 1 Enterprise System*

The Sun Ray enterprise system is the newest solution offered by Sun Microsystems Inc. for a zero administration appliance on the desktop. The deployable components in this system are:

- The Sun Ray 1 enterprise appliance
- A SPARC™ Solaris™ server running the Solaris 2.6 or Solaris 7 operating environment
- The Sun Ray enterprise server software
- The components of the interconnect (Ethernet switch, cat 5 wiring)

## *Sun Ray 1 Enterprise 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 the Sun Ray enterprise server software.

## *Sun Ray 1 Enterprise server software*

The server-based software used to manage, administer and provide the screen display for any Sun Ray 1 enterprise appliance on the network.

Its main components are the:

- Authentication Manager

- Session Manager
- Administration Tool

### *Interconnect*

The dedicated connection between the Sun Ray enterprise server and any Sun Ray 1 appliance. The first generation requires CAT5 wiring and 10/100 MB switched Ethernet.

The interconnect is a dedicated Fast Ethernet switch that connects Sun Ray 1 enterprise appliances to computational service providers. Through the interconnect, Sun Ray 1 enterprise appliance users can connect to a computational service provider of choice.

### *Hot Desk Architecture*

A computing model, 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 the architecture are:

- The Sun Ray 1 enterprise appliance
- The Sun Ray enterprise server software
- Hot Desk technology

While currently limited to the workgroup, in the future the architecture will be capable of extending beyond the workgroup across the enterprise. The Sun Ray Hot Desk architecture is the first step towards a model of computing where client sessions are maintained on the server and instantly available from any device, anytime, anywhere.

### *Hot Desk Technology*

This is 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 workgroup. “Hot Desking” is enabled by “Hot Desk technology.”

The key elements are:

- A fast and efficient interface used to communicate between the Sun Ray enterprise server and any Sun Ray 1 enterprise appliance
- Smart card technology
- Server software which instantly maps users' sessions to appliances

While the initial release supports only Sun Ray 1 enterprise appliance in the workgroup, Sun™ plans to license hot desk technology so that users will be able to access their sessions from any hot desk enabled device from within the workgroup.

### *Hot Desk Architecture Benefits*

This new system architecture retains many of the desirable features of previous approaches without their attendant drawbacks. By leveraging shared resources (i.e. CPU and memory), the Hot Desk architecture requires fewer total CPUs and much less memory than when every individual desktop has to be configured with sufficient resources. The Hot Desk architecture delivers enterprise-class performance to a desktop which never needs upgrading. It provides cost of ownership and administrative benefits of three-tier, thin-client computing without reducing functionality. It provides the applications, performance, and resources of distributed architectures while significantly reducing acquisition costs, administration, and desktop maintenance.

Overall, by defining a new way of delivering applications and services to the desktop, the Hot Desk architecture offers substantially greater levels of functionality at a significantly lower overall cost compared to other approaches.

## *Sun Enterprise Computing*

### *Power, Scalability, Reliability*

The Sun Ray 1 enterprise appliance and Hot Desk architecture require powerful, highly scalable and reliable servers for the central administration of Sun Ray 1 enterprise appliance user sessions. Sun Enterprise computing (Sun Enterprise servers running the Solaris Operating Environment) is therefore an integral component to the Sun Ray 1 enterprise appliance and Hot Desk

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architecture. Sun Enterprise servers running the Solaris Operating Environment lead the industry in offering some of the most powerful, scalable, and reliable systems available today.

### *Sun Enterprise Servers*

Sun Enterprise servers provide scalable, symmetric multiprocessing capabilities, featuring up to 64 high-performance UltraSPARC™ processors, up to 64 GB of physical memory, and up to 20 TB of disk storage. This helps ensure the necessary performance for peak demands as well as virtually unlimited growth. For the highest levels of availability, Sun Enterprise servers also have comprehensive reliability, availability, and scalability (RAS) that can deliver the lowest level of downtime.

### *Solaris Operating Environment*

Sun's Solaris Operating Environment, a premiere environment for enterprise network computing, is designed with the needs of enterprises in mind. The Solaris 7 product line allows full 64-bit processing, mainframe-class reliability, superior scalability, and unprecedented performance. The Solaris Operating Environment includes significant features to support multi-user environments and is uniquely suited to Sun Ray 1 enterprise appliance resource sharing.

### *Performance and Stability*

Sun Enterprise servers, together with the Solaris Operating Environment, provide Sun Ray 1 enterprise appliance users with all of the performance and stability they need now and in the future.

# *Interoperability With IBM Mainframe Legacy Business Systems*

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## *Facets of Interoperability*

The ability to execute mainframe applications, access and print IBM mainframe files, and perform system administration of IBM mainframe host systems from anywhere in the network has become a standard requirement in the modern enterprise computing environment.

Interoperability with IBM mainframe LBS consists of the ways in which a Sun Ray 1 enterprise appliance user can interact with an IBM mainframe host system running LBS applications. Three facets to interoperability with IBM mainframe LBS include:

- Application execution
- File access and printing using Sun Enterprise servers and the Solaris Operating Environment
- IBM mainframe system administration

Application execution interoperability consists of a Sun Ray 1 enterprise appliance user using an IBM mainframe LBS application. File access and printing using Sun Enterprise servers and the Solaris Operating Environment refers to a Sun Ray 1 enterprise appliance user having the ability to access and print IBM mainframe files anywhere on a network using Sun Enterprise file and print servers. IBM mainframe system administration interoperability comprises the administration of IBM mainframe host systems from a Sun Ray 1 enterprise appliance anywhere within the interconnect.

Each facet of interoperability with IBM mainframe LBS requires a Sun Ray 1 enterprise appliance user to establish a connection with an IBM mainframe host system via the Solaris Operating Environment using terminal display device emulation software. The most popular mode of connecting with an IBM mainframe host system is 3270 terminal emulation. One solution for establishing a connection with an IBM mainframe host system using 3270 emulation software requires installation of the below software components:

- SunLink™ SNA3270 9.1 Gateway software
- SunLink Client3270 9.1 software

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**Note** – Additional solutions are provided in the section titled “Additional Solutions.”

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## *SunLink SNA3270 9.1 Gateway Software*

### *Product Information*

Part of the SunLink IBM 9.1 family of software products, SunLink SNA3270 9.1 Gateway software provides traditional and peer-to-peer SNA communications and networking support for UNIX systems, and transforms a SPARC system into a high-performance SNA gateway for the enterprise.

SunLink SNA3270 9.1 Gateway software is implemented based on a client server architecture. It provides centralized SNA server services with the flexibility of locating SNA clients centrally or distributed throughout the IP and IPX/SPX network. SNA3270 9.1 Gateway software emulates either a full-function Physical Unit Type 2.1 (PU2.1) or Physical Unit Type 2.0 (PU2.0). It offers access from dumb terminals, personal computers, and TCP/IP-compatible systems to high-cost IBM mainframe host systems.

The 3270 support in SunLink SNA3270 9.1 Gateway software, coupled with the windowing features of the Solaris Operating Environment, offers quick and easy access to all enterprise applications. For TN3270E users, SunLink SNA3270 9.1 Gateway software includes a TN3270E server. This converts TCP/IP to SNA data streams and offloads the mainframe from TCP/IP processing. Client applications resident on SPARC systems can access many popular IBM mainframe on-line applications such as TSO/ISPF, CICS/VS, DB2, IMS/VS, and NetView, plus the most common IBM host system spooling programs such as JES2/3, RSCS, and POWER.

In all, the flexible, sophisticated emulation capability of SunLink SNA3270 9.1 Gateway software provides two significant advantages to organizations with IBM mainframe presence. First, it provides a simple, cost-effective way of integrating SPARC processor-based systems into IBM host system environments with no major modifications to existing mainframe hardware and mainframe software application implementations. Second, it allows organizations to leverage corporate data stored on IBM mainframe host systems by providing access to and manipulation of the information on powerful Sun workstations. Thus, organizations get the greatest possible return on their investment in mainframe hardware and mission-critical software applications.

### *Additional Information*

Additional information about SunLink SNA3270 9.1 Gateway software and the SunLink IBM 9.1 family of software products is available on the Sun Microsystems web site at the following URL:

<http://www.sun.com/products-n-solutions/hw/networking/connectivity/enterprise/>

### *Purchasing Information*

A variety of options exist for purchasing SunLink SNA3270 9.1 Gateway software and the SunLink IBM 9.1 family of software products. Each option is listed on the Sun Microsystems web site at the following URL:

<http://www.sun.com/sales>

## *SunLink Client3270 9.1 Software*

### *Product Information*

SunLink Client3270 9.1 software operates in conjunction with SunLink SNA3270 9.1 Gateway software. It provides IBM 3270 display terminal emulation and enables SPARC processor-based workstation users to gain access to IBM host system 3270 applications. SunLink Client3270 9.1 software



also includes a TN3270E client, which interacts with any Telnet server, including the TN3270E server resident in SunLink SNA3270 9.1 Gateway software.

SunLink Client3270 9.1 software emulates both monochrome and color alphanumeric 3270 display terminals. It is compatible with 3278 (models 2-5), 3178, 3279 (models 2A, 2B, 3A, & 3B), and 3179 display devices. The SunLink Client3270 9.1 software product also includes 3287 printer emulation in both standard LU3 and SCS/LU1 datastreams.

With SunLink Client3270 9.1 software, the many keyboard layouts and languages supported through the Graphical Keyboard Mapping feature allow users to customize keyboards to satisfy their application requirements. The user interface includes drag-and-drop keys that remap the keyboard, dynamic window resizing, and color mapping. SunLink Client3270 9.1 software also provides the 3270-PC file transfer support (IND\$FILE) and Extended High Level Application Program Interface (EHLAPI) to front-end existing mainframe-based 3270 applications.

### *Additional Information*

Additional information about SunLink Client3270 9.1 software and the SunLink IBM 9.1 family of software products is available on the Sun Microsystems web site at the following URL:

<http://www.sun.com/products-n-solutions/hw/networking/connectivity/enterprise>

### *Purchasing Information*

A variety of options exist for purchasing SunLink Client3270 9.1 software and the SunLink IBM 9.1 family of software products. Each option is listed on the Sun Microsystems web site at the following URL:

<http://www.sun.com/sales/>

## *How IBM Mainframe Legacy Business Systems Interoperability Works*

SunLink SNA3270 9.1 Gateway and SunLink Client3270 9.1 software work together to bring IBM mainframe LBS applications, files, and services to the Sun Ray 1 enterprise appliance. The diagram below provides a pictorial

representation of the location of the software components used to provide interoperability with IBM mainframe LBS. A description for how each facet of interoperability works follows.

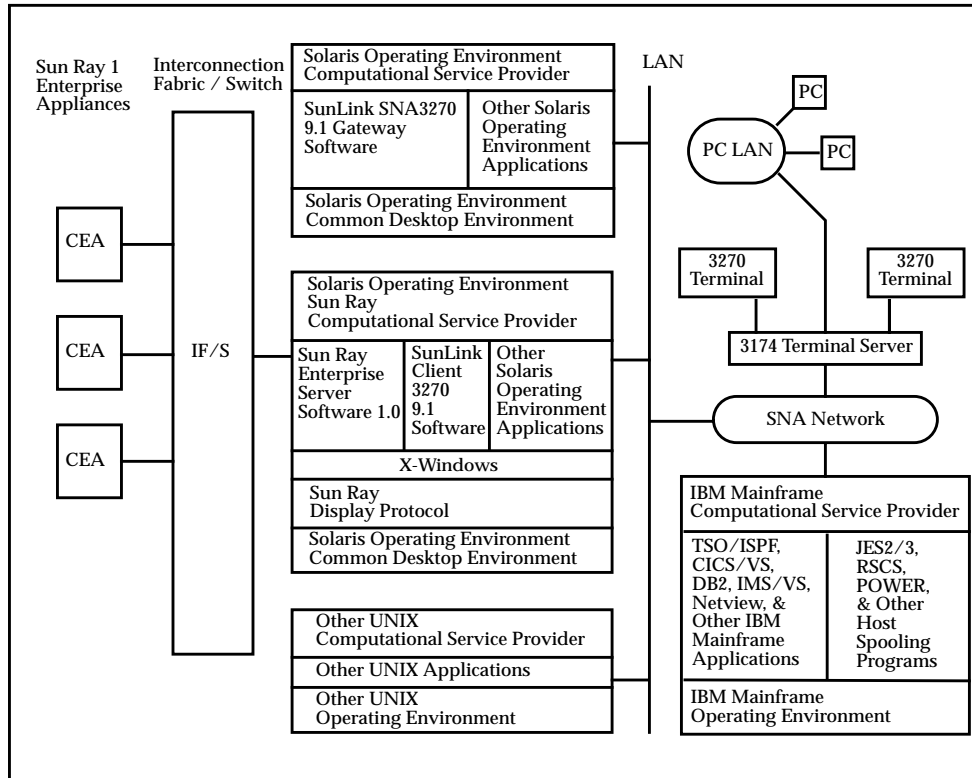


Diagram 1: high-level representation of interoperability software location.

**Note** – Diagram 1, for simplicity sake, shows only one Solaris Sun Ray computational service provider. In reality, the Hot Desk architecture can support multiple Sun Ray computational service providers connected to a single interconnection fabric.

## *Application Execution*

Application execution interoperability occurs in the following manner:

- Sun Ray 1 enterprise appliance user establishes a Solaris Operating Environment session and launches a 3270 display terminal session using SunLink Client3270 9.1 software.
- Sun Ray 1 enterprise appliance user selects an IBM mainframe LBS application to run.
- SunLink Client3270 9.1 software sends input to SunLink SNA3270 9.1 Gateway software (or TN3270 server on the IBM mainframe host system) via TCP/IP.
- SunLink SNA3270 9.1 Gateway software (or TN3270 server on the IBM mainframe host system) converts input from TCP/IP to SNA and transmits input to IBM mainframe host system via SNA.
- IBM mainframe host system processes request and transmits output via SNA to SunLink SNA3270 9.1 Gateway software (or TN3270 server on the IBM mainframe host system).
- SunLink SNA3270 Gateway software (or TN3270 server on the IBM mainframe host system) converts output from SNA to TCP/IP and transmits output in TCP/IP to SunLink Client3270 9.1 software.
- SunLink Client3270 9.1 software displays pixel data to virtual frame buffer using X-Windows protocol.
- Sun Ray 1 enterprise appliance pulls pixel data from virtual frame buffer and displays on Sun Ray 1 enterprise appliance using Sun Ray display protocol.

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**Note** – A similar process occurs with 3rd party product solutions.

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## *File Access and Printing using Sun Enterprise Servers and the Solaris Operating Environment*

File access and printing using Sun Enterprise servers and the Solaris Operating Environment interoperability occurs in the following manner:

- Sun Ray 1 enterprise appliance user exercises an action to open or print a file within an IBM mainframe LBS application.
- IBM mainframe host system transmits request to SunLink SNA3270 9.1 Gateway software (or TN3270 server on the IBM mainframe host system) via SNA.
- SunLink SNA3270 9.1 Gateway software (or TN3270 server on the IBM mainframe host system) converts request from SNA to TCP/IP and transmits request via TCP/IP to a Solaris Operating Environment file or print server.

If File Access:

- Solaris Operating Environment file server retrieves file from network storage device and transmits file to SunLink Client3270 9.1 software via TCP/IP.
- SunLink Client3270 9.1 software displays pixel data to virtual frame buffer using X-Windows protocol.
- Sun Ray 1 enterprise appliance pulls pixel data from virtual frame buffer and displays on Sun Ray 1 enterprise appliance using Sun Ray display protocol.

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**Note** – A Sun Ray 1 enterprise appliance has no local file system. All files are stored on one or more centralized file servers.

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**Note** – Most IBM mainframe host systems being accessed by Solaris Operating Environment clients run the OS390 operating environment. The above process is for the OS390 operating environment. A similar process occurs for saving a file to a Solaris Operating Environment file server.

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If Printing:

- Solaris Operating Environment print server prints file to network printing device.

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**Note** – Sun Ray 1 enterprise appliance printing services are discussed in greater detail in the paper “Sun Ray Printing Services.”

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## *IBM Mainframe System Administration*

- Sun Ray 1 enterprise appliance user establishes a Solaris Operating Environment session and launches a 3270 display terminal session using SunLink Client3270 9.1 software.
- Sun Ray 1 enterprise appliance user selects an IBM mainframe system administration application to run.

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**Note** – The remainder of the process for IBM mainframe system administration follows the application execution interoperability process above.

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## *Interoperability Software Installation*

### *SunLink SNA3270 9.1 Gateway Software*

SunLink SNA3270 9.1 Gateway software consists of a server component only and is installed on either a Sun SPARC or UltraSPARC system with an SBus/PCI. Detailed installation and configuration directions are available in the SunLink SNA 9.1 PU 2.1 Server Configuration Guide. This guide is available on the Sun Microsystems web site at the following URL:

<http://docs.sun.com>

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**Note** – There are no special SunLink SNA3270 9.1 Gateway software installation directions for interoperability with IBM mainframe LBS.

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### *SunLink Client3270 9.1 Software*

SunLink Client3270 9.1 software consists of client software and is installed on either a Sun SPARC or UltraSPARC system with an SBus/PCI. Detailed installation directions are available in the following documents:

- SunLink Client3270 9.1 Software Configuration Guide
- SunLink Client3270 9.1 Software User's Guide

These guides are available on the Sun Microsystems web site at the following URL:

<http://docs.sun.com>

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**Note** – There are no special SunLink Client3270 9.1 software installation directions for interoperability with IBM mainframe LBS.

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## *IBM Mainframe Legacy Business Sessions*

The interface for IBM mainframe connections is a CDE terminal window. Once SunLink SNA3270 9.1 Gateway and SunLink Client3270 9.1 software have been installed properly, interoperability with IBM mainframe LBS can be launched using several methods.

One method for launching an IBM mainframe LBS session is to open a Solaris Operating Environment terminal window and run SunLink Client3270 9.1 software from the command prompt. Another method is to either double-click on a desktop icon for mainframe connectivity or select an icon for mainframe connectivity from a preconfigured Common Desktop Environment subpanel.



# *Scalability and Performance with IBM Mainframe Legacy Business Systems*

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Scalability and performance with IBM mainframe LBS is primarily a function of available CPU and memory, and the SNA transaction rate sustained during peak steady state network loads on a Sun Enterprise server running SunLink SNA3270 9.1 Gateway software.

This chapter provides an architectural overview, processing limits and memory requirements, and formulas for determining the maximum LU limit and memory requirements for SNA3270 9.1 Gateway software.

## *SNA3270 9.1 Gateway Software Architecture*

SNA3270 9.1 Gateway software is designed to be scalable. The architecture is hierarchical and distributed across several processes, each with a dedicated task. There are limits imposed within the architecture and on a per process basis.

Each Sun Enterprise server running SNA3270 9.1 Gateway software can be configured with multiple `sunpu2.1` and `sunlu6.2` processes to overcome per process limits. This allows SNA3270 9.1 Gateway software to scale larger when installed on correctly sized Sun Enterprise servers. SNA3270 9.1 Gateway software also allows for multiple Sun Enterprise servers to be combined and managed as a single SNA gateway/domain so that larger implementations can be achieved to meet the needs of the enterprise network.

Diagram 2 below provides a high-level pictorial representation of the SNA3270 9.1 Gateway software architecture.



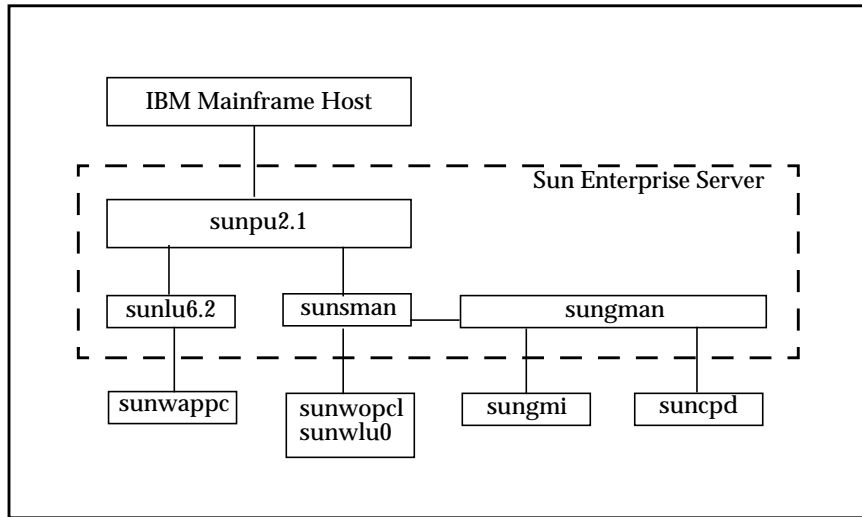


Diagram 2: SNA3270 9.1 Gateway Software Architecture

## SNA3270 9.1 Gateway Software Process Limits

TABLE 1 SUNPU2.1 Process Limit

# of PUs	# of LUs per PU	# of LUs per Process	Notes
64	255	4096	Each PU may have less than 255 LUS. Each LAN adapter can support a maximum of 64 PUs for communication to the IBM host. Additional LAN adapters may be installed if required. The number of LAN or SDLC ports and adapters supported is dependent on the SPARC platform capability and available adapter slots. Each instance of a sunpu2.1 process can support up to 64 Control Point names, representing 64 individual PU2.1 nodes. A maximum of 32 sunpu2.1 server processes can be configured.

TABLE 2 SUNLU6.2 Process Limit

# of PUs	# of LUs per PU	# of Sessions per LU	Total # of LUs per Process	Notes
64	255	1 dependent LU; 1024 independent LUs	2048	Each PU may have less than 255 LUS. Each LAN adapter can support a maximum of 64 PUs for communication to the IBM host. Additional LAN adapters may be installed if required. Additional sunlu6.2 server processes can be configured as needed. To utilize additional sunlu6.2 server processes, specific sunwappc TPRM and CPIC extensions must be used. A maximum of 32 sunlu6.2 server processes can be configured.

TABLE 3 SUNGMAN Process Limit

Total # of LUs	# of Systems	Notes
16,348	32	Total number of LUs supported by sungman is based on available memory. 16,384 LUs have been tested in a simulated IBM network. A total of 3 sungman processes may be configured. However only 1 sungman process may run on each UNIX system.

**TABLE 4 SUNSMAN Process Limit**

Total # of LUs per Process	Notes
16,348	Total number of LUs supported by sunsman is based on available memory. 16,384 LUs have been tested in a simulated IBM network. A maximum of 32 systems can be configured. There will be 1 sunsman process for each UNIX system running sunpu2.1 or sunlu6.2. Each sunsman process is responsible for managing all sunpu2.1 processes on a UNIX system.

**TABLE 5 SUNGMI Process Limit**

Total # of LUs per Process	Notes
16,348	Total number of LUs supported by sungmi is based on available memory. 16,384 LUs have been tested in a simulated IBM network. Any number of sungmi processes may be connected to sungman at any time. However, each instance of a connected sungmi process will increase the sungman CPU utilization by approximately 25%. Therefore it is recommended to run as few sungmi processes as possible.

**TABLE 6 SUNCPD Process Limit**

Notes
suncpd is a controlling process daemon and therefore holds no SNA configuration data. Each system that runs sungman or sunpu2.1 will have 1 suncpd process. However if sungman and sunpu2.1 run on the same unix system only 1 suncpd process will be used.

**TABLE 7 SUNWOPCL Process Limit**

Total # of Connections	Notes
Unlimited	Each sunwopcl, 3270 and TN3270 clients or 3287 printer emulation session occupies 1 UNIX process slot. The total number of clients that can run concurrently on a single Solaris Operating Environment SPARC system is dependent on system resources.

TABLE 8 SUNWAPPC Process Limits

Total # of Connections	Notes
Unlimited	sunwappc provides both CPIC and TPRM libraries for third party developers to implement LU6.2 transaction programs and file transfer applications. The total number of transaction programs that can run concurrently on a single Solaris Operating Environment SPARC system is dependent on system resources and the transaction programs themselves.

## SNA3270 9.1 Gateway Software Memory Requirements

The memory requirements for SNA3270 9.1 Gateway software consist of the memory requirements for its components. The components comprise sunsman, sunpu2.1, sungman, and sungmi. Memory requirements for each component are listed below.

TABLE 9 SunLink SNA3270 9.1 Gateway™ Software Component Memory Requirements

Component Process	Base Memory	Incremental Per LU	Incremental Per User Record
sunpu2.1 (see note below)	4MB	8KB	n/a
sunlu6.2 (see note below)	3MB	8KB	n/a
sunsman	4MB	2.5KB	1KB
sungman	4.5MB	2.5KB	1.5KB
sungmi	8MB	2.5KB	1.5KB
suncpd	1MB	n/a	n/a

**Note** – Runtime memory usage can vary depending on the number of concurrent sessions per LU and the type of lu6.2 traffic sustained. Typically unidirectional traffic, such as lu6.2 based file transfer programs, tend to saturate buffer space in both the sunpu2.1 and sunlu6.2 process.

SNA3270 9.1 Gateway software will flow control to either the SNA session or the client TP when approximately 2.4 MB of buffer space has been allocated per lu6.2 conversation. This is usually only apparent on gateway installations utilizing low speed SNA data links such as SDLC. Session level flow control

is based on SNA pacing windows, with valid ranges from 1-63. The use of a pacing window sizes of 0, will circumvent these flow control mechanisms, therefore maximum memory usage per conversation can not be calculated.

The Base Memory value is the amount of memory used to run the component(s) with an empty configuration and have no paging. The Incremental per LU value is the additional amount of memory required to support an active LU with client connections. The Incremental per User value reflects the additional memory required to support optional user records.

The memory requirements outlined reflect what is required to run steady state connections without substantial paging. Depending on configuration, paging activity may not be disruptive and permits systems to operate with less than the above memory. This is particularly true if all components are on the same system and use of `sunwgmi` is infrequent.

When configuring very large configurations, it is advantageous to install the `sunwgmi` and `sunwgman` components on one dedicated system and `sunwpu21` and `sunwlu62` on another. In this manner, system resources are dedicated to running the SNA protocol emulators for `sunlu6.2` and `sunpu2.1`. This configuration model will reduce the management and status operations of `sunwgmi` and `sunwgman` from impacting SNA throughput.

## *Determining Maximum LU Limits for SNA3270 9.1 Gateway Software*

The `vmstat` utility can be used to determine the load that SNA3270 9.1 Gateway software is placing on the system. To execute this command, specify a time interval indicating how often the system statistics should be retrieved. Typing `vmstat 10` will retrieve load information every 10 seconds. The return from `vmstat` looks like this:

```
procs      memory      page          disk      faults      cpu
r b w swap free re mf pi po fr de sr f0 s3 -- -- in sy cs us sy id
0 0 0 66444 10468 0 29 14 6 10 0 6 0 5 0 0 27 269 43 5 11 84
0 0 0 66444 10468 0 27 15 8 10 0 6 0 5 0 0 27 133 43 6 12 82
```

In this display the 'pi' and 'po' indicate how often memory is being paged-in or paged-out. These values should be zero or very close to it in the steady state case, if the system has enough memory to handle SNA3270 9.1 Gateway software along with its other duties. If these numbers are high, it might indicate that additional memory should be added to the system. Paging-in and out are expensive operations that steal CPU power so it is best to keep this low.

Under CPU statistics, 'id' is the best indicator of the system load; it shows the percentage of time that the system is idle. This number should not go to 0 (zero), indicating the system is quite heavily taxed. 'us' and 'sy' indicate percentages of user and system time being used by the processes. When running SNA3270 9.1 Gateway software on a system with no other applications running at the same time, these numbers should closely track each other. If they don't or if 'id' goes to zero, the system may need more CPU power.

Another important statistic is the 'swap' vs 'free' information. This indicates how much memory is available in swap and real memory. If the system is running out of real memory, the 'free' column will be low -- this could indicate that the system needs more memory to handle the current process load.

## *Calculating Memory Requirements for SNA3270 9.1 Gateway Software*

Following are several examples for calculating memory requirements for SNA3270 9.1 Gateway software. Use these examples as a guide when calculating memory requirements for a specific implementation.

### *Example 1: 10 independent lu6.2 LUs and 1000 3270 concurrent sessions*

- sunsman 4.0 MB base + 1010 Lus \* .0025 MB = 6.525MB
- sungman 4.5 MB base + 1010 Lus \* .0025 MB = 7.025MB
- sungmi 8.0MB base + 1010 Lus \* .0025 MB = 10.525MB
- sunpu2.1 4.0MB base + 1010 Lus \* .008 MB = 12.08MB
- sunlu6.2 3.0MB base + 10 Lus \* .008 MB = 3.08MB
- suncpd 1.0MB base = 1.0MB
- Total Memory Required = 40.235MB

***Example 2: 2 sunpu2.1 processes, 4096 session limit per process, 8000 concurrent 3270 sessions***

- sunsman 4.0MB base + 8000 Lus \* .0025MB = 24.0MB
- sungman 4.5MB base + 8000 Lus \* .0025MB = 24.5MB
- sungmi 8.0MB base + 8000 Lus \* .0025MB = 28.0MB
- sunpu2.1 4.0MB base + 4000 Lus \* .008MB = 36.0MB
- sunpu2.1 4.0MB base + 4000 Lus \* .008MB = 36.0MB
- suncpd 1.0MB base = 1.0MB
- Total Memory Required = 149.5MB

This configuration is large and therefore is recommended (but optional) that sunwgmi and sunwgman be installed on one Sun Enterprise server and that sunwpu2.1 on another. With this configuration model, impact to SNA performance is reduced as well as per system memory requirements. Note that suncpd will run on all systems and sunsman will only run on systems that also run sunpu2.1 processes.

***System 1:***

sungman 4.5MB base + 8000 Lus \* .0025MB = 24.5MB

sungmi 8.0MB base + 8000 Lus \* .0025MB = 28.0MB

suncpd 1.0MB base = 1.0 MB

Total Memory Requirements = 53.5MB

***System 2:***

sunsman 4.0MB base + 8000 Lus \* .0025MB = 24.0MB

sunpu2.1 4.0MB base + 4000 Lus \* .008MB = 36.0MB

sunpu2.1 4.0MB base + 4000 Lus \* .008MB = 36.0MB

suncpd 1.0MB base = 1.0MB

Total Memory Requirements = 97.0





## *Frequently Asked Questions*

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**Q: Can a Sun Ray 1 enterprise appliance interact with all IBM LBS applications?**

A: The Sun Ray 1 enterprise appliance uses SunLink SNA3270 9.1 Gateway and SunLink Client3270 9.1 software to provide IBM mainframe LBS interoperability. Restrictions from these applications (or 3rd party solutions) are restrictions for the Sun Ray 1 enterprise appliance.

**Q: In what ways does the Sun Ray 1 enterprise appliance impact interoperability with IBM mainframe LBS applications?**

A: The Sun Ray 1 enterprise appliance has no impact on interoperability with IBM mainframe LBS applications. The Sun Ray 1 enterprise appliance, however, does expect a computational service provider to support multiple users and remote display capabilities.

**Q: Does the Sun Ray 1 enterprise appliance impact the performance or scalability of applications running on IBM mainframe host systems?**

A: No, the Sun Ray 1 enterprise appliance is transparent to application performance and scalability. Application performance and scalability is primarily a function of available CPU and memory, and the SNA transaction rate sustained during peak steady state network loads on a Sun Enterprise server running SunLink SNA3270 9.1 Gateway software.

**Q: Does the Sun Ray 1 enterprise appliance support "cut and paste" functionality?**

A: Yes. "Cut and paste" functionality is delivered through the solution that provides IBM mainframe LBS interoperability (be it SunLink SNA3270 9.1 Gateway and SunLink Client3270 9.1 software or a 3rd party solution).

**Q: Can you launch an IBM mainframe LBS application directly from within the Solaris Operating Environment or a Solaris application?**

A: No. This requires object level interoperability that does not exist today.

**Q: How do I change my printer? The system default printer is on the other side of the building.**

A: Set the PRINTER environment variable in your ".profile" or ".login" file to include the name of the printer near your work area. For ".profile" (ksh and sh default shells), add the line: PRINTER='my\_printer'; export PRINTER. For ".login" (csh), add the line: setenv PRINTER 'my\_printer'.

**Q: Does SunLink SNA3270 9.1 Gateway software require the use of an SNA interface card?**

A: No. SunLink SNA3270 9.1 Gateway software is a software solution only. The only hardware requirement is that it must be installed on a SPARC or UltraSPARC system with an SBus/PCI. SunLink SNA3270 9.1 Gateway software is not supported on Sun x86 systems.



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