Interoperability and the Sun Ray Enterprise Appliance

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July 2000, Revision A

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CHAPTER 1

Introduction

This whitepaper explores the interoperability and integration of Sun Microsystems™ Sun Ray™ enterprise appliances with a variety of current computing platforms in an existing network. It provides an overview of the software solutions available, with the intent to facilitate a smooth transition of users from Windows NT, Macintosh, and mainframe platforms to Sun Ray appliances.

This whitepaper addresses four aspects of interoperability:

- "Application Serving" in Chapter 2
- "File Sharing" in Chapter 3
- "Network Printing" in Chapter 4
- "Authentication" in Chapter 5

Additionally, this whitepaper describes a sample scenario in Chapter 6 and provides vendor information in Appendix A.

Topics discussed in this chapter are:

- Problem Description
- An Example Scenario

1.1 Problem Description

A heterogeneous environment might contain some combination of the following server platforms networked together:

- A file server
- A mainframe for database applications
- A Windows NT server for office or legacy applications
- UNIX® based servers for technical work
- A Macintosh for graphic arts purposes

The network may also have network printers. To integrate Sun Ray appliances into this environment, Sun Ray enterprise servers are added along with a high-speed, dedicated, switched interconnect.

Sun Ray appliance users may require access to files produced on the Windows NT, Macintosh, mainframe, and UNIX systems as well as to printing facilities. To enable the Sun Ray users interoperability with the existing systems on the network, combinations of software products are implemented.

Note – UNIX systems refer to the Solaris™ Operating Environment, Linux, SCO UNIX, AIX, HP-UX, or any UNIX operating system.

Note – This whitepaper references Microsoft Windows NT, which uses the Server Message Blocks (SMB) file service protocol. In an analogy, Windows 2000 uses the Common Internet File System (CIFS) file service protocol. Whenever SMB is read, it pertains to Windows NT and can be substituted by CIFS for Windows 2000.

1.1.1 Application Serving

Access to existing applications and data must be provided to Sun Ray appliance users. This is accomplished through application serving, as explained in Chapter 2. Through application serving, the Sun Ray appliance user is able to run legacy applications as well as mainframe or UNIX applications. Application serving is appropriate for infrequent access or for applications without standard data formats.

Note – This document discusses Microsoft Windows NT applications and the application serving capabilities of Microsoft Windows NT 4.0 Terminal Server Edition and Microsoft Windows 2000 Server Editions. Typically, this whitepaper will refer to the three operating systems as simply the Windows Terminal Server (WTS). When appropriate, the specific operating system is named.

1.1.2 File Sharing

For more intensive data sharing, where data formats are common across applications, file sharing is possible. File sharing is explained in detail in Chapter 3. By sharing files, the directories of the Windows NT, Macintosh, mainframe, and UNIX systems can be accessed by a user on any of the Sun Ray appliances.

1.1.3 Network Printing

Printing from the Sun Ray appliances depends upon how network printing has been set up for the heterogeneous environment as well as which application the Sun Ray appliance user is trying to print from. See Chapter 4 for more network printing details.

1.2 An Example Scenario

FIGURE 1-1 provides a visual representation of a composite network that might be used by a small business.

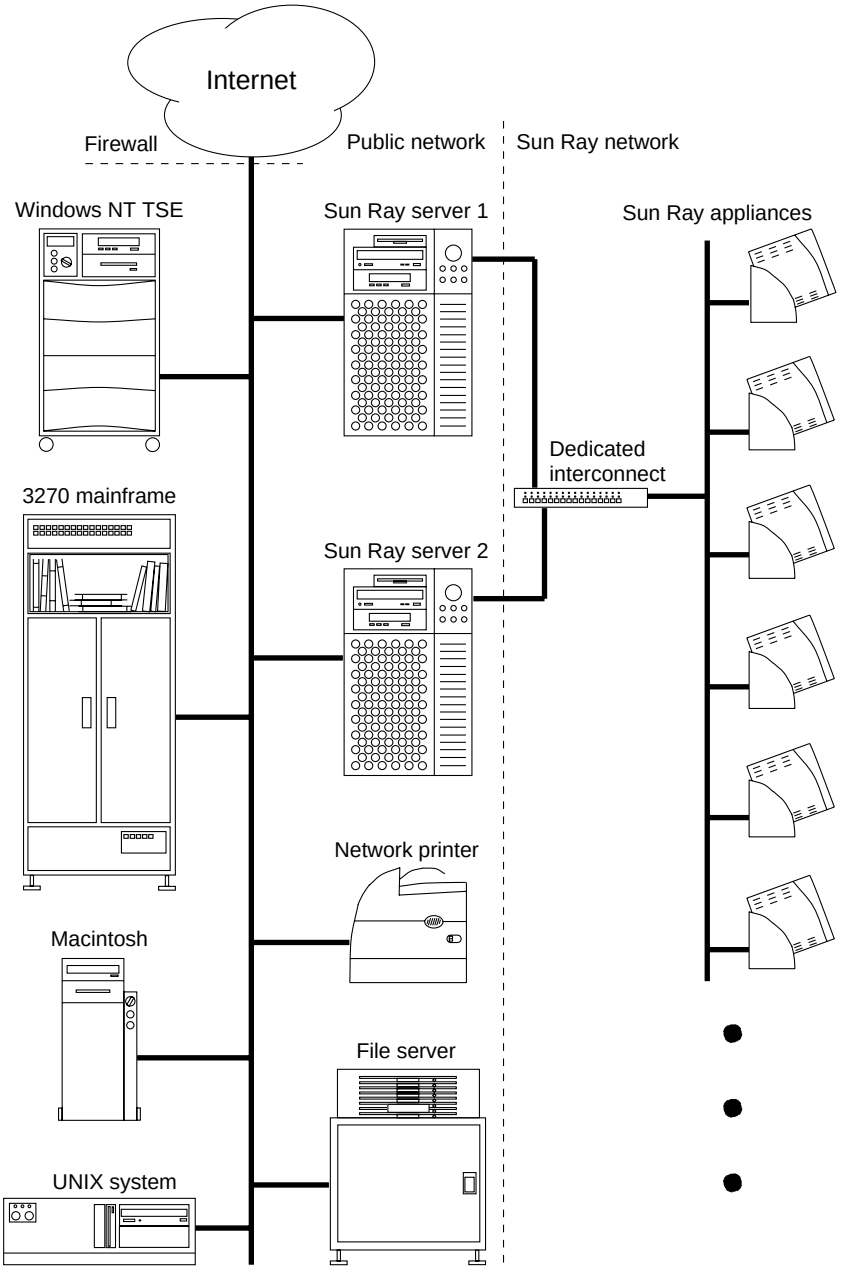

FIGURE 1-1 Heterogeneous Environment and Its Systems

Assume that this business has just installed the Sun Ray servers and Sun Ray appliances onto their network and is about to begin migration from the older servers to the new Sun Ray paradigm. The challenge of the migration is to integrate diverse computing platforms with specific tasks in this network.

The network in this scenario contains:

- Macintosh server — This platform is configured with a PowerPC processor and is running MacOS. This server's primary function is graphic arts and illustration for documentation, web pages and marketing materials.
- Windows NT server — This platform is configured with an *X*86-based processor, running Windows NT Terminal Server Edition (TSE). This server's primary function is for accounting.
- UNIX server — This platform is configured with a Pentium processor, running Linux. This server's primary function is for research and development.
- 3270 supporting mainframe — This platform is configured with an IBM processor, running the OS/390 operating environment. This server's primary function is for inventory and file serving.
- Sun Ray servers — These newly installed platforms are configured with dual UltraSPARC™ processors, running the Solaris Operating Environment. These servers' primary function is to provide Sun Ray services to the Sun Ray appliances.
- The network is also configured with a network printer and has a connection to the Internet.

Within the Sun Ray interconnect are:

- Sun Ray servers — These two servers are configured in a failover group. If one server fails, the other can provide services to the Sun Ray appliance users.
- Dedicated interconnect — The Ethernet switch provides constant bandwidth and a backbone for the Hot Desk environment.
- Sun Ray appliances — Existing and new employees will move to these terminals to conduct their job responsibilities. For simplicity, the diagram shows a subset of the available appliances.

Chapter 6 provides an example of how the components of this combined network can be configured to interoperate.

CHAPTER 2

Application Serving

This chapter discusses application serving between the Sun Ray enterprise server and other systems in the heterogeneous environment.

Topics covered in this chapter are:

- Description
- Windows NT and Windows 2000 Application Serving
- UNIX Application Serving
- Mainframe Application Serving
- Comparing Application Serving Software

2.1 Description

2.1.1 What Is Application Serving?

A major aspect of interoperability is sharing applications, particularly platform specific applications, among several clients of differing operating systems. This is achieved through application servers.

The application server is a central server to which remote clients connect. A user of the remote client can then access the resources and applications of the application server. The Sun Ray server is itself an application server for the Sun Ray enterprise appliances. In addition, applications on the Sun Ray server can act as clients of different types of application servers. Through this two stage process, a non-Solaris application server in the heterogeneous environment can provide Sun Ray appliance users access to platform specific applications from a window on their desktop. The software programs that make this process possible function under two models:

- Software on the Sun Ray server enables the Sun Ray appliance user to access a multi-user application server.
- Software on the application server enables Sun Ray appliance users to request applications through Sun Ray server connections.

2.1.2 How Does Application Serving Fit Into the Sun Ray Environment?

How the Sun Ray server interoperates with other platforms determines which software to use. For example, assume a Sun Ray appliance user needs access to a legacy application residing on a system running the Windows Terminal Server (WTS). This situation would require a Windows-based application server. By using software that enables the Sun Ray server to communicate the display protocol of the application server from which it's requesting service (X11 for Solaris and Remote Display Protocol (RDP) for WTS), the Sun Ray server is able to execute and share applications remotely from the application server.

A centralized application server provides many benefits, including:

- Resources are provided from a central point where administrators can allow Sun Ray appliance users access to the desired applications.
- It is not necessary to have all applications that a user needs actually residing on the Sun Ray server.
- The user is allowed greater mobility in so far as they can access the centralized application server from any Sun Ray appliance rather than having to be at their designated machine.

The Sun Ray model utilizes the benefits of application serving and provides enhancements. Centralized administration and resource sharing are inherent to the Sun Ray architecture as the Sun Ray appliances are stateless devices. The Sun Ray server, coupled with an application server solution, provides the Sun Ray appliance users with access to centrally located applications as well as the mobility of smart card Hot Desking. This combination provides users with continuous sessions regardless of which Sun Ray appliance they are using as well as access to applications that reside on remote servers.

With multiple users, application servers are configured to allow a specific number of concurrent users or licensing per seat. See Appendix A for information on where to get specific details on licensing options for servers and clients.

2.2 Windows NT and Windows 2000 Application Serving

2.2.1 A Brief History

The primary method of accessing Windows NT or Windows 2000 applications in the Sun Ray environment is with application server software. To better understand the solutions offered for Windows NT and Windows 2000 applications, this section describes the evolution of multi-user Windows NT.

In the mid 1990's, the Citrix Corporation licensed the Windows NT 3.x operating system from Microsoft. Citrix was to develop a version of Windows NT that enabled multiple users to run off of the same server. Additionally, Citrix created the Independent Computing Architecture (ICA®) protocol and ICA clients. These tools would enable Windows NT applications and desktops to display on various Microsoft platforms (Windows 95, Windows 3.1, and DOS) as well as Macintosh and UNIX platforms. Citrix packaged the modified operating system with administration tools for managing multiple users on the Windows NT server. The software bundle was a complete solution for multi-user Windows NT and was called WinFrame®.

In 1997, Microsoft licensed the multi-user operating system kernel and administration tools from Citrix. After adding Microsoft's own thin-wire protocol, the Remote Display Protocol (RDP), the complete package was released the following year as Windows NT 4.0 - Terminal Server Edition (TSE). Under the licensing agreement, Citrix bundled their administration tools with the ICA protocol into a release called MetaFrame™. MetaFrame ran on top of TSE to provide access to non-Windows clients.

At the end of 1999, Microsoft opened the RDP protocol to other software vendors who wanted to provide clients to the WTS. Some of these emerging products are described in the following sections. FIGURE 2-1 shows this history.

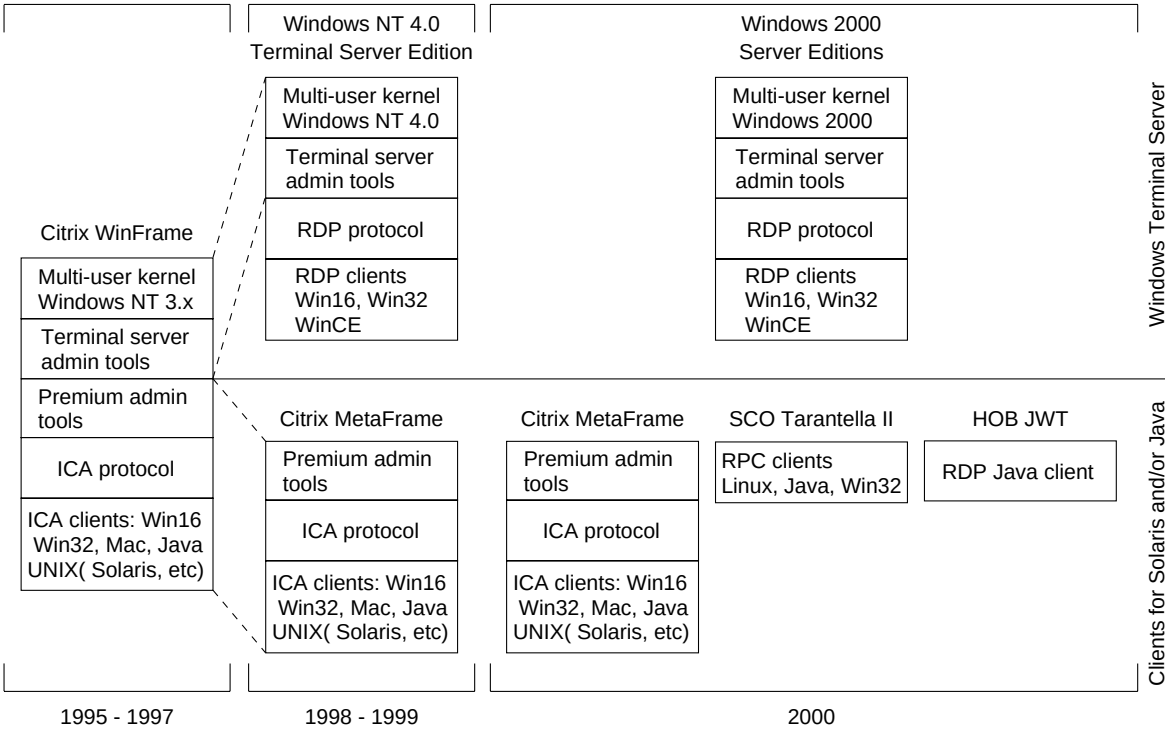

FIGURE 2-1 Multi-User Kernel WTS Application Serving History

In February 2000, Microsoft released Windows 2000. All of the server editions of the Windows 2000 have terminal server capabilities built in. However, these capabilities are activated after terminal server client licenses are explicitly purchased.

2.2.2 Citrix MetaFrame

Citrix's MetaFrame and ICA client products provide multi-user, remote display of WTS applications through the Citrix ICA protocol, an alternative to the Microsoft RDP.

MetaFrame is a WTS add-on which provides support for a wide range of clients, including Solaris software. This software supports automated local device re-direction, including printers, LPT ports, COM ports, and audio ports. MetaFrame also provides management capabilities, such as shadowing, anonymous logins, and with option packs, load balancing, and resource management.

Citrix's communication protocol, ICA, runs on top of TCP/IP, NetBEUI, or IPX™/SPX. It supports both RAS (Remote Access Server) and dial-in asynchronous connections for remote access. The ICA Java™ client requires a Java virtual machine (JVM™), built into most web browsers, and can be run from a web server as an applet. Alternatively, the ICA Java client can be run from the Solaris command line using the `appletviewer` command, which is part of the Java Development Kit (JDK™).

FIGURE 2-2 shows the Citrix MetaFrame ICA client model.

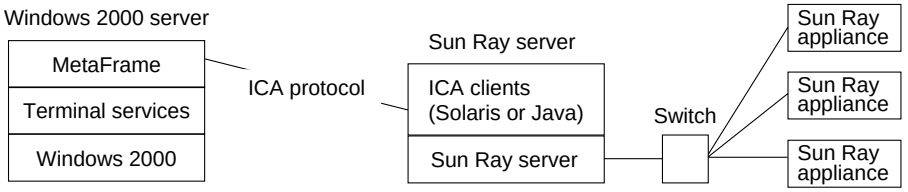

FIGURE 2-2 Citrix MetaFrame ICA Client Model

The Sun Ray/Citrix solution requires the following components:

- Sun Ray appliances
- An Ethernet switch
- A Sun Ray server running Citrix ICA client software
- A Windows NT Server running Terminal Server and Citrix MetaFrame

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Note – It is beneficial to get the latest ICA client release from the Citrix download site, as clients are updated frequently and incorporate the latest bug fixes and feature sets. The download site URL is: `http://download.citrix.com`

To run a Microsoft Windows based application, the Sun Ray appliance user typically accesses the Citrix software through a browser window. In the browser, the user can select available applications residing on the WTS. A session is created on the WTS and MetaFrame sends display information to the ICA client software on the Sun Ray server. The display information is then passed to the Sun Ray appliance user and the user's keystrokes and mouse movements are sent back to the ICA client software and on to MetaFrame.

More than one user can access the same Microsoft Windows based application at the same time through the Citrix software.

For a Sun Ray server to use the MetaFrame solution, the Sun Ray server must be using JVM version 1.1 or greater to run the ICA Java client as an application. To run the ICA Java client as an applet, the Sun Ray server must have a web browser with JDK version 1.1 or higher.

2.2.2.1 Citrix UNIX Integration Services

Citrix has an optional software program that runs on top of the WTS and provides native X11 integration into the terminal server. This software is an alternative to using ICA or RDP, as the Sun Ray server is a Solaris X11 client by default. The product also provides WTS tools to integrate into a NIS domain network and up to 24-bit color on the client.

Though the UNIX Integration Services client does not provide some of the advanced features available from an ICA client, such as multimedia, UNIX Integration Services does offer faster LAN-based access in an X11 environment.

2.2.3 SCO Tarantella

The Tarantella line of products from Santa Cruz Operations (SCO) allows Sun Ray appliance users to access Microsoft Windows based and legacy 3270 applications. Unlike an application server, the Tarantella Enterprise II server acts as an application broker, residing in a middle tier between the application servers and the Sun Ray server.

The Tarantella Enterprise II software functions in a three-step process:

1. The Tarantella server appears as a client to the application servers and receives display information from them.
2. The Tarantella server sends Java applets to the client, which then contact the Tarantella server and process the display information the Tarantella server sends.
3. The Tarantella server converts and forwards the display information to the applets through the Adaptive Internet Protocol (AIP), where they are viewed in a Java-enabled browser.

FIGURE 2-3 shows the Tarantella model.

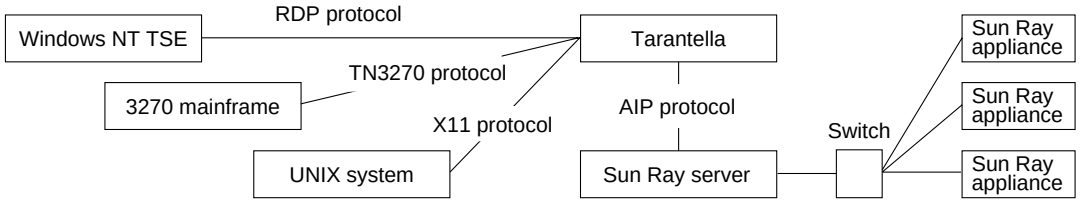

FIGURE 2-3 Tarantella Model

The Tarantella Enterprise II software requires a Java-enabled browser for the Sun Ray appliances and a web server. The Tarantella software supports both the Solaris Operating Environment and the WTS operating environment, and for a large number of users, may be installed on a separate server. If there are a small number of users, the Tarantella software can be installed on the Sun Ray server. The Sun Ray/Tarantella solution requires the following components:

- Sun Ray enterprise appliances
- An Ethernet switch
- A Sun Ray server
- Tarantella Enterprise II software and server
- Applications servers for Microsoft Windows based or 3270 applications

To run a Microsoft Windows based or 3270 application, the Sun Ray appliance user accesses the Tarantella software through a browser window. In the browser, the user can select applications available to them from the Windows NT server or 3270 mainframe. A session is created on the respective server and the Tarantella server receives the display information. Tarantella converts and forwards the display information to the Sun Ray appliance user. The user's keystrokes and mouse movements are sent back through the Tarantella server to the application server.

Tarantella provides file collaboration similar to that of Citrix MetaFrame. In addition, Tarantella's Suspend and Resume feature allows a user to suspend their session and then log back in later, either from the same location or remotely, to resume the same session.

For a Sun Ray server to use the Tarantella solution, SCO recommends the Sun Ray server be configured with Netscape™ Communicator 4.7 or later. The Sun Ray server needs the Tarantella Base Pack along with the connectivity and support packs for the operating systems that are to be accessed. The Tarantella Windows Connectivity Pack is for Microsoft Windows based applications and the Tarantella 3270 Connectivity Pack is for 3270 mainframe applications. In addition, SCO provides the Tarantella Security Pack, which allows Tarantella to use SSL for increased security.

2.2.4 HOB HOBLink

HOB Electronic offers a family of products called HOBLink. Neither an application server nor application broker, the Java-based HOBLink products are simply software clients of standard applications servers. They provide access to applications without additional server components. The only Sun Ray server requirement is a JVM or any Java-enabled browser. The preferred method of running HOBLink on Solaris is through AppletViewer, which is included with all JDK releases.

Upon initial connection, HOBLink provides a one-time load balancing feature as a default. Server connection options include connecting to:

- The first server to answer
- The server with the lightest load
- The server of choice, either from a list or from an IP address

FIGURE 2-4 shows the HOBLink model.

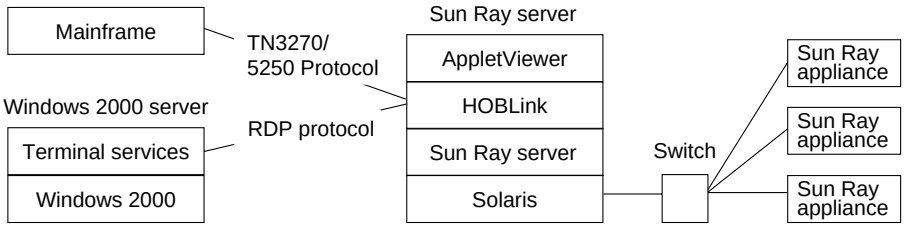

FIGURE 2-4 HOBLink Model

HOBLink JWT communicates directly with WTS through the use of RDP and uses TCP/IP as the network protocol. This provides location independence. HOBLink J-Term provides 3270 and 5250 mainframe emulation.

The HOBLink software is installed on the Sun Ray server. File sizes for the HOBLink products are small, approximately 120 Kbytes.

2.2.5 GraphOn Bridges For Windows

The GraphOn corporation provides another approach for Windows NT and Windows 2000 interoperability with the Bridges for Windows product. Bridges circumvents the need for the terminal server services by using an Application Publishing Service (APS). The APS performs several tasks. First, it separates the display portion of an application, then acting as a gateway, it forwards the display portion to the remote clients. Additionally, the APS provides authentication and application selection and setup services. Bridges for Windows also provides a Java applet for the remote clients. This applet enables viewing of the display portion of the application running on the Windows NT or Windows 2000 server, either from a Java enabled web browser, or an applet viewer.

FIGURE 2-5 shows the Bridges for Windows model.

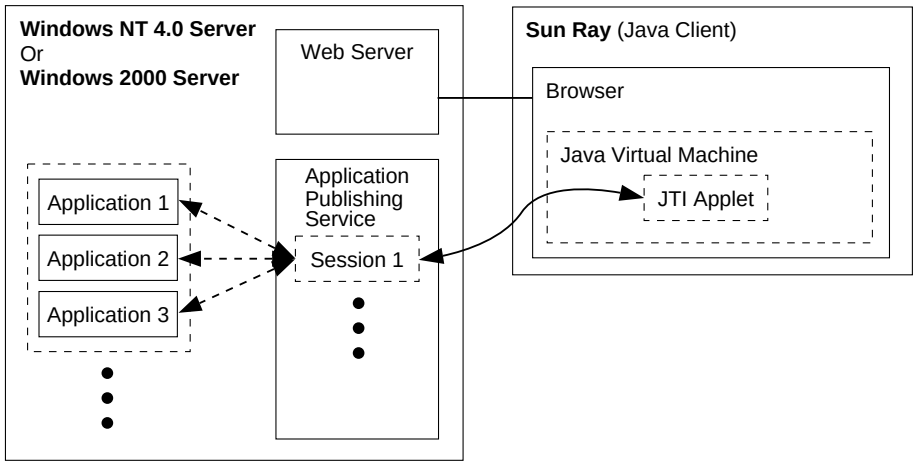

FIGURE 2-5 Bridges Model

Bridges for Windows, though still in development, is available to ISVs, VARs, ASPs, and Enterprise IT Departments. Bridges for Windows cannot provide remote display of all Windows NT and Windows 2000 applications, however it does offer a solution for single or fixed function legacy PC applications that have not or cannot be ported to XML, HTML, or Java.

2.3 UNIX Application Serving

2.3.1 X11 Windowing Protocol

Any UNIX based operating system can share applications with the Sun Ray server via the X11 windowing protocol. X11 has always supported remote display or execution of graphical applications across heterogeneous systems.

2.4 Mainframe Application Serving

2.4.1 Sun Microsystems SunLink 3270

The following information is excerpted from the *Integrating Sun Ray Enterprise Appliance and IBM Mainframe Legacy Business Systems* whitepaper. The whitepaper can be found at this URL:

```
http://www.sun.com/products/sunray1/whitepapers
```

There are three facets to interoperability with mainframe legacy applications:

- Application execution
- File access and printing
- Mainframe system administration

Each facet of interoperability with mainframe legacy applications requires a Sun Ray appliance user to establish a connection with the mainframe using terminal display device emulation software. The most popular mode of connecting is through 3270 terminal emulation.

A solution is to install the following software components on the Sun Ray server:

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

2.4.1.1 SunLink SNA3270 9.1 Gateway Software

Part of the SunLink IBM 9.1 family of software products, SunLink SNA3270 9.1 transforms an UltraSPARC system into a high-performance SNA gateway.

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 IBM mainframe host systems.

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 UltraSPARC systems can access

many popular IBM mainframe on-line applications such as TSO/ISPF, CICS/VS, DB2, IMSS/VS, and NetView, plus the most common IBM host system spooling programs such as JES2/3, RSCS, and POWER.

2.4.1.2 SunLink Client3270 9.1 Software

Also part of the SunLink IBM 9.1 family of software products, SunLink Client3270 9.1 provides IBM 3270 display terminal emulation and enables UltraSPARC 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.

The SunLink Client3270 9.1 software emulates both monochrome and color alphanumeric 3270 display terminals. It is compatible with 3278 (models2-5), 3178, 3279 (models 2a, 2B, 3A, and 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.

2.4.1.3 Additional Information

Additional information about SunLink SNA3270 9.1 Gateway software, 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/
```

2.4.2 OCS OC:/ /WebConnect Pro

OC:/ /WebConnect Pro from Open Connect Systems is a Java-based technology providing 3270 and 5250 emulation. OC:/ /WebConnect Pro delivers these applications through any Java enabled web browser.

Included with the product is OC:/ /WebConnect AutoVista , which provides a graphical user interface for 3270 applications. OC:/ /WebConnect Pro uses SSL for security and supports 128-bit encryption.

2.4.3 IBM Host On-Demand

Host On-Demand from IBM is a Java-based product providing 3270 and 5250 access. Host On-Demand provides a graphical user interface as a default and requires a JVM 1.1. The product uses SSL for security.

2.5 Comparing Application Serving Software

The following table provides a comparison of HOB HOBLink, Citrix MetaFrame, SCO Tarantella, Sun Microsystems SunLink 3270, OCS OC:/ /WebConnect Pro, and IBM Host On-Demand.

TABLE 2-1 A Comparison of Application Servers

Feature	MetaFrame ICA Client	Tarantella	HOBLink	Bridges for Windows	SunLink 3270	OC://WebConnect Pro	Host On-Demand
Microsoft Windows based application access	●	●	●	●			
Mainframe application access		3270	3270 5250		3270	3270 5250	3270 5250
Load Balancing	Option pack	●	●				
Suspend and Resume		●					
Local Printing	●	●		●	●	●	
Security with encryption	128-bit	128-bit	40-bit	40-bit		128-bit	128-bit
Multimedia support	Option pack						
Free evaluation software available		●	●				

CHAPTER 3

File Sharing

This chapter discusses how to share files between the Sun Ray enterprise server and other systems in a heterogeneous environment.

Topics covered in this chapter are:

- Description
- Models
- From a Sun Ray Point of View
- Technologies

3.1 Description

Files created on different platforms often have different file formats and in some instances the formats are specific to the application that created the file. Software is needed to view and modify files on the Sun Ray server if they were generated on a non-Solaris platform. The software tools available to work with diverse file types range in functionality from providing read only access, to allowing the user to modify and save the file into a different format.

In a heterogeneous environment extra software needs to be configured to enable file system or drive mapping. In the case of the Sun Ray server, the UNIX File System (UFS) can be mapped so that other operating systems can see the Solaris directory. Users then store working files onto the Solaris mapped directory so that shared files are readily available to the Sun Ray enterprise appliance user.

Additionally, the Sun Ray appliance user will likely need to view the files provided by the other systems on the network. Depending on the format of the file, the Sun Ray appliance user has various applications available to view these files. File modification may require some form of application sharing.

For the Solaris Operating Environment, the primary tool for manipulating different file types on the Sun Ray server is StarOffice™. StarOffice enables the user to view and modify proprietary file formats such as Microsoft Word documents. Another tool available for the Solaris Operating Environment is the PC fileviewer application.

3.2 Models

There are two basic models to sharing files within the local network:

- Centralized — Where all files are stored within one server, and clients are dependent upon this server.
- Distributed — Files are stored across many servers. Files of certain types may be stored on the same server that created those files.

3.2.1 Centralized File Serving

3.2.1.1 Benefits

Centralized File Sharing is beneficial for ease of administration such as admitting and restricting access, enabling scalability, ensuring data integrity, and easing backup by providing one central file system from which users access files.

3.2.1.2 Limitations

A limitation to this model is that with a single central file server comes issues regarding a single point of failure. Redundant Array of Inexpensive Disks (RAID) storage systems and Dual Attach storage systems (accessible from multiple servers)) can be used to provide failover capability, thus preventing any single failure from disrupting the workgroup.

Another limitation of a centralized file server is that depending upon the network design and load distribution, access and response times for file operation may be significant, unless the file server and network are adequately configured.

3.2.2 Distributed Local Repositories

3.2.2.1 Benefits

Distributed file systems can be implemented, for example, on a regional or departmental basis so that if one file server fails other departments can remain functional.

An additional benefit of distributed file serving is that file access can be limited and controlled, hence more secure.

3.2.2.2 Limitations

Files that are manipulated across multiple departments are subject to backup, data integrity, and revision issues.

Also, each file server must be capable of sharing files with all client types within the network. This multiplies the number of configurations to be managed.

3.3 From a Sun Ray Point of View

The main benefit of the software discussed in this chapter is that disparate files systems are made transparently available to the Sun Ray appliance user. This transparency is achieved by allowing access to a shared file system without changing or affecting the user experience. The user perceives the mapped file system to be local. Additionally, these files can be manipulated by remote application servers with interfaces that present the applications as if they were run locally.

A Sun Ray appliance user running a Solaris application on the Sun Ray server can access shared files using the software technologies described in this section. Similarly, when accessing applications through an application server on a different platform, the appropriate software technologies make the files available to the application server.

In a properly configured heterogeneous environment, shared files can be transparently available, regardless of where the ultimate application runs.

FIGURE 3-1 shows the interaction of file sharing and application serving.

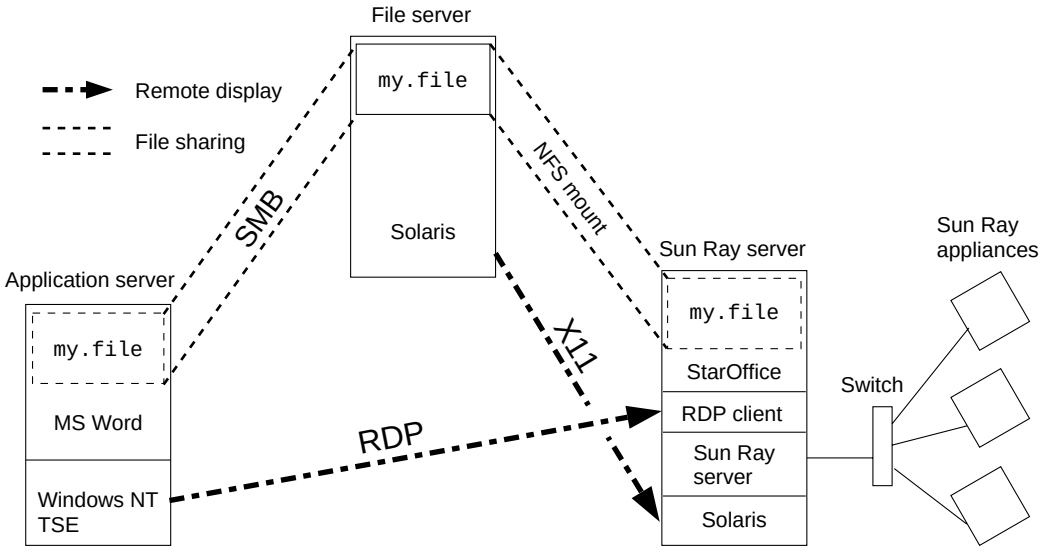

FIGURE 3-1 File Sharing and Application Serving

FIGURE 3-2 shows how the user accesses the file directly using StarOffice, or indirectly by using application serving.

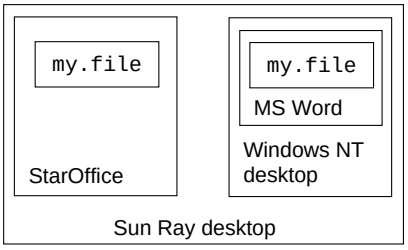

FIGURE 3-2 How the User Sees the File

3.4 Technologies

The software used to enable file sharing depends on the operating environments that need access to the files and type of file system the file server, if any, is running.

Note – For this section and hereafter, the term SMB (Server Message Blocks) pertains to a file system component of Windows NT 4.0 Terminal Server Edition. It is analogous to the Common Internet File System (CIFS) file system component of Windows 2000.

3.4.1 PC NetLink

PC NetLink is a Sun Microsystems product that enables a Solaris server to provide file and print services to a Windows NT server or client. PC NetLink is transparent to the Sun Ray appliance user in that the file system is UFS. In addition, PC NetLink provides several other services enhancing the centralized administration model.

3.4.2 Samba

Samba is a freeware program that enables the Solaris server to be accessed by the Windows NT server from its Network Neighborhood. This is possible through use of SMB. In this situation, UNIX drives can be mounted by the Windows NT server in a manner transparent to the end user. Because Samba is freeware, it does not have a commercial support channel.

3.4.3 Syntax TAS

The TotalNet Advanced Server (TAS) enables UNIX, Windows NT, and Macintosh file systems to communicate using SMB and AppleTalk. TAS enables the Windows NT NTFS file system, the Sun Ray server's Solaris UFS file system, and the Macintosh HFS file system to be mounted by any of the other supported systems, and their files shared. TAS works in a similar manner as Samba, but offers greater functionality and is a supported commercial product.

3.4.4 NFS

The Network File System (NFS) can be used by enabling the NTFS service on the Windows NT server and then mounting file systems between Solaris and Windows NT. NFS is a de facto industry standard, is supported by the Solaris Operating Environment, and is a product of Sun Microsystems, Inc.

3.4.5 Sharity

Sharity can map shared directories exported by Windows NT servers into a UNIX file system. When a Sun Ray appliance user mounts a Windows NT drive, those files appear to reside on the local file system.

3.4.6 AppleShareIP

AppleShareIP 6.3 works over TCP/IP and AppleTalk networks, and supports AFP, FTP, and SMB. The Sun Ray server can access files on the Macintosh file server via SMB, provided by a previously discussed software product. AppleShareIP enables the Macintosh file system to be accessed from a Windows NT server's Network Neighborhood. Once configured, the Macintosh is now a file server, and files are available through SMB.

CHAPTER 4

Network Printing

This chapter describes how to configure the Sun Ray servers for network printing within a heterogeneous environment.

Topics covered in this chapter are:

- Description
- Printing Models
- From a Sun Ray Enterprise Appliance Using Application Serving

4.1 Description

Leveraging existing printing services for use with the Sun Ray Appliance can be achieved in a variety of ways; PC NetLink, TCP/IP based printing, or SMB based printing.

4.2 Printing Models

4.2.1 PC NetLink

When PC NetLink is configured for print serving, it can receive and process requests for print jobs from Windows NT, Solaris (Sun Ray), or Macintosh (through AppleShareIP) clients. The PC NetLink software recognizes and processes compatible file types for each client.

4.2.2 TCP/IP-Based Printing

FIGURE 4-1 shows a diagram of a TCP/IP-based printing network.

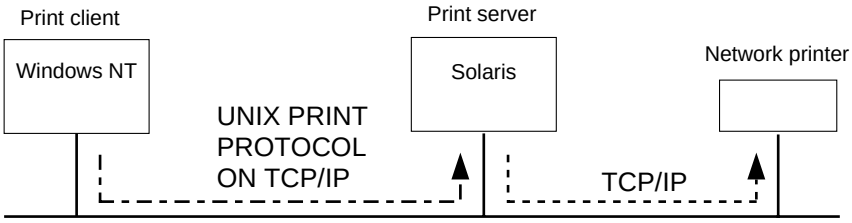

FIGURE 4-1 TCP/IP-Based Printing

The default print service for UNIX is `lp` which is based on the Berkeley Software Distribution (BSD) and uses TCP/IP.

4.2.2.1 Windows NT

In order for a Windows NT system to use TCP/IP for printing, the following steps should be taken:

1. Enable TCP/IP services on the Windows NT system. The Windows NT Resource Kit can be used to accomplish this task.
2. In the Sun Ray server's local `/etc/hosts` file, provide the hostname and IP address of the Windows NT system.
3. Configure the printer of the respective system depending on whether the Sun Ray server is the print server or the Windows NT system is the print server.

The Sun Ray server can now print to the TCP/IP based printer from a Windows NT print server and the Windows NT server can print to a Solaris print server.

4.2.2.2 Macintosh

For a Macintosh client to participate in this printing scenario, it must have AppleShareIP installed. AppleShareIP enables the Macintosh client to "speak" `lp`.

4.2.3 SMB Printing

FIGURE 4-2 shows a diagram of a SMB-based printing network.

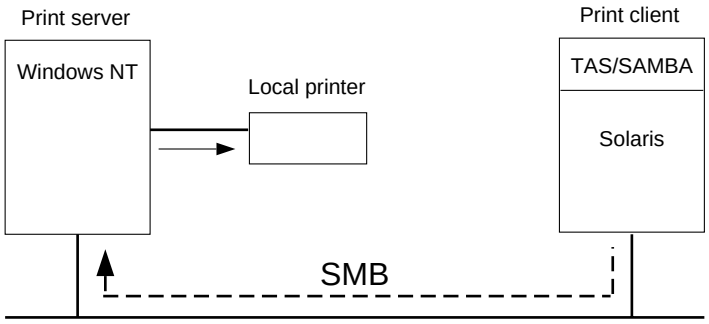

FIGURE 4-2 SMB Based Printing

4.2.3.1 Windows NT

The default print service for Windows NT uses SMB. In order for printing between the Sun Ray server and Windows NT system to be accomplished via SMB, the following steps should be taken:

1. Enable the Windows NT server's TCP/IP services.
2. Install and configure Samba or TAS.
3. Use Admintool on the Sun Ray server to configure it to use the Windows NT server's printer.

Note – An alternative is to use TAS to configure the Sun Ray server to be an SMB print server. In this case, configure the Windows NT machine to use the Sun Ray server's printer.

4.2.3.2 Macintosh

For a Macintosh client to participate in this printing scenario, it must have either TAS or AppleShareIP installed and configured. Either software enables SMB printing.

4.3 From a Sun Ray Enterprise Appliance Using Application Serving

4.3.1 Microsoft Windows Based Applications

Considering that either the Windows NT server or the Sun Ray server can be the print server, it may not matter which application is being served. From the Sun Ray server perspective, the Sun Ray appliance user is accessing Microsoft Windows based applications. Configure the Windows NT application server to print to a TCP/IP based or SMB based printer on the public network, near the user's location. This can be the same printer that local applications would use from the Sun Ray server.

4.3.1.1 SCO Tarantella

SCO's Tarantella has a feature called 'Follow Me Printing' which allows the Tarantella user to print from the browser's configured printer rather than the application server's configured printer. The advantage of this feature is that printing occurs locally regardless of where the user is physically located. Tarantella provides printing services for Windows NT, UNIX, or Legacy 3270 environments.

4.3.2 Macintosh Applications

If the Sun Ray user is accessing Macintosh applications, the AppleShareIP product is used to communicate with the printers the Windows NT server sees. This means that the Macintosh can print using any printer the Windows NT system is configured to use. To put it simply, the Macintosh uses AppleShare to send the print job to an Windows NT server which uses PC NetLink, TCP/IP, or SMB based printing.

4.3.2.1 AppleShareIP

AppleShareIP enables Macintosh clients to print to network printers whether the printers are served by an Windows NT system (SMB printing) or a Solaris system (`lp`).

CHAPTER 5

Authentication

This chapter discusses how authentication is implemented in a heterogeneous environment. Authentication is the process of validating a user.

Different operating environments use different methods of authentication. Authentication in a Sun Ray environment uses UNIX methods such as NIS, NIS+, or `passwd`. Windows NT systems depend on a user's Security Account Manager/Security Identifier (SAM/SID) for authentication.

5.1 PC NetLink

By using the PC NetLink server command `passwd2sam`, an administrator can transfer Sun Ray user accounts to Windows NT user accounts. After which, the Sun Ray user may login to their Sun Ray enterprise appliance or the Windows NT system using the same user name. Login to Windows NT is accomplished by whichever method is provided for connecting to the Windows NT domain, such as Citrix MetaFrame or SCO Tarantella. The password will have to be assigned by the user upon first access.

The opposite affect is obtained by using the PC NetLink server command `sam2passwd` to transfer Windows NT user accounts to Sun Ray user accounts. Again, the password must be assigned by the user upon the first access.

In Windows NT, the domain controller authenticates the user and acts as a naming service to return authorization data. Therefore, by using PC NetLink software on a Sun Ray enterprise server configured as a Primary Domain Controller (PDC) or Backup Domain Controller (BDC), the server can provide naming service, authentication, and directory services and file access through SMB. The PC NetLink software invokes the Windows NT Lan Manager (NTLM) protocol to access a SAM or SID database for which PC NetLink administers authentication.

Note – This solution does not provide for single sign-on. By default, neither the Solaris Operating Environment or Windows NT coordinates password encryption with the other.

When the PC NetLink software is configured on a Sun Ray server, the Windows NT systems can access resources on the Sun Ray server as though they were in an Windows NT domain. For example, printers, files, directories, etc.

Note – PC NetLink does not emulate the Windows NT environment, just the network services.

PC NetLink also provides features such as NetBIOS, WINS, Network Browser, and is Service Pack-compliant.

For more information regarding Windows NT and Solaris authentication methods, refer to the PC NetLink online documentation at the following URL:

```
http://docs.sun.com:80/ab2/coll.558.1/
```

The use of smart cards in the Sun Ray environment does not affect the necessity of using the PC NetLink server to transfer accounts between the Solaris and Windows NT environments.

CHAPTER 6

Example of a Heterogeneous Network

This chapter provides an example of Sun Ray enterprise server interoperability with the heterogeneous environment.

Topics covered in this chapter are:

- Example
- How the Example Works

6.1 Example

The example demonstrates a simple situation in which a Windows NT server provides application services to a Sun Ray server. This interaction is a subset of the entire network, but for simplification, only the two servers are discussed.

FIGURE 6-1 shows a diagram of the example.

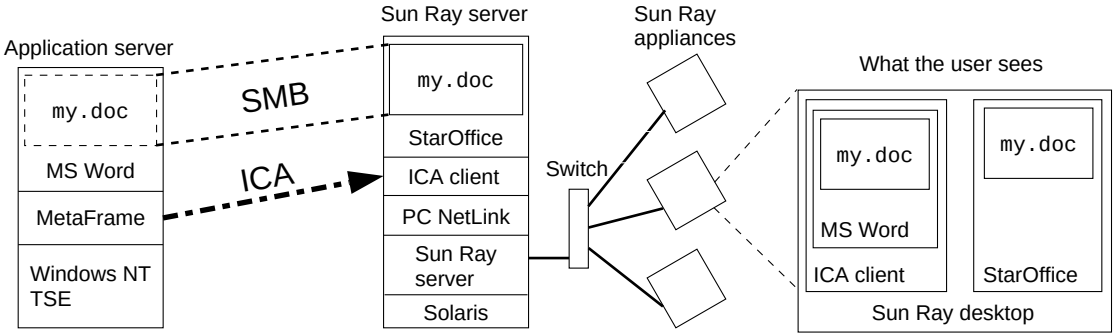

FIGURE 6-1 Example

There are four major hardware/software components of this example:

- Sun Ray Server — The Sun Ray server is a Sun™ Enterprise 250, configured with Solaris 7 Operating Environment. Though this server is part of a failover group, only one server needs to be discussed for the example.
- Windows NT Application Server — This platform is configured with a Pentium II processor, running Windows NT Terminal Server Edition (TSE)
- Citrix MetaFrame — The server side software component, MetaFrame, resides on the Windows NT application server. The client side software component, ICA Client, resides on the Sun Ray server.
- PC NetLink — The PC NetLink software is installed on the Sun Ray server and configured to use SMB.

6.2 How the Example Works

1. The hardware and software are configured.
2. A user logs in to their desktop Sun Ray enterprise appliance.
3. The user invokes the ICA Client. Because this is a Java applet, the client can be started from either a Java-enabled browser, or from the command line.
4. The ICA Client connects to the MetaFrame server on the TSE application server.
5. The user launches Microsoft Word.
6. From Microsoft Word, the user opens a document stored in a shared/mounted Solaris directory. Alternatively, the user can view the document directly using StarOffice.

7. To get feedback from a co-worker, the user removes their smart card, goes to the co-workers office, inserts their smart card into the appliance there, and using the Hot Desking feature, continues with the assistance of the co-worker.

APPENDIX **A**

Software Vendor Information

This chapter details how to contact the software vendors.

A.1 Sun PC NetLink

PC NetLink is made by Sun Microsystems. Contact Sun for licensing and purchasing information:

TABLE 6-1 Sun Microsystems Contact Information

Contact Method	Contact Information
Mail	Sun Microsystems, Inc., 901 San Antonio Road, Palo Alto, CA 94303
Telephone	SunStore 1-800-SUN-0404, or 1-800-555-9SUN
Internet	`http://www.sun.com/interoperability/netlink` `http://www.sun.com/sales-n-service/WWSales.html`

A.2 Citrix MetaFrame

MetaFrame and ICA Client are made by Citrix Systems. Contact Citrix for licensing and purchasing information:

TABLE 6-2 Citrix Contact Information

Contact Method	Contact Information
Mail	Citrix Systems, Inc., 6400 NW 6th Way, Fort Lauderdale, FL 33309
Telephone	1-800-437-7503 or 1-954-267-3000
Internet	`http://www.citrix.com/products/metaframe/unix/default.htm` `http://www.citrix.com/contact.htm`

A.3 SCO Tarantella

Tarantella is made by Santa Cruz Operations. Contact SCO for licensing and purchasing information:

TABLE 6-3 SCO Contact Information

Contact Method	Contact Information
Mail	Santa Cruz Operations, 425 Encinal Street, Santa Cruz, CA 95060
Telephone	1-800-SCO-UNIX or 1-831-425-7222
Internet	`http://tarantella.sco.com/` `http://www.sco.com/about/offices.html`

A.4 HOB HOBLink

The HOBLink suite of products is made by HOB Electronic. Contact HOB for licensing and purchasing information:

TABLE 6-4 HOB Contact Information

Contact Method	Contact Information
Mail	HOB Electronic GmbH & Co.Kb, Brandstaetter Strasse 2-10, 90513 Zirndorf, Germany
Telephone	Marketing: 49 - (0)911/96 66-393 or Support: 49 - (0)0911/96 66-299
Email	`marketing@hob.de` or `support@hob.de`
Internet	`http://www.hob.de/www_us/produkte/connect/jwt.htm` `http://www.hob.de/www_us/portrait/adress.htm`

A.5 GraphOn Bridges for Windows

The Bridges suite of products is made by GraphOn. Contact GraphOn for licensing and purchasing information:

TABLE 6-5 GraphOn Contact Information

Contact Method	Contact Information
Mail	GraphOn Corporation 400 Cochrane Circle Morgan Hill, CA 95037
Telephone	1-800-GraphOn or 1-408-776-3232
Email	`sales@graphon.com` or `support@graphon.com`
Internet	`http://www.graphon.com/Products/bridges_specsheet.html` `http://www.graphon.com/Company/contactus.html`

A.6 Samba

Samba is a freeware product. For information about Samba, refer to the following web sites:

- `http://www.samba.org`
- `http://us1.samba.org/samba/support/`

A.7 Syntax TAS

The TotalNet Advanced Server (TAS) is made by Syntax. Contact Syntax for licensing and purchasing information:

TABLE 6-6 Syntax Contact Information

Contact Method	Contact Information
Mail	Syntax, Inc., 840 South 333rd Street, Federal Way, WA 98003
Telephone	1-877-4SYNTAX or 1-253-838-2626
Email	`sales@syntax.com` or `support@syntax.com`
Internet	`http://www.syntax.com/totalnet/totalnet54.htm` `http://www.syntax.com/partners/howtobuy.html`

A.8 OD Sharity

Sharity is made by Objective Development. Contact OD for licensing and purchasing information:

TABLE 6-7 OD Contact Information

Contact Method	Contact Information
Mail	Objective Development, Porschestrasse 13-15/10/1, A-1230 Wien, Austria
Telephone	43-1-60936506
Email	`sharity@obdev.at`
Internet	`http://www.obdev.at/Products/Sharity.html` `http://www.obdev.at/Contact/index.html`

A.9 Apple AppleshareIP

The AppleShareIP software is made by Apple Computer. Contact Apple for licensing and purchasing information:

TABLE 6-8 Apple Contact Information

Contact Method	Contact Information
Mail	Apple Computer, Inc., 1 Infinite Loop, Cupertino, CA 95014
Telephone	1-800-538-9696 or 1-800-MY-APPLE or 1-408-996-1010
Internet	`http://www.apple.com/appleshareip/` `http://www.apple.com/appleshareip/text/purchasing.html`

A.10 OCS OC:/ /WebConnect Pro

OC:/ /WebConnect Pro is made by Open Connect Systems. Contact OCS for licensing and purchasing information:

TABLE 6-9 OCS Contact Information

Contact Method	Contact Information
Mail	Open Connect Systems, Inc., 2711 LBJ Freeway, Dallas, TX 75234
Telephone	1-972-484-5200
Email	`sales_info@openconnect.com`
Internet	`http://www.oc.com/technologies/webconnect/webconnect.cfm` `http://www.oc.com/sales/index.cfm`

A.11 IBM Host On-Demand

Host On-Demand is made by International Business Machines. Contact IBM for licensing and purchasing information:

TABLE 6-10 IBM Contact Information

Contact Method	Contact Information
Mail	International Business Machines Corporation, New Orchard Road, Armonk, NY 10540
Telephone	1-800-IBM4YOU or 1-770-863-1234 or 1-914-499-1900
Internet	`http://www.networking.ibm.com/con5/soft1.htm` `http://commerce.www.ibm.com`

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Sun Microsystems, Inc.
901 San Antonio Road
Palo Alto, CA 94303-4900 USA
650 960-1300 Fax 650 969-9131

For U.S. sales office locations, call: 800 821-4643

In other countries, call:

Corporate headquarters:	650 960-1300
Intercontinental sales:	650 688-9000