Configuring Compaq Servers in a Citrix WinFrame Environment

Compaq Computer Corporation

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Configuring Compaq Servers in a Citrix WinFrame Environment

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Introduction

This White Paper is intended for Compaq Field Systems Engineers (FSEs), Resellers, and customers who install and maintain Citrix WinFrame application servers on Compaq systems. The white paper provides guidelines and configuration information to help you optimally configure a Compaq server in a Citrix WinFrame application server environment.

Solutions focusing on Network centric computing and simplified management of application software are of rising importance in information system environments. Citrix, and other vendors with similar products that are based on the Intelligent Console Architecture (ICA) protocol, provide a way to implement these solutions in a multi-user Windows NT environment. Potential uses for ICA-based products include providing Windows access to remote and branch offices, consolidated control of Windows applications in a workgroup, and remote dial-in to a Windows environment. Supplying multi-user Windows access from a single platform provides an easy to manage solution to help lower customer total cost of ownership.

Other products, not included in the test, based on licenses from Citrix include the following:

- Tektronix WinDD
- Network Computing Devices, Inc. WinCenter PRO
- Insignia Solutions, Inc. NTrigue

Although all Compaq servers have been evaluated and tested with Citrix WinFrame 1.6, this paper focuses on the configurations, performance, and scalability test conducted on Compaq ProLiant 5000 and Compaq ProLiant 4500 servers.

This paper focuses on:

- Configuring of the Citrix WinFrame application server, which includes:
  - Performance characteristics
  - Test procedures
  - Server performance testing and response time
- Installing the Compaq Support Software for Microsoft Windows NT 3.51 on a Citrix WinFrame application server, which includes support for:
  - Hardware Abstraction Layer (HAL) Multiprocessor
  - SMART-2 Drive Array
  - Compaq Array Configuration Utility for Windows NT
  - SCSI Controller
  - Network Controller
  - ProLiant Storage System
  - Systems Management
  - Uninterruptible Power Supply

Summary of Results

Evaluations of WinFrame/Enterprise 1.6 verified that network traffic is minimal and is an effective solution for bandwidth constrained environments. Varying numbers of clients can be supported on different Compaq server models depending on the number of processors, speed of processors, and memory. These range from 8 - 20 users for a ProSignia 300, to 100 - 200 users for a Proliant 5000. Additional users are possible depending on their level of use of the system and the response time desired. Tests conducted on remote dial-in clients demonstrated similar results to individual LAN clients.

The ICA general purpose presentation services protocol provided great performance for network and remote application support with minimal resources required on a client unit.

The actual performance that end users will experience will vary based on the following hardware configurations:

- Server - number of processors installed, processor speed, amount of memory, and disk configuration
- Client - processor speed and graphics controller installed
- Network - available network bandwidth and network speed

ICA 3.0 LAN clients support various industry standard network protocols such as IPX, SPX, TCP/IP, NETBUEI, and NETBIOS. Remote dial-up connections are established using the standard PPP framing protocol.

Test Methodology

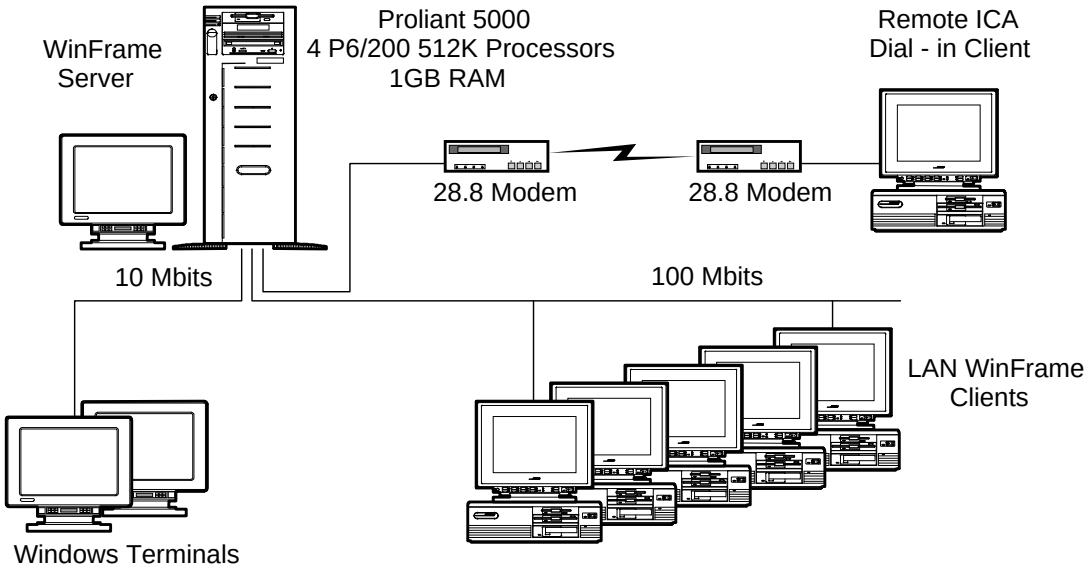

Figure 1. Example of a Citrix WinFrame environment

The goal of the tests performed were to understand the performance characteristics and implications associated with configuring a Citrix WinFrame multi-user Windows application server.

Microsoft Test was utilized to simulate ***Light*** and ***Heavy*** user interaction with the Citrix WinFrame server. The Microsoft Office 95 suite of applications were used in the scripts developed for the test.

As the test was conducted, the completion time was gathered from each client and an average completion time was compiled and recorded. The tests were conducted as Citrix WinFrame clients connected to various configurations of ProLiant 5000 and ProLiant 4500 Citrix WinFrame 1.6 servers.

Citrix WinFrame was tested in various types of connections including direct LAN connections, direct Intelligent Console Architecture (ICA) dial-in, and Remote Access Services (RAS) dial-up connections. The scenarios tested used configurations consisting of either TCP/IP, NetBUEI, or IPX/SPX network protocols. The servers utilized were configured as follows:

- ProLiant 5000
  - 1-4 200-MHz Pentium Pro processors with 512 Kbytes cache per processor
  - 256 megabytes - 1 gigabyte memory
  - 1 SMART-2/P SCSI Array Controller
  - 1 Netilligent 10/100 TX PCI Controller
  - 2 ProLiant Storage Systems with 2 gigabyte Wide SCSI Drives (RAID 0)
- ProLiant 4500
  - 1-4 166-MHz Pentium processors with 512 Kbytes cache per processor
  - 256 megabytes - 1 gigabyte memory
  - 1 SMART-2/E SCSI Array Controller
  - 1 NetFlex-3 Network Interface Controller with 10/100Base-TX UTP Module
  - 2 ProLiant Storage Systems with 2 gigabyte Wide SCSI Drives (RAID 0)
- Workstations consisted of various 486 and Pentium-based units running:
  - Windows 95
  - TCP/IP, NetBUEI, and IPX/SPX network protocols
  - RAS connections using 28.8Kbs modems
  - TCP/IP over PPP network protocol

Direct ICA dial-in connections also used 28.8Kbs modems. Wyse Winterm 2500T terminals were tested via direct LAN connections and direct ICA dial-in configurations.

Testing consisted of single and multiple WinFrame client sessions per workstation, all test scenarios were run with a variation of 1-200 simultaneous users.

LAN configuration consisted of 10/100 TX switches with clients running a combination of 10Mb/s and 100Mb/s. The network was a standalone configuration with no other network traffic generated. The 10M/bs network provided ample network bandwidth for the test conducted and did not require 100Mb/s technology to be implemented.

See the appendix for details on the workstation configurations.

NOTE: Test results shown in this white paper demonstrate ***Heavy*** user interaction and give a worst case perspective.

Server Comparison

The following criteria was used for defining ***Light*** and ***Heavy*** users:

- ***Light*** - a user that passively uses the network and saves a file about once every ten minutes with a typical file size of 100 Kbytes.
- ***Heavy***- a user that actively uses the network and saves a file about once a minute with a typical file size of 1 megabyte.

Figure 2 gives an overview of the number of ***Heavy*** users supported per server type.

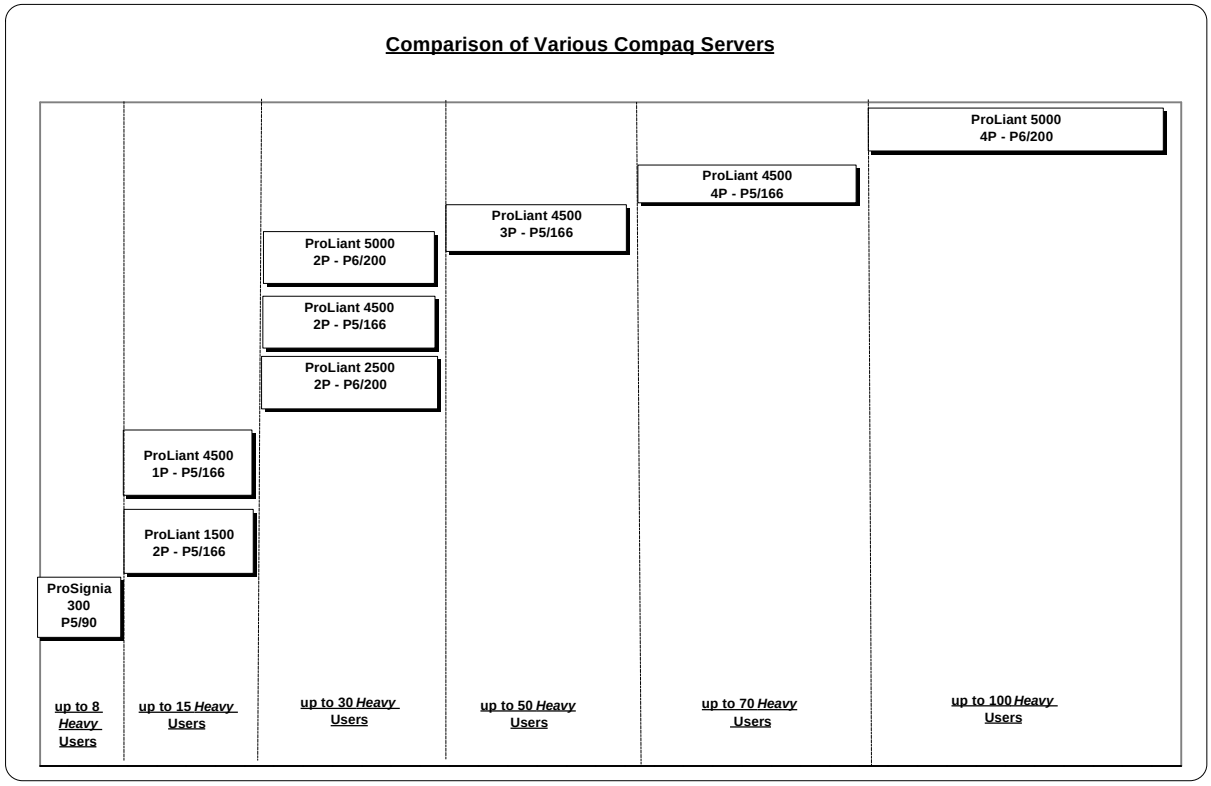

Figure 2. Compaq server scalability with simulated ***Heavy*** users

Figure 3 gives an overview of the number of *Light* users supported per server type.

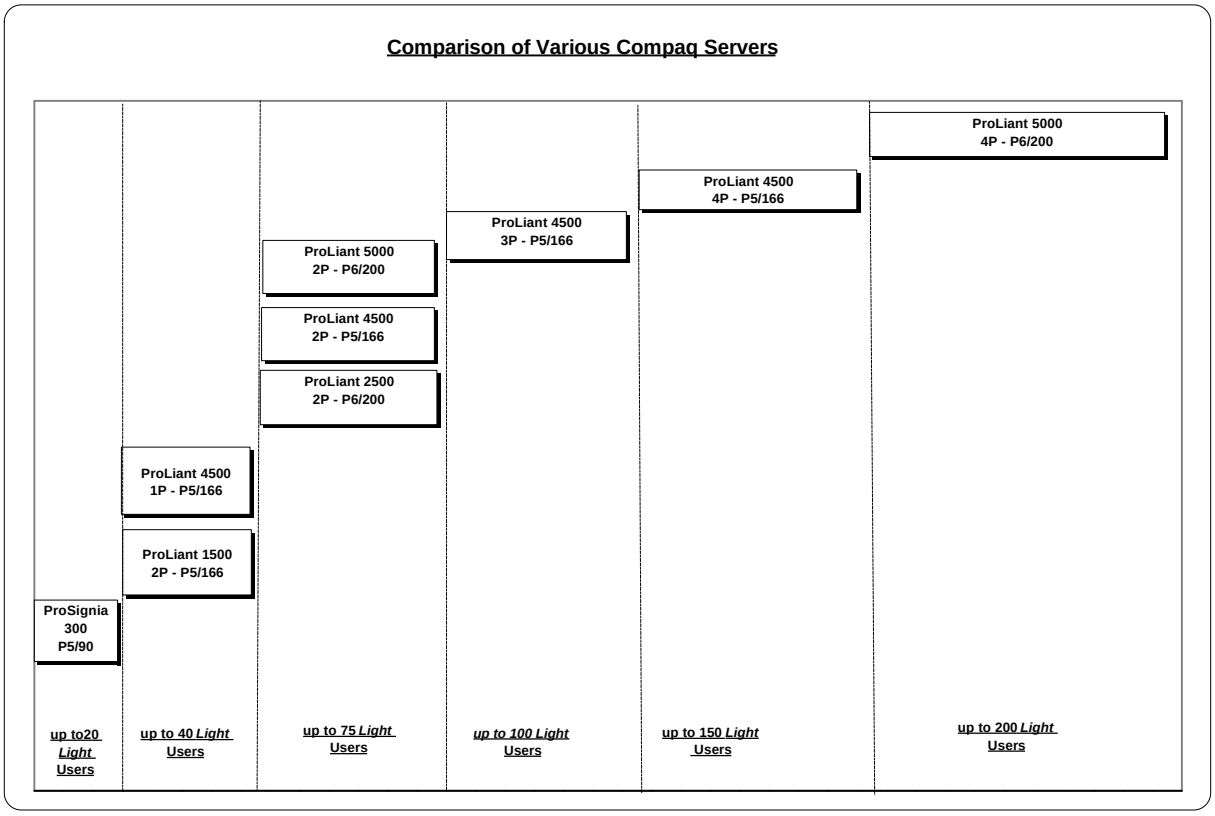

Figure 3. Compaq server scalability with simulated *Light* users

ProLiant 5000 Stress Runs

The four components that affects performance the most are:

- Processor speed
- Number of processors
- Processor cache
- Amount of memory installed in the WinFrame server

Memory configuration of the server should be carefully considered:

- approximately 5 megabytes of memory per light-medium user
- approximately 8 megabytes per heavy user

These amounts are suggested memory configurations. You should use the WinFrame Performance Monitor to monitor the memory usage and processor performance for the best configuration for a particular environment.

Performance of the server is also effected by running 16-Bit applications instead of 32-Bit applications. 16-Bit applications consume system resources and reduces the number of users a processor supports by approximately 20% and requires approximately 25% more memory per user.

Completion Time of 1 - 8 Simultaneous Heavy Users

Figure 4 gives the completion times of 1-8 simultaneous users running a Microsoft Test script developed to simulate a ***Heavy*** user interaction. This figure shows that 8 WinFrame clients running simultaneously, completed the script in 115 seconds, outperforming stand alone Pentium 75 MHz unit that completed the same test script in 120 seconds.

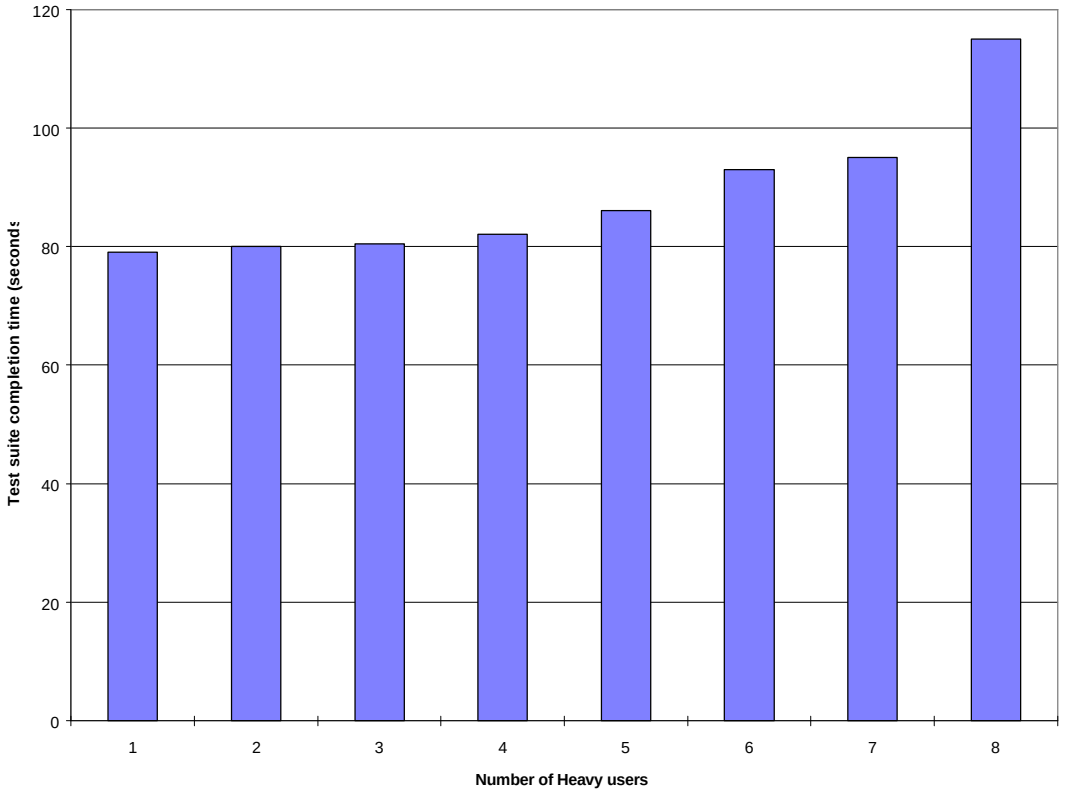

Figure 4. ProLiant 5000, 4 P6/200 with 512K cache and 1GB memory

Completion Time of 8 - 60 Simultaneous Heavy Users

Figure 5 gives the completion times of 8-60 simultaneous users running a Microsoft test script developed to simulate a ***Heavy*** user interaction. Completion time of 30 simultaneous ***Heavy*** users tested is comparable to a 486 unit running the test script as a stand alone unit which completed the test in approximately 400 seconds.

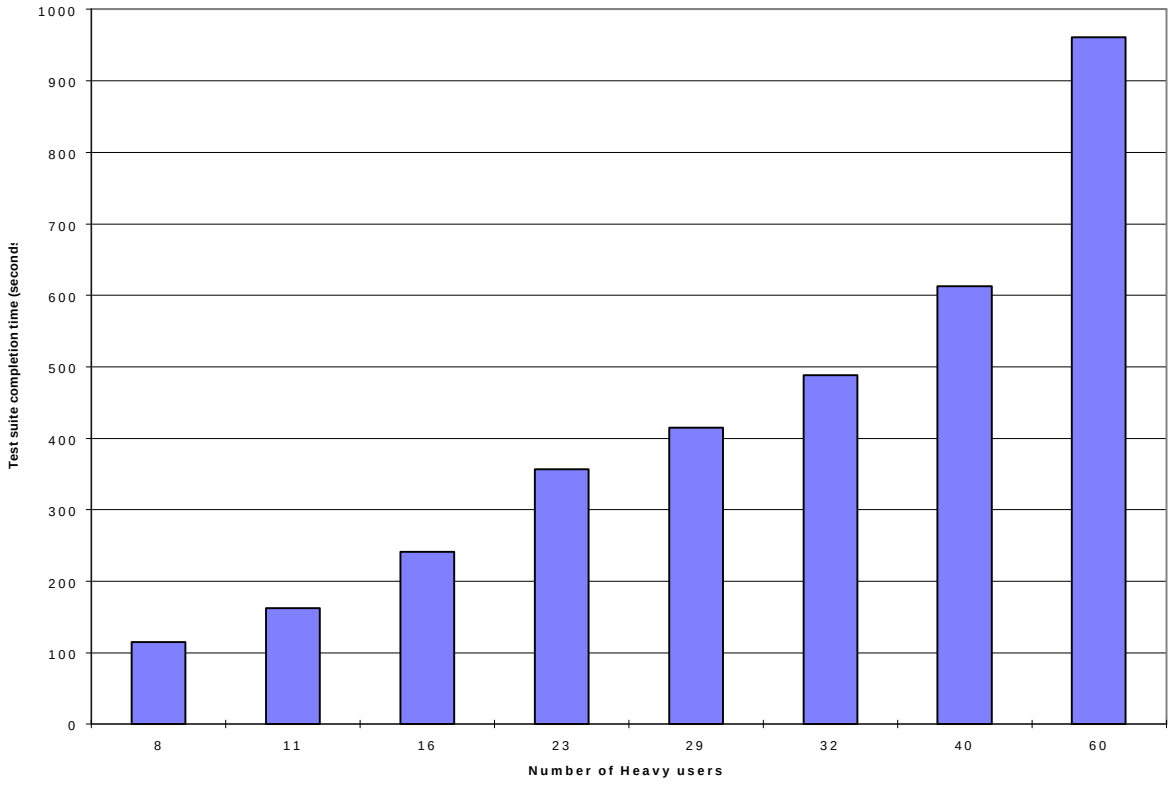

Figure 5. ProLiant 5000, 4 P6/200 with 512K cache and 1GB memory

ProLiant 4500 Stress Runs

Figure 6 demonstrates the effect of adding additional processors to the server and how it influences the overall performance of the clients. By adding additional processors to the WinFrame application server, completion time of the test conducted significantly improved.

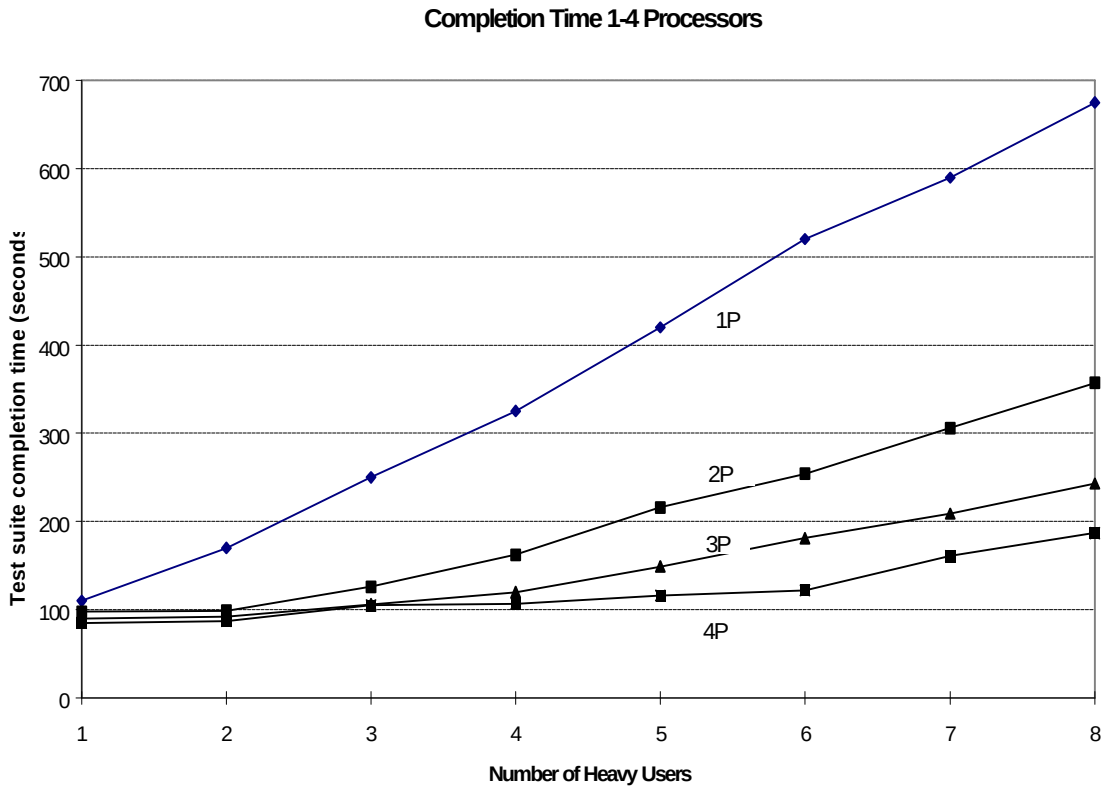

Figure 6. 1 - 4 processor ProLiant 4500

Remote User Connections

Remote user connections were tested running the same Microsoft Test scripts developed to run the stand alone and WinFrame client LAN configurations.

Three types of remote connections were tested:

- Windows 95 Dial-up Networking RAS connection using TCP/IP over PPP
- Direct ICA WinFrame client dial-in connection
- WinFrame client connection running Windows 95 Dial-up Networking RAS connection using TCP/IP over PPP

The connections were attached to 28.8Kbs modems, one at the WinFrame server and one at the client. Figure 7 shows the completion time for remote users.

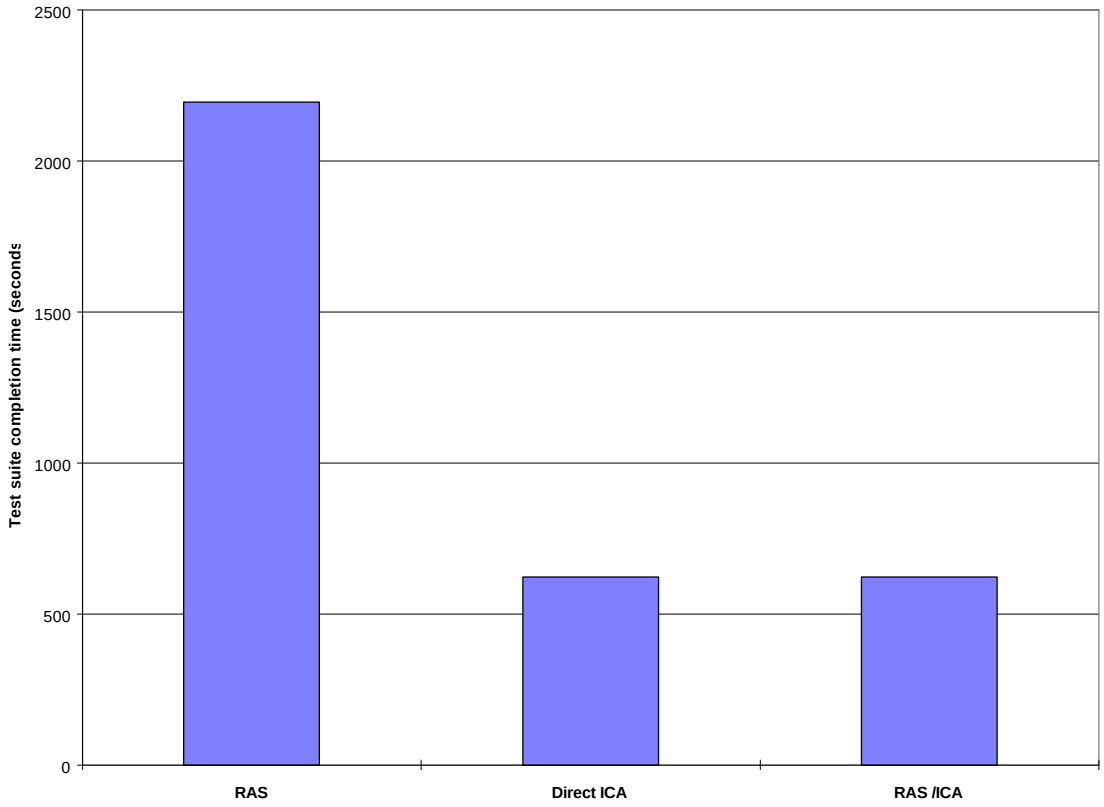

Figure 7. Remote user completion time

Compaq Support Software for Windows NT

Citrix WinFrame application server is based on Windows NT 3.51. The Compaq Software Support Diskette (SSD) for Windows NT 1.18 drivers functions and complement the features included with the Compaq server products in a Citrix WinFrame environment.

The first diskette contains the following drivers:

- Hardware Abstraction Layer (HAL)
- SCSI (32-Bit SCSI-2 Controllers and Drive Array Controllers)
- Network (NetFlex Family of Controllers)
- System Management

The second diskette contains the following drivers:

- Online and Standby Recovery Server
- Uninterruptible Power Supply (UPS)
- Remote Insight Management

In order to install the Compaq supplied drivers from the Compaq SSD on a server in a Citrix WinFrame environment, you must run the Citrix WinFrame *SETBUILD* command before running the *SETUP* command that is on the Compaq SSD.

The *SETBUILD* command sets the release build of WinFrame to be release number *1057*, this is the released version number of Windows NT 3.51. To run the *SETBUILD* command, type:

```
C:\ setbuild /ms
```

To get back to the WinFrame *OEM* build release number *179*, shutdown and restart the WinFrame server or type:

```
C:\ setbuild /oem
```

Hardware Abstraction Layer Multiprocessor Support

This section provides an overview of the Hardware Abstraction Layer (HAL) support for the Compaq ProLiant 5000 and Compaq ProLiant 4500. The HAL is a layer of software that interacts directly with the computer's hardware and is one of the modular components that make up the Windows NT operating system.

The HALs supplied by Microsoft included with Citrix WinFrame functions on the ProLiant 5000 and ProLiant 4500 servers and provides basic HAL functionality.

The HALs supplied by Compaq provide the same basic functionality as the WinFrame HALs and includes additional functionality to take advantage of the features built in to the ProLiant 5000 and ProLiant 4500.

Additional features of the HALs supplied by Compaq include:

- Performance Monitoring support.
- Compaq Insight Management Agents support that provide error logging features to the system management driver.
- Problem resolution with built in mechanisms for Compaq device drivers to dynamically call the HAL and intuitively determine which updates have been applied.
- Announcement of Compaq HAL during blue screen initialization.
- Printer support during blue screen crashes.
- Mechanism to control thread time slice.
- Mechanism to determine Compaq problem resolution.
- Bus mastering of Direct Memory Access (DMA) above 16-megabyte limit.
- Problem resolution for IOCheck during a Non-Maskable Interrupt (NMI).

- Problem resolution for a PCI map register limitation.
- Support for greater than 8 PCI Buses.

SMART-2 Drive Array Support

This section provides an outline of the device driver required to support the SCSI Managed Array Technology (SMART-2/P and SMART-2/E) Controller. The Compaq SSD for Windows NT 1.18 or later is required to support the SMART-2 Array Controller on the ProLiant 5000 and ProLiant 4500.

The SMART-2 Controller provides improved performance over other array controllers in many environments and capacity expansion. The SMART-2 Controller is a dual channel 32-Bit Fast-Wide SCSI-2 array controller. It provides you with an online expansion option of adding more disk drive space to an existing logical drive configuration, which results in more fault tolerant storage capacity.

The device driver, *CPQARRAY.SYS,* is included on the Compaq SSD. This driver has the latest device information and enhancements required to support the SMART-2 Controller on the ProLiant 5000 and ProLiant 4500 including:

- Compaq SMART Controller Family
  - SMART Array Controller
  - SMART-2 Array Controller

    SMART-2/E Array Controller

    SMART-2/P Array Controller

Compaq Array Configuration Utility

When installing or configuring any SMART-2 Array Controllers in your system, use the Compaq Array Configuration utility to configure these controllers. The Array Configuration utility is a graphical-based application that helps you configure the SMART-2 Array Controller.

The Array Configuration utility gives you the ability to do online capacity expansion that allows you to change an existing data storage configuration even in a fault tolerant configuration without requiring a data tape backup and restore cycle. If using hot-pluggable drives, storage expansion can be performed online without shutting down the server.

The Array Configuration utility provides the following configuration benefits:

- Illustrates the controller configuration in an easy-to-understand graphical format
- Provides descriptions of various configuration errors
- Contains configuration wizards that walk you through the configuration process
- Suggests optimal configuration and fault tolerance for controllers that are not configured

SCSI Controller Support

The ProLiant 5000 and ProLiant 4500 have an Integrated 32-Bit Fast-Wide SCSI-2 Controller that requires the *CPQ32FS2.SYS* device driver from the Compaq SSD in order to obtain full feature support.

The *CPQ32FS2.SYS* device driver features include:

- Enhanced performance
- Support for Compaq Insight Management Agents
- Support for the ProLiant Storage System

Network Controller Support

The network device drivers, which support the NetFlex Family of Network Controllers, are included in the Compaq SSD. The Compaq drivers conform to Microsoft NDIS 3.0 miniport architecture.

The following sections compare and contrast the component support included with the Microsoft base product to the Compaq enhanced driver.

Microsoft Network Controller Drivers

The Citrix WinFrame base product provides driver support for most Compaq network controllers. However, the base product does not include all the latest enhancements that take advantage of the features built into the Compaq hardware.

Compaq Network Controller Drivers

This section discusses the Compaq network controller device drivers and the support available with these drivers.

- *NETFLX3.SYS* device driver is NDIS 3.0 miniport compliant. The *NETFLX3.SYS* device driver supports the industry standard Ethernet topologies and the newer 100 Mb/s, 100Base-TX, and 100VG-AnyLAN technologies.

  This driver includes performance tuning algorithms that dynamically adjust settings on the adapter to optimize throughput and utilization. The *NETFLX3.SYS* device driver can support as many controllers as there are bus master slots in a server.

- The NetFlex-3 driver for Windows NT supports the following controllers:

  - Compaq NetFlex-3/P Controller
  - Compaq NetFlex-3/E Controller

The NetFlex-3 driver currently supports these controllers when configured with one of the following modules:

- 10Base-T UTP/BNC Module
- 100VG-AnyLAN UTP Module
- 10/100Base-TX UTP Module

The NetFlex-3 driver also supports the following non-modular controllers:

- Compaq Netelligent 10/100TX PCI UTP Controller
- Compaq Netelligent 10T PCI UTP Controller

Benefits of using network device drivers developed by Compaq include:

- Support for full-duplex operation in 10Base-T and 100Base-TX environments. Full-duplex allows simultaneous two-way transmission between nodes while eliminating collisions. The performance transmission and efficiency are increased by doubling the bandwidth of 10Base-T cabling to 20 megabits/second (Mb/s).
- NetFlex Advanced Registry Parameters that support Citrix WinFrame configuration are added to the WinFrame Registry with default values. These parameters should not be changed. However, you can modify optional parameters, if needed. A complete list of the parameters and a description for each is included in the*NTREADME.HLP* file on the Compaq SSD for Windows NT.

CAUTION: Compaq cautions you to modify Registry Parameters at your own risk. Using the Registry Editor incorrectly might cause serious, system-wide problems. This includes registry corruption that might cause you to have to install Citrix WinFrame again.

- Support for Compaq Insight Management Agents.
- Support of additional Performance Monitor counters with the *NETFLX3.SYS* device driver. A Performance Monitor utility developed by Compaq installs or removes counters that support the Compaq NetFlex-3 Performance Monitor DLL. This utility allows you to visually measure performance when you select the Citrix WinFrame Performance Monitor utility, *PERFMON.EXE*. The counters you select provide detailed information about transmit and receive operations for the Compaq NetFlex-3 Controller. These counters are helpful in understanding the performance characteristics for a particular NetFlex-3 Controller and can help pinpoint potential network performance bottlenecks.

Compaq Advanced Network Control Utility

The Compaq Advanced Network Control utility uses a Graphical User Interface (GUI) that allows you to install, configure, update, and monitor the status of all Compaq network controllers containing the TLAN chip set. The utility features include:

- Setting up a pair of controllers for duplexing as well as stand-alone network controllers.
- Graphically monitoring status and configure stand-alone and redundant network controllers.
- Resetting the network controllers and switch active controllers instantaneously in a controller pair.
- Changing the controller pair operating mode and primary controller settings instantaneously.

The Compaq Advanced Network Control utility uses the *NETFLX3.EXE* file to configure network controllers for redundancy or stand-alone configurations. Also, you can use the *NETFLX3.EXE* file to view controller status or network statistics.

ProLiant Storage System Support

Compaq provides a device driver,*PRLNTSS.SYS*, that supports the ProLiant Storage System when it is attached to the integrated 32-Bit SCSI-2 Controller or additional Compaq 32-Bit SCSI-2 Controllers installed in the ProLiant 5000 or ProLiant 4500.

The Citrix WinFrame base product does not include support for the ProLiant Storage System. The driver must be installed from the Compaq SSD.

*PRLNTSS.SYS*device driver features include:

- Supports the Compaq Insight Management Agents
- Intelligent management of the online status indicator on ProLiant drive trays.
- Writes to the Citrix WinFrame Event Log for any ProLiant alarms such as fan failures, critical temperature conditions, side door open, and redundant power supply fault.
- Writes to the Citrix WinFrame Event Log to record critical condition and hot plug events.
- Allows external management of the drive tray indicators.

System Management Support

Compaq provides systems management support for Citrix WinFrame with *SYSMGMT.SYS,*which is the Systems Management device driver. This device driver supports Compaq Server Management (CSM) and Automatic Server Recovery (ASR). These systems management features are available on the ProLiant 5000 and ProLiant 4500 servers.

The *SYSMGMT.SYS*device driver features include:

- Logging of critical errors
- Automatic Server Recovery (ASR)
- Fan outage and temperature detect alarms

- Logging of corrected memory errors
- Notification of Redundant Power Supply status
- Checking of the Real Time Clock
- Bus Utilization Statistics

This device driver is required to support Compaq Insight Management Agents. The System Management device driver depends on the Compaq HAL for support. If the System Management driver is installed, the Compaq HAL is automatically installed at the same time. You need the Compaq SSD for Windows NT to install the device driver and the Compaq System Configuration utility to configure and enable the device driver.

Uninterruptible Power Supply Support

The Compaq Uninterruptible Power Supply (UPS) provides battery-backup power to your system when the local power fails. The Compaq UPS support software notifies you that the system is going to shut down due to a power failure. However, the Compaq UPS does require the Compaq UPS support software for full feature support.

When the Compaq UPS support driver,*CPQUPS.DLL*, is installed, it runs as a Windows NT Service. The support driver adds the following functionality:

- Provides an extra level of fault tolerance support for environments running critical applications.

  NOTE: The Compaq UPS support driver supplements the Microsoft UPS support, it is not a replacement.

- Ability to start and stop the UPS through the Services Control Panel application of Citrix WinFrame.
- Compaq Insight Manager and Insight Management Agents supports the Compaq UPS.
- Ability to tune related parameters using the Registry Editor.

Appendix

Table 1
Workstation Configuration

System	Processor	Graphics Controller	Memory	Test Time*
Deskpro 386s/16	P3 - 16	Compaq AVGA	12	1254
Deskpro 386s/16	P3 - 16	Qvision 1280/I	12	878
Deskpro 386/33	P3 - 33	Compaq SVGA	16	569
ProLinea 4/33	P4 - 33	Tseng labs ET4000/W32	16	172
Deskpro 486/50L	P4 - 50	Compaq AVGA	16	285
ProLinea 450	P4 - 50	Cirrus Logic 5429/30/34	24	273
ProLinea 4/100	P4 - 100	Tseng labs ET4000/W32	16	135
Wyse Winterm 2500T	P4 - 50	Cirrus Logic 5429	8	82
Deskpro 575	P5 - 75	QVMAXX	16	110
Deskpro 575	P5 - 75	Cirrus Logic 5429/30/34	16	100
Deskpro 590	P5 - 90	Qvision 1280/P	16	98
Deskpro 590	P5 - 90	Qvision 2000/2000+ (MGA)	16	139
Deskpro XL 590	P5 - 90	Qvision	16	99
ProLinea 590	P5 - 90	Cirrus Logic 5429/30/34	64	95

continued

Workstation Configuration *continued*

System	Processor	Graphics Controller	Memory	Test Time*
ProLinea 590	P5 - 90	Cirrus Logic 5429/30/34	16	91
ProLinea 5100	P5 - 100	Cirrus Logic 5429/30/34	16	85
ProLinea 5120	P5 - 120	Cirrus Logic 5429/30/34	16	82
Deskpro XL 5133	P5 - 133	Qvision	16	84
Deskpro 5150	P5 - 150	Cirrus Logic 5429/30/34	16	79

* Test suite completion time (seconds) running as individual WinFrame clients.