

NotesBench Disclosure Report
for
IBM Netfinity 5500 M10 (RAID-1)
with
Lotus Domino 4.62 for Windows NT 4.0
Results Certified November 13, 1998

IBM Corporation



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Edition Notice

Executive Summary

Performance measurements using NotesBench were conducted with the IBM Netfinity 5500 M10 (Model 8661-1RY) running Lotus Domino Server Release 4.62 on Microsoft Windows NT Server Version 4.0 with Service Pack 3. Results for the IBM Netfinity 5500 M10 are based on the NotesBench Mail-only workload run on a RAID-1 configuration. The results are summarized in the following table.

Test Script	Maximum Users	NotesMark (tpm)	Ave. Response Time (sec)	\$/User	\$/NotesMark
Mail-Only	3,400	5,064	0.669	\$11.78	\$7.91

The IBM Netfinity 5500 M10, configured with two 400MHz¹ Intel** Pentium** II Xeon** processors, 2GB of memory, and seven 4.51GB² 10K-rpm hard disk drives (configured alternately as a RAID-1 array), supported a Mail-only workload of 3,400 active mail users (see price/performance results³ above).

In addition to the IBM Netfinity 5500 M10 system under test (SUT), the benchmarked configuration used three destination servers, 15 client driver systems, and one controller system. All systems were connected to the SUT through one 100Mbps Ethernet LAN segments, using the TCP/IP network protocol. Configuration details are provided in Appendix A: Overall Test Setup and Software Versions.

IBM's Server Performance Laboratory in Research Triangle Park, NC, conducted the benchmark in October, and KMDS Technical Associates, Inc., audited the results in November 1998.

NotesBench provides an objective method for evaluating the performance of different platforms running Lotus Domino Server Release 4.6x. NotesBench generates a transactions-per-minute (tpm) throughput metric, called a NotesMark, for each test, along with a value for the maximum capacity (number of users) supported, and the average response time.

Benchmarking Objectives

The benchmark objective was to provide customers with information on the number of Lotus Domino Server Release 4.62 Mail-only users supported on a high-end RAID-1 configuration of the IBM Netfinity 5500 M10 Model 8661-1RY, which ships with one 400MHz Pentium II Xeon processor. Performance measurements on IBM Netfinity servers using NotesBench for the Domino Server Release 4.6x are ongoing.

Test Methodologies

Test Setup and Hardware/Software Configuration

The IBM Netfinity 5500 M10 system under test used two 400MHz Pentium II Xeon processors (512KB of L2 write-back cache); 2GB of memory, and seven 4.51GB 10K-rpm Wide Ultra SCSI hard disks configured with RAID-1. The integrated ServeRAID II Ultra SCSI PCI controller and the integrated 100/10Mbps Ethernet controller were enabled for this test.

The system under test, the destination servers, and the driver systems were connected to the SUT through one 100Mbps Ethernet LAN segment, using the TCP/IP network protocol. An IBM PC 300GL system was used as the source driver (parent) system; IBM PC 350 systems were used as the client drivers. Three IBM PC Server 330 systems were used as destination servers, across which the mail addresses were distributed.

The IBM Netfinity 5500 M10 system under test ran Microsoft Windows NT Server Version 4.0 and Domino Server Release 4.62. The Name and Address Book in all the clients contained person documents for 4,500 mail recipients who were randomly selected by each active Mail user. The server under test contained mail files for 3,400 Mail users. The public Name and Address Book contained 4,500 mail-recipient person documents and each of the three destination servers contained mail files for 1,500 recipients.

The following NOTES.INI parameters were modified as recommended in the NotesBench operator's manual:

Mail-Only Workload - RAID-1
LOG_MAILROUTING=10
MAILLOGTOEVENTSONLY=1
MAILUSEPROCESS=0
MAILUSETHREADS=1
MAILMAXTHREADS=3
SERVER_SHOW_PERFORMANCE=1

The following parameters were added to suppress database activity logging after long runs and to capture server console output:

```
NO_FORCE_ACTIVITY_LOGGING=1
DEBUG_OUTFILE=_\nbfstb2\lastrun\SUTINFO.log
```

All Domino server tasks were disabled except Replica, Router and Update.

All Domino data files were located on the D - partition. The Domino executables were placed on the C - partition

Test Procedures

The number of users simulated in child drivers 1 through 15 were, respectively: 270, 270, 270, 270, 270, 250, 250, 250, 250, 250, 250, 200, 150, 100 and 100. The number of child drivers used and the number of users simulated by each child driver are defined by the “NumClientsN” parameters in the parent’s NOTES.INI file. For each child driver, users’ start times were staggered. Numerically by child driver they were, respectively, 0,1, 1, 3, 3, 4, 4, 4, 5, 5, 6, 6, 8, 8 and 8 seconds, as defined in the “ThreadStagger” parameter for each child driver. The start time of each child driver was staggered to allow sufficient time for all users simulated by each child driver to be connected at the SUT and to allow the SUT to settle for at least 5 minutes before releasing the users from the next child drivers.

Our experience shows that ramp-up time increases non-linearly as a function of the number of users simulated by a child driver. This effect becomes even more pronounced as we approach the capacity of the server. Since the NotesBench audit rules do not put any restriction on ramp-up time, and we had a limited number of child drivers, the attempt to minimize ramp-up time was only carried far enough to ensure adequate benchmarking productivity. During the test runs, the tools used to determine steady state included Windows NT’s PERFMON, the Notes Server SHOW command, and the child driver RES files. To confirm steady state, we monitored the number of users, the number of transactions per minute, and pending mail at the SUT. We confirmed steady state when:

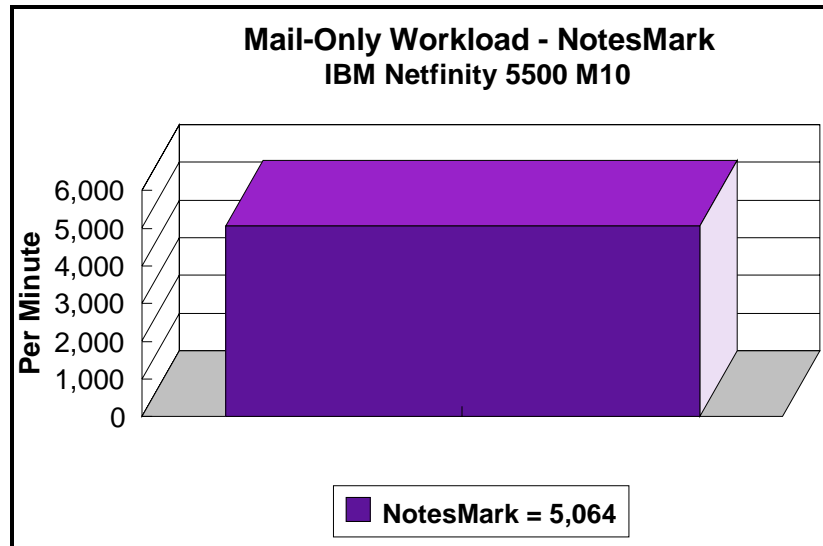
- The SUT Domino Server console sustained the peak user load
- Pending mail did not become backlogged, as verified by:
 - Inspection of the mail-routing log at the SUT after the test run ended
 - Server Mail statistics collected every thirty minutes throughout the test run.

To ensure that the test results were reproducible, the tests were repeated, and the results were compared and found to be consistent.

Data

IBM Netfinity 5500 M10 NotesMark Value for Mail-Only Test

The Mail workload was run for 13 hours, including ramp-up and steady state. The IBM Netfinity 5500 M10 system configured with RAID-1 demonstrated that it can support 3,400 concurrent active users. The NotesMark throughput value was 5,064. Average response time was .669 seconds.



The Mail workload executes Notes transactions that model a server for mail users at sites that rely only on mail for communication. The resulting capacity metric for a mail-only server is the maximum number of users that can be supported before the average user response time becomes unacceptable.

The mail-only test script models an active user who is reading and sending mail. The script contains an average of 15 minutes of waiting; thus, the average user would execute this script a maximum of four times each hour. For each iteration of the test script, there are 5 documents read, 2 documents updated, 2 documents deleted, 1 view scrolling operation, 1 database opened and closed, 1 view opened and closed, and some miscellaneous operations. In sending messages, each user sends a mail message to NumMessageRecipients no more frequently than every 90 minutes.

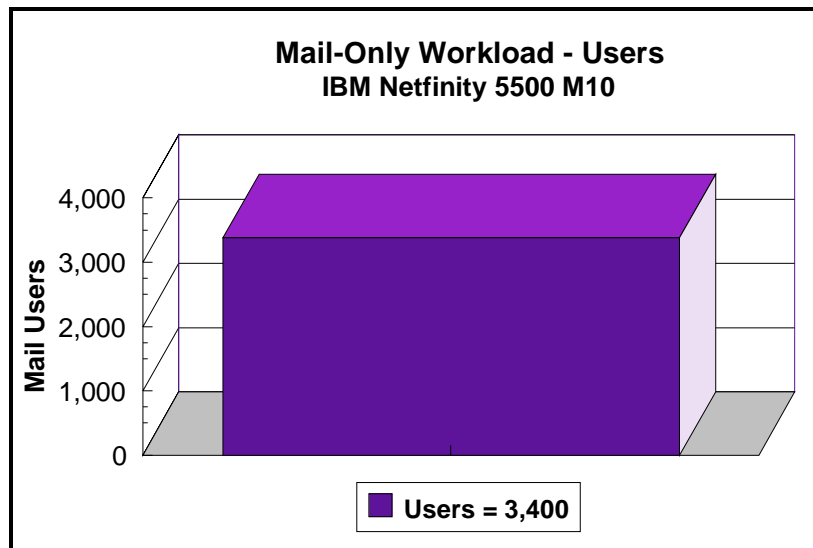
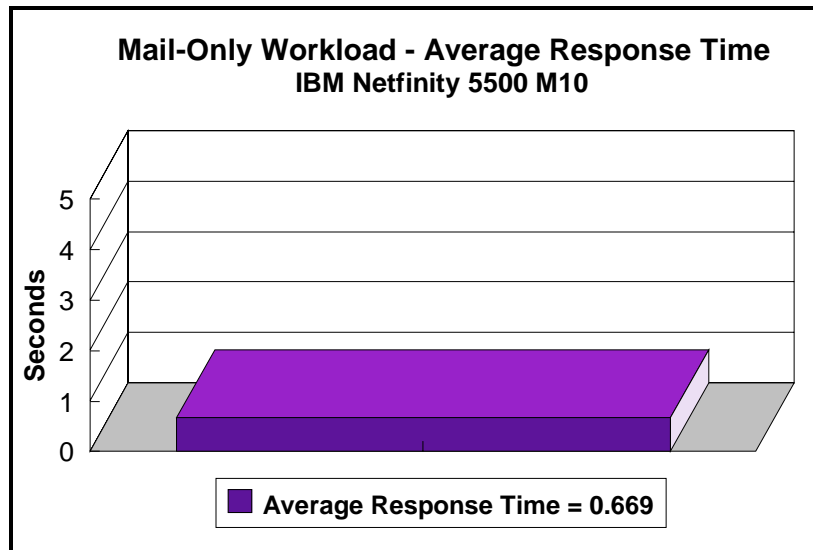
NotesNum Output for Mail-Only Test

Min Start Time = 11/03/98 09:06:55 AM Max Stop Time = 11/03/98 09:25:16 PM

Total Test Errors = 0

Total Test Time = 44340 sec

Test Run: Users = 3400 NotesMark = 5064 Response Time = 669 msec (11/03/98 02:13:00 PM to 11/03/98 09:05:00 PM)

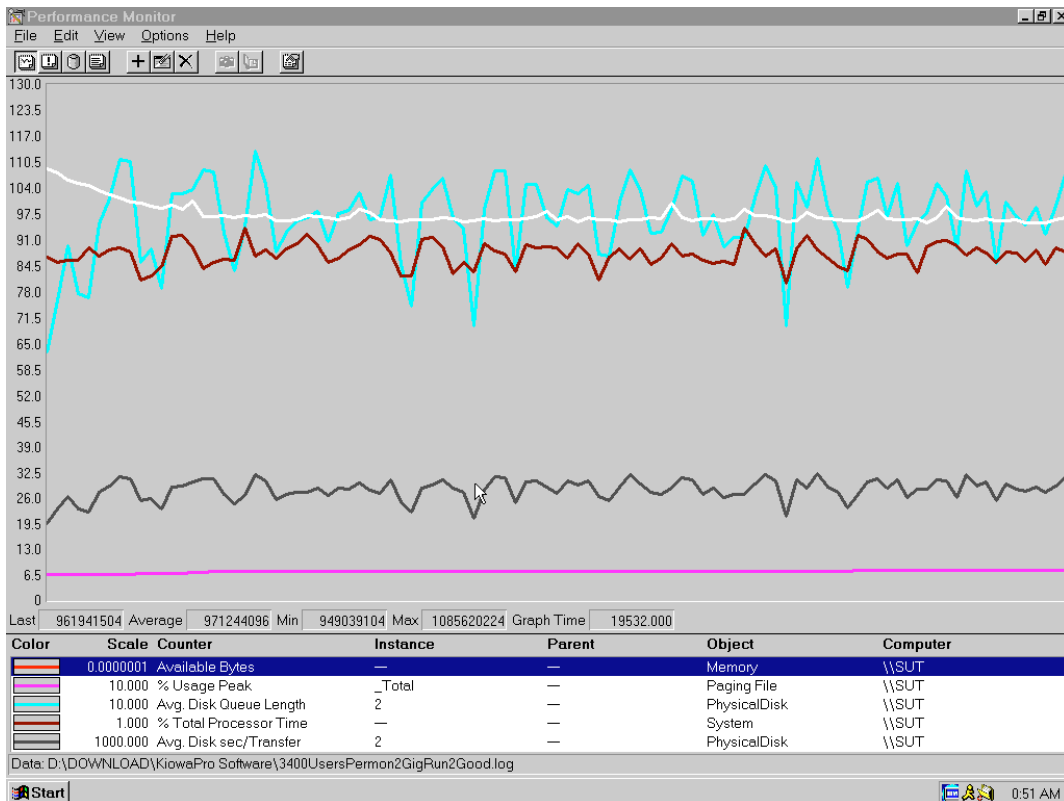


Analysis

PERFMON data was collected for a shorter run when the system was ramped up for about three hours. Ramp-up through shutdown is shown in the screen capture below. Steady-state statistics are shown in the table below.

Steady State Values	Domino Data
Maximum Concurrent Mail Users	3,400
Average CPU Utilization	87%
Average Memory Used *	1077MB
Average Memory Available	971MB
Average Pagefile Usage	0.7%
Average Physical Disk Q Length	9.6

*Average Memory Used is computed by subtracting the Average Available Bytes of Memory measured by PERFMON from the installed memory of 2GB. The available memory bytes are used as disk cache, helping to provide acceptable user response time. Due to the large amount of available memory, the customer could add more drives and upgrade the processor to 400MHz/1MB L2 cache to accommodate more users. Because of the significant system overhead required, PERFMON was not enabled or used for the audit run. For the audited run, all users ran error-free for 13 hours before the controller client performed an orderly stop of the run.



Conclusions

These NotesBench results demonstrate that the IBM Netfinity 5500 M10 (Model 8661-1RY) can support 3,400 Mail-only users. The results obtained are based on running the IBM Netfinity 5500 M10 as a dedicated Domino server; the addition of other application workloads will affect the number of users supported as well as the response time. Achieving optimum performance in a customer environment is highly dependent upon selecting adequate processor power, memory and disk storage as well as balancing the configuration of that hardware and appropriately tuning the operating system and Domino software.

Statement by Auditor

The original “Lotus NotesBench Test Results Report Certification Letter” was signed by Daryl K. Thompson, NotesBench Auditor for KMDS Technical Associates, Inc., and is on file at IBM.

Appendix A: Overall Test Setup and Software Versions

Number of Client Systems

Sixteen driver systems were used. Fifteen of those systems were configured as child drivers (child 1 through child 15). One system was configured as the parent (source driver).

The child drivers were IBM PC 350 systems, each configured with one 150MHz Pentium processor. Each child driver was configured with 80MB of memory, one 1.2GB hard disk, and one Intel EtherExpress 100/10 PCI TX Adapter.

The disk configuration used for the child systems is as follows:

- C: Partition (512MB - NTFS) - Windows NT Workstation 4.0
- D: Partition (2GB - NTFS) - Notes 4.62

Number of Server Platforms

One server platform, the IBM Netfinity 5500 M10 with two 400MHz/512KB L2 Cache Pentium II Xeon processors and 2GB of memory, was benchmarked.

The disk configuration used for the system under test is as follows:

- C: Partition (3GB - NTFS) - Windows NT Server Version 4.0 (boot partition) and Domino 4.62 executables
- D: Partition (13GB - NTFS) - Domino data

The disk configuration used for destination servers 1 through 3 is as follows:

- C: Partition (2GB - NTFS) - Windows NT Server Version 4.0 and Notes executables
- E: Partition (10GB - NTFS) - Domino data

Network

One 100Mbps Ethernet LAN segment was used.

Software Versions

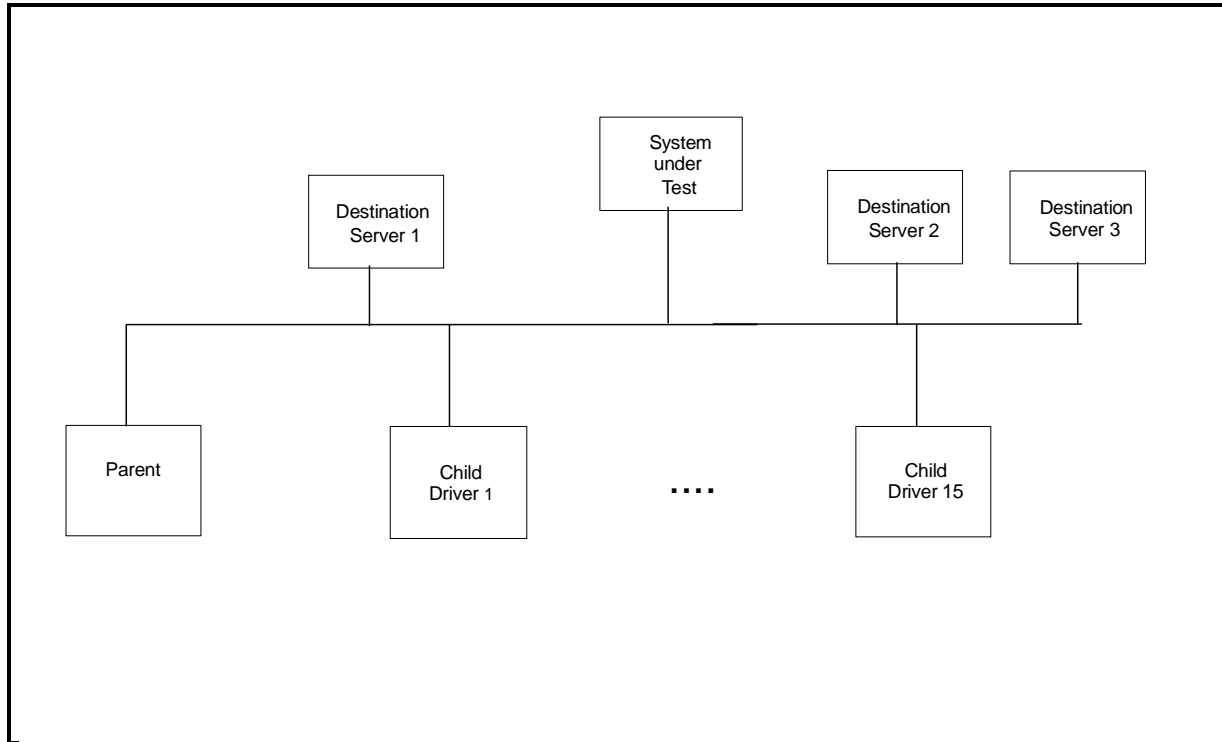
Software versions used on the system under test were as follows:

- Microsoft Windows NT Server Version 4.0 and Service Pack 3
- Lotus Domino Server Release 4.62
- NotesBench Version 4.62 - Windows/32

Software versions used on the child drivers were as follows:

- Microsoft Windows NT Workstation Version 4.0 and Service Pack 3
- Lotus Notes Client for Windows NT Release 4.62
- NotesBench Version 4.62 - Windows/32

High-Level Test Setup Diagram



Details of Configuration

System Under Test	Destination Servers 1-3	Child Drivers 1-15	Parent Source Driver
IBM Netfinity 5500 M10	IBM PC Server 330	IBM PC 350	IBM PC 300GL
2 x 400MHz Pentium II Xeon	1 x 200MHz Pentium Pro	1 x 150MHz Pentium	1 x 233MHz Pentium II
2GB Memory	256MB Memory	80MB Memory	96MB Memory
7 x 4.51GB Drives	6 x 2.25GB Drives (RAID-0)	1 x 1.2GB Drive	1 x 4.51GB Drive
1 x Integrated ServeRAID II Ultra SCSI Controller	IBM SCSI-2 Fast/Wide Streaming RAID Adapter		
1 x Integrated 100Mbps Ethernet Controller	IBM 100/10 Ethernet PCI Adapter	Intel EtherExpress 100/10 PCI TX Adapter	IBM 100/10 Ethernet PCI Adapter
Windows NT 4.0 and Service Pack 3	Windows NT 4.0 and Service Pack 3	Windows NT 4.0 and Service Pack 3	Windows NT 4.0 and Service Pack 3

One 100Mbps Ethernet LAN segment was used. One IBM PC Server 325 was configured as a router and used to connect the servers and clients to the LAN segment.

Appendix B: System Configurations

Server under Test	
System	IBM Netfinity 5500 M10
Processor	2 x 400MHz Pentium II Xeon Processor
Memory	2GB
Cache	512KB L2 Write-Back Cache
Disk Controller	Integrated ServeRAID II Ultra SCSI Controller
Disk Drive	7 x 4.51GB
Network Interface Adapter	1 x Integrated 100/10 Ethernet PCI Controller
I/O	PCI Bus
Operating System	Microsoft Windows NT Server 4.0 with Service Pack 3
Notes	Domino Server for Windows NT Release 4.62

Clients	
System	IBM PC 350
Processor	1 x 150MHz Pentium Processor
Memory	80MB
Disk Drive	1 x 1.2GB
Network Interface Adapter	Intel EtherExpress 100/10 PCI Adapter
I/O	PCI Bus
Operating System	Microsoft Windows NT Workstation 4.0
Notes	Notes Client for Windows NT Release 4.62

Appendix C: Operating System Parameters

The following registry variables were changed from their default values as shown :

HKEY_LOCAL_MACHINE/System/CurrentControlSet/Control/PriorityControl\Win32PrioritySeparation:
REG_DWORD:0

HKEY_LOCAL_MACHINE/System/CurrentControlSet/Control/SessionManager/MemoryManager/
LargeSystemCache: REG_DWORD:0

Appendix D: NOTES.INI Settings

NOTES.INI Files for the System under Test

[Notes]

```
KitType=2
Directory=d:\notes\data
SETUPDB=SETUP.NSF
USERNAME=Jackal
COMPANYNAME=Wacko
MTATEMP=C:\TEMP
;*****
; NotesBench parm changes
;*****
SERVER_SHOW_PERFORMANCE=1
MAILUSEPROCESSES=0
MAILUSETHEADS=1
MAILMAXTHREADS=3
MAILLOGTOEVENTSONLY=1
LOG_MAILROUTING=10
No_Force_Activity_Logging=1
DEBUG_OUTFILE=\\cmoylab\lastrun\sutinfo.log
;*****
WinNTIconPath=d:\notes\data\W32
$$HasLANPort=1
WWWDSPP_SYNC_BROWSERCACHE=0
WWWDSPP_PREFETCH_OBJECT=0
EnableJavaApplets=1
EnablePlugins=1
Preferences=-2146956175
Passthru_LogLevel=0
Console_LogLevel=2
VIEWIMP1=Lotus 1-2-3 Worksheet,0_IWKSV,,WKS,.WK1,.WR1,.WRK,.WK3,.WK4,,4,
VIEWIMP3=Structured Text,0_ISTR,,LTR,.CGN,.STR,,1,
VIEWIMP4=Tabular Text,0_ITAB,,PRN,.RPT,.TXT,.TAB,,1,
VIEWEXP1=Lotus 1-2-3 Worksheet,0_XWKS,,WKS,.WK1,.WR1,.WRK,,4,
VIEWEXP3=Structured Text,0_XSTR,,LTR,.CGN,.STR,,1,
VIEWEXP4=Tabular Text,1_XTAB,,LTR,.RPT,.CGN,.TAB,,1,
EDITIMP1=ASCII Text,0_ITEXT,,TXT,.PRN,.C,.H,.RIP,,1,
EDITIMP2=MicrosoftWord RTF,0_IRTF,,DOC,.RTF,,2,
EDITIMP3=Lotus 1-2-3 Worksheet,0_IWKSE,,WKS,.WK1,.WR1,.WRK,.WK3,.WK4,,4,
EDITIMP4=Lotus PIC,0_IPIC,,PIC,,8,
EDITIMP5=CGM Image,0_IFL,,GMF,.CGM,,8,
EDITIMP6=TIFF 5.0 Image,0_ITIFF,,TIF,,18,
EDITIMP7=BMP Image,0_IBMP,,BMP,,18,
EDITIMP8=Ami Pro,0_IW4W,W4W33F/V0,.SAM,,2,
EDITIMP17=WordPerfect 5.x,0_IW4W,W4W07F/V1,.DOC,.WPD,,2,
EDITIMP21=WordPro 96/97,0_IW4W,W4W12F/V0,.LWP,,2,
EDITIMP22=PCX Image,0_IPCX,,PCX,,18,
EDITIMP28=Binary with Text,0_ISTRNGS,,*,1,
EDITIMP29=WordPerfect 6.0/6.1,0_IW4W,W4W48F/V0,.WPD,.WPT,.DOC,,2,
EDITIMP30=Excel 4.0/5.0,0_IW4W,W4W21F/V4C,.XLS,,4,
EDITIMP31=Word for Windows 6.0,0_IW4W,W4W49F/V0,.DOC,,2,
EDITIMP32=GIF Image,0_IGIF,,GIF,,18,
EDITIMP33=JPEG Image,0_IJPEG,,JPG,,18,
EDITEXP1=ASCII Text,2_XTEXT,,TXT,.PRN,.C,.H,.RIP,,1,
EDITEXP2=MicrosoftWord RTF,2_XRTF,,DOC,.RTF,,4,
EDITEXP3=CGM Image,2_XCGM,,CGM,.GMF,,8,
EDITEXP4=TIFF 5.0 Image,2_XTIFF,,TIF,,18,
EDITEXP5=Ami Pro,2_XW4W,W4W33T/V0,.SAM,,2,
```

Appendix E: Network Configuration

The standard TCP/IP stack provided by Microsoft Windows NT Server 4.0 was used.

In the system under test, the network adapter speed was changed from the default 'Auto' to 100Mbps. This forced the Duplex Mode to 'Half'.

Under the 'Advanced' configuration option, the following three parameters were changed from their default values to double the default value:

- Coalesce Buffers
- Receive Buffers
- Transmit Control Block

At the destination servers, under 'Advanced' configuration options for the Ethernet adapter, the following three parameters were changed from their default values to double their default values:

- Coalesce Buffers
- Receive Buffers
- Transmit Control Block

Appendix F: Guidelines for Information Usage

This report is intended for IBM Business Partners, customers, and IBM marketing and technical support personnel. The report may be distributed in accordance with the requirements stated in the Edition notice.

Appendix G: Pricing

The table provides the IBM Estimated Reseller Price to end users for the U.S. only. Actual Reseller prices may vary, and prices may also vary by country. Prices are subject to change without notice. For additional information and current prices, contact your local IBM representative.

Item Description	Order Number	Qty	IBM Estimated Reseller Unit Price	Extended IBM Estimated Reseller Price
IBM Netfinity 5500 M10	8661-1RY	1	\$7,399	\$7,399
1 x 400MHz/512MB L2 Cache Pentium II Xeon Processor				
1 x 128MB ECC DIMM				
Integrated RAID Wide Ultra SCSI Controller				
Integrated 100/10Mbps Ethernet PCI Controller				
IBM 512MB SDRAM ECC DIMM	01K7263	4	5,585	22,340
400MHz/512KB Pentium II Xeon Processor Upgrade	10L7264	1	1,825	1,825
IBM Netfinity EXP10 4.51GB 10K Wide Ultra SCSI Hard Disk	01K7960	7	685	4,795
IBM Netfinity EXP15 Rack Storage Expansion Enclosure	35202RU	1	2,799	2,799
IBM G42 14" (13.2" Viewable) Color Monitor	654000N	1	219	219
Software				
Windows NT Server 4.0	227-01025	1	676	676
Lotus Domino Server Release 4.62 included on ServerGuide* with IBM Netfinity 5500 M10 at no charge		1	0	0
Total System Price				\$40,053

Appendix H: Optional (Vendor-Defined Information)

None.

First Edition - November 1998

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Notes

¹ MHz only measures microprocessor internal clock speed, not application performance. Many factors affect application performance.

² When referring to hard disk capacity, GB equals one billion bytes. Total user-accessible capacity depends on operating environment.

³ The price/performance results are based on pricing IBM's Estimated Reseller Prices to end users. IBM resellers set their own prices, and actual prices may vary.