

NotesBench Disclosure Report
for
IBM Netfinity 3500 (RAID-5)
with
Lotus Domino Server 4.6a for Windows NT 4.0

Audited May 8, 1998

IBM Corporation



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Edition Notice

Executive Summary

Performance measurements using NotesBench were conducted with the IBM Netfinity 3500 (Model 8644-21U) running Lotus Domino Server Release 4.6a on Microsoft Windows NT Server Version 4.0 with Service Pack 3. Results for the IBM Netfinity 3500 are based on the NotesBench Mail-only workload run on a single configuration. The results are summarized in the following table.

Test Script	Maximum Users	NotesMark (tpm)	Ave. Response Time (sec)	\$/User	\$/NotesMark
Mail-Only	1,500	2,096	0.141	\$10.84	\$7.75

The IBM Netfinity 3500, configured with one 266MHz¹ Intel** Pentium** II processor, 512MB of memory, and nine 4.51GB² hard disk drives (configured as a RAID-5 array), supported a Mail-only workload of 1,500 active mail users (see price/performance results³ above).

In addition to the IBM Netfinity 3500 system under test (SUT), the benchmarked configuration used three destination servers, 13 client driver systems, and one controller system. All systems were connected on a single 100Mbps Ethernet LAN segment, 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 April, and KMDS Technical Associates, Inc., audited the results in May 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 4.6a Mail-only users supported on a high-end configuration of the IBM Netfinity 3500 Model 8644-21U, which ships with one 266MHz Pentium II processor. Performance measurements on IBM Netfinity and PC servers using NotesBench for the Domino Server Release 4.6x are ongoing.

Test Methodologies

Test Setup and Hardware/Software Configuration

The IBM Netfinity 3500 system under test used one 266MHz Pentium II processors (512KB of L2 write-back cache); 512MB of memory, and nine 4.51GB Wide Ultra SCSI hard disks. The IBM ServeRAID II Ultra SCSI Adapter and the integrated 100/10Mbps Ethernet controller were used for this test.

A single 100Mbps Ethernet LAN segment was used. The system under test, the destination servers, and the driver systems were connected to the LAN by two Bay Networks 100BaseT Hubs. A 150MHz Pentium-based system was used as the source driver (parent) system; IBM PC 330 computers were used as the client driver (child) systems. Three IBM PC Server 720 systems were used as destination servers. Destination mail addresses were distributed across these three destination servers.

The IBM Netfinity 3500 system under test ran Microsoft Windows NT Server Version 4.0 and Domino Server Release 4.6a. The Name and Address Book in all the clients contained person documents for 3,000 mail recipients who were randomly selected by each active Mail user. The server under test contains mail files for the 3,000 Mail users. The public Name and Address Book contains 3,000 mail-recipient person documents and each of the three destination servers contains mail files for 1,000 recipients.

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

Mail-Only Workload
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=_\cmoylab\lastrun\SUTINFO.log
```

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

All Notes data files were located on the E - partition. The Notes executables were placed on the C - partition.

Test Procedures

Thirteen child drivers were used. Start times for the child drivers were set for approximately every 20-22 minutes. Start time for users in the child drivers was every 6 minutes.

On ramp-up, all users were connected within 4 hours and 15 minutes. The system under test ran for an extended period of 10 hours. 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:

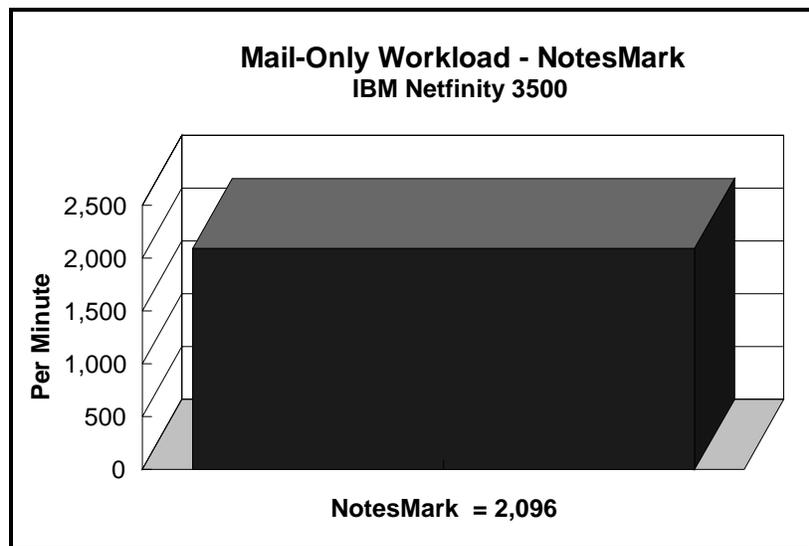
- The SUT Notes Server console sustained the peak user load
- Pending mail did not become backlogged, as verified by:
 - Inspection of mail-routing log at the SUT after the test run ended
 - Pending mail snapshots prior to stopping the test run.

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 3500 NotesMark Value for Mail-Only Test

The Mail workload was run for 10 hours, including ramp-up and steady state. This high-end configuration of the IBM Netfinity 3500 system demonstrated that it can support 1,500 concurrent active users with this workload and still have ample CPU and memory capacity to support other applications. The NotesMark throughput value was 2,096. Average response time was 0.141 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

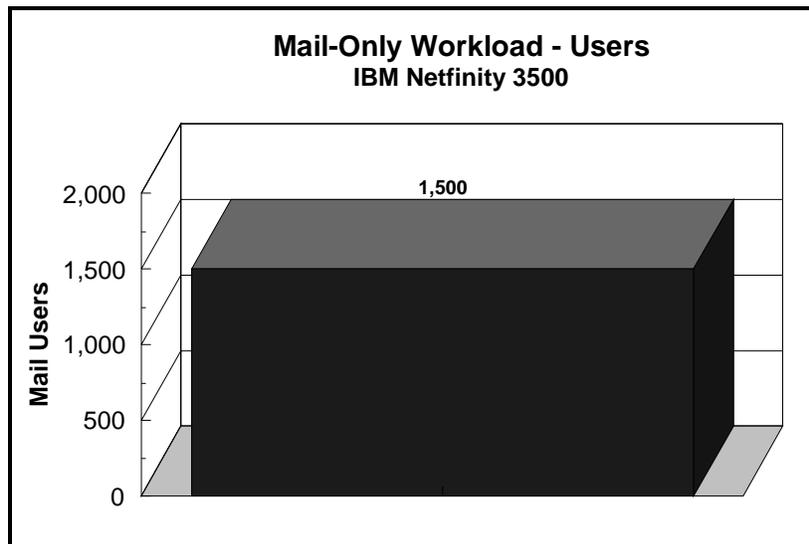
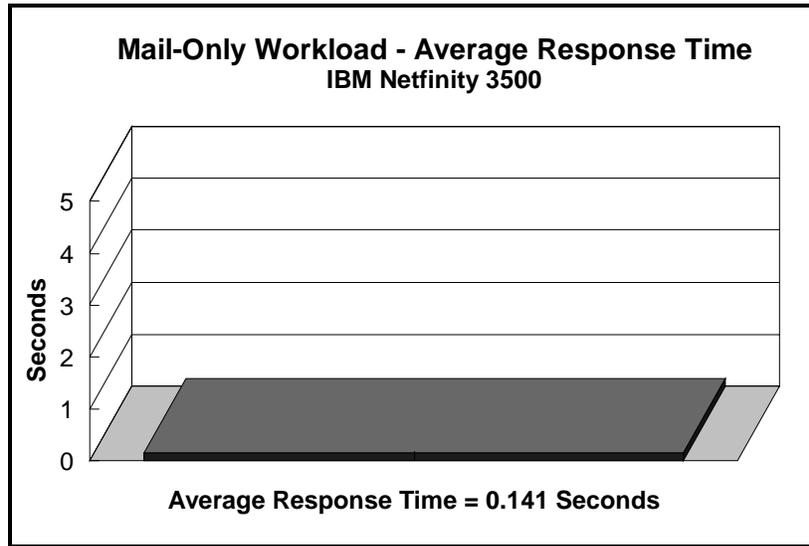
Min Start Time = 04/21/98 06:22:57 AM Max Stop Time = 04/21/98 09:20:17 PM

Total Test Errors = 0

Total Test Time = 53880 sec

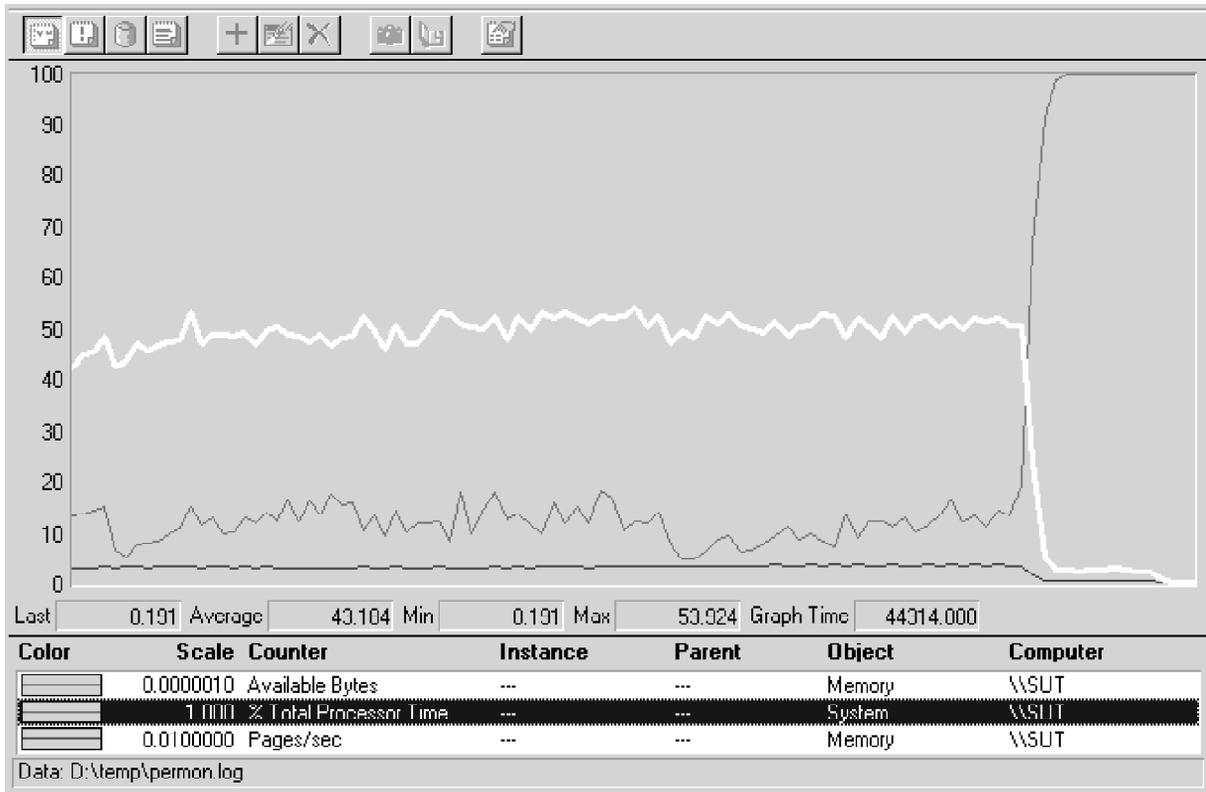
Test Run: Users = 1500 NotesMark = 2096 Response Time = 141 msec (04/21/98 10:09:00 AM to 04/21/98 09:03:00 PM)

The response time satisfies the 5 seconds (5000 msec) NotesBench response time criteria.



Analysis

Based on PERFMON data measurement from ramp-up through shutdown and shown in the following screen capture, CPU utilization rose as high as 70 percent during user sign-on, but averaged only 45 percent for the period displayed. All users ran error-free for 10 hours before the controller client performed an orderly stop of the run. Because of the significant system overhead required, PERFMON was not enabled or used for the audit run.



Conclusions

The test results demonstrate that the IBM Netfinity 3500 (Model 8644-21U), using a high-end configuration, can support 1,500 Mail-only users while providing sufficient processor capacity for the addition of other applications. The results obtained are based on running the IBM Netfinity 3500 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 Dana M. 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

Fourteen driver systems were used. Thirteen of those systems were configured as child drivers (child 1 through child 13). One system was configured as the parent (source driver).

The child systems were IBM PC 330 computers, each configured with one 150MHz Pentium processor. Each child driver was configured with 80MB of memory, one 1.6GB hard disk, and one IBM 100/10 Ethernet PCI Adapter.

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

C: Partition (1.5GB - FAT) - Windows NT 4.0 Workstation / Notes Domino 4.6 a

Number of Server Platforms

One server platform, the IBM Netfinity 3500 with one 266MHz Pentium II processor and 512MB of memory, was benchmarked.

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

- C: Partition (4GB - NTFS) - Windows NT Server Version 4.0 (Boot Partition) and Domino 4.6a executables
- E: Partition (10GB - NTFS) - Notes data (22GB of free space)

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) - Notes data

Network

A single 100Mbps Ethernet LAN segment was used. Two Bay Networks 100BaseT Hubs were used to connect the servers and clients to the LAN segment.

Software Versions

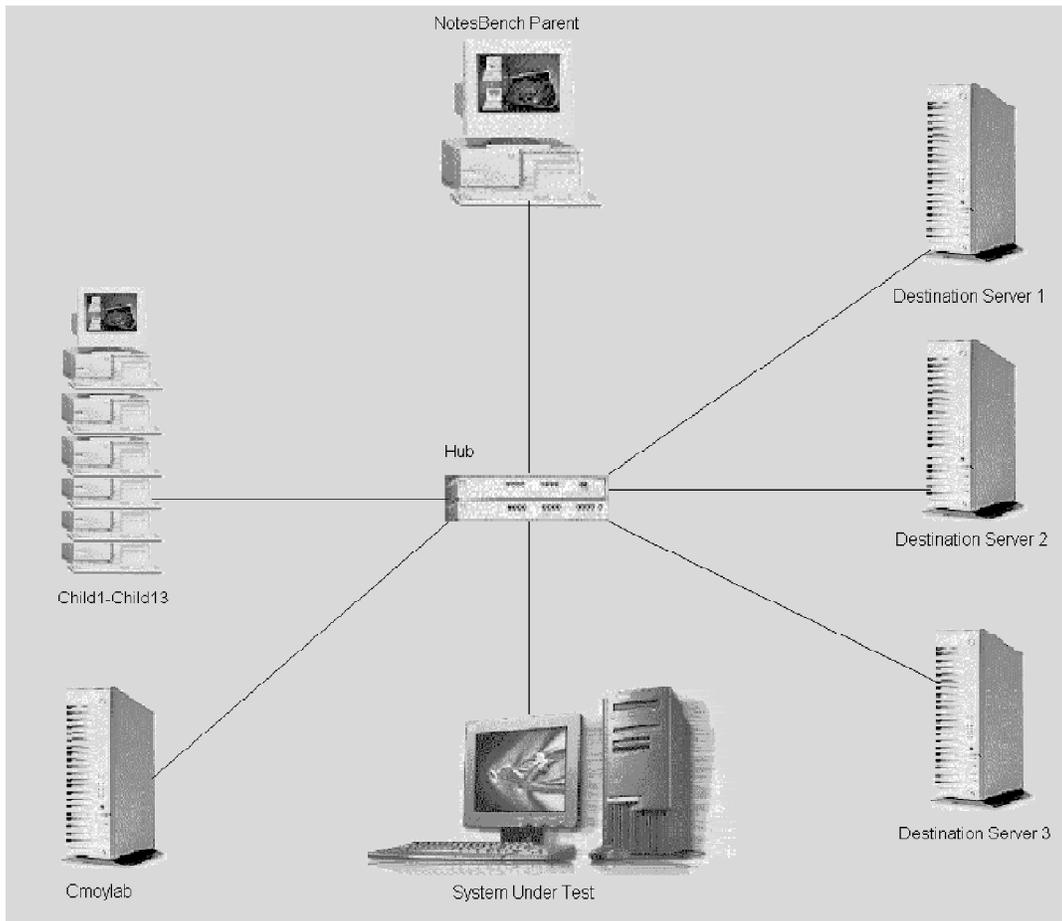
Software versions used on the system under test were as follows:

- Microsoft Windows NT Server Version 4.0 and Service Pack 3
- Lotus Domino Server Release 4.6a
- NotesBench Version 4.6 - 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 4.6a
- NotesBench Version 4.6 - Windows/32

High-Level Test Setup Diagram



Details of Configuration

System Under Test	Destination Servers 1-3	Child Drivers 1-13	Parent Source Driver
IBM Netfinity 3500	IBM PC Server 720	IBM PC 330	IBM PC 330
1 x 266MHz Pentium II	2 x 100MHz Pentium	1 x 150MHz Pentium	1 x 150MHz Pentium
512MB Memory	256MB Memory	80MB Memory	64MB Memory
9 x 4.51GB Drives	6 x 2.25GB Drives (RAID-0)	1 x 1.6GB Drive	1 x 1.5GB Drive
IBM ServeRAID II Ultra SCSI Adapter	IBM SCSI-2 Fast/Wide Streaming RAID Adapter		
Integrated Ethernet 100/10 PCI Controller	IBM 100/10 Ethernet PCI Adapter	IBM 100/10 Ethernet PCI 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

A single 100Mbps Ethernet LAN segment was used. Two Bay Networks 100BaseT Hubs were used to connect the servers and clients to the LAN segment.

Appendix B: System Configurations

Server under Test	
System	IBM Netfinity 3500
Processor	1 x 266MHz Pentium II Processor
Memory	512MB
Cache	512KB L2 Write-Back Cache
Disk Controller	IBM ServeRAID II Ultra SCSI Adapter
Disk Drive	9 x 4.51GB
Network Interface Adapter	Integrated Ethernet 100/10 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 4.6a

Clients	
System	IBM PC 330
Processor	1 x 150MHz Pentium Processor
Memory	80MB
Disk Drive	1 x 1.6GB
Network Interface Adapter	100/10 Ethernet PCI Adapter
I/O	PCI Bus
Operating System	Microsoft Windows NT Workstation 4.0
Notes	Notes Client for Windows NT Release 4.6

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 File for the System under Test

[Notes]

```
KitType=2
Directory=e:\notes\data
SETUPDB=SETUP.NSF
USERNAME=jacko
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=e:\notes\data\W32
$$HasLANPort=1
OldRegKey_MAILTO=rundll32.exe url.dll,MailToProtocolHandler %1
WWWDSPPREFETCH_OBJECT=0
WWWDSPPREFETCH_OBJECT=0
EnableJavaApplets=1
EnablePlugins=1
Preferences=527473
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,,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,_JPEG,,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,
EDITEXP14=WordPerfect 5.1,2,_XW4W,W4W07T/V1,.DOC,,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 3500	8644-21U	1	\$3,294	\$3,294
1 x 266MHz / 512KB Pentium II Processor				
1 x 64MB ECC DIMM				
1 x 4.51GB Wide Ultra SCSI Hard Disk				
Integrated Wide Ultra SCSI Controller				
Integrated 100/10Mbps Ethernet PCI Controller				
IBM 128MB SDRAM ECC DIMM	04K0075	4	695	2,780
IBM ServeRAID II Ultra SCSI Adapter	76H3584	1	1,949	1,949
4.51GB Wide Ultra SCSI Hard Disk	01K1327	3	689	2,067
4.51GB Wide Ultra SCSI Hard Disk	94G7491	5	799	3,995
SCSI Multi-Storage Enclosure	3517002	1	1,269	1,269
IBM G42 14" (13.2" Viewable) Color Monitor	654000N	1	224	224
Software				
Windows NT Server 4.0	227-01025	1	676	676
Lotus Domino Server Release 4.6 (single-processor edition included on ServerGuide* with IBM Netfinity 3500)		1	0	0
Total System Price				\$16,254

Appendix H: Optional (Vendor-Defined Information)

None.

First Edition - May 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.