

NotesBench Disclosure Report
for
IBM PC Server 330
with RAID-5
and
Lotus Domino 4.6a for Windows NT 4.0

Results Certified February 5, 1998

Performance results obtained using NotesBench 4.6 on a system configured with RAID-5 should not be compared with results from previous versions of NotesBench, which used RAID-0. While RAID-5 implementations provide substantial data redundancy, the increased I/O overhead consumes disk subsystem bandwidth, which could otherwise be used to support additional users.



IBM Corporation

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Edition Notice

Executive Summary

Recent measurements were conducted with the IBM PC Server 330 (Model 8640-11Y) running Lotus Domino Server Release 4.6a on Microsoft Windows NT Server Version 4.0 with Service Pack 3. Results for the IBM PC Server 330 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	1,700	2,218	0.382	\$12.82	\$9.83

The IBM PC Server 330, configured with one 300MHz¹ Intel** Pentium** II processor, 512MB of memory, and ten 4.51GB² hard disk drives, supported a Mail-only workload of 1,700 active mail users (see price/performance results³ above).

In addition to the IBM PC Server 330 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 January, and KMDS Technical Associates, Inc., audited the results in February 1998.

NotesBench provides an objective method for evaluating the performance of different platforms running Lotus Domino Server Release 4.6a. 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 the IBM PC Server 330 Model 8640-11Y, which ships with one 300MHz Pentium II processor. Performance measurements on IBM Netfinity and PC servers using NotesBench for the Domino Server Release 4.6x are ongoing.

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 the operating environment.

³ The price/performance results are based on pricing provided by an IBM Business Partner. IBM resellers set their own prices, and actual prices may vary.

Test Methodologies

Test Setup and Hardware/Software Configuration

The IBM PC Server 330 system under test used one 300MHz Pentium II processor (512KB of L2 write-back cache); 512MB of memory; and ten 4.51GB Wide Ultra SCSI hard disks, using RAID-5 for data redundancy; one IBM ServeRAID II Ultra SCSI Adapter; and one IBM EtherJet 100/10 PCI Adapter. (The integrated ServeRAID II Ultra SCSI PCI controller 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 one 3COM 100BaseT Hub. A 150MHz Pentium-based system was used as the source driver (parent) system; IBM PC 350 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 PC Server 330 system under test ran Microsoft Windows NT Server Version 4.0 and Domino Server Release 4.6a. 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
NSF_BUFFER_POOL_SIZE=128000000
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.

Ten 4.51GB Wide Ultra SCSI Hot-Swap hard disks were configured into three partitions as follows:

- Partition C (RAID-5) contained the NT and Domino executables.
- Partition D (RAID-0) contained the Pagefiles.
- Partition E (RAID-5) contained the Notes data.

Test Procedures

During ramp-up, all users were connected within approximately 180 minutes. The system under test ran for an extended period of 11 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:

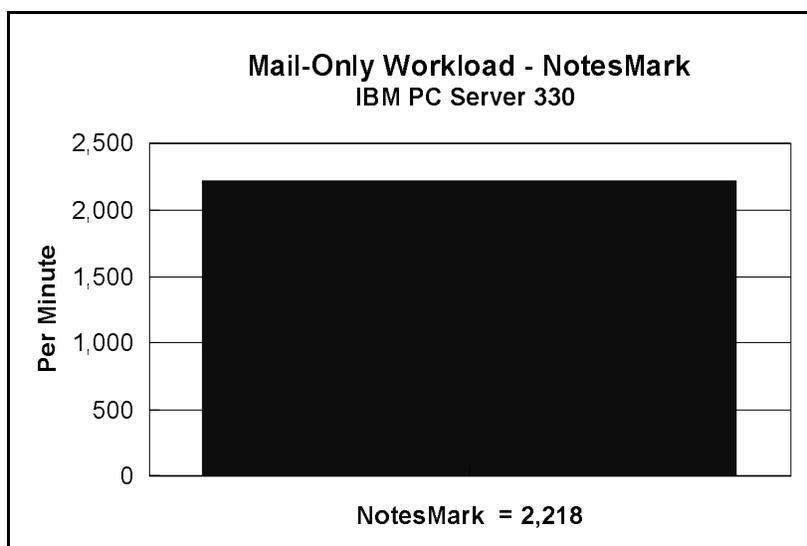
- The SUT Notes Server console sustained the peak user load
- Pending mail did not become backlogged, as verified by:
 - Inspection of mail-routing log at the SUT after the test run ended
 - Pending mail snapshots prior to stopping the test run.

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

Data

IBM PC Server 330 NotesMark Value for Mail-Only Test

The Mail workload was run for 11 hours, including ramp-up and steady state. The IBM PC Server 330 demonstrated that it can support a Mail workload of 1,700 concurrent, active users. The NotesMark throughput value was 2,218. Average response time was .382 seconds.



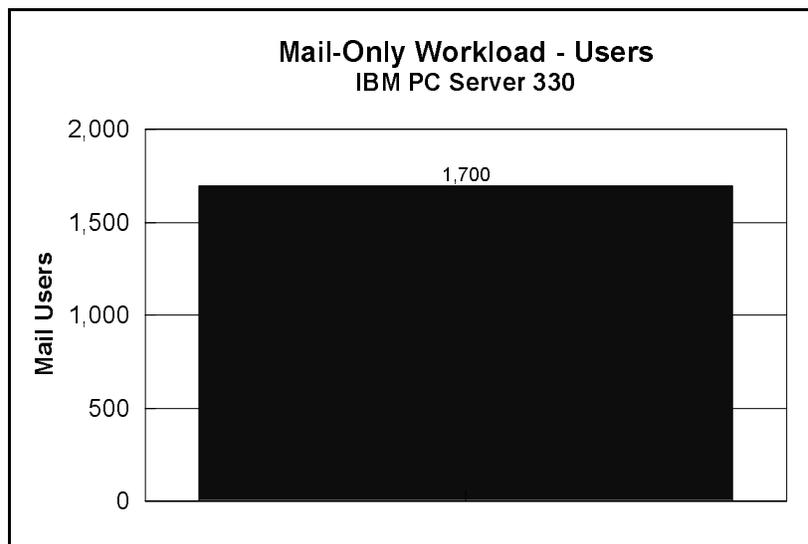
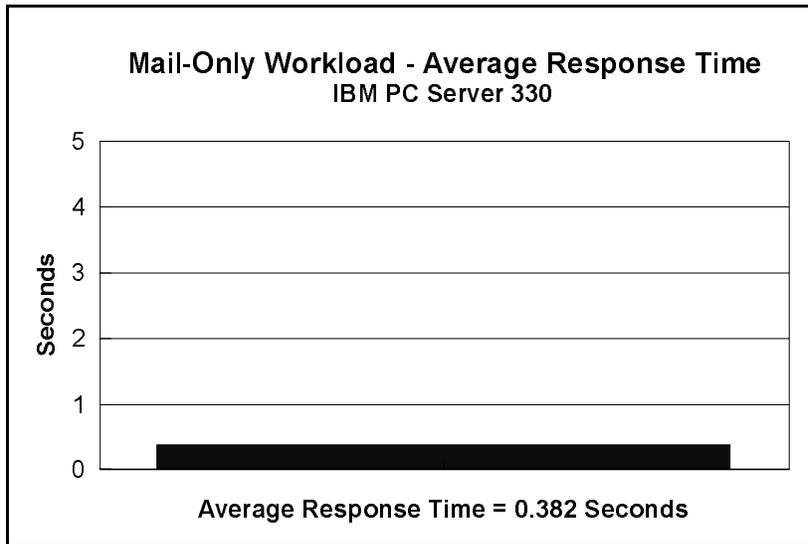
The Mail workload executes Notes transactions that model a server for mail users at sites that rely only on mail for communication. The resulting capacity metric for a mail-only server is the maximum number of users that can be supported before the average user response time becomes unacceptable.

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

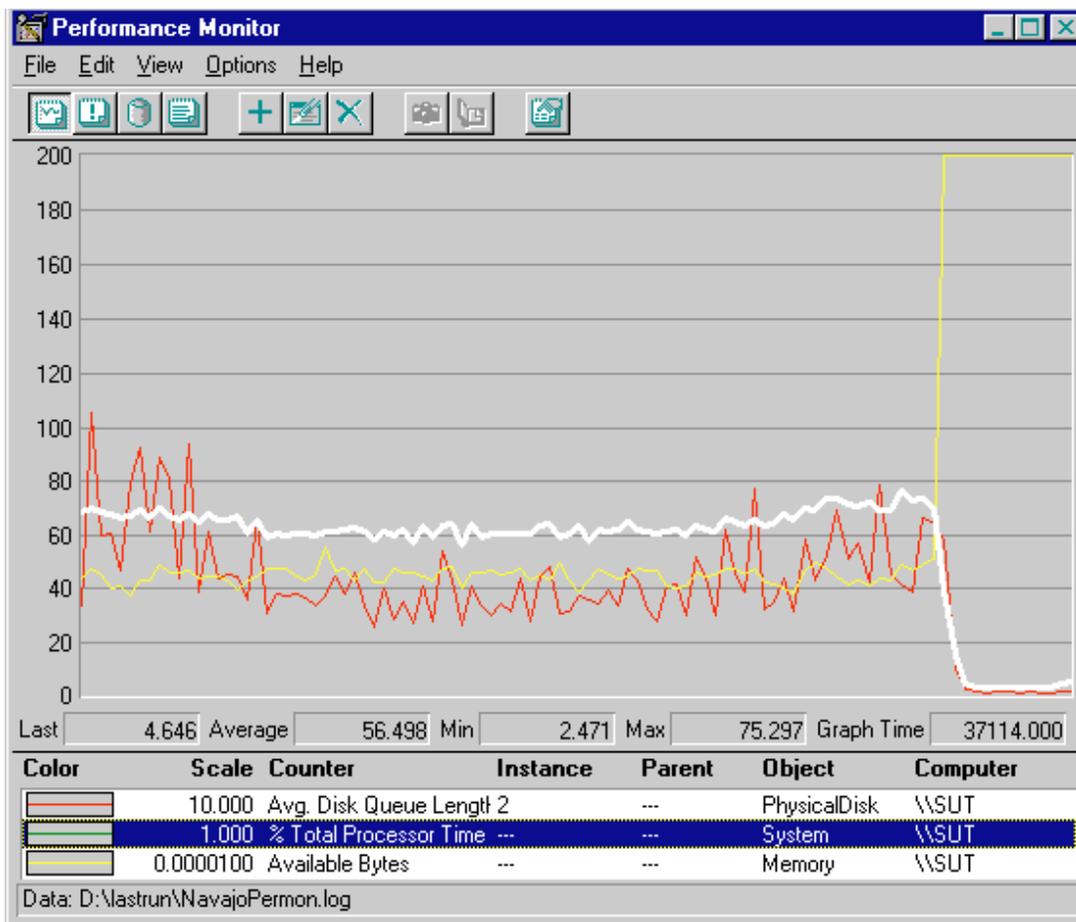
Min Start Time = 01/27/98 07:10:11 PM Max Stop Time = 01/28/98 06:19:36 AM
 Total Test Errors = 0
 Total Test Time = 40140 sec
 Test Run: Users = 1700 NotesMark = 2218 Response Time = 382 msec (01/27/98
 10:10:00 PM to 01/28/98 06:03:00 AM)

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 88.5 percent during user sign-on, but averaged only 56 percent for the period displayed. The NotesNum results indicate that the IBM PC Server 330 can service 1,700 Mail users efficiently with a response time of .382 (seconds). The number of Mail users can be increased by adding a second processor and more drives to the system. A second processor would ease the stress on the system during the peak login hours; additional drives would increase throughput and ensure acceptable response time.



Conclusions

The test results demonstrate that the IBM PC Server 330 (Model 8640-11Y), using RAID-5, can support 1,700 Mail-only users. These results obtained are based on running the IBM PC Server 330 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.

These results demonstrate that the IBM PC Server 330 system provides outstanding price/performance in a hardware platform for the Domino Server environment.

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 350 computers, each configured with one 150MHz Pentium processor. The 13 child drivers were configured with 80MB of memory, one 1.5GB 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 PC Server 330 with one 300MHz 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 (RAID-5)
D: Partition (2GB) - Pagefiles (RAID-0)
E: Partition (12GB - NTFS) - Notes data (RAID-5)

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. One 3COM 100BaseT Hub was used to connect the servers and clients to the LAN segment.

Software Versions

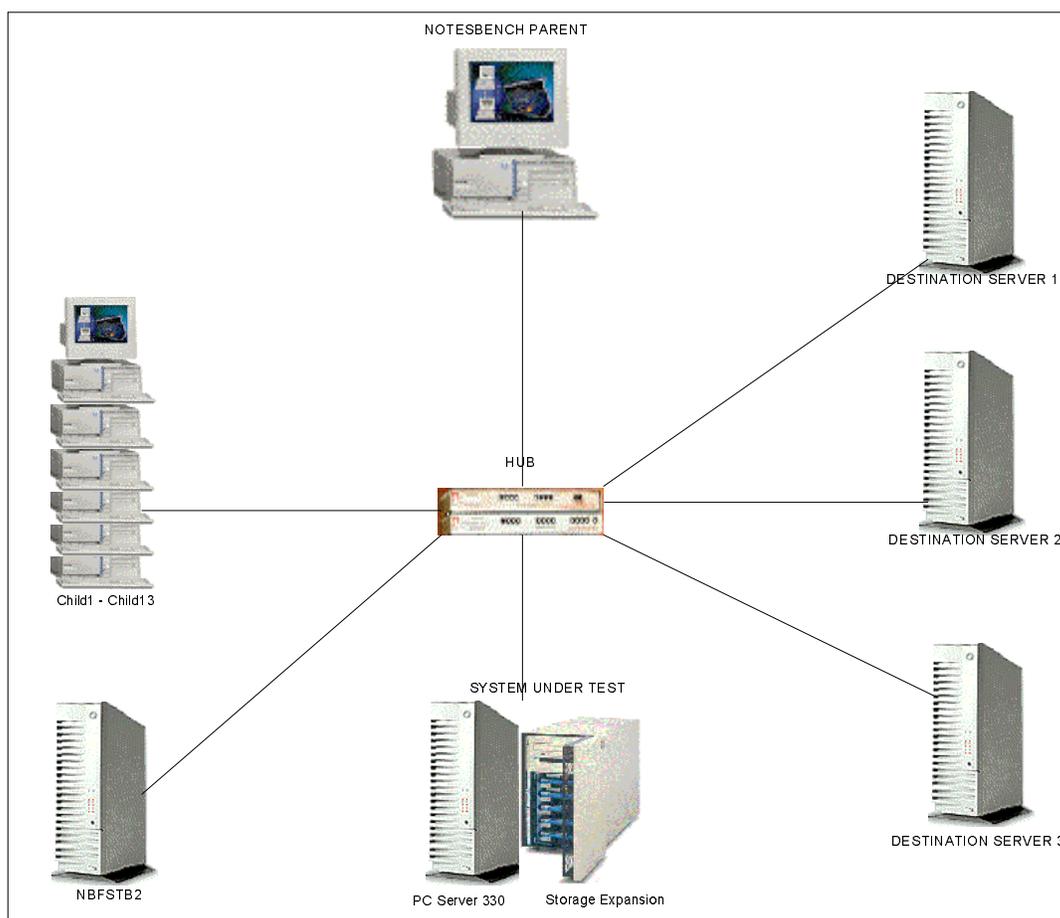
Software versions used on the system under test were as follows:

- Microsoft Windows NT Server Version 4.0 and Service Pack 3
- Lotus Domino Server Release 4.6a
- NotesBench Version 147 - 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 4.6
- NotesBench Version 147 - 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 PC Server 330	IBM PC Server 720	IBM PC 350	IBM PC 350
1 x 300MHz Pentium II	2 x 100MHz Pentium	1 x 150MHz Pentium	1 x 150MHz Pentium
512MB Memory	256MB Memory	80MB Memory	64MB Memory
10 x 4.51GB Drives	6 x 2.25GB Drives (RAID-0)	1 x 1.5GB Drive	1 x 1.5GB Drive
IBM ServeRAID II Ultra SCSI Adapter	IBM SCSI-2 Fast/Wide Streaming RAID Adapter		
IBM EtherJet 100/10 PCI Adapter	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. One 3COM 100BaseT Hub was used to connect the servers and clients to the LAN segment.

Appendix B: System Configurations

Server under Test	
System	IBM PC Server 330
Processor	1 x 300MHz Pentium II Processor
Memory	512MB
Cache	512KB L2 Write-Back Cache
Disk Controller	IBM ServeRAID II Ultra SCSI Adapter
Disk Drive	10 x 4.51GB
Network Interface Adapter	IBM EtherJet 100/10 PCI Adapter
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 350
Processor	1 x 150MHz Pentium Processor
Memory	80MB (Clients 1-3), 48MB (Clients 4-13)
Disk Drive	1 x 1.5GB
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=ConCac
COMPANYNAME=Yokorikmi
MTATEMP=C:\TEMP
;*****
; NotesBench parm changes
;
SERVER_SHOW_PERFORMANCE=1
MAILUSEPROCESSES=0
MAILUSETHEADS=1
MAILMAXTHREADS=3
MAILLOGTOEVENTSONLY=1
LOG_MAILROUTING=10
; NSF_BUFFER_POOL_SIZE=128000000
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 %l
WWWDSPPREFETCH_OBJECT=0
WWWDSPPREFETCH_OBJECT=0
EnableJavaApplets=1
EnablePlugins=1
Preferences=-2146956175
Passthru_LogLevel=0
Console_LogLevel=2
VIEWIMP1=Lotus 1-2-3 Worksheet,0_IWKS,.,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,

```


DESKWINDOWSIZE=16 23 420 288
MAXIMIZED=1
WinNTIconCommonConfig=Universal
WinNTIconSize=2
WinNTIconPos=2
WinNTIconHidden=0
WinNTIconRect=-1 -1 641 25
ECLSetup=3

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	IBM Business Partner Quote
IBM PC Server 330	8640-11Y	1	\$4,105	\$4,341
1 x 300MHz / 512KB Pentium II Processor				
1 x 64MB ECC DIMM				
128MB DIMM	94G6475	4	1,400	1,289
PC Server 4.51GB Wide Ultra SCSI Hard Disks	94G7491	10	910	841
IBM ServeRAID II Ultra SCSI Adapter	76H3584	1	1,949	1,780
SCSI Multi-Storage Expansion Unit	3517002	1	1,269	1,132
IBM EtherJet 100/10 PCI Adapter	86H2432	1	109	77
IBM G42 14" (13.2" Viewable) Color Monitor	654000N	1	249	225
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 PC Server 330)		1	0	0
Total System Price			\$23,057	\$21,798

Note: Price/performance results presented in this document are based on pricing provided by an IBM Business Partner.

Appendix H: Optional (Vendor-Defined Information)

None.

First Edition - February 1998

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