

NotesBench Disclosure Report
for
IBM PC Server 330
with
Lotus Domino 4.51 for Windows NT 4.0

Audited September 19, 1997

IBM Corporation



NotesBench Disclosure Report

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Edition Notice

Executive Summary

In recently conducted measurements, using Lotus Development Corporation's NotesBench benchmark, the IBM PC Server 330 system demonstrated leadership performance and price/performance running Lotus Domino Server Release 4.51 on Microsoft Windows NT Server Version 4.0 with Service Pack 3. The results for the IBM PC Server 330 are based on two NotesBench workloads: Mail-only and Mail and Shared Database (MailDB), which were 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	2,200	2,917	0.360	\$13.45	\$10.14
MailDB	1,700	3,914	1.427	\$17.40	\$7.56

The IBM PC Server 330, configured with two 233MHz¹ Intel** Pentium** II processors, 512MB of memory, and nine 4.51GB² hard disk drives, supported a Mail-only workload of 2,200 active mail users and a MailDB workload of 1,700 active 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 for Mail and 15 for MailDB, 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.

The Server Performance Laboratory in the IBM PC Company conducted the benchmark in September, and KMDS Technical Associates, Inc., audited the results in September.

NotesBench provides an objective method for evaluating the performance of different platforms running Lotus Domino Server Release 4.51. 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 4.51 Mail-only and MailDB users supported on the new IBM PC Server 330 system with two 233MHz Pentium II processors. Performance measurements on IBM PC Servers using NotesBench for the Domino Server Release 4.x are ongoing.

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

² GB is the abbreviation for gigabyte; 1GB equals one billion bytes; total user-accessible capacity may vary.

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 was configured with two 233MHz Pentium II processors (512KB of L2 write-back cache); 512MB of memory; nine 4.51GB Wide Ultra SCSI Hot-Swap hard disks configured as a RAID-0 array, using the IBM ServeRAID II Ultra SCSI Adapter; and one EtherJet 100/10 PCI Adapter. (The integrated IBM ServeRAID SCSI controller and the integrated 100/10Mbps Ethernet adapter were not used.)

For these tests, 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 Asante 100BaseT Hubs. An IBM PC 350 computer 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 RAID controller stripe size for the RAID-0 array was changed from the default value of 8KB to 16KB.

The IBM PC Server 330 system under test ran Microsoft Windows NT Server Version 4.0 and Domino Server Release 4.51. 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 or MailDB user.

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

Mail-Only Workload	MailDB Workload
LOG_MAILROUTING=10	LOG_MAILROUTING=10
MAILLOGTOEVENTSONLY=1	MAILLOGTOEVENTSONLY=1
MAILUSEPROCESS=0	MAILUSEPROCESS=0
MAILUSETHEADS=1	MAILUSETHEADS=1
MAILMAXTHREADS=3	MAILMAXTHREADS=3
NSF_BUFFER_POOL_SIZE=14000000	NSF_BUFFER_POOL_SIZE= Default
SERVER_SHOW_PERFORMANCE=1	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=D:\SUTDATA\SUTINFO
```

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

During ramp-up for both the Mail and MailDB tests, all users were added over a period of 120 to 200 minutes to accommodate the test environment in which a single Notes client had to support up to 220 users. In both tests, the system under test ran for an extended period of more than 8 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:

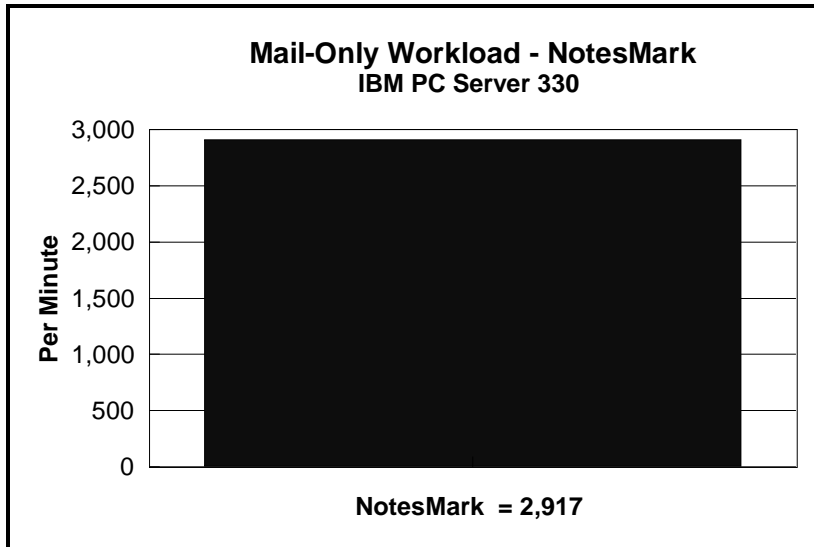
- The SUT Notes Server console sustained the peak user load
- Pending mail did not become backlogged, as verified by:
 - Inspection of mail-routing log at the SUT after the test run ended
 - Pending mail snapshots prior to stopping the test run.

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 at least 8 hours, including ramp-up and steady state. The IBM PC Server 330 system demonstrated that it can support 2,200 concurrent active users with this workload. The NotesMark throughput value was 2,917. Average response time was .360 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

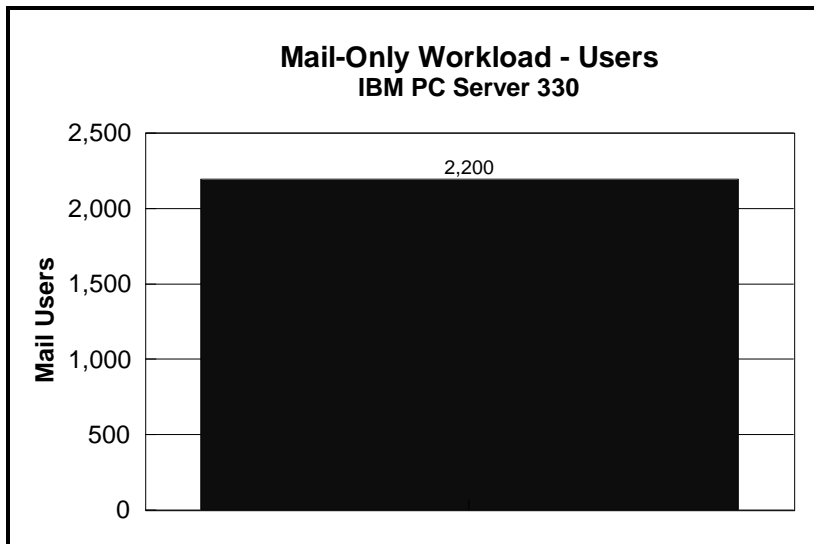
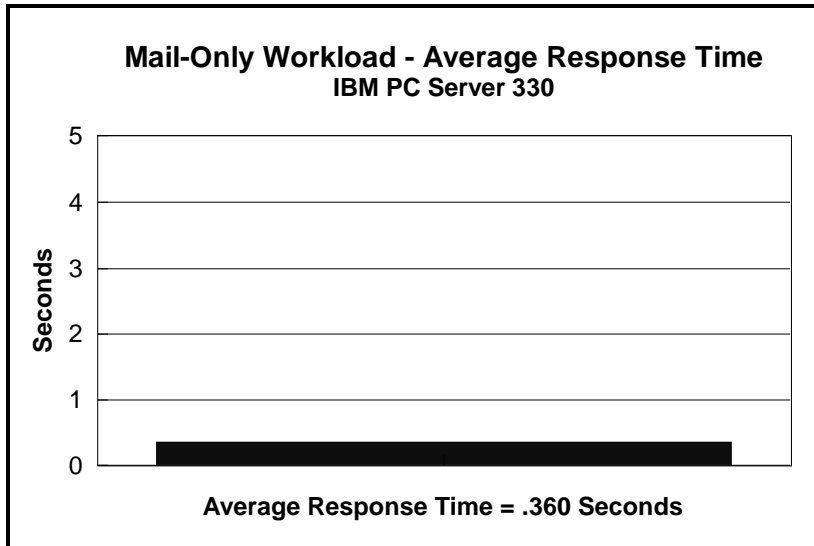
Min Start Time = 09/13/97 09:30:39 PM Max Stop Time = 09/14/97 06:45:48 AM

Total Test Errors = 0

Total Test Time = 33300 sec

Test Run: Users = 2200 NotesMark = 2917 Response Time = 360 msec (09/13/97 11:53:00 PM to 09/14/97 06:29:00 AM)

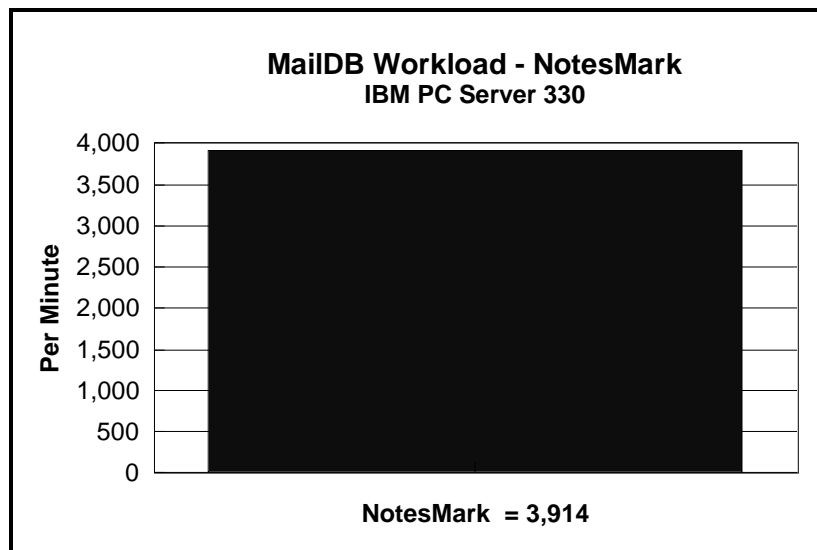
The response time satisfies the 5 seconds (5000 msec) NotesBench response time criteria.



IBM PC Server 330 NotesMark Value for Mail and Shared Database Test

The MailDB workload was run for 8 consecutive hours, including ramp-up and steady state. The IBM PC Server 330 system demonstrated that it can support 1,700 concurrent active users with this workload. The NotesMark throughput value was 3,914. Average response time was 1.427 seconds.

A single error occurred in child driver 7 during ramp-up, and recovered. The error resulted from a too-rapid ramp-up schedule, but the SUT was able to handle the ramp-up user load with no further errors.



The MailDB workload models a server for active users who are performing only mail and simple shared database operations. The test includes mail-only activity plus view operations in a shared database and navigation of unread documents in a shared database. The test applies especially to sites that rely primarily on mail for communication or that have Notes users who do not yet use all the Notes features. The throughput for this test is a capacity metric. It indicates the maximum number of active users that can be supported before the average user response time becomes unacceptable.

The MailDB script models an active user who is reading mail, sending mail and reading a shared database. It contains an average of 15 minutes of waiting; thus, an average user will execute this script no more frequently than four times per hour. For each iteration of the script, there are 8 documents read, 2 documents updated, 2 documents deleted, 4 view scrolling operations, 2 databases opened and closed, 2 views opened and closed, and some miscellaneous operations. In sending messages, each user sends one mail message to NumMessageRecipients approximately once every 90 minutes.

NotesNum Output for Mail and Shared Database Test

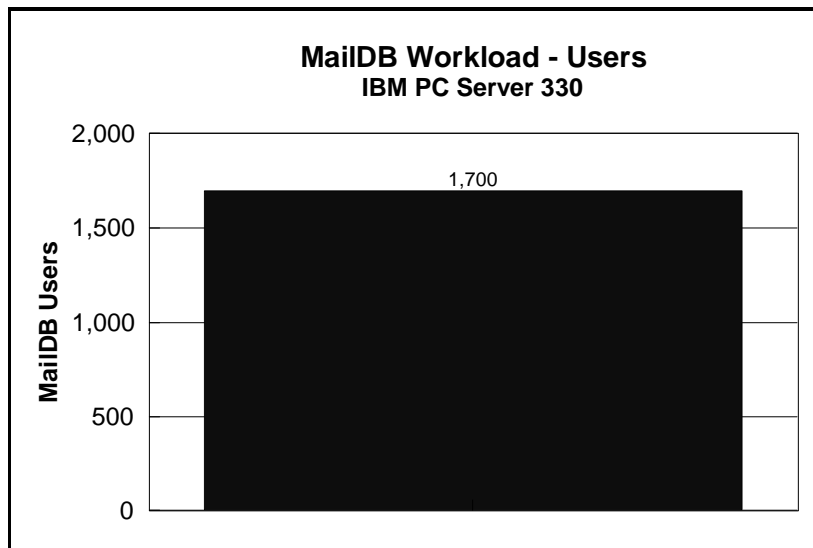
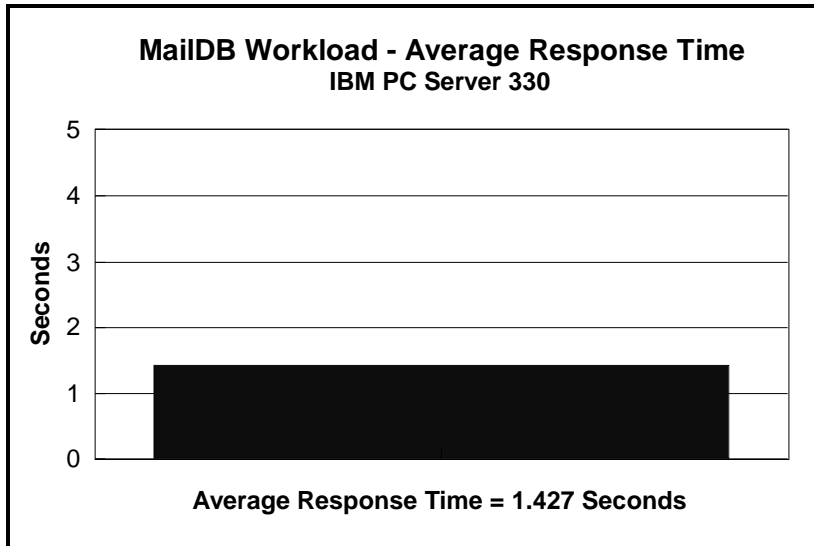
Min Start Time = 09/12/97 11:43:45 PM Max Stop Time = 09/13/97 09:01:56 AM

Total Test Errors = 1

Total Test Time = 33480 sec

Test Run: Users = 1700 NotesMark = 3914 Response Time = 1427 msec (09/13/97 02:10:00 AM to 09/13/97 08:42:00 AM)

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



Analysis

Mail-Only and MailDB Tests: During ramp-up, use of PERFMON to observe system activity showed that the performance of the tested configuration was limited by the amount of memory installed. The IBM ServeRAID II Ultra SCSI controller has three Wide Ultra SCSI channels; only two channels were used for these tests. One channel was used for the disk drives in the SUT; the other channel was used to connect to the expansion unit that held the additional disk drives. Because of the significant system overhead required to monitor the disk subsystem, disk I/O performance data was not collected.

Conclusions

The test results demonstrate that an IBM PC Server 330 configured as described within this report can support 2,200 Mail-only users and 1,700 MailDB users with a response time well within what the test criteria permit. These results 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

For the Mail-only test, 14 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). For the MailDB test, 16 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 systems were IBM PC 350 computers, each configured with one 133MHz Pentium processor. Child drivers 1 through 3 were configured with 80MB of memory, one 1.5GB hard disk, and one IBM Ethernet 100/10 PCI Adapter. The remaining child drivers were configured with 48MB of memory.

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

C: Partition (1.5GB - FAT) - Windows NT 4.0 Workstation / Notes Domino 4.51

Number of Server Platforms

One server platform, the IBM PC Server 330 with two 233MHz Pentium II processors 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 4.51 executables
E: Partition (12GB - NTFS) - Notes 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) - Notes data

Network

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

Software Versions

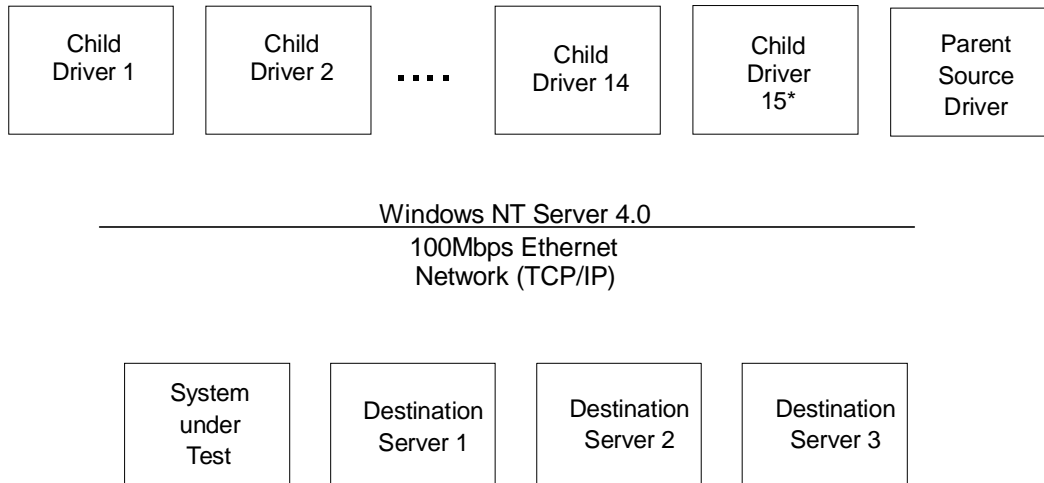
Software versions used on the system under test were as follows:

- Microsoft Windows NT Server Version 4.0 and Service Pack 3
- Lotus Domino Server Release 4.51
- NotesBench Version 145 - 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 4.51
- NotesBench Version 145 - Windows/32

High-Level Test Setup Diagram for Mail-Only and MailDB



- Child Drivers 14 and 15 were not used for the Mail-Only Test.

Details of Configuration

System Under Test	Destination Servers 1-3	Child Drivers 1-15	Parent Source Driver
IBM PC Server 330	IBM PC Server 720	IBM PC 350	IBM PC 350
2 x 233MHz Pentium II Processors	2 x 100MHz Pentium Processors	1 x 133MHz Pentium Processor	1 x 133MHz Pentium Processor
512MB Memory	256MB Memory	80MB Memory for Child Drivers 1-3; 48MB for Child Drivers 4-15	64MB Memory
9 x 4.51GB Drives (RAID-0)	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		
EtherJet 100/10 PCI Adapter	IBM Ethernet 100/10 PCI Adapter	IBM Ethernet 100/10 PCI Adapter	IBM Ethernet 100/10 PCI Adapter
Service Pack 3	Service Pack 3	Service Pack 3	Service Pack 3

The IBM ServeRAID II Ultra SCSI Adapter and the EtherJet 100/10 PCI Adapter used in the SUT were installed on the Primary PCI bus.

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

Appendix B: System Configurations

Server under Test	
System	IBM PC Server 330
Processors	2 x 233Hz Pentium II processors
Memory	512MB
Cache	512KB L2 write-back cache per processor
RAID Controller	IBM ServeRAID II Ultra SCSI Adapter
Disk	9 x 4.51GB (configured as a RAID-0 array)
Network Interface Adapter	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 4.51

Clients	
System	IBM PC 350
Processor	1 x 133MHz Pentium processor upgrade
Memory	80MB for child drivers 1-3 and 48MB for child drivers 4-15
Disk	1 x 1.5GB
Network Interface Adapter	IBM Ethernet 100/10 PCI Adapter
I/O	PCI/ISA bus (I/O bus used was PCI)
Operating System	Microsoft Windows NT Workstation 4.0
Notes	Notes Client for Windows NT Release 4.51

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

;

.*****

;

; 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=c:\svrdata\sutinfo.log

;

.*****

;

WinNTIconPath=e:\notes\data\W32

\$\$HasLANPort=1

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,

VIEWIMP3=Structured Text,0,_ISTR,,LTR,.CGN,.STR,

VIEWIMP4=Tabular Text,0,_ITAB,,PRN,.RPT,.TXT,.TAB,

VIEWEXP1=Lotus 1-2-3 Worksheet,0,_XWKS,,WKS,.WK1,.WR1,.WRK,

VIEWEXP3=Structured Text,0,_XSTR,,LTR,.CGN,.STR,

VIEWEXP4=Tabular Text,1,_XTAB,,LTR,.RPT,.CGN,.TAB,

EDITIMP1=ASCII Text,0,_ITEXT,,TXT,.PRN,.C,.H,.RIP,

EDITIMP2=MicrosoftWord RTF,0,_IRTF,,DOC,.RTF,

EDITIMP3=Lotus 1-2-3 Worksheet,0,_IWKSE,,WKS,.WK1,.WR1,.WRK,.WK3,.WK4,

EDITIMP4=Lotus PIC,0,_IPIC,,PIC,

EDITIMP5=CGM Image,0,_IFL,,GMF,.CGM,

EDITIMP6=TIFF 5.0 Image,0,_ITIFF,,TIF,

COM3=XPC,3,15,0,
COM4=XPC,4,15,0,
COM5=XPC,5,15,0,
Ports=TCPIP,WAN1
DisabledPorts=LAN0,VINES,SPX,AppleTalk,COM1,COM2,COM3,COM4,COM5
LOG_REPLICATION=0
LOG_SESSIONS=0
ExistingServerName=CN=S1/O=NotesBench
KeyFilename=SUTserver.id
CertificateExpChecked=e:\notes\data\SUTserver.id 09/08/97
MailServer=CN=SUT/O=NotesBench
Domain=TstBed
Admin=CN=Admin/O=NotesBench
TemplateSetup=2
Setup=49
ServerSetup=7
ZONE_SET=1
Timezone=5
DST=1
ECLSetup=3
DESKWINDOWSIZE=0 0 604 424
WINDOWSIZEWIN=11 5 612 470
MAXIMIZED=1
WinNTIconCommonConfig=Universal
WinNTIconSize=2
WinNTIconPos=2
WinNTIconHidden=0
WinNTIconRect=-1 -1 641 25
FileDlgDirectory=E:\notes\data
PhoneLog=2
Log=log.nsf, 1, 0, 7, 40000
CONSOLE_Lotus_Domino_Server=80 25 7 -7 55 645 386
NAMES=names.nsf
EmptyTrash=0
WeekStart=1
WAN1=TCP,0,15,0,,12288,
SDI_WINDOW=0
BCASEWINDOWSIZE=0 0 604 424

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 for the EtherJet 100/10 PCI Adapter 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 the default value:

- Coalesce Buffers
- Receive Buffers
- Transmit Control Block

Appendix F: Guidelines for Information Usage

This report is intended for IBM Business Partner, 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 the end user 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-PT0	1	\$6,159	\$5,643
1 x 233MHz / 512KB Pentium II Processor				
1 x 64MB ECC DIMM				
IBM ServeRAID II Ultra SCSI Adapter	76H3584	1	1,949	1,805
PC Server 233MHz Pentium II Processor Upgrade	94G7080	1	1,725	1,631
4 x 128MB DIMMs	94G6475	4	1,608	1,495
PC Server 4.51GB Wide Ultra SCSI H/S Disks	94G7491	9	1,264	1,169
SCSI Multi-Storage Enclosure	3517002	1	1,269	1,169
EtherJet 100/10 PCI Adapter	86H2432	1	109	81
IBM G42 14" (13.2" Viewable) Color Monitor	654000N	1	299	272
Software				
Windows NT Server 4.0		1	701	701
Lotus Domino Server Release 4.51 for SMP ⁴		1	1,778	1,778
Total System Price			\$31,797	\$29,581

⁴ A single-processor edition of Domino Server Release 4.51 is included with the PC Server 330 on ServerGuide*. The price quoted here is for an upgrade to Domino Server 4.51 for SMP.

Appendix H: Optional (Vendor-Defined Information)

None.

First Edition - September 1997

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