Full Disclosure Report

Exchange MAPI Messaging Benchmark 3 (MMB3)

Category: Single Server

Hardware: **IBM® eServer® xSeries® 206**
Software: **Microsoft® Exchange Server 2003**
Test Profile: **MAPI Messaging Benchmark 3**
Date Accepted: **6/7/2004**

Revision History

6/7/2004– Original Submission

Executive Summary

IBM eServer xSeries 206 – Single Server	
Test results	
MMB3 score	**3,800**
Response time	**324** milliseconds (ms)
CPU utilization	**78.6%**
Avg. queue	**43**
Messages submitted	**163,201** (4-hour steady state period)
Messages delivered	**406,743** (4-hour steady state period)
Messages sent	**163,150** (4-hour steady state period)
Server configuration	
CPU	**3.2-gigahertz (GHz) Intel® Pentium® 4**
CPU count	**One, with Hyper-Threading enabled**
RAM	**4 gigabytes (GB)**
L1 cache	**Instruction: 12 Kilobytes (KB) μops** **Data: 8 kilobytes (KB)**
L2 cache	**1 megabytes (MB)**
L3 cache	**NA**
Operating system	**Microsoft® Windows® 2003 Server Enterprise Edition**
Storage	**1 – 73-GB disk for operating system** **1 – 36-GB disk for Exchanger Server 2003 executable files** **1 – 73-GB disk for paging file** **70 – 36-GB disks for Exchange files**
Controller	**1 – Integrated Adaptec U320 SCSI controller (operating system and Exchanger Server 2003 executable files)** **1 – Mylex eXtremeRAID 2000 controller (Exchange files)** **1 – IBM ServeRAID® 4Lx controller (Exchange files)**
NIC	**1 – Integrated Intel PRO/1000 Gigabit Ethernet controller**

Results based on 4 hours of steady state running.

Results should be interpreted as a benchmark for messaging throughput and should *not* be confused with deployment recommendations. Factors such

as backup/restore, topology and other issues should be considered when planning a deployment. For information on how MMB3 results differ from deployment and configuration information refer to the "Benchmark vs. Production Configuration Disclosure Note" section.

IBM eServer xSeries 206 Server

With the 3.2GHz Intel Pentium 4 processor supporting Hyper-Threading technology and up to 4GB DDR SDRAM, the general-purpose x206 server provides exceptional performance. Hyper-Threading enables one physical processor to appear as two logical processors allowing multiple tasks to execute simultaneously in certain application environments for a good balance of performance and cost.

Features

- Tower with 4U rack capability via optional rack-mount kit
- Intel Pentium 4 processor up to 3.4GHz with high-performance 800MHz front- side bus speed
- 256MB standard/4GB maximum PC2700 or PC3200 ECC DDR memory
- Choice of fixed SCSI HDDs (up to 587GB), hot-swap SCSI (up to 440GB) or simple-swap Serial ATA (up to 320GB, 640GB optional)
- Alert Standard Format 2.0 provides secure remote power on and off support for remote clients, even in an OS-absent state
- ServeRAID 7e allows you to configure your new server with RAID 0 or 1, without having to purchase hardware adapters

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1 Benchmark vs. Production Configuration Disclosure Note

This test measures the messaging throughput of a single-server, single- site topology. Its purpose is to measure the maximum throughput of a Microsoft Exchange Server on this hardware configuration. This can provide a benchmark for comparing hardware and/or software products, **but cannot be used as a deployment guide for production environments.** For deployment specific information, contact a Microsoft or an IBM representative.

The MMB3 benchmark does not account for:

- Usage profiles that do not match those of the Load Simulator MMB3 profile
- Per user storage and per server backup requirements
- Fault tolerance requirements
- Anti-virus processes and effects on the server
- UBE/UCE (spam) mail flow
- Workloads other than MAPI private folder access, including Public Folder, NNTP, POP3 and other email interfaces
- Multiple Exchange Server deployments, where additional resources are required to forward mail intra-site
- Connectors, links and replication to remote Exchange sites
- Network topologies, bandwidth availability, latency requirement and SLA-related factors such as QOS and fail-over path issues.

2 Test Results

The new MAPI Messaging Benchmark (MMB3) measures throughput in terms of a specific profile of user actions executed over an 8-hour working day.

This benchmark is different from the MMB2 setting that was used with Exchange 2000 in that the rate of client requests is significantly greater for the MMB3 profile.

Summary	
Supported Benchmark Load	**3,800** MMB3s
Benchmark Profile	MAPI Messaging Benchmark 3 (MMB3)
Protocol	Exchange MAPI
Length of Steady State	4 Hours
Length of Test	8 Hours
Unless otherwise noted, values listed below are averages over entire 4 hour steady state period.	
Transactions in Total	
Total Messages Submitted	163,201
Total Message Recipients Delivered	406,743
Total Messages Sent	163,150
Message Recipients Delivered / Messages Submitted	2.49
Total Messages Submitted	163,201
Transaction Load (per hour)	
Messages Submitted / hour	40,718
Message Recipients Delivered / hour	101,481
Messages Sent / hour	40,706
Transaction Load (per Second)	
Message Opens / sec	44
Folder Opens / sec	15
RPC Read Bytes / sec	126,976
RPC Write Bytes / sec	2,375,880
Transaction Queues	
MSExchangeIS Send Queue Average Length	43
MSExchangeIS Receive Queue Average Length	0

SMTP Local Queue	48
SMTP Categorizer Queue	0
Processor Utilization	
System Processor Utilization (%)	79
System Processor Interrupts/sec (Total)	1,857
System Processor Queue Length	9
System Context Switches/Sec	6,284
Process % CPU Time - Store	138
Process % CPU Time - Inetinfo	5
Exchange server is also domain controller? (yes/no)	Yes
Process % CPU Time – LSASS (on domain controller)	4
Memory Utilization	
Available Bytes	1,492,977,398
Pages / sec	1
Process Private Bytes - Store	243,875,881
Process Working Set Bytes - Store	1,287,027,139
Process Virtual Bytes - Store	2,057,325,732
MSExchangeIS VM Largest Block Size	875,598,316
MSExchangeIS VM Total 16MB Free Blocks	5
MSExchangeIS VM Total Free Blocks	263
MSExchangeIS VM Large Free Block Bytes	963,526,984
Disk Utilization (Aggregate for Database Logical Disks)	
Logical Drive Utilization (%)	3,917
Database Disk Reads/Sec	1,829
Database Disk Read Bytes/Sec	9,961,430
Database Disk Writes/Sec	682
Database Disk Write Bytes/Sec	5,691,705
Database Disk Avg. Disk sec / Read	0
Database Disk Avg. Disk sec / Write	0
Database Average Disk Queue Length	39

Disk Utilization (Aggregate for Transaction Log Logical Disks)	
Logical Drive Utilization (%)	34
Log Disk Reads/Sec	6
Log Disk Read Bytes/Sec	25,704
Log Disk Writes/Sec	283
Log Disk Write Bytes/Sec	2,678,941
Log Disk Avg. Disk sec / Read	0
Log Disk Avg. Disk sec / Write	0
Log Average Disk Queue Length	0
Network Utilization	
Packets Sent/sec	720
Packets Received/sec	879
Bytes Sent/sec	1,020,512
Bytes Received/sec	247,321

2.1 Response Times (Latencies)

Client Actions	95th Percentile Response Time (in milliseconds)
Send	719
Read	218
Reply	109
Reply All	110
Forward	125
Move	265
Delete	156
Permanently Delete	187
S+ Free/Busy	156
Browse Calendar	219
Make Appointment	625
Request Meeting	1,281
Create Smart Folder	344
Delete Smart Folder	703
Create Rule	203
Delete Rule	250
Apply View/Sort	5,313
Weighted Total	324

2.2 Message Throughput

Summary of the MMB3 profile for an 8 hour day:

	Expected	Measured
Messages Submitted/MMB3/Day	85	85.7
Messages Delivered/MMB3/Day	210	213.6
Average Recipients per Message	2.47	2.49

3 Test Configuration

Describe below the configuration of the Exchange Server machines (physical) used for this test. If more then one, they should have an identical configuration.

Hardware	Exchange Server	Domain Controller (if remote)
Vendor	IBM Corporation	
Model	x206	
Processor	Intel Pentium 4 3.2GHz	
# of Processors (Physical)	1	
# of Processors (Logical)	2	
Hyper-Threading enabled?	Yes	
Primary Cache	Instruction: 12KB μops Data: 8KB	
Secondary Cache	512KB	
Other Cache	1MB	
Memory	4GB	
Disk Subsystem	1 – 73-GB disk for operating system 1 – 36-GB disk for Exchanger Server 2003 executable files 1 – 73-GB disk for Paging file 70 – 36-GB disks for Exchanger Server 2003 files	
Disk Controllers	1 - Integrated Adaptec U320 SCSI controller (operating system and paging files) 1 – Mylex eXtremeRAID 2000 controller (Exchange Server 2003 files) 1 – IBM ServeRAID 4Lx (Exchanger Server 2003 files)	
Other Hardware	1 – Integrated Intel$^®$ PRO/1000 Gigabit Ethernet controller	

Mail Software	Exchange Server	Domain Controller (if remote)
Vendor	Microsoft Corporation	n/a
Mail Server	Exchange Server	n/a
Release Version	**2003**	n/a
Operating System	**Exchange Server**	**Domain Controller (if remote)**
OS Version	Microsoft Windows Server 2003 Enterprise Edition	
Service Pack	None	
OS Hot-fixes/patches		
File System Type	NTFS	
Network	**Exchange Server**	**Domain Controller (if remote)**
Type of Network	Ethernet	
Network Speed	1 Gbit	
TCP/IP Offload/Checksum	Yes	
PCI Flow Control?		
Interrupt Coalescing?		

3.1 Load Generator Configuration

This section holds all the configuration parameters of the load generator machines used in the test.

# of Load Generators (LG)	9
Total # of LG processes	3,700
Simulated Users/Process	1 control client with 50 users 7 clients with 500 users each 1 client with 50 users
Model	X330
Processor	Intel Pentium® III
# of Processors (Physical)	1
# of Processors (Logical)	0
Hyper-Threading enabled?	N/A
Memory	1GB

Network Controller	Integrated IBM Netfinity 10/100 Ethernet Adapter
Network Bandwidth	100 Mbit
Operating System	Microsoft Windows Server 2003 Standard Edition

4 Additional Configuration and Tuning

Describe below in items any modifications done to the Exchange Server(s) and the server/client operating systems. These modifications include but are not restricted to performance tuning changes like registry keys and boot.ini settings. All modifications must be approved by Microsoft prior to the testing and submission of the MMB3 result.

Boot.ini Modifications:
/3GB
/userva=3030

Registry Changes:
HeadDeCommitFreeBlockThreshold=0x00040000