Exchange 2000 MAPI Messaging Benchmark (MMB2) Performance Result

Hardware: **IBM @server xSeries 360**
Software: **Exchange 2000 Enterprise Server**
Test Profile: **MAPI Messaging Benchmark**

The new MAPI Messaging Benchmark (MMB2) measures throughput in terms of a specific profile of user actions, executed over an 8-hour working day.

This benchmark is different from the "Medium User" setting that was used with Exchange 5.5 in that the rate of client requests is significantly greater for this MMB2 profile.

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 MMB2 results differ from deployment and configuration information, see Benchmark vs. Production Configuration Disclosure Note below.

Summary of Results

The IBM @server xSeries 360 was configured with four 1.6GHz Intel® Xeon™ MP processors and 4GB of memory. The Microsoft® LoadSim MMB2 profile was used, which represents the tasks typically performed by a corporate e-mail user. During the 4-hour steady state, the xSeries 360 provided a weighted 95th-percentile response time of 149 ms for 10,200 MMB2, with average send queue size of 65.6 and average CPU utilization of 72.6 percent.

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 IBM representative.

The MMB2 benchmark does not account for:

- Usage profiles that do not match that of the Load Simulator MAPI Medium profile
- Per-user storage and per-server backup requirements
- Fault tolerance requirements
- Workloads other than MAPI private folder access, including Public Folder, NNTP, POP3 and other e-mail interfaces
- Multiple Exchange Server deployments, in which additional resources are required to forward mail intra-site
- Connectors, links and replication to remote Exchange sites

Test Results

Summary	
Supported Benchmark Load	10,200 MMB2s
Benchmark Profile	MAPI Messaging Benchmark 2 (MMB2)
Protocol	Exchange MAPI
Length of Steady State	4 Hours
Length of Test	8 Hours
Unless otherwise noted, values listed below are averages over the entire 4-hour, steady-state period.	
Transactions in Total	
Total Messages Submitted	255,998
Total Message Recipients Delivered	936,756
Total Messages Sent	255,954
Ratio Message Recipients Delivered / Messages Submitted	3.66
Transaction Load (per Hour)	
Messages Submitted / Hour	64,000
Message Recipients Delivered / Hour	234,189
Messages Sent / Hour	63,989
Transaction Load (per Second)	
Message Opens/Sec	100.4
Folder Opens/Sec	42.6
RPC Read Bytes/Sec	224,735
RPC Write Bytes/Sec	1,687,570
Transaction Queues	
IS Send Queue Average Length	65.6
Processor Utilization	
System Processor Utilization (%)	72.6
System Processor Queue Length	5.9
System Context Switches/Sec	13,799
Process % CPU Time - Store	470
Process % CPU Time - Inetinfo	23
Exchange 2000 server is also domain controller? (Yes/No)	Yes
Process % CPU Time – LSASS (on domain controller)	33
Memory Utilization	
Available Bytes	1784MB
Pages/Sec	0.7
Process Working Set Bytes - Store	1.295GB
Process Virtual Bytes - Store	2.10GB
Logical Drive Utilization	
IS Database Disk Reads/Sec	1866
IS Database Disk Writes/Sec	1044
IS Database Average Disk Queue Length	1.9
IS Log Disk Reads/Sec	0
IS Log Disk Writes/Sec	906
IS Log Average Disk Queue Length	0.12

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Descriptive Terms

Messages Submitted

Submit calls made by clients. This equates to total messages sent by users.

Messages Sent

Messages that the Store sends to the categorizer in Inetinfo (SMTP Service in particular). [1]

Message Recipients Delivered

Separate mailboxes that messages have been delivered to.

Message Opens/Sec

Messages accessed for reading per second.

Folder Opens/Sec

Folders opened for browsing per second.

RPC Read Bytes/Sec

Bytes read from clients, sent via RPCs.

RPC Write Bytes/Sec

Bytes written to clients, sent via RPCs.

IS Send Queue Average Length

Send Queue Size is the number of messages in the private information store's send queue.

Response Times (Latencies)

Client Actions	95th Percentile Response Time (in Milliseconds)
Read	94
Send	265
Delete	63
Move	125
Submit	94
Weighted Total	**149**

Message Throughput

Summary of the MMB2 profile for an 8-hour day:

	Expected	**Measured**
Messages Submitted/MMB2/Day	51	50.2
Messages Delivered/MMB2/Day	185	183.7
Average Recipients per Message	3.63	3.66

- <List Any Modifications to the default profile – NONE >

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[1] All messages – even MAPI messages – are sent to the categorizer, as this replaces the MTA for all but communication via X.400, with an Exchange 5.5 server.

Server Configuration

Hardware	Exchange Server	Domain Controller (if remote)
Vendor	International Business Machines Corporation	N/a
Model	xSeries 360	N/a
Processor	1.6GHz Intel Xeon MP	N/a
Number of Processors	4	N/a
Primary Cache		N/a
Secondary Cache	256KB	N/a
Other Cache	1MB – L3 cache	N/a
Memory	4GB DDR DIMMs	N/a
Disk Subsystem	70 x 18.2GB in 5 EXP300 Storage Expansion units. 3 x 18.2GB internal disk drives	N/a
Disk Controllers	4 x IBM ServeRAID Adapters. 1 x Integrated SCSI Adapter.	N/a
Other Hardware	1 x Intel PRO/1000 Gigabit Server Adapters	N/a
Hardware Tunings	2 x 7 disks R0 for Exchange log files 4 x 14 disks R0 for 4 mail databases. OS and Exchange software are on one of internal drives, system log files are stored on the second internal drive, and the pagefile on the third internal drive.	N/a
Comments		N/a
Mail Software		N/a
Vendor	Microsoft Corporation	N/a
Mail Server	Exchange Server 2000	N/a
Build/Release Version	Enterprise Edition + SP1	N/a
Additional Software Tuning	None	N/a
OS Software		N/a
Operating System/Version	Microsoft Windows 2000 Advanced Server	N/a
Service Pack/Patch Info	SP2	N/a
File System Type	NTFS	N/a
Other Software		N/a
Network		N/a
Type of Network	Ethernet	N/a
Network Speed	1 gigabit Full Duplex	N/a
MSL (sec)	120	N/a
Time-Wait (sec)	60	N/a

Load Generator Configuration

Number of Load Generators (LG)	8
Total Number of LG processes	8
Simulated Users/Process	1300 on the first 7 clients and 1100 on the 8th client
Model	IBM Netfinity 4000R
Processor	650MHz Pentium II
Number of Processors	2
Memory	512MB
Network Controller	Integrated 10/100 Ethernet Controller
Operating System	Microsoft Windows 2000 Server