# Exchange 2000 MAPI Messaging Benchmark (MMB2) Performance Result

**Hardware:** **IBM @server x250**
**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 x250 was configured with four 900MHz Intel Pentium III Xeon 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 250 provided a weighted 95th-percentile response time of 245 ms for 7,600 MMB2, with average send queue size of 75 and average CPU utilization of 89 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 | 7,600 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 | 191,536 |
| Total Message Recipients Delivered | 701,294 |
| Total Messages Sent | 191,487 |
| Ratio Message Recipients Delivered / Messages Submitted | 3.66 |
| **Transaction Load (per hour)** | |
| Messages Submitted / hour | 47,751 |
| Message Recipients Delivered / hour | 174,838 |
| Messages Sent / hour | 47,739 |
| **Transaction Load (per Second)** | |
| Message Opens/Sec | 72.8 |
| Folder Opens/Sec | 37.4 |
| RPC Read Bytes/Sec | 171,986 |
| RPC Write Bytes/Sec | 1,239,737 |
| **Transaction Queues** | |
| IS Send Queue Average Length | 75 |
| **Processor Utilization** | |
| System Processor Utilization (%) | 89 |
| System Processor Queue Length | 12.4 |
| System Context Switches/Sec | 10,233 |
| Process % CPU Time - Store | 296 |
| Process % CPU Time - Inetinfo | 12.1 |
| Exchange 2000 server is also domain controller? (yes/no) | Yes |
| Process % CPU Time – LSASS (on domain controller) | 18.6 |
| **Memory Utilization** | |
| Available Bytes | 2043MB |
| Pages/Sec | 1.89 |
| Process Working Set Bytes - Store | 1.26 GB |
| Process Virtual Bytes - Store | 2.25GB |
| **Logical Drive Utilization (*see note 1)** | |
| IS Database Disk Reads/Sec | 1,280 |
| IS Database Disk Writes/Sec | 804 |
| IS Database Average Disk Queue Length | 3.46 |
| IS Log Disk Reads/Sec | 0 |
| IS Log Disk Writes/Sec | 818 |
| IS Log Average Disk Queue Length | 0.18 |

Note 1: Data were taken from the online system perfmon of a similar run. The data could not be logged into logfile.

## 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 | 172 |
| Send | 359 |
| Delete | 109 |
| Move | 218 |
| Submit | 156 |
| **Weighted Total** | **245** |

## Message Throughput

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

| | **Expected** | **Measured** |
|---|---|---|
| Messages Submitted/MMB2/Day | 51 | 50.3 |
| Messages Delivered/MMB2/Day | 185 | 184 |
| Average Recipients per Message | 3.6 | 3.66 |

- The standard MMB2 profile was used for testing

[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 250 | N/a |
| Processor | 900MHz Pentium III | N/a |
| Number of Processors | 4 | N/a |
| Primary Cache | 2MB | N/a |
| Secondary Cache | None | N/a |
| Other Cache | None | N/a |
| Memory | 4GB SDRAM DIMMs | N/a |
| Disk Subsystem | 1 x FAStT500 Storage Server<br>76 x 9.1GB and 4 x 18.2GB disk drives in 8 EXP500 Storage Expansion units.<br>2 x 18.2GB internal disk drives | N/a |
| Disk Controllers | 2 x IBM FASt Host Adapters.<br>1 x Integrated SCSI Adapter. | N/a |
| Other Hardware | 2 Netfinity 10/100 Ethernet Adapters | N/a |
| Hardware Tunings | 2 x (1+1) disk R0 for Exchange log files<br>2 x 38 disks R0 for 2 mail storage groups.<br>Each group has two mail databases. Each database has 19 disks.<br>OS and Exchange software are on one of the internal drives and log files are stored on the other 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 | Windows 2000 Advanced Server – Build 2195. Exchange 2000 Server – Enterprise Edition RTM Release. | N/a |
| Additional Software Tuning | None | N/a |
| **OS Software** | | N/a |
| Operating System/Version | Microsoft Windows 2000 Advanced Server, Build 2195 | N/a |
| Service Pack/Patch Info | SP1 | N/a |
| File System Type | NTFS | N/a |
| Other Software | | N/a |
| **Network** | | N/a |
| Type of Network | Ethernet | N/a |
| Network Speed | 100Mbps 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 | 950 |
| Model | IBM NF 4000R |
| Processor | 650MHz Pentium II |
| Number of Processors | 2 |
| Memory | 512MB |
| Network Controller | Integrated 10/100 Ethernet Controller |
| Operating System | Microsoft Windows 2000 Server |