Compaq ActiveAnswers

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Prepared by Knowledge Management and Messaging Business Unit

Enterprise Solutions Division

Compaq Computer Corporation

Contents

Compaq achieves highest MMB number to date: 33,400 MMB on its ProLiant 8500 550/2m system with Windows 2000

Abstract: *Using Microsoft Windows 2000 and Microsoft Exchange V5.5, Compaq demonstrated a 33,400 Exchange MAPI Messaging Benchmark (MMB) operating on a ProLiant 8500 powered by eight - 550 megahertz (MHz) Intel Pentium® III Xeon™ processors.*

Compaq achieved new record-breaking Exchange Server scalability by achieving ***33,400 MMB*** *with a* ***200-millisecond*** *response time on a ProLiant 8500 server equipped with eight 550-MHz Intel Pentium® III Xeon™ processors. Using Microsoft's Load Simulation utility, the ProLiant 8500 with eight 550-MHz processors was tested at Compaq's Performance Center in Nashua, New Hampshire. This performance result demonstrates the highest numbers of benchmarked MMB to date on ANY 8-processor system, from ANY vendor. It also shows that migrating from NT4.0 to Windows 2000 in an Exchange environment will show an improvement in performance.*

The Compaq ProLiant 8500 provided an average CPU utilization rate of 51.9% during the 33,400 MMB test. The weighted 95th percentile response-time score was 200 milliseconds, and the average send-queue size for the four-hour steady state was 77 messages.

Compaq enables a confident deployment and management of Microsoft Exchange Server on their products by conducting extensive integration engineering and capacity planning. Microsoft Exchange Server has been the focal point for extensive development and testing by both Microsoft and Compaq. Throughout this activity, Compaq and Microsoft have worked to optimize Microsoft Exchange Server performance on Compaq server products in order to provide an optimal balance between performance, availability, manageability, and cost. Compaq not only provides world-class server platforms, but also the experience necessary for successful deployments of messaging and collaborative applications.

Notice

Compaq achieves highest MMB number to date: 33,400 MMB on its ProLiant 8500 550/2m system with Windows 2000
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Introduction

Compaq ProLiant 8500

The Compaq ProLiant 8500 is the ultimate standards-based server delivering the most scalable performance and the highest levels of availability. The ProLiant 8500 supports up to eight Pentium® III Xeon™ processors and 8 GB of system memory. Its architecture supports Enhanced PCI Hot-Plug and eleven 64-bit PCI slots. Combined with the latest high-availability features and processor technology, the ProLiant 8500 is designed for the most demanding and mission-critical applications.

- 8-Way Symmetric Multi-Processor (SMP) Profusion architecture with near-linear scalability for Microsoft Windows NT 4.0, Microsoft Windows 2000, Netware, SCO Unix, and memory - intensive, and processor-intensive applications.
- Up to eight 550MHz PIII Xeon processor with five 100MHz front-side busses.
- 512KB, 1MB, or 2MB of L2 Cache depending on model.
- 7U Form factor (12.25 inch); server comes with sliding rails, Enhanced/Advanced Cable Management Arm, and integrated lift handles.
- Dual memory bus architecture
- 2 x Cache Accelerators , required when 5 or more processors are configured.
- 256MB to 2GB of ECC, 100MHz, Registered SDRAM; maximum of 8GB on a single Memory Board of 16 DIMM sockets. 2 SDRAM DIMMs per bank.
- Service Features: 3 removable non-hot plug Service Modules consisting of the Processor/Memory, I/O Expansion, and Media Modules. There are System Interconnect Status Indicators that can be viewed from retracting the server's top cover.
- Redundant hot-plug fans in all models.
- 2 x Redundant hot-plug 1150/500 Watt Power Supplies; (1 x Power Supply in Model 1) [1]
- 11 Hot Plug, PCI, 64-bit, I/O Expansion slots: Nine 33-MHz slots, two 66-MHz slots on three PCI buses. (ISA and EISA slots are not available)
- 2 half-height removable media bays.
- PCI Hot Plug Button, and LED functionality on all expansion slots.
- Supports up to four Wide Ultra2 SCSI disk drives in an internal LVD, Low Voltage Differential, drive cage.
- Integrated, Dual Channel, Wide Ultra2 SCSI Smart Array Controller. Channel 1 is dedicated to the internal LVD drive cage. Channel 2 can be interfaced externally to optional tape drives and Wide Ultra SCSI-3 and Fast-Wide SCSI-2 storage options.
- 1.44 diskette drive and 24X or greater MAX IDE CDROM occupies the only non hot plug removable media bays in the server.
- NIC: PC164, NC10/100 PCI UTP occupying a single slot.
- External connections: VHDCI for Channel 2 of the Integrated Smart Array Controller, two Serial ports, keyboard, video, and mouse.
- Video: PCI video controller providing a maximum of 1024 x 768 non-interlaced resolution with 2MB of memory.
- Redundant System ROM image providing backup in case primary firmware is corrupted.
- Operating System support for Windows NT, Novell, and SCO.
- Integrated Management Display (optional in Model 1)
- Warranty: Three year parts, labor, and On-Site

For more information about the ProLiant 8500, please refer to the Compaq web site, at http://www.compaq.com/products/servers/proliant8500/index.html.

Test Methodology

The tests were conducted using Microsoft Messaging Application Program Interface (MAPI) Messaging Benchmark. The MAPI Messaging Benchmark (MMB) measures throughput in terms of a specific profile of user actions, executed over an 8-hour working day. This benchmark utilizes the 'Medium User' setting of the Load Simulator (LoadSim) MAPI tool. Results should be interpreted as a benchmark for comparing messaging throughput of various servers and configurations and should not be confused with deployment recommendations. Factors such as backup/restore, topology and other issues should be considered when planning a deployment.

Exchange Server Performance Test Results

Test Result Highlights

Table 1: Performance Highlights (Compaq ProLiant 8500, (8) Pentium III Xeon 550-MHz)

MAPI Messaging Benchmark (MMB)	33,400
Response Time (milliseconds)	200
Messages Submitted (4-hour steady-state period)	226,900
Message Recipients Delivered (4-hour steady-state period)	1,250,348
Messages Sent (4-hour steady-state period)	61,074

Note: Complete disclosure of test results can be found in Appendix A of this document.

Table 2: Tested Configuration

COMPAQ PROLIANT 8500 TESTED CONFIGURATION
Eight (8) Pentium III Xeon 550-MHz Processors – 2 MB L2 cache per processor
4 GB RAM
One (1) Compaq SMART 3200 Array Controller with 64 MB Cache; three (3) Compaq KGPSA Fibre Controllers OS/Exchange DS/MTA Files: Two (1 + 1) 4.3-GB Drives – RAID 1 Pagefile: One (1) 4.3-GB Drive Exchange Log Files: six (3 + 3) 4.3-GB Drives – RAID 0+1 Exchange Information Store Files: Seventy-two (72) 4.3-GB Drives – RAID 0
Compaq NC3131 64 bit dual-port 10/100 Controller – 2 ports
Windows NT 2000 Advanced Server – Build 2195 Exchange Server Version 5.5 – Enterprise Edition with Service Pack 3

Note: Complete disclosure of test results can be found in Appendix A of this document.

What the Benchmarks Don't Tell You

It is important to understand that benchmarks such as these are designed to give planners of Exchange Server implementations baseline references for understanding and comparing the relative capabilities of hardware platforms from a single vendor such as Compaq or among competing hardware vendors. When interpreting these benchmarks, two things should be kept in mind.

First, consider whether benchmark tests are performed on what can be referred to as *customer-deployable configurations.* A hardware vendor may publish a result that is based on a platform or configuration that should not be deployed in a "real world" Exchange Server deployment. For example, many vendors (including Compaq) publish results using disk subsystems configured with RAID0. While RAID0 does provide the highest levels of disk subsystem performance, it fails to provide any protection against data loss. Compaq recommends deploying an Exchange Server with disk fault tolerance such as RAID1 or RAID5 for the highest levels of data protection.

Second, most vendors, including Compaq, conduct benchmark tests for Exchange Server that are *single-server* in nature. Also keep in mind that benchmarks do not account for issues such as backup and disaster recovery or information-store-maintenance sizing. Whatever the issue, care must be taken when interpreting benchmarks to ensure that they represent useful information for your Exchange Server deployment and are based on valid simulation methodologies.

While it is significant that the Compaq ProLiant 8500 server can successfully scale to 33,400 MMB in a single-server benchmark exercise, Compaq recommends careful evaluation of all issues involved in real-world Exchange Server deployments – issues such as management, administration, and disaster recovery.

MAPI Messaging Benchmark (MMB) – LoadSim Medium User Redefined

To distinguish clearly between throughput benchmarks and capacity planning information for Microsoft Exchange Server, Microsoft has established the MAPI Messaging Benchmark (MMB) based on the workload from LoadSim Medium User profile. The MAPI Messaging Benchmark representative workload focuses on the resulting throughput and clearly communicates the profile under test.

The workload profile has not changed from the LoadSim Medium User profile formerly used, but is now expressed in clearer fashion. The intent is to make sure that customers can understand the MAPI Messaging Benchmark workload and can compare the MMB for one platform to the MMB for other platforms. In addition, the renaming of the benchmark reinforces the fact that the test is a measurement of messaging throughput and that additional considerations are required in capacity planning.

MMB Transaction Load

The transaction load created by the benchmark is equivalent to the user actions outlined in Table 3 over an eight-hour day.

Table 3: MMB Transaction Load

User Action	Actions Per Day
Check Inbox	12
Send Message	14.18
Avg. Recipients per Message	4.7
Messages Received	66.3
Read Message	81.3
Move Message	16.3
Delete Message	32.5
Update Calendar	5

Thirty percent of all mail messages have one distribution-list recipient. The average size of the distribution list (DL) is ten recipients. (Recipients created by distribution lists are included in the summary transaction load outlined in Table 3). All users are logged on prior to the benchmark measurement as the users are assumed to be using mail in a corporate setting. Mail is not cleared from the deleted-items folder during the test as this is assumed to occur when the user logs off.

Message Mix Description

The weights used when the Load Simulator randomly selects which message to send are listed in the following Table 4.

Table 4: Weights Given to Different Types of Messages in LoadSim Random Selection

Message Files	Body	Attachment	Content Description	Weight
Ups1k.msg	1K		Body as RTF	60
Ups2k.msg	2K		Body as RTF	16
Ups4k.msg	4K		Body as RTF	4
Ups10kat.msg	1K	10K	Body as RTF	6
			Notepad attachment	
Upsxlatt.msg	1K	15K	Body as RTF Microsoft Excel spreadsheet attached	4
Upswdatt.msg	1K	16K	Body as RTF	4
			Microsoft Word document attached	
Upsbmobj.msg	0.5K	43K	Body as RTF	2
			Bitmap attachment	
Upsxlobj.msg	1K	17K	Body as RTF	4
			Excel spreadsheet attachment	

Load Simulator

The tool used in generating the workload for the MMB benchmark was Microsoft Load Simulator (LoadSim). Load Simulator is a tool for simulating a client-user load on a server running Microsoft Exchange. Its purpose is to enable a single Windows NT server, called a LoadSim client, to simulate multiple Microsoft Exchange client users.

The operation of Load Simulator users is governed by a Load Simulator profile. This profile controls factors such as how long a Load Simulator "day" is, how many e-mail messages to send in a day's time, how many times to open and read e-mail, whether to use distribution lists, whether to use public folders, etc.

Load Simulator creates a highly accurate simulation of reality. It mimics the full Microsoft Exchange Client in many respects. First, it uses .MSG files, the same format used by the Exchange Client. This guarantees that messages generated by Load Simulator have the same properties as those sent by actual users of the Exchange Client. Second, Load Simulator uses the same MAPI remote-procedure-call (RPC) semantics as those used by the Client. Third, Load Simulator registers MAPI change notifications in the same manner as they are registered by the Client. Finally, Load Simulator even emulates the Microsoft Exchange Client list-box cache, which the Client uses for folder and message panes in the viewer when a user browses and selects messages on the server. For more information on LoadSim Medium canonical profiles, refer to the LoadSim homepage at http://www.microsoft.com/.

Appendix A

LoadSim Client

Table A-1 details the configuration of the LoadSim clients used to simulate multiple Microsoft Exchange users generating the MMB workload for the MMB measurement.

Table A-1: Configuration of LoadSim Client

LoadSim Clients	Configuration
Model	Compaq Deskpro EN 450
Client CPU types and speeds	1P/450-MHz Pentium II processor
Number of clients	43 clients with 256 MB RAM (1000 users for 28; 750 users for 2; 500 users for 6; 200 users for 2 systems; 100 users for five systems)
Network Topology (100Base T, Token Ring, etc.)	100 Base-TX
Network Controllers	Compaq NC3131
Client network software name and version	Microsoft Windows NT Workstation 4.0 with SP-5
LoadSim version	5.5 (Build 2187)

Performance Data

Performance data for the MMB measurement are detailed in Table A-2.

Table A-2: 33,400 MMB (Measured During Test Run at Steady State)

Summary	
Supported Benchmark Load	33,400 MMB
Benchmark Profile	MAPI Messaging Benchmark
Protocol	Exchange MAPI
Length of Steady State	4 hours
Length of Test	9 hours
Unless otherwise noted, values listed are averages over entire steady state period.	
Transaction Load (hourly)	
Messages Submitted	56728.94
Message Recipients Delivered	312608.71
Messages Sent	15269.56

continued

Table A-2 *(continued)*

Transaction Load (per Second)	
Message Opens/Sec	109.1
Folder Opens/Sec	30.3
RPC Read Bytes/Sec	103668
RPC Write Bytes/Sec	653963
Transaction Queues	
IS Send Queue Average Length	77
MTA Work Queue Average Length	4.5
Processor Utilization	
System Processor Utilization (%)	51.9
System Processor Queue Length	3.4
System Context Switches/Sec	23688
Process % CPU Time - Store	352.4%
Process % CPU Time - DS	14.5%
Process % CPU Time - MTA	15.3%
Memory Utilization	
Available Bytes	1.73GB
Pages/Sec	0.009
Process Working Set Bytes - Store	1.67GB
Process Virtual Bytes - Store	2.69GB
Logical Drive Utilization	
IS Database Disk Reads/Sec	2121.3
IS Database Disk Writes/Sec	615.4
IS Database Average Disk Queue Length	4
IS Log Disk Reads/Sec	0.0
IS Log Disk Writes/Sec	172.6
IS Log Average Disk Queue Length	0.08

Note: Performance Results were measured using Microsoft Windows NT Performance Monitor. Measurements were obtained by measuring averages for the period of steady-state activity (i.e. after 33,400 users were successfully logged on). Tests measure the messaging throughput of a single-server, single-site topology.

For deployment-specific information contact a Microsoft or Compaq representative. More information can be found at**:**

http://www.microsoft.com/exchange/DeployAdmin/DeployAdmin.htm

User Response Times

Table A-3 details response times for various user actions during benchmark testing.

Table A-3: User Response Times (Latencies) from Load Simulator

Client Actions	95th-Percentile Response Time (in Milliseconds)
Read	160
Send	300
Delete	260
Move	260
Submit	210

Descriptive Terms

Messages Submitted

Submit calls made by clients. This equates to total message sends by users.

Messages Sent

Messages that the Information Store sends to the MTA (not messages sent by clients). Normally all messages submitted by the clients are sent to the MTA, except in the case where all recipients are local mailboxes. In that case, since all the deliveries can be performed locally, no message is sent to the MTA.

Message Recipients Delivered

Separate mailboxes that messages have been delivered to. Think of this as the number of Reads that are 'caused' by sending a message (one per recipient).

Message Opens/Sec

Messages accessed for reading per second.

Folder Opens/Sec

Folders opened for browsing per second.

RPC Read Bytes/Sec

RPC Bytes read from clients (i.e., submit calls).

RPC Write Bytes/Sec

RPC Bytes written to clients (i.e., message opens).

IS Send Queue Average Length

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

MTA Work Queue Average Length

Work Queue Length is the number of outstanding messages in the Work Queue, which indicates the number of messages not yet processed to completion by the MTA.

Appendix B: Related Documents

The following key documents and locations provide a wealth of information regarding successful deployment of Microsoft Exchange Server on Compaq platforms.

Compaq ActiveAnswers

www.compaq.com/activeanswers

Managing and Monitoring Microsoft Exchange Server

Microsoft Exchange Server Backup and Restore Performance using Compaq 35/70 DLT Arrays

Microsoft Exchange Server Performance and Tuning Guide

Implementing High Availability for Microsoft Exchange Server

Compaq White Paper Index

www.compaq.com/support/techpubs/whitepapers

Compaq TechNote Index

www.compaq.com/support/techpubs

RAID Technology for Database Servers

Microsoft Exchange Server Web site

www.microsoft.com/exchange