Compaq ActiveAnswers

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Prepared by Knowledge Management and Messaging Business Unit

Industry Standard Server Group

Compaq Computer Corporation

Contents

Compaq Achieves 13, 000 MMB on the ProLiant ML530 800MHz System with Windows 2000

Abstract: *Using Microsoft Windows 2000 and Microsoft Exchange V5.5, Compaq demonstrated a 13,000 Exchange MAPI Messaging Benchmark (MMB) operating on a ProLiant ML530 powered by one 800-megahertz (MHz) Intel Pentium III Xeon processors.*

Compaq achieved new record-breaking Exchange Server scalability by reaching ***13,000 MMB*** *on a ProLiant ML530 server equipped with one 800-MHz Intel Pentium III Xeon processors. Using Microsoft's Load Simulation utility, the ProLiant ML530 was tested at Compaq's Performance Center in Nashua, New Hampshire.* ***This performance test resulted in the highest numbers of a benchmarked MMB to date on any single-processor system, from any vendor.***

The Compaq ProLiant ML530 provided an average CPU utilization rate of ***83.9%*** *during the 13,000 MMB test. The weighted 95th percentile response-time score was* ***204 milliseconds,*** *and the average send-queue size for the four-hour steady-state period was* ***14 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

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Introduction

Compaq ProLiant ML530

The ProLiant ML530, the world's fastest 2-way server, combines maximum performance with ultimate expansion and manageability features. With the next generation Highly Parallel System Architecture, 133MHz SDRAM, 64-bit/66MHz PCI, and the new Pentium III 800MHz and 866MHz Xeon processors, the ML530 provides the fastest overall 2-way system performance.

In addition to its leading performance, the new ML530 is also optimized for maximum internal system expansion. The ML530 features sixteen bays including twelve hot-plug hard drive bays, eight PCI slots, memory expandable to 4GB, and dual processing support ensuring that it provides the highest level of IT investment protection by enabling the server to grow with your business and application requirements. Combined with its performance and expansion capabilities, the ML530 also features industry leading management tools including Compaq Remote Insight Lights-Out management support, Compaq Insight Manager, and SmartStart guaranteeing maximum network uptime and simplicity of ownership.

- Intel Pentium® III Xeon Processor (dual processor capability)
- Next generation Highly Parallel System Architecture featuring the RCC LE 3.0 Chipset with 133MHz Front Side Bus
- 64-Bit PCI for latest I/O performance
- 133MHz SDRAM
- Memory expansion to 4GB
- 16 media bays: twelve Hot Pluggable hard drive bays, two 5.25-inch removable media bays, CD ROM, and floppy
- Internal hot pluggable storage capacity up to 218.4 GB
- Eight total PCI slots: two 64-Bit, 66Mhz PCI, five 64-Bit, 33Mhz PCI, and one 32-Bit, 33Mhz PCI
- Redundant Hot Plug system fans support
- Hot Pluggable hard drives
- 450-Watt Hot Pluggable Redundant Power Supply support
- Redundant NIC support
- Prefailure Alerting on hard drives, processors and memory allows replacement of a degraded component before it fails
- ECC protected memory
- Lights Out Management support
- Newly designed chassis improves serviceability by featuring a pull-out electronics drawer that allows easy access to all system board components
- Modular, tool-free internal design simplifies access to all components of the system for easier maintenance and upgrade saving the customer valuable IT resource time
- Quick release levers for processors, memory board, removable media - and peripheral boards enable tool-free upgrades
- Unique cable management features color coding for easy identification reducing service time and support costs
- Diagnostic lighting provides status indication of degraded or failed components in the major subsystems for quick and easy hardware diagnostics
- Lights Out Management Support
- Compaq Insight Manager, SmartStart, Integrated Remote Console (IRC) and Automatic Server Recovery-2 (ASR-2)
- Protected by a global three-year, on-site limited warranty with next business day response, and extended Pre-Failure Warranty, which covers processors, memory and disk drives, as well as a wide range of Compaq Services.

- Customer driven interior system fan design

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 ML530, (1) Pentium III Xeon 800-MHz)

MAPI Messaging Benchmark (MMB)	13,000
Response Time (milliseconds)	204
Messages Submitted (4-hour steady-state period)	93,417
Message Recipients Delivered (4-hour steady-state period)	524,905
Messages Sent (4-hour steady-state period)	25,676

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

Table 2: Tested Configuration

COMPAQ PROLIANT ML530 TESTED CONFIGURATION
One (1) Pentium III Xeon 800-MHz Processors – 256K L2 cache per processor
4 GB RAM
One (1) Compaq SMART 4200 Array Controller One (1) ML530 Integrated Controller OS/Exchange DS/MTA Files (4GB): Two (1 + 1) 9.2-GB Drive – RAID 1 Pagefile: (2nd partition on System Disk) Exchange Log Files: two (1 + 1) 9.2-GB Drives– RAID 1 Exchange Information Store Files: Twenty-four (24) 9.2-GB Drives – RAID 0
Compaq NC3134 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 ML530 server can successfully scale to 13,000 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 documentation, which can be found 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/500-MHz Pentium III processor 256Mb Memory
Number of clients	10 clients @ 1000 MMB for 10,000 2 clients @ 500 MMB for 1000 8 clients @ 250 MMB for 2000
Network Topology (100Base T, Token Ring, etc.)	100 Base-TX
Network Controllers	Compaq 10/100 TX
Client network software name and version	Windows 2000 Professional (B.2195)
LoadSim version	5.5 (Build 2187)

Performance Data

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

Table A-2: 13, 000 MMB (Measured During Test Run at Steady State)

Summary	
Supported Benchmark Load	13, 000 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	23,354
Message Recipients Delivered	131,226
Messages Sent	6419

continued

Table A-2 *(continued)*

Transaction Load (per Second)	
Message Opens/Sec	47.9
Folder Opens/Sec	12.1
RPC Read Bytes/Sec	42,010
RPC Write Bytes/Sec	270,435
Transaction Queues	
IS Send Queue Average Length	14
MTA Work Queue Average Length	3.7
Processor Utilization	
System Processor Utilization (%)	83.9%
System Processor Queue Length	13
System Context Switches/Sec	2,926
Process % CPU Time - Store	67%
Process % CPU Time - DS	4.9%
Process % CPU Time - MTA	6.7%
Memory Utilization	
Available Bytes	2.2 GB
Pages/Sec	0.008
Process Working Set Bytes - Store	1.6 GB
Process Virtual Bytes - Store	2 GB
Logical Drive Utilization	
IS Database Disk Reads/Sec	316.18
IS Database Disk Writes/Sec	196.5
IS Database Average Disk Queue Length	0.7
IS Log Disk Reads/Sec	0.0
IS Log Disk Writes/Sec	100
IS Log Average Disk Queue Length	0.0

Note: Performance Results were measured using Microsoft NT Performance Monitor. Measurements were obtained by measuring averages for the period of steady-state activity (i.e. after 13.0000 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	130
Send	370
Delete	280
Move	381
Submit	300

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 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