

December 1998
ECG042/1298

Prepared by Messaging and
Collaboration Solutions Business
Unit

Compaq Computer Corporation

Contents

| | |
|--|-----------|
| Compaq DS7310 Server | 3 |
| Executive Summary | 3 |
| Performance Results..... | 4 |
| Appendix A: Test Disclosure | 8 |
| Performance Data | |
| Disclosure..... | 8 |
| Descriptive Terms..... | 9 |
| Appendix B: Related | |
| Documents | 11 |

Microsoft Exchange Server 5.5 on the Compaq DS 7310 Server

Abstract: In a demonstration of Microsoft Exchange Server 5.5 scalability, the Compaq DS7310 Server with up to four 600 MHz processors was tested with user loads of up to 13,500 simultaneous MAPI e-mail users. The Compaq DS7310 Server has been designed for any business that requires scalability, expandability, and flexibility of a high-performance server system.

Compaq enables a confident deployment and management of Microsoft Exchange Server on its products by conducting extensive integration engineering and capacity planning at Compaq's Messaging and Collaboration Solutions Business Group located in Nashua, New Hampshire. 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 to provide an optimal balance between performance, availability, manageability, and cost. Compaq also provides the experience necessary for the successful deployment of messaging and collaborative applications.

Notice

The information in this publication is confidential and proprietary to Compaq and is protected by the terms of an end-user license agreement. The information is subject to change without notice and is provided “AS IS” WITHOUT WARRANTY OF ANY KIND. THE ENTIRE RISK ARISING OUT OF THE USE OF THIS INFORMATION REMAINS WITH RECIPIENT. IN NO EVENT SHALL COMPAQ BE LIABLE FOR ANY DIRECT, CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER DAMAGES WHATSOEVER (INCLUDING WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION OR LOSS OF BUSINESS INFORMATION), EVEN IF COMPAQ HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

The limited warranties for Compaq products are exclusively set forth in the documentation accompanying such products. Nothing herein should be construed as constituting a further or additional warranty.

This publication does not constitute an endorsement of the product or products that were tested. The configuration or configurations tested or described may or may not be the only available solution. This test is not a determination of product quality or correctness, nor does it ensure compliance with any federal state or local requirements.

The software described in this guide is furnished under a license agreement or nondisclosure agreement. The software may be used or copied only in accordance with the terms of the agreement.

Compaq, Deskpro, Fastart, Compaq Insight Manager, Systempro, Systempro/LT, ProLiant, ROMPaq, QVision, SmartStart, NetFlex, QuickFind, PaqFax, ProSignia, are registered with the United States Patent and Trademark Office.

Netelligent, Systempro/XL, SoftPaq, QuickBlank, QuickLock are trademarks and/or service marks of Compaq Computer Corporation.

Microsoft, Windows, Microsoft Exchange, Windows NT, are trademarks and/or registered trademarks of Microsoft Corporation.

Pentium is a registered trademark of Intel Corporation.

Other product names mentioned herein may be trademarks and/or registered trademarks of their respective companies.

©1998 Compaq Computer Corporation. All rights reserved. Printed in the U.S.A.

Microsoft Exchange Server 5.5 on the Compaq DS 7310 Server
Solutions Guide prepared by Messaging and Collaboration Solutions Business Unit

First Edition (December 1998)
Document Number ECG042/1298

Compaq DS7310 Server

The Compaq DS7310 Server is a system that employs four 600 MHz Alpha processors with 8 MB of secondary cache per processor. This member of the Compaq DS Server (Alpha processor-based) family achieved 9,500 MMBs (MAPI Messaging Benchmark) on a two-processor system and 13,500 MMBs on four-processors, based on the Microsoft Exchange 5.5 MAPI Messaging Benchmark Policy Guidelines V1.1. These numbers have been verified by Microsoft.

Executive Summary

These test results show the maximum MMB load that Exchange Server 5.5 can support using the Exchange MAPI/RPC protocol on a Compaq DS7310 Server configured with two and four processors. (See Table 3 for Compaq DS7310 Server Tested Configurations). The tests were conducted using Microsoft's LoadSim Tool. Default settings were used for the LoadSim user profiles. The process adhered to the specific practices as described in the Load Simulator 5.5 User Guide for test setup, configuration, and monitoring. All testing was conducted using a steady state period of four hours.

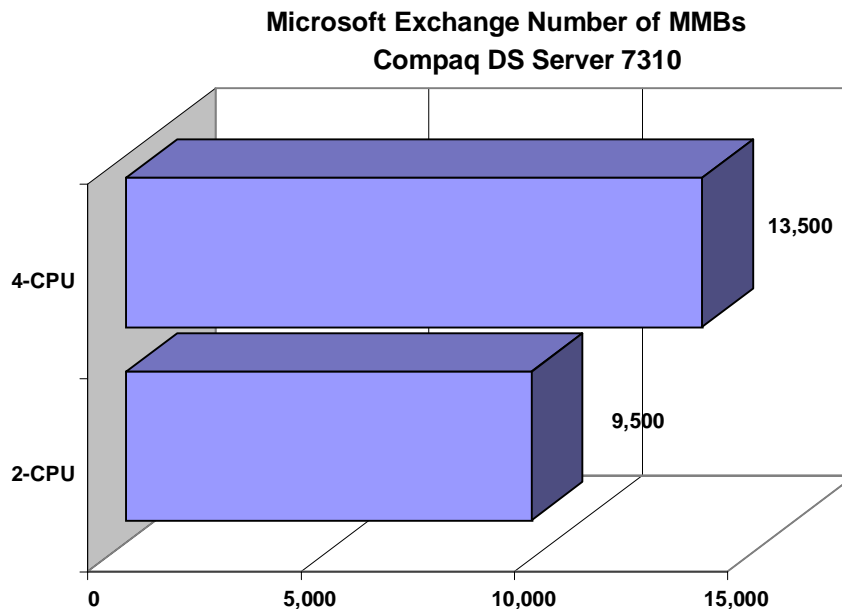


Figure 1. Microsoft Certified Number of MMB's

Table 1: Test Result Highlights

| Test Result Highlights | 2-Processors | 4-Processors |
|--|--------------|--------------|
| Max Users per server (UPS) | 9,500 | 13,500 |
| 95 th percentile response time (ms) | 337 | 300 |
| Average CPU Utilization | 79% | 78% |
| Average Send Queue Size | 2.6 | 3.6 |

Performance Results

The benchmark was conducted using Microsoft's Load Simulator tool. For each test, the Load Simulator Medium MAPI canonical profile was chosen. The Medium MAPI profile reflects the task workload of a typical corporate e-mail user, including common daily mail tasks such as send, browse, read, and forward, as well as calendaring tasks and distribution list usage. The Response Time score represents a 95th-percentile score of the measured test run. The score is expressed in milliseconds (ms). The Compaq DS7310 Server Response Time score of 337 ms for the 2-processor configuration and 300 ms for the 4-processor configuration is well below the 1000 ms acceptable threshold for e-mail users utilizing Exchange Server's MAPI protocol. Microsoft has certified these benchmark results based on the Microsoft Exchange Server 5.5 MAPI Messaging Benchmark (MMB) Policy Guidelines V1.1.

Table 2. Performance Highlights (Compaq DS7310 Server)

| | | |
|--|-------------|--------------|
| Number of Processors | 2 | 4 |
| Supported Benchmark Load | 9500 | 13,500 |
| Response Time (milliseconds) | 337 | 300 |
| Messages Submitted (4-hr steady state period) | 17224.74/hr | 23879/hr |
| Messages Recipients Delivered (4-hr steady state period) | 95087.75/hr | 132540.25/hr |
| Messages Sent (4-hr steady state period) | 4692.25/hr | 6468.75/hr |

Note: Test results based on Microsoft Exchange Server 5.5 MMB Policy Guidelines V1.1. The test result disclosure can be found in Appendix A.

Table 3. Compaq DS7310 Server Tested Configurations

| | |
|---|--|
| (2) Alpha 5/600 – 8Mb secondary cache per processor | (4) Alpha 5/600 – 8Mb secondary cache per processor |
| 2Gb of memory with 950Mb set in the Exchange Optimizer | 2Gb of memory with 1350Mb set in the Exchange Optimizer |
| KZPSC-BA and KZPBA-CB OS/Pagefile/Exchange DS/MTA Files: (1) 4Gb drive Exchange Log Files: (2) 4Gb drives – RAID0 Exchange Information Store Files: (24) 4Gb drives – RAID0 (Subsequent tests showed the same MMB number could be achieved with a total of only 12 disks) | KZPSC-BA and KZPBA-CB OS/MTA Files: (1) 4Gb drive Pagefile: (1) 2Gb drive Directory: (2) 4Gb drives Exchange Log Files: (3) 4Gb drives – RAID0 Exchange Information Store Files: (40) 4Gb drives – RAID0 (Subsequent tests showed the same MMB number could be achieved with a total of only 16 disks) |
| Ethernet 10-BASET | (2) Ethernet 10-BASET |
| Microsoft Windows Enterprise Server NT 4.0 with SP 3 Exchange Server V5.5 –Enterprise Edition | Microsoft Windows Enterprise Server NT 4.0 with SP 3 Exchange Server V5.5 –Enterprise Edition |

Note: RAID0 does not provide fault tolerance. Compaq does not recommend this configuration for production Exchange servers. For deployment specific information, contact a Compaq or Microsoft representative. More information can be found at:

www.microsoft.com/exchange/support/deployment/planning/deploy.asp?A=5&B=1

What the Benchmarks Don't Tell You

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

1. Consider whether benchmarks 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 have published results using disk subsystems configured with RAID0 disk arrays. While RAID0 does provide the highest levels of disk subsystem performance, it fails to provide any protection against data loss. In addition, most vendors, including Compaq, conduct benchmarks for Microsoft Exchange Server that are single-server in nature. In the real world of messaging, customer sites are usually multi-server and multi-site. Single-server, single-site lab benchmarks do not account for the communication demands from other servers on the network.
2. 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 they represent useful information for your Exchange Server deployment and they are based on valid simulation methodologies.

While it is significant that the Compaq DS7310 Server can successfully scale up to 13,500 MMBs in a single site, single store benchmark exercise, Compaq does not recommend deploying 13,500 users on this configuration. Compaq does recommend, however, careful evaluation of all issues involved in real-world Exchange Server deployments, such as management, administration, and disaster recovery.

Load Simulator

The main tool used in generating the workload for this scalability demonstration was the Microsoft Exchange Server Load Simulation utility called Load Simulator. Load Simulator is a tool for simulating a client user load on an Exchange Server. Its purpose is to enable a single Windows NT machine, 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 the following:

- the length of a Load Simulator "day"
- 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

Load Simulator creates a highly accurate simulation of reality. It mimics the full Microsoft Exchange Client in many respects, as follows:

- Load Simulator 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 real users of the Exchange Client.
- Load Simulator uses the same MAPI remote procedure call (RPC) semantics as those used by the Client.
- Load Simulator registers MAPI change notifications in the same manner as they are registered by the Client.
- 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.

The following steps are necessary to perform a successful simulation:

- The Load Simulator setup and initialization process comes first Load Simulator creates the test topology by generating the user directory entries.
- Next, the test store is initialized and populated with the test messages and folder items.
- The tests are typically run for up to 8 hours, depending upon the user load simulated and amount of time required for reaching a steady state for measurement purposes.
- During a test run, users log on to the Exchange Server and begin processing various messaging tasks.
- Task response time data is logged to the LSPERF.LOG file and client messages and error loggings are stored in the LOADSIM.OUT file.

- To produce test scores, the LSLOG utility is used to parse the LSPERF.LOG file and calculate the response time score. By default, 95th- and 50th-percentile response time scores are calculated. Ninety-fifth-percentile response time scores for the MAPI/RPC protocol should be less than 1000 ms, according to Microsoft.
- Also, the Exchange Server IS Send Queue and the MTA Work Queue (other message and delivery queues should also be considered, depending on the protocol) must consistently return to near-zero during the steady-state period for which test measurements are taken. Queues that continue to grow and fail to return to near-zero indicate that the server is not sustaining the required workload.
- There should be no errors logged by the LoadSim clients during the test.

When these conditions are met, a successful test run has been completed.

For more information on LoadSim Medium canonical profiles, please refer to the LoadSim documentation at: www.microsoft.com/exchange/library/loadsim55x86.exe.

Balancing Scalability and Availability

While server performance and capacity are key criteria in selecting a messaging deployment platform, one must also consider price and performance. Several competing hardware vendors offer platforms capable of supporting heavy user loads. They also provide these systems at a price significantly higher than Compaq's price. However, Compaq delivers leading performance on industry-standard platforms with the lowest total cost of ownership.

For many corporations, messaging and collaboration have recently become mission critical. Unscheduled downtime for any server can result in a significant loss of productivity. To limit exposure to downtime, Exchange Server 5.5, Compaq ProLiant and DS Server Clusters provide high availability through Microsoft Cluster Server (MSCS). When MSCS is deployed on Compaq ProLiant and DS Server Clusters, enterprise-messaging customers can achieve scalability without sacrificing the reliability that is required in an enterprise environment.

Another critical concern is backup and disaster recovery. Compaq provides industry-leading tape array and library hardware solutions integrated with applications such as Computer Associates' Cheyenne ArcServe. These solutions will help meet the requirements of enterprise customers deploying messaging and collaboration applications.

Appendix A: Test Disclosure

Table 4. LoadSim Clients and Configuration

| LoadSim Clients | 2-processor Configuration | 4-processor Configuration |
|---------------------------|---------------------------|---------------------------|
| # of Load Generators (LG) | 13 | 19 |
| Total # of LG processes | 25 | 25 |
| Simulated Users/Process | 30 | 30 |
| Model | Digital PC 5000 | Digital PC 5000 |
| Processor | Pentium – 300MHZ | Pentium – 300MHZ |
| # of Processors | 1 | 1 |
| Memory | 128Mb | 128Mb |
| Network Controller | DE435 | DE435 |
| Operating System | NT4.0 | NT4.0 |

Performance Data Disclosure

2-processor and 4-processor (Measured during test run at steady state)

Table 5. Summary

| | | |
|--------------------------------|--------------------------|--------------------------|
| Supported Benchmark Load | 9,500 MMBs | 13,500 MMBs |
| Weighted 95th Percentile Score | 337 milliseconds | 300 milliseconds |
| Benchmark Profile | MAPI Messaging Benchmark | MAPI Messaging Benchmark |
| Protocol | Exchange MAPI | Exchange MAPI |
| Length of Steady State | 4 hours | 4 hours |
| Length of Test | 8 hours | 8 hours |

Table 6. Transaction Load (hourly)

| | | |
|-------------------------------|-----------|------------|
| Messages Submitted | 17,224.75 | 23,879 |
| Messages Recipients Delivered | 95,087.75 | 132,540.25 |
| Messages Sent | 4,692.25 | 6,468.75 |

Table 7. Transaction Load (per second)

| | | |
|---------------------|---------|-----------|
| Messages Opens/Sec | 35.5 | 47.716 |
| Folders Opens/Sec | 8.9 | 12.496 |
| RPC Read Bytes/Sec | 30,792 | 42,884.6 |
| RPC Write Bytes/Sec | 212,504 | 289,129.8 |

Table 8. Transaction Queues

| | | |
|-------------------------------|-------|-------|
| IS Send Queue Average Length | 2.354 | 3.6 |
| MTA Work Queue Average Length | 1.875 | 2.563 |

Table 9. Processor Utilization

| | | |
|----------------------------------|---------------------|---------------------|
| System Processor Utilization (%) | 79.1 | 78.8 |
| System Processor Queue Length | 5.167 | 3.271 |
| System Context Switches/Sec | 2,845.5 | 5,616 |
| Process % CPU Time - Store | 100 (Perfmon error) | 100 (Perfmon error) |
| Process % CPU Time - DS | 9.046 | 15.8 |
| Process % CPU Time - MTA | 9.905 | 16.1 |

Table 10. Memory Utilization

| | | |
|-----------------------------------|---------------|---------------|
| Available Bytes | 778,308,288 | 2,913,018,624 |
| Pages/Sec | 0.009 | 0.008 |
| Process Working Set Bytes - Store | 1,202,607,104 | 1,175,005,568 |
| Process Virtual Bytes - Store | 1,584,887,680 | 1,795,077,248 |

Table 11. Logical Drive Utilization

| | | |
|---------------------------------------|---------|---------|
| IS Database Disk Reads/Sec | 126.947 | 112.747 |
| IS Database Disk Writes/Sec | 75.2 | 57.578 |
| IS Database Average Disk Queue Length | 3.018 | 1.639 |
| IS Log Disk Reads/Sec | 0.00 | 0.461 |
| IS Log Disk Writes/Sec | 53.2 | 23.1 |
| IS Log Average Disk Queue Length | 0.421 | 0.294 |

Descriptive Terms

Messages Submitted

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

Messages Sent

Messages that the 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 received the messages. 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 (submit calls).

RPC Write Bytes/Sec

RPC Bytes written to clients (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.

Note: Performance results were measured using Microsoft NT Performance Monitor. Measurements were obtained by measuring averages for the period of steady-state activity (that is, after 13,500 users were successfully logged on). Tests measure the messaging throughput of a single-server, single-site topology. For deployment-specific information, contact a Compaq or Microsoft representative. More information can be found at:

www.microsoft.com/exchange/support/deployment/planning/deploy.asp?A=5&B=1

Appendix B: Related Documents

These documents are available on the Compaq website.

Compaq and Microsoft Demonstrate Enterprise Scalability with Exchange Server 5.5

www.compaq.com/support/techpubs/whitepapers/ECG0961197.html

Microsoft Exchange Server 5.5 on the Compaq ProLiant 850R

www.compaq.com/support/techpubs/whitepapers/ECG0710698.html

Microsoft Exchange Server 5.5 on the Compaq ProLiant 3000

www.compaq.com/support/techpubs/whitepapers/ECG0720698.html

Microsoft Exchange Server 5.5 on the Compaq ProLiant 6000 Class Servers

www.compaq.com/support/techpubs/whitepapers/ECG0730698.html

Compaq Deployment and Configuration Guide: Microsoft Exchange Server on Compaq ProLiant Servers

www.vcmproapp02.compaq.com/

Performance of Exchange Server 4.0 on Compaq ProLiant Servers

www.compaq.com/support/techpubs/whitepapers/444A0696.html

Deschutes Family Processor Technology

www.compaq.com/support/techpubs/whitepapers/ecg0500698.html

Disk Subsystem Performance and Scalability

www.compaq.com/support/techpubs/whitepapers/ECG0250997.html

Configuring Compaq RAID Technology for Database Servers

www.compaq.com/support/techpubs/technotes/184206-1.html

Compaq SMART-2SL Array Controller Technology

www.compaq.com/support/techpubs/whitepapers/667A0697.html

Hardware vs. Software Fault Tolerance

www.compaq.com/support/techpubs/whitepapers/ECG0660298.html

Compaq Pentium Pro Processor-based Servers

www.compaq.com/support/techpubs/whitepapers/308A0496.html

Configuring the Compaq ProLiant 5000 Server for Peak Performance

www.compaq.com/support/techpubs/whitepapers/679A0697.html

Compaq White Paper Index

www.compaq.com/support/techpubs/whitepapers