PERFORMANCE BRIEF

MICROSOFT EXCHANGE SERVER 5.5 ON THE COMPAQ PROLIANT 850R

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Internet Solutions
Business Unit

Compaq Computer
Corporation

Compaq ProLiant servers deliver proven performance for Microsoft Exchange Server customers

The Compaq ProLiant 850R is well suited as a Microsoft Exchange Server deployment platform for small and medium-sized organizations, and for satellite locations of larger organizations. It is cost-effective while also allowing room for growth: using Microsoft's Load Simulation utility, the ProLiant 850R was tested with user loads ranging from 500 to 3000 simultaneous MAPI e-mail users at Compaq's Microsoft Competency Center located in Redmond, Washington.

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 ProLiant 850R

The Compaq ProLiant 850R is the industry's first low-profile server to combine affordability and a unique space-saving design tailored exclusively for rack environments.

The ProLiant 850R features up to two 200-MHz Pentium® Pro processors and the latest technology in network and disk controllers in a 3U rack-mount form factor. This server has been designed for all businesses requiring an affordable, space-efficient rack-mount solution for communications, Internet/intranet, gateway, or file and print applications. If you require a tower form factor, the ProLiant 800 will provide similar features and the same cost-effective performance.

Key Features
- **Hot Plug Drive capability** provides increased uptime and serviceability
- **Rack-Optimized 3U Design** provides a high-density, convenient rack-mount solution
- **200-MHz Pentium Pro 256K Processor** delivers high performance at an affordable price
- **Second processor capability** allows customers to grow while providing investment protection
- **ECC EDO Memory** expands up to 512 MB using industry-standard unbuffered DIMMs
- **Integrated Remote Console** delivers seamless remote console and full remote server reboot capabilities with the addition of a modem
- **Integrated Wide-Ultra SCSI-3 Controller** transfers data at rates of up to 40 MB per second, doubling the data transfer rates of the Fast-Wide SCSI-2 controllers for higher performance
- **Integrated 10/100 TX UTP Controller** is a high-performance NIC that autosenses both 10 Mb/s and 100 Mb/s for maximum performance, and has ports for both UTP and coax cable connections

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- **SmartStart and CD-ROM Drive** makes configuration and software installation faster, easier, and more reliable
- **Compaq Insight Manager** simplifies in-band management of your servers regardless of the size of your network or location of your server
- **Full support for dual processing** takes advantage of next-generation operating systems such as Microsoft Windows NT 4.0
- **Total of 5 bays and 4 slots** (2 PCI, 1 ISA, 1 shared) allows installation of 2 Hot-Plug hard drives and 1 non-Hot-Plug hard drive in addition to the standard CD-ROM and diskette drives.

Performance Results

The tests were 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). A Response Time score of 1000 ms or less is considered an acceptable response time for e-mail users utilizing Exchange Server's MAPI protocol.

Performance Highlights (ProLiant 850R, 2 CPU, 256 MB RAM)

User Load	500	1,000	2,000	3,000
Response Time (milliseconds)	92	125	198	383
Average CPU Utilization	5.67%	11.48%	24.40%	44.69%
Messages Delivered (8-hour period)	9,537	19,727	38,397	58,039

COMPAQ PROLIANT 850R TESTED CONFIGURATION
(2) Pentium Pro/200-MHz – 256K Level-2 cache per processor
256 MB RAM
(1) SMART-2/DH Array Controller OS/Pagefile/Exchange Log Files/Exchange DS/MTA Files: (2) 4.3-GB Drives – RAID1 Exchange Information Store Files: (5) 4.3-GB Drives – RAID5
Compaq Netelligent (100BaseTX) network interface card (NIC)
Microsoft Windows NT Server v4.0 with Service Pack 3 Microsoft Exchange Server v5.5 – Standard Edition (Tuning: Perfwiz defaults)

NOTE: Similar results can be expected using a Compaq ProLiant 800 server. Tested configurations may support higher user loads. In addition, the ProLiant 800-class family of servers is capable of larger hardware configurations (memory and disk subsystems). This summary indicates performance results for tested configurations only. Test results disclosure can be found in Appendix A.

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, two things should be kept in mind.

First, 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 one would never use 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. One must consider the implications of the same benchmark performed on a system using RAID5. This would provide the necessary fault tolerance that typical deployments require, but delivers different performance. In addition, most vendors, including Compaq, conduct benchmarks for Exchange Server that are *single-server* in nature.

Second, 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.

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 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 real 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.

Several steps are necessary to performing a successful simulation. The Load Simulator setup and initialization process comes first. Load Simulator creates the test topology by first 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 to reach 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 logging are stored in the LOADSIM.OUT file. To produce test scores, the LSLOG utility is used to parse out 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 http://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/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. Compaq delivers leading performance on industry-standard platforms with the lowest total cost of ownership.

For many corporations, messaging and collaboration have quickly 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 and Compaq ProLiant Clusters provide high availability through Microsoft Cluster Server (MSCS). When MSCS is deployed on Compaq ProLiant 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

LoadSim Clients	Configuration
Network type (10Base T, Token Ring, etc.)	100 Base-TX
Number and type of clients	($\leq$40) 2x5/133, 128 MB RAM ($\leq$ 250 users each) or better (indicates minimum configuration)
Number and type of hubs/concentrators (full duplex, switching, etc.)	Compaq Netelligent 5708 Switch and Netelligent 2624 Hub
Number of clients/segment	20
Client CPU type and speed in percentages	2P/133-MHz Pentium processors or better
Client network controller broken down by percentages	Compaq Netelligent 10/100
Client network software name and version (drivers, protocols, redirector)	Microsoft Windows NT Workstation 4.0 with SP3 TCP/IP
Size of any client network cache	None
Network controller software	Compaq Netelligent 10/100 driver
LoadSim version	5.5 (Build 2187)

NOTE: Response time measurements were taken from a LoadSim Control Client simulating 100 users configured with 96 MB RAM and a Pentium/166 CPU. The client is located on an isolated network segment connected to a 100-Mb/s switch.

Performance Data Disclosure (ProLiant 850R, 2 CPU, 256 MB RAM)

(Measured during test run at steady state)

Indicator	500 Users	1,000 Users	2,000 Users	3,000 Users
Response Time (ms)	92	125	198	383
IS Buffer Cache Hit %	98.81%	98.42%	98.72%	98.30%
Disk Queue Length – IS Volume	0.257	0.671	1.193	4.802
Disk Queue Length – Log Volume	0.01	0.016	0.018	0.029
Average Read I/Os – IS	24.55	58.525	70.355	143.968
Average Write I/Os – IS	15.362	32.772	25.211	46.798
Average Write I/Os – Log	23.263	36.44	38.548	55.861
Average Pages/sec	0.088	0.092	0.088	0.069
Average Available Bytes	9.34 MB	4.85 MB	4.79 MB	4.72 MB
IS Send Queue Average	0.03	0.061	0.374	2.152
IS Receive Queue Average	0.626	0.717	0.475	0.677
MTA Work Queue Average	0.071	0.111	0.202	0.485
Messages Open/sec	2.034	4.119	8.116	12.223
Average RPC Operations/sec	25.093	51.272	100.572	151.453
Messages Submitted (8 hours)	7432	15358	30090	45346
Calculated Messages/User	14.864	15.358	15.045	15.115
Average CPU Utilization	5.67%	11.48%	24.40%	44.69%
Average Context Switches/sec	521	880	982	1491
Average CPU Queue Length	0.202	0.343	0.525	1.455
Working Set – STORE	209 MB	213 MB	213 MB	211 MB
Virtual Bytes – STORE	501 MB	519 MB	524 MB	569 MB

NOTE: Performance results measured using Microsoft NT Performance Monitor. Measurements were obtained by measuring averages for the period of steady-state activity (i.e. after 3,000 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/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,

http://www.compaq.com/support/techpubs/whitepapers/ECG00961197.html

Performance of Exchange Server 4.0 on Compaq ProLiant Servers,

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

Disk Subsystem Performance and Scalability,

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

Configuring Compaq RAID Technology for Database Servers,

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

Compaq SMART-2 Array Controller Technology,

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

Hardware vs. Software Fault Tolerance,

http://www.compaq.com/support/techpubs/whitepapers/ECG066/0298.html

Compaq Pentium Pro Processor-based Servers,

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

Configuring the Compaq ProLiant 5000 Server for Peak Performance,

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

Compaq White Paper Index,

http://www.compaq.com/support/techpubs/whitepapers

Compaq ProLiant 800,

http://www.compaq.com/products/servers/proliant800/index.html

Compaq ProLiant 850R,

http://www.compaq.com/products/servers/proliant850r/index.html

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