WHITE PAPER

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Enterprise Computing Group

Compaq Computer Corporation

CONTENTS

Positioning Pentium II and Pentium Pro Processors in Server Environments

This paper discusses the specific features and performance testing results of both the Pentium II and the Pentium Pro processors that make them ideal for use in server environments. It is intended for use by Compaq Field Systems Engineers and technical sales personnel.

EXECUTIVE SUMMARY

With the recent addition of the Intel Pentium II processor to the Intel family of processors, customers now face a number of choices as to which processor to use in their servers. Whereas previously a high-speed processor indicated a faster system, today the solution is not as simple. The key to selecting the appropriate processor for a server is to analyze the environment in which it will be running. For example, an environment that uses the server for primarily file/print, webservers, or small database applications has different requirements than one that loads the server with transaction-intensive applications.

When purchasing servers, customers will now find that servers ship with either a Pentium II or Pentium Pro processor. Each processor offers its own advantages that are appropriate for particular server environments. Performance testing on both processors yielded the following results:

- NetBench® tests that compare single CPU performance of the two processors show that the Pentium II processor outperforms the Pentium Pro processor in file/print server environments.
- ServerBench® tests that compare single and dual CPU performance of the two processors show that the Pentium II processor outperforms the Pentium Pro processor in application server environments.
- Transaction processing tests that compare dual CPU performance of both processors in complex transaction and database environments show that the Pentium Pro processor outperforms the Pentium II processor.

From these performance tests, the suitability of each processor for server environments can be assessed as follows:

- The Pentium II processor offers superior performance for file/print and small database applications because of its faster processing speeds in single and dual configurations; and
- The Pentium Pro processor is still the choice for compute or memory intensive applications because of its multiprocessing and large memory configuration capabilities.

NOTE: All benchmark results are based upon server technology current as of July 1, 1997.

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NOTICE

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Features of The Pentium II Processor In Server Environments

The new Pentium II processor combines the existing technologies of the Pentium Pro processor with the capabilities of Intel's new MMX media enhancement technology to create new levels of performance and visual computing. These technological advances make it ideal for single and dual processor workgroup and web servers. The Pentium II processor features:

- A Dual Independent Bus architecture, first implemented in the Pentium Pro processor, which addresses current bandwidth limitations;
- 32KB L1 cache;
- MMX technology to enhance performance for audio, video, and graphics applications as well as speed data encryption and compression;
- Dynamic Execution Technology which allows more data to be processed in parallel in a given period of time; and
- A Single Edge Contact (SEC) cartridge to replace the Pin Grid Array (PGA) technology.

Features of the Pentium Pro Processor in Server Environments

Pentium Pro processor-based systems offer outstanding performance, manageability, and reliability for customers with servers running Windows NT, UNIX, or other 32-bit operating systems and compute intensive applications such as sophisticated financial modeling, intensive transactions processing, and multi-dimensional databases. These systems usually require more than 512MB system memory and up to four processors. The Pentium Pro processor features:

- Dual Independent Bus Architecture;
- Dynamic Execution;
- Currently the only Intel CPU that is scaleable to four processors in one system unit; and
- Integrated L2 cache that runs at the same speed as the processor.

Comparing Pentium II and Pentium Pro Processors Performance in Server Environments

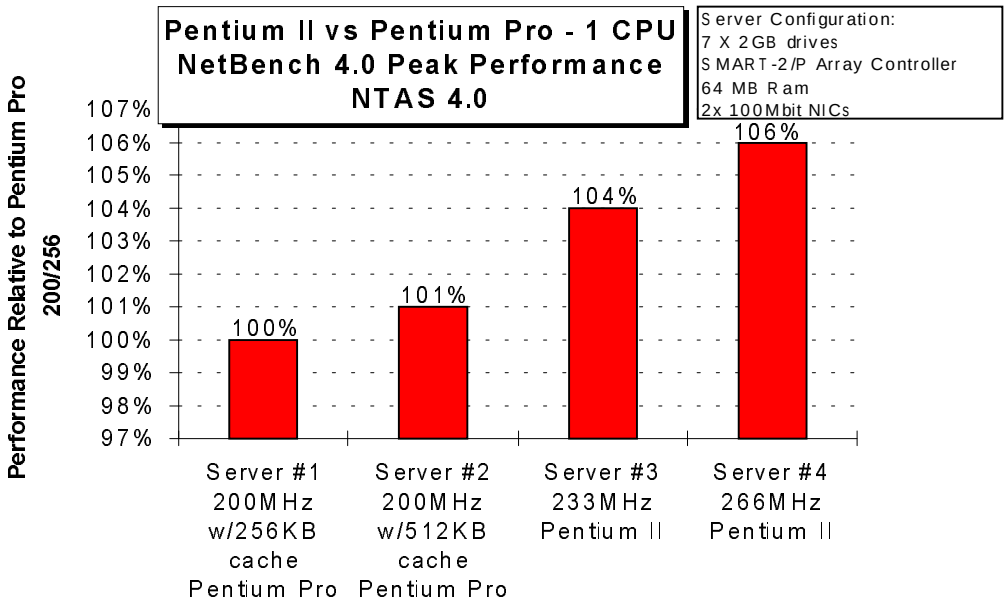
In addition to the particular features of each system, another key indicator of a processor's suitability for a particular server environment can be found in performance testing results. From Netbench®, ServerBench® and TPC performance testing conducted on both the Pentium II processor and the Pentium Pro processor, the following can be concluded:

- The new Pentium II processor is the best choice for single and dual processor workgroup and webservers because of its higher processing frequency and MMX technology.
- The Pentium Pro processor is the better solution for four-way OLTP and database servers because it provides better performance for compute or memory intensive applications by taking advantage of its multiprocessing and large memory configuration capabilities. The Pentium Pro processor design also allows servers to support up to four processors and 4GB of system memory to meet the requirements of computational intensive applications.

For a more detailed summary on the technical features of each processor and their suitability to a particular server environment, please reference the Compaq White Paper entitled, *Performance of Pentium Pro and Pentium II Processor/Cache Combinations* (document number 436A/0597).

The following illustration (Figure 1) shows NetBench test results that compare the single CPU performance of a Pentium II processor to a Pentium Pro processor in a server environment. NetBench adds all the client throughputs together to produce the overall throughput for the server. The results of the NetBench testing show that the Pentium II processor outperforms the Pentium Pro processor in a single CPU server environment. NetBench 4.0 is a portable benchmark program that measures how well a file server handles file I/O requests from as many as four different client types: DOS, 32-bit Windows, 16-bit Windows, and/or Mac OS systems. The clients load the server with requests for network file operations. Each client tallies how many bytes of data it moves to and from the server and how long the process takes. The client uses this information to calculate its throughput for that test mix.

FIGURE 1.



Figures 2 and 3 show ServerBench results that compare the performance of single and dual CPU processor configurations of a Pentium II processor to Pentium Pro processor in a server environment. Similar to the NetBench results, the Pentium II processor again outperforms the Pentium Pro processor in both one and two processor configurations. ServerBench measures the performance of application servers in a client/server environment by running tests that produce different types of load on the server. The ServerBench test environment includes the server being tested, its PC clients, and a PC designated as the controller (test suites are executed and monitored from the controller).

FIGURE 2.

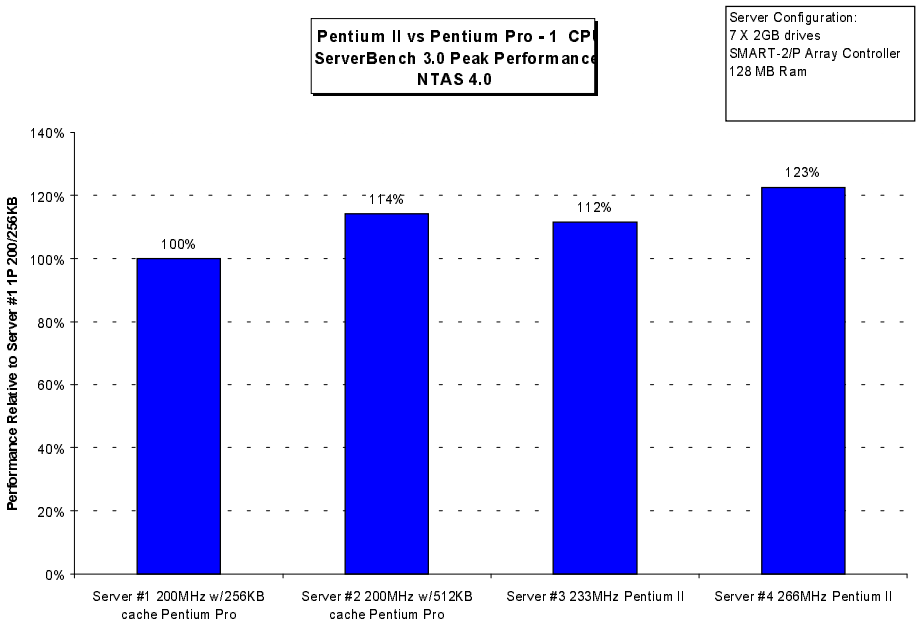
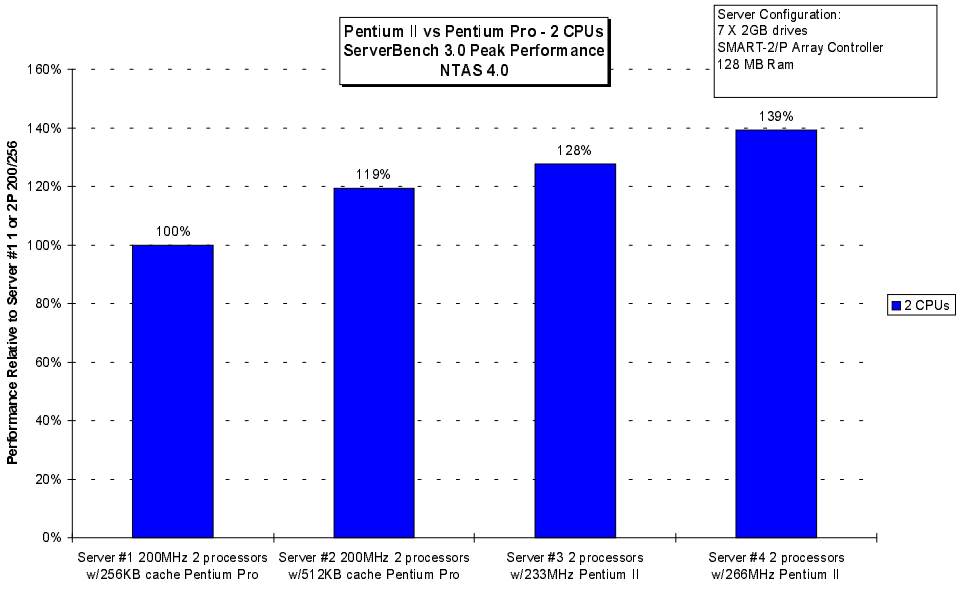
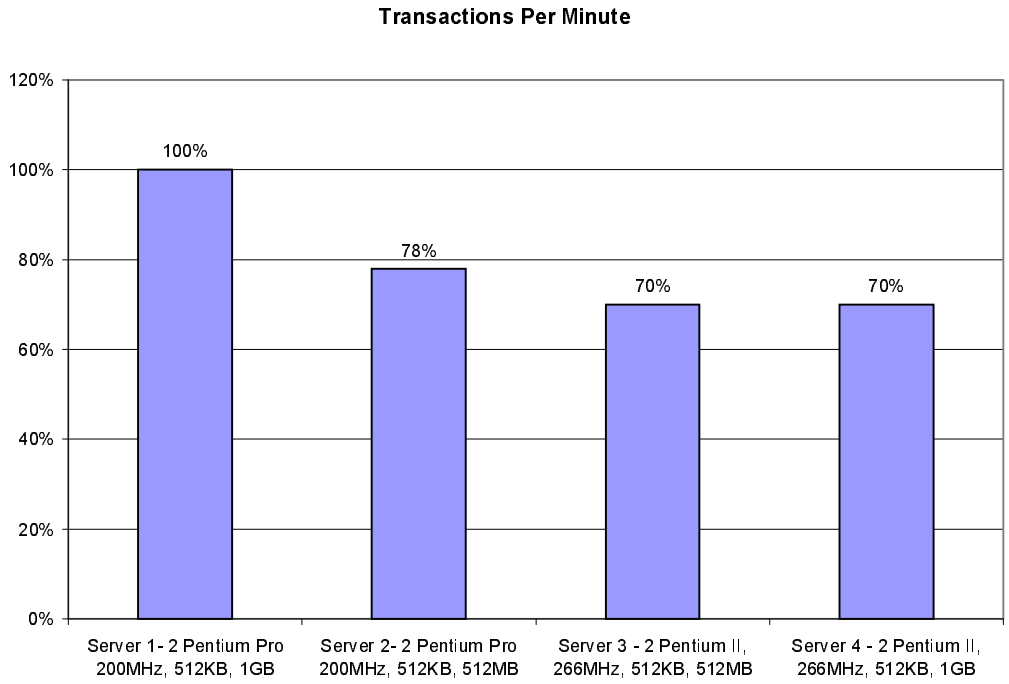


FIGURE 3.



The chart shown in Figure 4 compares the performance of dual CPU processor performance of a Pentium II and Pentium Pro processors in a transaction heavy server environment. Here the results show the 200MHz, 512KB with 1GB system memory Pentium Pro processor outperforms a 200MHz, 512KB with 512MB or 1GB system memory Pentium II processor by 22%. This benchmark simulates a complete computing environment where a population of terminal operators executes transactions against a database. The benchmark is centered on the principal activities (transactions) of an order-entry environment. These transactions include entering and delivering orders, recording payments, checking the status of orders, and monitoring the level of stock at warehouses. The benchmark is not limited to the activity of any particular business segment, but rather represents any industry that must manage, sell, or distribute a product or service.

FIGURE 4.



Conclusion

Given each processor's feature set and performance testing results, the following conclusions can be drawn:

- The Pentium II processor is best suited for single and dual processor environments for file/print and small database applications; and
- The Pentium Pro processor is best suited for server environments requiring up to four processors that are running memory and CPU intensive applications and/or large database applications.

Customers should weigh all factors affecting processor performance to determine which server best meets their particular requirements.

APPENDIX

Performance Test Disclosures

The following tables identify the NetBench and ServerBench Test configurations of the servers tested as discussed in this paper.

NETBENCH CONFIGURATIONS TESTED

	Servers #1, #2, #3 or #4
Number and type of processor	Pentium Pro 200MHz, Pentium II 233 MHz, or Pentium II 266MHz
Size of hardware CPU cache	256KB or 512KB
Amount of memory	64MB
Type of I/O bus	PCI/ISA
Number and type of hard disk Controllers	1 Smart-II/P
Number and type of hard disks	7 2GB Seagate Fast-Wide SCSI-2
Disk organization	Striped
Disk controller driver version	1.19
Number and type of network Controllers	2 Netelligent 10/100 TX PCI UTP
Network controller driver version	netflx3.lan
Network operating system name and version	Windows NT 4.0
Any relevant modifications to default network operating system parameters	n/a

NETBENCH TESTBED DISCLOSURE

Network type (10Base T, Token Ring, etc.)	100 Base-TX
Number and type of clients	57 Compaq ProLineas, 3 DeskPro XL
Number and type of hubs/concentrators (full duplex, switching, etc.)	4 SynOptic 28115 switched hubs into 1 SynOptic 28115
Number of clients/segment	15
Client CPU type and speed	90MHz Pentiums- 45: 75MHz Pentiums-7: 100MHz Pentiums-3: 100 MHz 486s- 3: 50MHz 486's-2
Client network controller broken down by percentages	Intel Pro/100B- 100%
Client network software name and version (drivers, protocols, redirector)	DOS 6.20
Size of any client network cache	none
Disk controller software	n/a
Network controller software	Intel Pro/100 driver
NetBench Disclosure	
NetBench version	4
Description of the test parameters for each mix in the test suite	Standard Disk Mix, mixlg4x.tst

SERVERBENCH CONFIGURATIONS TESTED

	Servers #1, #2, #3 or #4
Number and type of processor	Pentium Pro 200MHz, Pentium II 233 MHz, or Pentium II 266MHz
Size of hardware CPU cache	256KB or 512KB
Amount of memory	128MB
Type of I/O bus	PCI/ISA
Number and type of hard disk controllers	1 Smart-II/P
Number and type of hard disks	7 2GB Seagate Fast-Wide SCSI-2
Disk organization	Striped
Disk controller driver version	1.19
Number and type of network controllers	Netelligent 10/100 TX PCI UTP
Network controller driver version	netflx3.sys
Network operating system name and version	Windows NT Advanced Server 4.0
Any relevant modifications to default network operating system parameters	n/a

SERVERBENCH TESTBED DISCLOSURE

Network type (10Base T, Token Ring, etc.)	100 Base-TX
Number and type of clients	57 Compaq ProLineas, 3 DeskPro XL
Number and type of hubs/concentrators (full duplex, switching, etc.)	4 SynOptic 28115 switched hubs into 1 SynOptic 28115
Number of clients/segment	15
Client CPU type and speed in percentages	90MHz Pentiums- 45: 75MHz Pentiums-7: 100MHz Pentiums-3: 100 MHz 486s- 3: 50MHz 486's-2
Client network controller broken down by percentages	Intel Pro/100B- 100%
Client network software name and version (drivers, protocols, redirector)	DOS 6.20
Size of any client network cache	none
Disk controller software	n/a
Network controller software	Intel Pro/100 driver
ServerBench Disclosure	
ServerBench version	3.0
Description of the test parameters for each mix in the test suite	sys_60d.tst