
IBM PC Server 315

Performance Report

Version 1.0
May 1997



1

Introduction

About This Report

Who Should Read This Report

This report presents benchmark performance results for the IBM PC Server 315 announced worldwide in May 1997. The audience for this report includes business partners, customers and IBM marketing and technical support representatives.

How This Report Is Organized

Three benchmarks by Ziff-Davis were used to evaluate the IBM PC Server 315 system's performance:

- ServerBench** 3.0
- WebBench** 1.0
- NetBench** Version 5.0

Each benchmark was conducted with two different configurations for the IBM PC Server 315. First, the system was measured with a 7200-rpm IBM Ultrastar 2XP 4.51GB Wide Ultra SCSI Hard Disk Drive. Then, the three benchmarks were repeated using a 5400-rpm IBM Ultrastar 2ES 4.33GB¹ Ultra SCSI (Fast) Hard Disk Drive.

This report presents the results, including a performance comparison for a similarly configured Compaq** ProLiant** 800 (with 7200 rpm drive) and a Hewlett-Packard** NetServer** E40² (with 5400 rpm drive).

The remainder of this report is organized in the following sections:

- Section 2, "Executive Overview," which introduces the IBM PC Server 315 and presents highlights of the benchmark results

¹ When referring to hard disk capacity, GB, or gigabyte, means 1 billion bytes; total user-accessible capacity may vary.

² The Hewlett-Packard NetServer E40 does not support a 7200-rpm drive.

- Section 3, “Test Environment and Results,” which provides all test results, along with the measurement methodology and analysis
- Section 4, “Server Configurations,” which provides information about the server configurations used for conducting the benchmarks
- Section 5, “Test Disclosure Information,” which describes the testbeds used for the benchmarks.

How to Obtain More Information

The IBM PC Server Performance Laboratory publishes white papers and performance reports, including audited disclosures for benchmarks such as TPC-C and NotesBench. These documents are available on the World Wide Web at the following URL:

<http://www.us.pc.ibm.com/techlink/srvperf.html>

Trademarks

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2

Executive Overview

IBM PC Server 315

Small business can now take advantage of either 200MHz³ or 180MHz Pentium** Pro power backed by IBM's proven service and support and the latest in PC server technology with the affordable IBM PC Server 315 system. Available in both a preconfigured model and open bay models designed for custom configuration, these systems can meet the network server requirements of small business and function as interconnected departmental file servers that support workgroups in medium-size to large business. The PC Server 315 system's features include:

- A 200MHz or a 180MHz Pentium Pro microprocessor with integrated 256KB L2 write-back cache
- Standard 32MB of EDO ECC DIMM (dual in-line memory module) memory, expandable to 512MB
- Four 32-bit PCI, two ISA, and one PCI/ISA combination slot
- A PC Server Wide Ultra SCSI PCI Adapter for performance, flexibility and expandability
- A total of six drive bays (two 5.25-inch half-high and four 3.5-inch slim-high) supporting up to 22.63GB of data storage
- SVGA PCI adapter with 1MB video memory for optimized resolution in systems management and setup applications
- An 8X-speed SCSI CD-ROM drive, 1.44MB diskette drive, two high-speed serial ports, and one parallel port
- A 2.1GB Ultra SCSI 5400-rpm hard disk and 10/100Mbps Ethernet PCI adapter standard with the preconfigured model⁴
- Optional 7200-rpm IBM Ultrastar 2XP 4.51GB and 9.1GB Wide Ultra SCSI Hard Disk Drives
- ServerGuide*, which enables the installation of one of several popular operating systems
- IBM NetFinity*, a systems and asset management tool.

³ MHz denotes internal clock speed of the microprocessor; other factors also affect application performance.

⁴ The preconfigured model with the 2.1GB hard drive was not used for these benchmarks because the competitive systems were configured with 4GB drives.

Performance Highlights

ServerBench 3.0

ServerBench 3.0 was used to measure the IBM PC Server 315 system as a single-processor, non-RAID application server running Microsoft Windows NT Server 4.0.

The IBM PC Server 315 provided overall throughput equivalent to that of the Compaq ProLiant 800 and averaged 35 percent better throughput with 3 to 15 client machines connected than the Hewlett-Packard NetServer E40.

WebBench 1.0

WebBench 1.0 measures the overall performance of Web servers. Its primary results are two overall server scores: throughput measured in Kbytes per second and requests per second.

Throughput

The IBM PC Server 315 and Compaq ProLiant 800 delivered equivalent performance. The IBM PC Server 315 system provided better overall throughput than the Hewlett-Packard NetServer E40.

Requests per Second

The IBM PC Server 315 and the Compaq ProLiant 800 serviced an equivalent number of requests per second. The IBM PC Server 315 system demonstrated better overall performance in the number of requests per second serviced than the Hewlett-Packard system.

NetBench 5.0

NetBench 5.0 Disk Mix was used to measure the performance of the IBM PC Server 315 system as a single-processor, non-RAID file server running Novell ** NetWare** 4.11 in a 100Mbps Ethernet environment.

The IBM PC Server 315 system provided network clients with 9 percent more throughput at the peak load of 30 clients than the Compaq ProLiant 800 and 21 percent more throughput than the HP NetServer E40.

3

Test Environments and Results

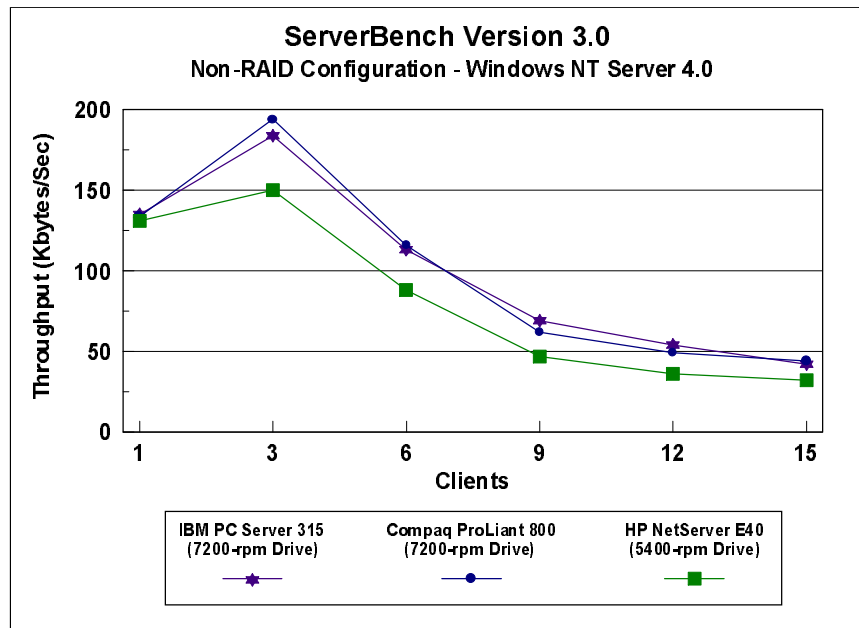
ServerBench 3.0

ServerBench 3.0 was used to measure the IBM PC Server 315 as a single-processor, non-RAID application server running Microsoft Windows NT Server 4.0 and providing services to Windows NT Workstation 4.0 clients. Each ServerBench client represents the I/O activity of several actual users.

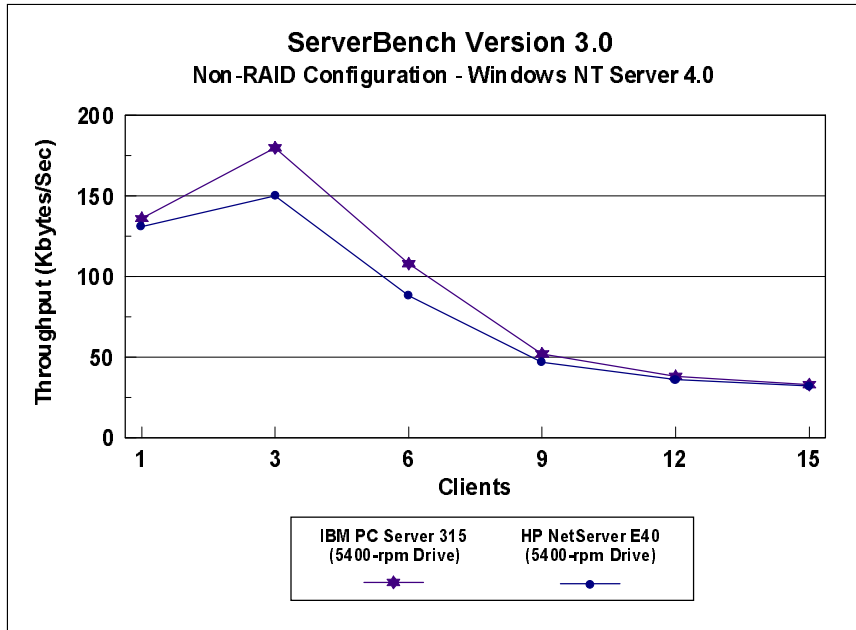
ServerBench 3.0 measures the performance of an application server and provides an overall transactions-per-second (TPS) score showing how well the server handles client requests for a variety of operations. With ServerBench 3.0, you can compare the performance of different application servers, providing you run the same test suite and use the same parameters and testbed with each server.

Results Summary

The IBM PC Server 315 system provided overall throughput equivalent to that of the Compaq ProLiant 800 and averaged 35 percent better throughput than the Hewlett-Packard NetServer E40 with 3 to 15 client machines connected.



The IBM PC Server 315 system provided an average of 17 percent better throughput with three to nine client machines connected than the Hewlett-Packard NetServer E40 system. As more clients were added, the bottleneck quickly shifted to the disk subsystem. The impact of the slower (5400 rpm) drive in the two systems is most dramatic between 9 and 15 clients.



Measurement Methodology

The system test suite was performed using one 100Mbps Ethernet network segment with a total of 15 IBM PC 750 166MHz systems as client workstations attached to the server. All three servers were configured with 64MB of memory and a single 4GB hard disk. The only significant difference in the configurations was the drive speeds.

Each of the IBM PC 750 client workstations ran Microsoft Windows NT Workstation 4.0 and executed the ServerBench 3.0 SYS_15.TST workload (a variation of the SYS_60.TST modified for 15 clients rather than 60), which includes the client/server, server/client, random read, and random write requests typically made in a client/server computing environment.

A transaction is a request issued by any one of the 15 clients; the TPS score is the number of transactions per second completed by the server under test. In the ServerBench environment, the server will not service the next request until it has finished the previous

one. Thus, a higher number of transactions per second indicates better performance.

Each client is assigned a Disk Test Data file of 20MB. The block size of each request varies from .5Kbytes to 2Kbytes within a range of 10MB inside the Test Data file. Each client randomly issues requests to the server, which sorts, filters and performs computations. The server returns the result to the clients by disk caching if system memory is available, or swapping mapped memory out to paged files if system memory is full.

The SYS_15.TST test suite contains a total of six test mixes. Measurements of transactions per second (TPS) were recorded as a weighted harmonic mean of the total TPS obtained by all clients in each test mix as clients were added. Clients were added incrementally as follows: 1, 3, 6, 9, 12, 15.

Measurement Analysis

ServerBench's server application on Microsoft Windows NT provides up to 47 service threads with 15 clients, plus one thread for each server processor. For this test, the servers were configured with one processor. A client workstation generates a request for the server to begin the next phase of a mix or to ask the server to perform some operation. The server creates a new service thread and passes that connection with the client to an I/O completion port.

As clients are added to the network, the I/O workload increases, requiring more service threads to be allocated to the clients. When all the service threads have been allocated, any new client requests cannot be serviced until an I/O completion port becomes available. Thus, the network subsystem becomes the bottleneck and provides a lower TPS throughput. Using one 100Mbps network adapter provided sufficient bandwidth to the application server.

ServerBench requires a large amount of system memory in order to produce a meaningful result. When workload increases gradually, the processor subsystem (processor and system memory) provides adequate service to all requests by caching them in the system memory, which is the primary factor affecting the TPS throughput. Using Windows NT's Performance Monitor, we observed that processor utilization usually measured over 90 percent, indicating a high cache-hit ratio, hence the term "processor-bound application."

As the workload continued to increase (i.e., more clients joined the test mixes), system memory was exhausted, and the server had to rely on the disk subsystem for virtual memory. When this

happened, the bottleneck shifted to the disk subsystem, and the application became disk-bound. Running ServerBench with Windows NT may result in a low cache-hit ratio because some NT system threads (e.g., cache manager's lazy writer thread, memory manager's mapped page writer thread) will automatically move some mapped memory into paged files. If a client happens to request that paged-out data again, a cache-hit-miss will result.

The exact number of clients required to move the bottleneck from the processor to the disk subsystem depends on the amount of installed system memory. In these measurements, the application was processor-bound when running from three to six clients; as more clients were added, the bottleneck quickly shifted to the disk subsystem.

In a typical client/server environment, Windows NT Server would be set to run as an application server, which is the setting used for these ServerBench 3.0 measurements. According to Ziff-Davis, setting the server to run as a file server may improve TPS throughput.

The default values were used for all Windows NT registry variables except one: 'Max throughput as network application server'. The NT default is 'Max throughput for file sharing'. This variable was changed in order to simulate a real-world application server in a client/server environment where each client request is serviced in real time mode (i.e., the server does not know in advance what the next request will be and cannot store any previous request or calculated answer in shared file cache).

WebBench 1.0

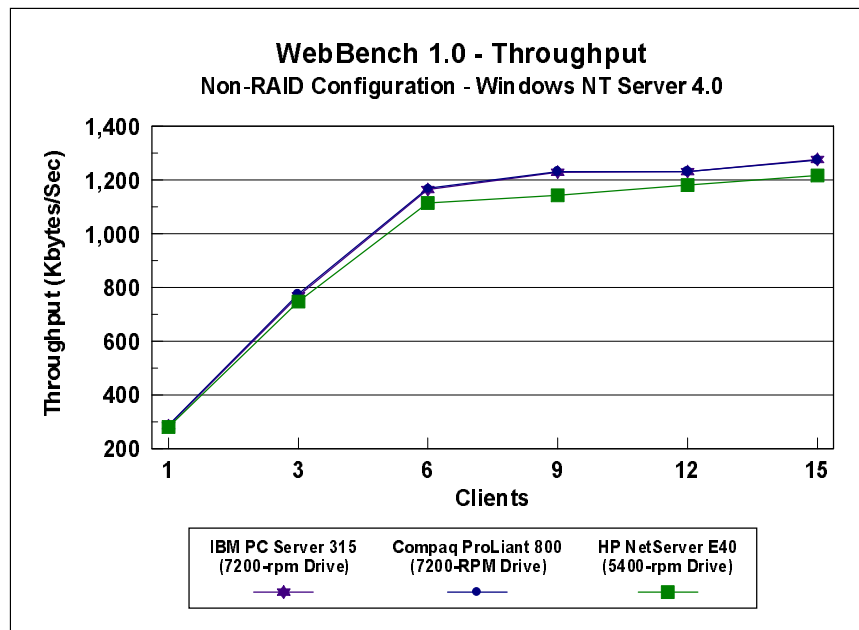
WebBench 1.0 measures the overall performance of Web servers. Its primary results are two overall server scores: throughput measured in Kbytes per second and requests per second. WebBench runs on a server networked to a PC running the controller program and to one or more PCs each running the client program. The controller runs on Microsoft Windows NT 3.51 or 4.0 and the clients run on Windows 95 or Windows NT 3.51 or 4.0.

Results Summary

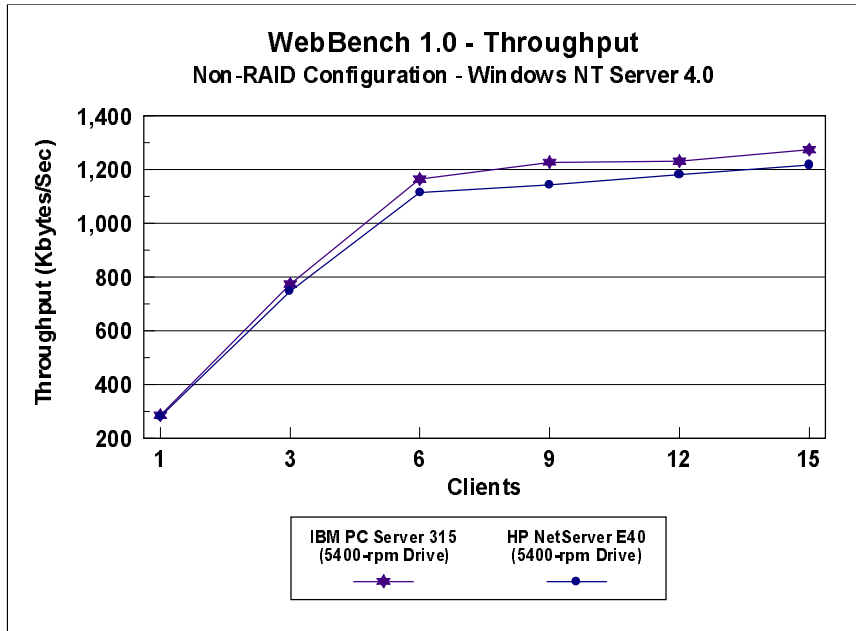
WebBench 1.0 was used to measure the IBM PC Server 315 as a single-processor, non-RAID Web server running Microsoft Windows NT Server 4.0 and Microsoft Internet Information Server 2.0.

Throughput

The IBM PC Server 315 and the Compaq ProLiant 800 systems delivered equivalent performance. The IBM PC Server 315 system and provided better overall throughput than the Hewlett-Packard NetServer E40.

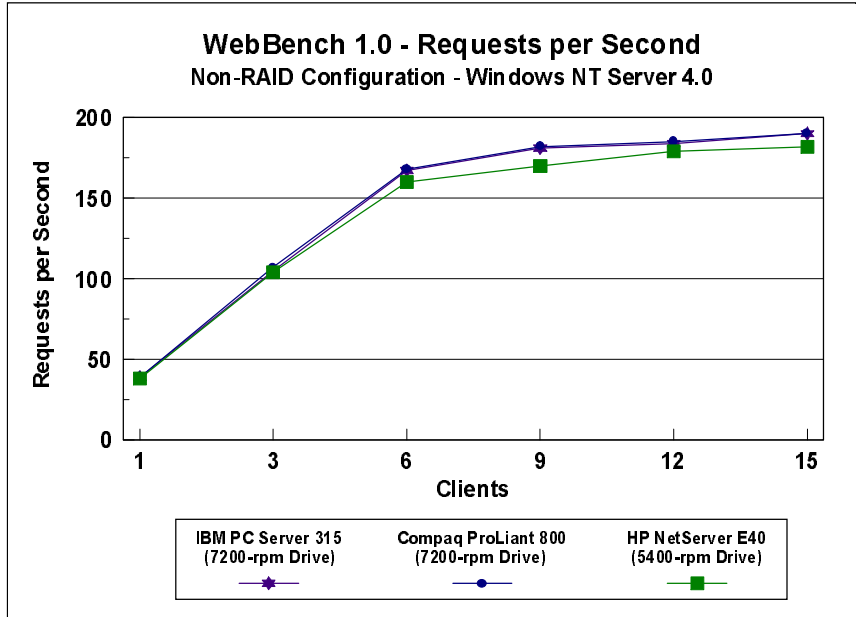


The IBM PC Server 315 system delivered better overall throughput than the Hewlett-Packard NetServer E40. WebBench does not stress the disk subsystem; therefore, the 5400-rpm drive did not substantially impact the overall performance of either system.

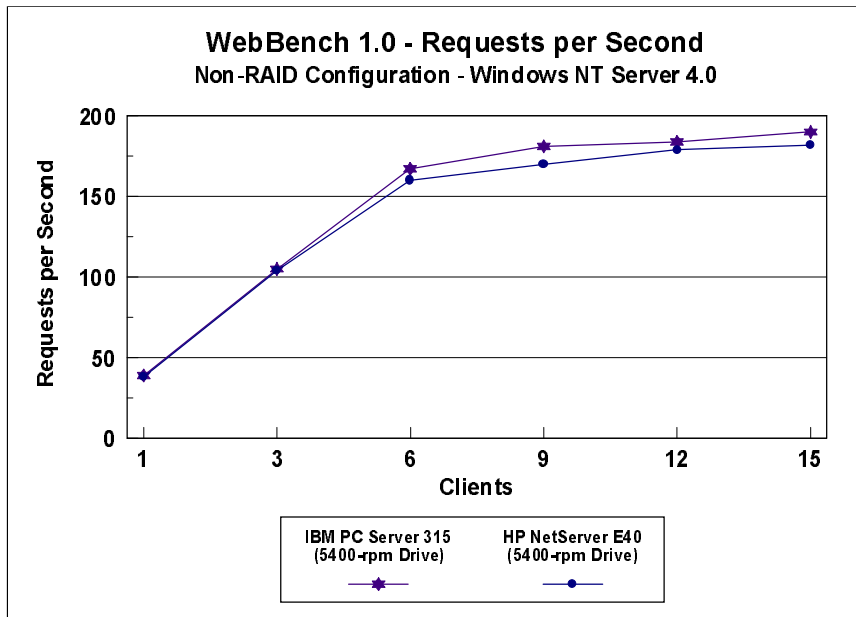


Requests per Second

The IBM PC Server 315 system and the Compaq ProLiant 800 system serviced an equivalent number of requests per second. The PC Server 315 system demonstrated better overall performance in the number of requests per second serviced than the HP system.



The IBM PC Server 315 system demonstrated better overall performance in the number of requests per second serviced than the HP system. WebBench does not stress the disk subsystem; therefore, the 5400-rpm drive did not substantially impact the overall performance of either system.



Measurement Methodology

Two kinds of performance measurements were conducted in this test suite:

- Static HTML page requests, which demonstrates server throughput as each of the 15 clients, simulating an actual Web browser, fetched predesigned HTML pages using the HTTP protocol from the server. The HTML pages of different sizes (from 0.25KB to 128KB) were spread out in the home and 10 other directories (one of which has subdirectories two levels deep) in the server.
- Dynamic Common Gateway Interface (CGI) requests, which demonstrates the number of requests per second completed by the server.

One 100Mbps Ethernet network segment with 15 Windows NT Workstation 4.0 clients was used for these measurements. Each client executed the WebBench NT_SIMPLE_CGI20_V1.TST workload, which includes HTML pages requests and Common Gateway Interface requests, two of the primary functions of a Web server. Each client randomly issued these requests to the Web server according to a workload file that specifies each request a client makes and how frequently the client makes that request. The workload file associates a request percentage with each HTTP request and CGI request. The request percentage tells the client the number of requests it issues during a mix and what the percentage of requests should be for that particular mix. If all clients requested the same file at the same time, the results could be adversely affected; therefore, each client's request access patterns are randomized.

The NT_SIMPLE_CGI20_V1.TST test suite contains a total of six mixes. Each mix uses 30 seconds as ramp-up time, and 30 seconds as ramp-down time, during which periods measurements were not done. Each mix ran for 300 seconds. Clients were added incrementally to each mix as follows: 1, 3, 6, 9, 12, 15.

After the six mixes in the test suite were finished, WebBench created two graphs: one that plots the requests per second against each mix and another that plots the throughput against each mix. Also supplied is the amount of time it took the clients to connect to the server and receive data from the server, and the number of connections per second made by each client.

Measurement Analysis

In a typical two-tier Internet/Intranet environment, the Web browser is usually the user front-end that makes requests to the Web server. The Web server functions either as a large HTML document store directly returning the HTML documents to the browser or as a back-end logic unit building a dynamic HTML document based on calculation of input fields from the Web browser.

In a three-tier Internet/Intranet environment, the Web server usually functions as middleware directing Web browser requests to the appropriate business unit (e.g., database) to retrieve information for the user.

WebBench is designed to measure a Web server in a two-tier Internet/Intranet environment. To calculate the scores, WebBench counts only completed requests, which consist of four steps:

- The client connects to the server.
- The client issues an HTTP request (either HTML or CGI) to the server.
- The server responds to the request. This response usually results in the server sending to the client an HTML file associated with the URL specified by the client.
- The client disconnects from the server.

In a single mix, the request begins with each client connecting to the server and ends with the client disconnecting from the server, followed immediately by another repeating the process. The cycle continues until the mix is completed.

Because each WebBench client generally stresses the server as much as several actual users do, the test suites can be run with a relatively small number of clients and still provide an accurate measure of a server's performance.

To get a valid measure of the server's performance, ensure that the requests-per-second score and the throughput score reach a point where they flatten out. This "flattening out" indicates that the server has been saturated, or fully loaded.

In this test, adding clients increased the total requests-per-second and throughput scores. The IBM PC Server 315, when configured with a 5400-rpm drive, provided performance equivalent to the Compaq ProLiant 800, which was configured with a 7200-rpm drive. The slower drive caused no significant performance impact because the client requests (both static and dynamic) were cached in system memory, reducing the number of disk accesses. The IBM PC Server 315, under the high-end load of 15 clients, delivered optimal performance for an entry-level PC server.

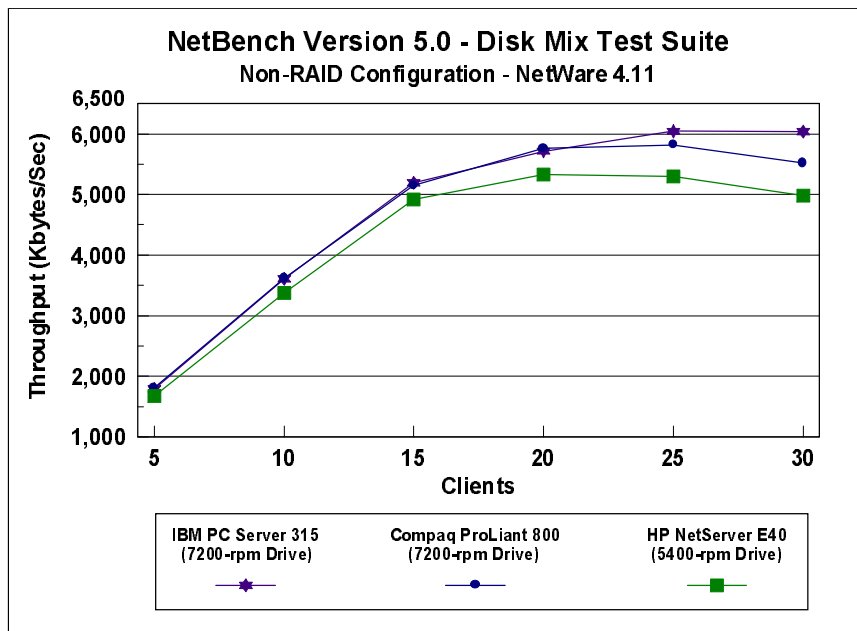
NetBench 5.0

NetBench 5.0 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 testbed can be made up of any combination of these four client types; however, for our tests, we used only Windows for Workgroups (16-bit) clients.

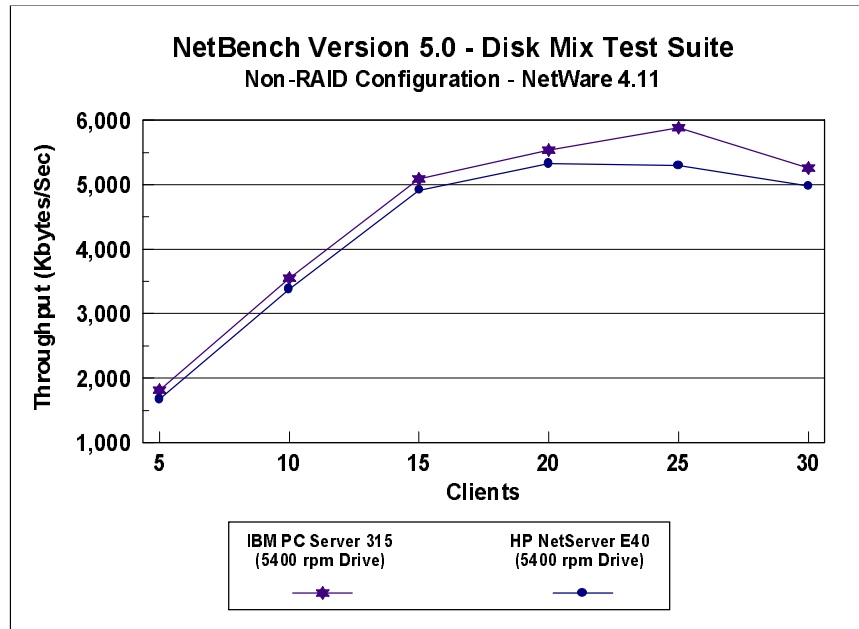
Results Summary

NetBench 5.0 Disk Mix was used to measure the performance of the IBM PC Server 315 system as a single-processor file server running Novell NetWare 4.11 in a 100Mbps Ethernet environment. Each NetBench client represents the I/O activity of several actual users.

The IBM PC Server 315 system provided network clients with 9 percent more throughput at the peak load of 30 clients than the Compaq ProLiant 800 and 21 percent more throughput than the Hewlett-Packard NetServer E40 system.



The IBM PC Server 315 system, configured with the 5400-rpm hard drive, provided network clients with better overall throughput than the Hewlett-Packard NetServer E40 system. Over a range of 15 to 30 clients, the IBM PC Server 315 system averaged 6 percent better performance and up to 11 percent better performance with 25 clients than the HP system.



Measurement Methodology

The Disk Mix test suite was performed using two 100Mbps Ethernet network segments with a total of 30 IBM PC 350 systems as client workstations attached to the server. Each workstation ran Microsoft Windows for Workgroups Version 3.11 and executed the NetBench 5.0 Disk Mix workload, which is based on leading Windows applications such as Lotus** 1-2-3** Release 4.01, Microsoft Excel** 5.0, Microsoft Word 6.0a for Windows, and Claris** FileMaker** Pro 2.12.

Each client randomly simulated the Windows application workloads, accessing shared and unshared data files located on the server. Each client used a workspace of 80MB. Clients were added incrementally as follows: 5, 10, 15, 20, 25, 30. Measurements were recorded each time clients were added. See Section 5, "Test Disclosure Information," for testbed details.

Measurement Analysis

The NetBench Version 5.0 workload exercises the server in a manner similar to actual Windows applications executing on a network-attached PC; that is, the NetBench Version 5.0 Disk Mix emulates the actual I/O operations performed by leading Windows applications, placing a diverse load on the server by using multiple files, different request sizes and different network file operations.

As clients are added to the network, the I/O workload (i.e., the number of I/O requests to the server) increases, requiring more server resources, such as network adapter transfers, processing power, memory and disk operations. Initially, with a small number of clients, server resources are adequate to handle requests. During this time, the server's network adapter becomes the bottleneck.

The Disk Mix test requires each client to have its own directory and also to be able to access the shared directory in the server. As the number of clients increases, any workload involving non-shared data files creates a burden on the disk subsystem. As a result, competition for caching user data in server memory causes the bottleneck to migrate from the network adapter to the disk subsystem.

In addition, when a server's memory buffer space is exhausted, requests are forced to go directly to the disk; therefore, the performance bottleneck quickly migrates from the network adapter to the disk subsystem, resulting in a low, disk cache-hit-ratio. Moreover, if the disk subsystem cannot quickly write "dirty" (updated) data in memory to disk, thereby freeing memory for other I/O requests, memory fills up, creating a disk backlog.

The exact number of clients required to move the bottleneck from the network adapter to the disk subsystem is dependent upon many factors. However, the most significant contributors are the I/O workload, server memory, and server disk subsystem performance. Because the Disk Mix's I/O workload is predefined, server memory and server disk subsystem performance contribute most to the server's disk cache-hit-ratio.

Server hardware can be configured so that the results of the NetBench Disk Mix test highlight the performance of either the server network adapter or the server disk subsystem. For example, if a large amount of memory and a fixed number of 30 simultaneous clients are used, the bottleneck will always be on the server network adapter. If too little memory is used, the bottleneck will most likely occur at the disk subsystem. The ideal measurement configuration should utilize enough memory and simultaneous clients to demonstrate the performance of the server

network adapter and the server disk subsystem. This was our goal for the Disk Mix test.

In evaluating the performance results of any measurement, it is important to understand the relationship between the server configuration and the workload generated by the benchmark. We experimented with several configurations. For these servers in this configuration of 30 clients, we found that using 64MB of memory accounted for a high percentage of cache-hits. With the workload range of 5 to 20 clients, most of the test file was cached, thus stressing the memory subsystem rather than the disk subsystem. However, as the workload increased to 30 clients, the bottleneck migrated to the disk subsystem, showing the effects of the slower drive (5400 rpm) in the IBM PC Server 315.

Also, the entire server was stressed as the workload increased. The reason is that the 100Mbps network adapter provided sufficient bandwidth to allow the server's subsystems (i.e., memory, disk and processor complex) to be saturated. This is important because in most production environments, the number of users is dynamic, and the server bottleneck may change several times daily. Showing both the network adapter and disk subsystem bottlenecks provides more useful information about how the server will perform in production environments.

NetBench is designed to measure the ability of a file server to respond to client file open, close, read and write I/O operations. Our measurements show that increasing the processor speed alone provides little, if any, increase in throughput for most file server environments. However, additional CPU power and memory capacity can provide improvements for servers that are supporting a very large number of users.

4

Server Configurations

ServerBench 3.0

Non-RAID Configurations

Features	IBM PC Server 315	Hewlett-Packard NetServer E40	IBM PC Server 315	Compaq ProLiant 800
Processor	200MHz Intel Pentium Pro	200MHz Intel Pentium Pro	200MHz Intel Pentium Pro	200MHz Intel Pentium Pro
Memory	64MB EDO ECC DIMMs	64MB ECC SIMMs	64MB EDO ECC DIMMs	64MB EDO ECC DIMMs
L2 Cache	256KB	256KB	256KB	256KB
RAID Type	Non-array	Non-array	Non-array	Non-array
Disk Drive	4.33GB Ultra SCSI Fast Hard Disk	4.2GB Fast SCSI-2 Hard Disk	4.51 Wide Ultra SCSI Hard Disk	4.5GB Ultra SCSI Hard Disk
Disk Drive Adapter	Wide Ultra SCSI PCI Adapter	SCSI-2 Fast PCI Adapter	Wide Ultra SCSI PCI Adapter	Wide Ultra SCSI Adapter on Planar
Disk Adapter Driver	AIC78XX.SYS	AIC78XX.SYS	AIC78XX.SYS	SYMC810.SYS
Drive Speed (RPMs)	5400	5400	7200	7200
Network Adapter	IBM 10/100 Ethernet PCI Adapter	HP DeskDirect 10/100TX PCI Adapter	IBM 10/100 Ethernet PCI Adapter	Netelligent 10/100 TX Ethernet PCI Adapter
Network Adapter Driver	E100B.SYS	E100B.SYS	E100B.SYS	NETFLX3.SYS
Network Operating System	Microsoft Windows NT Server 4.0	Microsoft Windows NT Server 4.0	Microsoft Windows NT Server 4.0	Microsoft Windows NT Server 4.0
File System	NTFS	NTFS	NTFS	NTFS
Allocation Unit Size	4096	4096	4096	4096
ServerBench Version	3.0	3.0	3.0	3.0

WebBench 1.0

Non-RAID Configurations

Features	IBM PC Server 315	Hewlett-Packard NetServer E40	IBM PC Server 315	Compaq ProLiant 800
Processor	200MHz Intel Pentium Pro	200MHz Intel Pentium Pro	200MHz Intel Pentium Pro	200MHz Intel Pentium Pro
Memory	64MB EDO ECC DIMMs	64MB ECC SIMMs	64MB EDO ECC DIMMs	64MB EDO ECC DIMMs
L2 Cache	256KB	256KB	256KB	256KB
RAID Type	Non-array	Non-array	Non-array	Non-array
Disk Drive	4.33GB Ultra SCSI Fast Hard Disk	4.2GB Fast SCSI-2 Hard Disk	4.51GB Wide Ultra SCSI Hard Disk	4.5GB Ultra SCSI Hard Disk
Disk Drive Adapter	Wide Ultra SCSI PCI Adapter	SCSI-2 Fast PCI Adapter	Wide Ultra SCSI PCI Adapter	Wide Ultra SCSI Adapter on Planar
Disk Adapter Driver	AIC78XX.SYS	AIC78XX.SYS	AIC78XX.SYS	SYMC810.SYS
Drive Speed (RPMs)	5400	5400	7200	7200
Network Adapter	IBM 10/100 Ethernet PCI Adapter	HP DeskDirect 10/100TX PCI Adapter	IBM 10/100 Ethernet PCI Adapter	Netelligent 10/100 TX Ethernet PCI Adapter
Network Adapter Driver	E100B.SYS	E100B.SYS	E100B.SYS	NETFLX3.SYS
Network Operating System	Microsoft Windows NT Server 4.0	Microsoft Windows NT Server 4.0	Microsoft Windows NT Server 4.0	Microsoft Windows NT Server 4.0
WebBench Version	1.0	1.0	1.0	1.0

NetBench 5.0

Non-RAID Configurations

Features	IBM PC Server 315	Hewlett-Packard NetServer E40	IBM PC Server 315	Compaq ProLiant 800
Processor	One 200MHz Intel Pentium Pro	One 200MHz Intel Pentium Pro	One 200MHz Intel Pentium Pro	One 200MHz Intel Pentium Pro
Memory	64MB EDO ECC DIMMs	64MB ECC SIMMs	64MB EDO ECC DIMMs	64MB EDO ECC DIMMs
L2 Cache	256KB	256KB	256KB	256KB
RAID Type	Non-array	Non-array	Non-array	Non-array
Disk Drive	4.33GB Ultra SCSI Fast Hard Disk	4.2GB Fast SCSI-2 Hard Disk	4.51 Wide Ultra SCSI Hard Disk	4.5GB Ultra SCSI Hard Disk
Disk Drive Adapter	Wide Ultra SCSI PCI Adapter	SCSI-2 Fast PCI Adapter	Wide Ultra SCSI PCI Adapter	Wide Ultra SCSI Adapter on Planar
Disk Adapter Driver	AIC7870.DSK V2.13	AIC7870.DSK V2.13	AIC7870.DSK V2.13	CPQS710.DSK V2.11
Drive Speed (RPMs)	5400	5400	7200	7200
Network Adapter	IBM 10/100 Ethernet PCI Adapter	HP DeskDirect 10/100TX PCI Adapter	IBM 10/100 Ethernet PCI Adapter	Netelligent 10/100 TX Ethernet PCI Adapter
Network Adapter Driver	E100B.LAN V1.47	HPTX.LAN V1.40	E100B.LAN V1.47	CPQNF3.LAN V2.20
Network Operating System	Novell NetWare 4.11	Novell NetWare 4.11	Novell NetWare 4.11	Novell NetWare 4.11
NetWare Volume Block Size	32KB	32KB	32KB	32KB
File Compression	Off	Off	Off	Off
Block Allocation	On	On	On	On
Data Migration	Off	Off	Off	Off
NetBench Version	5.0	5.0	5.0	5.0

5

Test Disclosure Information

ServerBench 3.0

The measurements were conducted using Ziff-Davis' ServerBench 3.0 running Microsoft Windows NT Workstation 4.0 clients as described below:

Version

- ServerBench 3.0

Mixes

- System Test Mixes
- Clients: 1, 3, 6, 9, 12, 15
- Disk Test Data File: 20MB
- Disk Test File I/O Range: 10MB
- Ramp up: Default setup
- Ramp down: Default setup

Network Operating System (NOS): Microsoft Windows NT Server 4.0

NOS Parameters:

HKEY_Local_Machine\System\CurrentControlSet\Control\SessionManager\MemoryManagement\LargeSystemCache

Testbed Disclosure

All products used for these measurements were shipping versions available to the general public. All measurements were performed without independent verification by Ziff-Davis.

Network	100Mbps Ethernet
Clients	15
Hubs	Asante 100Mbps Ethernet
Clients per Segment	15
CPU / Memory	166MHz Pentium / 32MB
Network Adapters	IBM 10/100 Ethernet PCI Adapter
Software	Microsoft Windows NT Workstation 4.0
Cache	L2 = 512KB
Controller Software	Microsoft Windows NT Workstation 4.0

WebBench 1.0

The measurements were conducted using Ziff-Davis' WebBench 1.0 running the NT_SIMPLE_CGI20_V1.TST test suite with Microsoft Windows NT Workstation 4.0 clients as described below:

Version

- WebBench 1.0

Mixes

- NT_SIMPLE_CGI20_V1.TST
- Clients: 1, 3, 6, 9, 12, 15
- Ramp up: 30 seconds
- Ramp down: 30 seconds
- Length: 300 seconds
- Think: 0 seconds
- Delay: 0 seconds
- Threads per client: 1
- Receive buffer size: 4KB
- Keep-alive: Off

Network Operating System (NOS): Microsoft Windows NT Server 4.0

Web Server: Microsoft Internet Information Server 2.0

Testbed Disclosure

All products used for these measurements were shipping versions available to the general public. All measurements were performed without independent verification by Ziff-Davis.

Network	100Mbps Ethernet
Clients	15
Hubs	Asante 100Mbps Ethernet
Clients per Segment	15
CPU / Memory	166MHz Pentium / 32MB
Network Adapters	IBM 10/100 Ethernet PCI Adapter
Software	Microsoft Windows NT Workstation 4.0
Cache	L2 = 512KB
Controller Software	Microsoft Windows NT Workstation 4.0

NetBench 5.0

The measurements were conducted using Ziff-Davis' NetBench 5.0 running the Disk Mix test suite as described below:

Version

- NetBench 5.0

Mixes

- Disk Mix
- Clients: 5, 10, 15, 20, 25, 30
- Client workspace: 80MB
- Total runtime: 11 minutes
- Ramp up and down: 30 seconds

Network Operating System (NOS)

- Novell NetWare 4.11 with patches 411sp1B applied

NOS Parameters

- Immediate Purge of Deleted Files = ON
- Enable Disk Read after Write Verify = OFF
- Minimum Packet Receive Buffers = 500
- Maximum Packet Receive Buffers = 1000
- Maximum Physical Receive Packet Size = 1514
- Set NCP Packet Signature Option = 0
- Reserved Buffer Below 16MB = 200
- Maximum Service Processes = 70
- Maximum Concurrent Directory Cache Write = 50
- Dirty Directory Cache Delay Time = 10
- Maximum Concurrent Disk Cache Write = 50
- Maximum Directory Cache Buffers = 500
- Minimum Directory Cache Buffers = 150
- Minimum File Cache Buffers = 150
- Maximum Number of Directory Handles = 30
- Dirty Disk Cache Delay Time = 5
- Directory Cache Buffer Non-Referenced Delay = 30
- Directory Cache Allocation Wait Time - 2.2 seconds

If clients drop out, set the following:

- Number of Watchdog Packets = 50
- Delay Between Watchdog Packets = 10 minutes
- Delay Before First Watchdog Packet = 20 minutes

To monitor the dropping out of clients, set:

- Console Display Watchdog Logouts = On

Testbed Disclosure

All products used in this test were shipping versions available to the general public. All the tests were performed without independent verification by Ziff-Davis.

Network	100Mbps Ethernet
Clients	30
Hubs	Asante 100Mbps Ethernet
Clients per Segment	30
CPU / Memory	133MHz / 16MB
Network Adapters	IBM 10/100 Ethernet PCI Adapter
Software	IBM DOS 6.3 NetWare DOS Requester LSL.COM (8-3-95) E100BODI (5-21-96) IPXODI (8-8-95) VLM.EXE (11-8-94)
Cache	L2 = 512KB
Controller Software	PC-DOS Version 6.3 Microsoft Windows for Workgroups 3.11

Clients NET.CFG

- Checksum = 0
- Large Internet Packet = On
- PB Buffers = 10
- PBurst Read Windows Size = 64
- PBurst Write Windows Size = 64
- Cache Buffers = 64
- Cache Buffers Size = 4096
- True Commit = Off
- Signature Level = 0

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