Purpose Built N440BX DP Server Board
Performance Brief

NetBench and ServerBench

350 MHz/512KB Pentium® II processor

intel.

Revision History		
Date	Rev	Modifications
3/4/98	0.5	Preliminary, ready to post
3/31/98	1.0	Fixed Trademark errors and various grammar changes
4/28/98	1.5	Changed format. No data changes, additions, or deletions compared to revision 1.0

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1. INTRODUCTION

1.1 Scope

The information contained in this performance report is intended to assist in characterizing the application, performance features, and price of the N440BX DP Server board when compared to various other system designs. The N440BX DP Server architecture features dual Pentium® II processors with 100MHz System Bus. This entry-level server offers traditionally high-end reliability, availability, and serviceability (RAS) features at an affordable price range.

This platform report is comprised of results from the following benchmarks: ServerBench*, NetBench*, and references to iCOMP®. The configurations used for these benchmarks were designed to put maximum stress on the system and achieve reasonably performing results. These are called baseline numbers. These results should be easily duplicated when using the same configuration. No special modifications were made to any BIOS, software, or hardware in order to achieve these results the numbers.

Given limited resources, a complete and comprehensive set of tests at any given time is difficult to achieve. Moreover, new revisions of both hardware and software will inevitably become available and continuing effort by many to achieve the "true benchmark" status. Therefore, this report may be updated periodically with new data for additional hardware and software configurations, as resources become available. Additionally, the versions of the benchmarks may have been updated since testing was conducted and reported in this document.

1.2 The True Benchmark

The phrase "true benchmark" is a misnomer. Numerous committees, forums, individuals and companies have allocated vast resources attempting to develop a "true benchmark" for computer systems. While no benchmark has completely achieved the desired result, these efforts have not been completely in vain. Many different methods, techniques and approaches for benchmarking have been developed. Choosing an appropriate server depends on the desired performance level and monetary investment. Buying higher performance does not always guarantee a faster system. For this reason, buyers must understand and characterize the applications being measured. The task is to select the benchmarks that test and simulate the desired computing environment in which the server will eventually be placed.

Many of the more popular benchmarks are associated with workstations. Workstations and servers have a completely different set of requirements. Blindly using many of these workstation "true benchmarks" for servers will lead to confusion and not to an informed buying decision. In general, quality server benchmarks are based on the use of workloads that relate to the specific elements and subsystems. These elements, which include the processor, cache, memory, I/O subsystem bandwidth, disk subsystem, and the network operating system, are stressed by the benchmark routines and properly evaluated. Furthermore, many of the market-driven factors (e.g. high performance, low cost, and standard components) which have driven the numerous choices made in both the PC desktop market segment and the workstation market segment; still apply to the server market segment. However, additional criteria including reliability, availability, serviceability and scalability, usability, manageability (RASUM), must be considered when evaluating server products.

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1.3 N440BX DP Server Features

The N440BX DP Server board is a high integration entry-level Pentium II processor-based server that provides a low-cost entry-level path to the performance premium of the Pentium II processor with 100MHz System Bus.

Features	Benefits
Supports dual Intel Pentium II processors at 333 MHz and beyond with 512 Kbytes of ECC L2 cache	Build entry-level servers with plenty of headroom for growth
100 MHz System Bus speed	Higher system bandwidth, highest performance on the market today, using Pentium II processors at 350MHz and beyond
Advanced Intel 82440BX chip set	Support for the latest Intel Pentium® II processors, memory, and drive technologies
Advanced Emergency Management Port (EMP)	Remote management lowers cost of ownership
Integrated dual-channel SCSI, LAN, and graphics (with 2 MB SGRAM)	Validated and tested SCSI, LAN, and graphics support saves integration time and money.
DIMM sockets support 1 GB SDRAM ECC memory	Greater memory expandability and reliability
Five full-length slots: 3 PCI, 1 ISA, 1 shared PCI/ISA	On-board integration yields more available slots for greater configuration flexibility
Intel LANDesk® Server Manager software	Built-in server management features for lower cost of ownership.
Modified server AT form factor	Easy, low-cost integration into ATX compatible chassis

2. Performance Test Results and Analyses
2.1 NetBench* 5.01 Test Suite; Benchmark Description

NetBench 5.01 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* operating systems. The clients pelt 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. NetBench adds all the client throughputs together to produce the overall throughput for a server. NetBench provides you with a way to measure, analyze, and predict how a server handles network file I/O requests in a file server environment. If you are using a server as a file server (i.e., you are running applications, such as a word processing program, on the client and only using the server as a place to access data), then NetBench is a very good tool for measuring the server's performance. NetBench reports its results as bytes per second. It also reports the overall server score as megabits per second for the convenience of publications that use that unit of measure.

NetBench can be executed on SCO UNIX*, various Novell NetWare* versions, or Microsoft Windows* NT. The Intel Software Performance Lab (iSPL) chose to execute this file server benchmark suite with a

leading network operating system: Windows NT 4.0. More information can be obtained on these and other Ziff-Davis benchmarks on the World Wide Web at http://www.zdnet.com/zdbop/.

You can also use NetBench to compare a server's performance to the performance of other servers. To get a valid comparison, though, you must run NetBench the same way on all servers you include in the comparison: run the same test suite, use the same parameters on all the servers, and use the same testbed.

To accurately represent the interaction clients have with the server the iSPL modeled the NetBench setup after a file server environment. This would be an environment where the application, such as a word processing or spreadsheet program, is running on the client and the client primarily uses the server to access data. As a result, the server's disk I/O speed and the network I/O speed are major areas that affect the test score.

2.1.1 NetBench Results; Dual Processor

	Mix ID	Clients Participating	Total Throughput (bytes/sec)	Total Throughput (MBits/sec)	Peak Throughput (bytes/sec)	Peak Client #	Low Throughput (bytes/sec)	Low Client #
Table 1: Overall Results f:\netbench\suites\nbmod_60.tst								
dm_1_client	1	1	527310.112	4.023	527310.112	1	527310.112	1
dm_4_clients	2	4	2109388.104	16.093	528463.633	3	525972.181	4
dm_8_clients	3	8	4196348.265	32.016	527625.690	8	519614.228	4
dm_12_clients	4	12	6233359.688	47.557	524004.400	6	514003.582	9
dm_16_clients	5	16	8290643.106	63.253	522697.350	13	514441.235	9
dm_20_clients	6	20	10276062.054	78.400	522561.157	19	506453.761	2
dm_24_clients	7	24	12246211.128	93.431	518627.845	7	499884.448	20
dm_28_clients	8	28	14074373.532	107.379	513205.597	19	489514.556	24
dm_32_clients	9	32	15884047.099	121.186	511124.819	23	484662.901	28
dm_36_clients	10	36	17645522.265	134.625	506888.686	7	472644.928	20
dm_40_clients	11	40	19032375.937	145.206	491603.417	39	458746.229	36
dm_44_clients	12	44	20440392.643	155.948	486062.363	3	447842.121	36
dm_48_clients	13	48	21393363.444	163.218	467643.940	12	427624.889	32
dm_52_clients	14	52	22570761.007	172.201	456126.721	47	413789.202	40
dm_56_clients	15	56	23065516.528	175.976	433512.926	15	388195.087	56
dm_60_clients	16	60	23260493.910	177.463	407761.895	11	374288.092	44
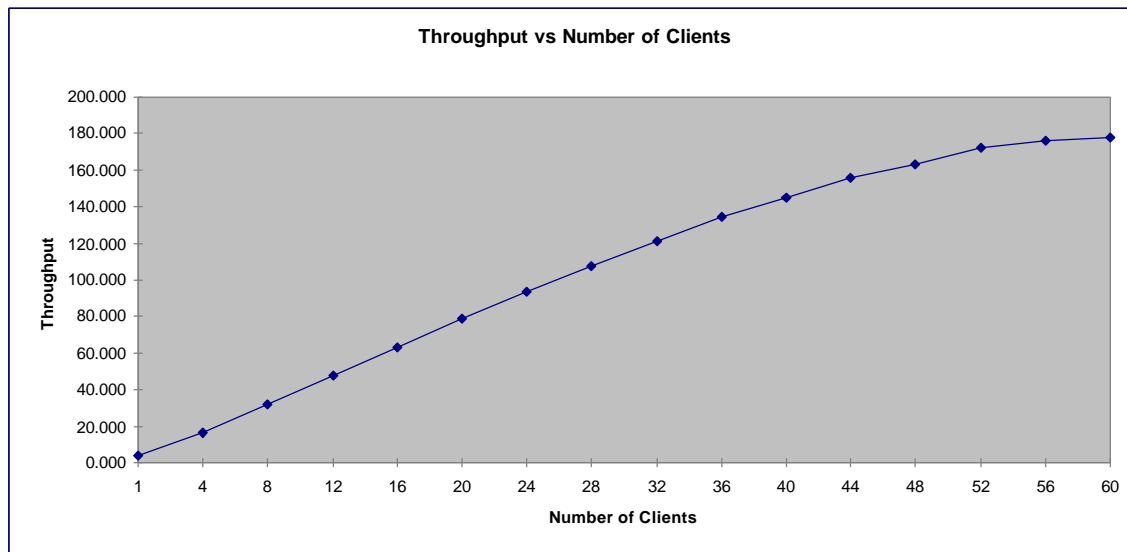
Dual Processor at 350MHz on N440BX Server Board

2.1.2 NetBench Results; Single Processor

	Mix ID	Clients Participating	Total Throughput (bytes/sec)	Total Throughput (MBits/sec)	Peak Throughput (bytes/sec)	Peak Client #	Low Throughput (bytes/sec)	Low Client #
			Table 1: Overall Results					
			f:\netbench\suites\nbmod_60.tst					
Mix Name								
dm_1_client	1	1	528161.704	4.030	528161.704	1	528161.704	1
dm_4_clients	2	4	2112941.663	16.120	529057.864	1	527152.918	3
dm_8_clients	3	8	4199346.696	32.038	529048.137	2	519834.146	8
dm_12_clients	4	12	6231930.759	47.546	523013.808	5	515875.854	7
dm_16_clients	5	16	8217492.217	62.694	516857.724	6	510398.473	7
dm_20_clients	6	20	10078624.696	76.894	508063.399	13	495463.311	20
dm_24_clients	7	24	11901985.156	90.805	503681.788	22	490361.125	24
dm_28_clients	8	28	13391229.431	102.167	489028.466	22	469089.880	12
dm_32_clients	9	32	14909246.835	113.749	474940.940	13	456519.877	24
dm_36_clients	10	36	15822162.532	120.714	447721.371	15	431549.043	36
dm_40_clients	11	40	16030031.662	122.299	410682.163	16	391036.134	27
dm_44_clients	12	44	16646553.878	127.003	388346.296	19	366349.454	38
dm_48_clients	13	48	16516194.452	126.009	355771.470	2	331444.371	33
dm_52_clients	14	52	16586249.779	126.543	331817.715	30	311378.335	32
dm_56_clients	15	56	16435589.603	125.394	311635.385	30	284466.933	32
dm_60_clients	16	60	16078676.314	122.671	275041.260	13	253534.456	40

Single Processor at 350MHz on N440BX Server Board

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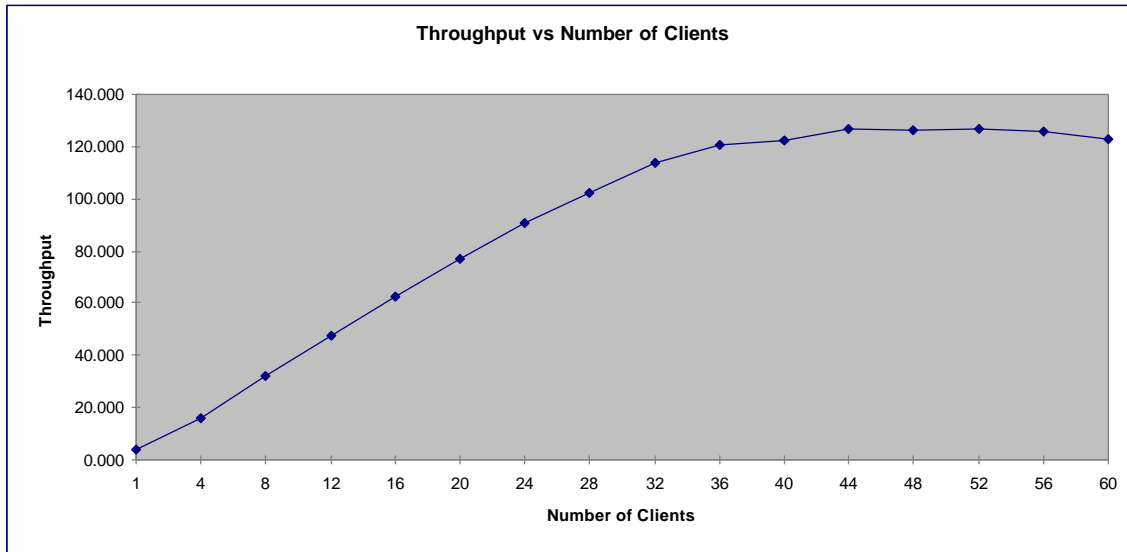
2.2 ServerBench* 4.0 Test Suite; Benchmark Description

ServerBench is a Ziff-Davis benchmark that lets you measure the performance of a server in a client/server environment.   ServerBench can be executed on: SCO UNIX, SCO UnixWare, OS/2, Novell NetWare, or Microsoft Windows NT. The clients can be running either Windows 95 or Windows NT. The Intel Software Performance Lab (iSPL) chose to execute this application server benchmark suite with the Microsoft Windows NT 4.0 version.   More information can be obtained on these and other Ziff-Davis benchmarks on the World Wide Web at [http://www.zdnet.com/zdbop/]
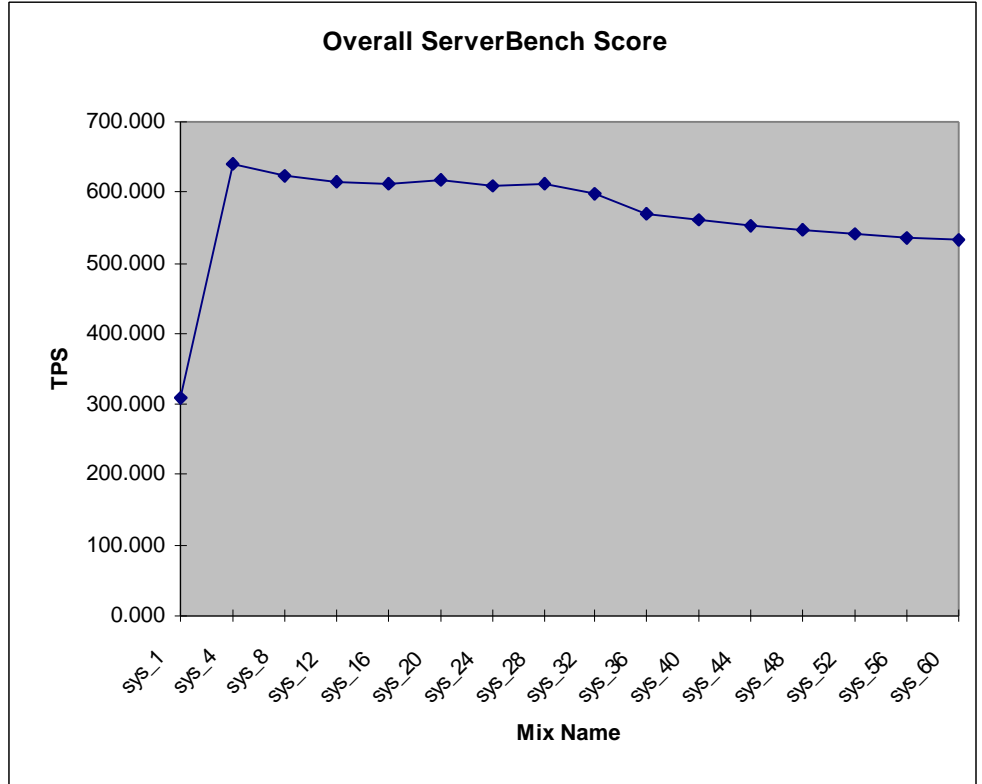
ServerBench produces numerous results. One of its primary results is an overall ServerBench score for a server. ServerBench's test setup is similar to an application server environment. In this environment, data and applications exist on the server. The client desktop machines are primarily a front-end to provide an access point into the applications. ServerBench lets the tester determine the exact blend of requests the clients make of the servers. Tests can involve requests that hit only a single server subsystem, such as the disk subsystem, or a mixture of all three subsystems and varying numbers of clients. ServerBench reports the test results as ServerBench transactions per second (TPS). It combines the TPS scores for different transactions using a weighted harmonic mean.

ServerBench comes in three main parts:

1. **Server Software:** The first part is a specially written piece of software that can stress any or all of the three main subsystems of a server: the processor, disk, and network. Instead of running server-based applications, ServerBench uses its own programs to exercise a server. The processor test behaves much like the processor-intensive portions of typical database servers. The test includes data searches, sorts, and integer arithmetic. During its work each processor test program on the server consumes about 400K of RAM.
2. **Client Software:** The client software lets the clients ask for a mix of processor, disk, and network services. The disk tests can perform random or sequential read or write operations, as well as file appends. ServerBench lets the tester determine such characteristics as the size of the test file each client uses, the size of the chunks in which the test moves data, and the placement of the files on the server's disks.
3. **Controller Software:** Testers control the whole show from a single PC that runs the controller software. The network tests basically read and write data to the server using the client-to-server network connection. Like the disk tests, the network tests let testers determine key test parameters, such as the total amount of data to move over the network and the size of the chunks the data should move

2.2.1 ServerBench Results, Dual Processor

Table 1: ServerBench Summary c:\svrbench\suites\sys_60.tst	
Mix Name	Harmonic mean of Total TPS Scores
sys_1	*310.146*
sys_4	*641.548*
sys_8	*624.851*
sys_12	*615.405*
sys_16	*612.994*
sys_20	*617.113*
sys_24	*610.335*
sys_28	*612.246*
sys_32	*596.582*
sys_36	*570.904*
sys_40	*561.618*
sys_44	*553.171*
sys_48	*546.885*
sys_52	*540.332*
sys_56	*536.849*
sys_60	*533.021*

Overall ServerBench Score

(chart: TPS vs Mix Name, values from sys_1 through sys_60)

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2.2.2 ServerBench Results, Single Processor

Table 1: ServerBench Summary c:\svrbench\suites\sys_60.tst	
Mix Name	Harmonic mean of Total TPS Scores
sys_1	312.519
sys_4	348.805
sys_8	341.216
sys_12	338.171
sys_16	338.158
sys_20	337.855
sys_24	340.356
sys_28	340.339
sys_32	330.437
sys_36	320.718
sys_40	314.133
sys_44	309.041
sys_48	305.099
sys_52	303.587
sys_56	299.454
sys_60	298.598

Overall ServerBench Score
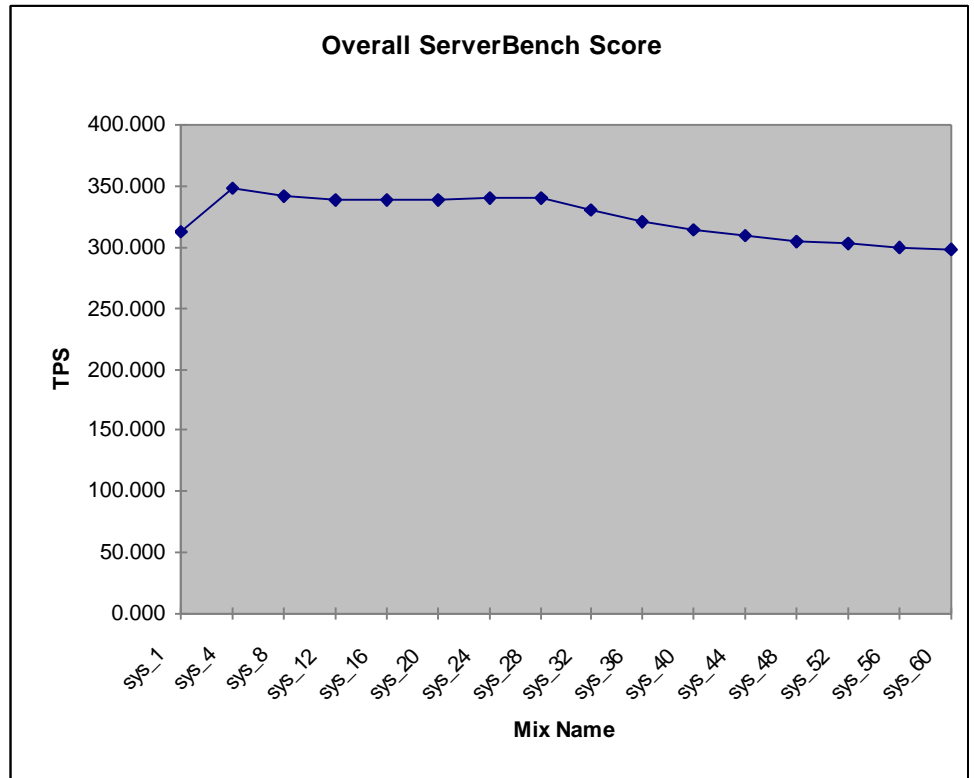
Single Processor at 350MHz on N440BX Server Board

3. NetBench and ServerBench Differences

NetBench operates at a different level from ServerBench. NetBench focuses on file servers and deals with file access. ServerBench focuses on application servers that perform in a client/server environment. NetBench accesses data through a well-defined, publicly available API. ServerBench only communicates with itself using a proprietary client program to create a data packet that goes along the network and a proprietary server program to decode the client data packet. Then the server program returns the response to the client program. NetBench returns scores showing I/O throughput for file servers while the ServerBench scores show how well servers handle client requests for a variety of operations. ServerBench also measures the performance of individual server subsystems. These subsystems are transparent to the NetBench tests. NetBench does not execute any special programs on the server while ServerBench executes a specially written ServerBench program on the server. As a result, NetBench does not require any special network software other than what is currently available for communication between the server and the clients.

4. Appendix A - References

The Ziff-Davis Benchmark Operation (ZDBOp), "Understanding and Using NetBench 5.01"

The Ziff-Davis Benchmark Operation (ZDBOp), "Understanding and Using ServerBench 4.0"

The Ziff-Davis Benchmark Operation (ZDBOp) URL: http://www.zdnet.com/zdbop/

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The iCOMP Index 2.0: http://pentium.intel.com/procs/perf/icomp/icomp_paper/ICOMP.HTM

http://www.intel.com/PROCS/PERF/PentiumII/sysmarknt.htm

http://www.intel.com/PROCS/PERF/PentiumII/windows_config.htm

http://www.intel.com/PROCS/PERF/index.htm