Understanding and Using NetBench™ 2.10

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Preface

This manual tells you how to install, set up, and run NetBench™.

NetBench is one of several benchmark programs developed by the Ziff-Davis Benchmark Operation to help you test your PCs, servers, and Macintoshes. For information on getting copies of other benchmarks or additional copies of NetBench, see Appendix F.

Notes about NetBench

WARNING

The user is cautioned against running these tests on a "live" production network. NetBench is designed to exercise the network in various ways. <u>Running NetBench should be done in isolation when other user activity on the network is non-existent. Results would be meaningless if the network were active with user tasks.</u>

Please note the following before you run NetBench:

1.	You must read and agree to the license information in the front of this manual before running NetBench. The same licensing information appears on your PC's screen when you first run NetBench and on-line in the README file. If you do not agree to the licensing information, remove

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NetBench entirely from your system and return it and all accompanying materials (including any documentation) to ZDBOp at the following address:

The Ziff-Davis Benchmark Operation
One Copley Parkway, Suite 510
Morrisville, NC 27560

2. **System Requirements**

The minimum configuration required to run NetBench is one computer which acts as a file server and another computer which runs the NetBench test station software. This test station accesses the file server through a logical drive.

NetBench Diskette Contents

ABOUT TXT		Information about NetBench
BATCH TXT		Sample Batch command file
LICENSE TXT located in		License text agreed to by user (also Document)
LICFILE TXT		Created by License procedure
NETBENCH EXE	Actual	NetBench executable file
PARMS CFG		Used in Batch example

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PARMS1   CFG   Used in Batch example

README.TXT   Readme file referred to within NetBench

USERINFO TXT   Licensed to text (user and
organization) Created   after the first time a
program is licensed to a user.

ZD_NB210 PCX   Startup Graphics Screen

ZDLPARMS CFG   Essential file required for NetBench to
execute

NETBENCH TXT   ASCII readable Text version of User Guide

NETBENCH RTF   Rich Text Format - User Guide

NETBENCH DOC   Word for Windows version 2.0a - User
Guide

End of Preface

Table of Contents

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Benchmark Request Form

Glossary

Chapter 1
NetBench Overview

This guide describes what NetBench is, how it is installed, the basics of setting up and running each of the NetBench tests, and some scenarios of how each NetBench test has been used during pre-release testing to measure network file server performance. It includes some cautions and suggestions, but it cannot anticipate all possible uses (proper or improper) for NetBench. You are responsible for understanding the objective of your test and how you use NetBench.

NetBench is a tool

NetBench is a tool that helps determine relative file server performance. In order to do this, two distinct tests were developed: Network Interface Card, and I/O Throughput. The purpose of each test is to isolate, exercise, and measure throughput over time at the respective system location: the network interface card, or the file server disk I/O subsystem.

These tests are influenced by the operating system used by the network, memory, memory cache, CPU types and speeds, server

disk speeds, and Network Interface Cards -- the same items that influence the performance of a user application on a network.

Although the fundamental operation of a NetBench test does not change, modifications to test parameters such as test duration and file size, as well as modifications to the network system under examination produce results which can be comparatively analyzed and evaluated. Proper interpretation of the results produced allow the user to determine what type of network configuration is most effective for a simulated network load.

NetBench acts like an application

NetBench was designed to "act like an application" (see Figure 1) and is not reliant on any specific network operating system. In other words, "special system calls" were avoided so that the specific network operating system used would be transparent to the testing process. The goal of the software is to test File Services (the capacity of the file server for file I/O activity), and to test the capacity of the network through the network interface card.

The tests allow the user to specify one of two locations in the system to generate a simulated "bottleneck" of activity. This helps the user determine the network configuration best suited for a particular application environment. The term "bottleneck" is deliberately chosen. It represents the maximum number of times an "activity" is performed in a user-specified time frame. The maximum number of "activities" performed depends on the specific hardware chosen for the network and is also influenced by the number of test stations configured for the test.

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Finally, it is important to keep in mind that because each test station performs the maximum number of test iterations possible during the test period, an actual application load of the same network configuration would likely perform better. NetBench tests worst-case scenarios. Typical applications on a production network tend to be less resource demanding than the "bottleneck" tests performed under NetBench.

Model of Network Application Layers

The following provides you with an example of the different layers that are in a network application.

µ §**A.** Application Layer

running on a test station

NetBench viewpoint

B.   Network Redirector (redirected drive)

C.   Network Adapter Driver

(protocol e.g. IPX, IP, DECNET)

D.   Network Interface Card

(Workstation adapter card)

E.   Wire

F.   Network Interface Card

        (Network server adapter card)

G.   Server

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Figure 1.   Representation of a Simulated Network Application

   In this example, everything that appears below the dashed line (i.e., B through G) represents information hidden from NetBench.

The results reflect the system configuration

The results are representative of the specific configuration used (hardware, software, and NetBench parameters). The results may be compared properly when one variable at a time is modified in the configuration. Careful thought must be taken when choosing the variable to change. Some modifications may have little or no effect on the network. Understanding which items make sense to vary really depends on how well you (the NetBench user) understand the network configuration that you are using.

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Using NetBench

The following sequence is suggested to help you get started using NetBench:

1) Install NetBench.

   In Chapter 2, the section, **Installing NetBench on a PC,** provides instructions for installing NetBench on a single-user PC system should you desire to become familiar with the tool before installing it on a network. <u>Network testing cannot be accomplished using the PC installation procedure.</u>

   The section, **Installing NetBench on a Network Server**, provides instructions for installing NetBench on a server drive for actual network testing.

   The **Installing NetBench on a PC**, section should not harm a network as long as NetBench is installed on the local C: drive, whereas the network installation procedure will seriously impair the network (and compromise its functioning) if the network were active with user tasks. At the same time, the values returned as a result of the test will be meaningless.

2) Decide on a test.

   Determine which NetBench test to run: NIC Throughput or I/O

Throughput.

3) Read about the test.

Read the corresponding section in this guide about the test.

4) Configure test network.

Make any test-specific adjustments to the test network.

5) Understand the NetBench menus.

Use the **Running NetBench** section to learn about using the
menus to configure NetBench parameters for the test.

6) Set any NetBench parameters.

Use the menus to set the NetBench parameters.

7) Run the test.

End of Chapter

Chapter 2
Installing NetBench

This chapter talks about how you can install and start using NetBench. It includes information on installing NetBench on a PC and on a network server.

Installing on a PC

This section provides instructions for installing NetBench on a PC in order become familiar with the tool. <u>Network testing cannot be accomplished using the PC installation procedure.</u>

Load the NetBench files in an empty directory on the PC. To do this:

1. Create the directory on the PC. Any directory name will work. The drive must be **local** with respect to the PC. In this case we will assume the C: drive.

   md fakenet

   In this example we will use fakenet.

   NOTE: This directory must be empty and should only

contain files which are pertinent to Ziff-Davis' NetBench. Files located in the directory will be overwritten if they correspond to filenames reserved by NetBench.

2. Insert Ziff-Davis' NetBench disk into the floppy drive and copy all NetBench files to the newly created file directory.

3. Run the NetBench License Utility.

    NETBENCH / L

    You are required to provide your Name and Organization under the terms of the Licensing Agreement. Follow the directions on the display.

4. Create a file named WS.ID with any text editor and type a unique 3 digit numeric identifier (example: 001) at the first position in the file (no lead spaces or line feeds), then save the file to the **C:\WS.ID** local drive root directory (Refer to: Definitions WS.ID and Test Stations). The purpose of the file is to identify the test station with **a unique 3 digit numeric identifier**. <u>NetBench requires this file be located on the **C:** drive root directory of each test station.</u>

5. Once NetBench is installed it is best to:

    A) Determine which NetBench test to run (NIC Throughput or I/O Throughput)
    B) Read the corresponding section in this guide about the test.

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C) If you were actually using the network for testing, you would normally make specific adjustments to the test network at this point in time. Because you have installed NetBench on your local drive, NetBench results are "simulated" and no network adjustments are required.

D) Go to the **Running NetBench** section to learn how to use the menus and configure NetBench parameters for the test. It would be useful to "play" with the test parameters in order to become familiar with them.

E) Configure the NetBench parameters

F) Run the test.

Installing NetBench on a Network Server

WARNING

The user is cautioned against running these tests on a "live" production network.   NetBench is designed to exercise the network in various ways. Running NetBench should be done in isolation when other user activity on the network is non-existent.

Load all the NetBench diskette files onto the server such that the program can run off a common logical drive with the other test stations on the network.

To do this :

1. Log into the server from your workstation over your LAN connection.

2. Create a default directory on the server. This directory will be accessed by all the test stations as a common workspace from which they will read and write. Any directory name will work. In this example we will use NETBENCH. **Warning:** This directory must be empty and should only contain files which are pertinent to Ziff-Davis' NetBench. Other files may be overwritten if they are contained in this directory.

   J: {substitute your Network drive name for J in all cases}

   MD J:\NETBENCH

   CD J:\NETBENCH

3. Install the NetBench programs. Insert Ziff-Davis' NetBench disk into the floppy drive and copy the floppy files to the server directory you have designated.

4. Run the NetBench License Utility.

   CD \NETBENCH

   NETBENCH / L

   You are required to provide your Name and Organization under the terms of the Licensing Agreement. Follow the directions on the display.

5. At each Test station: Create a file named WS.ID with any text editor and type a unique 3 digit numeric identifier (example: 001) at the first position in the file (no lead spaces or line

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> feeds), then save the file to the **C:\WS.ID** local drive root
> directory (Refer to: Definitions WS.ID and Test Stations). The
> purpose of the file is to identify each test station in the network
> with **a unique 3 digit numeric identifier**. A sequential
> scheme is suggested for convenience (example: 001, 002, 003).
> <u>NetBench requires this file be located on the **C:** drive root</u>
> <u>directory of each test station.</u>

6. Set the login sequence on each test station to execute NetBench
   on startup. Modify AUTOEXEC.BAT and CONFIG.SYS so
   that the test stations will boot and automatically start up
   NetBench for the current test run. (See Novell example Figure
   2A and 2B.) Automatic boot up is not required, but suggested
   for convenience. It also prevents other software interfering
   with the performance tests.

7. Prevent any non-test stations from interfering with the
   network. **Warning:** Do not run these tests from the same
   network that other users are accessing since it will interfere
   with both the NetBench testing and the user. Any non-test
   stations may remain physically connected to the network but
   must be logged off the network server.

8. Ensure that the file server and network LAN is properly
   configured for the test. This includes:

- LAN server network interface card.

- All connectivity and cabling.

- Software drivers on LAN server and test stations.

- Operating system parameters which might affect the test (Disk caching, memory, maximum packet size, minimum packet size).

NetBench is now installed.

What's Next?

Once NetBench is installed it is best to:

- Determine which NetBench test you want to run: NIC Throughput or I/O Throughput.

- Read the corresponding section in this guide about the test.

- Make any test specific adjustments to the test network.

- Go to the **Running NetBench** section to learn how to use the menus and configure NetBench parameters for the test.

- Configure the NetBench parameters.

- Run the test.

Example 2A (below).

Example of Test Station files which use a Novell operating system server (Note: The following is only an example. The user

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must configure the test stations to match the LAN server used.)

An example of the contents of AUTOEXEC.BAT :

```
@ECHO OFF
PROMPT $p$g
PATH C:\DOS;C:\;
set TEMP=C:\DOS
ipx                   Novell
net5                  Novell
e:                    logon sequence to file server
login supervisor      logon username to file server
g:                    common logical drive
cd  \NetBench\        common logical directory
NetBench              start up NetBench
```

An example of the contents of CONFIG.SYS:

```
DEVICE=C:\DOS\SETVER.EXE
DEVICE=C:\DOS\HIMEM.SYS
DOS=HIGH
FILES=30
lastdrive=d
```

An example of WS.ID contained in the root directory of C:\

12345678901   column position in file

001 GROUPA1   file contents

NOTE:The 3 digit number of the WS.ID field must always be unique on each test station.

Figure 2B (below). Example of matching Novell server configuration files

STARTUP.NCF

    set minimum packet receive buffers=200
    set maximum physical receive packet size=4096

AUTOEXEC.NCF

    set enable disk read after write verify=OFF
    set maximum packet receive buffers=2000
    set maximum concurrent disk cache writes=100
    set immediate purge of deleted files=ON
    set new service process wait time=0.3
    set maximum service processes=40

End of Chapter

Chapter 3
Running NetBench

Now that NetBench is installed and the licensing procedure has been executed, it is time to begin interacting with NetBench. To run NetBench, enter:

NETBENCH

If NetBench does not start up:

1. Check to see if the default directory for NetBench is present.

2. Verify that NetBench has been correctly installed. The ZDLPARMS.CFG file is essential for NetBench to operate. See the ZDLPARMS.CFG Appendix.

NetBench Displays

NetBench will always start up in the following sequence:

Display 1   ZIFF-DAVIS Logo
                                   Pause

Display 2   Licensing display

with Copyright and
your ID
Pause

Display 3   "Waiting" display

The "**Waiting**" display is the default display which will appear on the test station after the NetBench command is issued. All the test stations in the waiting mode are waiting for the coordinator which will trigger testing within its current directory path.

One test station must be designated as the **Test Station Coordinator**. The test station coordinator becomes an interactive test station and no longer has the message "Waiting." Any one test station can become the test coordinator station.

The Test Station Coordinator also acts as a test station for the duration of the test and reverts to the Test Station Coordinator again when the test duration has elapsed.

Ziff-Davis' NetBench Screensaver

This is an optional screen saver "time out" feature which is activated by the Options, General submenu. It "floats" around on the display to prevent "burn-in" of the display phosphor. The default display will reappear by pressing any key.

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Waiting Display

Ziff-Davis' NetBench(TM) ∇.∇

File	Performance	Options	Help

Waiting

Waiting for test identification from Coordinator station

[OK]

ID:ð ð ð **Group**:õ õ õ õ õ õ õ	**Test Station**	**No Test Selected**	**Waiting..** **.**
	= = = = = = = = = =		= = = = = =

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Interactive   *Idle*

(Words indicated below the === bar indicate status changes which
are reflected in the window immediately above.)

Activating the Test Station Coordinator

Activating the OK box in the waiting window causes the test
station to become "interactive" and available to become the Test
Station Coordinator.

The OK box is selected by pressing the space bar or enter key, or
by clicking the OK button with the mouse. Because NetBench is
performing activity on the local PC in waiting mode, it is
conceivable for the test station to "miss" a mouse click. Repeating
the mouse click or using the enter key or space bar will usually
assure success. Once the OK button has been activated the
"Waiting" window disappears. The word "Interactive" appears in
place of "Test Station".

It is now possible to select from a menu. To revert back to waiting
mode, select the Performance Menu and choose "Wait Mode".
While two or more test stations can be in interactive mode, only
one test station acting as the Test Station Coordinator may update
items within any submenus, or run a test under the Performance
Menu. Because there is no practical reason to have multiple test
stations in "interactive" mode, Ziff-Davis strongly advises against

doing so.

Test stations in "interactive" mode cannot be selected as actual test stations except the one actually running the test as the Test Station Coordinator. If a second interactive test station attempts to activate another test concurrently, an error will occur.

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Basic Navigation - Your choice: Mouse or Keypress

Navigation is accomplished by using a mouse. If a mouse is not available or not configured properly, alternative keys may be used. Use the **alt** key combined with the **letter** underlined within the menu or list.

If a menu is accidentally selected, the *esc* key is pressed to deselect the menu. Items may be entered in dialog boxes by typing the requested information. The *Tab* or *Shift+Tab* or *Arrow* keys are used to navigate within dialog boxes. The *Enter* key commits the action unless otherwise specified.

Navigation Keys

Mouse - Point and click	select a menu
Mouse - Point and click	activate a choice

alt + letter	select a menu or choice
Esc	deselect a sub-menu
Tab	forward to field
Shift+Tab	backward to field.
Enter	commit choice
Arrow keys Left, Right	highlight a menu item
Arrow keys Up, Down	highlight a submenu item

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NetBench Menus and sub-menus

<u>F</u>ile	<u>P</u>erformance	<u>O</u>ptions	<u>H</u>elp
_____	_____	_____	_____
<u>D</u>ata File...	<u>N</u>IC Test...	<u>S</u>et Name...	**ReadMe**
		_____	
<u>B</u>atch File...	<u>I</u>O Test...	<u>G</u>eneral Test...	<u>A</u>bout
S<u>t</u>ats File...		<u>N</u>IC Options...	

IO Options...

Batch Run...

Wait Mode

Statistics

Stop Loads

Quit

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Status Message

Waiting for test identification from Coordinator station

	Mode	Test name or operation	Error or status

ID:ððð **Group:õõõõõõõ**	**Test** **Station**	**No test selected**	**Waiting....**
	========	============	=========

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	==	=	==
	Interactive	*NIC Throughput Test*	*Polling*
	Batch Cmd x	*I/O Throughput Test*	*Running*
		Test Setup	*Making Test File*
			Done
			Aborted
			Idle

(Words indicated below the === bar indicate status changes which are reflected in the window immediately above.)

File Menu

The file menu allows changes to file names referenced by NetBench. It is also used to invoke the batch run file, and to compute and display statistics captured in the statistics file. Finally, it allows a test station in an interactive mode (test coordinator) to exit the NetBench program back to the DOS operating system.

If **Data** file, **Batch** File, or **Stats** File is selected, the user is asked to supply the filename(s) used while running NetBench.   Each of the filename parameters has a 12 character limit.

The **Data** file is the data collector file name referenced by NetBench. The data file contains a detailed entry by station identification number (WS.ID) for each test station successfully answering the poll at the conclusion of the test. Each detail line represents the actual "raw" data collected from the test station. It also retains a record of the parameters used during the test. The Data file successively appends each test record to the previous test record. Therefore, consider purging these files periodically. At Ziff-Davis, file naming conventions are used to group tests together.

The **Stats** File (Statistics File) contains a summary of the test. It contains a subset of the configuration data from the Data file. The Stats file also contains a total throughput number that is the sum total of all the test stations reporting at the end of a test run. Every time the

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Statistics command is issued, the Stats file is regenerated from the current Data file and the total is displayed.

The **Batch** file is used to automate a series of NetBench tests. The batch file will generally take advantage of the group identifier code in the WS.ID file. This section should be skipped until the user becomes familiar with using NetBench.

Rules for Batch files

The Batch file consists of any number of test statements each terminated by a semi-colon. The file is terminated by a statement consisting of a single exclamation mark. Each statement should begin on a new line. A statement consists of the following items which can be preceded and followed by one or more spaces, tabs or new line characters:

Valid Syntax

1) 3 letter test code: NIC or IOT (these must be upper case).

2) Parameter file name (any valid DOS filename except
   ZDLPARMS.CFG, case insensitive). This parameter file must
   follow the rules found in **Appendix: ZDLPARMS.CFG.**

3) One or more group IDs, each of which are no more than 7
   characters in length. Group Identifiers correspond to those
   specified in each individual test station WS.ID file. This field
   is converted into a DOS file name and is therefore case
   insensitive.

Valid Batch Examples

Example: Single Batch Command

Command	Activity
NIC parms.cfg group1;	1. Perform the NIC test, using PARMS.CFG file, activated for those workstations with common group identification of GROUP1 in their WS.ID file

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!	End of batch file indicator

Example: Multiple Batch Commands in a Single File

Command	Activity
NIC parms.cfg group1;	1. Perform the NIC test 2. using PARMS.CFG file 3. activated for those workstations with common group identification of GROUP1 in their WS.ID file
IOT test1.prm sector5 sector6 sector9 ;	1. Perform the IOT test 2. using a different parameter file called TEST1.PRM 3. using group id's sector 5, sector 6 and sector 9.
!	End of batch file indicator

Example: Occurrence of Legal Leading and Trailing Spaces Batch File

Command	Activity

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^NIC	Perform the NIC test
^whatever.xxx	using the file WHATEVER.XXX for parameters
^123	Activated for group 123
^anygrp^grp2	group anygrp
^onemore	group grp2, group onemore
^;	end of NetBench statement

^!	end of batch file indicator.
	Note: ^ = one or more spaces

The **Statistics** command must be executed in order to produce the statistics file. Please refer to the comments above (**Stats** File).

The **Quit** command is executed in order to properly exit NetBench. This command is generally used from the Test Coordinator Station. Stop Loads is a related "exiting" command used from the Test Coordinator Station and is found on the Performance menu. The Quit command exits the test station on which the command is activated while the Stop Loads command exits all test stations that are in the "Waiting" mode. For details please refer to the Stop Loads command.

Performance Menu

The performance menu contains commands that begin NetBench tests and commands that perform administrative functions.

- Selecting **NIC Test** causes the network interface card test to begin.

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- Selecting **I/O Test** causes the I/O throughput test to begin.

The parameters associated with each test are supplied from the **Options** Menu. All test stations perform the same test and each test station displays its individual results on its own monitor. The Test Station Coordinator gathers the data, and saves all results in the **Data** file.

Wait Mode changes a test station from interactive to "waiting". Waiting mode signifies that the test station waits for commands directed to it from the Test Station Coordinator. The command is useful when a test station has accidentally been placed into "interactive" mode. There can only be one Test Station Coordinator for any test on the same network.

Stop Loads forces all the test stations to exit the NetBench application and return to the DOS prompt. This option is normally selected when all testing is completed.

Use of this command will require the person performing the tests to invoke NetBench on each test station again to resume testing.

Once the Stop Loads choice is selected there is no automatic way to resume testing. To continue testing after performing this option requires either rebooting (if the autoexec.bat automatically starts up NetBench), or manually executing NetBench (which starts up in waiting mode).

Options Menu

The Options menu allows the user to set certain parameters, such as file size and test duration, that influence the test. When a test is completed, these variable parameters are written out to the **Data** file. The primary categories for this menu are Set Name, General, NIC Options, and I/O.

Set Name

Set Name allows the user to enter a **User Name** and a **LAN Name**. These are treated as comments in the **Data** file and **Stat** file (each has a 25 character length limit).

General

General Test Options allow the user to set Test Length, Variance, Blanking Interval, and Common Path.

> **Test Length**   (1 - 9999 minutes)
> Test length, in units of minutes, is the actual duration of the test. This number determines the duration of the test, after any preliminary initialization sequence. Initialization time is not counted as part of this number, nor is polling time counted as part of the test time.

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Caution: Network tests should be run sufficiently long to reach an ordered and productive behavior pattern (particularly if a large number of work stations are present). If the test is run for an insufficient time, the results may be meaningless. Ziff-Davis usually sets this parameter at 10.

Variance   (1 - 99 seconds)
Variance is a user-specified estimate of time (in seconds) between the first and the last work station completing the test and reporting results. The more test stations that are on the network performing the test, the greater the variance time needed to insure collection of results.

Ziff-Davis recommends that this number be set to a minimum of 20 seconds, because most systems will have no more than a 20 second variance when writing results files.

If the number of test stations reported in the **Data** file or **Stat** file is less than expected, increase the variance number. It may also be necessary to increase this number if the following message is received: "Warning: Not all Load Stations statistics gathered".

Blanking Interval   (1 - 99 minutes)
Blanking interval sets the duration, in minutes, before the
screensaver will activate. When the screensaver activates, the
display will blank and the Ziff-Davis logo will float around the
display. Any key aborts the screensaver and resumes the default
NetBench display.

Common Path

The Common Path parameter specifies the directory that
NetBench uses to create temporary files and other temporary test
resources. Ziff-Davis recommends that this parameter always be
set to ".".

NIC Options

NIC (Network Interface Card) Options relate specifically to the
NIC throughput test. The only available option for this test is the
NIC block size. The purpose of this option is to permit a parameter
setting of "usable" characters that can be sent through the
communication path.

NIC Block Size   (1 - 65,532 bytes)
This number is the size of the blocks in bytes that will be
transferred during the NIC Throughput test.

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Because all test stations are reading from the same file (netbench.exe), the entire test will run from the cache server subsystem. The test stations will not access the disk and the bottleneck is moved to the NICs. **Note:** If a network monitor were used to isolate the message sizes sent, the actual packet size would be higher due to the overhead required for the packet routing.

The tester needs to be aware of the physical minimum and maximum sizes of usable bytes for the network protocol chosen.

Rules for selecting the proper number: For maximum line utilization, this number should be set to the maximum packet-frame size (subtracting the encapsulating header and trailer portion) which your LAN can handle. (Example: 1460 to 1500 for Ethernet; Ethernet maximum including overhead is 1512) For the maximum frames per second, set this number to 1.

Note: In order to run this test correctly the parameter entered here must be less than the cache size of the server.

I/O

I/O Options relate to the Input/Output Throughput test. They exist to help approximate network activity according to a desired model. Four buttons and three parameters permit creation of the desired I/O operation and seek type (random or sequential), I/O file size, I/O block size, and a ratio of reads to writes.

Test type has two buttons: **Random** or **Sequential**

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Read / Write has two buttons: **Read only**, **Do Writes**.

There are three numeric parameters allowable: R/W Ratio, I/O
File Size, and I/O Block Size.

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Valid combinations for these buttons and parameters are represented in the following table:

Valid I/O Throughput test options	Read only button	Do Writes button
Sequential button	Sequential reads only R/W Ratio is not used	Sequential writes only R/W Ratio is not used
Random button	Random reads only R/W Ratio is not used	Random reads and writes according to the R/W Ratio
R/W Ratio parameter	Parameter not used	Parameter enterable and active with Random and Do Writes

		0 = write only
		1= 1 read for 1 write
		10 = 10 reads to 1 write
I/O File Size parameter	always required	always required
I/O Block Size parameter	always required	always required

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R/W Ratio   (0 - 99 valid range)

The Read/Write ratio number determines the number of reads for every write performed during the I/O Throughput test. Setting this at 0 performs writes only. Example: a ratio of 10 indicates that for each write performed on the server there will be 10 reads. Correspondingly a ratio of 1 indicates that for every write performed there will be 1 read. The parameter is only valid for the button combination of Random, and Do Writes. It is ignored for the other tests.

I/O File Size (Kb)   (1 - 2,097,152 K bytes)

The I/O File Size field contains the size of a test file created by each test station during the initialization sequence of the I/O Throughput test. This file is not reused; it is recreated each time the test is run. A larger number will increase the disk surface area on which the test operates, placing the server disk subsystem under more stress. Allocating a large file size is desirable as it reduces the impact of caching on test performance. If a large number of test stations are present and disk space on the file server is low, the file size may need to be reduced if the test file creation fails.

I/O Block Size (Bytes)   (1 - 65532 bytes)

The I/O block size field contains the size (in bytes) of the block to be read or written by the test station during the I/O Throughput test. This block should be significantly smaller than the test file to allow for random I/O or due to caching, the results may be meaningless.

Help

The HELP option permits access to a **ReadMe** ASCII file and an **About** statement. The ReadMe file contains the Menu and Sub-menu portion of the NetBench User Guide. The About statement contains the product name, version, program developers, and the Ziff-Davis staff at the time of release.

End of Chapter

Chapter 4
Network Interface Card (NIC) Throughput Test

This chapter describes how to use the Network Interface Card (NIC) Throughput Test.

Mechanics

During this test, all NetBench test stations perform sequential reads from the NetBench.exe file of the size specified by NIC Throughput Block Size. Because all stations are reading from the same file, the entire test will run from the server cache subsystem. Because NetBench.exe is in the server cache, the test stations will not access the disk and the maximum data throughput will be limited by the throughput capability of the network interface cards. The test stations count the number of blocks read from the server during the test and display the total throughput (number of iterations times the block size in bytes) when the test is over.

Objective

The objective of this test is to exercise network activity from the

NIC test station through the NIC on the file server.

This test result indicates the maximum amount of network traffic which can occur within a specific amount of time using the test stations supplied at a specific block size. (Refer to the Running NetBench section, Parameters, Testing the server NIC and Testing the test station NIC).

The NIC Throughput test results are in bits per second

Factors that influence the test

- NIC card contained in the server and associated driver software.

- NIC card contained in the test station and associated driver software.

- Cache on NIC card.

- Theoretical Maximum network speed (Ethernet 10 Mbits, Token Ring 4 Mbits, 16 Mbits, FDDI, etc.).

- Cable type - bandwidth.

- CPU in the server.

- CPU in the test station.

- Memory in server.

- Memory in test station.

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Parameters

NIC Throughput Block Size. - The user should vary the block size to simulate the network application for small and large block sizes for successive test runs. Workstation drivers usually have a minimum block size. The parameter selected for NetBench should never drop below this minimum because network activity must be forced to occur on the cable used. Ridiculous results may be an indicator of "out of bounds" conditions, for example: 15 Mbits / sec when the maximum for Ethernet is 10 Mbits /sec.

Special Rules

1. This test is network operating system (NOS) dependent, in that one NOS cannot properly be compared with another NOS <u>and</u> also vary the NIC at the same time.

2. Do not turn cache memory off on the server.

3. Network configuration files in the test station must remain constant for a proper comparison of NIC cards.

4. Different software driver versions from the same manufacturer may affect the results. Be certain the item being measured is the correct one. Vendor cards may also have version differences.

Guidelines

Determine which type of card to test. There are often two kinds of NIC adapters: server cards and workstation cards. The NIC installed in the server must have as high or higher performance capability than the test station NIC for the test to be informative.

Testing the server NIC

If the test is designed to test the *server* network interface card throughput, replace only that card in the server and rerun the test with each new server card to be tested, not varying the NIC adapters in the test stations. This type of test would generally require a server and multiple test stations.

Example: For testing an Ethernet Novell network, 1 server and 4 test stations are probably required. If each test station had the capacity to generate 3 Mbits of information the network would be saturated, because 4 stations times 3 Mbits = 12 Mbits and the capacity of the Ethernet is only 10 Mbits.

Testing the test station NIC

If your test is designed to evaluate the *test station* NIC, only one server and one test station is required. The highest performance NIC card would still be placed in the server for the test. However the various cards that were being evaluated would be placed in the test station, varying one at a time for each test with all other factors remaining the same.

Setting up and Running the Test

1. Configure the physical network, cable connectivity and server connectivity. Ensure that the network is in operation, proper software network parameters have been established, NetBench has been installed on the server common drive from a workstation and licensed, and that all test stations have been logged on the server and have changed their current directory to the common drive on the server. Each test station should start up NetBench using this common drive and directory. The test stations must not reference NetBench from any other location (such as a copy on a local disk).

2. Select one test station to act as the Test Station Coordinator.

3. Set the File Menu parameters (File Menu - Data File, Stats File).

4. Set the Options (Options - Set Name, General Test, **NIC** options)

5. Run the test (Performance, **NIC** test)

6. The display on each test station should show its individual results. This will also be true of the Test Station Coordinator.

7. Collect the results (File menu - Statistics). A summary will
    display on the Test Station Coordinator. The total number of
    test stations responding to the test will be shown in the Final
    Statistics window.

8. Exit NetBench (File - Quit). (Or run the next test.)

9. Examine the detail results in the Data File using a text editor or
    from a printout. There should be an entry in this file for each
    test station which reported back results to the Test Station
    Coordinator during the polling sequence. The entry is listed by
    the station WS.ID number.

    If an entry is missing, there are three possible causes.

    Cause A The missing test station was not setup correctly
    pointing to the common directory on the file server.

    Cause B The WS.ID file is incorrect or has the same number
    on two or more of the test stations. These must be unique
    numbers for each test station on the network and must be on
    the individual C: root directory for each test station.

    Cause C The Variance setting under Options Menu, General
    Test was too short for all the test stations to report back in
    sufficient time to the Test Station Coordinator. Increase this
    value. However, if there are fewer than 10 test stations on the
    network and the variance setting is greater than 30 seconds, re-

examine Cause A or B, and the network connectivity. Thirty seconds should be plenty of time for 10 stations to respond unless something is wrong with the network itself.

10. Examine the totals for all test stations in the Statistics File.

Evaluation Scenarios

Example 1

The test bed consisted of one test station connected to a Novell Netware server. V
486/33M systems with 12MB of RAM was used for the server and Vendor XYZ 3
8MB of RAM was used for the test station. The server was loaded with Novell's N
network operating system. The test station was a DOS client loaded with ABC dri

A QRX card was installed in the server and remained in place
throughout this test. Each card tested was placed in the
workstation in turn. Using Ziff-Davis' NetBench NIC test, the
performance of the card was measured at different block sizes
(512, 1K, 2K bytes). The test was performed for the
VendorCardA, VendorCardB, VendorCardC, and VendorCardD
cards. The duration of each test was 10 minutes.

Test 1 (Netware Server)

Vendor Name	512B	1KB	2KB
VendorCard A	2331989	3402410	3899939
VendorCard B	1889621	2747050	3064162

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VendorCard C	2009770	2861738	3200341
VendorCard D	2012501	2824263	3145728

Example 2

The test bed consisted of 3 test stations and one LANManager server.
Ziff-Davis used Computer 486/33M systems with 12MB of RAM for the server a
with 8MB of RAM for the workstations. The server was loaded with Microsoft's I
2.1 with OS/2 1.3 as a primary operating system. The test stations used DOS.

A vendor ACF card was installed in each of the three client test
stations and in the server. Using Ziff-Davis' NetBench NIC test,
the total throughput was measured at a 4Kbyte block size.

The same procedure was repeated by replacing the ACF card in the
server with the FGH card. The duration of each test was 10
minutes.

VendorName	Throughput
	(bits per sec)

FGH	9209874
ACF (server)	8312173
ACF (client)	8194716

End of Chapter

Chapter 5
I/O Throughput Test

This chapter explains how to use the I/O Throughput Test.

Mechanics

When this test is selected, each test station writes a test file to the common server drive. Once the Test Station Coordinator determines that all test stations have completed this initialization operation, I/O throughput testing begins. During the test, each test station performs the file reads and/or writes (at the block size, for the length of time specified, according to the parameters set under the I/O Options menu). After the test duration has elapsed, each test station reports its results.

Objective

The objective of this test is to determine the performance of a file server relative to a baseline system. Performance in this case is defined in terms of two concepts - peak I/O throughput, and scalability. Peak I/O throughput is the maximum amount of user data (block size and file size) which can be read or written to the

server during the test. Scalability is the ability of a server to sustain peak I/O throughput (disk and disk cache) as the file service load on the server is increased during the test.

File server performance should be measured across the test station to the server disk path. To use this test effectively, ensure that the system is configured so that the desired components are stressed and that other extraneous components are eliminated with respect to their influence in such a way that they do not hamper performance. Components, such as the number of clients and the network wire must be set up in such a way as not to cause bottlenecks.

For example, to prevent the NIC from becoming the bottleneck, multiple NICs would be placed in the server, each corresponding to a separate LAN segment (usually four NICs are sufficient). Multiple test stations and a server NIC would be attached to each segment so that the server becomes a common link to all LAN segments. Additional test stations could be added to the segments and the test re-run to identify the point at which server I/O Throughput begins to be maximized. Also, by using higher bandwidth network services, such as 16Mbit Token Ring, the network bottleneck is reduced and places more emphasis on file service performance. This will cause the disk subsystem to be stressed rather than the LAN NICs.

To use NetBench properly, a throughput curve should be plotted for comparing performance measurement. A throughput curve is formed by combining the results (datapoints) from multiple NetBench iterations into a single dataset.

The dataset is formed by configuring a baseline network, setting the I/O Options parameters, running the I/O throughput test,

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varying one load factor (for example, increasing test stations) and running the test again, varying the same load factor and running the test again, etc.

A throughput curve, consisting of charting the collection of data points, not only displays the peak throughput of a server, but also demonstrates the servers scalability and how the server will perform from light to harsh conditions.

By comparing one single data point to multiple points (the throughput curve), it becomes clear that a single point measurement can be very misleading. For example, experiments with this test have shown that throughput curves of servers being compared often cross. A server which displays superior performance at low test station loads may display inferior performance as the load is increased. This information is very important to a complete analysis of performance.

Throughput curves for file servers generally fall into three categories. The most common is the Poor Scalability category, typical of a desktop machine turned into a file server. This curve may display an acceptable throughput at a light test station load, but the performance quickly drops off as the load is increased. The next category is that of Median Scalabilty. This curve has a very high peak throughput but as soon as the client load rises above the ability of the cache, the performance drops rapidly and bottoms out at a low level. The last is the Superior Scalability category. This type of curve has a very high peak throughput that is sustained far beyond the other two categories.

I/O Throughput test results are in bits/ second.

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Factors that influence the test

- Cache in the server.
- Cache in the test station.
- Number of test stations.
- All NetBench Option parameters for I/O Options.

Parameters

I/O File Size   **(in Kbytes)**

One disk file is created for each test station prior to the commencement of the test (of the size specified in I/O Throughput File Size). This file is created on the server in the current working directory. Increasing this number creates a greater amount of relative disk head movement from the beginning of the file to the end of the file.

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I/O Block Size **(in Bytes)**

Each test station testfile is read or written a block at a time according to the I/O Throughput Block Size parameter. Increasing this number decreases the amount of disk activity for the given test (if other factors are held constant).

Read or **Write** and **Random** vs **Sequential** are specified according to radio buttons selected in the Options, I/O Options submenu.

There are five read/write options for this test. These are Sequential Read only, Sequential Write only, Random Read only, Random Write only*,and Random Read/Write*.

If Sequential is selected, the only testing performed is Sequential Read or Sequential Write according to the respective button selected: Read Only or Do Writes. Sequential Read and Write is **not** performed.

If Random is selected with the Read Only button the only testing performed are Random Reads.

If Random is selected with the Do Writes button, then Random Reads and Random Writes are permitted according to the number specified in **R/W Ratio** field.

I/O Options Definitions

Sequential means that each test file created on the server by the test station is read or written one block at a time according to the Read or Write operation selected. When the end of the file is reached, the test sequence starts over and continues until the test duration limit has elapsed.

Random means that each test file created on the server by each test station is read or written one block at a time according to the Read, Write, Read/Write operation selected. The relative "start point" of the read or write is randomly determined by each test station. This process repeats until the test duration has elapsed. An attempt to read or write beyond the end of the file size allocated is not permitted.

* When both the Random button and Do Writes button are selected, the mix of read/write operations are determined by the read/write ratio field. The read/write ratio field represents the number of read operations for every write operation. Example: If the ratio is 3, there are 3 reads for every 1 write. If the ratio is 0 there is only random writing. If the ratio is 10, there are 10 reads for 1 write.

Guideline

Generally use multiple NICs in the server with multiple LAN segments in order to cause a bottleneck at the disk. The number of LAN segments may also be varied.

Setting up and Running the Test

1. Configure the physical network, cable connectivity and server connectivity. Ensure that the network is in operation, proper software network parameters have been established, NetBench

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has been installed on the server common drive from a workstation and licensed, and that all test stations have been logged on the server and have changed their current directory to the common drive on the server. Each test station should start up NetBench using this common drive and directory. The test stations must not reference NetBench from any other location (such as a copy on a local disk).

2. Select one test station to act as the Test Station Coordinator.

3. Set the File Menu parameters (File Menu - Data File, Stats File).

4. Set the Options (Options - Set Name, General Test, **IO** options).

5. Run the test (Performance, **IO** test).

6. The display on each test station should show its individual results. This will also be true of the Test Station Coordinator.

7. Collect the results (File menu - Statistics). A summary will display on the Test Station Coordinator. The total number of test stations responding to the test will be shown in the Final Statistics window.

8. Exit NetBench (File - Quit). (Or run the next test.).

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9. Examine the detail results in the Data File using a text editor or from a printout. There should be an entry in this file for each test station which reported back results to the Test Station Coordinator during the polling sequence. The entry is listed by the station WS.ID number.

    If an entry is missing, there are three possible causes.

    Cause A The missing test station was not setup correctly pointing to the common directory on the file server.

    Cause B The WS.ID file is incorrect or has the same number on two or more of the test stations. These must be unique numbers for each test station on the network and must be on the individual C: root directory for each test station.

    Cause C The Variance setting under Options Menu, General Test was too short for all the test stations to report back in sufficient time to the Test Station Coordinator. Increase this value. However, if there are fewer than 10 test stations on the network and the variance setting is greater than 30 seconds, re-examine Cause A or B, and the network connectivity. Thirty seconds should be plenty of time for 10 stations to respond unless something is wrong with the network itself.

10. Examine the totals for all test stations in the Statistics File.

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Evaluation Scenarios

Example of evaluating servers at 1024 K bytes I/O throughput evenly distributed on 4 NIC cards. Two NICs are Token Ring, Two use Ethernet.

# of Test Stations	Server Vendor C	Server Vendor D	Server Vendor E
8	17317884	12937894	14231139
16	23567830	18288905	14905063
24	24918961	20149030	15439179
48	23426979	19689402	12576168
72	21369669	16986887	4200039

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96	18114029	13708320

3880144

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Example of evaluating servers with 96 test stations evenly
distributed on 4 NICs. Two NICs are 16 Mbit Token Ring, Two
NICs are Ethernet.

File size K bytes	Server Vendor C	Server Vendor D	Server Vendor E
512	23464845	19857675	6469524
1024	18114029	13708320	3880144
2048	14063785	10256700	2980629
4096	12039712	9155468	2635356
8192	10873353	7716024	2319071

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These statistics were gathered using Novell 3.11 using the same amount of RAM. Different CPU, and disks were used. Test Length was 10 minutes.

End of Chapter

Appendix A
Data File and Statistics File Parameters

Parameters Common to Both Files

- @@@
- Date / Time Stamp.
- User name comment line.
- LAN Tested comment line

Test File	Options, I/O Options, I/O File Size	(I/O throughput test) kbytes
IO Blocks	Options, I/O Options, I/O Block Size	(I/O throughput test) bytes
Do Writes	Options, I/O Options,	(I/O throughput test) Y=Do Writes, N=Read Only
Sequential	Options, I/O Options,	(I/O throughput test) Y=Sequential N=Random
R/W Ratio	Options, I/O Options	(I/O throughput test)
NT Blocks	Options, NIC Options, NIC Block Size	(NIC Throughput Test) bytes

Test Length	Options, General Options	
Variance	Options, General Options	
Blank Int.	Options, General Options	Blanking Interval
Common Path	Options, General Options	
Data File	File, Data	
Batch File	File, Batch	
Comment	Performance, (any test selected)	

Test Type	Performance, (any test selected)

NIC Throughput

...

{ Common parameters }...

@@@

012	3283690	0	123200	600
022	3283690	0	123200	600
132	3283690	0	123200	600

@@@

@@@   Indicates start or end of repeating data.

Each line represents results from each test station. The test station fields are described from left to right.

- Workstation ID
- Test Station Throughput (bits/sec)
- Total Writes During the Test (Always 0)
- Total Reads During the Test
- Duration of the Test Station run (sec)

I/O Throughput

...

{ Common parameters } **...**

@@@

010 143360 0   1050   60   0.00000   0.05714

011 143360 0   1050   60   0.00000   0.05714

012 143360 0   1050   60   0.00000   0.05714

@@@

@@@   Indicates start or end of repeating data.

Each line represents results from each test station. The test station fields are described from left to right.

- Workstation ID
- Test Station I/O Throughput (bits/sec)
- Total Writes During the Test
- Total Reads During the Test
- Duration of the Test Station run (sec)
- Average Time Per Write Cycle(sec)*
- Average Time Per Read Cycle(sec)*

*Note that the value for these two items will always be 0.00000 when the Random and Do Writes I/O Throughput test options are selected, and the Read Write Ratio is greater than 0.

Stats File

This file contains the configuration information from each run accompanied by an extra line that has the total system throughput for that test iteration.

End of Appendix

Appendix B
Temporary Files

NetBench creates a number of temporary files for coordination between test stations. The names (or "wild card" syntax) are listed below. This is not a comprehensive list. The user should avoid placing any file in this directory that is important to retain.

IOTEST   .SEM

NTTEST   .SEM

CBTEST   .SEM

NOTEST   .SEM

??TEST   .SEM

EXTEST   .SEM

IOT_YES .SEM

IOT_NO   .SEM

IOT_* .SEM

FILEOPT   .SEM

EVALOPT .SEM

STATOPT .SEM

```
STS*   .SEM
STF*   .SEM
STB*   .SEM
ST*    .SEM
B*     .SEM
YXZVQ???.X$X
IOT*   .X$X
*      .X$X
```

Appendix C
ZDLPARMS.CFG

Listing of ZDLPARMS.CFG (same format for any Parameter file)

Mike Bicuspid	User Name
Lan A	LAN Name
1024	I/O File Size Kbytes
512	I/O Block Size Bytes
1	1=Do Writes; 0= Read only

0	1=Sequential; 0=Random
3	R/W Ratio
1999	NIC Block size bytes
10	Test Length minutes
20	Variance in seconds
5	Blanking Interval minutes
.	Current Directory (period)

data.dat	Data File
batch.txt	Batch File
stat.dat	Stats File
NetBench™ Version 2.10	

The ZDLPARMS.CFG file is essential for NetBench to operate. If this file is accidentally deleted, NetBench cannot run. If the ZDLPARMS.CFG file is missing, obtain it from the backup disk, or look for an alternative file PARMS.CFG. Copy the ".cfg" file to ZDLPARMS.CFG. NetBench will then startup properly.

If this file cannot be located, the file can be carefully created with an editor. The New line character terminates each line. It is essential that the new line character appears within the length limitation set forth in the documentation. This file is in the same format required for the batch parameter files listed in the batch file syntax.

For batch operations, it is quickest to copy the ZDLPARMS.CFG file to a new file name and then carefully edit the parameters you wish to change. Alternatively, set up your parameters within NetBench, then quit and copy ZDLPARMS.CFG to a new file name. Repeat this procedure for each new parameter file.

End of Appendix

Appendix D
Data File Output Example

@@@

Sat Sep 26 16:52:14 1992

User Name :	Mike Bicuspid
LAN Tested :	Token Ring
Test File :	1024 kb
IO Blocks :	8192 b
Do Writes :	Y
Sequential :	N
R/W Ratio :	3
NT Blocks :	512 b
Test Length:	10 minutes
Variance :	20 seconds
Blank Int. :	15 minutes
Common Path:	.
Data File :	nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :NetBench test

Test Type :   NIC Throughput

@@@

026	1611244	0	35600	181	0.00000	0.00000
027	380181	0	8400	181	0.00000	0.00000
028	537180	0	12000	183	0.00000	0.00000
029	504123	0	11200	182	0.00000	0.00000
030	452596	0	10000	181	0.00000	0.00000
036	1529173	0	33600	180	0.00000	0.00000
037	133565	0	6000	184	0.00000	0.00000
038	543116	0	12000	181	0.00000	0.00000
039	468114	0	10400	182	0.00000	0.00000
040	432105	0	9600	182	0.00000	0.00000

@@@

Sat Sep 26 16:57:21 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   1024 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   512 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :NetBench test

Test Type :   I/O Throughput

@@@

026	1194211	820	2460	180	0.2195	0.00000
027	728177	500	1500	180	0.3600	0.00000
028	833035	572	1716	180	0.3147	0.00000
029	766043	526	1578	180	0.3422	0.00000
030	798082	548	1644	180	0.3285	0.00000
036	1188386	816	2448	180	0.2206	0.00000

037	570633	394	1182	181	0.4594	0.00000
038	734003	504	1512	180	0.3571	0.00000
039	805260	556	1668	181	0.3255	0.00000
040	675748	464	1392	180	0.3879	0.00000

@@@

Sat Sep 26 17:01:41 1992

User Name :	Mike Bicuspid
LAN Tested :	Token Ring
Test File :	1024 kb
IO Blocks :	8192 b
Do Writes :	Y
Sequential :	N
R/W Ratio :	3
NT Blocks :	512 b
Test Length:	10 minutes
Variance :	20 seconds
Blank Int. :	15 minutes
Common Path:	.
Data File :	nb1912.dat
Batch File :	batch.txt
Stats File :	nb1912s.dat

Comment   :NetBench test

Test Type :   CPU Bandwidth

@@@

026	171	30901	180	0.00000	0.00000
027	80	14401	180	0.00000	0.00000
028	73	13201	180	0.00000	0.00000
029	81	14601	180	0.00000	0.00000
030	84	15201	180	0.00000	0.00000
036	136	24701	181	0.00000	0.00000
037	80	14401	180	0.00000	0.00000
038	96	17401	180	0.00000	0.00000
039	90	16501	182	0.00000	0.00000
040	87	15801	181	0.00000	0.00000

@@@

Sat Sep 26 17:06:06 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   512 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   1024 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :NetBench test

Test Type :   NIC Throughput

@@@

026	1419946	0	31200	180	0.00000	0.00000
027	414101	0	9200	182	0.00000	0.00000
028	525012	0	11600	181	0.00000	0.00000
029	519274	0	11600	183	0.00000	0.00000
030	418702	0	9200	180	0.00000	0.00000
036	1456355	0	32000	180	0.00000	0.00000
037	425098	0	9600	185	0.00000	0.00000
038	582542	0	12800	180	0.00000	0.00000

```
039     468114  0       10400   182     0.00000   0.00000
040     455111  0       10000   180     0.00000   0.00000
@@@
```

Sat Sep 26 17:11:11 1992

User Name :	Mike Bicuspid
LAN Tested :	Token Ring
Test File :	512 kb
IO Blocks :	8192 b
Do Writes :	Y
Sequential :	N
R/W Ratio :	3
NT Blocks :	1024 b
Test Length:	10 minutes
Variance :	20 seconds
Blank Int. :	15 minutes
Common Path:	.
Data File :	nb1912.dat
Batch File :	batch.txt
Stats File :	nb1912s.dat
Comment	:NetBench test

Test Type :   I/O Throughput

@@@

026	1193406	824	2472	181	0.2197	0.00000
027	728177	500	1500	180	0.3600	0.00000
028	780606	536	1608	180	0.3358	0.00000
029	798082	548	1644	180	0.3285	0.00000
030	675748	464	1392	180	0.3879	0.00000
036	1127219	774	2322	180	0.2326	0.00000
037	710701	488	1464	180	0.3689	0.00000
038	798082	548	1644	180	0.3285	0.00000
039	835948	574	1722	180	0.3136	0.00000
040	771868	530	1590	180	0.3396	0.00000

@@@

Sat Sep 26 17:15:31 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   1024 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   512 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :NetBench test

Test Type :   NIC Throughput

@@@

026 1601991 0 35200   180   0.00000   0.00000

028 540131 0   12000   182   0.00000   0.00000

029 561219 0   12400   181   0.00000   0.00000

030 527928 0   11600   180   0.00000   0.00000

036 1683659 0 37200   181   0.00000   0.00000

038 582542 0   12800   180   0.00000   0.00000

039 543116 0   12000   181   0.00000   0.00000

040 546133 0   12000   180   0.00000   0.00000

@@@

Sat Sep 26 17:19:51 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   1024 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   512 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :NetBench test

Test Type :   NIC Throughput

@@@

026 1818443 0   40400   182   0.00000   0.00000

029 720175 0   16000   182   0.00000   0.00000

```
030 669843  0    14800    181   0.00000    0.00000
036 1792282 0    39600    181   0.00000    0.00000
039 819200  0    18000    180   0.00000    0.00000
040 651739  0    14400    181   0.00000    0.00000
@@@
```

Sat Sep 26 17:24:11 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   1024 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   512 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :NetBench test

Test Type :   NIC Throughput

@@@

026 2038897 0   44800   180   0.00000   0.00000

030 1037653 0   22800   180   0.00000   0.00000

036 2166328 0   47600   180   0.00000   0.00000

040 1134276 0   25200   182   0.00000   0.00000

@@@

Sat Sep 26 17:29:11 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   512 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   1024 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :NetBench test

Test Type :   I/O Throughput

@@@

026	1808793	1242	3726	180	0.1449	0.00000
029	1179648	810	2430	180	0.2222	0.00000
030	1034012	710	2130	180	0.2535	0.00000
036	1721412	1182	3546	180	0.1523	0.00000
039	1034012	710	2130	180	0.2535	0.00000
040	1112655	764	2292	180	0.2356	0.00000

@@@

Sat Sep 26 17:34:11 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   512 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   1024 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :NetBench test

Test Type :   I/O Throughput

@@@

026	2236962	1536	4608	180	0.1172	0.00000
030	1430141	982	2946	180	0.1833	0.00000
036	2271914	1560	4680	180	0.1154	0.00000
040	1517522	1042	3126	180	0.1727	0.00000

End of Appendix

Appendix E
Statistics File Output Example

Sat Sep 26 16:52:14 1992

User Name	:	Mike Bicuspid
LAN Tested	:	Token Ring
Test File	:	1024 kb
IO Blocks	:	8192 b
Do Writes	:	Y
Sequential	:	N
R/W Ratio	:	3
NT Blocks	:	512 b
Test Length	:	10 minutes
Variance	:	20 seconds
Blank Int.	:	15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :   NetBench test

Test Type :   NIC Throughput

Total Throughput = 6591397

Number of Work Stations = 10

Sat Sep 26 16:57:21 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   1024 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   512 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :   NetBench test

Test Type :   I/O Throughput

Total Throughput = 8293578

Number of Work Stations = 10

Sat Sep 26 17:01:41 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   1024 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   512 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :   NetBench test

Test Type :   CPU Bandwidth

Total Throughput = 978

Number of Work Stations = 10

Sat Sep 26 17:06:06 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   512 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   1024 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :   NetBench test

Test Type :   NIC Throughput

Total Throughput = 6684255

Number of Work Stations = 10

Sat Sep 26 17:11:11 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   512 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   1024 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :   NetBench test

Test Type :   I/O Throughput

Total Throughput = 8419837

Number of Work Stations = 10

Sat Sep 26 17:15:31 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   1024 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   512 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :   NetBench test

Test Type :   NIC Throughput

Total Throughput = 6586719

Number of Work Stations = 8

Sat Sep 26 17:19:51 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   1024 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   512 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :   NetBench test

Test Type :   NIC Throughput

Total Throughput = 6471682

Number of Work Stations = 6

Sat Sep 26 17:24:11 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   1024 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   512 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment : NetBench test

Test Type : NIC Throughput

Total Throughput = 6377154

Number of Work Stations = 4

Sat Sep 26 17:29:11 1992

User Name : Mike Bicuspid

LAN Tested : Token Ring

Test File : 512 kb

IO Blocks : 8192 b

Do Writes : Y

Sequential : N

R/W Ratio : 3

NT Blocks : 1024 b

Test Length: 10 minutes

Variance : 20 seconds

Blank Int. : 15 minutes

Common Path: .

Data File : nb1912.dat

Batch File : batch.txt

Stats File : nb1912s.dat

Comment   :   NetBench test

Test Type :   I/O Throughput

Total Throughput = 7890532

Number of Work Stations = 6

Sat Sep 26 17:34:11 1992

User Name :   Mike Bicuspid

LAN Tested :   Token Ring

Test File :   512 kb

IO Blocks :   8192 b

Do Writes :   Y

Sequential :   N

R/W Ratio :   3

NT Blocks :   1024 b

Test Length: 10 minutes

Variance   :   20 seconds

Blank Int. :   15 minutes

Common Path: .

Data File :   nb1912.dat

Batch File :   batch.txt

Stats File :   nb1912s.dat

Comment   :   NetBench test

Test Type :   I/O Throughput

Total Throughput = 7456539

Number of Work Stations = 4

End of Appendix

Appendix F
Technical Support

NetBench is available free of charge on 3 1/2" diskettes. If you would like to receive a copy of NetBench or any other Ziff-Davis benchmark, send your name, address, and phone number to the Ziff-Davis Benchmark Operation (ZDBOp) benchmark request FAX number (919-380-2879) using the form in this appendix. The benchmark will arrive via third-class US Mail.

If you want to receive this benchmark sooner and you have a Federal Express account, include your account number and shipping instructions on the FAX form, and the benchmark will arrive via Federal Express.

Contacting ZDBOp

If you have comments or questions about NetBench, please contact ZDBOp. You can contact ZDBOp in several ways:

- If you have a modem and communications software, you can use CompuServe® to access ZiffNet, the Ziff-Davis on-line service. The ZiffNet forum is a way for you to communicate your questions and comments to Ziff-Davis. (Access to CompuServe is available for a fee.)

  If you are a member of CompuServe, simply type GO ZIFFNET at the CompuServe prompt. If you are not a member of CompuServe, you can access ZiffNet following the steps below:

1. Set your communications software to seven data bits, even parity, one stop bit. Select a data transfer rate (bits per second) of 1200, 2400, or 9600. Using your modem, call the local ZiffNet number. To find your local ZiffNet number, dial 800-346-3247 (by modem) or 800-635-6225 (by voice). If you login by modem, at the user ID prompt, type PHONES.

2. Respond to the prompts by entering the information below:

   When you connect: <Ctrl C>
   Host Name: CIS
   User ID: 177000,5555
   Password: ZIFF*NET
   Agreement Number: MACMAN2
   Register your name and credit card number for billing.

3. You will receive a Personal User ID and Temporary Password on-line. Write them down and use them to log on. You will get a permanent password by mail within 10 business days.

- You can FAX your questions and comments directly to NetBench Technical Support at the ZDBOp benchmark FAX number (919-380-2879).

- You can mail your questions and comments to ZDBOp at the following address:

  Ziff-Davis Benchmark Operation
  One Copley Parkway, Suite 510
  Morrisville, North Carolina 27560

  Attn.: NetBench Technical Support

End of Appendix

Benchmark Request Form

FAX OR MAIL THIS FORM TO:

The Ziff-Davis Benchmark Operation
One Copley Parkway, Suite 510
Morrisville, NC 27560

FAX: (919) 380-2879

for assistance call (919) 380-2800

WHO I AM:

Name:

_____

Company:

_____

Address:

_____

City: _____ State: _____ Zip:
_____

Phone Number:

_____

Fax:

_____
___

We answer requests in the order that we receive them. We ship all benchmarks via third-class US Mail unless you supply a Federal Express account number. Please allow four to six weeks for delivery via regular mail.

Your Federal Express account number:
_____

Check one: ___ priority overnight ___standard overnight

WHAT I WANT:

___ PC Bench™ 8.0
___ WinBench™ 4.0
___ Winstone™ 1.0 (available only on CD-ROM)
___ NetBench™ 2.1
___ ServerBench™ 1.0
___ MacBench™ 1.0

(All benchmarks **EXCEPT** Winstone are available only on 3.5"
diskettes.)

Glossary

Batch Run File
   This is an optional text file which contains NetBench commands. It is designed to run a series of NetBench tests unattended.

NIC
   Network interface card.

Server
   A computer containing the physical drive that contains the NetBench files. Test stations reference this common logical drive in order to run NetBench.

Test station
   A DOS computer running NetBench. Each computer waits to be triggered by the Test Station Coordinator to begin the test. After the test is completed, the results are collected by the Test Station Coordinator. Each test station is identified with a unique user-assigned identifier called WS.ID**. A PC workstation must be placed in NetBench "waiting mode," and be physically connected to the network to be considered a test station by NetBench.**

Test Station Coordinator

> One test station computer running NetBench (selected by the user) to synchronize the test and collect test station results. The Test Station Coordinator also acts as a test station. It performs the same tests as the other test stations and then reactivates as the coordinating test station at the completion of each NetBench test.

WS.ID

> Each test station must a have local C: drive. Each test station must also have a file in the root of the local C: drive called WS.ID. This file must contain a unique three digit test station identifier in position 1 of the file (no leading spaces or line feeds before the identifier). Example: 001. For administrative purposes, it is a good idea to sequentially number each test station across the network. In addition, this file may also contain a seven-digit alpha-numeric Group identifier. If this is used, it must be separated from the test station ID by at least one space. Example: 001 GroupA1. Group identifiers are not case sensitive, but characters other than numeric and alpha must not be used. When a Batch Run File is used, Group identifiers are referenced from the batch file.

End of Glossary