

Table of Contents

Installation	1	Installation Checklists	73
Installation Checklists	1	Manual Installation	74
Manual Installation	2	Automated Installation	75
Automated Installation	3	MIB Definition	75
Getting Started	5	Technical Support	77
Loading the NetWare Server Module	5	Troubleshooting	77
Executing the Clients	5	Contact Information	81
Server Module Operation	7		
Command Line Options	8		
Supported Keys	15		
Log Files	16		
DOS Client Operation	17		
Command Line Options	17		
Supported Keys	18		
Windows Client Operation	19		
Main Window	19		
Menubar	21		
Toolbar	23		
Graphbar	25		
Window Management	26		
Desktop Management	27		
View Window	28		
Trend Window	30		
Linked Trend Window	33		
Information Window	36		
Reports	48		
Server Connections	51		
License Information	52		
Preferences	53		
File Types	54		
Statistics	55		
Statistical Levels	55		
Key Statistics	56		
Server Management Concepts	65		
Capacity Planning	65		
Monitoring Levels	66		
Isolating Bottlenecks	66		
SNMP MIB Agent (NCAGENT option)	73		

Installation

NConsole® combines a Server module with Client programs to perform Trends Analysis / Baseline Sampling / Monitoring of Servers. This combination of utilities provides real-time monitoring and historical measurement of Server performance in an unobtrusive fashion, yielding in-depth information about the health and growth of the Server and network in general.

Installation Checklists

Before beginning the installation, the following checklists should be reviewed and verified:

DOS Client Checklist

- Microsoft MS-DOS v3 (or later) compatible OS
- Client files destination (drive:\path)
- NetWare Server support requires the latest Novell NetWare Client (non-Novell NetWare Clients do not support all of the required API sets)

Windows Client Checklist

- Workstation OS supporting Microsoft Windows v3.1x 16 bit applications
- Client files destination (drive:\path)
- NetWare Server support requires the latest Novell NetWare Client (non-Novell NetWare Clients do not support all of the required API sets)

NetWare Server Checklist

- Novell NetWare Server platform
(Refer to the Technical Support section for NetWare version and CLIB compatibility requirements)
- Logged in to Server as NDS Admin, Bindery SUPERVISOR, or equivalent
- Mapped drive to the destination Server
- Server files destination (UNC: \\Server\Vol\path)

Installation

Note: If the desired NetWare Server destination directory does not already exist, it will need to be created prior to Installation.

Manual Installation

Manual installation involves the copying of specific files to the desired destination directories.

Copy the following files to the client destination directory:

README	(Notes pertinent to the release)
NCREMOTE.EXE	(DOS Client - Remote Console)
NCREMOTE.HLP	(Help - Server module)
NCREMOTE.PIF	(Windows DOS Box .PIF file)
REVISION.DOC	(ASCII revision history)

Copy the following file(s) to the Server destination directory:

For NetWare Servers:

NCONSOLE.NLM	(Server module)
NCREMOTE.HLP	(Help - Server module)

Note: Files with extensions ending in an underscore (e.g., filename.ex_) are Windows compressed files that should only be installed through the Automated Installation. If these files are of interest, Automated Installation is recommended.

As the final step, the README file should be reviewed in its entirety: It will list any revisions or enhancements since the last manual printing or on-line help update. It also provides additional support and usage information.

Once the files have been copied to the destination locations, a Server module must be loaded before any of the Clients can establish communication.

Automated Installation

The Windows Client Installation program (SETUP.EXE) will install all of the Client and Server files in their appropriate destination directories. Automated installation comprises the following steps:

Execute the SETUP.EXE installation utility as follows:

- Windows v3.1: Select File -> Run and browse the distribution media then select the SETUP.EXE utility.

- Windows '95 &
- Windows '98 &
- Windows NT: Select Start -> Run from the TaskBar menu and browse the distribution media then select the SETUP.EXE utility.

Follow the instructions provided during the installation process. On-line help is available, as appropriate.

As the final step, the installation utility will display the README file. This file should be reviewed in its entirety: It will list any revisions or enhancements since the last manual printing or on-line help update. It also provides additional support and usage information.

Once the files have been copied to the destination locations, a Server module must be loaded before any of the Clients can establish communication.

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Getting Started

NConsole consists of three main components: The Server module that is the statistical collection agent; a DOS remote access Client that can also be used to repair a corrupt Trend data file or to convert the data collected by a previous release; and a Windows graphical Client that can be used to view real-time Server information or historical trends. While each has a purpose, the Server module is the primary component since it must be loaded for either of the Client components to be fully functional.

Loading the NetWare Server Module

Initial execution of the NetWare Server module requires access to the Server Console either physically at the Server or through Novell's RCONSOLE utility. To load the Server module, type the following at the console:

```
LOAD [vol:path\]NCONSOLE
```

If the Server module was installed in the SYS:SYSTEM directory or in one of the defined Server Console search paths, the volume and path are not required. Otherwise, the volume and path should correspond to the destination directory for the Server files.

The LOAD command line should be added to the AUTOEXEC.NCF file to insure automatic loading of the Server module during subsequent rebooting of the File Server.

Command line options can be used to configure the operation of the Server module. Refer to the Server Module Operation section for specifics on the supported command line options and their use.

Executing the Clients

Once installed properly, the Clients can be executed either by double-clicking the appropriate icon or by any other means configured and supported for launching DOS or Windows application programs.

Default Server

The Clients will attempt to communicate with the default Server. When used in a Novell NetWare network, the default Server is defined as follows:

- If the current drive is a network drive, the Server with which the network drive is associated.
- If the current drive is not a network drive, the Primary Server to which the workstation initially logged in.

The workstation must be attached to a Server with a Server module loaded before communication can be established.

Required Rights

The User must be logged into the desired Server with File Server Console Operator rights or ADMIN/SUPERVISOR equivalence. Insufficient rights will result in limited functionality for the Clients.

Note: File Server Console Operator rights can be assigned via Novell's SYSCON (NWv3 - Supervisor options) or NWADMIN / NETADMIN (NWv4/v5 - Server Object) utilities. Insufficient rights will result in limited functionality.

Server Module Operation

The Server module collects, averages, accumulates, tracks, displays, and logs hundreds of key performance statistics. It provides these statistics to the DOS Client and to the Windows Client. The Server module also provides additional Server configuration and operational information to the Windows Client.

Overview

Once the Server module has been loaded, it is ready to begin the statistical logging process. The most critical performance statistics are displayed on the Server module screen which also has a scrolling bar graph showing the CPU Utilization.

The Server module automatically tracks and logs the statistics based upon the configured or command line specified options. The bar graph shows the overall CPU Utilization for the last 74 seconds and scrolls from right to left across the bottom of the screen as the statistics are collected.

The values in the Curr columns represent the current activity over the last second. These are the real-time statistics, similar to what Novell's MONITOR NLM offers, yet more extensive and accessible.

The values in the Avg columns represent the average level of activity for each second since the last cycle started. The amount of time which has passed since the cycle started is shown in the bottom right corner of the screen header.

The values in the Peak columns represent the highest level of activity collected at any time since the last cycle started. The time which has elapsed since the cycle started is shown in the bottom right corner of the screen header.

The values in the Cuml columns represent the accumulated level of activity since the last cycle started. The time which has elapsed since the cycle started is shown in the bottom right corner of the screen header.

Server Module Operation

Each of these values, Curr, Avg, Peak, and Cuml, is reset at the end of each cycle once recorded (if configured for logging).

The CPU Utilization bar graph is five lines deep and uses three types of indicators:

- Each full height block represents 20 percent utilization increments.
- Half-height blocks indicate an additional 10-19 percent utilization.
- An underscore reflects another 1-9 percent of utilization.

Additionally, each CPU Utilization bar is color coded based upon its relationship to the Avg (average) and Peak (maximum) level tracked since the last cycle started:

- CPU Utilization levels **at or above the previous Peak** are displayed in red (color monitor) or flashing (mono monitor) attributes.
- CPU Utilization levels **from the current average up to, but not including, the Peak** are displayed in yellow (color monitor) or black (mono monitor) attributes.
- CPU Utilization levels **below the current average** are displayed in green (color monitor) or grey (mono monitor) attributes.

The CPU Utilization bar graph also doubles as a screen saver, scrolling up and down the screen once activated. By using the bar graph as the screen saver, the Server module is able to provide more in-depth information than that offered by Novell's MONITOR NLM. The Server module screen saver is automatically activated after the configured or command line specified period has elapsed (refer to Command Line Options for more information). It can also be manually activated by pressing the F10 key whenever the Server module screen is active (refer to the Supported Keys section for more information).

Command Line Options

The following command line options can be used to define how the Server module operates. The options must be appended to the command line used to load the Server module:

Note: With the exception of the command line options listed below, most of the options can be set as default parameters for the Server module using either the CONFIG / RECONFIG command line options or via the Server -> Server Information -> NConsole Configuration -> Edit option in the Windows Client:

FORCE
MONO
NOESC
NOLOGKEY

ARCHIVE[=###]

Copies each day's log file statistics to unique archive files at midnight, and then resets the primary log files for the next day's logging activity.

Examples:

Jan. 01 - NCNSL001.ext ([ext] = ASC, LOG &/or MAX)
Feb. 29 - NCNSL060.ext ([ext] = ASC, LOG &/or MAX)

Note: If ARCHIVE= is specified, the ### must be a numeric value between 0 and 364 specifying the maximum number of days worth of archive files to maintain. If the parameter is not used or a zero [0] value is specified, the default is that the archiving process should be continuous.

Only the ASCII/DATA (.ASC) and Log (.LOG) files are archived in this manner. Trend (.DAT) data is archived via the Trend Window options in the Windows Client.

ASCII[=NUM]
ASCII[=PACK]
ASCII[=NAME]
ASCII[=STRING]

Records the statistics at the end of each cycle as ASCII quote enclosed data fields with comma delimiters to the ASCII Data (.ASC) log file (e.g., "12","34","56", . . .)

Notes: If =NUM is specified, the cycle start/stop fields are logged in numeric format ("mm/dd/yy hh:mm").

If =PACK is specified: The individual data items are only comma delimited, not quote enclosed; And, the cycle start/stop fields are logged in packed numeric format as separate date/time fields (yymmdd,hhmm).

If =NAME is specified, each cycle record is preceded by the Server name.

If =STRING is specified, the cycle start/stop fields are logged in 'C' string format ("day mon dd hh:mm?m")

If more than one option is desired, i.e., PACK and NAME, an ASCII=[opt] must be given for each (e.g., ASCII=PACK ASCII=NAME).

NUM, PACK, and STRING conflict since each specifies a different format for the cycle start/stop fields. Thus, if more than one is used, the last one overrides.

The default configuration is ASCII=NUM.

CONFIG

Saves the active configuration once all the command line option processing is finished.

CYCLE=##

Specifies the length of each statistical tracking cycle (default = 60 minutes, minimum value is 1). The statistics are collected, averaged, accumulated, and tracked once per second during the statistical tracking cycle before being logged at the end of the cycle and then reset for the next cycle.

Notes: If the CYCLE period is too short, it is difficult to determine capacity trends. If the CYCLE period is too long, isolating bottlenecks is more difficult. CYCLE intervals

ranging from a minimum of 15 minutes to a maximum of 4 hours are recommended.

Shorter CYCLE intervals generate larger logs over time.

DATA[=NUM]
DATA[=PACK]
DATA[=NAME]
DATA[=STRING]

(Refer to the ASCII command line option section.)

FORCE

Forces the Server module screen to become the active screen on the Server Console whenever the screen saver timeout period elapses (see SAVER for more information on the screen saver).

Note: This option is not saved by CONFIG/RECONFIG.

LOCK[=AUTO]

Locks the Server module screen on the Server Console upon load providing an additional level of Server Console access control without compromising overall system security. Once activated, either the Bindery SUPERVISOR password or the user defined password configured for the Server module is required to release the lock.

Notes: For NetWare v4 and later, the Bindery SUPERVISOR password exists even if Bindery context is not set. By default, the OS installation process sets the Bindery SUPERVISOR password to the same password defined for the ADMIN account.

If LOCK=AUTO is specified, the Server Console keyboard will relock whenever the screen saver is activated; whether initiated manually by pressing the F10/Sh-F10 or automatically after the default/specified screen saver (SAVER=) timeout period.

LOG

Records the statistics to the ASCII print format (.LOG) file at the end of each cycle.

MONO

Forces the Server module display into monochrome mode.

Note: This option is not saved by CONFIG/RECONFIG.

NOARCHIVE

Disables the ARCHIVE option, if previously configured.

NOASCII

Disables the ASCII or DATA option, if previously configured.

Note: Does not affect the LOG or TREND options.

NODATA

Disables the DATA or ASCII option, if previously configured.

Note: Does not affect the LOG or TREND options.

NOESC

Disables support for terminating the Server module via the ESC key.

Note: This option is not saved by CONFIG/RECONFIG.

NOLOCK

Disables the LOCK option, if previously configured.

NOLOG

Disables the LOG option, if previously configured.

Note: Does not affect the ASCII/DATA or TREND options.

NOLOGKEY

Disables support for statistical logging via the F4, F5, and F6 keys.

Note: This option is not saved by CONFIG/RECONFIG.

NOSAVER

Disables the SAVER option, if previously configured.

NOTRENDS

Disables the TRENDS option, if previously configured.

Note: Does not affect the ASCII/DATA or LOG options.

P=pwd

An optional password (pwd), in addition to the default Bindery SUPERVISOR password (see the notes under the LOCK command line option for more information), that can be used to unlock the Server module screen.

RECONFIG

(Refer to the CONFIG command line option section.)

SAVER=##

Maximum period of Server Console keyboard inactivity (in minutes) that must elapse before the screen saver will invoke (default = 10 minutes, minimum value is 1, and -1 disables the Server module screen saver logic).

Note: The CPU Utilization bar graph will scroll up and down the screen after the specified period of keyboard inactivity has passed.

START=hh:mm

Time to initiate periodic logging of the statistics (specify in military format, i.e., 00:00 = midnight and 23:59 = 11:59 pm).

Note: START/STOP times must be different.

STOP=hh:mm

Time to suspend periodic logging of the statistics (specify in military format, i.e., 00:00 = midnight and 23:59 = 11:59 pm).

Note: START/STOP times must be different.

TRENDS[=###]

Records each completed cycle's statistics to the historical Trend (.DAT) file.

Notes: The trend data is logged once per cycle.

If TRENDS= is specified, the ### must be a numeric value between 0 and 364 specifying the maximum number of days worth of trend data to maintain. A zero [0] value indicates that the trend logging should be continuous (the default if trend logging is active).

If the logging of the Trend data is disabled, the historical activity will not be available for the Trends and Linked

Trends views within the Windows Client or for the SNMP MIB Agent to instrument. The Trend file occupies minimal space when configured at recommended intervals, due to the packed binary format of the file. The advantage of being able to review past Server activity more than compensates for the minimal disk space consumed. Therefore, use of the NOTRENDS option is not recommended.

Default Parameters

The default configuration upon installation is for continuous logging. A sixty (60) minute CYCLE is used with the statistics recorded in ASCII print format to the .LOG file and in compressed binary format to the .DAT Trend file, the Server module screen displayed in color, and a ten (10) minute screen saver timeout period.

Supported Keys

The following keys are supported by the Server module:

- Escape terminate operations/exit the program

 Note: Disabled if NOESC option specified.
- F1 or ? activate on-line help system

 Note: Additional levels of help information can often be accessed by pressing the '?' key from within a help screen.
- F4 record the current stats (Average, Peak, and Cumulative) in the configured or command line specified log files

 Note: Disabled if NOLOGKEY option specified.
- F5 clear the configured or command line specified log file(s), write the current stats to the new log file(s), and reset all of the stats (Average, Peak, and Cumulative)

- Note: Does not clear/reset the Trend file. Disabled if NOLOGKEY option specified.
- F6 clear/reset the log file(s)

 Note: Does not clear/reset the Trend file. Disabled if NOLOGKEY option specified.
- F10 activate screen saver mode

 Note: Pressing any key will reactivate the full screen display of the statistics.
- Sh-F10 activate screen saver mode and lock the Server module screen

 Note: Pressing any key will reactivate the full screen display of the statistics. The Bindery SUPERVISOR or optional Server module password is required to unlock the console keyboard (refer to the LOCK documentation in the Server Module Command Line Options section for more information).

Log Files

The Server module can be optionally configured to log the tracked statistics in two separately formatted files.: The ASC or DATA option will record the statistics in the NCONSOLE.ASC file as ASCII comma delimited entries. The LOG option will record the statistics in the NCONSOLE.LOG file as ASCII print formatted entries.

- Note: All log files are created in the same [vol:path] in which the Server module was loaded.

 For configuration information, refer to the Command-Line Options section for the Server Module or the Information Window - NConsole Configuration section for the Windows Client.

 For log file format documentation, refer to the Windows Client on-line help for the version in use.

DOS Client Operation

The DOS Client (NCREMOTE.EXE) interacts with the Server module as a remote access utility: A simple to use and low overhead interface providing access to the Server module screen. This is achieved in a manner similar to Novell's RCONSOLE, yet vastly more secure since access is limited to only the Server module screen. It can also be used to analyze and convert or repair the historical Trend file.

Command Line Options

The following command line options are supported by the DOS Client:

- S=<server>
 <server> Specifies the Server with which a remote session is to be established.
- Note: The default Server is assumed, if not specified.
- <dat_file> Specifies the Trend file or archived Trend file to check or rebuild.
- Note: The Trend file associated with the Server module on the default Server is assumed, if not specified.
- C Checks for corruption in the Trend file(s) for the default / specified Server.
- R Rebuilds the Trend file for the default / specified Server.
- V Verbose informational display of the results for the Server module Trend file(s) checked (-C) or rebuilt (-R).
- Note: Only valid with -C or -R option

Supported Keys

The following keys are supported by the DOS Client:

- | | |
|---------|--|
| Escape | terminate operations/exit the program |
| | Note: Disabled if NOESC option specified. |
| Insert | change Servers |
| | Note: Pressing Insert in the Attached Servers list brings a list of the other Available Servers. |
| F1 or ? | activate on-line help system |
| | Note: Additional levels of help information can often be accessed by pressing the '?' key from within a help screen. |
| F4 | record the current stats (Average, Peak, and Cumulative) in the configured or command line specified log files |
| | Note: Disabled if NOLOGKEY option specified. |
| F5 | clear the configured or command line specified log file(s), write the current stats to the new log file(s), and reset all of the stats (Average, Peak, and Cumulative) |
| | Note: Does not clear/reset the Trend file.
Disabled if NOLOGKEY option specified. |
| F6 | clear/reset the log file(s) |
| | Note: Does not clear/reset the Trend file.
Disabled if NOLOGKEY option specified. |

Windows Client Operation

The Windows Client interacts with the Server module to present the real-time and historically collected data. Statistical data can be displayed in 2D or 3D format with support for exporting either the data or the graphs to the clipboard for subsequent import into other applications. Server configuration data, the status of Modules loaded on the Server, and the configuration parameters are also provided, plus the ability to modify and export the new configuration parameters to the base startup files. The default configuration parameters for the Server module can also be defined and exported to other Servers through this Client.

Main Window

The Main Window contains five areas: The Titlebar, the Menubar, the Toolbar, the Workspace, and the Status Bar. Each area has specific uses and functions.

Titlebar

The Main Window Titlebar displays the program name and version, plus the standard Windows Titlebar controls.

Control Box

At the left side of the Titlebar is the Control Box, which is used to access the Main Control menu for the Window. Double-clicking on the Control Box terminates the program.

Text Display

Double-clicking on the text display section of the Titlebar switches the Window between a maximized and normal state.

Positioning Buttons

Located at the right side of the Titlebar are the Main Window's positioning buttons. When the Window is maximized, the Maximize button is replaced by the Restore button.

Menubar

The Menubar contains the main option categories, each listing a family of selections, each performing a specific action.

Toolbar

Below the Menubar is a row of buttons collectively called the Toolbar. These buttons perform an action, just like a Menubar selection.

Workspace

The Workspace is the area below the Menubar and Toolbar. When a Window is opened or created, it resides within the Workspace.

Desktop

When multiple Windows are opened or created in the Workspace, it is referred to as a Desktop. Within the Desktop, the individual Windows may be sized as desired, reduced to an icon, or maximized. This feature facilitates the easy viewing of many Windows.

Note: It is possible to save the Desktop to facilitate a quick return to a previously configured Workspace.

Window Types

An Information Window and three Window types with different viewing perspectives of monitored data (View, Trend, and Linked Trend) are provided.

Information Window

Displays operational and configuration information about each Server which has the Server module loaded.

View Window

Displays up to ten real-time statistics for one or more Servers which have the Server module loaded.

Trend Window

Displays the archived trend data for a Server.

Linked Trend Window

Displays archived trend data on up to four statistics for a Server.

Status Bar

Below the Workspace is a line of text referred to as the Status Bar. The Status Bar displays a text string describing what operation is currently being performed.

Menubar

Upon executing the Windows Client, the main screen appears displaying both a bar of menu categories and a bar of graphical buttons. The main menu is displayed as a horizontal list, or Menubar, of option categories which remain consistent through the program's execution. Each Menubar category lists a family of selections, each performing a specific action. To access the list associated with a Menubar category, double-click on the category, highlight the category, and press <Enter>; or press the <Alt> key plus the letter that is underlined in the category (referred to as a keyboard short cut). For example, pressing <Alt> + <F> is the keyboard short cut to access the File options list on the Menubar.

Note: Menubar categories and list selections that are not currently available will appear in grey.

The following is a list of Menubar categories and their associated pull-down lists (the keyboard short cut is the <Alt> Menubar category short cut key plus the underlined character in the listed option):

<u>F</u> ile	(Short cut = Alt+F plus the underlined character)
<u>N</u> ew	Create a new Window
<u>O</u> pen	Open a previously defined Window
<u>C</u> lose	Close the current Window
<u>S</u> ave	Save the current Window
Save <u>a</u> s...	Save the current Window using a different file name
<u>E</u> dit	Edit the current Window options
<u>P</u> rint	Print the current Window
Close <u>D</u> esktop	Close the desktop
Save <u>D</u> esktop	Save the desktop
Save <u>D</u> esktop as...	Save the desktop to a different file name
<u>S</u> uspend Update	Suspend the periodic updating of the current View Window
<u>R</u> esume Update	Resume the periodic updating of the current View Window
<u>S</u> elect Printer	Select the current printer
<u>C</u> onfigure Printer	Configure the current printer
<u>E</u> xit	Exit the program
<u>#</u> [filename]	Most recently used file list in numerical order (1 - 10)

<u>R</u> eports	(Short cut = Alt+R plus the underlined character)
<u>D</u> efined Reports	Create, Edit or Print reports
<u>L</u> oaded Module Variance	Print a Variance report for Loaded Modules on multiple Servers
<u>S</u> ET Parameter Variance	Print a Variance report for SET Parameters on multiple Servers

<u>T</u> rend Data	(Short cut = Alt+T plus the underlined character)
<u>C</u> rop Data	Crop the Trend Window data
<u>A</u> rchive Data	Archive the Trend Window data

Note: A Trend Window must be selected before any Trend Data options are available.

<u>O</u> ptions	(Short cut = Alt+O plus the underlined character)
Copy <u>D</u> ata to Clipboard	Copy the current Window graph data to Window's clipboard
Copy <u>G</u> raph to Clipboard	Copy the current Window graph image to Window's clipboard
Default <u>C</u> olors	Define the default colors used for new Windows
Default <u>G</u> raph Types	Define the default graph type used for new Windows
Default <u>S</u> erver	Define the default Server used for new Windows
<u>C</u> onfigure Toolbar	Define the Toolbar buttons
Show/Hide <u>T</u> oolbar	Show/Hide the Toolbar
Show/Hide <u>S</u> tatus bar	Show/Hide the Status bar

Note: A View, Trend, or Linked Trend Window must be selected before either Copy options will be available.

<u>S</u> erver	(Short cut = Alt+S plus the underlined character)
Server <u>I</u> nformation	Open the Information Window to access Server detailed information and configure the Server module
<u>S</u> erver Connections	Manage Server connections
<u>L</u> icense Information	View license information for all the Servers with a Server module loaded

<u>Window</u>	(Short cut = Alt+W plus the underlined character)
<u>C</u> ascade	Cascade the open Windows
<u>T</u> ile Vertical	Tile the open Windows vertically
Tile <u>H</u> orizontally	Tile the open Windows horizontally
Arrange <u>I</u> cons	Arrange the icons
<u>R</u> estore All	Restore all minimized Windows
Close <u>A</u> ll	Close all the open Windows

<u>H</u> elp	(Short cut = Alt+H plus the underlined character)
<u>I</u> ndex	Access the online help Index
<u>S</u> tatistics	View information about Statistics
<u>A</u> bout	View information about the program

Toolbar

Below the Menubar is a row of buttons collectively referred to as the Toolbar. The Toolbar buttons represent short cuts to some of the most commonly used functions in the Menubar category lists.

The buttons displayed on the Toolbar will change as appropriate to the current level of operation. It is also possible to hide the Toolbar to provide additional Workspace for the Windows. The following buttons may appear on the Toolbar, as configured and appropriate to the current level of operation:

Note: Buttons which perform actions that are not currently available will appear in grey.

	Access the online help
	Create a Desktop; View, Trend, or Linked Trend Window
	Open a Desktop; View, Trend, or Linked Trend Window

	Close a Desktop; View, Trend, or Linked Trend Window
	Save a Desktop; View, Trend, or Linked Trend Window
	Edit a View, Trend, or Linked Trend Window
	Print a View, Trend, or Linked Trend Window
	Pause/Resume a View Window
	Exit
	Define the Default Colors
	Manage Server connections
	Tile open Windows
	Cascade open Windows

To modify the buttons which appear on the Toolbar and the display order, select Configure Toolbar from the Options list on the Menubar.

Modify the Toolbar as follows:

To remove a button, highlight it and press the Delete button. Once a button is deleted, it is removed from the Current Buttons list box and placed back in the Available Buttons list box.

To add a button, highlight it and press the Insert button. Once a button is inserted, it is removed from the Available Buttons list box and placed back in the Current Buttons list box.

To move the currently highlighted button one position to the left on the Toolbar, click on the Move Left button.

To move the currently highlighted button one position to the right on the Toolbar, click on the Move Right button.

Once the Toolbar is configured as desired, click the Ok button.

Graphbar

At the top of each View, Trend, or Linked Trend Window is a row of buttons collectively referred to as the Graphbar. The buttons on the Graphbar can be used to access the basic graph editing options available in the Edit Graph Options dialog for each Window:

 Edit the graph configuration

 Increase the maximum graph value (y-axis)

 Decrease the maximum graph value (y-axis)

 Rotate the position of the graph legend

 Toggle the scrollable status

 Change to a 2 Dimensional graph

 Change to a 3 Dimensional graph

To modify additional graph options, click on the Graph Options button in the Edit Graph Options dialog. The following additional graph options can then be modified:

Display Graphbar	Enable/disable the Graphbar
Scrollable Graph	Enable/disable scrolling (if disabled, all interval points are compressed into a non-scrollable line graph)
Line Width	Width of lines in 2D line graphs
Marker Size	Marker size for interval points (2D/3D line graphs)
Bar Width	Percent of graph width to use for bar graphs (maximum = 100)
Max Interval	Maximum interval points in the graph window (scrollable)
Interval Display	Intervals to display time references
Legend Position	Position for the graph legend

Note: Grayed options are not applicable to the Window type in use.

To modify the graph colors, highlight the desired graph item then click the Color button to access the Choose Color dialog from the Edit Graph Options dialog.

Window Management

The Main, View, Trend, Linked Trend, and Informational Windows can be moved, sized, and arranged in various manners.

To minimize, maximize, or restore a Window, use the Positioning buttons that appear at the right side of the Window's Titlebar.

To move a Window to a different location:

1. Point the cursor at the display portion of the title bar.
2. Press and hold the primary mouse button.
3. Drag the Window by moving the mouse.
4. Release the mouse button.

To change the size of a Window:

1. Point at a side or corner of the Window.
2. Press and hold the primary mouse button.
3. Resize the Window by moving the mouse.
4. Release the mouse button.

To tile the active Windows, click the Tile button on the Toolbar or select Tile from the Window options list on the Menubar.

To cascade the active Windows, click the Cascade button on the Toolbar or select Cascade from the Window options list on the Menubar.

If additional Workspace is needed for the Desktop, the Toolbar and/or Status bar can be hidden from view.

Desktop Management

Desktops are pre-configured collections of Windows that are arranged to fit in the Workspace.

To create a new Desktop of pre-configured Windows, access the Create New Window dialog by clicking the New button on the Toolbar or by selecting New from the File options list on the Menubar.

Clicking on the Desktop button will create a new Desktop after closing the current Desktop, if open.

To open a previously saved Desktop, access the Open File dialog by clicking the Open button on the Toolbar or selecting Open from the File options list on the Menubar.

Change the File Type to Desktop Files by clicking on the List Files by Type drop down button and highlighting the Desktop Files selection. Select the desired Desktop file.

To close a Desktop, select Close Desktop from the File options list on the Menubar.

To save the current Desktop, click the Save button on the Toolbar or select Save Desktop from the File options list on the Menubar. If a new Desktop is being saved, the File Save As dialog will open.

Enter or select the desired Desktop file name.

View Window

A View Window shows real-time data on Server activity and can be configured to provide information about one or more statistics on one or more Servers in a variety of formats.

To open a View Window, access the Open File dialog by clicking the Open button on the Toolbar or by selecting Open from the File options list on the Menubar:

Change the File Type to View Files by clicking on the List Files by Type drop down button and highlighting the View Files selection. Select the desired View file.

To create a new View Window, access the Create New Window dialog by clicking the New button on the Toolbar or by selecting New from the File options list on the Menubar:

By clicking the View button, the Edit View Window dialog is displayed.

To edit a View Window, select the desired Window then access the Edit View Window by clicking the Edit button on the Graphbar, or by selecting Edit from the File options list on the Menubar:

The following Window characteristics can be defined:

Type of Graph	2D/3D Bar or Line Graph, Pie Chart
Graph Item Colors	Graph Elements and their colors

Update Interval	Update interval (seconds)
Cycles to view	Number of interval points in the graph (2D/3D Line graph)
Window Title	Window title/name
Statistic Listing	Statistics to graph

To insert a statistic, access the Insert Statistic dialog by clicking the Insert button. The Edit Statistic dialog will appear and the desired statistic can be defined.

To edit a statistic, highlight the desired statistic then click on the Edit button. The Edit Statistic dialog will appear and the desired statistic can be edited.

To delete a statistic, highlight the desired statistic, then click on the Delete button.

To modify the graph options, access the Edit Graph Options dialog by clicking on the Graph Options button.

To modify the graph colors, highlight the desired graph item then click the Color button to access the Choose Color dialog.

To save a View Window, select the desired Window then click the Save button on the Toolbar, or select Save from the File options list on the Menubar. If a new View Window is being saved, a File Save As dialog will appear.

Enter or select the desired View file name.

To print a View Window, select the desired Window then click the Print button on the Toolbar, or select Print from the File options list on the Menubar.

To suspend the updating of a View Window, select the desired Window then click the Pause button on the Toolbar, or select Suspend from the File options list on the Menubar.

Note: When the updating of a View Window is suspended, the Titlebar will change to reflect that status.

To resume the updating of a View Window, select the desired Window then click the Pause button on the Toolbar, or select Resume from the File options list on the Menubar.

To copy the graph data to the Windows Clipboard, select the desired Window then select Copy Data to Clipboard from the Options list on the Menubar. The graph data can now be viewed as ASCII text in the Windows Clipboard.

To copy the graph image to the Windows Clipboard, select the desired Window then select Copy Graph to Clipboard from the Options list on the Menubar. The graph image can now be viewed as a bitmap picture in the Windows Clipboard.

Trend Window

Trend Windows present an historical perspective of Server activity. Multiple Trend Windows may be active and each can be configured by Server, statistics, graph type, and colors.

To create a new Trend Window, access the Create New Window dialog by clicking the New button on the Toolbar or by selecting New from the File options list on the Menubar.

By clicking the Trend button, the Edit Trend Window dialog is displayed.

To open a Trend Window, access the Open File dialog by clicking the Open button on the Toolbar or by selecting Open from the File options list on the Menubar:

Change the File Type to Trend Files by clicking on the List Files by Type drop down button and highlighting the Trend Files selection. Select the desired Trend file.

To edit a Trend Window, select the desired Window then access the Edit Trend Window dialog by clicking the Edit button on the Toolbar, or by selecting Edit from the File options list on the Menubar:

The following characteristics can be modified:

File Server

This list box will display an index of the available Servers based on the following criteria:

Actual Trend Data File

For Windows using the active trend data file, only those Servers with a valid Server module loaded to which the workstation is connected will be listed.

Archive Trend Data File

For Windows using an archived trend data file, will list only the name of the Server from which the trend data was extracted.

Graph Settings

Defines the following graph criteria:

Graph Type	Type of graph to display
Graph Item Colors	Graph Elements and their selected color

Window Title

The description string to be used as the Window title.

Archive File

Specifies that previously exported trend data is to be used instead of the default trend data file:

Use Archive File	Indicates that an exported archive file is to be used
File	Archive file name (if used)

To select the trend data cycles to graph, access the Select Cycles to View dialog by clicking on the Select Cycles button:

Define the criteria to use for viewing trend data.

To select the archived trend data file to graph, enable the Use Archive File option, and then access the Open File dialog by clicking on the Select Archive button:

Change the File Type to Archive Files by clicking on the List Files by Type drop down button and highlighting the Archive Files selection. Select the desired Archive File.

To modify the graph options, access the Edit Graph Options dialog by clicking on the Graph Options button.

To modify the graph colors, highlight the desired graph item then click the Color button to access the Choose Color dialog.

To change the currently displayed statistic in a Trend Window, access the supported statistics list by clicking on the Statistics pull down button then double-click on the desired statistic in the list.

To save a Trend Window, select the desired Window then click the Save button on the Toolbar, or select Save from the File options list on the Menubar. If a new Trend Window is being saved, a File Save As dialog will appear.

Enter or select the desired Trend file name.

To print a Trend Window, select the desired Window then click the Print button on the Toolbar, or select Print from the File options list on the Menubar.

To copy the graph data to the Windows Clipboard, select the desired Window then select Copy Data to Clipboard from the Options list on the Menubar. The graph data can now be viewed as ASCII text in the Windows Clipboard.

To copy the graph image to the Windows Clipboard, select the desired Window then select Copy Graph to Clipboard from the Options list on the Menubar. The graph image can now be viewed as a bitmap picture in the Windows Clipboard.

To selectively extract cycles from the currently displayed trend data file to a new archive trend data file, select the desired Trend Window then access Archive Data from the Trend Data options list on the Menubar.

Click the Select Cycles button to access the Select Cycles to Archive dialog:

Enter the date and time ranges for the desired cycles.

Click on the Select Archive button to access the Save File dialog.

Enter or select the desired Archive file name.

To crop, or selectively delete, cycles from the currently displayed trend data file, select the desired Trend Window then access Crop Data from the Trend Data options list on the Menubar.

The Select Cycles to Crop dialog will appear where the desired cycles can be chosen:

Enter the date and time ranges for the desired cycles.

Note: Use caution since the records are permanently deleted from the trend file and cannot be retrieved.

Linked Trend Window

Linked Trend Windows provide historical information about the Server for up to four separate statistics in a linked graph.

To create a new Linked Trend Window, access the Create New Window dialog by clicking the New button on the Toolbar or by selecting New from the File options list on the Menubar.

By clicking the Linked button, the Edit Linked Trend Window dialog is displayed.

To open a Linked Trend Window, access the Open File dialog by clicking the Open button on the Toolbar, or by selecting Open from the File options list on the Menubar:

Change the File Type to Linked Trend Files by clicking on the List Files by Type drop down button and highlighting the Linked Trend Files selection. Select the desired Linked Trend file.

To edit a Linked Trend Window, select the desired Window then access the Edit Linked Trend Window dialog by clicking the Edit button on the Toolbar, or by choosing Edit from the File options list on the Menubar:

The following characteristics can be modified:

File Server

This list box will display an index of the available Servers based on the following criteria:

Actual Trend Data File

For Windows using the active trend data file, only those Servers with a valid Server module loaded to which the workstation is connected will be listed.

Archive Trend Data File

For Windows using an archived trend data file, will list only the name of the Server from which the trend data was extracted.

Graph Settings

Defines the following graph criteria:

Graph Type	Type of graph to display
Graph Item Colors	Graph Elements and their selected color

Window Title

The description string to be used as the Window title.

Archive File

Specifies that previously exported trend data is to be used instead of the default trend data file:

Use Archive File	Indicates that an exported archive file is to be used
File	Archive file name (if used)

To select the trend data cycles to graph, access the Select Cycles to View dialog by clicking on the Cycles button:

Define the criteria to use for viewing trend data.

To insert a statistic, access the Edit Statistic dialog by clicking the Insert button.

Note: A maximum of four (4) statistics can be displayed in a Linked Trend Window.

To edit a statistic, access the Edit Statistic dialog by double-clicking the desired statistic or highlighting it, then click the Edit button.

Edit the statistic as desired.

To delete a statistic, highlight the desired statistic then click the Delete button.

To select the archived trend data file to graph, enable the Use Archive File option and then access the Open File dialog by clicking the Archive button:

Change the File Type to Archive Files by clicking on the List Files by Type drop down button and highlighting the Archive Files selection. Select the desired Archive File.

To modify the graph options, access the Edit Graph Options dialog by clicking on the Graph Options button.

To modify the graph colors, highlight the desired graph item then click the Color button to access the Choose Color dialog.

To save a Linked Trend Window, select the desired Window then click the Save button on the Toolbar or select Save from the File options list on the Menubar. If a new Linked Trend Window is being saved, a File Save As dialog will appear.

Enter or select the desired Linked Trend Window file name.

To print a Linked Trend Window, select the desired Window then click the Print button on the Toolbar or select Print from the File options list on the Menubar.

To copy the graph data to the Windows Clipboard, select the desired Window then choose Copy Data to Clipboard from the Options list on the Menubar. The graph data can now be viewed as ASCII text in the Windows Clipboard.

To copy the graph image to the Windows Clipboard, select the desired Window then choose Copy Graph to Clipboard from the Options list on the Menubar. The graph image can now be viewed as a bitmap picture in the Windows Clipboard.

Information Window

The Information Window displays real-time operation and configuration information about each Server where the Server module is loaded. This information is categorized and detailed.

Server Information

This category selection displays information about the Server and the current User connection.

The following information is displayed:

Server	
Name	Defined name for the Server
Version	OS Version and Serial Number
Up Time	Time since Server last restarted
CPU Utilization	Current CPU Utilization
Processors	Number of CPUs installed
CPU Speed	OS calculated speed factor
Cache Buffers	Ratio of Cache Buffers to Total Memory
Cache LRU	Cache Least Recently Used time factor
Connections	Number of active connections
Licenses	Number of User Licenses installed
In Use	Number of Licenses In Use
DOS Present	DOS Present (Yes) or Removed (No)
Remote Console	
Support	Remote support (REMOTE.NLM) status
Login Status	Logins allowed (Enabled/Disabled)
Security Restriction Level	
Allow Unencrypted	
Passwords	Old Password APIs support status
Number of Drives	Number of physical drives installed
Number of	
Mounted Volumes	Number of mounted volumes
STARTUP.NCF	Full name/path
AUTOEXEC.NCF	Full name/path

User

Name	User name
Connection	Connection number
Supervisor	Supervisor Equivalent status
Console Operator	Console Operator status

NConsole Configuration

This category selection displays information about the loaded Server module and the current configuration.

The following information is displayed:

NConsole

Name	Defined name for the Server
Version	Version of NConsole installed
Serial Number	NConsole Serial Number
Licensed to	The registered User information

Time

Cycle	Updated frequency with which the statistics are logged and reset
Start Time	Time to initiate periodic logging of the statistics (in military format, i.e., 00:00 = midnight and 23:59 = 11:59 pm)
Stop Time	Time to suspend periodic logging of the statistics (in military format, i.e., 00:00 = midnight and 23:59 = 11:59 pm)
Screen Saver	Maximum Server Console keyboard inactivity permitted before the screen saver activates (default = 10 minutes, minimum value is 1, and -1 disables the screen saver)

Log Files

Archive	Enable/Disable archiving of Data/Log files into daily archives
Data	Enable/Disable logging of statistics in ASCII delimited format (.ASC)
Log	Enable/Disable logging of statistics in ASCII print format (.LOG)
Trend	Enable/Disable logging of statistics in the Trend format (.DAT)

Keyboard

Locked	Enable/Disable auto-locking of the Server console keyboard upon Server module load
Auto-Lock	Enable/Disable auto-locking of the Server console keyboard whenever the Server module screen saver activates

Limits

Max Archive	Maximum days of archive files
Max Trend	Maximum days of Trend data

Data Format

Numeric	(format control for the .ASC file) Log date/time fields in numeric format ('mm/dd/yyyy,hh:mm' for dates and 'dd:hh:mm:ss' for intervals)
String	Log date/time fields in string format ('Sun Jan 02 1994,12:01am' for dates and 'xxx days xx hrs xx mins xx secs' for intervals)
Packed	Comma delimited fields only (default = quote enclosed and comma delimited)
Name	Include Server name in each record
All	Include all possible fields even if non-existent (fixed length record format)

Password

An optional password can be used to unlock the Server module display when locked.

Edit the configuration:

By clicking the Edit button, each configuration parameter can be modified.

NConsole Log File

This category selection displays the contents of the ASCII Print Log File maintained by the Server module when the LOG option is enabled. The log file can also be cleared after being viewed.

STARTUP.NCF/AUTOEXEC.NCF

IOSTART.NCF/IOAUTO.NCF (requires optional SFT-III agent)

MSSTART.NCF/MSAUTO.NCF (requires optional SFT-III agent)

These categories display the contents of the selected .NCF file. To edit the selected file, click on the Edit button to activate the Edit .NCF File Window.

Edit .NCF File Window

This Window is a fully functional text editor for editing the .NCF files. The Window is divided into two sections, the Workspace and the Toolbar.

Workspace

This space is where the contents of the file are displayed.

Toolbar

The Toolbar contains the buttons that perform actions related to the editing of a .NCF file.

Note: A backup file (.BAK extension) will be created in the directory where the Windows Client resides.

To cut text, highlight the desired text then click the Cut button on the Window's Toolbar.

To copy text, highlight the desired text then click the Copy button on the Window's Toolbar.

To paste text, position the pointer where the text should be pasted then click the Paste button on the Window's Toolbar.

To locate a text string, click the Search button on the Window's Toolbar. Enter the text string to search for and whether it should be a Case Sensitive comparison.

To replace a text string, click the Replace button on the Window's Toolbar. Enter the text string to search for, the string to replace it with, and select the appropriate options.

To print the contents, click the Print button on the Window's Toolbar. A prompt will appear asking if line numbers should be included or not.

Note: To change the current printer, select Configure Printer from the File options list on the Menubar.

To close the currently displayed .NCF file, click the Close button on the Window's Toolbar. If the contents have been modified without being saved, a prompt will appear to save the file before it is closed.

Memory

This category selection displays information about the Memory configuration and utilization on the Server.

The following information is displayed:

Memory

DOS	Memory used by DOS
Conventional	Conventional (low DOS) memory
Total RAM	Total recognized Server memory

Memory Pools

Permanent Pool (NetWare v3)	Permanent memory pool size: This pool as a percentage of the Total Work Memory, and the amount of the pool that is currently in use
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Code and Data (NetWare v4/v5)

Static Code and Data memory allocated by all loaded NLMs (including the kernel), plus this pool as a percentage of the Total Work Memory

Alloc Pool

Alloc (Short Term/Dynamic) memory pool size: This pool as a percentage of the Total Work Memory, and the amount of the pool that is currently in use

Cache Buffers

File Cache Buffer memory pool size and this pool as a percentage of the Total Work Memory

Cache Movable

Cache Movable memory pool size and this pool as a percentage of the Total Work Memory

Cache NonMovable	Cache Non-Movable memory pool size and this pool as a percentage of the Total Work Memory
Total Work Memory	Total amount of memory in the defined memory pools
Memory Pool Graph	3-D graph of the memory pools

File I/O

This category selection displays information about the logical (client requested) File I/O activity on the Server.

The following information is displayed:

File I/O Activity

Opens	File Open requests
Creates	File Create requests
Deletes	File Delete requests
Reads	File Read requests
Writes	File Write requests
Graph	3-D graph of the Activity

Read/Write Request Activity

Reads	File Read requests
Writes	File Write requests
Graph	3-D graph of the Activity

Read/Write Byte Activity

Reads	File Read request bytes
Writes	File Write request bytes
Graph	3-D graph of the Activity

Disk I/O

This category selection displays information about the physical Disk I/O activity on the Server.

The following information is displayed:

Read/Write Request Activity

Reads	Disk Read operations
Writes	Disk Write operations
Graph	3-D graph of the Activity

Read/Write Byte Activity

Reads	Disk Read bytes
Writes	Disk Write bytes
Graph	3-D graph of the Activity

NIC I/O

This category selection displays information about the Network Interface Card (NIC) I/O activity on the Server.

The following information is displayed:

Tx/Rx Request Activity

Transmitted	NIC Transmitted packets
Received	NIC Received packets
Graph	3D graph of the Activity

Tx/Rx Byte Activity

Transmitted	NIC Transmitted bytes
Received	NIC Received bytes
Graph	3-D graph of the Activity

NIC I/O - Individual NIC

This category selection displays information about the Network Interface Card (NIC) I/O activity on the Server by individual NIC.

The following information is displayed:

Tx/Rx Request Activity

Transmitted	NIC Transmitted packets
Received	NIC Received packets
Graph	3D graph of the Activity

Protocol I/O

This category selection displays information about the Protocol I/O activity on the Server.

The following information is displayed:

Protocol Tx Request Activity

Protocol	Protocol Name (provided by NetWare)
Count	Protocol Transmitted packets
Graph	3-D graph of the Activity

Protocol Rx Request Activity

Protocol	Protocol Name (provided by NetWare)
Count	Protocol Received packets
Graph	3-D graph of the Activity

Protocol I/O - Individual Protocol

This category selection displays information about Server Protocol I/O activity on the Server by individual Protocol.

The following information is displayed:

Tx/Rx Packet Activity

Transmitted	Protocol Transmitted packets
Received	Protocol Received packets
Graph	3-D graph of the Activity

Volumes

This category selection displays information about the logical Volumes configured on the Server.

The following information is displayed:

KB Information

Total	Defined size
In Use	Space in use
Free	Space available
Purgeable	Deleted space that is Purgeable
Not Yet Purgeable	Deleted space that is Not Yet Purgeable
Graph	3-D graph of the volume space

Directory Slots

Total	Directory slots allocated
In Use	Directory slots in use
Free	Directory slots available
Graph	3-D graph of the directory slots

Volumes - Individual Volume

This category selection displays information about the logical Volumes configured on the Server by individual Volume.

The following information is displayed:

Volume Information

Drive Number	Drive number containing the volume
Block Size	Block size defined
Hashing	Hashing status
Removable	Removable status
Mounted	Mounted status

KB Information

Total	Defined size
In Use	Space in use
Free	Space available
Purgeable	Deleted space that is Purgeable
Not Yet Purgeable	Deleted space that is Not Yet Purgeable
Graph	3-D graph of the volume space

Directory Slots

Total	Directory slots allocated
In Use	Directory slots in use
Free	Directory slots available
Graph	3-D graph of the directory slots

Drives

This category selection displays information about the physical Drives installed on the Server.

The following information is displayed:

Drive Number	Drive number
Controller Number	Controller number
Mirrored Status	One of the following: Not Mirrored Mirrored Configured, out of sync Mirrored Secondary, remirroring Mirrored Primary in sync, secondary off-line Mirrored Primary in sync, secondary remirroring Mirrored In sync
Hot Fix Status	Good or Bad

Drives - Individual Drive

This category selection displays information about the physical Drives installed on the Server by individual Drive.

The following information is displayed:

Description	Drive description (provided by NetWare)
Drive Type	Drive type (provided by NetWare)
Drive Number	Drive number for the Controller
Controller/Id	ID of the Controller (IDE/SCSI ID)
Card	Controller number
Heads	Number of heads
Sectors	Number of sectors
Cylinders	Number of cylinders
Partitions	Number of partitions
Partition Type	One of the following partition types: NetWare 386 NetWare 286 OS/2 HPFS 32 bit FAT Extended DOS DOS 16 bit FAT DOS 12 bit FAT Unknown

Mirror Status	One of the following: Not Mirrored Mirrored Configured, out of sync Mirrored Secondary, remirroring Mirrored Primary in sync, secondary off-line Mirrored Primary in sync, secondary remirroring Mirrored In sync
Hot Fix Status	Good or Bad
Disk Size	Physical Disk size
Partition Size	Physical Partition size
Data Size	Space allocated for data
Hot Fix Size	Space allocated for Hot Fix
Hot Fix Used	Hot Fix space in use
Hot Fix	
Reserved	Hot Fix space reserved

LANs

This category selection displays information about the Local Area Networks (LANs) configured on the Server.

The following information is displayed:

Frame Type	Defined Frame type
Max Packet	Maximum Transport Unit (MTU) size
Max Receive	Maximum packet receive size
Max Protocol	Maximum packet protocol size
Line Speed	Defined line speed for the NIC driver

Note: A logical network is defined by network address, not by NIC. Each BIND command performed on a NIC Driver creates another logical network.

LANs - Individual LAN

This category selection displays information about the Local Area Networks (LANs) configured on the Server by an individual LAN.

The following information is displayed:

Description	LAN description (provided by NetWare)
Card Name	Card name (provided by the NIC driver developer)
Frame Type	Frame type in use (FRAME=)
Logical Name	Logical name assigned (NAME=)
Node Address	NIC physical node address
Primary	Primary port, Interrupt and Memory address
Secondary	Secondary port, Interrupt and Memory address (if used)
Max Packet	Maximum Transport Unit (MTU) size
Max Receive	Maximum packet receive size
Max Protocol	Maximum packet protocol size
Line Speed	Defined line speed for the NIC driver
Slot Number	NIC EISA Slot (EISA systems only)

Note: A logical network is defined by network address, not by NIC. Each BIND command performed on a NIC Driver creates another logical network.

Loaded Modules

This category selection displays information about the NetWare Loadable Modules (NLMs) loaded on the Server.

The following information is displayed:

Graph	3-D graph of the memory allocated by each of the loaded modules (NLMs).
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Loaded Modules- Individual Module

This category selection displays information about the NetWare Loadable Modules (NLMs) loaded on the Server by individual Module.

The following information is displayed:

Description	Description (provided by the developer)
Copyright	Copyright (as defined by the developer)
Version	Version (as defined by the developer)

Date	Date the module was compiled
Load Order	Order in which the module was loaded
Screens	Count of screens created
Processes	Count of processes created
Code Size	Static Code memory allocation (at load)
Data Size	Static Data memory allocation (at load)
Alloc Large	Additional Large memory allocations
Alloc Medium	Additional Medium memory allocations
Alloc Small	Additional Small memory allocations
Total Size	Total memory for Code, Data, and additional allocations
Graph	3-D graph of allocated memory pools

SET Parameters

This category selection displays information about the SET Parameters available on the Server.

The following information is displayed:

Parameters	List box of the SET parameters
Category	Highlighted SET parameter category
Value	Current value
Limits	Lower and Upper limits for the value
Description	Parameter description (provided by NetWare)

To edit a SET Parameter, highlight the desired SET Parameter then click on the Edit button. The Edit SET Parameters dialog will appear and the SET Parameter can be modified and saved.

Reports

Reports can be output for most information that is displayed on the screen through the File Print option or Print buttons supported for most Windows. In addition, custom reports and reports based upon a comparison of criteria on different Servers can be defined.

Defined Reports

It can be advantageous to combine information from multiple report categories or Servers into a single report. This capability is supported through the Defined Report option.

To create, edit, delete, or generate custom reports, select Defined Reports from Reports options list on the Menubar. The Report Database dialog box for the Defined Reports will appear with a list of the currently defined reports.

To create a new Defined Report, access the Edit Report Items dialog by clicking the New button on the Toolbar. Modify the report definition as desired then click the Ok button.

To edit a Defined Report, access the Edit Report Items dialog by clicking the Edit button on the Toolbar or by double-clicking on the desired report.

Modify the report definition as follows:

To add a new report item, click on the New button to access the Edit Report Items dialog.

To edit a report item, select the desired item and click on the Edit button to access the Edit Report Items dialog where the report item can be defined.

To delete a report item, select the desired item and click on the Delete button. A prompt confirming the deletion of the item will appear. Answer Yes to delete the item, or No to cancel the operation.

To delete a Defined Report, highlight the desired report then click on the Delete button. A prompt confirming the deletion of the report will appear. Answer Yes to delete the report, or No to cancel the operation.

To generate a report using a Defined Report template, highlight the desired report and click the Print button. A prompt confirming the generation of the report will appear. Answer Yes to generate the report, or No to cancel the operation.

Note: The Information Window must be open in order to generate a Defined Report.

Loaded Module Variance

It can be advantageous to compare the list of NetWare Loadable Modules (NLMs) loaded on multiple Servers for differences. This capability is supported through the Loaded Module Variance option.

To generate a Loaded Module Variance report for multiple Servers, select Loaded Module Variance from the Reports options list on the Menubar. The Loaded Module Variance Report dialog box will appear.

Modify the report characteristics as follows:

To add a Server, select the desired Server from the Available Server list box by clicking on the Add Server button or double-clicking on the Server.

To remove a Server, remove the desired Server from the Selected Servers list box by clicking on the Remove Server button or double-clicking on the Server.

Click the Generate button to generate the report.

Note: The Information Window will be minimized while the report is being generated and restored once the report generation is complete.

SET Parameter Variance

It can be advantageous to compare the SET Parameters on multiple Servers for differences. This capability is supported through the SET Parameter Variance option.

To generate a SET Parameter Variance report for multiple Servers, select SET Parameter Variance from the Reports options list on the

Menubar. The SET Parameter Variance Report dialog box will appear.

Modify the report characteristics as follows:

To add a Server, select the desired Server from the Available Server list box by clicking on the Add Server button or double-clicking on the Server.

To remove a Server, remove the desired Server from the Selected Servers list box by clicking on the Remove Server button or double-clicking on the Server.

Click the Generate button to generate the report.

Note: The Information Window will be minimized while the report is being generated and will be restored once the report generation is complete.

Server Connections

The Servers -> Server Connections option on the Menubar provides alternatives for managing Server Connections and viewing License Information for any Server modules loaded on the network. It is also possible to attach and detach from the Servers on the network directly within the Windows Client.

To view the active Server Connections, click the Servers button or select Server Connections from the Servers options list on the Menubar. The File Server connections dialog box will appear.

To view information about a Server, highlight the desired Server. The following information is displayed:

File Servers	Alphabetical listing of known Servers
Status	Connection status (attached or not)
Server Name	Defined name for the Server
Version	NetWare NOS version installed

To select the highlighted Server as the default Server, click the Ok button.

To Attach to a new Server, highlight one of the Servers displaying an open connection and click on the Attach button. If the highlighted Server is running NetWare v3 or the current User is not authenticated to the tree that the Server resides on, a prompt for a User name and Password will appear.

To Detach from a Server, highlight one of the Servers displaying a closed connection and click on the Detach button.

License Information

It is possible to retrieve information about all the copies of the Server module loaded on the network.

To view the information about any of the Server modules loaded on the network, select License Information from the Servers options list on the Menubar. The License Information dialog box will appear.

The Windows Client will begin to poll the network for Servers where a valid Server module is installed. The following information will be displayed:

Version	NConsole version installed
Serial Number	NConsole Serial Number
Licensed to	The registered User information
Path	vol:path\name for the Server Module
Status	Current status of the polling process

Note: Clicking on the Stop button will terminate the polling process.

Click on the Print button to print the License Information.

Click on the Ok button after reviewing the License Information.

Preferences

Preferences can be set for several operational characteristics, both for the Windows Client and its interaction with Windows.

Printer Selection

To change the Selected (or default) Printer, select Printer from the File options list on the Menubar then select the desired printer.

Note: Change the printer by selecting one from the Available Printers list box.

Printer Configuration

To change the Printer Configuration for the selected (or default) printer, select Configure Printer from the File options list on the Menubar. Modify the Printer Configuration options.

Note: Refer to the Windows help for more information on configuring printers.

Default Colors

To change the Default Colors used when new graphs or Windows are created:

Select Default Colors from the Options list on the Menubar. The Default Colors dialog box will appear:

The color for the following graph items can be modified by highlighting the item and clicking the Edit button:

Background	Surrounding Background
Graph Background	Interior Background
Axis	X/Y Axis, Legend, and Title
Mean	Mean range between the high and low averages for the plotted current values
Statistic #1 - #10	For each defined statistic

Note: Separate colors are maintained for each graph type.

As each characteristic is modified, the graph sample in the Preview area will be updated. Once properly configured, click the Ok button.

Default Graph Types

Several different graph types are supported when displaying statistical information. The currently supported graph types are: 2D or 3D Line graphs; 2D or 3D Vertical Bar graphs; 2D or 3D Horizontal Bar graphs; And, 2D or 3D Pie charts.

To change the Default Graph Type used whenever a new Window is created, select Default Graph Types from the Options list on the Menubar. The Default Graph Types dialog box will appear:

Highlight the Window type to modify: View, Trend, or Linked Trend Window. Select the new Graph Type.

Default Server

To change the Default Server used whenever a new Window is created, select Default Server from the Options list on the Menubar. The Default Server dialog box will appear:

Select the desired Server by double-clicking on the desired selection or by highlighting it and clicking the Ok button.

File Types

The following is a list of file types created/used by the Windows Client:

.DSK	Desktop files
.VUE	View files
.TND	Trend files
.LNK	Linked Trend files
.DAT	Archived Trend Data
.NCA	Archived Trend Data Information file
.INI	NConsole Information file

Statistics

The Server module tracks hundreds of statistics to provide both real-time and historical trends. This section provides an overview of the statistics, statistical levels, ratios, and trends that are supported.

Statistical Levels

The Server module tracks three levels of activity for most statistics and four for transactional statistics. The levels tracked are as follows:

Current Statistics

Represents activity on the Server over the last second.

Average Statistics

Represents the average activity (per second) on the Server since the last cycle started and is reset at the start of each new logging cycle.

Peak Statistics

Represents the highest level of activity reached on the Server since the last cycle started and is reset at the start of each new logging cycle.

Cumulative Statistics

Represents the accumulated level of activity on the Server since the last cycle started and is reset at the start of each new logging cycle. This statistic is only tracked for transactional statistics, i.e., reads, writes, requests, replies, etc.

Mean Range

The Mean Range represents the median average of all the Current Statistics in the graph and only appears in line and bar graphs. The following method is used to calculate the Mean Range: The Current Statistics values are sorted in ascending order; The sorted values are divided in two groups, one containing the lower half of the values and the other containing the upper half. The average value for each group is calculated and used as the Mean Range boundaries.

Key Statistics

The Server Module collects, averages, accumulates, and logs hundreds of statistics pertaining to Server activity in response to loads caused by Clients, NLMs, and interaction with other Servers. The following are some of the key statistics and ratios tracked by the Server module:

Utilization

This statistic represents the Utilization on the Server as a percentage with 0% as the minimum and 100% as the maximum possible values.

NetWare is a non-pre-emptive NOS which provides CPU time slices for processes (or threads) on the Run Queue. Once a process is activated, it retains CPU control until intentionally relinquishing its time slice; or executing an I/O function that allows NetWare to intercede on behalf of other scheduled processes (blocking) at which point it is returned to the Run Queue for a subsequent CPU time slice.

NetWare's Utilization calculation is based on the amount of time spent polling the Run Queue (Polling Process under NetWare v3, Idle Loop Process under NetWare v4, or Idle Thread under NetWare v5). The algorithm is based upon a Maximum versus Current ratio (i.e., the maximum amount of time spent polling the process queue during any one second period since the Server was brought up, versus the amount of time spent polling in the last second).

As additional processes are added to the Run Queue, NetWare provides CPU time slices to each based upon process priority and its order on the Run Queue. As the Run Queue grows, utilization can also be expected to increase. In addition, poorly designed (or ill-behaved) processes can also raise utilization levels by failing to frequently relinquish CPU control. The more time NetWare spends polling, the lower the utilization (i.e., 100% polling activity equals 0% utilization).

Cache Buffers

This statistic represents the ratio of File Cache Buffers to the Original File Cache Buffers (just after SERVER.EXE was loaded and before other NLM or dynamic tuning allocations).

One key to NetWare's performance is its use of File Caching to improve file I/O performance. File Caching allows recently accessed data to remain in memory for faster response to subsequent requests. File Cache Buffers are the key to File Caching efficiency since the higher the number of buffers, the greater the amount of data which can be retained in memory. Because retrieving data from memory is significantly faster than reading it from disk (by a factor of 100 or more), the higher the Cache Buffer ratio the better the file I/O performance.

One exception is networks that are predominantly oriented towards heavy file creation and updating, since file writes must eventually be written to the physical disk. Another exception is for networks that make extensive use of large files (such as CAD or image files) which will tend to recycle the Cache Buffers, depending upon the file size and frequency of access.

As a general rule, it is recommended that Cache Buffers remain at or above the 50% level. However, this value is subjective based upon the total Server memory given that 50% of 16Mb and 50% of 64Mb represent a large difference in Cache efficiency. A better algorithm to use is for a Cache level of 75% of total Server memory AFTER deducting the base memory requirements for NetWare and the number/size of drives attached to the Server.

Using the previous example, the goal for the 16Mb Server would remain roughly the same, while that for the 64Mb Server would increase to approximately 70%. The difference is that the amount of memory used by other resources is bound to impact the Server's performance in various ways (i.e., the Server with 64Mb and 50% Cache Buffers has 24Mb +/- of RAM lost to additional NLMs and other resources that may be better distributed elsewhere).

Service Processes

This statistic represents the number of active processes that are dedicated to servicing client requests (File Service Processes).

File Service Processes (a.k.a. Server Processes) are the threads used by NetWare to service client requests. When a client request is received, the data in the LAN buffer is moved to temporary work storage and the request is passed off to a Server Process thread so that other requests can be handled. The Server Process threads actually handle the client request and provide the reply data.

NetWare allocates a base number of Server Process threads to handle requests. If the number of active requests exceeds the number of Server Process threads, NetWare will allocate another Server Process thread up to the maximum defined in the SET parameters. Once allocated, Server Processes are not released.

The last Server Process thread used (freed) is reused when another request is received. The threads are used in a circular buffer fashion until all are active, at which time another is allocated (if the maximum has not been reached) or the request is refused with a Server Busy reply.

The most active Server Process thread may not be the first (or 01) process. It depends upon the most recent load, last completed client request, and Server Process thread count activity/status. Therefore, it is impossible to associate a Server Process and a specific client.

It is not unusual for clients to experience intermittent delays in the processing of requests due to Server Process loads. NetWare v4/v5 delays can often be traced to compression or NDS (Directory Service) synchronization. Improper or too aggressive compression can create more problems than the extra disk space buys. NDS Servers create client connections with other NDS Servers in order to keep the NDS database and replicas synchronized. During desynchronization or updates to the database and replicas, it is not unusual for Server performance to degrade due to heavy Server processing of NDS client requests.

In addition, Anti-Virus, Auditing, and Software Licensing NLMs will often hook into the Server Process through CLIB File Hook APIs (in such events, you should see a Console message announcing the registration of a CLIB File Hook when loading the NLM). Failure by these NLMs to provide timely processing will often be masked since they are using Server Process time slices allocated by NetWare.

Further adding to the Server Process load is that NLMs can log into both the local and remote Servers, submitting requests which are received and processed as client activity. Such NLM connections are not unusual in Print Server, Backup, and similar applications that process across Servers.

For these same reasons, it is also not unusual for NetWare to report a Server xx Process as the active process in an ABEND. The challenge is identifying the true source of the problem.

Active Processes

This statistic represents the number of active processes which are not Service Processes.

With the exception of Library NLMs (e.g., CLIB), most NLMs will have at least one process (or thread). The number of threads that a specific NLM generates can be viewed through the MONITOR NLM by selecting the desired NLM in the System Module Information option and checking the Threads Resource Tag.

Each active process allocates memory resources for stack and code, plus NetWare must expend processing time to monitor the process activity and queue it appropriately. The design of the code executed by the process not only impacts its performance but the performance of other processes that must share CPU time slices with it.

Total Processes

This statistic is the total of the Service Processes and Active Processes.

As the number of executing processes increases, utilization can also be expected to increase. In addition, poorly designed (or ill-behaved) processes can also raise utilization levels by failing to frequently relinquish CPU control.

Directory Buffers

This statistic represents the number of Cache Buffers allocated specifically for Directory table management by NetWare.

NetWare allocates Directory Cache Buffers to help expedite its response to client directory requests, including file opens and searches. By storing the Directory Entry Tables (DETs) for the most recently accessed files in memory, NetWare is able to reduce the physical Disk I/O required to satisfy these client requests and proportionately improve performance.

The memory for the Directory Cache Buffers is allocated from the Cache Movable memory pool with each buffer capable of maintaining 32 directory entries. Directory entries which are not referenced for a specified period of time (at least the SET Directory Cache Buffer NonReferenced Delay Time) can be replaced or overwritten with new directory entries that satisfy more recent requests. If all of the current directory entries within the Directory Cache Buffers have been accessed within that period, additional buffers may be allocated (up to the SET Maximum Directory Cache Buffers value).

Once allocated, Directory Cache Buffers are not released back to the system and the memory space consumed is subject to relocation by NetWare, based upon a changing need for contiguous blocks. Since Directory management programs and backup utilities may artificially increase the Directory Cache Buffers due to the rapid rate at which they scan and update directory information, it can be advantageous to define Minimum and Maximum levels to preset an appropriate block of memory and reduce the need for such relocations.

Receive Buffers

This statistic represents the number of Packet Receive Buffers allocated by NetWare.

NetWare allocates Packet Receive Buffers to store incoming network packets until they can be processed. Since packet processing is among the highest internal processing priorities, these buffers tend to turn around very quickly.

In the case of client requests, incoming requests are copied to a data area allocated at the time the connection was created and the Packet Receive Buffer is returned for re-use. Other requests are either copied to other data areas or responded to using the Packet Receive Buffer. If the rate of incoming packets exceeds NetWare's ability to process the requests, additional Packet Receive Buffers are allocated once 75% of the current buffers contain unprocessed data

(up to the SET Maximum Packet Receive Buffers). Insufficient Packet Receive Buffers to accommodate inbound processing requests may compromise Server integrity.

I/Os Pending

This statistic represents the number of Disk I/Os Pending on the Server.

NetWare uses a method called elevator seeking to speed up physical disk access. Simply described, elevator seeking organizes Disk I/O requests in a manner which allows them to be completed in a single sweep of the disk head, rather than the typical back/forth activity that occurs if disk requests are serviced in the order received. Elevator seeking results in significant improvements in I/O efficiency, as well as a major reduction in disk wear and tear. In the period between when the request requiring physical disk access is received by NetWare and when it is actually serviced, the request is queued to the Disk I/O subsystem and reflected in the Disk I/Os Pending statistic.

Dirty Blocks

This statistic represents the number of File Cache Buffers marked as being Dirty Blocks on the Server.

One key to NetWare's performance is its use of File Caching to improve file I/O performance. Besides caching most recently read data, NetWare will also cache file writes in order to optimize the efficiency of the physical disk update process. Whenever any portion of a File Cache Buffer is modified, the buffer is marked as being a "Dirty Block" and is scheduled to be updated to disk. If the entire File Cache Buffer has changed, the buffer is immediately queued to the I/O subsystem to be updated to disk. However, if less than the entire File Cache Buffer changes (from one byte up to the defined SET Cache Buffer Size value), it is allowed to remain "Dirty" for a specified amount of time (the SET Dirty Disk Cache Delay Time value) before being queued to the I/O subsystem for an update to disk.

Typically, NetWare will suspend the acceptance and processing of further write requests if the number of Dirty Blocks reaches or exceeds 75% of the available File Cache Buffers. NetWare will

resume accepting and processing write requests once the I/O subsystem is able to reduce the level below 50%.

Memory Pools

The following Memory Pools are monitored and logged:

Memory: Allocated Memory Pool

This memory pool is primarily used for smaller, i.e., less than the defined Cache block size, short-term memory requests. The memory for the Short Term pool is taken from the Permanent Memory pool (NetWare v3) or the Code And Data Memory Pool (NetWare v4/v5) and is not returned until the Server is downed. This memory pool is used by NetWare for drive mappings, file and record locks, RIP and SAP tables, and User tables. Another common allocation of this pool is for Server screen information storage, for NLM file handles, and for semaphores.

Memory: Permanent Memory Pool - NetWare v3

This memory pool is used to satisfy large, long-term memory requests, such as those of the Communications and Directory Cache subsystems. The memory for the Permanent memory pool is allocated from the File Cache Buffers and is not returned until the Server is downed.

The Semi-Permanent memory subpool is used for large, temporary memory allocations which will likely be returned. The memory for the Semi-Permanent subpool is taken from and returned to the Permanent memory pool. The Disk and LAN subsystems will use this pool for such needs as disk transfer and packet receive buffers.

Memory: Code and Data - NetWare v4/v5

This memory pool represents the amount of memory allocated by the kernel and other loaded NLMs/drivers to fulfill their static code and data requirements. This memory is taken from and returned to the File Cache Buffers.

Memory: Cache Non-Moveable Memory

This memory pool is where NLMs, such as CLIB and MONITOR, satisfy their memory requirements for code, fixed data, and stack. Memory from this pool is allocated as large, contiguous blocks. Memory needed to satisfy the Cache Non-Moveable memory subpool requirements is taken from and returned to the File Cache Buffers memory pool.

Memory: Cache Moveable Memory

This memory pool is owned by NetWare and used for tables which may need to change size over time. The memory for the Cache Moveable pool is taken from and returned to the File Cache Buffers. NetWare uses this pool for directory entry tables, file allocation tables, hash tables, TTS tables, and volume tables.

Memory: Cache Buffers

This memory pool is primarily used for the caching of file data. However, this is also the pool from which the needs of most other memory requirements are satisfied.

Memory: Allocated Pool In Use

This statistic represents the ratio of the amount of the Work Dynamic (Alloc Short Term) memory pool in use versus that which has been allocated by NetWare. Once the ratio reaches 100%, NetWare will allocate additional memory (up to the SET Maximum Alloc Short Term Memory value). If the in use ratio reaches 100% of the SET Maximum value, Server integrity may be compromised.

Memory: Permanent Pool In Use

This statistic represents the ratio of the amount of the Permanent Memory Pool in use versus that which has been allocated by NetWare. Once the ratio reaches 100%, NetWare will allocate additional memory from the File Cache buffers memory pool.

Memory: Work Dynamic Memory In Use

This statistic represents the ratio of the amount of the Work Dynamic (Alloc Short Term) memory pool in use versus that which has been allocated by NetWare. Once the ratio reaches 100%, NetWare will allocate additional memory (up to the SET Maximum Alloc Short Term Memory value). If the in use ratio reaches 100% of the SET Maximum value, Server integrity may be compromised.

File I/O: Directory Search Requests

This statistic represents the number of directory searches performed by the Server.

Included in this count are directory searches (DIR) by client workstations and NLMs. This count may climb rapidly during backup, anti-virus scanning, and File Manager or Windows Explorer activity.

File I/O: File Create Requests

This statistic represents the number of file creations performed by the Server.

Comparing this statistic to the File Delete Requests (over time) can be helpful in approximating new file growth on the Server. The relationship can also be used to measure temporary file loads (creation and deletion of temporary files by applications such as database and word processing programs).

File I/O: File Delete Requests

This statistic represents the number of file deletions performed by the Server.

Comparing this statistic to the File Create Requests (over time) can be helpful in approximating new file growth on the Server. The relationship can also be used to measure temporary file loads (creation and deletion of temporary files by applications such as database and word processing programs).

Server Management Concepts

Proper Server management is one of the most challenging aspects of a Network Administrator's job. It tends to be a reactionary task rather than a proactive one. Using the data collected by the Server module, Network Administrators can build detailed baselines of Server activity in order to more accurately plan, monitor, and control network growth, as well as identify those areas that may tend to degrade overall network performance.

Capacity Planning

Proper capacity planning allows Network Administrators to anticipate bottlenecks before they occur or early enough to prevent a major impact on performance. Before it is possible to create a plan for long-term load requirements, it is critical to have a thorough understanding of current usage.

The impact on system reconfiguration or equipment upgrades can only be properly measured if broad and accurate data is available for before and after comparisons. Moreover, better projections on the impact of adding new applications or users can be made if statistics are available from previous such additions.

Proper definition of cycles and monthly review of the statistics can identify peak periods of activity and trends towards resource saturation. It is recommended that the default cycle period of one hour be used. While this recommendation may not apply to all situations, cycles that are too short fail to provide a truly balanced perspective and tend to overwhelm the User with excess data. By contrast, cycles that are too long fail to help in isolating peak periods and loads.

Thorough review of the statistics on a monthly basis at a minimum, will help to identify trends within the work week and month, as well as growth over the year. As the impact of changes to the network is measured and compared to previous levels, trends become evident enabling projections to be made, based upon similar changes that have occurred over the monitored period.

Key areas to watch are the four bottlenecks which tend to impact Server performance: Utilization, Memory, Disk I/O, and LAN I/O. Another important item to watch is Volume usage.

Note the following:

- Adding NLMs will affect Utilization and Memory. It may also impact Disk I/O, LAN I/O, and Volume usage, depending upon the NLM.
- Adding applications or Users may impact Utilization but typically affects Disk and LAN I/O. Increased Volume usage is almost always a concern in these cases.

Monitoring Levels

Monitoring and alerting are important aspects of proper network management. However, emphasis is too often placed on the alerting aspects without proper consideration for the appropriate threshold levels.

Much as smoke detectors can sense smoke leading up to a fire, alerting product thresholds need to be configured to notify when "Normal" levels have been exceeded beyond a safe margin. The problem is both determining what is "Normal" and adjusting the thresholds as the network load grows. Since no two networks are identical in configuration and load, periodic review of the statistical levels tracked by the Server module makes it possible to both determine and track the appropriate thresholds for the network.

Isolating Bottlenecks

Isolating bottlenecks is typically a reactionary effort resulting from a degradation in network performance. As the heart of the network, the Server tends to be the most common source of bottlenecks. However, the Server actually contains several potential bottlenecks, each of which can trigger degradation in other areas. The four main areas which tend to bottleneck in Servers are: Utilization, Memory, Disk I/O, and LAN I/O.

Utilization

High Server utilization is one of the easiest bottlenecks to spot. However, because of NetWare's non-pre-emptive design and the fact that other bottlenecks may also impact it, high utilization may only be a symptom of other problems.

Spikes are not uncommon since Disk and LAN I/O interrupts may delay processor task switching. Closely spaced spikes without associated Disk or LAN I/O activity may indicate poor code design within an NLM. Other causes of Utilization spikes may be related to an NLM's attempt to allocate a block of memory from a fragmented Server memory pool.

Keys to identifying the source of Utilization spikes:

- Was another NLM loaded?
 - Check Active Processes and available Cache Buffers. Loading an NLM requires processor overhead. Yet, it is also important to identify the extent to which additional resources may be required by the NLM and how many processing threads it may add to the Run Queue.
- Was additional memory allocated by an NLM?
 - Check available Cache Buffers. If the change is slight but a noticeable spike occurred, the Server's memory may be badly fragmented. In that case, schedule a convenient time to bring down the Server. Upon restarting the Server, the memory pools will be realigned.
- Did increased I/O activity contribute to the spike?
 - A sudden increase in Packet Receive Buffers or above average Dirty Cache Buffers / Disk I/Os Pending could indicate that unusual File I/O activity occurred. A sustained level of elevated activity or a steadily increasing Packet Receive Buffers count could indicate a disk/controller latency problem.
 - Another indicator of potential disk/controller latency is a rapid increase in the File Service Processes.

One method that can be used to isolate the source of elevated Utilization levels is to load Novell's MONITOR NLM and view the Server load for individual processes. This can be accomplished as follows:

- NetWare v3: Load the MONITOR NLM with the -P option and select the Processor Utilization option. Press the F3 key to reveal the activity levels for each process and interrupt on the Server.
- NetWare v4: Load the MONITOR NLM and select the Processor Utilization option. Press the F3 key to reveal the activity levels for each process and interrupt on the Server.
- NetWare v5: Load the MONITOR NLM and select the Kernel option, the Applications option, and the NetWare Application option. Press the F4 key to reveal the levels for the most active threads (processes) on the Server.

Note: With NetWare v3/v4, it is possible to view the activity associated with specific processes or interrupts. To mark a selection, use the cursor keys to position the highlighted bar over the process or interrupt in the Available Processes & Interrupts list. Mark it by pressing the F5 key. Once all the desired threads have been marked, pressing Enter will display the activity levels for all the marked threads.

The Polling Process (NW v3), Idle Loop Process (NW v4), and Idle Thread (NW v5) are NetWare's internal queue management routines. The higher their values, the more time NetWare is spending looking for work to do (i.e., the lower the Server Utilization).

While NetWare v5 only reports values related to the time spent in each process, NetWare v3/v4 report the time spent in each process and the number of times the process was executed (i.e., the number of time slices it received). For NetWare v3/v4, specific levels to note are high Time values with low Counts. Counts indicate the number of times that the thread relinquished control to other processes. The higher the Time and the lower the Count, the more ill-behaved the process.

Memory

One of the keys to NetWare's performance is its use of file caching to improve file I/O performance. File caching allows recently accessed data to remain in memory for faster response to subsequent requests. File Cache Buffers are the key to file caching efficiency since the higher the number of buffers, the greater the amount of data which can be retained in memory. Because retrieving data from memory is significantly faster than reading it from disk (by a factor of 100 or more), the higher the Cache Buffer ratio the better the file I/O performance.

A frequently recommended objective is to maintain a minimum of 50% of Server RAM for File Cache Buffers. However, it should be kept in mind that 50% of 8Mb RAM and 50% of 32Mb RAM are vastly different, not only in terms of File Cache Buffers but in the amount of memory being used by other NLMs and drivers. A better algorithm to use is a Cache level of 75% of total Server memory AFTER deducting the base memory requirements for NetWare and the number/size of drives attached to the Server.

It should also be noted that some NLMs will allocate and release memory in such ways that NetWare's memory pools can become severely fragmented over time. NetWare v4 and NetWare v5 both vastly improved upon the recollection of such memory over previous versions. However, it is still possible to fragment Server memory such that subsequent allocations can cause significant performance hits while NetWare attempts to recollect memory. The only way to fully recover from fragmented memory is to down the Server.

Other important memory notes:

- Work Dynamic Memory (or Short Term Alloc Memory) is not released after being allocated until the Server is downed. NLMs use Work Dynamic Memory for screens and temporary buffer needs of 4Kb or less. Should the in use amount of the Work Dynamic Memory pool reach the maximum defined through the SET Parameters, Server stability may be compromised.
- Packet Receive Buffers are not released after being allocated until the Server is downed. Temporary backlogs of client requests can cause these buffers to increase rapidly. Should Packet Receive Buffers reach the maximum defined through the SET Parameters, Server stability may be compromised.

- Directory Cache Buffers are not released after being allocated until the Server is downed. Large directory searches, such as logging a volume under file managers, can cause these to increase rapidly. Ideally, Directory Cache Buffers should not reach more than 25% of File Cache Buffers.

Disk I/O

One key to NetWare's performance is its use of File Caching to improve file I/O performance. Besides caching most recently read data, NetWare will also cache file writes in order to optimize the efficiency of the physical disk update process. Whenever any portion of a File Cache Buffer is modified, the buffer is marked as being a "Dirty Block" and is scheduled to be updated to disk. If the entire File Cache Buffer has changed, the buffer is immediately queued to the I/O subsystem to be updated to disk. However, if less than the entire File Cache Buffer changes (from one byte up to the defined SET Cache Buffer Size value), it is allowed to remain "Dirty" for a specified amount of time, i.e., the SET Dirty Disk Cache Delay Time value, before being queued to the I/O subsystem for an update to disk.

Typically, NetWare will suspend the acceptance and processing of further write requests if the number of Dirty Blocks reaches or exceeds 75% of the available File Cache Buffers. NetWare will resume accepting and processing write requests once the I/O subsystem is able to reduce the level below 50%.

NetWare uses a method called elevator seeking to speed up physical disk access in flushing the Dirty Cache Buffers to disk. Simply described, elevator seeking organizes Disk I/O requests in a manner which allows them to be completed in a single sweep of the disk head, rather than the typical back/forth activity that occurs if disk requests are serviced in the order received. Elevator seeking results in significant improvements in I/O efficiency, as well as a major reduction in disk wear and tear. In the period between when the request requiring physical disk access is received by NetWare and when it is actually serviced, the request is queued to the elevator seeking subsystem and reflected in the Disk I/Os Pending statistic.

If Dirty Cache Buffers reaches 50% of the File Cache Buffers for an extended period of time or if the number of Disk I/Os Pending maintains a high level for more than a brief period, it could indicate a disk/controller latency problem.

LAN I/O

NetWare stores incoming network packets in the Packet Receive Buffers until they can be processed. Since packet processing is among the highest internal processing priorities, these buffers tend to turn around very quickly.

In the case of client requests, incoming requests are copied to a data area allocated at the time the connection was created and the Packet Receive Buffer is returned for re-use. Other requests are either copied to other data areas or responded to using the Packet Receive Buffer. If the rate of incoming packets exceeds NetWare's ability to process the requests, additional Packet Receive Buffers are allocated once 75% of the current buffers contain unprocessed data (up to the SET Maximum Packet Receive Buffers). Insufficient Packet Receive Buffers to accommodate inbound processing requests may compromise Server integrity.

Note the following:

- If multiple NICs are configured in the Server, NetWare will route packets between the network segments as needed. Routed packets can be the result of: Workstations on one network segment communicating with a Server on another network segment for which this Server acts as a router between the two network segments; a client application communicating directly with an NLM running on the Server via IPX/SPX; or, RIP/SAP packet forwarding between network segments for which this Server is a router.
- The ratio of routed packets to the packets received by the Server can help isolate situations where the Server is being unduly taxed by acting as a router. If more than 25% of the packets received are being routed, it may be best to reconsider network design and/or install a dedicated router.

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SNMP MIB Agent (NCAgent option)

The optional NConsole SNMP MIB agent (NCAgent) extends the capabilities of NConsole, allowing SNMP Management Consoles to browse or poll hundreds of individual items pertaining to Server configuration, performance, and trend information. In this role, NCAgent instruments several hundred individual MIB entries covering Server configuration information plus current activity and past trends while acting as the communications bridge between NConsole and SNMP Management Consoles such as Hewlett-Packard's Openview, IBM's NetView, or Novell's NMS.

Overview

NCAgent is a supplemental Server module which responds to SNMP GET/GETNEXT requests for entries in the NConsole SNMP MIB definition. It accomplishes this task by retrieving the appropriate data from the NConsole Server module and formatting it into an SNMP reply. The NCAgent Server module is the interface between the NConsole Server module and the NetWare SNMP support modules. The current releases of NConsole and NCAgent do not support SNMP Traps. However, such support is possible in future releases.

Installation Checklists

Before beginning the installation, the following checklists should be reviewed and verified:

Windows Client Checklist (only if using Automated Installation)

- Workstation OS supporting Microsoft Windows v3.1x 16 bit applications
- Client files destination (drive:\path)
- NetWare Server support requires the latest Novell NetWare Client (non-Novell NetWare Clients do not support all of the required API sets)

NetWare Server Checklist

- Novell NetWare Server platform
(Refer to the Technical Support section for NetWare version and CLIB compatibility requirements)
- Logged in to Server as NDS Admin, Bindery SUPERVISOR, or equivalent
- Mapped drive to the destination Server
- Server files destination (UNC: \\Server\Vol\path)

Note: If the desired NetWare Server destination directory does not already exist, it will need to be created prior to Installation.

Manual Installation

Manual installation involves the copying of specific files to the desired destination directories.

Copy the following files to the client destination directory:

README.MIB	(Notes pertinent to the release)
NCONSOLE.MIB	(NConsole SNMP MIB ASN.1 file)
REVISION.MIB	(ASCII revision history)

Copy the following file(s) to the Server destination directory:

For NetWare Servers:

NCAgent.NLM	(Server module)
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As the final step, the README.MIB file should be reviewed in its entirety: It will list any revisions or enhancements since the last manual printing or on-line help update. It also provides additional support and usage information.

Once the files have been copied to the destination locations, the NCAgent Server module must be loaded by the installer.

Note: Both the NConsole and NCAgent Server modules must be loaded on the Server for full NConsole MIB support.

Automated Installation

The Windows Client Installation program (SETUP.EXE) will install all of the Client and Server files in their appropriate destination directories. Automated installation comprises the following steps:

Execute the SETUP.EXE installation utility as follows:

- Windows v3.1: Select File -> Run and browse the distribution media then select the SETUP.EXE utility.
- Windows '95 &
- Windows '98 &
- Windows NT: Select Start -> Run from the TaskBar menu and browse the distribution media then select the SETUP.EXE utility.

Follow the instructions provided during the installation process. On-line help is available, as appropriate.

As the final step, the installation utility will display the README file. This file should be reviewed in its entirety: It will list any revisions or enhancements since the last manual printing or on-line help update. It also provides additional support and usage information.

Once the files have been copied to the destination locations, the NCAgent Server module must be loaded by the installer.

Note: Both the NConsole and NCAgent Server modules must be loaded on the Server for full NConsole MIB support.

MIB Definition

The items (statistics) instrumented by the NCAgent SNMP MIB Agent are defined in the NCONSOLE.MIB (ASN.1 format) text file. This file will need to be integrated into the SNMP Management Console before the NCAgent can be polled.

Notes: Refer to the documentation for the SNMP Management Console in use for instructions on how to compile or import the NCONSOLE.MIB definition file.

Review the NCONSOLE.MIB (ASN.1 format) text file for specifics on which statistics are instrumented.

Technical Support

Several checks have been incorporated into the installation procedure, Client programs, and the Server modules to insure compatibility with the installation environment. Most problems encountered during the installation and use of this product are a result of these checks limiting the operation of the software.

Installation Troubleshooting

The user must be logged in to the Server to which the software is to be installed as SUPERVISOR (NWv3), Admin (NWv4+), or a User with equivalent rights. This insures that the files can be copied to the destination locations.

The workstation must have a drive mapped to the Server. The installation utility uses DOS Copy logic which requires that a physical or logical drive be mapped to the file copy destination.

The Windows installation process requires that Novell's NetWare Clients be running and properly configured on the workstation where the software is to be installed.

If the workstation has the Microsoft drivers or an older set of Novell's drivers installed, it will be necessary to upgrade to the latest NetWare Client available from Novell. Older versions have been known to cause General Protection Faults (GPFs) under Windows and Microsoft's NetWare Client drivers do not fully support the Novell NetWare API set.

Note: Should you experience any problems in the installation or initial execution of this software, it is most likely due to using older or mismatched drivers. Prior to seeking support, please verify that the latest release of the appropriate Novell NetWare Client has been properly installed.

The latest Novell NetWare client drivers can usually be found on Novell's Support WEB Site:

<http://support.novell.com>

Contact technical support if you have any trouble finding the latest drivers and we will try to help you locate a source.

NetWare Server Module Troubleshooting

The Server module should load, either manually or via AUTOEXEC.NCF, without conflict on supported Server platforms. The requirements for the NLM are as follows:

- NetWare v3.1x: CLIB v3.11 revision D or later
- NetWare v3.2x: Any revision of CLIB v3.2x
- NetWare v4.0x: CLIB v4.01 revision A or later
- NetWare v4.1x: Any revision of CLIB v4.1x
- NetWare v4.2x: Any revision of CLIB v4.2x
- NetWare v5.x: Any revision of CLIB v5.x

Error messages which may be encountered:

- 'Loader unable to resolve public symbol ...' appears when loading the NLM

Cause: The Server module requires CLIB v3.11 revision D, dated 12/16/92, or later.
- The NLM loads but shortly terminates with the error message, 'Unsupported version of CLIB.NLM.'

Cause: The original CLIB shipped with NetWare v4.00 or NetWare v4.01 is loaded on the Server. It contains a bug in one of the NetWare APIs that could ABEND Server operations. The NLM will terminate rather than expose the Server to such instability.

Note: To review the modules loaded on the Server, including the CLIB information, type MODULES at the Server console. The latest CLIB can usually be found on Novell's Support WEB Site:

<http://support.novell.com>

Contact technical support if you have any trouble finding the latest CLIB and we will try to help you locate a source.

DOS Client Troubleshooting

To support the NetWare environment, the workstation must have the latest Novell NetWare Client loaded and be logged into the desired Server. The DOS Client will attempt to establish a proxy session with the default Server.

The default NetWare Server is defined as follows:

- If the current drive is a network drive, it is the Server with which the network drive is associated (Resource Server).
- If the current drive is not a network drive, it is the Server where the workstation initially logged in (Primary Server).

The workstation must be attached to a Server with the Server module loaded before a remote session can be established.

Other error messages which may be encountered:

- NWCalls initialization failure (0xhhhh)!

Cause: Novell NetWare Client is not properly installed/loaded on the workstation.

Note: If the error persists once the client driver has been loaded, note the error code and contact technical support.

- Get Primary Connection failure (0xhhhh)!
- Get Default Connection failure (0xhhhh)!
- Set Primary Connection failure (0xhhhh)!
- Get Connection Number failure (0xhhhh)!

Cause: There is a problem with the Novell NetWare Client installed on the workstation. Note the error code and contact technical support.

- Incompatible Client/Server program versions

Cause: There is a version difference between the Server module loaded on the Server and the DOS client. Reinstall the software and reload the Server module.

Note: If you have recently upgraded/updated the software, it is likely that the previous Server module needs to be unloaded and the newer Server module loaded.

Windows Client Troubleshooting

To support the NetWare environment, the workstation must have the latest Novell NetWare Client loaded and be logged into the desired Server. The Windows Client will attempt to establish a proxy session with the default Server.

The default Server under Novell NetWare is defined as follows:

- If the current drive is a network drive, it is the Server with which the network drive is associated (Resource Server).
- If the current drive is not a network drive, it is the Server where the workstation initially logged in (Primary Server).

If the Server module is not loaded on the default Server, the Windows Client will search all attached Servers for the Server module. The workstation must be attached to a Server with the Server module loaded before a remote session can be established.

Other error messages which may be encountered:

- NWCalls initialization failure (0xhhhh)!

Cause: The Novell NetWare Client is not properly installed/loaded on the workstation.

Note: If the error persists once the client driver has been loaded, note the error code and contact technical support.

- Get Primary Connection failure (0xhhhh)!
- Get Default Connection failure (0xhhhh)!
- Set Primary Connection failure (0xhhhh)!

- Get Connection Number failure (0xhhhh)!

Cause: There is a problem with the Novell NetWare Client installed on the workstation. Note the error code and contact technical support.

- Incompatible Client/Server program versions

Cause: There is a version difference between the Server module loaded on the Server and the DOS client. Reinstall the software and reload the Server module.

Note: If you have recently upgraded/updated the software, it is likely that the previous Server module needs to be unloaded and the newer Server module loaded.

Contact Information

Product support is available to registered Users. To insure eligibility, Users **MUST** register the software by completing and returning the Product Registration Card within the first thirty days following receipt of the software. Failure to comply may result in the refusal of technical support until this requirement has been fulfilled.

Every effort is made to thoroughly test every product prior to shipment. However, problems may occur in spite of the best quality assurance. In addition, the integration of new features and the evolution of the hardware / software which it supports can also affect the product.

The technical support staff endeavors to respond quickly to any inquiries on a first received, first responded to basis. Having the following information readily available, prior to initiating technical support contact, will help generate a quicker response to any support queries:

- Workstation: Workstation OS version
NetWare Client versions
- NetWare Server: NetWare version
CLIB support module versions

- NConsole: Client version
Server module version
NConsole Serial Number

Also, the more in-depth the problem description, including any error message, the quicker the chances are for resolution. Technical support is available by the following means:

- Phone: (+1)512/335-1168
- Fax: (+1)512/402-1262
- Internet: tech@avanti-tech.com
- WEB Site: www.avanti-tech.com

The latest product release information and updates can be found on Avanti's WEB Site.

Index

Contact Information	
Technical Support	81
DOS Client	
Command Line Options	17
Default Server	6
Execution	5
Required Rights	6
Supported Keys	18
Getting Started	
Clients - Default Server	6
Clients - Execution	5
Clients - Required Rights	6
Server Module - Loading	5
Installation	
Automated	3
Checklists	1
Manual	2
Log File	
Formats	16
NCAgent	
Installation - Automated	75
Installation - Checklists	73
Installation - Manual	74
MIB Definition	75
Overview	73
Server Management Concepts	
Capacity Planning	65
Isolating Bottlenecks	66
Monitoring Levels	66
Server Module	
Command Line Options	8
Configuration	37
Configuration (Default)	15
Loading	5
Log File Formats	16
Overview	7
Supported Keys	15
Statistics	
Active Processes	59
Average	55

Cache Buffers	57
Cumulative	55
Current	55
Directory Buffers	59
Dirty Blocks	61
File I/O	64
I/Os Pending	61
Key Statistics and Ratios	56
Mean Range	55
Memory Pools	62
Peak	55
Receive Buffers	60
Service Processes	57
Utilization	56
Technical Support	
Contact Information	81
Troubleshooting - DOS Client	79
Troubleshooting - Installation	77
Troubleshooting - NetWare Server Module	78
Troubleshooting - Windows Client	80
Troubleshooting	
DOS Client	79
Installation	77
NetWare Server Module	78
Windows Client	80
Windows Client	
Default Server	6
Desktop Management	27
Execution	5
File Types	54
Graph Colors	26
Graph Options	26
Graphbar	25
Information Window	36
Information Window - .NCF	39
Information Window - Disk I/O	41
Information Window - Drives	44
Information Window - Edit .NCF	39
Information Window - File I/O	41
Information Window - LANs	46
Information Window - Loaded Modules	47
Information Window - Memory	40
Information Window - NConsole Configuration	37

Information Window - NConsole Log File	38
Information Window - NIC I/O	42
Information Window - Protocol I/O	42
Information Window - Server	36
Information Window - SET Parameters	48
Information Window - Volumes	43
License Information	52
Linked Trend Window	33
Main Window	19
Menubar	21
Preferences	53
Preferences - Default Colors	53
Preferences - Default Graph Types	54
Preferences - Default Server	54
Preferences - Printer Configuration	53
Preferences - Printer Selection	53
Reports	48
Required Rights	6
Server Connections	51
Server Module Configuration	37
Toolbar	23
Trend Window	30
View Window	28
Window Management	26