



IBM Network Station Quick Start Boot Server Guide

Setting Up A Small Boot Server To Run IBM Network Station Manager Release 3

A Road Map for IBM Business Partners and Integrators to achieve a "Quick Start" installation of IBM Network Computers.

Last Updated 10/22/98

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Purpose of this Quick Start Guide

This Quick Start guide describes how to quickly install, set up, and use the IBM Network Station Manager for Windows NT Server 4.0/Window NT Server 4.0 Terminal Server Edition, regardless what host platform the customer uses for production work. The boot server described here is for booting and Network Station administration and user authentication. [The reasons for building this separate "boot server" are listed below.](#) This guide will provide step-by-step instructions, key reference information, and several special use template examples (e.g. 5250, 3270, X Station, Windows applications, and browser based applications) to make the initial installation process fast and efficient. In order not to impact the customer's production servers, this guide recommends the use of a dedicated "boot and administration server" which will provide the programs and data files that an IBM Network Station needs for its set up and initialization. IBM Network Stations boot server configuration specifications, performance information, service and support information are included in this guide.

It is assumed that the professionals that perform this installation have strong skills and experience with NT Server 4.0/NT Server 4.0 Terminal Server Edition, TCP/IP, and networking/LAN technologies.

Note to Business Partners and Integrators: To achieve the best "out of box experience" for the customer, please build the NSM "boot" server on your site then move the "built" system to the customer location.

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Introduction to the IBM Network Station

The IBM Network Station is IBM's network computer. It is designed to be easy to install, use and manage. It operates without any internal disk storage, using supporting software and applications from associated servers. Through network connections, the IBM Network Station can attach to a number of servers, including the IBM AS/400, RISC System/6000, System/390, or PC server. Ideal for multi-platform computing environments, it allows access to a wide variety of applications running on one server or many servers, to the worldwide resources of the Internet or a private intranet, and to the fast emerging world of Java (TM) applets and applications downloaded on demand from Internet or intranet servers. Visit our web site at www.ibm.com/nc for more information.

This document explains the highlights of installing IBM Network Station Manager for NT Server 4.0. Once Network Station Manager is installed, the IBM Network Stations can be booted and managed by an administrator. Once booted, the IBM Network Station can access applications on any server in the TCP/IP network.

IBM Network Station Manager has been developed to provide a common support environment for the IBM Network Station across all IBM server platforms, and versions have been introduced for the AS/400, RISC System/6000, System/390, and PC Server running Windows NT.

The user of the IBM Network Station may access a Windows NT Server for various reasons:

- The first reason, and the purpose of this document is to "boot" the IBM Network Stations
 - When the IBM Network Station is powered on, it links to the network by downloading relevant control information from a designated server. This is called the "boot" process and the NT server is called the "boot server" in this case.
 - Some small local applications can also be loaded from this small "boot" server,

for local execution on the Network Station. These are 3270 Emulation, 5250 Emulation, and VT320 Emulation.

- A second reason an IBM Network Station (after booting) might access another Windows NT Server, is to run Windows applications. A special multi-user version of NT Server is required, such as WinCenter from NCD Inc., or WinFrame or MetaFrame from Citrix Inc. In this case the applications actually execute on the server and only the screen content, keystrokes and mouse movements are handled by the IBM Network Station.
- A third reason an IBM Network Station (after booting) might access another Windows NT Server, is to run eSuite applications from Lotus. In this case, these Java applications are loaded from the server to local memory of the IBM Network Station. Execution of the eSuite (JAVA) applications then run locally in the IBM Network Station. Note: The IBM Network Station Series 1000 is the only model optimized for Java applications.

Just How Does It Work Anyway?

When powered on, the IBM Network Station performs initial diagnostics and then initiates contact, requesting the server to download the IBM Network Station operating system kernel. Upon completion of the kernel download, various software environments can be downloaded to the IBM Network Station. These environments include 5250 or 3270 terminal session support, the NC Navigator browser, X-windows capability and a Java Virtual Machine.

At power-on, the Flash-BIOS (512K) has sufficient intelligence to activate the IP address of the unit. It can use either a fixed address to a certain boot server, or a dynamic IP address from DHCP server. The IBM Network Station is then ready to download the required software as needed.

The required software for the IBM Network Station can be downloaded from the Internet or delivered free of charge by requesting the "Quick Start Server" package from the web, and details are given in the sections which follow. This document is intended as an overall guide.

[Why Might A Customer Want A Separate Boot Server](#)

The IBM Network Station Manager Quick Start configuration should be considered in the following environments:

- The customer wants to quickly install and test a pilot Network Station environment
 - The customer does not want to disrupt the production server environment
 - The customer does not want to/cannot bring the production server down to install NSM
- The operating system on the production server is not at the level required by IBM's Network Station Manager (NSM)

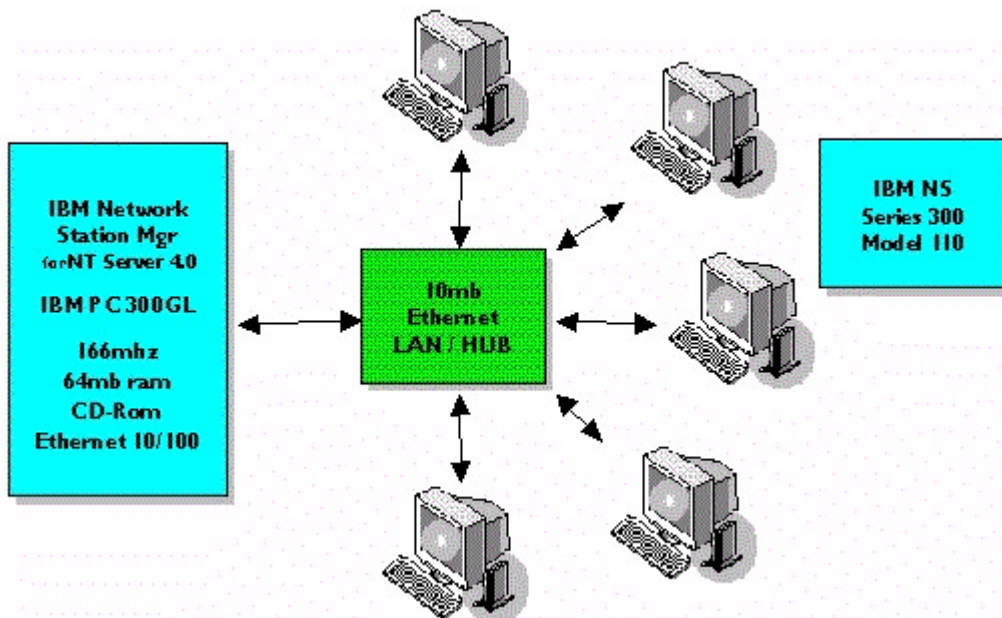
What Are The Hardware/Software Requirements ?

The following is a tested boot server configuration that will ease the installation of Network Stations by removing the requirement to install NSM on the customers production server.

This low cost configuration is provided as a guide and is not intended to imply a formal product offering.

Deviations to this configuration may change the performance results.

Tested Configuration:



Server (IBM PC 300GL)

- 166 Mhz
- 64 MB RAM
- 2.5GB hard disk
- CD-ROM drive
- IBM PCI EtherJet 10/100 Adapter
- Keyboard and mouse
- 2 MB Video RAM
- Monitor
(note: video adapter and monitor must support 800x600 resolution with 256 colors)

IBM Network Stations

- Series 300 Model 110 (Ethernet)
- The base 16 MB of dynamic RAM in the Series 300 will be adequate for light application load.
- A monitor for each Network Station
- With the standard 1 MB video RAM, the IBM Network Station supports resolutions up to 1024x768. With the additional 1 MB of video RAM, resolutions up to 1600X1280 can be supported.

Infrastructure choices

- Ethernet (tested) or Token Ring (see note in [performance section](#))
- TCP/IP protocol is required on each host for access to emulation, and for Internet and intranet applications.
- Speeds: 10Mbit Ethernet; 4 or 16 Mbit Token Ring
- RJ45 LAN connection to IBM Network Stations

For further information on cabling, see Table A-3 on page A-4 of the booklet SA41-0036, IBM Network Station Use packaged with each IBM Network Station.

Software Prerequisites

- Windows NT Server 4.0 (with Service Pack 3) or Windows NT Server 4.0 Terminal Server Edition
 - Windows NT Server is a product of Microsoft Corporation and its use is governed by Microsoft's license terms. These include the requirement of "client access" licenses permitting access to the server. Microsoft currently offers the option of purchasing a client access license for each of your Network Stations, or a server-based license, allowing a certain number of Network Stations to access the server at any one time. Depending on your need to access other Windows NT servers and the particulars of your Network Station environment, you should carefully consider which of these options makes the most sense for you. Of course, you are responsible for your licensing arrangements with Microsoft for Windows NT Server.

- IBM Network Station Manager 3.02 for NT 4.0
 - The software can be obtained on the following CD-ROMs
 - LCD4-1733-02 North America
 - LCD4-1734-02 International
 - LCD4-1735-02 French
 - The software CD and product hardcopy documentation can be obtained in the US. by calling 1-800-879-2755 and ordering
 - SK3T-3038-02 North America
 - SK3T-3039-02 International
 - SK3T-3052-02 French
 - The software and product documentation can be obtained by requesting the "[Network Station NT Quick Start Server Package](#)" at <http://www.pc.ibm.com/networkstation/support>
 - This software can also be downloaded from the Web at <http://service.boulder.ibm.com/nc>

[How Is The Server Built ?](#)

In the previous versions of this Quick Start Guide, the exact details of server creation and software installation were included within this WEB based guide. Now the greatly enhanced product documentation contains the required steps to "Plan" and "Build" the server and configure the IBM Network Stations.

Chapters 1 and 2 of the "[IBM Network Station Manager Installation and Use](#)" describes in exactly the required steps to build the server on the NT Server or NT Terminal Server.

Complete NSM Manual for all IBM Servers (Adobe Acrobat PDF Format).

 "[IBM Network Station Manager Installation and Use](#)"

If you do not have the Acrobat Reader, you can download here.



[Installing NT Server 4.0](#)

Installing and Configuring an IBM Network Station Environment on a Microsoft Windows NT Server

To view or print the latest update, go to <http://www.ibm.com/nc/pubs> and print the "Release 3 IBM Network Station Manager"

You will find instructions for planning, installing, upgrading, and configuring a Network Station environment on a Windows NT Server 4.0 server or a Windows NT Server 4.0, Terminal Server Edition server in this section.

The following table is created from Chapter 2 of the PDF version of "[IBM Network Station Manager Installation and Use](#)" it should be used as a guide to find information on common IBM Network Station Manager installation tasks and IBM Network Station Manager configuration tasks. It is recommended that you print at least Chapters 1 & 2 of the PDF document.

If you need to...	Read this section
Install IBM Network Station Manager for the first time.	Read the “Prerequisites and Installation” on page 31 to install Windows NT Server 4.0 software; or Windows NT Server 4.0, Terminal Server Edition software; and all of the IBM Network Station Manager software.
Install IBM Network Station Manager on several identical servers.	Read the “Installing IBM Network Station Manager Software Automatically Using a Response File” on page 49 to install IBM Network Station Manager on several identical servers.
Install IBM Network Station Manager software as a separate boot server and a separate authentication server.	Read the “Installing a Boot Server for Your Network Stations” on page 51 to install IBM Network Station Manager software on separate boot servers and separate authentication servers.
Upgrade IBM Network Station Manager software. Apply a Service Update to your IBM Network Station Manager software.	Read the “Updating IBM Network Station Manager Software and Migrating IBM Network Station Manager Preference Files” on page 80 to upgrade your IBM Network Station Manager software to the new release and preserve your current IBM Network Station Manager information.
Add a new IBM Network Station user to your network.	Read the “Managing Users and Groups for IBM Network Station Users” on page 74 to add a Windows NT Server 4.0 user and add the new user to the IBM Network Station Manager software.
Configure a printer to work with your IBM Network Station Manager.	Read the “Configuring Printers on Windows NT Server 4.0” on page 77 to configure printers to work with your Network Stations.
Run Windows applications on your IBM Network Station	Read the “Installing Citrix MetaFrame Software on Your Windows NT Server 4.0, Terminal Server Edition Server” on page 53 for information how to run Windows applications on your Network Station.
Use DHCP to assign IP addresses to your IBM Network Stations	Read the “Installing Additional Software Components After the Initial Installation” on page 53 to install DHCP services and configure DHCP services in your network.

Note: Do not use this guide to install the IBM Network Station Manager on a WinCenter version 3. x server.

You can find the WinCenter information in the book ²IBM Network Station Manager for WinCenter Pro V3.0,² 6th Edition. The publication code of that book is WINAB202. PDF. You can access the WinCenter book on the Web at [http:// www.ibm.com/nc/pubs](http://www.ibm.com/nc/pubs).

How Are The IBM Network Stations Configured ?

Chapter 10 of the PDF version of ["IBM Network Station Manager Installation and Use"](#) describes how to configure the Setup Screens on the Network Stations.

References will be made to screen captures included in the *IBM Network Station Use* booklet

SA 41-0036, included with every IBM Network Station.

Arranging the Network Station Hardware

Set the Monitor Display Resolution

Set the Network Parameters (TCP/IP)

Configuring Boot Parameters for each IBM Network Station

Setting Up Applications using NSM Administration

One way the Network Station simplifies desktop management while reducing your total cost of ownership is by delivering a powerful tool for centralized desktop administration: The **IBM Network Station Manager** or **NSM**. The Network Station Manager eliminates the need to send a team of people out to the "desktop" to manage and support the users. One person can do it all ... from one location ... with just one tool ... **NSM !**

It is highly recommended to use Network Station Manager to setup applications for the users of the IBM Network Stations. By using NSM to manage the Network Stations and associated applications, the administrator can perform these tasks from any Java capable browser that has network access to the NSM boot server.

By default, Network Station Manager sets up the Network Stations to present a login screen to the user after boot. After successful login the user can be presented with different buttons to start different applications. This login feature is sometimes referred to as "LOGIN" or "ACTLogin".

By using NSM an administrator can:

- Assign applications to Buttons on the Menu bar that the user can click on to start them.
- Configure the Menu bar to disappear, i.e. hide it, when not actively being used.
- Auto start applications after the user logs into the Network Station.
- Modify the default behavior of applications and the Network Station
Easily access useful, context sensitive, help

If however the customer needs a more custom solution, some manual templates are provided in the Appendix section to allow the customization of control files normally handled by Network Station Manager.

Use the override templates with extreme care.

To start NSM from the NT system console

- Log on to the NT console as the system administrator ID
- Start the NSM in your favorite Java capable browser
 - EX: C:\<PATH>\netscape "localhost"
- Log in as administrator and supply the proper password
 - This will be the regular NT administrator ID

Caution

Liberal use of the **Help** button while in Network Station Manager may result in a thorough understanding of the options available and how to use and implement the features of NSM to manage the Network Station desktop(s). The context sensitive help screens are really very good.

Configuring a 3270 session

The 3270 session can be globally configured via NSM to:

- Add a button to the Menu bar to start a 3270 session
 - Select **Startup -> Menu -> System defaults -> Next**
 - Scroll down to the **3270 Menu Items** section
 - Fill in the text that is to appear on the button of the menu bar in the **Menu item label** box
 - Enter the hostname or IP address in the **System/390** box
 - Optionally enter a title to appear on the 3270 window in the **Session tile (optional)** box
 - Scroll the window to the right for additional configuration boxes
 - Select a preferred screen size from the pull down in the **Screen size** box
 - Select whether you want to enable graphics via the pull down in the **Graphics** box
 - Optionally enter a telnet port if using a SNA gateway or specific port on the S/390 in the **Telnet port** box
The default is port 23 and probably does not need to be changed
 - Put any additional optional parameters in the **Optional parameters** box
See the available **Help** screen for a list of valid choices
 - If you want to configure additional Menu bar 3270 buttons, select the **Add a 3270 session** button and fill in the fields as appropriate
 - Select **Finish**
- Auto start a 3270 session
 - Select **Startup -> Programs -> System defaults -> Next**
 - Scroll down to the **3270 Sessions to AutoStart** section
 - Fill in the appropriate values, as listed in the Add a button section, above
 - If you wish to start multiple 3270 sessions, select the **Add a 3270 session** button and fill in the fields as appropriate
 - Select **Finish**
- Configure the default behavior of all 3270 sessions
 - Select **3270 -> System defaults -> Next**
 - Select and adjust available options
Some of the options do NOT have an available adjustment, but many do, especially the ones towards the bottom of the screen

- See the available **Help** screen for a list of valid choices
- Select **Finish**

In addition to the System wide settings described above, settings can be made on a per user basis.

However, not as many options are available on the per user settings.

Things to know about per user settings:

- Only the authenticated user or the NSM Administrator can change per user settings
- All of the available **Help** screens are available
- Per user settings will take precedence over system wide settings
- The user can be selected from the list of available users or entered directly into the users box
- Select the topic, as above, then select **User defaults** instead of **System defaults**
 - Press the **Browse...** button to select from the list of users
 - Select **Next**
 - Adjust the settings as needed
 - Select **Finish**

[Configuring a 5250 session](#)

The 5250 session can be globally configured via NSM to:

- Add a button to the Menu bar to start a 5250 session
 - Select **Startup -> Menus -> System defaults -> Next**
 - Scroll down to the **5250 Menu Items** section
 - Fill in the text that is to appear on the button of the menu bar in the **Menu item label** box
 - Enter the hostname or IP address in the **AS/400 system** box
 - Optionally enter a title to appear on the 5250 window in the **Session tile (optional)** box
 - Scroll the window to the right for additional configuration boxes
 - Select a preferred screen size from the pull down in the **Screen size** box
 - Select whether you want to enable Image/graphics via the pull down in the **Image/Fax display** box
 - Put any additional optional parameters in the **Optional parameters** box
See the available **Help** screen for a list of valid choices
 - If you want to configure additional Menu bar 5250 buttons, select the **Add a 5250 session** button and fill in the fields as appropriate
 - Select **Finish**
- Auto start a 5250 session
 - Select **Startup -> Programs -> System defaults -> Next**
 - Scroll down to the **5250 Sessions to AutoStart** section
 - Fill in the appropriate values, as listed in the Add a button section, above
 - If you wish to start multiple 5250 sessions, select the **Add a 5250 session**

- button and fill in the fields as appropriate
- Select **Finish**
- Configure the default behavior of all 5250 sessions
 - Select **5250 -> System defaults -> Next**
 - Select and adjust available options
 - Some of the options do NOT have an available adjustment, but many do, especially the ones towards the bottom of the screen
 - See the available **Help** screen for a list of valid choices
 - Select **Finish**

In addition to the System wide settings described above, settings can be made on a per user basis.

However, not as many options are available on the per user settings.

Things to know about per user settings:

- Only the authenticated user or the NSM Administrator can change per user settings
- All of the available **Help** screens are available
- Per user settings will take precedence over system wide settings
- The user can be selected from the list of available users or entered directly into the users box
- Select the topic, as above, then select **User defaults** instead of **System defaults**
 - Press the **Browse...** button to select from the list of users
 - Select **Next**
 - Adjust the settings as needed
 - Select **Finish**

[Configuring the Navio NC Navigator browser](#)

The Navio browser can be globally configured via NSM to:

- Add a button to the Menu bar to start the Navio browser
 - Select **Startup -> Menus -> System defaults -> Next**
 - Scroll down to the **Navio NC Navigator Menu Items** section
 - Fill in the text that is to appear on the button of the menu bar in the **Menu item label** box
 - Enter the target Universal Resource Locator, URL, in the **URL** box
 - Select whether you prefer to allocate a private color map in the check box
 - Put any additional geometry or **Window size and location** information in the appropriate boxes
See the available **Help** screen for a list of valid choices
 - If you want to configure additional Menu bar Navio buttons, select the **Add a browser session** button and fill in the fields as appropriate
 - Select **Finish**
- Auto start a Navio session
 - Select **Startup -> Programs -> System defaults -> Next**
 - Scroll down to the **Navio NC Navigator Sessions to AutoStart** section
 - Fill in the appropriate values, as listed in the Add a button section, above
 - If you wish to start multiple Navio sessions, select the **Add a browser session** button and fill in the fields as appropriate
 - Select **Finish**
- Configure the default behavior of all Navio sessions
 - Select **Internet -> Navio NC Navigator -> System defaults -> Next**
 - Select and adjust available options
All of the options DO have an available adjustment
 - Have I mentioned the available **Help** screens for a list of valid choices ?
 - Select **Finish**

In addition to the System wide settings described above, settings can be made on a per user basis.

However, not as many options are available on the per user settings.

Things to know about per user settings:

- Only the authenticated user or the NSM Administrator can change per user settings
- All of the available Help screens are available
- Per user settings will take precedence over system wide settings
- The user can be selected from the list of available users or entered directly into the users box
- Select the topic, as above, then select **User defaults** instead of **System defaults**
 - Press the **Browse...** button to select from the list of users
 - Select **Next**
 - Adjust the settings as needed
Select **Finish**

[Syntax To Pass Parameters To Applications From Menu Buttons](#)

This section will explain how to add some additional items to the menu bar of the Network Station that may not appear obvious.

The concept relies heavily upon optional command line flags of programs as well as an environmental variable that is normally set by ACTLogin, i.e. `${IP}`. `${IP}` is the IP address of the Network Station that is issuing the command. We can start applications on any remote host that will allow us to start them via rsh. The Network Station can also be a target host.

The following examples will be for the global or system wide settings. Individual user setting can also be set for these buttons.

So fire up your favorite Java enabled browser and open up an NSM session.

- To add a VT320 session button to the menu bar
 - Select **Startup -> Menus -> System defaults -> Next**
 - Scroll down to the **Remote Program Menu Items** section
 - Fill in the text that is to appear on the button of the menu bar in the **Menu item label** box
 - Enter the target host in the **Remote host** box
[Here is where the trick part comes in play](#). We will enter `${IP}` in this box
 - Enter the program to run in the **Program to run** box
 - Enter any additional parameters in the **Optional parameters** box
 - If you want to configure additional **Remote Program Menu Item** buttons, select the **Add a Remote Program** button, if there are no blank lines left, and fill in the fields as appropriate
 - Select **Finish**

Essentially, items entered into this table will end up being issued with the rsh command.

Examples:

```
"VT session" = rsh ${IP} telnet -fg white -bg blue -host 1.1.1.2  
Starts a VT320 session to the host 1.1.1.2
```

```
"Console" = rsh ${IP} console  
Starts the Network Station console program
```

[Remote Program Menu Items](#)

Menu Item Label	Remote Host	Program to Run	Optional Parameters
VT session	\${IP}	telnet	-fg white -bg blue -host 1.1.1.2
Console	\${IP}	console	
WinCenter	123.123.123.123	wincenter	-display \${IP}:0

[Command Line Options for the VT320 emulator](#)

When starting the terminal emulation client, options can be specified that will modify the actions or appearance of the telnet client. The list of allowable options is shown in the following Table.

Flag	Parameter	Description
-/+132	NA	Enable/disable 132 column mode switching
-b	margin (pixels)	Specifies the size of the inner margin. The distance between the window and the outer edge of the characters.
-bd	color	Specifies the color of the border.
-bg	color	Specifies the background color.
-bw	border_width (pixels)	Specifies the width of the border surrounding the window.
-cr	color	Specifies the color for the text cursor.
-ctype	telnet cterm lat serial	Connection type to start
-cu,+cu	NA	Use this to work around curses xenl glitch.
-fg	color	Specifies the color for the text characters.
-fn	font name	Specifies the font to use for displaying normal text. The foundry, family name, and point size from the specified font are used to override the corresponding resource values. Proportional fonts are not supported.

-geometry	columns x rows +/-xoff +/-yoff	Startup size and location. The default is ".80x24"..
-help	NA	Print the help text to the console message window.
-host	host name	Host system to connect to. Use this option only with -ctype
-iconic	NA	Start in iconic form
-j,+j	NA	Use jump scrolling. This may improve performance on long test scrolls.
-mb,+mb	NA	Determines if margin bell should ring at end of typing line.
-ms	color	Specifies the color of the pointer.
-n	icon_title	Specifies the text which will appear under the icon.
-name	Class name for X resources. The default is ".NCDterm"..	
-nb	number	The number of characters from the right end of the line at which the margin bell will ring when enabled.
-ph	host:port	Specifies the remote printer host and TCP/IP port for printing.
-pm	mode	Specifies the print mode. Options are ".Serial"., ".Parallel"., or ".Remote"..
-rv	NA	Specifies that the terminal emulation session should start in reverse video.
-rw,+rw	NA	Specifies that reverse-wraparound should be used.
-sb,+sb	NA	Specifies that a scroll bar should be displayed.
-title	titlebar	Title for the application window.
-tn	term_type	Specifies a terminal type to be offered during telnet negotiation.
-vb	NA	Use a visual bell over an

		audible one.
-xrm	resource_string Specify an X resource string. This option may be used more than once.	

Performance Considerations

Performance Section of NT Boot Server White Paper

Abstract

NOTE: The boot server also is the application server for the Network Station emulators and the NC Navigator browser.

The exact number of Network Stations you can boot and serve from the that boot server depends on the number of native emulators and browser sessions that you wish to deploy and how often the user starts and stops them. Whether or not the browser is setup to write back to home directories on the server can also impact boot server load.

Some rules of thumb based on lab tests: Your mileage may vary.

-- Browser only (similar to emulator use, no home directory writes)

72-74 clients supported per boot server

-- Above test with Java write test (simulate users exercise NFS home directories)

40-41 clients supported per boot server

The following tests primarily focus on the booting process up to the point of logon.

This section describes the performance study that was done to characterize the behavior of the NT boot server and to determine it's capacity to support booting several Network Stations concurrently. The server used was a 300GL, with a 166MHz Pentium CPU and 64 MB of RAM connected via an ethernet network to the Network Stations. The results presented here are meant to be a guideline to enable customers to design their network, server and Network Station configurations. Depending on the actual configurations chosen, the results observed differ from those described here.

Assuming a worst case scenario where all Network Stations boot at the same instant, the boot time increases with the number of Network Stations in the configuration. Boot time is defined as the time from when all Network Stations are powered on until the time when the last Network Station reaches the ACTlogin screen. The main factors that affect the boot time are the CPU capacity of the Server the capacity of the network interconnecting the

limiting factors are the CPU capacity of the server, the capacity of the network interconnecting the server with the Network Stations.

Two network configurations are considered in this study. The first configuration (Figure 1) has the NT server connected via a 10 megabit ethernet to a set of cascaded 10 megabit hubs which are used to connect to all the Network Stations. Although this is probably the simplest network configuration, the bandwidth that it can support from the server is limited to the capacity of a single 10 megabit ethernet link.

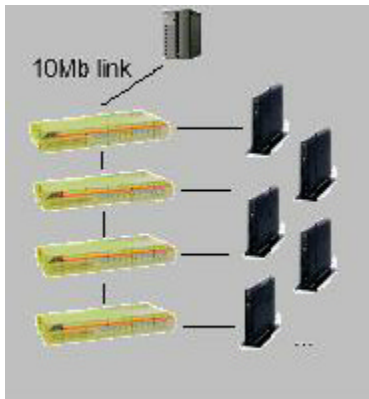


Figure 1. 10 megabit hub configuration

This configuration is recommended when the number of Network Stations is small (typically 20-30). The time taken to boot 20 Network Stations using this configuration is 90 seconds. At this point, the 10 Megabit ethernet link is already saturated, and adding further Network Stations to the same ethernet segment linearly increases the boot time. The Section on Configuration 1 later in this document provides additional measurement results. To circumvent this network bottleneck, one option is to add a second 10 megabit ethernet adapter to the NT Server. With two 10 Megabit LAN segments, 40 Network Stations (20 per segment) can be booted in 92 seconds, with the network again becoming the bottleneck (see section on Configuration 2). Using the 2 PCI slots in the 300 GL, it should be possible to add multiport PCI adapters to increase the overall network bandwidth. For example, using 2 dual ported adapters would give 4 independent LAN segments with a combined maximum network bandwidth of 40 megabits per second.

The recommended configuration for larger numbers of Network Stations is shown in Figure 2. A 100 megabit adapter on the NT Server is connected to a 100 megabit switch (such as the 8271 IBM Nways ethernet switch), which is then connected to multiple 10 megabit hubs which connect to the Network Stations. In such a network, the 300 GL NT Server will become CPU bound before the configuration reaches its network bandwidth limit (see section on Configuration 3).

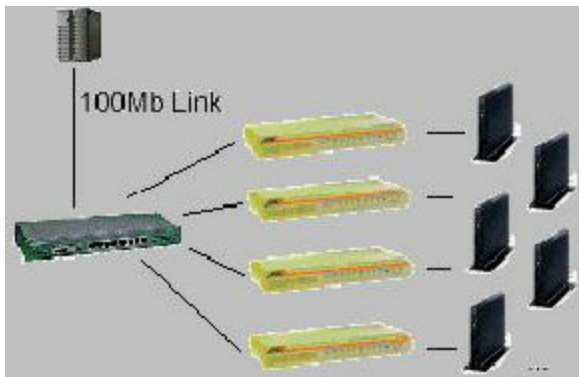


Figure 2. 100 megabit switch configuration

Measurements with this configuration show that the 300GL NT server can boot 30 Network Stations in 55 seconds with a mean CPU utilization of 67% and an average network utilization of 17%. This implies that the server could support around 40 Network Stations before the CPU utilization reaches 100%, after which the boot times will elongate linearly with the number of Network Stations. To better utilize the network bandwidth available in this configuration, the 300GL could be replaced by a machine with a faster CPU.

The boot times mentioned above assumed a worst case situation where all Network Stations are booted simultaneously. During normal operation, however, a more reasonable assumption would be to stagger Network Station boots, such that they are spread evenly over a fixed time interval. Assuming that all Network Stations are booted once during a 1 hour period (say, between 8a.m. and 9a.m.), a single segment 10 megabit Ethernet LAN can support 480 Network Stations with the Ethernet being utilized 35% due to the boot activity. This leaves sufficient bandwidth to be used by either the 3270 or 5250 emulators. If the stagger interval is changed, the number of Network Stations which can be booted should be scaled accordingly (at a rate of 8 Network Stations per minute). For example, if boots are uniformly staggered over a 20 minute period, a single segment Ethernet LAN can support 160 Network Stations.

Although the results described here should be accurate, there are several factors which would cause an actual NT boot server configuration to behave differently.

- Some of the results presented in this study were measured using a 30 Network Station setup. To estimate larger networks, however, results were obtained by simulating the Network Station traffic using a boot simulator tool running on an AIX server. The simulated results, especially for large networks, will underestimate boot times by around 15%.
- The results presented here assume that there is *no other network traffic* while these Network Stations are being booted. For larger networks, the recommended network configuration is to connect the NT boot server to a 100 megabit switch, which could provide one 100 megabit link to the external network, with the other ports connected to 10 megabit ethernet hubs.
- The results presented here are valid only if the NT boot server is not being used concurrently to support other applications, especially on the same network. Doing so would cause the two applications to interfere with each other and lead to performance degradation of both applications.

Configurations

The following configurations were used in the performance study:

- The *NT Server* used was an IBM 300 GL, with a 166MHz Pentium CPU, 512 KB L2 cache, 64MB RAM, 2.5 GB EIDE disk, a 100/10 Etherjet PCI adapter, monitor, keyboard and mouse. The server was running Windows NT Server version 4.0, and IBM's Network Station Manager (NSM) version 3.
- The *client* machines are IBM Network Station model 300s with a 66MHz PowerPC 403GCX CPU, 16 MB of dynamic RAM, a 10 Mb Ethernet NIC, monitor, keyboard and mouse.
- Two network configurations are evaluated (as shown in Figures 1 & 2). The simple configuration has Network Stations and the NT Server connected to a single segment of a 10 megabit Ethernet LAN. This is achieved by cascading several 10 megabit hubs to obtain the appropriate number of ports. The alternate configuration uses a 100 megabit link from the NT server going to an 8271-216 Ethernet LAN switch which is then connected to four 10 megabit hubs. Each 10 megabit hub is then connected to several Network Stations. The Network Stations are spread as evenly as possible across the four 10 Megabit hubs.

The *workload* used in the measurement is the worst case scenario where all Network Stations are powered on and boot simultaneously. This scenario places the greatest demand on the network as well as the boot server. While booting, several megabytes of data must be read by the boot server from its disks, and then sent to the Network Station over the network. While in terminal emulation mode, on the other hand, each command typed on the emulator window causes a few hundreds of bytes to be sent over the network to the mainframe host (and nothing to the boot server). The response from the mainframe host (typically 2 KB) is also much smaller than the files transferred at boot time.

The NSM configuration allows a choice of TFTP or NFS for transferring files from the NT Server to the Network Station. For optimal performance, it is recommended that TFTP with a block size of 8192 bytes (the default) be used. NFS is not recommended for configurations that have more than 15 Network Stations supported by a single boot server. During startup, the Network Station either has the address of the NT Server saved in NVRAM, or the DHCP protocol is used by the NT Server to address the Network Stations. DHCP was not used in this study. Using DHCP would add an additional initial delay to the boot time (a few seconds).

To avoid having to build a large network of Network Stations, a network station boot simulator tool is used in parts of this study to place a load on the network and NT Server. During a normal boot sequence, a Network Station requests a series of files from the NT boot server (the kernel, libraries, font files, etc.). The boot simulator runs on an RS/6000 server, and simulates many Network Stations booting by sending several streams of requests to the NT boot server concurrently. Although the boot simulator is calibrated and validated to be as accurate as possible, there are some inherent sources of error in this methodology that can cause the results to be skewed. The biggest potential source of inaccuracy is that since the boot simulator uses a single adapter to connect to the network, it can send only a single Network Station request at a given time. This serialization of outgoing Network

Station traffic causes different behavior on the network (few or no ethernet collisions, for example).

During the boot process, each Network Station makes a request for a file, and then waits while the NT boot server satisfies the file transfer request. Only after the file has been completely received does the Network Station generate the next asynchronous request on the ethernet. Around 95% of the traffic goes from the NT boot server to the Network Stations. Since a single system, the boot server, is generating most of the network traffic, there is very little chance of having ethernet collisions. For the boot workload in particular, it is permissible to overload the ethernet to some extent, without causing a situation with excessive collisions and retries. In this study, the ethernet network utilization during Network Station booting frequently reaches as high as 85%. For other applications in general, this is not a recommended approach - a rule of thumb is to load the ethernet no more than 40%. But

Measurements

The main metric of interest is the *boot time*, defined to be the time it takes from power-on until the ACTlogin screen appears on the last Network Station to complete booting. Other secondary metrics are used to identify bottlenecks in the configuration (% utilization of the boot server CPU and network), or to verify that the boot process was error free (number of bytes & frames sent over the network, number of collisions). The CPU & Network utilizations reported here are the mean utilization *after* the NT boot server has started servicing the TFTP or NFS requests from the Network Stations. It does not include the period from power-on until the Network Station makes its first request.

Single Network Station

A single Network Station booting over a 10 megabit Ethernet LAN, using TFTP with 8 KB block sizes, has the following characteristics:

Time from power on until start of load of kernel = 18 seconds

Time from power on until ACTlogin screen appears = 35 seconds

Total number of bytes transferred over network = 3 Megabytes

Total number of frames sent (by server and Network Station) = 2,974

From power-on until the start of kernel load, the Network Station places no load on the network or boot server while it goes through it's internal startup process (memory check, initialize keyboard and mouse, etc.). This is followed by the transfer of the compressed kernel file, local decompression of the kernel file on the client, followed by the transfer of the rest of the files required to complete the boot process. Removing 18 seconds from the boot time for a single Network Station leaves 17 seconds during which the server sends 3 megabytes over the network (at an effective bandwidth of around 1.5 megabits per second). On a 10 Mbps Ethernet, only 4-5 Network Stations are required to saturate the ethernet during this 17 second interval, assuming the ethernet can sustain a bandwidth of around 7 Mbps. When more than 4-5 Network Stations boot, the boot time is extended since the LAN

is saturated.

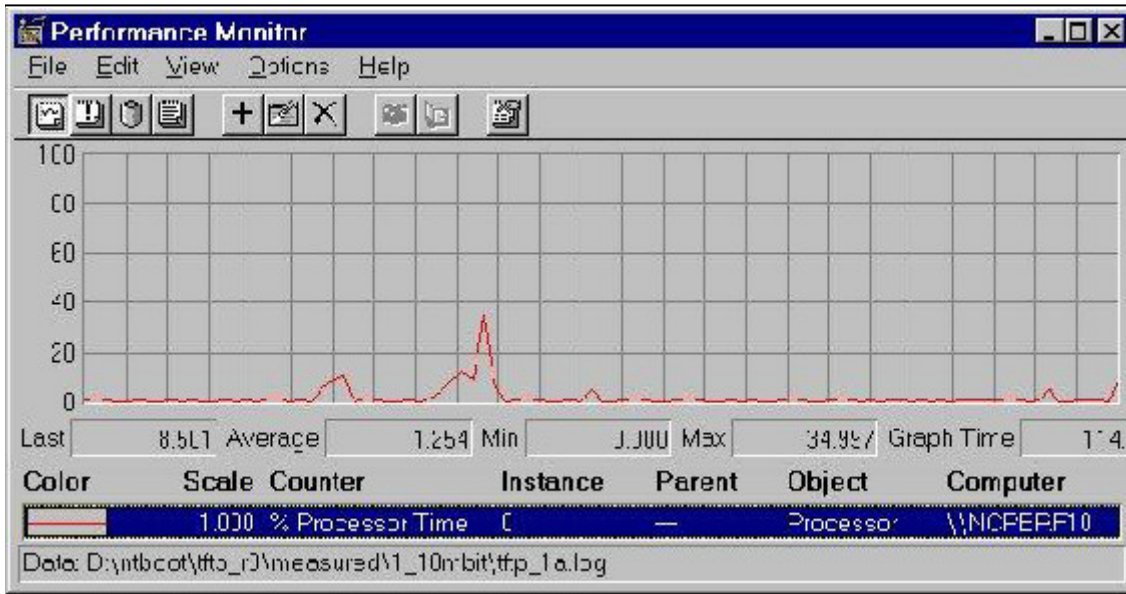


Figure 3. CPU Utilization graph for Single Network Station boot using TFTP with 8 KB blocks. Time scale used is approximately 4.5 seconds per horizontal unit.

The graph in Figure 3 shows that the CPU activity is divided into two segments. The first burst of CPU activity occurs when the kernel is being transferred to the Network Station, followed by a delay of approximately 8 seconds during which the Network Kernel uncompresses the kernel. The second section of CPU activity is due to the transfer of the remaining files.

Configuration 1: One 10-Mbit Ethernet LAN Segment

In this configuration, several Network Stations are connected using cascaded 10 megabit ethernet hubs. The first two tables show measured results using TFTP and NFS, while the third table shows simulated TFTP boot times for upto 100 Network Stations. NFS is not recommended for configurations with more than 15 Network Stations.

# of Network Stations	1	10	20	30
Boot Time (sec)	35	57	90	122
CPU Utilization (%)	7	21	25	26
Network Utilization (%)	12	56	64	71
Network Traffic (MB)	3	31	62	98

Table 1. Single 10-Mbit LAN segment; TFTP with 8 KB block size; measured

Although the boot times for the TFTP and NFS tables (Tables 1 & 2) are similar, the server CPU utilization in the NFS case is twice as much as when TFTP is used.

# of Network Stations	1	10	20	30
Boot Time (sec)	34	57	91	126
CPU Utilization (%)	10	41	50	46
Network Utilization (%)	12	54	62	64
Network Traffic (MB)	3	31	61	92

Table 2. Single 10-Mbit LAN segment; NFS with 8 KB block size; measured

Table 3 below shows simulated results for booting upto 80 Network Stations using TFTP on a single 10 Megabit LAN segment. The simulated results are within 10% of the measured results in Table 1. Since there is an estimated error of 15% in the simulation results, the worst case boot times should be increased accordingly. For example, the worst case boot time for 60 Network Stations is 219 seconds (190 + 29).

# of Network Stations	1	10	20	30	40	60	80
Boot Time (sec)	34	56	82	110	136	190	237
% CPU Util	5	20	23	25	26	27	29
% Network Util	15	61	73	76	79	81	86
Network Traffic (MB)	3	29	58	87	116	175	235

Table 3. Single 10-Mbit LAN segment; TFTP with 8 KB block size; simulated

It is recommended that no more than 40 Network Stations be connected on a single 10 megabit LAN. The bottleneck is obviously the network in this configuration. The boot server CPU utilization for 40 Network Stations is just 26% with a boot time of 136 seconds. Thus, it should be possible to connect the NT boot server to more than one 10 megabit LAN, in order to boot additional Network Stations.

Figure 4 shows CPU utilization booting 30 Network Stations using TFTP over a single 10 Megabit LAN. The horizontal (time) scale is 7:1 (i.e. each horizontal unit corresponds to 7 seconds). The graph shows that the CPU utilization is fairly steady at 20% for the first 7 units (around 49 seconds) while all the Network Stations load their kernel. At this time, the bottleneck is the single 10-Megabit ethernet. The second phase of the boot has all Network Stations downloading

several files, typically much smaller than the kernel. This activity is much more CPU intensive, with a much smaller bandwidth requirement (opening, reading and closing several files).

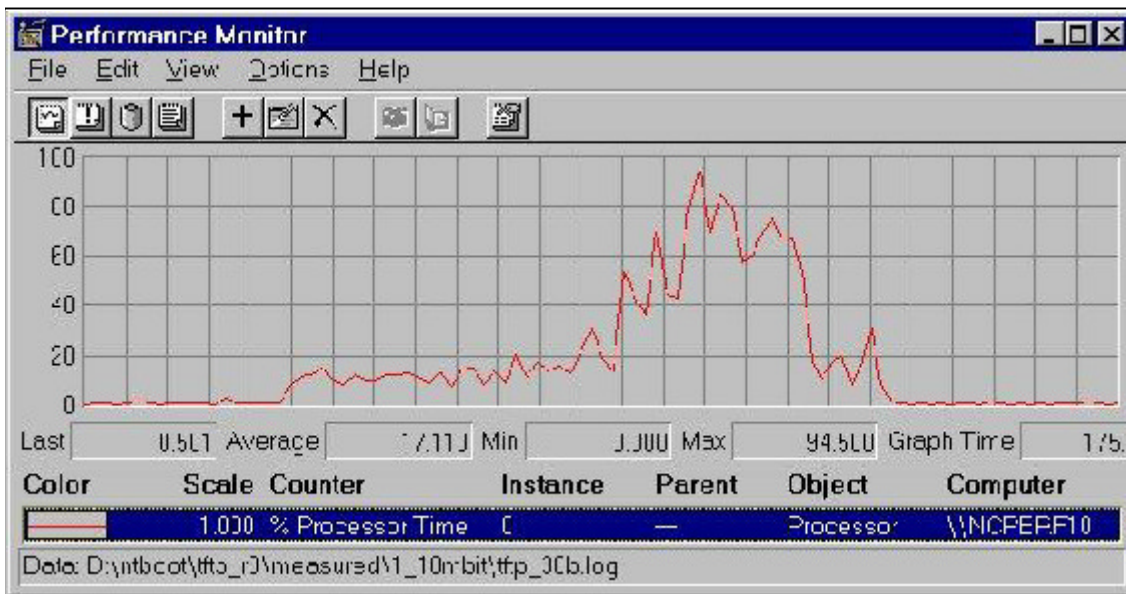


Figure 4. CPU Utilization: 30 Network Stations using TFTP, 8 KB blocks, & Single 10-Mbit LAN. Time scale used is 7 seconds per horizontal unit.



Figure 5. CPU Utilization: 30 Network Stations using NFS, 8 KB blocks, & Single 10-Mbit LAN. Time scale used is 7 seconds per horizontal unit.

The total amount of time the CPU is busy in Figure 4. is 15 units (105 seconds). Adding on the 18 seconds that each Network Station uses for internal startup (memory initialization, etc.) gives the total boot time of 122 seconds for booting 30 Network Stations using TFTP.

Comparing this with Figure 5, which shows CPU utilization while booting 30 Network Stations using NFS, it can be observed that although the overall shape of the two curves is similar, the overall CPU utilization is much higher when using NFS. During the second phase of the NFS boot storm, the CPU utilization remains at 100%, while the non-kernel files are downloaded to the Network Stations.

Configuration 2: Two 10-Mbit Ethernet LAN segments

The results in Table 4 below show boot times when a second 10/100 Ethernet adapter is added to the NT Server, and connected to a second set of cascaded 10 megabit hubs. The second LAN allows a total of 80 Network Stations (40 per LAN) to be booted in 152 seconds.

Total # of Network Stations in 2 Segments	20	40	60	80	100	120
Boot Time (sec)	63	92	123	152	183	213
% CPU Utilization	37	44	45	49	50	50
% Network Utilization	52	63	66	69	70	72

Table 4. Two 10-Mbit LAN segments; TFTP with 8 KB block size; simulated

The CPU utilization of the NT Server is still only 50% with both LANs saturated. This implies that by adding additional network bandwidth capacity, the NT Server could support even more Network Stations. Since the 300GL server has two PCI slots which can be used for network cards, additional 10/100 Ethernet cards cannot be added. There are some other options which could provide additional network connectivity from the server:

- using multiport adapters allows connectivity to more than one LAN using the same adapter. By using two 2-port 10/100 megabit adapters, it should be possible to obtain a balanced configuration which maximizes both network and CPU utilization.
- using a 100 megabit ethernet adapter on the NT Server to connect to a 100 megabit switch, with each port of the 100 megabit switch connected to a 10 megabit hub.

Configuration 3: 100 Megabit Switched backbone

# of Network Stations	1	10	20	30
Boot Time (sec)	35	39	44	55
CPU Utilization (%)	5	31	55	64
Network Utilization (%)	1	9	15	17

Table 5. 100 Mbit Switch; TFTP with 8 KB block size; measured

In both the configurations above, the network was the bottleneck, while the NT Server was operating well below its capacity. In order to eliminate this network bottleneck, the ethernet link from the server was replaced by a 100 megabit link connected to a 100 megabit to 10 megabit switch (as shown in Figure 2). In each configuration shown below, the Network Stations were evenly spread across 4 10-Megabit hubs. As the results show, this configuration yields the best performance results for larger networks. The boot time for 30 network stations using this configuration is 56 seconds, a 50% improvement over the 110 seconds obtained using a single 10 megabit link.

The network utilization numbers in Table 5 are based on utilization of the 100 Megabit link between the boot server and the switch. The utilization of individual 10 Megabit segments can be extrapolated from Table 1. Compared to the single 10 Mbit configuration, this configuration results in a decrease by approximately 5% of the total number of frames transferred between the server and the Network Stations. This is due to fewer collisions on the ethernet. The server CPU utilization is higher in this configuration than in the single 10 Mbit case since the server has to send roughly the same amount of data to the Network Stations in a much shorter (boot) time. Figure 6 shows the CPU utilization graph for booting 30 Network Stations in this configuration.

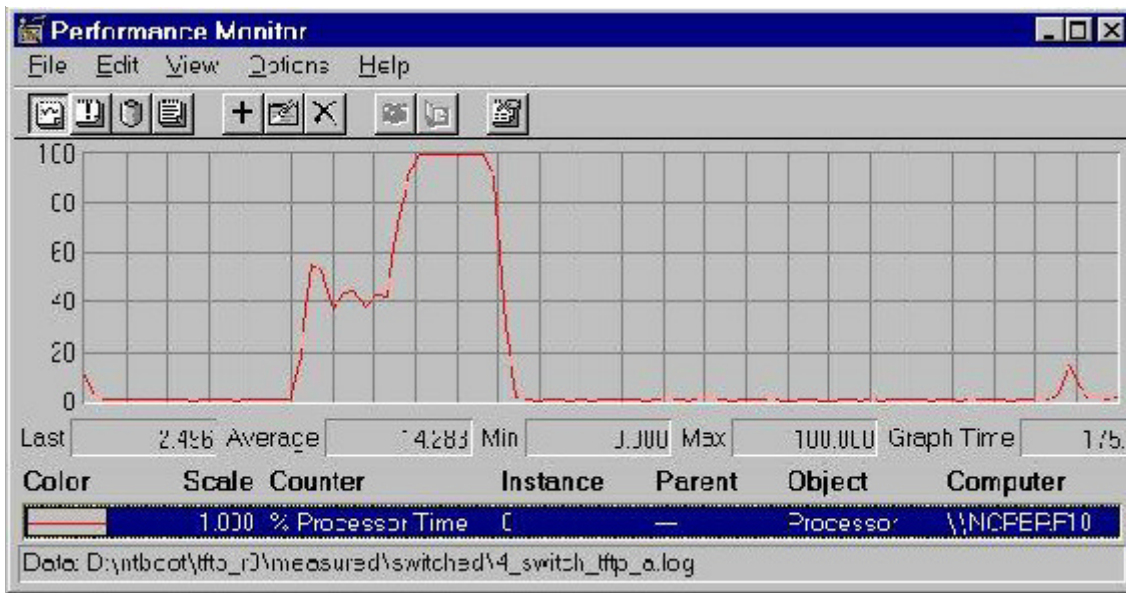


Figure 6. CPU Utilization: 30 Network Stations using TFTP, 8 KB blocks, & 100 Megabit Switch. Time scale used is 7 seconds per horizontal unit.

Uniformly Staggered Booting

A more common situation than booting all Network Stations simultaneously would be to stagger the booting over some period of time, say an hour. In this scenario, it is no longer acceptable to use the full capacity of the network for booting. Once a Network Station has completed booting, a user begins using the 3270 (or 5250) emulator to communicate with a host. In order to ensure responsiveness, the Ethernet utilization should not exceed 40%. Since the 3270 and 5250 emulator applications do not place any significant load on the network, a major part (35% of the network utilization) may be used for booting.

# of Network Stations	40	80	120	160	240	480
Staggered Boot Time (minutes)	5	10	15	20	30	60
Simultaneous Boot Time (minutes)	2.5	4.4	6.3	8.3	12.1	23.7

Table 6. Staggered Boot Times: TFTP with 8 KB block size; based on simulation results

Table 6 shows the number of Network Stations that can be booted on a 10 megabit LAN segment, assuming that they were booted uniformly over a period of time equal to the staggered boot time. For example, If Network Station boots are uniformly spread out over a 20 minute period, a single segment 10 megabit LAN can support 160 Network Stations, while leaving sufficient bandwidth for the 3270 or 5250 emulator on the Network Stations that have been booted. If it ever became necessary to boot all 160 Network Stations simultaneously, it would take 8.3 minutes before the last boot completed. Further, the booted Network Stations would see very poor 3270 or 5250 emulator response times until after all booting activity had completed. The simultaneous boot times in the table were extrapolated from the simulated times shown in Table 3, and have a margin of error of 15%.

Many other applications are far more network intensive than 3270 and 5250 emulation. For such applications, less (than 35%) network bandwidth should be used for booting, reducing the number which can be booted per hour without affecting application performance. An example of a network intensive application is viewing an animated GIF on WinCenter or another graphic application displayed by the X protocol. Displaying the animation requires network bandwidth proportional to the size of the image and the rate of change. This can be large; for example, a web page from the Fox Network viewed from a browser (e.g., Netscape) running on WinCenter displaying on a Network Station requires 0.6 megabits per second (about 16% of the useable Ethernet bandwidth). For such applications, response times for both application and booting would be poor if booting needed more than the Ethernet bandwidth remaining from the applications in use. Thus, more of the Ethernet bandwidth must be reserved for application use, thereby lowering the number of Network Stations that can be booted per hour without effecting application performance. This tradeoff between booting and application performance is dependent on many things and is beyond the scope of this study. In general, boot rates that would drive Ethernet traffic above 40% are to be avoided if applications will be using the Ethernet concurrently with booting Network Stations.

Other Factors

This section discusses the effect of various factors on the boot server capacity. Further work needs to be done to quantify the effects of each of these factors.

- If the network were token ring instead of ethernet, it would increase the capacity of the network, and the number of Network Stations that could be booted in a specified time would increase.
- Adding a second NT Server will make the solution more robust. The best way to integrate the second server into the network is to use a 100 megabit switch, which is used to connect to each of the servers, as well as to the 10 megabit hubs to which the Network Stations are connected. In general, half the Net stations could boot from each server. However, in the case that one server is down, all could use the same server. This would elongate the boot time, but maintain the operability of the Network Stations.

Technical Support

How to obtain technical support for the Quick Start Boot Server

The primary approach to solving problems with your Quick Start Boot Server is via the IBM Network Computer Division's web site service and support information web page, located at <http://www.pc.ibm.com/networkstation/support>. Among the options available to you within the Service and Support section of our Web site is information on our support offerings and services, a Frequently Asked Questions (FAQ) function, a list of related publication options to inform you about training options available to you, along with problem submission functions to allow you to interact with people that can help you successfully deploy your Quick Start Boot Server within your enterprise.

If you have a question about installation, choose "Quick Start Server", then choose Submit Questions or Problems to ask your question.

Appendix

Helpful Shortcuts and Tips

Useful IBM Network Station key combinations.

ESC during boot file load Network Station Setup Screen

Pause After booted brings up Console panel

Alt+CapsLock+Pause Panic button, gets you to Boot Monitor

Alt+Shift+Control+F1 From Network Station Setup Screen, to Boot Monitor

F1 From Boot Monitor, to Network Station Setup Screen

Ctrl+U From the Network Station Setup Screens, **F5** & **F6**, will delete the entire line

Useful Boot Monitor commands

- To reset erratic behavior due to the NVRAM getting corrupted, reset the NVRAM by going to the Boot Monitor prompt

then key in: **nv [enter], l [enter], s [enter], y [enter], q [enter]**

- To set Token ring speed, enter **tr 4** or **tr 16**

- To reboot NFS, enter **bn**
 - To reboot TFTP, enter **bt**
 - Press **?** for help
 - To ping an address from boot monitor use the **pi** syntax (see **? help**)
-
-

MANUAL OVERRIDES TO ACHIEVE CUSTOM REQUIREMENTS

ATTENTION: Please Read

Bypassing the Network Station Manager configuration tool and ACTLogin is NOT generally recommended.

Please note that these manual overrides to the configurations files are for NSM Release 3.0 for NT and will not migrate "as is" to future releases of IBM Network Station Manager. We intend to provide equivalent replacements for these templates/functions in future releases of NSM.

It is recommended that you use standard NSM Administration Menus to manage and configure applications for the IBM Network Stations. If a customer situation exists that requires a one-off installation from what is provided within NSM 2.5 then use the following templates to satisfy the customer's requirements.

However, in certain environments it may be desirable to override the default behavior of the IBM Network Stations by manually editing a subset of the configuration files. This can be the case when a certain type of environment or terminal is being replaced by a Network Station and the initial desire is to have the screen, or "glass", look and behave much like the terminal it is intended to replace. This may help keep retraining costs of the users down or may simply make integrating the Network Station more simple.

Below are some "templates" or examples of how to manually configure the IBM Network Stations to mimic some typical environments when the Network Station is booted from an NT boot server.

General notes about these templates:

- The comment character for the configuration files is the US pound sign, #, placed at the beginning of the line
- The TCP/IP settings may need to be set in all of the following templates, i.e. the "defaults.dft" file

There are two methods. In both methods, the name "localhost" is always defined as address 127.0.0.1 and represents the Network Station that is using it. This is referred to as the loopback address of the Network Station

- Configure to use an existing domain name service, DNS, environment
 - In this case, these lines are modified and used. The rest are commented out in the TCP/IP section
- Use local name resolution, all names are defined locally to the Network Station and the server.

In this case, you must also define these same name/IP_address pairs on the NT server in C:\WINNT\System32\drivers\etc\Hosts

- In this case, these lines are used. Change the hostnames and IP addresses to suite your needs

```
set tcpip-name-local-cache = {  
    { localhost 127.0.0.1 }  
    { bigsmile 1.2.3.232 }  
    { bigeasy 1.2.3.248 }  
    { sorry 1.2.3.211 }  
}
```

[Template For Replacing Single Session 3270 Terminals](#)

This is the information to enable bringing up a full screen 3270 emulator session. In effect, all Network Station screens will essentially look and behave like a "dumb" 3270 terminal.

To accomplish this configuration:

- ACTLogin is NOT used
- The native window manager is NOT used
- Only one session can be started at a time
- If the session dies, the NC must be rebooted
- Requires changes to two files
 - defaults.dft
 - pref
- The NC must be rebooted for any changes to the two files to be in effect

Below are the entries for the "defaults.dft" file

#####

```

## START /nstation/configs/defaults.dft
##
## START TCP/IP configuration ##
## Either use name-local-cache stanza or other three lines
## Comment out one of the choices below
set tcpip-name-server-protocol = dns
set tcpip-name-servers[-1] = {"1.2.3.2"}
set tcpip-dns-default-domain = austin.ibm.com
set tcpip-name-local-cache = {
#       { bigsmile 1.2.3.232 }
#       { bigeasy 1.2.3.248 }
#       { localhost 127.0.0.1 }
#       { sorry 1.2.3.211 }
}
## END TCP/IP configuration ##
##
## START environment variables configuration ##
## Have to set these since ACTLogin is not being used
## The PATH for these values may be different between platforms
##
set pref-environment = {
  {"PATH" "/nstation/mods"}
  {"HOME" "/nstation/"}
  {"BOOTPATH" "/nstation/"}
  {"LANGID" "ENU" }
  {"MRIPATH" "MRI2924"}
  {"NSM_PROD_SYSDEFAULTS" "/nstation/ProdData/SysDef"}
  {"NSM_ADMIN_SYSDEFAULTS" "/nstation/UserData/SysDef"}
}
## END environment variables configuration ##
##
## START modules configuration ##
## set these to avoid loading unneeded modules to conserve memory
##
set modules-load-policy = {{ }}

```

```

## END modules configuration ##
##
## START screen background configuration ##
## Set this to cover any non-fit of the emulator screen
##
set pref-screen-background-type=solid-color
set pref-screen-background-color=black
## END screen background configuration ##
##
## See table below depending on display resolution
set exec-startup-commands = {"ns3270 -fn 8x13,9x15,10x20,fixedR28 -LANGID ENU
<Host> "}}
## END /nstation/configs/defaults.dft

```

#####

NOTES:

- 1) The TCP/IP information may not need to be set if TCP/IP is already working properly.
If it is NOT already set, then modify the values in *defaults.dft* as appropriate.
Otherwise, remove the entire sub-section.
- 2) The LANGID value can be any value found in /nstation/mods/NS3270/nls directory of the boot host
<Host> = hostname to login to, could be an IP address
- 3) The actual command to use in the "set exec-startup-command" should be varied according to the following table. Although, the desired font or a smaller font can be placed at the front of the font list parameter -fn. The first font in the list will be used upon startup and the other fonts may be available as an alternate font via the Options -> Fonts pulldown menu, if the screen resolution allows.

Also, the fonts must exist in one of the font directories, /nstation/fonts/pcf/...
Choose the one to your liking.
The Alternate option allows the user to "scale" down the window and font.

Display Resolution

Display Resolution	set exec-startup-command={{ }} Alternate set exec-startup-command= {{ }}
640x480	"ns3270 -fn 8x13 -LANGID ENU <Host>"
800x600	"ns3270 -fn 9x15 -LANGID ENU <Host>" "ns3270 -fn 9x15,8x13 -LANGID ENU <Host>"
1024x768	"ns3270 -fn 8x13 -LANGID ENU <Host>" "ns3270 -fn 10x20,9x15,8x13 -LANGID ENU <Host>"
1280x1024	"ns3270 -fn 8x13 -LANGID ENU <Host>" "ns3270 -fn fixedR28,10x20,9x15,8x13 -LANGID ENU <Host>"

Command-line options supported by the NS3270 emulator:

3270 Command Line Arguments	
Argument	Description
-LANGID xxx -langid in GA version	xxx is the 3 character id of a supported language
-MRIPATH	MRIxxxx corresponds with a subdirectory in which the 3270 translatable files are located. The default is MRI2924. (available in multi-session version only)
-title	Title of the 3270 emulator window. The default is 3270.
-rows nn, -cols nnn	Select the size of the 3270 window. Only selected values allowed
-graphics, -nographics	Used to specify if GDDM style graphics should be used for the emulator.
-pfkeys	Causes the keypad to pop-up at emulator startup.
-ims	Used when interacting with IMS applications.
-debug	This option is used when debugging a 3270 problem. A number of detailed messages are written to the message console that will be useful to service.
-trace	Causes the telnet 3270/3270 data stream traffic to be written to the message console.
-sk. -nosk	Sets the position of the enter key to Enter or Ctrl/Act Control of the enter key is available now only through the

Control of the enter key is available now only through the preferences (or through remapping the keyboard).

Below are the entries for the "PREF" file

```
## START 3270 preferences file
## /nstation/userdata/SysDef/NS3270/pref
NS3270*KeyRemap: disable
NS3270*Keymap101Path: 0
NS3270*Keymap102Path: 0
NS3270*ColorMap: basic
NS3270*ColorMapPath: 0
NS3270*rows: 32
NS3270*cols: 80
NS3270*autoAction: false
NS3270*buttonBox: false
NS3270*Speckey: false
NS3270*Port: 23
NS3270*Graphics: false
NS3270*DefaultColorMapPath: 0
## END 3270 preference file
```

#####

NOTE:

The /nstation/userdata/NS3270/pref file is normally managed by NSM and is the global or system wide defaults file. It is an ASCII file that can be edited. However, care must be taken so as not inject any erroneous characters at the end of the line and file. It is NOT normally edited on systems that are using NSM, but can be if all due caution is exercised.

Values/definitions of the 3270 "PREF" file

3270 X Resources Preferences			
Resource	Description	Default	Values
NS3270*KeyRemap	Controls the use of the keyboard remapper utility.	disable	enable, disable, disable_and_hide
Effect:			

- disable -> grey out the keyboard remapper button
- disable_and_hide -> Do not even show the keyboard remapper button
- enable -> do NOT grey out the keyboard remapper button

Notes: The keyboard remapper utility is a common utility shared between the 5250 and 3270 emulator.

NS3270*Keymap101Path	Path to a customized default.101 keyboard file to use if the user does not have a personal keyboard mapping file.	0	0, Pathname
-----------------------------	---	---	-------------

Effect: A value of 0 means there is no path to a default key translation file for a 101 keyboard. If a value is specified, then it should point to a file by the extension .101 that contains the default translations for a 101 style keyboard. There could still be user-level translation files that override this file.

Notes: If no path is specified, then use the hard coded default translations.

NS3270*Keymap102Path	Path to a customized default.101 keyboard file to use if the user does not have a personal keyboard mapping file.	0	0, Pathname
-----------------------------	---	---	-------------

Effect: A value of 0 means there is no path to a default key translation file for a 102 keyboard. If a value is specified, then it should point to a file with an extension of .102 that contains the default translations for a 102 style keyboard. There could still be user-level translation files that override this file.

Notes: If no path is specified, then use the hard coded default translations. /TD>

NS3270*ColorMap	Determines if the ColorMapper button is displayed.	basic	advanced, basic, disable, disable_and_hide
------------------------	--	-------	--

Effect:

- disable/disable_and_hide -> affect presentation of the ColorMapper button
- advanced/basic -> input to the colormapper

Notes: No support for this right now.

NS3270*ColorMapPath	The path to the default color mapping file. Currently not supported.	0	0, path
----------------------------	--	---	---------

NS3270*rows:	The number of rows for the 3270 display. This value can be overridden from the command line	32	24, 32, and 43
---------------------	---	----	----------------

Notes: The intent is to use this resource as a method for the system administrator to set

the default. The design is for the Act Manager to present only four choices for screen sizes:

- 24x80 (mod 3278-2)
- 32x80 (mod 3278-3)
- 43x80 (mod 3278-4)
- 27x132 (mod 3278-5)

However, the ns3270 code only sees this in terms of specific settings for rows and columns. This note also applies to **NS3270*cols**

NS3270*cols	Number of columns	80	80, 132
NS3270*autoAction	This function is similar to but not quite the same as hot spot support. With the mouse, you can highlight and execute a word (by double clicking) on it as if you had pressed a corresponding key. For example, you could highlight the string "pa1", double-click, and the 3270 emulator will treat this as if you pressed the PA1 key. The "words" that the 3270 will accept are common 3270 actions such as all of the function keys, the enter key, PA1, etc. For the function keys (PF1-PF24), the user can highlight just the number and it will be treated as if the user pressed the corresponding function key (i.e., a "1" is treated as pf1).	false	true, false
<p><i>Effect:</i></p> <ul style="list-style-type: none"> • false -> turn autoAction function off • true -> turn autoAction function on, which enables the user to use the mouse to highlight text to be interpreted as a attn key (pf1, f1, Enter, etc.) 			
	The <i>buttonBox</i> , externally known as the <i>keypad</i> , is a pop-up window that contains a series of customizable buttons for		

NS3270*buttonBox	3270 actions. As shipped, the keypad presents buttons for the function keys 1-12. The keypad can be invoked from the options pull down menu. It also can be invoked at the same time as the emulator window by supplying the -pfkeys command line option.	false	true, false
-------------------------	---	-------	-------------

Effect:

- false -> "keypad" button, as its now called, should be greyed out.
- true -> "keypad" button should NOT be greyed out.

Notes: The intent of this setting was for the administrator to disable/enable use of the keypad (xbuttons) function. There has not been a lot of emphasis placed on the keypad function and its flexibility. The main reason for this is that there is no interface/utility for maintaining the keypad layout. It can only be customized by editing the file N3keypad under the MRIxxxx directory (ex: %PATH/NS3270/MRI2924/N3keypad). The possible actions that can be invoked from a button are essentially the same actions that you can configure using the keyboard remapper.

NS3270*Speckey	Determines the position of the Enter key	false	true,false
-----------------------	--	-------	------------

Effect:

- true -> use the Enter key as the Enter key.
- false -> use the Ctrl/Act key as the Enter key.

Notes: The Speckey setting is ignored if there is a customized keyboard mapping file. The thought here is that the speckey setting is a poor man's keyboard remapping. If a keyboard file has been defined, then it should contain the correct location of the Enter key.

NS3270*Port	TCP/IP port of the target telnet 3270 server	23	23, 5001-65K
--------------------	--	----	--------------

Effect: Value should override the code default for the corresponding port resource (NS3270*port). This value can still be overridden by a command line option.

Notes: Normally this will not need to be customized. However, if you are using a tn3270 gateway product (like a comm. server), then the tn3270 port will normally NOT be the default port of 23.

NS3270*Graphics	Determines whether the 3270 session is started in graphics mode or not.	false	true,false
------------------------	---	-------	------------

Effect:

- true -> Set NS3270*graphics to true, run emulator session in graphics mode. Setting can still be overridden by the command line.
- false -> Set NS3270*graphics to false, run emulator session in normal mode.

Notes: The intent was to give the system administrator the ability to set the graphics mode on a system wide basis in the event that running in graphics mode would be the norm for everyone. If a user attempts to access a graphics application when in non graphics mode, it is application dependent as to what kind of error will occur. The 3270 will NOT automatically switch into a graphics mode.

Graphics mode consumes considerably more than non graphics mode such that it should only be used as needed.

Template For Replacing Single Session 5250 Terminals

This is the information to enable bringing up a full screen 5250 emulator session. In effect, all Network Station screens will essentially look and behave like a "dumb" 5250 terminal.

To accomplish this configuration:

- ACTLogin is NOT used
- The native window manager is NOT used
- Only one session can be started at a time
- If the session dies, the NC must be rebooted
- Requires changes to two files
 - defaults.dft
 - pref
- The NC must be rebooted for any changes to the two files to be in effect

Below are the entries for the "defaults.dft" file

#####

```
## START /nstation/Configs/defaults.dft
## 5250 template definition
##
## START TCP/IP configuration ##
## Either use name-local-cache stanza or other three lines
## Comment out one of the choices below
set tcpip-name-server-protocol = dns
set tcpip-name-servers[-1] = {"1.2.3.2"}
set tcpip-dns-default-domain = austin.ibm.com
set tcpip-name-local-cache = {
#     { bigsmile 1.2.3.232 }
#     { bigeasy 1.2.3.248 }
#     { localhost 127.0.0.1 }
#     { sorry 1.2.3.211 }
```

```

}
## END TCP/IP configuration ##
##
## START environment variables configuration ##
## Have to set these since ACTLogin is not being used
## The PATH for these values may be different between platforms
##
set pref-environment = {
    {"PATH" "/nstation/mods"}
    {"HOME" "/nstation/"}
    {"BOOTPATH" "/nstation/"}
    {"LANGID" "ENU" }
    {"MRIPATH" "MRI2924"}
    {"NSM_PROD_SYSDEFAULTS" "/nstation/ProdData/SysDef"}
    {"NSM_ADMIN_SYSDEFAULTS" "/nstation/UserData/SysDef"}
}
## END environment variables configuration ##
##
## START modules configuration ##
## set these to avoid loading unneeded modules to conserve memory
##
set modules-load-policy = {{ }}
## END modules configuration ##
##
## START screen background configuration ##
## Set this to cover any non-fit of the emulator screen
##
set pref-screen-background-type=solid-color
set pref-screen-background-color=black
## END screen background configuration ##
##
set exec-startup-commands = {"ns5250 -geometry 9999x9999+0+0 <Host> "}
## END /nstation/configs/defaults.dft

```

#####

NOTES:

- 1) This -geometry option is set to 9999x9999 so it works in any of the big 4 monitor resolutions.
- 2) <Host> = hostname to login to, could be an IP address

Below are the entries for the "PREF" file

#####

```

## START 5250 preferences file
## /nstation/userdata/SysDef/NS5250/pref
NS5250*27x132: enable
NS5250*ImageView: disable

```

```

NS5250*ColumnSeparator: disable
NS5250*KeyRemap: disable
NS5250*ColorMap: basic
NS5250*KeyPad: disable_and_hide
NS5250*PlayBack: enable
NS5250*Control: enable
NS5250*Edit: enable
NS5250*LocalPrint: enable
NS5250*ChangeIPAddress: enable
NS5250*Command: enable
NS5250*Keymap101Path: 0
NS5250*Keymap102Path: 0
NS5250*Keymap122Path: 0
NS5250*ColorMapPath: 0
NS5250*PlayBackPath: 0
NS5250*DefaultColorMapPath: 0
## END 5250 preference file

```

```
#####
```

NOTE:

The /nstation/userdata/NS5250/pref file is normally managed by NSM and is the global or system wide defaults file. It is an ASCII file that can be edited. However, care must be taken so as not inject any erroneous characters at the end of the line and file. It is NOT normally edited on systems that are using NSM.

Template For Replacing PC Running Windows

This is the information to enable bringing up a full screen WinCenter session. In effect, all Network Station screens will essentially look and behave like the WinCenter console.

To accomplish this configuration:

- ACTLogin is NOT used
- The native window manager is NOT used
- Only one session can be started at a time
- If the session dies, the NC must be rebooted
- Requires changes to one file
 - defaults.dft
- The NC must be rebooted for any changes to be in effect

Below are the entries for the "defaults.dft" file

```
#####
```

```

## START /nstation/configs/defaults.dft
## WinCenter template definition
##

```

```

## START TCP/IP configuration ##
## Either use name-local-cache stanza or other three lines
## Comment out one of the choices below
set tcpip-name-server-protocol = dns
set tcpip-name-servers[-1] = {"1.2.3.2"}
set tcpip-dns-default-domain = austin.ibm.com
set tcpip-name-local-cache = {
#     { bigsmile 1.2.3.232 }
#     { bigeasy 1.2.3.248 }
#     { localhost 127.0.0.1 }
#     { sorry 1.2.3.211 }
}
## END TCP/IP configuration ##
##
## START environment variables configuration ##
## Have to set these since ACTLogin is not being used
## The PATH for these values may be different between platforms
##
set pref-environment = {
    {"PATH" "/nstation/mods"}
    {"HOME" "/nstation/"}
    {"BOOTPATH" "/nstation/"}
    {"LANGID" "ENU" }
    {"MRIPATH" "MRI2924"}
    {"NSM_PROD_SYSDEFAULTS" "/nstation/ProdData/SysDef"}
    {"NSM_ADMIN_SYSDEFAULTS" "/nstation/UserData/SysDef"}
}
## END environment variables configuration ##
##
## START modules configuration ##
## set this to be empty avoid loading unneeded modules to conserve memory
##
set modules-load-policy = {{ }}
## END modules configuration ##
##
##START command to execute configuration ##
set exec-startup-commands = {
    {"wincenter <Host> -depth 4 -resolution fullscreen -noaudio " }
}
##
## END command to execute configuration ##
## END /nstation/configs/defaults.dft

```

#####

NOTES:

1. The TCP/IP information may not need to be set if TCP/IP is already working properly. If it is NOT already set, then modify the values in defaults.dft as appropriate. Otherwise, remove the entire sub-section.
 2. <Host> = hostname to login to, could be an IP address The <Host> value must be placed as shown in the command example. It cannot be placed elsewhere within the command string.
 3. The user will be returned to the WinCenter login screen if they exit or log out of WinCenter without needing to reboot the NC.
-

Template For Replacing UNIX/CDE Terminals

This is the information to enable bringing up a full screen UNIX session. In effect, all Network Station screens will essentially look and behave like a UNIX console.

To accomplish this configuration:

- ACTLogin is NOT used
- The native window manager is NOT used
- Only one session can be started at a time
- If the session dies, the NC must be rebooted
- Requires changes to one file
 - defaults.dft
- The NC must be rebooted for any changes to be in effect

Below are the entries for the "defaults.dft" file

#####

```
## START /nstation/configs/defaults.dft
## UNIX Login template definition
##
## START TCP/IP configuration ##
## Either use name-local-cache stanza or other three lines
## Comment out one of the choices below
set tcpip-name-server-protocol = dns
set tcpip-name-servers[-1] = {"1.2.3.2"}
set tcpip-dns-default-domain = austin.ibm.com
set tcpip-name-local-cache = {
#     { bigsmile 1.2.3.232 }
#     { bigeasy 1.2.3.248 }
#     { localhost 127.0.0.1 }
#     { sorry 1.2.3.211 }
}
## END TCP/IP configuration ##
##
## START environment variables configuration ##
## Have to set these since ACTLogin is not being used
##
set pref-environment = {
```

```

    {"PATH" "/nstation/mods"}
    {"HOME" "/nstation/"}
    {"BOOTPATH" "/nstation/"}
    {"LANGID" "ENU" }
    {"MRIPATH" "MRI2924"}
    {"NSM_PROD_SYSDEFAULTS" "/nstation/ProdData/SysDef"}
    {"NSM_ADMIN_SYSDEFAULTS" "/nstation/UserData/SysDef"}
}
## END environment variables configuration ##
##
## START modules configuration ##
## set this to be empty avoid loading unneeded modules to conserve memory
##
set modules-load-policy = {{ }}
## END modules configuration ##
##
##START command to execute configuration ##
set exec-startup-commands = {{ "login <Host>" }}
## END command to execute configuration ##
## END /nstation/configs/defaults.dft

```

#####

NOTES:

- 1) The TCP/IP information may not need to be set if TCP/IP is already working properly.
If it is NOT already set, then modify the values in defaults.dft as appropriate.
Otherwise, remove the entire sub-section.
- 2) <Host> = hostname to login to, could be an IP address
- 3) The user will be returned to the UNIX login screen if they exit or log out of UNIX without needing to reboot the Network Station.
- 4) The template assumes that the target UNIX host is running a window manager such as Motif or CDE.

[Template For Navio full screen session](#)

This is the information to enable bringing up a full screen Navio browser session.
In effect, all Network Station screens will essentially look and behave like a browser only session.

To accomplish this configuration:

- ACTLogin is NOT used

- The native window manager is used
- Only one session can be started at a time
- If the session dies, the NC must be rebooted
- Requires changes to one file
 - defaults.dft

The NC must be rebooted for any changes to be in effect

Below are the entries for the 'defaults.dft' file

#####

```

## START /nstation/configs/defaults.dft
## Navio template definition
##
## START TCP/IP configuration ##
## Either use name-local-cache stanza or other three lines
## Comment out one of the choices below
set tcpip-name-server-protocol = dns
set tcpip-name-servers[-1] = {"1.2.3.2"}
set tcpip-dns-default-domain = austin.ibm.com
set tcpip-name-local-cache = {
#     { bigsmile 1.2.3.232 }
#     { bigeasy 1.2.3.248 }
#     { localhost 127.0.0.1 }
#     { sorry 1.2.3.211 }
}
## END TCP/IP configuration ##
##
## START environment variables configuration ##
## Have to set these since ACTLogin is not being used
## The PATH for these values may be different between platforms
##
set pref-environment = {
    {"PATH" "/nstation/mods"}
    {"HOME" "/nstation/"}
    {"BOOTPATH" "/nstation/"}
    {"LANGID" "ENU" }
    {"MRIPATH" "MRI2924"}
    {"NSM_PROD_SYSDEFAULTS" "/nstation/ProdData/SysDef"}
    {"NSM_ADMIN_SYSDEFAULTS" "/nstation/UserData/SysDef"}
    {"SOCKS_HOST" "<socks server>"}
    {"SOCKS_PORT" "1080"}
    {"HOME_PAGE" "http://<somehost>/<somepage>"}
}
## END environment variables configuration ##
##
## START modules configuration ##
## set this to be empty avoid loading unneeded modules to conserve memory
##
set modules-load-policy = {{ }}

```

```

## END modules configuration ##
##
##START commands to execute configuration
set exec-startup-commands = {
    { wm }
    {"navio -geometry <resolution>+0+0 <Host> "}
}
## END /nstation/configs/defaults.dft

```

#####

NOTES:

1) The TCP/IP information may not need to be set if TCP/IP is already working properly. If it is NOT already set, then modify the values in defaults.dft as appropriate. Otherwise, remove the entire sub-section.

2) Use the following table to determine the exact parameter to use based upon desired screen resolution.

Display Resolution	set exec-startup-command={{ }}
640x480	"navio -geometry 640x480+0+0 <Host>"
800x600	" navio -geometry 800x600+0+0 <Host>"
1024x768	"navio -geometry 1024x768+0+0 <Host>"
1280x1024	"navio -geometry 1280x1024+0+0 <Host>"

3) <Host> = hostname to login to, could be an IP address

4) <socks server> = Your socks host. Comment out the line if not applicable

5) <somehost> and <somepage> = A default HOME page to start the browser with

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