IBM Network Station

IBM Network Station Manager Installation and Use November 1998

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SC41-0664-02

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Note

Before using this information and the product it supports, be sure to read the information in “Appendix H. Notices” on page 383.

Third Edition (November 1998)

This edition applies to version 1, release 3, modification 1 of IBM Network Station Manager (product number 5648-C05) and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces SC41-0664-01.

Contents

About IBM Network Station Manager Installation and Use (SC41-0664)

How to Use this Book

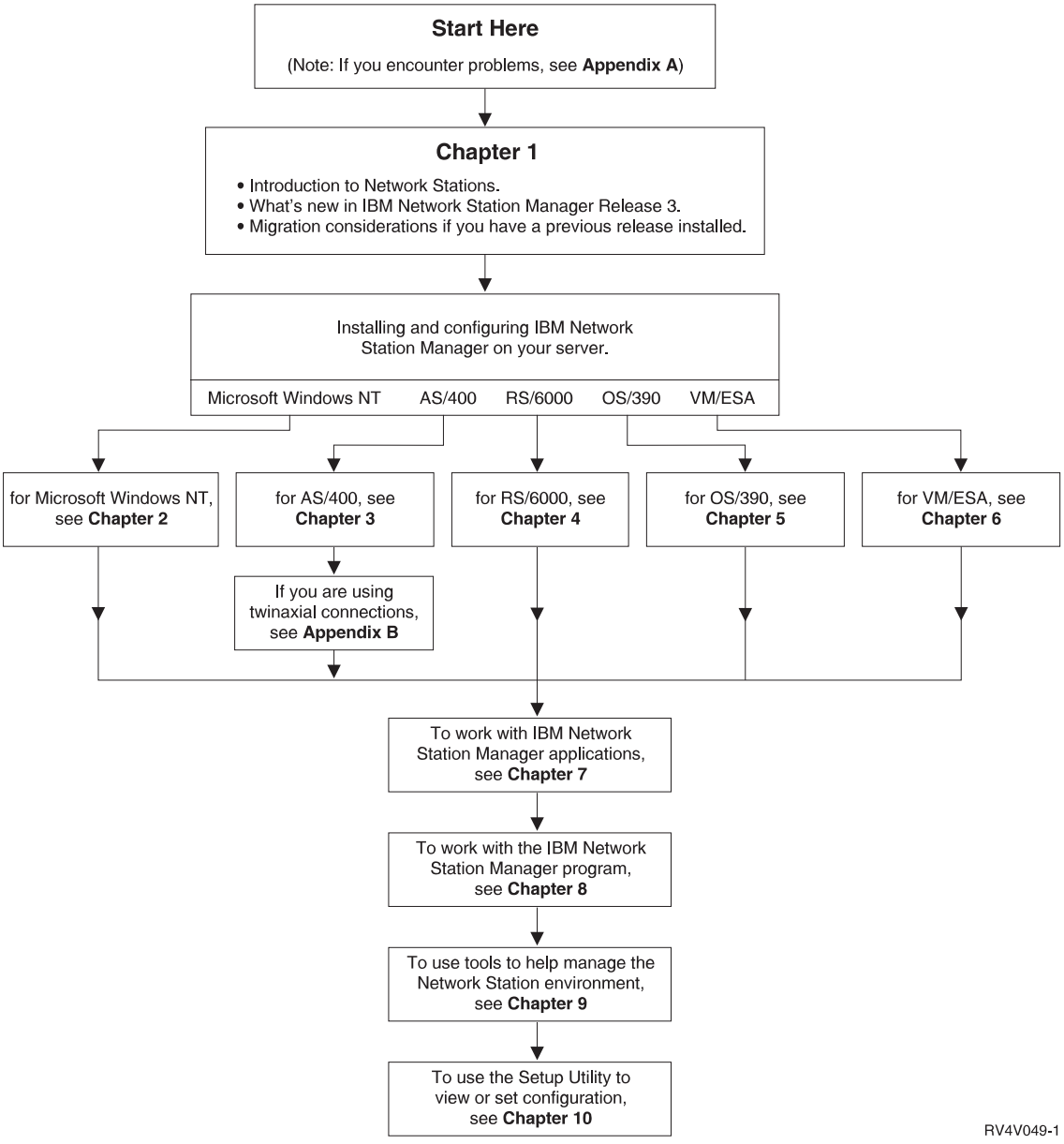

Figure 1. How to Use this Book

Who should read this book

This information is intended for the person who is installing and administering the IBM Network Station Manager.

Information Available on the World Wide Web

You can obtain the latest version of this book on the World Wide Web from the following URL:

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Chapter 1. Understanding the Network Station

What Is the Network Station?

Traditionally, the user's interface with the server has been either the nonprogrammable workstation or the personal computer (PC). The IBM Network Station network computer (hereafter referred to as Network Station) offers an attractive alternative to traditional methods of network computing. Individual diskless workstations connect to a server (or series of servers), and you can manage them centrally with the IBM Network Station Manager program.

Using a Network Station is similar to using a PC. The Network Station uses a keyboard, mouse, and display. The biggest difference is that the Network Station files reside on a network server rather than on a hard drive inside of each user's machine. The Network Station presents a graphical user interface (GUI), which provides the user access to many resources. Network Stations can access the following kinds of resources:

- 5250 emulator
- 3270 emulator
- Remote X applications
- Web browser

- Java applets or applications
- Windows NT applications
- Local and remote printers

The Network Station communicates using Transmission Control Protocol/Internet Protocol (TCP/IP) over a token-ring, Ethernet, or twinaxial connection to the server. Each Network Station runs the common client program, and the server runs the IBM Network Station Manager program and several other application programs.

How Do Network Stations Work?

Figure 2 shows what happens when you power on an IBM Network Station.

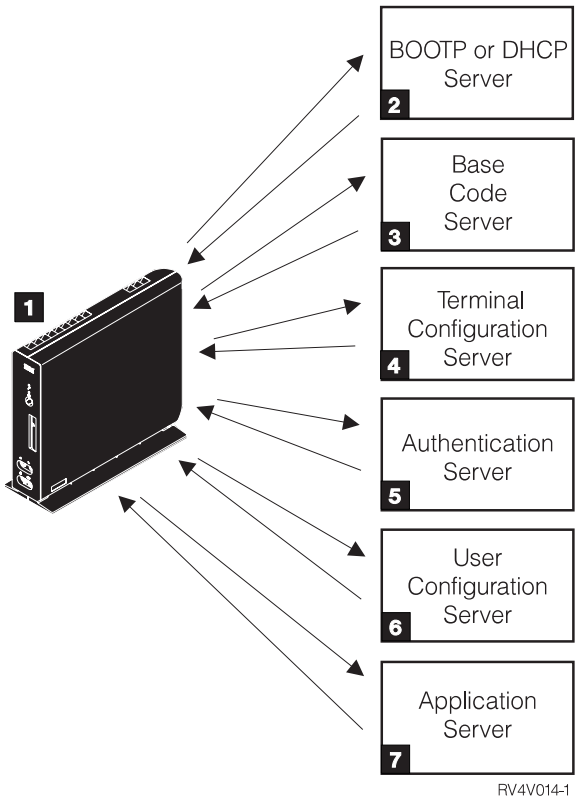


Figure 2. Network Station Power-On Sequence

1 A non-volatile random access memory (NVRAM) resident boot monitor program is started. The Network Station automatically runs a series of power-on self tests (POST).

2 The Network Station contacts a BOOTP or DHCP boot server. The Network Station exchanges its media access control (MAC) address for the IP address that is provided

by the server. The boot server also provides the address or path of the base code server. The Network Station may alternatively retrieve this information from values that are stored in its NVRAM.

3 The Network Station downloads the base code from the base code server using trivial file transfer protocol (TFTP) or network file system (NFS).

4 The Network Station downloads the terminal-based configuration information from the terminal configuration server.

5 The Network Station presents a log-on screen. When the user enters a userid and password, the authentication server verifies the user's identification.

6 The user's configuration server downloads and initiates the personalized environment preferences of the user.

7 The Network Station displays the personalized desktop of the user. The user accesses applications on the servers where they reside.

The IBM Network Station Manager program allows you to set and change configurations for Network Stations and Network Station users. Your HTTP server makes the IBM Network Station Manager program available to your Web browser. See "Chapter 8. Using the IBM Network Station Manager Program" on page 245 for more information about the IBM Network Station Manager program.

Each Network Station contains a simple network management protocol (SNMP) agent as part of its operating system. An SNMP manager at a central location can communicate and exchange information with the agent on a Network Station. You can use this information to manage your network environment. SNMP is an industry-standard protocol for network management. See "Collecting Hardware Information Using the Inventory Server" on page 140 for information about using SNMP to collect hardware information for Network Stations that are attached to AS/400 servers.

Each Network Station can display the IBM Network Station Setup Utility. The IBM Network Station Setup Utility allows you to **View** or **Set** (change) configuration settings on a particular Network Station. For example, you can view the MAC address or set the monitor resolution of the Network Station. See "Chapter 10. Working With the IBM Network Station Setup Utility" on page 301 for more information.

After the Network Station base code is loaded, the User Services programs become available. User Services are programs that provide users with tools to manage the Network Station's operational environment. Listed below are some of the user services:

- Monitoring messages applicable to a specific Network Station
- Locking your screen (with password control)
- Monitoring statistics (for example, how much memory is available on a specific Network Station)

See “Chapter 9. Working with User Services” on page 297 for more information on User Services.

What Do I Need To Know About TCP/IP Networks?

In order for the Network Station to communicate with your servers, you need a TCP/IP network. If you understand your TCP/IP network, installing and configuring your Network Station and IBM Network Station Manager program is much easier. To help understand your network, you should draw a diagram of your network.

Refer to the network examples in this section to help you understand how to configure your network. Choose the network example that most closely resembles your network diagram. Refer to these examples as you go about configuring and installing Network Stations on your network. If you are going to be using twinaxial Network Stations, see “Appendix B. Twinaxial Network Stations” on page 347.

Note: You do not need to be an expert in order to set up a TCP/IP network. However, you should have an understanding of basic TCP/IP. A detailed introduction to TCP/IP is beyond the scope of this book. If you need to improve your understanding of TCP/IP, you can contact your IBM sales representative, who has information about classes in your area.

LAN Network Examples

LAN Network Example 1

Figure 3 on page 5 shows an example of a network diagram in which two Network Stations are connected over a simple local area network (LAN).

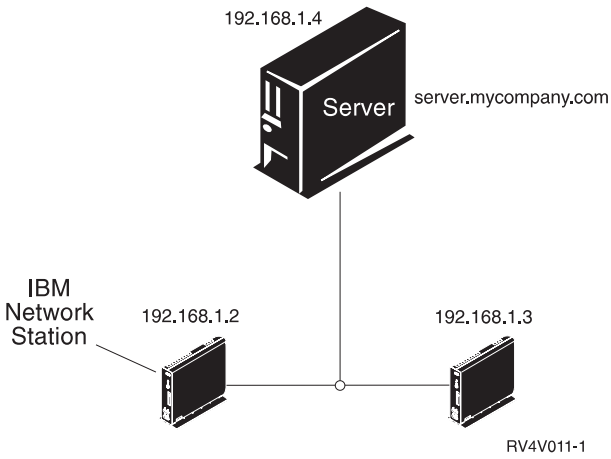


Figure 3. Two Network Stations Connected to the Server over a Simple LAN

LAN Network Example 2

Figure 4 on page 6 shows an example of a network diagram in which two Network Stations are connected to the server over a local LAN. Two more Network Stations connect to the server through a router over a remote LAN.

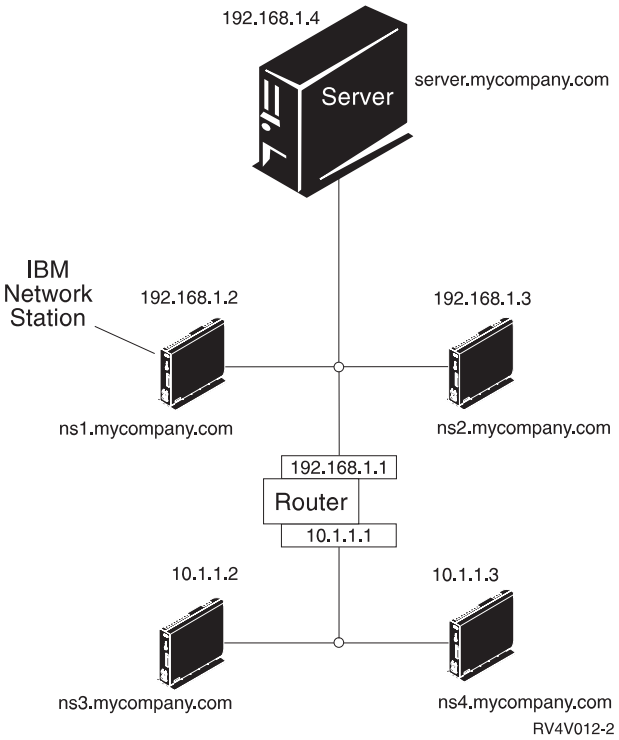


Figure 4. Two Network Stations Connected to the Server over a Local LAN and Two Network Stations Connected to the Server through a Router over a Remote LAN

LAN Network Example 3

In Figure 5 on page 7, additional Network Stations connect to the server using both Ethernet and token-ring connections. Two token-ring LANs connect via a router. A Domain Name Server also connects to the network.

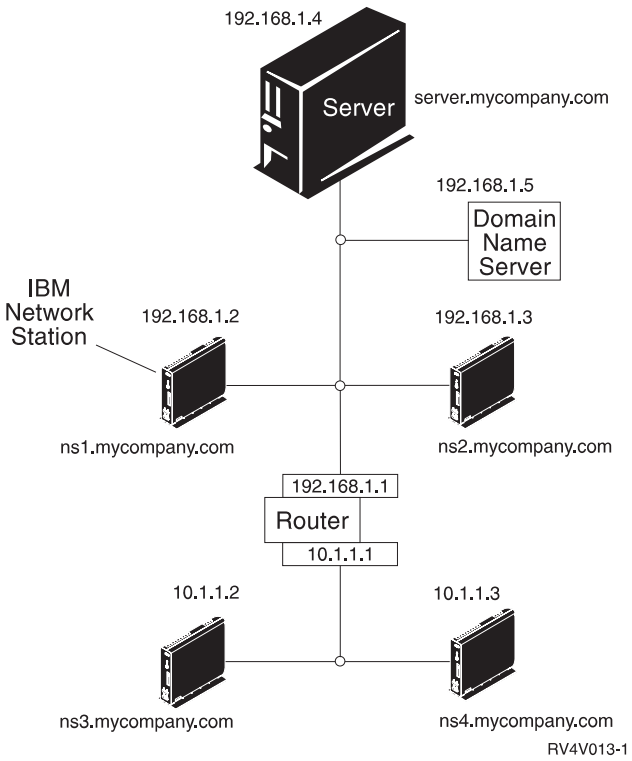


Figure 5. Four Network Stations Connected to a Network Using a Router and a Domain Name Server

MAC Addresses

Every Network Station comes with a unique identifying number that can be used to keep track of which IP address has been assigned to it. Media access control (MAC) addresses of each Network Station are assigned by manufacturing and hard-coded into the machine. The MAC address of a Network Station is on the side panel of the small box in which the logic unit is packaged (see Figure 6 on page 8). If you no longer have the box, see “Finding the Default MAC Address” on page 306 for instructions on how to find the MAC address.

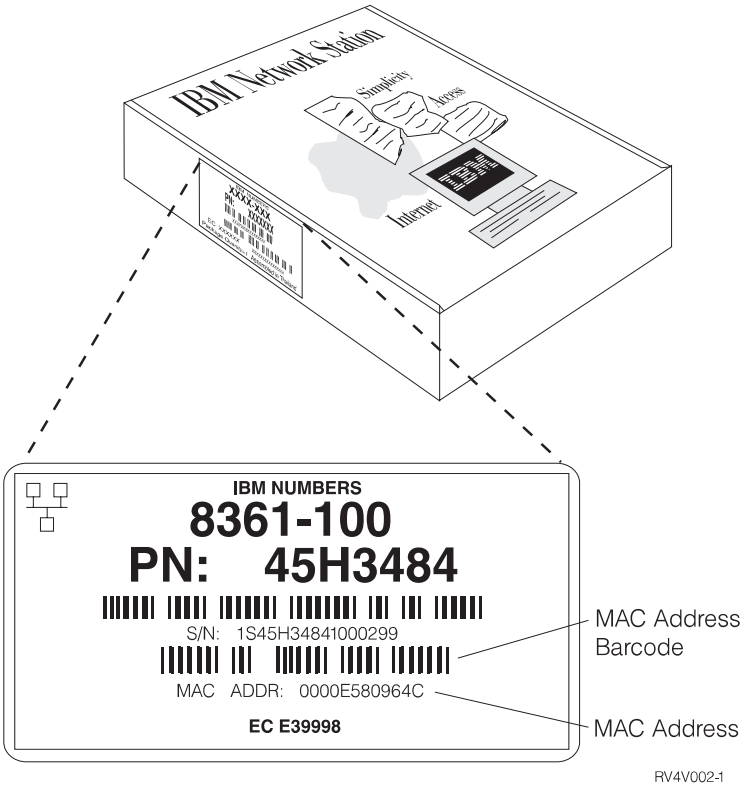


Figure 6. MAC Address on the Box

You can override the burned-in MAC address with a customer-assigned MAC address. See “Specifying a User-Configurable MAC Address” on page 307 for instructions on how to override the burned-in MAC address.

IP Addresses

Internet Protocol (IP) addresses are numbers that are assigned to devices on a network (or on the Internet). IP addresses allow computers to communicate through TCP/IP. IP addresses consist of four numbers (from 0 to 255) that are separated by periods, for example 192.168.1.1. The numbers that are separated by periods indicate the network to which a computer belongs and the specific location of the host computer within that network.

IP addresses are not just for computers such as Network Stations, but also for routers, servers, and even subnets and networks themselves. For example, the IP address of a network might be 192.168.1.0. A router on that network might use the IP address 192.168.1.1. A Network Station on the same network might have the address 192.168.1.145.

Each Network Station must have a unique IP address. If you are using the DHCP boot method, you must specify a range of IP addresses so that the server can assign an address to each Network Station. For intranets (networks within your own organization), you can assign your own addresses. However, if you want to connect to the Internet, a central authority must officially assign the network addresses and domain names. At the time of this writing, the authority is as follows:

```
Network Solutions, Inc.
InterNIC Registration Services
505 Huntmar Park Drive
Herndon, VA 22070
1-703-742-4811
E-mail: hostmaster@internic.net
WWW: http://rs.internic.net
```

Subnets and Subnet Masks

A subnet is a division within a computer network. Some administrators of large networks need to divide their networks into subnetworks (or subnets). Subnets allow certain groups of users to share access to certain files or resources. Other administrators divide their networks in order to make the most efficient use of a relatively small address pool. Most small networks do not require subnetting. A basic introduction to subnets and subnet masks is in the paragraphs that follow. You should read this discussion only if it is up to you to subnet your network or to find out the subnet mask.

The subnet mask is a value that allows the system to determine which are the network parts and which are the host parts of an IP address. In IP addressing, there are many different subnet masks. Sometimes the first six digits of an IP address indicate the network; other times the first nine digits indicate the network. The subnet mask is the code that determines which digits indicate the network and which indicate the host.

Later in the book, you will record your network's subnet mask on a table. If you belong to a large subnetted network that someone else set up, you can ask that person for the subnet mask value. If you know that your network is not subnetted, use the following table to find your subnet mask.

Remember: You should use Table 1 only if you are sure that your network is **not** subnetted.

Table 1. Subnet Mask Default Values According to Network Class

Network Type	Left-Most Value of IP Address	Subnet Mask Default
Class A	0 through 126	255.0.0.0
Class B	128 through 191	255.255.0.0
Class C	192 through 223	255.255.255.0

An IP address such as 192.168.1.2 is really a dotted decimal expression of a 32–bit binary value. In binary numbers, 192.168.1.2 is expressed as 11000000.10101000.00000001.00000010. Each set of eight numbers (0 or 1)

represents eight bits of the IP address. Every IP address contains some bits that identify it as belonging to a particular network. The other bits identify a single host (such as a Network Station) along the network.

Most networks fall into one of three classes: Class A, Class B, or Class C. As Table 1 on page 9 shows, the network's class can be determined by examining the first eight bits of the network's IP address. When expressed in dotted decimal notation, those first eight bits are the leftmost number of the address, the number that comes before the first dot. In Class A networks, the first eight bits are expressed in decimal as a number from 1 to 126. For Class B networks, that number ranges from 128 to 191. For Class C networks, the value of the first eight bits of the IP address ranges from 192 to 223.

The class of the network determines how much space is available for subnetting. For example, in a Class A network, the network portion of the address is only the first eight bits. In other words, the first eight bits are all that is necessary to indicate the network to which the IP address belongs. That leaves the remaining 24 bits to serve as pointers toward the subnet and the individual hosts that lie on the network. In this discussion, host means any device that has a unique IP address including Network Stations. The IP address of a Class A network is `network.host.host.host`. The `host.host.host` does not indicate three separate hosts, but rather that three eight-bit segments a(or 24 bits) are required to indicate a single host on the network. Obviously, there can be only a very small number of true Class A networks. In fact, there are only 126 such networks. Most of these belong to large corporations or universities, which acquired their Class A networks in the early days of the Internet when network addresses were plentiful. All Class A network addresses are all assigned.

In a Class B network, the first 16 bits of an IP address indicate the network while the remaining 16 are available for subnetting. IP addresses that belong to Class B networks are `network.network.host.host`.

In a Class C network, the first 24 bits indicate the network, while only the last eight can be used for subnetting or to identify the host. IP addresses that belong to Class C networks are `network.network.network.host`. Class C networks are the most common type of network.

You must know more than the class of the network to determine how an IP address is deciphered. When you subnet a network, it is not always apparent what subnet a device belongs to unless you know the subnet mask. For example, given the Class C IP address 192.168.1.45, you know that the network to which the device belongs is 192.168.1.0. You can tell this by applying the simplified formula `network.network.network.host`. However, you do not know how the network is subnetted or to what subnet the device belongs. Additionally, the class of the network is not always apparent. The subnet mask allows you to determine all of these things.

Like IP addresses, subnet masks are 32–bit values expressed in dotted decimal notation. The subnet mask 255.255.255.0 is expressed in binary as 11111111.11111111.11111111.00000000. A binary 1 in the subnet mask indicates that the corresponding bit in the IP address is treated as part of the network address. Using Boolean algebra, if you perform an ″AND″ operation on the binary IP address and subnet mask, the result is the IP address of the network. In Boolean algebra, the ″AND″

function means that if both numbers are 1's, the result is 1. If either number is not a 1, the result is 0. For example, given the IP address 192.168.1.2 and the subnet mask 255.255.255.0, the ″AND″ operation is as follows:

```
11000000.10101000.00000001.00000010 = IP add. 192.168.1.2
11111111.11111111.11111111.00000000 = Subnet Mask 255.255.255.0
11000000.10101000.00000001.00000000 = Subnet add. 192.168.1.0.
```

You can think of the subnet mask as a code for deciphering what an IP address means. You can use Table 2 to determine how many subnets are indicated by specific eight-bit mask values. For example, if you see the address 192.168.1.35 and you know that the subnet mask of the Class C network to which that address belongs is 255.255.255.128, you know how to decipher the address. By using Table 2, you can say that the network address is 192.168.1.0 and that the host whose IP address ends in .35 belongs to the first of two subnets.

To put it more simply, the network address 192.168.1.0 means that devices whose adresses begin with 192.168.1 belong to the 192.168.1 network. The first 24 bits of the address indicate the network, and the last eight bits of the address indicate the subnet and host. The way that you arrived at this distinction was by applying the subnet mask. Because the subnet mask ends in 128, you know that the network is broken into two subnets. If you want to divide the Class C network 192.168.1.0 into two subnets, you should use a subnet mask of 255.255.255.**128**. The first 24 bits of the address indicate the network. The last eight bits of the address indicate the hosts.

Since the maximum value of each eight bits is 11111111 in binary or 255 in decimal, there are, theoretically, 255 possible hosts in the two subnets. Therefore, the theoretical number of possible hosts per subnet is 255 hosts that are divided by two subnets, or 128 hosts per subnet. You could theoretically use the IP addresses 192.168.1.**0** through 192.168.1.**127** for the first subnet and 198.165.1.**128** through 192.168.1.**255** for your second subnet. In reality, you would have to give up some of these addresses. The first and last addresses in each subnet have special values. You cannot assign the first and last addresses to any devices on the network. The first address in each subnet is the subnet address; the last address is the broadcast address. Therefore, the true range of your addresses is 192.168.1.**1** to 192.168.1.**126** and 192.168.1.**129** to 192.168.1.**254**.

If you need to subnet a Class C network, the way in which you specify the last eight bits of the subnet mask determines how you divide your network. Table 2 shows the number of available subnets according to the value that is given to an eight-bit subnet mask in a Class C network.

Table 2. Subnet Mask Values For Class C Addresses

Subnet Mask	Binary Value	Number of Subnets	Number of Hosts Per Subnet
255.255.255.0	00000000	1	254
255.255.255.128	10000000	2	126
255.255.255.192	11000000	4	62
255.255.255.224	11100000	8	30
255.255.255.240	11110000	16	14

Table 2. Subnet Mask Values For Class C Addresses (continued)

Subnet Mask	Binary Value	Number of Subnets	Number of Hosts Per Subnet
255.255.255.248	11111000	32	6
255.255.255.252	11111100	64	2
255.255.255.254	11111110	128	0
255.255.255.255	11111111	254, Do not use on Class C networks	0

Suppose that you want to break the same Class C network into four subnets instead of two. Using Table 2 on page 11, you choose the subnet mask 255.255.255.192. You can then configure a network with 248 hosts on four subnets. Since 248 hosts divided by four subnets equals 62, you could have 62 hosts on each of your four subnets. You can create a table for planning your network that looks like Table 3.

By planning ahead, you should allocate IP and mask addresses to anticipate a maximum number of controllers and Network Stations. If you do not do this and your network environment changes, you will have to reallocate your initial assignments. Then your initial devices will receive different IP addresses.

Table 3. Subnet Mask 255.255.255.192 Example

Subnet	IP Address	Comments
1st Subnet	192.168.1.0	Network Address (not assigned to any host)
1st Subnet	192.168.1.1	Network Station #1
1st Subnet	192.168.1.2	Network Station #2
. . .	. . .	. . .
1st Subnet	192.168.1.62	Network Station #62
1st Subnet	192.168.1.63	Broadcast Address (not assigned to any host)
2nd Subnet	192.168.1.64	Network Address (not assigned to any host)
2nd Subnet	192.168.1.65	Network Station #63
2nd Subnet	192.168.1.66	Network Station #64
. . .	. . .	. . .
2nd Subnet	192.168.1.126	Network Station #124
2nd Subnet	192.168.1.127	Broadcast Address (not assigned to any host)
3rd Subnet	192.168.1.128	Network Address (not assigned to any host)
3rd Subnet	192.168.1.129	Network Station #125
3rd Subnet	192.168.1.130	Network Station #126
. . .	. . .	. . .
3rd Subnet	192.168.1.190	Network Station #186

Table 3. Subnet Mask 255.255.255.192 Example (continued)

Subnet	IP Address	Comments
3rd Subnet	192.168.1.191	Broadcast address (not assigned to any host)
4th Subnet	192.168.1.192	Network Address (not assigned to any host)
4th Subnet	192.168.1.193	Network Station #187
4th Subnet	192.168.1.194	Network Station #188
:	:	:
4th Subnet	192.168.1.254	Network Station #248
4th Subnet	192.168.1.255	Broadcast Address (not assigned to any host)

Of course, you could assign any network device to any IP address. We simply filled the Comment section of our sample tables with ″Network Station #X″ by way of illustration. In reality, you must devote IP addresses to routers, Domain Name Servers, and other devices on your network.

Class C networks are not the only networks to be subnetted. Class B networks are often subnetted. The only difference in subnetting a Class B network is that the network portion of its address is shorter (and its host portion is longer) than that of a Class C address. For example, the network portion of the Class B address 192.168.0.0 is 192.168. That leaves the last 16 bits (the 0.0) free for subnetting. To divide that network into two large subnets, you would use the subnet mask 255.255.192.0. That configuration results in the two subnets 192.168.**0.0** through 192.168.**127.0** and 192.168.**128.0** through 192.168.**254.0**.

Subnets are meaningful only to hosts on your physical network. Hosts outside of your network are concerned only with the network portion of the IP address. Routers inside your network apply the subnet mask to IP addresses to determine how to deliver information packets inside the network.

For more information about subnets, refer to the Redbook, *TCP/IP Tutorial and Technical Overview*, GG24-3376.

Boot Methods

Because a Network Station has no disk from which to boot, it must request information either from its own non-volatile-random-access memory (NVRAM) or from a server. The Network Station needs to find an IP address for itself. The IP address allows the Network Station to communicate with other hosts. The Network Station can use one of three methods to request and receive this information:

- Non-Volatile-Random-Access Memory (NVRAM)
- Bootstrap Protocol (BOOTP)
- Dynamic Host Control Protocol (DHCP)

Both the BOOTP and DHCP boot methods require a boot server. BOOTP servers can only respond to BOOTP clients, but DHCP servers can respond to both BOOTP and DHCP clients.

Table 4 shows the boot servers that are available on each platform.

Table 4. Boot Servers Supported by Various Operating Systems

	OS/390	**VM/ESA**	**OS/400**	**AIX**	**NT**
Boot Servers	DHCP	BOOTP, DHCP	BOOTP, DHCP	BOOTP, DHCP	DHCP

Note: If you use the BOOTP or DHCP boot methods, you must configure all routers and gateways in your network to send and receive BOOTP or DHCP packets. If you cannot configure your routers to be BOOTP or DHCP relay agents, you could do either of the following:

- Use an AIX or UNIX system that has the necessary configuration support to receive limited BOOTP or DHCP broadcasts. Then forward those broadcasts to the appropriate server.
- Use the NVRAM boot method for those Network Stations that are behind a router that cannot forward BOOTP or DHCP broadcasts.

NVRAM

Non-Volatile Random-Access Memory (NVRAM) refers to the local Network Station memory. When you use the NVRAM boot method, you code the IP addresses of the Network Station and its server into the memory of the individual Network Station. The Network Station powers on and requests the base code file download from the server.

The NVRAM boot method is most practical in small, stable networks. You may also choose to use the NVRAM boot method for one of the following reasons:

- As a method to avoid routers that block BOOTP and DHCP broadcast requests. BOOTP and DHCP broadcast requests for IP addresses can create unnecessary traffic on the network. Many network routers are configured not to pass these broadcast requests. Since NVRAM does not need to request its IP address (because it has been entered in the memory of the Network Station), it does not make the broadcasts.
- As an aid in finding and correcting problems with network connections.
- As an aid in finding and correcting problems with BOOTP or DHCP configurations.

This method may not work well for larger networks for the following reasons:

- You must enter setup data into each Network Station manually.
- DHCP and BOOTP can configure many more parameters (such as the DNS address) that cannot be easily configured with this method.

For information about how to configure NVRAM, see “Configuring an IBM Network Station to Boot from the NVRAM Setting” on page 309.

BOOTP

Bootstrap protocol (BOOTP) is a TCP/IP protocol that allows the Network Station to request an IP address and the location of the base code file from a server.

To use the BOOTP boot method, the network administrator must record the MAC addresses of all the Network Stations on the network. Then the network administrator assigns each of them an IP address. The administrator then enters those assignments on a BOOTP table. When you need to change IP addresses, you can do so centrally on the table in the boot server rather than individually on each Network Station.

When a Network Station powers on, it broadcasts its MAC address to the BOOTP server. The server looks up the IP address of the Network Station according to its MAC address. BOOTP then returns a reply that assigns the IP address for the Network Station and the name and location of the base code file.

Because BOOTP assigns IP addresses statically (fixing an IP address according to a computer's MAC address and then recording this assignment), it is less versatile than DHCP.

DHCP

Dynamic Host Configuration Protocol (DHCP) is also a TCP/IP protocol. DHCP provides a way for a server to automatically allocate IP addresses and configuration information without forcing the administrator to record and track the MAC addresses of the networked computers. DHCP is capable of assigning either a permanent IP address or a temporary IP address for every host or Network Station within a predetermined range of IP addresses. It is also capable of assigning IP addresses either statically or dynamically.

The static assignment is similar to the way BOOTP allocates IP addresses. You define the MAC address of every Network Station in the DHCP server configuration along with an IP address, which is reserved for the station with this MAC address. When the Network Station sends a request into the DHCP server, identifying itself by its MAC address, the server returns the IP address that it has reserved for that client.

In dynamic IP address assignment, the server still identifies a Network Station by its MAC address. However, instead of using a fixed IP address, it allocates any address out of the available pool. The server leases the address to the Network Station for a specified period of time. The address returns to the pool either when the client releases it or when the lease runs out.

DHCP can allow for unlisted clients. Any client, even if its MAC address is not defined in the DHCP configuration, may request an IP address from the pool of available addresses. The use of unlisted clients might be appropriate in an environment in which it is not necessary or preferable to keep track of MAC addresses.

While BOOTP servers can handle requests only from BOOTP clients, DHCP can handle requests from both DHCP and BOOTP clients.

DHCP servers (unlike BOOTP servers) can reuse IP addresses that are not currently being used.

Finally, DHCP provides a large set of configuration options, including user-defined options. These options configure many advanced network environments. See “Taking Advantage of Multiple Server Environments” on page 18 for more information.

TFTP or NFS for Boot File Service

The Network Station can use either of two protocols to receive the base code file from the base code server. The protocol that you use may depend on the operating system platform of your base code server (see Table 5).

Trivial file transfer protocol (TFTP) is a simple protocol that is used to transfer files. TFTP is available on every platform.

The network file system (NFS) makes files and directories available to clients. NFS is generally more reliable than TFTP.

Table 5. Protocols Supported by Various Operating Systems

	OS/390	**VM/ESA**	**OS/400**	**AIX**	**NT**
Protocols	TFTP, NFS	TFTP, NFS	TFTP	TFTP, NFS	TFTP, NFS

Java on the Network Station

Java is a programming language that is designed to bridge the gap between different platforms. Java’s imperative, ″Write once, run anywhere,″ refers to its portability and to the ability of a single Java program to run on different platforms. To view Java applications, you need a bundle of Java-enabling programs called a Java Virtual Machine (JVM). Using the JVM on diskless clients such as the Network Station allows the user to access applications without using permanent disk space either on the Network Station or on the server. You can download a JVM from servers, making it possible to start and configure Java programs.

There are two kinds of Java programs:

- Applets — require a browser or applet viewer
- Applications — display directly

The first variety, applets, rely on a browser or applet viewer to provide windows and graphical layout. In general, the browser does not trust applets since they are downloaded across the Internet. In other words, the browser can restrict applets from reading or writing to local files and from connecting to machines other than those from which they are downloaded. These restrictions protect users from virus-contaminated programs and provide a safe environment for examining programs on the Internet.

The Network Station can run Java applets and applications. Only a single Java application can run within the Network Station. When a Java application is running, it precludes applets from running, both on the desktop and in the browser.

For more information about Java, see the following Web sites:

- `http://www.javasoft.com`
- `http://www.ibm.com/java`

Windows Applications on the Network Station

Network Stations can run Windows applications through the use of a multi-user Windows server. There are several products that can provide a multi-user Windows server:

- Citrix WinFrame is a multi-user Windows application server based on Windows NT 3.51. Citrix WinFrame communicates to the Network Station using the independent computer architecture (ICA) protocol.
- NCD WinCenter is an multi-user Windows application product that requires Citrix WinFrame. NCD WinCenter communicates to the Network Station using the X11 protocol.
- Citrix MetaFrame is a multi-user Windows application product that requires Microsoft Windows NT Server 4.0, Terminal Server Edition. Citrix MetaFrame communicates to the Network Station using the ICA protocol.

Network Stations that boot from a Release 2.5 IBM Network Station Manager licenced program server can communicate to a multi-user Windows server using the X11 protocol. Network Stations that boot from a Release 3 IBM Network Station Manager licenced program server can communicate to a multi-user Windows server using the X11 protocol or the ICA protocol.

For more information see the following Web sites:

- WinFrame and MetaFrame - http://www.citrix.com
- WinCenter - http://www.ncd.com
- Windows NT Server 4.0, Terminal Server Edition - http://www.microsoft.com

Network Station Memory Requirements

Network Stations download each of their appplications including their base systems into memory. You should verify that your Network Stations have enough memory to run their applications. Use the table at
http://www.pc.ibm.com/networkstation/support/memrec_data.html to determine how much memory your Network Stations need.

Taking Advantage of Multiple Server Environments

You can install the IBM Network Station Manager licensed program on multiple computer systems. Each of these computer systems can perform specific server roles. On any particular computer, the IBM Network Station Manager program can perform more than one server role. A brief description of each server role follows:

BOOTP/DHCP Server
The BOOTP or DHCP server provides the Network Station with information such as its IP address, the base code server address, and the address of the terminal configuration server. You can change these addresses on DHCP servers. See “Load Balancing Example” on page 19 for an example of how to specify a different address for the base code server and terminal configuration server. You do not need to install the IBM Network Station Manager program on this server.

Base Code Server
The IBM Network Station Manager program on this server provides the operating system and the application programs that are downloaded to the Network Stations. You do not use this server to configure Network Stations.

Terminal Configuration Server
The IBM Network Station Manager program on this server provides terminal-based configuration settings. The IBM Network Station Manager program manages these settings. Examples of items to configure on this server are a printer that is attached to the Network Station or the Network Station’s keyboard language. The address of the terminal configuration server is the same as the address of the base code server by default. The inventory server (AS/400 only) runs on this server.

Authentication Server
The IBM Network Station Manager program on this server provides user authentication (where the user logs in) and user-based configuration settings. The IBM Network Station Manager program manages these settings. Examples of what you might configure on this server are a user’s start-up programs or a user’s browser preferences. The address of the authentication server is the same as the address of the base code server by default. See “Roaming User Example” on page 19 for an example of how to specify a different address for the authentication server.

Some examples when you might want to take advantage of multiple servers, are as follows:

- A user from Chicago is visiting New York and expects to sign on and use the same configuration that he has at home. For more information, see “Roaming User Example” on page 19.
- All users power on their IBM Network Station at 8:00 AM and create network congestion. For more information, see “Load Balancing Example” on page 19.

Note: All servers must be running version 1 release 3 of the IBM Network Station Manager licensed program for these examples to work.

Roaming User Example

Figure 7 shows how multiple servers can allow visiting users to obtain their home configurations.

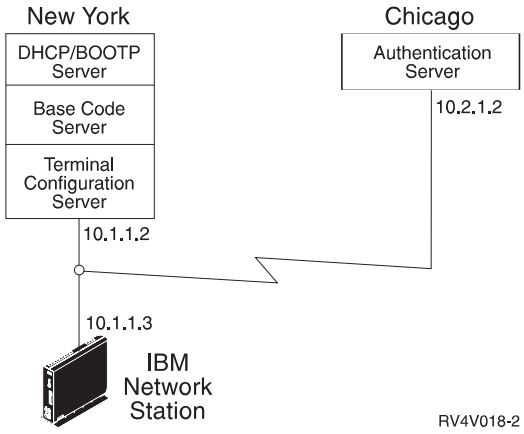


Figure 7. Roaming User Example

In the case of a user from Chicago visiting New York, one server is in Chicago, and one server is in New York.

The server in New York provides the following information:

- The IBM Network Station IP address
- The operating system and applications
- The terminal-based configuration information
- A log-on dialog

The visiting user selects the **Roam** button on the login dialog. The user then enters the name or address of the Chicago authentication server (10.2.1.2).

The Chicago authentication server provides the following information:

- The authentication of the user
- The user-based configuration information

The IBM Network Station Manager program on the server in New York manages the terminal-based configuration information. The IBM Network Station Manager program on the server in Chicago manages the user-based configuration information.

Load Balancing Example

Figure 8 on page 20 shows how multiple servers can reduce network congestion when a large number of Network Stations power on simultaneously. The administrator installs the IBM Network Station Manager program on multiple servers that act as base code servers.

This distributes copies of the large executable files (operating system and applications) across servers. You can use DHCP to configure groups of Network Stations to access different base code servers.

Note: There is no way to separate the base code server from the terminal configuration server when using BOOTP. You can only do this by using DHCP.

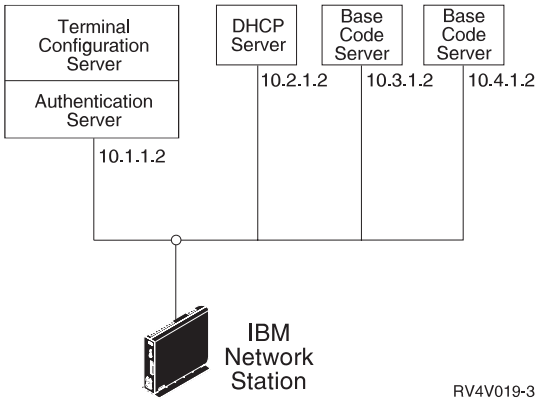


Figure 8. Load Balancing Example

This example uses four systems to divide up the work load:

- Two Windows NT systems are performing the role of base code servers (host 10.3.1.2, the base code server that we use in our example, and host 10.4.1.2). This example uses two base code servers to divide the work load. Any number of base code servers is possible.
- A RS/6000 system is performing the role of a DHCP server (host 10.2.1.2). You do not need to install the IBM Network Station Manager program on this system.
- An AS/400 system is performing the role of terminal configuration and authentication server (host 10.1.1.2). We use the IBM Network Station Manager program that is installed on the terminal configuration and authentication server to centrally manage all user configurations and terminal configurations. One IBM Network Station Manager program should manage all IBM Network Stations to prevent conflicts.

A user would see a log-on dialog from the base code server and do the following:

1. Click the **Roam** button.
2. Enter the address of the authentication server (10.1.1.2).

Tip: If you want to use DHCP, you should use the IBM Network Station Manager program to check that DHCP is configuring DNS. Ensure that you have selected **DNS Configuration from BOOTP or DHCP server**. To find this setting, click **Hardware**, click **Workstations**, and then select **System Defaults**.

For this configuration to work, you must configure the items in Table 6 on page 21 in the DHCP server settings.

Table 6. DHCP Options for Load Balancing

Description	Example
Option 66 or bootstrap server - base code server IP address	10.3.1.2
Option 67 - bootfile path	/netstation/prodbase/kernel
Option 211 - protocol to use for the base code server. Possible values are tftp, nfs or rfs/400.	nfs
Option 212 - terminal configuration server IP address. Up to two addresses separated by a blank can be specified.	10.1.1.2
Option 213 - Configuration files path name for option 212. Up to two paths separated by a blank can be specified.	/QIBM/ProdData/NetworkStation/configs/
Option 214 - Protocol to use for option 212. Possible values are tftp, nfs, or rfs/400. Up to two values separated by a blank can be specified.	rfs/400

Notes:

1. Options 211, 212, 213, and 214 are site specific options in DHCP. If you are already using these options for another purpose, you will need to configure DHCP to avoid conflicts. See "Configuring DHCP to Avoid Conflicts".
2. When two configuration servers are specified, the first server is tried. If that fails, then the second server is tried. If the second server is successful, then the second value in options 213 and 214 are used.
3. The IBM Network Stations must be using boot monitor version 3.0.0 or later. See "Viewing the Boot PROM Version of an IBM Network Station" on page 308 for information on how to view the boot monitor version.

Refer to the appropriate page for instructions on how to configure DHCP for load balancing on your platform:

- AS/400, see "Configuring DHCP for Load Balancing" on page 151
- RS/6000, see "Configuring Dynamic Host Configuration Protocol (DHCP)" on page 165
- VM/ESA, see "Configuring DHCP for Load Balancing" on page 220
- Windows NT, see "Configuring DHCP for Multiple Servers on Windows NT Server 4.0" on page 71

Configuring DHCP to Avoid Conflicts

The DHCP options in Table 6 have the flexibility to apply on a network, subnet, class, or client basis. If you find that options 211-214 are already in use for other purposes, you can separate these options by subnet or class. Use Table 7 on page 22 to determine the Network Station classes.

Determining DHCP Classes

Table 7 lists the DHCP classes assigned to each IBM Network Station type and model.

Table 7. IBM Network Station DHCP Classes

Type-Model	Class
8361-100	IBMNSM 2.0.0
8361-110	IBMNSM 2.1.0
8361-200	IBMNSM 1.0.0
8361-210	IBMNSM 1.1.0
8361-341	IBMNSM 3.4.1
8362-A22	IBMNSM A.2.0
8362-A23	IBMNSM A.2.0
8362-A52	IBMNSM A.5.0
8362-A53	IBMNSM A.5.0
If you cannot find the type and model number of your Network Station listed in the table, then do the following: 1. Power on the Network Station. 2. As soon as the Network Station begins to search for its host server (message NS0500), press the Escape key. 3. Press the F2 key to view the hardware configuration. The class number is in the **DHCP** field.	

What is New in Release 3?

This release of the IBM Network Station Manager licensed program introduces many new features. These features include:

World-Wide National Language Enablement
The IBM Network Station Manager licensed program is enabled across a wide variety of languages and locales.

Integrated NC Navigator
The NC Navigator for the IBM Network Station is a fully compatible subset of the popular Netscape Navigator Release 3 browser. A 40-bit browser is included. A 128-bit browser is available in the United States and Canada as a separately orderable program (except for IBM Network Station Manager for PC Servers, where it is included). The NC Navigator provides many new functions including a mail client and a news reader. See “Learning About NC Navigator Browser Functions” on page 236 and the NC Navigator online help for more information. Installing the 128-bit browser disables the 40-bit browser.

Converged 3270/5250 Emulators
The 3270 and 5250 client functions have been enhanced, and now have very similar interfaces and functionality. See “Learning About the 3270 Emulation Function” on page 231, “Learning About the 5250 Emulation Function” on page 227, and the emulator online help for more information.

VTxxx Telnet

The IBM Network Station Manager program supports VTxxx telnet client.

Java Virtual Machine (JVM) 1.1.4

The JVM 1.1.4 provides an updated JVM.

Java Just-In-Time (JIT) Compiler

The Java JIT compiler compiles an application's or applet's Java bytecode as it downloads into the Network Station. The JIT is most effective in improving compute intensive and string manipulation operations.

Group Support

User group support allows an administrator to specify configuration values for a group of users. See "Assigning Group Settings to a User" on page 288 and the IBM Network Station Manager program online help for more information.

Independent Computing Architecture (ICA) Client Protocol Support

The integrated ICA client provides a low bandwidth connectivity for accessing Microsoft Windows applications. See "Configuring a Local (ICA) Client Session Menu Button for a Network Station" on page 278 for more information.

Printing Support

Support for print client (LPR) allows local print applications to print on remote printers. Support for printer server (LPD) allows remote print clients to print on printers attached to the Network Station. See "Configuring a Local Area Network Attached Printer" on page 269 and "Configuring a Network Station-Attached Printer for Other Users" on page 270 for more information.

Separation of Servers

Several server functions that were previously bundled can now be installed on multiple servers. This allows you to balance network traffic and allows end users to access their normal desktop when they are away from their normal server. See "Taking Advantage of Multiple Server Environments" on page 18 for more information.

Dynamic Host Configuration Protocol (DHCP)

You should use DHCP when possible. DHCP allows you to take advantage of new features such as separating your servers to balance network traffic. See "Taking Advantage of Multiple Server Environments" on page 18 for more information.

DHCP is available on the following platforms: AIX, OS/390, OS/400 V4R2, VM/ESA, and Windows NT.

To configure DHCP on OS/400 you must have V4R2 Operations Navigator. Operations Navigator requires Client Access installed on your Windows 95/NT PC and a connection from that PC to the AS/400 system.

Lotus eSuite 1.1 WorkPlace

Lotus eSuite 1.1 WorkPlace is available as a separately orderable program. The IBM Network Station Manager program allows the Lotus eSuite WorkPlace to be configured as the system desktop. See "Changing your Desktop Style to Lotus eSuite WorkPlace" on page 262 for more information.

Omron, Japanese Input Method

The Omron, Japanese Input Method is available in multi-byte character set countries as a separately orderable program. The IBM Network Station Manager program allows for the configuration of the Omron, Japanese Input Method.

Network Station Memory Requirements

Each of the applications that are downloaded to the Network Station require memory. See “Network Station Memory Requirements” on page 17 for more information.

Broadcast Boot (for AS/400)

The broadcast boot support provides the capability to boot multiple Network Stations in parallel through a single transmission. See “TFTP Subnet Broadcast” on page 148 for more information.

Inventory Server (for AS/400)

The inventory server provides the capability to collect information about your Network Stations. See “Collecting Hardware Information Using the Inventory Server” on page 140 for more information.

Twinaxial Network Station Support (for AS/400)

The twinaxial support allows the attachment of twinaxial Network Stations over existing twinaxial cabling. See “Appendix B. Twinaxial Network Stations” on page 347 for more information.

Moving from an Older Version?

If you are moving from an older version of the IBM Network Station Manager licensed program to this version (Release 3) of the IBM Network Station Manager licensed program, you may want to consider the following:

Configuration Information and User Data

Any configuration information that you entered through the IBM Network Station Manager program interface is migrated. This includes user data, system-wide, user, and workstation configuration information. If you edited configuration files manually (such as standard.nsm), you should refer to the Advanced User Information at http://www.ibm.com/nc/pubs for more information on how to migrate your configuration.

NC Navigator

The IBM Network Station Manager Release 3 licensed program does not support the IBM browser. Installation of Release 3 will automatically install and reset your primary browser to the 40-bit NC Navigator. IBM browser bookmarks are migrated to the NC Navigator. It is possible that the NC Navigator may render HTML slightly differently than the IBM browser. The 128-bit browser is available in the US and Canada. You can install the 128-bit browser after installing the IBM Network Station licensed program. The NC Navigator provides many new functions, including a mail client and a news reader. See “Learning About NC Navigator Browser Functions” on page 236 and the NC Navigator online help for more information.

If prior to Release 3 you had installed both the IBM Browser and the NC Navigator Browser, then one of the following conditions apply after the migration is complete:

- If only IBM Browser bookmarks were saved, then the IBM Browser bookmarks are available in the NC Navigator bookmarks.
- If both NC Navigator and IBM Browser bookmarks were saved, then the NC Navigator bookmarks are available in the NC Navigator bookmarks and the IBM Browser bookmarks are converted to NC Navigator bookmarks format. The converted IBM Browser bookmarks are stored on the users home workspace in a file called IBMBrowser.html.

If you want to incorporate the IBM Browser bookmarks into the NC Navigator bookmarks, have each user perform the following steps:

1. Start the NC Navigator browser.
2. Click **Window->Bookmarks**. This opens the Bookmarks window.
3. Click **File->Import**. A list of files in the user's home workspace appear.
4. Click the IBMBrowser.html file.
5. Click **OK**. The IBM Browser bookmarks are now included in the NC Navigator bookmarks under a new folder called Hotlist Page.

New Boot Monitor Code

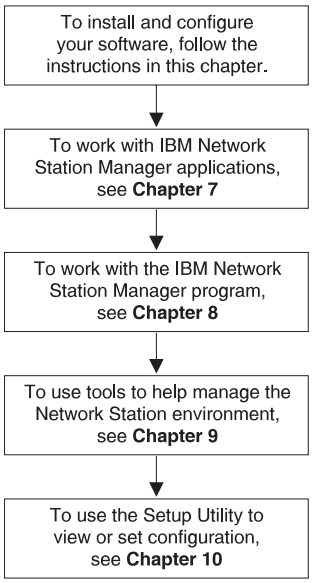
The boot monitor code in Release 3 contains many new functions. To take advantage of these new functions, you must update the boot monitor code on each of your Network Stations. See "Updating the Boot Monitor Code" on page 265 for instructions on how to update the boot monitor code.

Chapter 2. Installing and Configuring an IBM Network Station Environment on a Microsoft Windows NT Server

About this Chapter

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 chapter.

The following figure demonstrates the flow of the entire manual.



Use the following table to find information on common IBM Network Station Manager installation tasks and IBM Network Station Manager configuration tasks.

If you need to...	Read this section
Install IBM Network Station Manager for the first time.	Read the “Installing IBM Network Station Manager and Prerequisites” on page 29 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 51 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 52 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 79 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 76 to configure printers to work with your Network Stations.
Run Windows applications on your IBM Network Station	Read the “Installing IBM Network Station Manager to Run Windows-based Applications” on page 46 for information how to run Windows applications on your Network Station.
Use DHCP to assign Internet Protocol (IP) addresses to your IBM Network Stations	Read the “Installing Additional Software Components After the Initial Installation” on page 54 to install DHCP services and configure DHCP services in your network.

Installing IBM Network Station Manager and Prerequisites

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 ″IBM Network Station Manager for WinCenter Pro V3.0,″ 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.

Before you begin

Before you begin the following installation checklists, you should have done the following:

- Drawn a diagram of your network. See “What Do I Need To Know About TCP/IP Networks?” on page 4.
- Bookmarked or copied the pages which contain the Network Example diagrams that you will use as you install and configure your network. These are Figure 3 on page 5, Figure 4 on page 6, and Figure 5 on page 7.
- Checked to ensure that there are no users that are logged onto your server. If you need to restart your server, any active Network Station users will lose their applications.
- Read the readme.txt file on the IBM Network Station for PC Server compact disk (CD). If you downloaded your IBM Network Station Manager for PC Server software from the Internet, refer to the download Web pages for the readme.txt file. The file contains information about prerequisites, installation, and late-breaking code changes.

Depending on whether your server has the proper prerequisites in place, the installation process may take from 30 minutes to 90 minutes.

If you encounter problems during the installation process, refer to “Resolving Installation Problems” on page 45.

Complete the following checklist and mark off each item as you complete it. The checklist has three stages. To complete the installation checklist, you will do the following:

- Verify prerequisites—hardware, software, and memory requirements.
- Install the IBM Network Station Manager software. You may also install the following software that is included on your IBM Network Station Manager software CD. (The Web download only includes IBM Network Station Manager software and eNetwork On-Demand software. You must get the additional software products separately.):
  - Adobe Acrobat Reader
  - Netscape Navigator 4.04
  - Lotus Domino Go 4.6.2.2
- Configure DHCP on your server if you plan to use DHCP to start your IBM Network Stations.

Planning and installing: Check off each item as you complete the task.

__ 1. Verify IBM Network Station memory requirements:

Network Stations download each of their applications that includes their base systems into memory. You should verify that your Network Stations have enough memory to run their applications. Use the table at

http://www.pc.ibm.com/networkstation/support/memrec_data.html to determine how much memory your Network Stations need.

Notes:

a. If you plan to use multiple applications on your Network Stations, ensure that each Network Station has adequate memory to handle the projected applications.

b. Subsequent releases may have increased memory requirements.

__ 2. Make sure that you properly install Microsoft Windows NT Server 4.0 with all prerequisites:

You may install both Windows NT Server 4.0 and Windows NT Server 4.0, Terminal Server Edition with the instructions in this manual. The installation for both Windows NT Server software types is identical unless otherwise noted. Consult Table 8 to make sure that your system is ready for the installation. If you lack any of the prerequisites, you may enter the procedure as directed by the column titled ″Where Can I Find Instructions?″.

Table 8. Operating System Prerequisites

Prerequisite	**How Do I Know If the Prerequisite Is In Place?**	**Where Can I Find Instructions?**
You need 800 MB of free hard disk space to install both Windows NT Server 4.0 and all IBM Network Station Manager software. Windows NT Server 4.0 and Service Pack 3 require 300 MB. You need up to 500 MB of free disk space for the IBM Network Station software. You need 1 GB of free hard disk space to install both Microsoft Windows NT Server 4.0, Terminal Server Edition and IBM Network Station Manager software. Windows NT Server 4.0, Terminal Server Edition requires 500 MB for installation. You need up to 500 MB of free disk space for the IBM Network Station Manger software. **Note:** If you plan to install your IBM Network Station Manager software after you download it from the Web, you need an extra 250 MB of free space to download the software and expand the setup executable files on your hard drive.	__ a. Determine if you have enough hard disk space for the IBM Network Station Manager software after you install Windows NT Server. From the Windows NT desktop, double-click on the *My Computer* icon. __ b. Right mouse-click on the drive on which you plan to install the IBM Network Station Manager. __ c. Select **Properties**. __ d. Make sure that there is at least 500 MB of free space.	You may need to reinstall the operating system beginning with Step 3 on page 34.

Table 8. Operating System Prerequisites (continued)

Prerequisite	How Do I Know If the Prerequisite Is In Place?	Where Can I Find Instructions?
Windows NT Server 4.0	__ a. Click **Start->Settings->Control Panel->System**. __ b. Select the *General* tab if it is not currently selected. __ c. Read the information under *System:* at the top of the page to make sure that Windows NT Server 4.0 is installed.	Step 3 on page 34.
Windows NT Server 4.0, Terminal Server Edition	__ a. Click **Start->Settings->Control Panel->System**. __ b. Select the *General* tab if it is not currently selected. __ c. Read the information under *System:* at the top of the page to make sure that Windows NT Server 4.0, Terminal Server Edition is installed.	Step 3 on page 34.
Configure Regional Settings	__ a. Select **Start->Settings->Control Panel**. __ b. Double-click on **Regional Settings**. __ c. Click the **Input Locales** tab. __ d. Check to see if your locale is highlighted.	Step 55 on page 38.

Table 8. Operating System Prerequisites (continued)

Prerequisite	How Do I Know If the Prerequisite Is In Place?	Where Can I Find Instructions?
Service Pack 3 **Note: Do not add Service Pack 3** if you are running Windows NT Server 4.0, Terminal Server Edition.	__ a. Choose **Start->Programs->Administrative Tools->Windows NT Diagnostics**. __ b. Select the *Version* tab if it is not yet selected. __ c. Read the information under the computer graphic to make sure that Service Pack 3 has been installed.	Step 56 on page 38.
NTFS (not FAT) file system	__ a. From the Windows NT desktop, double-click on the *My Computer* icon. __ b. Right mouse-click on the drive on which you plan to install the IBM Network Station Manager. __ c. Select **Properties**. __ d. Look under *file system:* to ensure that the drive uses NTFS instead of FAT.	You can convert a FAT partition to NTFS by carrying out the following steps __ a. Open a command prompt. __ b. Type the following command: `convert x: /fs:ntfs`, where x is the partition that you want to convert.
Proper MTU size (for token-ring and mixed token-ring and Ethernet networks only) **Note:** Some token-ring adapters may not have an option to change the MTU size. If you experience network problems that you attribute to the MTU size, you may need an updated token-ring adapter.	__ a. Access the Network Control Panel by clicking **Start->Settings->Control Panel->Network->Adapters**. __ b. Click on **Properties**. __ c. Click on **Advanced**. __ d. The MTU size appears in the *Maximum Packet Size* text field. In a pure token-ring local area network (LAN), the maximum packet size should be 4096. In a mixed Ethernet and token-ring network, the maximum packet size should be 1400.	Step 54 on page 38.

Table 8. Operating System Prerequisites (continued)

Prerequisite	How Do I Know If the Prerequisite Is In Place?	Where Can I Find Instructions?
Stand-Alone Server or Stand-Alone Server attached to a domain. (recommended)	__ a. Choose **Start->Programs->Administrative Tools->Server Manager**. __ b. Read the description of your computer. If there is no indication of the server type (Primary Domain Controller or Backup Domain Controller), then your machine is a Stand-Alone server or a Stand-Alone server attached to a domain. Stand-Alone server and Stand-Alone server attached to a domain are the recommended server types.	To change the server type to Stand-Alone or Stand-Alone server attached to a domain from a Primary Domain Controller or a Backup Domain Controller, you must reinstall the operating system beginning with Step 3. You may also switch between Stand-Alone server and a Stand-Alone server attached to a domain. You do not have to reinstall the operating system to change between the Stand-Alone server and the Stand-Alone server attached to a domain.

If all of the prerequisites are in place, go to 57 on page 38.

__ 3. To install Windows NT Server 4.0 or to install Windows NT Server 4.0, Terminal Server Edition on your machine, begin here. With the machine off, insert the diskette labeled ″Microsoft Windows NT Server (or Microsoft Windows NT Server 4.0, Terminal Server Edition) Setup Disk 1″. Start your computer.

__ 4. When prompted to do so, insert the second diskette and press the Enter key.

__ 5. On the Windows NT Server Setup *Welcome to Setup* screen, press Enter to set up Windows NT now.

__ 6. Press Enter for Setup to detect mass storage devices in your computer.

Note: You may need to follow the instructions from your personal computer manufacturer to configure some mass storage devices and network interface cards.

__ 7. Insert the third diskette as prompted and press Enter.

__ 8. Once Setup recognizes your computer's mass storage devices, press Enter as prompted.

__ 9. When prompted to do so, insert the CD, ″Microsoft Windows NT Server″, or ″Microsoft Windows NT Server 4.0, Terminal Server Edition″. Press the Enter key.

__ 10. Use the Page Down key to scroll to the end of the licensing agreement. Press F8 if you agree with the conditions.

__ 11. If Setup finds a previous version of NT, press N to cancel the upgrade and install a fresh copy of Windows NT.

__ 12. If the list of components that Setup displays matches your computer, press Enter.

__ 13. Setup detects partitions on your drive. Unless you need to preserve data on your existing partitions, you should delete the existing partitions and create new ones. Otherwise, you may install Windows NT on an existing partition.

Notes:

a. Windows NT Server 4.0 and IBM Network Station Manager require at least 800 MB of free space.

b. Windows NT Server 4.0, Terminal Server Edition, and IBM Network Station Manager requires at least 1 GB of free space.

c. Unless you need to preserve a partition in order to save other software, you should delete any existing partitions and create a new one.

__ 14. Highlight the install partition and press Enter to install Windows NT.

__ 15. Use the arrow keys to highlight *Format the partition using the NTFS file system*. Press Enter.

Important: Do not choose the FAT file system. If you choose the FAT file system, the IBM Network Station Manager installation fails.

__ 16. After Setup formats the new partition, press Enter to accept the default location to install the Windows NT Server operating system. If you wish, you may enter a different directory for the Windows NT Server software installation.

__ 17. Press enter to perform an exhaustive examination of your hard disk.

__ 18. After Setup has copied the necessary files, remove the diskettes and the CD from their drives and press Enter to restart the computer as instructed.

Note: Some PC Server computers will ask you if you expected the hardware configuration change. This happens because you reformatted a hard drive partition. Select **Change is expected** or simply accept the changes.

__ 19. When Setup continues, insert the CD and click **OK** as directed.

__ 20. Click **Next** to begin the Setup program.

__ 21. Enter your name and organization. Click **Next**.

__ 22. Enter the CD key as directed. Click **Next**.

__ 23. Choose the correct licensing model. For Windows NT Server 4.0 if you choose *Per Server*, select only the number of licenses that you have purchased. For Windows NT Server 4.0, Terminal Server Edition, select the number of terminal server desktops. Click **Next**.

__ 24. Type a computer name and click **Next**.

__ 25. Select a server type and then click **Next**. The recommended server type is Stand-Alone server. You can install IBM Network Station Manager on Windows NT Servers configured as Primary Domain Controllers (PDCs) or Backup Domain Controllers (BDCs). These configurations are not suggested due to the work load the BDCs and PDCs handle in addition to the typical IBM Network Station Manager work load. The server type options are as follows:

Primary Domain Controller (PDC) (not recommended)
The server that contains the primary copy of the security accounts database for a domain. Each domain contains only one PDC.

Backup Domain Controller (BDC) (not recommended)
A server that contains a backup copy of the security accounts database for a domain. A domain can contain more than one BDC.

Stand-Alone server (recommended)
A server that supports clients but that is neither a BDC nor the PDC of its domain. Create a Stand-Alone server and then, if desired, configure it to be part of a domain.[1]

__ 26. Create an administrator password as prompted, then click **Next**.

__ 27. Choose whether or not to create an emergency repair disk, then click **Next**.

__ 28. When Setup continues, select the components that you want to install and then click **Next**. If you are not certain of what components to install, simply accept the default values.

__ 29. For Windows NT Server 4.0, Terminal Server Edition, if you want to install Internet Explorer 4.01 at this time, select **Yes**. If you want to install Netscape Navigator 4.04, select **No**. You will install Netscape Navigator 4.04 later.

__ 30. Click **Next** to continue Setup.

__ 31. Select *This computer will participate on a network*. Choose *Wired to the Network*, then click **Next**.

__ 32. De-select the check box for installing Microsoft Internet Information Server and then click **Next**. You will install a newer Microsoft Internet Information Server version later.

__ 33. Click the **Start Search** button to find your network adapter card. If Windows NT Server cannot find your card, select **Choose from list**.

Note: You should install the latest driver for your network adapter card. Check with your network adapter card manufacturer for the latest updates.

__ 34. Select an adapter card and click **Next** to install the selected adapter card.

__ 35. Follow the prompts to define or install your network adapter card.

Note: If your network contains any routers or bridges, you must make sure that your network adapter card supports them. If a dialog box prompts you to configure your network adapter card, look to see if the configuration window includes advanced properties. If you do not have the option of configuring advanced parameters, you must install a more advanced network adapter card.

Note: If your server token-ring adapter supports advanced functions, check to make sure that the MTU size is correct by carrying out the following steps:

---

1. You may attach your Stand-Alone server configuration to a domain after you install your Windows NT software and your IBM Network Station Manager software.

__ a. Access the Network Control Panel by clicking **Start->Settings->Control Panel->Network->Adapters**.

__ b. Click on **Properties**.

__ c. Click on **Advanced**.

__ d. The MTU size appears in the *Maximum Packet Size* text field.

__ e. Refer to Table 8 on page 31 for the correct packet size information for your network.

__ f. Enter the correct packet size and click **Ok** and then **Close**.

__ 36. Once you have defined your network adapter card, select the networking protocols to use on your network, then click **Next**.

Note: IBM Network Station Manager software requires Transmission Control Protocol/Internet Protocol (TCP/IP) services.

__ 37. Click **Next** to install Network Services.

__ 38. Click **Next** to install selected components.

__ 39. Enter the IP address of the server in the *Network Address* field, then click **Continue**.

__ 40. In the TCP/IP Setup window, select **No** when asked if you want to use DHCP.

Note: This question relates to your Windows NT Server IP Address and not to your Network Station IP addresses. Unless you want your NT Server to receive its IP address dynamically, select **No**.

__ 41. In the *Microsoft TCP/IP Properties* window, specify your server's IP address, your network's subnet mask, and the IP address of the default router.

__ 42. Select the DNS tab. Enter your TCP/IP domain name address and your DNS Server IP address.

__ 43. If you use WINS, select the WINS Address tab. Enter your WINS Server IP address.

__ 44. Click **Apply**, then **OK**.

__ 45. Click **Next** to enable bindings for all services.

__ 46. Click **Next** to start the network.

__ 47. Click on **Domain** and enter the domain (for example, my company) or the workgroup (for example, workgroup) in which your server belongs. Then click **Next**.

__ 48. Click **Finish**.

__ 49. In the *Date/Time Properties* window, under the *Time Zone* tab, highlight your time zone. If appropriate for your location, select *Automatically adjust clock for daylight saving changes*.

__ 50. Select the *Date and Time* tab. Verify the information and then click **Close**.

__ 51. In the *Detected Display* window, click **OK**.

__ 52. To accept your display type and adapter, you must select the following commands in order:

a. From the *Settings* tab, click **Test**.

b. If the test succeeds, click **OK** in the *Testing Mode* window.

c. Select **Yes**, **OK** (if everything is correct), and **OK**.

__ 53. When Setup finishes copying files, remove all disks as directed and click on the button to restart the computer.

__ 54. When the computer restarts, log in as administrator.

__ 55. Make sure that the regional settings are correct for your location.

Important: You must configure the regional settings for your locale. If you do not, the IBM Network Station Manager will not install in your language, even if you choose your language during the installation.

To configure regional settings, carry out the following steps:

__ a. Select **Start->Settings->Control Panel->Regional Settings->Input Locales**.

__ b. If your locale is not highlighted, click on **Add**, then select your locale from the scrolldown list and click **OK**.

__ c. Click **Apply** in the *Regional Settings Properties* window.

__ d. Click the *Regional Settings* tab.

__ e. If your region is not highlighted, select your region from the scrolldown list.

__ f. Check the box that is labeled *Set as system-default locale*.

__ g. Insert the CD, ″Microsoft Windows NT Server, (or Microsoft Windows NT Server 4.0, Terminal Server Edition)″ into the CD-ROM drive.

__ h. Click **OK**.

__ i. After the Regional Settings program runs, remove the CD and close the CD interface window.

__ j. Select **Yes** to restart the computer.

__ 56. Install Service Pack 3 if you installed Windows NT Server 4.0. Obtain Service Pack 3 from Microsoft or download it from http://www.microsoft.com. If you installed Windows NT Server 4.0, Terminal Server Edition, do not install Service Pack 3.

Note: Carry out the following steps to see if you previously installed the service pack:

__ a. Click **Start->Settings->Control Panel->System**.

__ b. Select the *General* tab.

__ c. Read the information under *System* at the top of the page. You will see Service Pack 3 if it is installed.

Once you have installed Windows NT Server 4.0 with Service Pack 3, you may continue.

__ 57. Install prerequisite software:

Besides properly installing either Windows NT Server 4.0, or Windows NT Server 4.0, Terminal Server Edition; you must make three decisions before you install the IBM Network Station Manager:

Table 9. Three Prerequisite Component Decisions

Component	IBM Option	Microsoft Option
1. Choose a Web browser. You use this Java enabled Web browser on either your Windows NT Server 4.0 or Windows NT Server 4.0, Terminal Server Edition to run IBM Network Station Manager. Later, you can install a NC Navigator Web browser for individual Network Station users.	Netscape Navigator 4.04. Included on CD. See Step 58 for instructions.	Microsoft Internet Explorer 4.0.1. Obtain from Microsoft. This version is required for Microsoft Internet Information Server Web server. See Step 58 for instructions.
2. Choose a Web server.	Lotus Domino Go 4.6.2.2 or greater. Included on CD. See Step 59 on page 40 for instructions.	Microsoft Internet Information Server 4.0. This Web server requires Microsoft Internet Explorer 4.0.1 browser. Do not use an older version. Obtain from Microsoft. See Step 59 on page 40 for instructions.
3. Choose a DHCP server (not required if using NVRAM boot method).	IBM DHCP. Included on CD. See Step 60 on page 42 for instructions and a discussion of the advantages of choosing IBM DHCP.[2]	Microsoft DHCP. Included on Windows NT Server 4.0 installation CD. See Step 60 on page 42 for instructions.

__ 58. Install either Netscape Navigator 4.04 or Microsoft Internet Explorer 4.0.1 as your default browser:

You must install one of the above Web browsers as your default browser in order to use the IBM Network Station Manager. You can load Netscape Navigator 4.04 from the IBM Network Station Manager for PC Server CD or obtain Internet Explorer 4.0.1 from Microsoft. Remember that Microsoft Internet Information Server 4.0 requires Internet Explorer 4.0.1. Make sure that you install that browser if you are using Internet Information Server 4.0. Do not try to use an older version of the browser.

If you want to use Internet Explorer 4.0.1, you need to install it on a Windows NT Server 4.0 server. Skip to Step 58.l on page 40.

Note: If you installed Windows NT Server 4.0, Terminal Edition Server, and you previously installed Internet Explorer 4.0.1; skip to Step 59 on page 40.

To install Netscape Navigator 4.04 from the IBM Network Station Manager installation for PC Server CD, carry out the following steps:

__ a. Insert the CD, ″IBM Network Station Manager for PC Server″ into the CD-ROM drive. It may take a moment for the first screen to appear on your display.

2. You may install the eNetwork On-Demand software on a separate server without any of the IBM Network Station Manager software. This way, you can dedicate the separate server to DHCP or DNS especially in large enterprise networks.

__ b. Select the language of your choice. This selection only identifies the language that the CD uses to perform the installation. It is not necessarily the language of the installed software.

> **Note**
>
> To install Netscape in a language that does not appear on the first screen of the CD, carry out the following steps:
>
> __ 1) Select **Other Languages**.
>
> __ 2) Select **Install Additional Products**.
>
> __ 3) Select **Netscape Navigator 4.0**.
>
> __ 4) Open the readme.txt file. Follow the instructions that are contained in the readme.txt file.
>
> __ 5) Go to Step 58.f.

__ c. Select **Install Additional Products**.

__ d. Select **Netscape Navigator 4.0**.

__ e. Click **Yes** to proceed with the installation.

__ f. Follow the Setup instructions. You can choose either a typical or a custom installation.

__ g. After the successful installation, double-click on the Netscape Navigator icon to open the browser.

__ h. Follow the wizard prompts until you are asked if you want to make Netscape Navigator 4.04 your default browser. You do not need to create a user profile. If you do not want to create a user profile, you can click on **Next** and then **Finish** until you see the default browser prompt.

__ i. Select **Yes** to make Netscape Navigator 4.0.4 your default browser. You must make this selection in order to use this browser to open the IBM Network Station Manager.

Note: You may select the check box to not perform this check in the future.

__ j. When a window appears indicating that Netscape is unable to locate the server, close the window and ignore the message.

__ k. Close the browser and continue to Step 59.

__ l. To install Internet Explorer 4.0.1, carry out the following steps:

1) Obtain the browser from Microsoft or download it from http://www.microsoft.com.
2) Install the browser as your default browser by following the instructions that accompany the product.
3) Restart the machine as prompted.
4) Continue to Step 59.

__ 59. Install either IBM's Lotus Domino Go Webserver 4.6.2.2 or Microsoft Internet Information Server 4.0:

Choose a Web server from which to run the IBM Network Station Manager. Look for IBM's Lotus Domino Go Webserver 4.6.2.2 on the installation CD.

To install Microsoft Internet Information Server, go to Step 59.j on page 42.

To install IBM's Lotus Domino Go Webserver 4.6.2.2 from the installation CD, carry out the following steps:

__ a. If you have not yet done so, insert the CD, ″IBM Network Station Manager for PC Server″ into your CD-ROM drive.

__ b. Select the language of your choice if you have not yet done so. This selection only identifies the language that the CD uses to perform the installation. It is not necessarily the language of the installed software.

> **Note**
>
> If you want to install Lotus Domino Go Webserver 4.6.2.2 in a language that does not appear on the screen, carry out the following steps:
>
> __ 1) Select **Other Languages**.
>
> __ 2) Select **Install Additional Products**.
>
> __ 3) Select **Lotus Domino Go Webserver 4.6.2.2**.
>
> __ 4) Open the readme.txt file. Follow the instructions that are contained in the readme.txt file.
>
> __ 5) Go to Step 59.e.

__ c. Select **Install Additional Products** if you have not yet done so.

__ d. Select **Lotus Domino Go 4.6.2.2**.

__ e. Follow the prompts of the installation program. When you are prompted to choose what components to install, you must choose at least the following components:

- Lotus Domino Go Webserver 4.6.2.2
- Security File
- NT Service

__ f. Setup prompts you to enter the directories for the installation of the Web server. You may simply accept the defaults.

__ g. When prompted to do so, enter an administrator ID and an administrator password to use while administrating your Web server.

__ h. After the installation, you may choose to restart your server machine later if you continue immediately with the installation of the IBM Network Station Manager.

Note: After the installation of the IBM Network Station Manager, you can install a more advanced version of Lotus Domino Go Webserver 4.6.2.2. The IBM Network Station Manager does not require the advanced version of the Web server. You can download the advanced version from http://www.lotus.com.

__ i. After the installation of the Web server, go to Step 60 on page 42.

__ j. If you choose to use Microsoft Internet Information Server 4.0, carry out the following steps:

1) Obtain Microsoft Internet Explorer 4.0.1 if you do not already have it on your machine. The download operation of Internet Information Server requires this level of the browser. Do not use an older version of the product. You can download the browser from http://www.microsoft.com.
2) Obtain Microsoft Windows NT Option Pack. You can download the option pack from http://www.microsoft.com. Because this is a large download, create a directory in which to place the option pack. The option pack contains the Internet Information Server software.
3) Follow the installation instructions that accompany the product.
4) Once the Web server has installed successfully, go to Step 60.

__ 60. If you will use DHCP in your network, install IBM DHCP or Microsoft DHCP:

You must choose between IBM and Microsoft DHCP. Look for IBM DHCP on the IBM Network Station Manager installation CD. If you select IBM DHCP during the installation, it will install along with the IBM Network Station Manager. IBM DHCP is part of the eNetwork On-Demand Server (eNOD). It includes the following features:

- Full compliance with Internet RFCs
- Dynamic DNS updates
- User classing
- Support for interfacing with other corporate IP management systems
- Automatic detection of duplicate IP addresses
- Full compatibility with DHCP on all IBM platforms

To install IBM DHCP, you do not need to take any action at this time. When you install the IBM Network Station Manager software, you can automatically install the IBM DHCP software. Choose **Yes** at that time.

If you choose to use IBM DHCP, go to Step 61 on page 43.

Microsoft DHCP is not included on the IBM Network Station Manager CD.

To install Microsoft DHCP, carry out the following steps:

__ a. Choose **Start->Settings->Control Panel->Network->Services**.
__ b. Select **Server**.
__ c. Click on **Add**.
__ d. Insert the CD, ″Windows NT Server 4.0″ into the CD-ROM drive.
__ e. From the *Services* tab in the *Network* panel, select **Microsoft DHCP Server**.
__ f. Click on **OK**.
__ g. Click **Continue** if the text box indicates the proper path from your CD-ROM drive.
__ h. Shut down and restart your computer as prompted.

__ i. Make sure that the Microsoft DHCP server is running by carrying out the following steps:

__ 1) From the Windows NT desktop, choose **Start->Settings->Control Panel->Services**.

__ 2) If the Microsoft DHCP server is not running, highlight it and select **Start**.

Attention: You may need to reinstall Service Pack 3 if you install Microsoft DHCP if you installed Windows NT Server 4.0. Refer to step 56 on page 38 to determine if Service Pack 3 is currently installed.

__ j. Once you have successfully installed DHCP, continue with Step 61.

__ 61. Install the IBM Network Station Manager software, including TCP/IP services and other dependencies:

Note:

Some software packages require the following commands before you install them on your Windows NT Server 4.0, Terminal Edition Server. Refer to the documentation that ships with your software for specific installation instructions.

To install IBM Network Station Manager software on your Windows NT Server 4.0, Terminal Edition Server, carry out the following steps to make the registry information and icons accessible to all users:

__ a. At a command line prompt, type 'change user /install'.

__ b. Press enter to start the installation program.

__ c. Type 'change user /execute'.

__ a. If you plan to upgrade from an older version of the IBM Network Station Manager, read the information in "Updating IBM Network Station Manager Software and Migrating IBM Network Station Manager Preference Files" on page 79. If the information in that section instructs you to perform a single-server migration, make sure that you instruct any users to log off your server. Active Network Station users will lose their applications. You may want to perform the migration after business hours or at some time when there are no Network Station users on the network.

__ b. Close all programs and log on as administrator.

__ c. If you have not yet done so, insert the CD, ″IBM Network Station Manager for PC Server.″

__ d. Select the language of your choice if you have not yet done so. This selection only identifies the language that the CD uses to perform the installation. It is not necessarily the language of the installed software.

__ e. Select **Install IBM Network Station Manager**.

__ f. Select **Run Installation**.

__ g. Confirm your language choice on the pop-up screen that appears. This language is only the language in which the installation dialogs appear. It is not necessarily the language of the software after installation. The Setup program automatically detects the language of your server and installs the software accordingly.

__ h. Click **Next** on the Welcome screen.

__ i. Select **Yes** to accept the license agreement.

__ j. Use the following instructions to install your IBM Network Station Manager software:

__ 1) If you are upgrading from a previous version of IBM Network Station Manager, read "Updating IBM Network Station Manager Software and Migrating IBM Network Station Manager Preference Files" on page 79.

__ 2) If you plan to use IBM DHCP, select **Yes**. If you plan on using another DHCP, or none at all, select **No**.

Note: At the time of this writing, you should not use IBM DHCP on an Integrated PC Server Card in an AS/400 server.

__ 3) Choose a destination directory and select **Next**.

__ 4) Choose **Program Group** and select **Next**.

__ 5) If you are upgrading from a previous version of IBM Network Station Manager, refer to Step 3 on page 83 for the proper directory path to fill in here. If you are not upgrading, do not enter anything here. Select **Next**.

__ 6) Choose the destination for your eNetwork On-Demand software and select **Next**.

__ 7) If you are in the United States and Canada, you may install the 128-bit version of the NC Navigator Web browser in place of the standard version. Select **Yes** to install this United States and Canada-only software.

__ 8) Verify products to be installed and select **Next**.

__ 9) If you are installing IBM DHCP, select **OK** to install the NDIS Intermediate Driver 3.0. This message only appears if you install IBM DHCP.

__ 10) If you want a shortcut to the IBM Network Station Manager software on your desktop, select **Yes**.

__ 11) After the installation, select **Yes** to restart your computer and finish the installation.

Now that you have finished installing the IBM Network Station Manager, continue to "Configuring DHCP on the Windows NT Server Platform" on page 55. If you are updating your IBM Network Station Manager software, refer to Step 4 on page 83 to move your Network Stations to the new server.

In order to run Windows-based applications, you need to install additional software. Refer to “Installing IBM Network Station Manager to Run Windows-based Applications” on page 46.

Resolving Installation Problems

If problems occur during the installation of the IBM Network Station Manager, consider the following items:

- If a previous version of the NDIS Intermediate Driver exists on your machine, Setup will attempt to uninstall it automatically. If that uninstallation fails, you must uninstall the driver manually. Setup will bring up the Network Control Panel. Uninstall the driver by carrying out the following steps:
  __ 1. From the Network Control Panel, select the *Protocols* tab.
  __ 2. Highlight **DHCP Driver** by clicking on it once.
  __ 3. Click on **Remove**.
  __ 4. Click on **Yes**.
  __ 5. Click on **Close**.
  __ 6. Click on **Yes**.
  __ 7. Restart the server.
  __ 8. Begin the installation process again by returning to Step 61 on page 43.
- If you choose to use IBM DHCP, Setup will automatically install the NDIS Intermediate Driver for you. If that installation fails, you must install it manually. To install the driver manually, carry out the following steps:
  __ 1. When Setup asks if you want to use IBM DHCP, click on **Yes**.
  __ 2. The licensing agreement appears. Click on **OK** if you agree to it.
  __ 3. Click on **Next**.
  __ 4. When the Network Control Panel appears, click on the *Protocols* tab.
  __ 5. Click on **Add**.
  __ 6. Click on **Have Disk**.
  __ 7. The path to the NDIS Intermediate Driver should appear in the text box. Make sure that the path is correct and that the path indicates your CD-ROM drive.
  __ 8. Click on **OK**.
  __ 9. Click on **Close**.
  __ 10. When prompted to reboot, choose **No**. It is safe to wait until after the installation to restart your computer. If you choose **Yes**, you must begin the installation again by returning to Step 61 on page 43.
- For Windows NT Server 4.0 servers only, if you try to install IBM DHCP on a multiprocessor machine, you may encounter problems. Contact Microsoft to fix the problem. Microsoft provides a fix that is called Q156655 (″ndis-fix″).

Installing IBM Network Station Manager to Run Windows-based Applications

You can run Windows-based applications on your Network Stations if you add additional software to your Windows NT Server 4.0, Terminal Edition Server computer. You can use the ICA protocol or the X11 Windows protocol to run your Windows-based applications. The additional software includes the following:

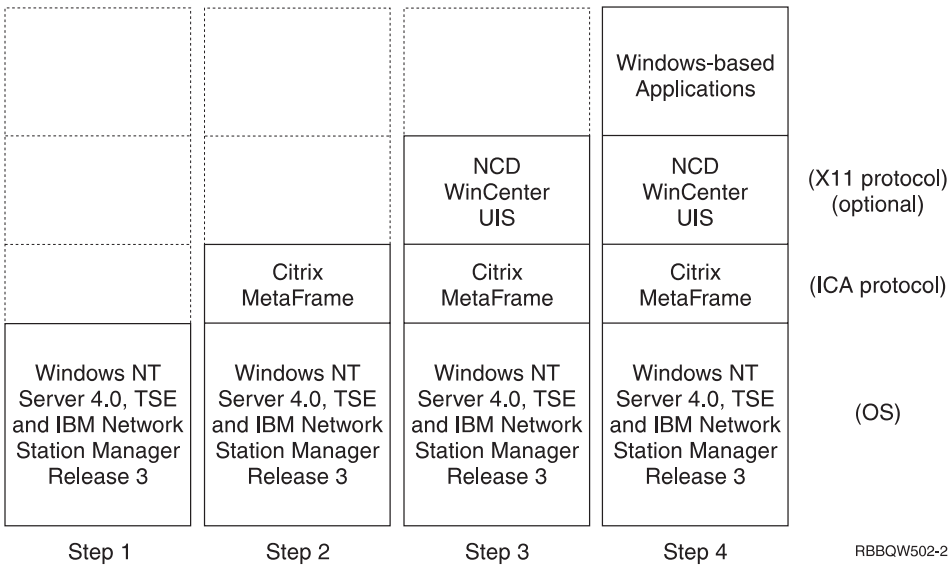
Note: This trial-use software does not work on Windows NT Server 4.0 servers. You must run Windows NT Server 4.0, Terminal Server Edition to activate the trial-use software.

1. IBM Network Station Manager (required)
2. Citrix MetaFrame software (required)
3. NCD WinCenter UIS (optional)
4. Windows application such as Lotus SmartSuite 97

Look for the Try and Buy NCD WinCenter UIS software on your IBM Network Station Manager – Supplemental Trial Products CD. Look for the Demonstration Version of Citrix MetaFrame software, and Lotus SmartSuite 97 on a separate CD delivered with your IBM Network Station Manager software.

After you install your Windows-based software, you need to create a Network Station user button to start a MetaFrame or WinCenter UIS session. Refer to “Configuring a Local (ICA) Client Session Menu Button for a Network Station” on page 278 and configure your Network Stations to use MetaFrame. Refer to “Setting Up a Windows NT Session Using the IBM Network Station Manager Program” on page 294 and configure your Network Stations to use NCD WinCenter UIS.

Read this section and follow the instructions to install and configure these applications.



Note: To activate this trial-use software to run Windows-based applications on your Network Stations, you must install MetaFrame and TCP/IP services in your operating system. To use the optional X11 Windows protocol you must install both Citrix MetaFrame and NCD WinCenter UIS software.

Figure 9. Additional Software Needed to Run Windows-based Applications on Your Network Stations

Using the Citrix ICA client that is provided with the IBM Network Station Manager software package, IBM Network Station users can execute Windows-based applications on a server running Microsoft Windows NT Server 4.0, Terminal Server Edition and Citrix MetaFrame.

This package includes a Demonstration Version of Citrix MetaFrame with a five (5) concurrent user license and a Demonstration Version of Lotus SmartSuite 97 application software to demonstrate these capabilities.

The Demonstration Version of Citrix MetaFrame has limited functionality, and must be activated on Citrix's activation website within 5 days of installation. Upon activation, this software is functional for 45 days and can be used to run the Lotus SmartSuite 97 Windows-based applications. Other Windows-based applications cannot be added with this trial offering.

You may install Lotus SmartSuite 97 at the same time that you install Citrix MetaFrame. If you install Lotus SmartSuite 97 at this time, the entire SmartSuite 97 package will be installed to C:\Lotus. If you do not install Lotus SmartSuite 97 at this time, refer to the Terminal.doc file located in the root directory of the Windows NT Server 4.0, Terminal Server Edition CD-ROM for instructions on installing Lotus SmartSuite 97.

To install this software, please follow the directions in “Installing Citrix MetaFrame and Lotus SmartSuite 97”. If you downloaded your IBM Network Station Manager software package from the Internet and you wish to obtain the trial offering, contact your IBM Business Partner.

NCD WinCenter UIS allows you to use the X11 Windows protocol to run Windows-based applications on your Network Stations. However, this protocol is optional. You may simply run Windows-based applications with the ICA protocol Citrix MetaFrame provides. To activate the optional X11 Windows protocol, you must install both Citrix MetaFrame and NCD WinCenter UIS.

Installing Citrix MetaFrame and Lotus SmartSuite 97

Follow these steps to install the Demonstration Version of MetaFrame and Lotus SmartSuite 97. Before you install MetaFrame, ensure that no other users are logged on to the server.

__ 1. Find your MetaFrame license number. This number is on a sticker attached to the Demonstration Version MetaFrame CD booklet.

__ 2. Insert the MetaFrame Demonstration CD-ROM in the server’s CD-ROM drive. The MetaFrame CD-ROM installation splash screen automatically appears. If the splash screen does not automatically appear, choose Run from the Start menu and type d:\i386\autorun.exe where d is the letter of your CD-ROM drive.

__ 3. Click MetaFrame Setup to begin installation.

__ 4. The MetaFrame license is displayed. Please read the terms of the license agreement and then click **I Agree** to continue with the installation or **Quit** to cancel installation.

__ 5. The MetaFrame Licensing **Enter License Serial Number** dialog box appears. Enter your MetaFrame license number exactly as it appears on the license sticker and click **OK**.

   Various dialog boxes will appear on-screen quickly as MetaFrame is installed. You can safely ignore these dialog boxes.

__ 6. When the Lotus SmartSuite 97 installation panel appears, select an appropriate installation option. If you install Lotus SmartSuite 97 at this time, the entire SmartSuite 97 package will be installed to C:\Lotus.

   If you do not install Lotus SmartSuite 97 at this time, refer to the Terminal.doc file located in the root directory of the Windows NT Server 4.0, Terminal Server Edition CD-ROM for instructions on how to install Lotus SmartSuite 97.

__ 7. If any errors occur during installation, a dialog box appears with the location of the error log file. View the log file with a text editor to determine the cause of the errors.

__ 8. When the installation is completed, the server is automatically rebooted.

Activating Citrix MetaFrame

Once the Demonstration Version of MetaFrame is installed, it must be activated within 5 days. Follow these steps to activate your MetaFrame server.

__ 1. Logon as an administrator. Select **Start**, **MetaFrame Tools (common)**, and **Citrix Licensing**. Citrix Licensing displays all of your installed licenses and their license numbers. You must use the license numbers displayed by Citrix Licensing when activating your software in Step 5 below.

The next step in the installation process is to activate your software by contacting the Citrix Activation Server. This is done using the Citrix License Activation Wizard.

The Citrix License Activation Wizard can connect to the Citrix Activation Server using a TCP/IP Internet connection, a modem connection, or a connection to the Citrix Activation Web page using a Web browser. To use a TCP/IP Internet connection, you must install TCP/IP on your server and have Internet access. To use a modem connection, you must have a modem attached and properly configured for dial out. To use a Web browser, you must have an Internet connection and a Web browser.

__ 2. Click **Activation Wizard** in the **MetaFrame Tools** folder. The **Citrix License Activation Wizard** dialog box appears.

__ 3. Select the method you want to use to activate your MetaFrame server and click **Next**.

__ 4. If you choose **Activate Over The Internet** or **Activate By Modem** and the Citrix ICA Win32 Client is not installed, you are prompted to install it. Follow the instructions that appear to install the Citrix ICA Win32 Client. After installation, select **Activate Over The Internet**, **Activate With Web Browser** (does not require additional software), or **Activate By Modem** and click **Next**.

__ 5. Click **Finish** to connect to the Citrix License Activation Server. When the Citrix License Activation System window appears, follow the directions to obtain your activation code. Record your activation code exactly as it appears.

Notes:

a. The license number is a 29-digit number. This 29-digit number is different than the 21-digit serial number on the serial number sticker. Use the Citrix Licensing interface to determine the license number as explained in Step 1.

b. If your server does not have a modem or an Internet connection, see the MetaFrame booklet for a list of URLs and telephone numbers to use for activation.

__ 6. To activate your Citrix software, start **Citrix Licensing** or click on the **Citrix Licensing** window if it is already started. Select the Citrix license you are activating from the list of displayed licenses, and then click **Activate License** on the License menu. The **Activate License** dialog box appears. Enter your activation code from Step 1 above and click **OK**. Your Citrix software is now activated.

Refer to “Configuring a Local (ICA) Client Session Menu Button for a Network Station” on page 278 and configure your Network Station to use the ICA protocol to run Windows-based applications. You need to enter three items to create a Network Station MetaFrame button: A button name, ICACLNT, and the IP address for your MetaFrame server. (If you have DNS running, you may enter the server name.)

Installing NCD WinCenter UIS

Before you install your trial NCD WinCenter UIS software, you need to contact NCD, Inc. for a temporary key that activates your trial-use software on the IBM Network Station Manager – Supplemental Trial Products CD. The easiest method is to enter the temporary key during installation; however, you may also enter the key after you install the software.

To get your temporary NCD WinCenter UIS key, perform the following instructions:

__ 1. In the US only call 1-800-800-9599 or send an e-mail to info@ncd.com

Note: For customers outside the US, contact your nearest NCD reseller by viewing the NCD website at http://www.ncd.com.

__ 2. Provide your company information. NCD provides you with a temporary key to activate your Try and Buy NCD WinCenter UIS software.

__ 3. Write your temporary key in the table below.

Table 10. Temporary Key to Activate NCD WinCenter UIS Try and Buy Software

Requested information:	**Write your information here:**
NCD WinCenter UIS software temporary key (supplied by NCD).	

To install NCD WinCenter UIS on your Windows NT Server 4.0, Terminal Server Edition server, perform the following instructions. Make sure that you have the trial-use activation key before you proceed. Refer to Table 10. You may use your trial-use activation key after you install; however, activating your software during installation is the easiest method.

Note: During this trial-use period, you must have Citrix MetaFrame PC Based licenses to use the NCD WinCenter UIS licenses.

__ 1. Insert your IBM Network Station Manager – Supplemental Trial Products CD into your CD-ROM drive.

__ 2. Select **Installing NCD WinCenter UIS**.

__ 3. Select **Install UIS**.

__ 4. You may enter your trial-use activation key when prompted to add a Citrix license.

__ 5. If you want an X11 and Microsoft Client Allocation, select **Yes** to enable them. If you do not want these options, select **No** to disable them.

Refer to “Setting Up a Windows NT Session Using the IBM Network Station Manager Program” on page 294 and configure your Network Station to use the X11 Windows protocol to run Windows-based applications. You need to enter four items to create a Network Station WinCenter UIS button: A button name, the server IP address, wincenter, and required parameters for your WinCenter UIS server.

Installing IBM Network Station Manager Software Automatically Using a Response File

You can use the setup.exe command to install the IBM Network Station Manager software suite on more than one identical server. During your first server installation, the setup.exe command line options record a response file, setup.iss, which you can use to install the IBM Network Station Manager software suite on additional servers.

Note: The automatic installation only works from a CD copy of the IBM Network Station Manager software. You cannot use this procedure if you downloaded the IBM Network Station Manager software from the Web.

The setup.iss response file records the installation of the IBM Network Station Manager, eNetwork On-Demand Server, (and depending on user input), the NDIS Intermediate Driver and NC Navigator (North-American) browser on your PC Server. Make sure that you install the prerequisites for these products on each additional server. The response file records error messages and user-specified paths. If the additional servers do not have identical prerequisite software installed such as Netscape Navigator 4.04, the installation prompts you for input and the installation is not automatic.

To create the response file and install your software automatically in batch mode from the command line, follow the instructions below:

1. On a command line, enter the following command to install the IBM Network Station Manager software suite on your first server and generate the setup.iss response file for additional installations: **x:\ntnsm\en\products\nsm\setup.exe -r -SMS** where x is your CD-ROM drive letter.

   Note: This command installs the full IBM Network Station Manager software suite that includes eNetwork On-Demand services.

To install the IBM Network Station Manager software suite automatically in batch mode on an additional, identical Windows NT Server, use the response file from your first installation. Use the setup command to invoke the response file.

1. Copy the setup.iss file from your first installed server Windows NT subdirectory (commonly C:\WINNT) to the Windows NT subdirectory on your additional server.
2. Enter the following command to run the IBM Network Station Manager software suite installation automatically on your additional servers: **x:\ntnsm\en\products\nsm\setup.exe -s -f1C:\WINNT\setup.iss** where x: is the CD-ROM drive or a mapped network drive, and C:\WINNT\ is your Windows NT subdirectory.

Installing a Boot Server for Your Network Stations

Separating Boot servers from Authentication servers is a powerful way to centrally administer several Network Stations in your enterprise. You can do this with the IBM Network Station Manager for PC Server software. By separating your Boot server from your Authentication server, you can make your LAN network traffic and your WAN network traffic more efficient.

A Boot server includes only the executable programs for the Network Station clients and the TCP/IP services. The Boot server does not include any of the IBM Network Station Manager software or IBM Network Station login services. You need a separate Authentication server for these services.

For example, consider an enterprise with a centralized hub office and several branch offices. The branch offices connect to the centralized hub office via a slow wide area network (WAN) link, and locally the Network Stations connect within the branch via a fast LAN connection. With this network topology, you would install the Network Station configuration server and authentication server at the centralized hub office. This provides a single point for you to store company-wide preference information and user data. You would install a smaller boot server at each branch for your Network Station executable programs to run locally from the boot server.

You may centralize your Network Station administration with this concept. Run your IBM Network Station Manager software at the centralized hub office. Reduce the network traffic by sending authentication and user specific files over the WAN link. Start your Network Stations (a network intensive activity) locally, and run common programs across the LAN to reduce your WAN traffic.

Set your Network Station to start from the local network and obtain the operating system (OS) configuration files from the remote network. The login screen starts locally, authenticates the user remotely, and obtains his or her login preferences and home files from the remote system. After the user authenticates through the remote system, all programs operate from the local server. The remote server saves all user preferences and personal files.

Setting up Your Boot Server and Your Authentication Server

Install the IBM Network Station Manger software on your Network Station boot server. This Windows NT Server 4.0 (or Windows NT Server 4.0, Terminal Server Edition) Boot server should be closer (via LAN hops) to your Network Stations than your Authentication server. Typically this solution authenticates Network Stations over a WAN and starts Network Stations via a LAN (with or without routers).

To install the IBM Network Station Manager software on your Network Station boot server, perform the following command:

1. From a Command Prompt, enter the following command:
   x:\ntnsm\en\products\nsm\setup.exe /bs
2. where x: is your CD-ROM drive letter.

To install the IBM Network Station Manager software on your authentication, configuration, and user home directory server, perform the following commands. This Windows NT 4.0 Server has a remote wide area network (WAN) connection to your LAN.

1. From a Command Prompt, enter the following command:
   x:\ntnsm\en\products\nsm\setup.exe /as
2. where x: is your CD-ROM drive letter.

Using DHCP on Your Boot Server

In order to set up the Network Station to access its preferences, you must set the Configuration Host IP Address on each Network Station. You can do this through the Setup Utility for NVRAM, or through a DHCP implementation. DHCP is recommended. You can use DHCP to centrally administer your network topology without individually changing each Network Station through NVRAM.

You should set the following DHCP options to your desired network settings.

Set the following DHCP options to use a separate boot server:

DHCP Option	DHCP Option Purpose	Write your value here...
Option 66	Specifies the boot server	
Option 212	Specifies the configuration server	
Option 213	Directory for downloading configuration data	/netstation/prodbase/configs/ (this is the default value)
Option 214	Protocol for downloading configuration data	″nfs″ (this is the default value)

Using NVRAM on Your Boot Server

You may configure each Network Station separately with NVRAM. Change these setting through the Setup Utility on each Network Station. Access the Setup Utility on the Network Station by carrying out the following steps:

1. Power on the Network Station
2. When the 'NS0500 Search for Host System' message appears on the screen, press the Escape key.
3. If password control is active, enter the case-sensitive administrator password.
4. Press the F3 key to Set Network Parameters.
5. Under 'IP Addressed from' choose NVRAM.
6. Set the first 'Boot Host IP Address' to the IP address of the Local Boot/Application server.
7. Set the first 'Configuration Host IP Address' to the IP address of the Remote Configuration/Home server.

Installing Additional Software Components After the Initial Installation

You may want to install certain software components after you install the IBM Network Station Manager software.

Note: TCP/IP services allow you to serve the operating system to your Network Stations. The operating system is in a file that is called the kernel. After the kernel downloads to the Network Station, the Network Station relies on the TCP/IP services to interact with information on your Windows NT server.

Installing IBM DHCP

If you previously installed your IBM Network Station Manager software without the IBM DHCP server, carry out the following steps to install the IBM DHCP server now:

__ 1. Insert the IBM Network Station Manager for PC Server CD into your CD-ROM drive.

__ 2. Select the language of your choice.

__ 3. Click **Explore CD**.

__ 4. Find the directory `x:\ntnsm\en\products\eNOD\tcpip\`, where `x` is the letter that is associated with your CD-ROM drive.

__ 5. Double-click on the file `setup.exe` to run the installation of the eNetwork On-Demand server.

__ 6. During the installation, choose to install only the DHCP component.

Installing Microsoft DHCP

If you previously installed your IBM Network Station Manager software without the Microsoft DHCP server, carry out the following steps to install the IBM DHCP server now: To install the Microsoft DHCP server after you previously installed the IBM Network Station Manager software, refer to Step 60 on page 42.

Installing the NDIS Intermediate Driver

The NDIS intermediate driver controls the networking on your Windows NT server. This driver automatically installs when you install the IBM Network Station Manager software. However, you may need to install the NDIS intermediate driver manually or reinstall the NDIS intermediate driver manually under certain conditions.

To manually install the NDIS intermediate driver, perform the following steps:

1. Insert the IBM Network Station Manager CD into your CD-ROM drive.
2. Wait for the autorun dialog box to appear.
3. Select **Exit**.
4. Right click on the Network Neighborhood Icon on you desktop.
5. Select the **Protocols** tab.
6. Click the **Add** button.

7. Click the **Have Disk** button.
8. Enter {your CD-ROM drive letter}:\ntnsm\en\products\enod\ndis.
9. Click **OK**.
10. The IBM Intermediate Support Driver is highlighted, click **OK**.
11. Close the Network panel.
12. Click **Yes** to restart your computer.

Installing the 128–Bit NC Navigator Browser

During the installation of the IBM Network Station Manager software, customers in the United States and Canada have the option of installing the 128–bit NC Navigator browser. However, if you would like to install it after the installation of the IBM Network Station Manager, carry out the following steps:

__ 1. Insert the CD, ″IBM Network Station Manager for PC Server.″
__ 2. Select the language of your choice
__ 3. Click **Explore CD**.
__ 4. Find the directory `x:\ntnsm\en\products\ncnav\`, where `x` is the letter that is associated with your CD-ROM drive.
__ 5. Double-click on the file `setup.exe` to run the installation program.
__ 6. When the installation is complete, open the IBM Network Station Manager.
__ 7. Under *Setup Tasks*, choose **Startup**.
__ 8. Under *Startup*, choose **Environment Variables**.
__ 9. If you want all users to access the 128–bit browser, select the **System** button. If you only want one group to use the browser, select the **Group** button.
__ 10. Above the **Add an Environment Variable** button, type `NAV_128SSL` in the empty text field on the left.
__ 11. Type `True` in the empty text field on the right.
__ 12. At the bottom of the screen, click on **Finish** to save the variable. The browser is ready for use.

Configuring DHCP on the Windows NT Server Platform

DHCP is a powerful network administration tool. A careful, well-thought out DHCP configuration can make a network run effectively. Whenever you make changes to your network configuration, you must ensure that the DHCP configuration reflects those changes. Read “DHCP” on page 15 for additional information about DHCP.

Collect the following information about your network before configuring DHCP. Record your information in Table 11 on page 56.

Table 11. Gathering DHCP Information

DHCP Option Number	Field	Description	Write Your Network Value Here
		Defining the Subnet Options	
N/A	Subnet Number (Subnet IP Address)	The IP address associated with a particular subnet. For Class C networks whose subnet mask is 255.255.255.0, the subnet address is the same as the network address. For Figure 5 on page 7, the subnet IP address is 192.168.1.0. If the subnet mask of your network is not 255.255.255.0, see “Subnets and Subnet Masks” on page 9 for more information.	
N/A	Start DHCP Pool Address (IP Range From)	The first IP address in the range which you have specified for your pool of available addresses. In Network Example 3, for the subnet 192.168.1.0, the Start DHCP Pool Address could be 192.168.1.2.	
N/A	Last DHCP Pool Address (IP Range To)	The last IP address in the range which you have specified for your pool of available addresses. In Network Example 3, for the subnet 192.168.1.0, the Last DHCP Pool Address could be 192.168.1.3.	
		Defining DHCP Options	
Option 1	Subnet Mask	A value that enables network devices to direct packets of information accurately in a subnetted environment. For Figure 5 on page 7, the subnet mask is 255.255.255.0. For a discussion of subnet masks, refer to “Subnets and Subnet Masks” on page 9.	
Option 3	Router IP Address (Default Gateway)	The IP address of the default router to which TCP/IP packets not addressed to your network will be sent. In Network Example 3, for the subnet 192.168.1.0, the default gateway IP address is 192.168.1.1.	
Option 6	Domain Name Server (IP Address)	Delivering the Domain Name Server IP address to clients allows them to use either fully qualified host names or IP addresses when they communicate with other devices. In Figure 5 on page 7, the IP address of the Domain Name Server is 192.168.1.5.	
Option 15	Domain Name	The domain name allows the Network Station to specify its domain to other devices. In Figure 5 on page 7, where the fully qualified host name is `server.mycompany.com`, the domain name is `mycompany.com`.	

Table 11. Gathering DHCP Information (continued)

DHCP Option Number	Field	Description	Write Your Network Value Here
Option 66	Trivial File Transfer Protocol (TFTP) Server Name (TFTP or NFS)	The server from which the Network Station downloads its operating system. This option serves the operating system kernel using both NFS, and TFTP. When you specify this option, you must use an IP address, not the computer name of the server. NFS is the recommended download protocol. Enable the NFS download with Option 211.	
Option 67	Boot File name	The name of the file that contains the Network Station operating system. This value is a constant and has been entered for you on the table.	/netstation/prodbase/kernel **Note:** This is the NFS pathname.
Option 211	Base Code Server Protocol	This option sets the protocol used for the operating system kernel download. Specify this option to enable Option 66 to serve the kernel using NFS.	nfs

Configuring IBM DHCP on Windows NT Server 4.0

The minimum number of steps to run IBM DHCP are to create a new subnet; define an IP address pool for your subnet; define DHCP options 1, 3, 6, 15, 66, 67, and 211; save your new configuration values; and stop and restart your DHCP service. See Table 11 on page 56 for the values for your DHCP configuration.

Note: Before any of your IBM DHCP settings take effect, you need to stop your DHCP service and start your DHCP service. See “Starting and Stopping Servers and Services on Windows NT Server 4.0” on page 76 for detailed information.

You may wish to set up advanced DHCP features by adding classes, clients, and multiple server options. The sample DHCP configuration walks you through the steps necessary to configure an advanced DHCP setup. Most of the IBM DHCP default values are sufficient for common DHCP configurations. The following instructions guide you in changing the defaults as needed.

Note: If you plan to use IBM DHCP, you must ensure that the device driver associated with your LAN adapter card is compatible with the NDIS Intermediate Driver. Please refer to the installation readme.txt file for known incompatibilities.

Note: Several of the DHCP utility screens have comment fields. Use these comment fields to keep track of information about your DHCP configuration.

To configure IBM DHCP, carry out the following steps:

__ 1. If you have not yet done so, complete Table 11 on page 56.

__ 2. In order to configure DHCP on your server, you must access the eNetwork On-Demand Server:

To access the program from the Windows NT desktop, click **Start->Programs->eNetwork On-Demand Server->DHCP Server Configuration.**

The following screen appears:

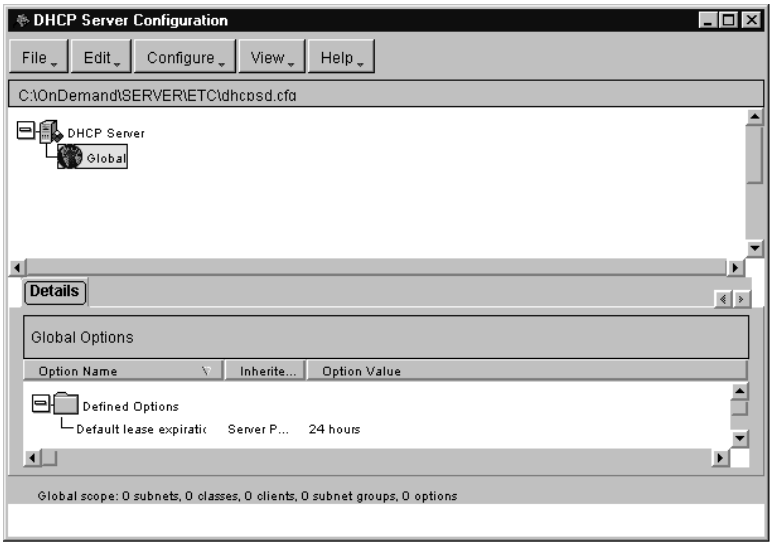


Figure 10. Main eNOD DHCP Configuration Window

__ 3. Once you open the eNetwork On-Demand (eNOD) DHCP Server Configuration window, change the options to describe your own network structure. Refer to Table 11 on page 56 for the information that you provided which pertains to your network structure.

The following example shows a DHCP configuration that is based on Network Example 3, Figure 5 on page 7. As you read the instructions for configuring DHCP, you can see what configuration values you would enter to configure the sample environment.

The sample environment contains the following entities:

- 1 DHCP server
- 1 Token-ring network
- 4 IBM Network Stations. Ns1 and ns2 belong to the subnet and receive their addresses dynamically. Ns3 and ns4 exist as clients with fixed IP addresses outside of the subnet.
- 1 Domain Name Server
- 1 Router

All of these exist on the same token-ring network. Table 12 on page 59 summarizes the configuration. A step-by-step explanation of the example accompanies the DHCP instructions which follow the table.

Table 12. Sample DHCP Information for Network Example 3

Field	Value
Defining the Subnet Options	
Subnet Number (subnet address)	192.168.1.0
Start DHCP Pool Address (IP Range From)	192.168.1.1
Last DHCP Pool Address (IP Range To)	192.168.1.100
Defining DHCP Options	
Subnet Mask (DHCP Option 1)	255.255.255.0
Router (DHCP Option 3)	192.168.1.1 and 10.1.1.1
DNS Address (DHCP Option 6)	192.168.1.5
Domain Name (DHCP Option 15)	mycompany.com
Boot File Name (DHCP Option 67)	/netstation/prodbase/kernel
Defining Advanced DHCP Options	
Client Name	ns3
Client Name	ns4
Client ID (MAC address)	0000e5686f14 (for ns3)
Client ID (MAC address)	0000e5806g63 (for ns4)
Client IP Address	10.1.1.2 (for ns3)
Client IP Address	10.1.1.3 (for ns4)

Note: The IBM Network Stations ns1 and ns2 do not appear in the table because they represent hosts whose MAC addresses are unknown to the server. The DHCP server will allocate their IP addresses dynamically.

You can configure options on several levels, including the global, subnet, class, and client levels. If you configure an option at the global level, the value applies to every client unless a value from a more specific level (such as a subnet level) overrides it. For example, if you configure a router at the global level, every client in the network recognizes that router as its own. However, if you configure a different router at the subnet level, all clients within that subnet recognize the second router as their own.

Refer to your network diagram to decide how to configure your network. Usually, you begin by declaring some global options, and then you set up at least one subnet or class and possibly some individual clients.

To construct the sample network, the administrator carries out the following steps:

__ a. First, the administrator defines some global DHCP options. To configure global options, carry out the following steps:

__ 1) Once you have opened the eNetwork On-Demand DHCP Configuration utility, select **File->New**.

__ 2) The graphical display beneath *Current Configuration — untitled* should show a DHCP server with a highlighted Global icon.

__ 3) If *Global* is highlighted, select **Configure->Modify selected item**.

__ 4) The *Global Parameters* window opens with the *Excluded Addresses* tab selected.

Later, when you configure a subnet, you will specify a range of addresses that your DHCP server will use to supply clients with IP addresses. You must exclude from the range the IP addresses of any entities on your network whose addresses are permanent or fixed. You must exclude the following types of addresses from the DHCP range:

- Any device whose address is fixed, including:
  - Boot servers, configuration servers, http servers, domain name servers
  - Routers and network printers
  - Network Stations that start using NVRAM

If you do not exclude such addresses from the range, you might cause address conflicts in your network.

To exclude IP addresses, like the router in Network Example 3, enter them in the IP address field and click on **Add**. The administrator in Network Example 3 does not exclude the broadcast address because it does not fall within the range of available IP addresses. For Network Example 3, if the DHCP range extended from 192.168.1.2 to 192.168.1.50, the administrator would have to exclude three IP addresses from the range. The administrator would exclude the addresses of the DHCP server (192.168.1.4), the Domain Name Server (192.168.1.5), and the router (192.168.1.1).

__ 5) Select the **DHCP Options** tab. The following screen appears:

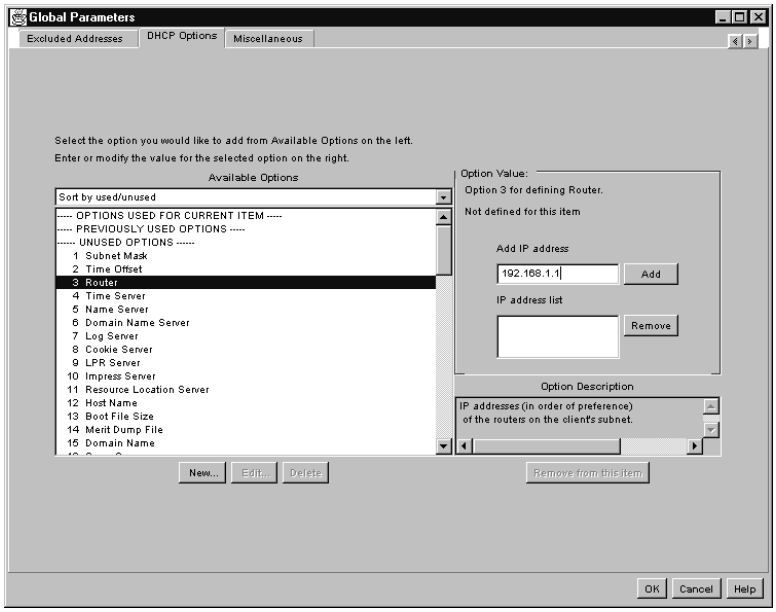


Figure 11. Defining Global DHCP Options

__ 6) In the new window, select a DHCP option from the field on the left of the screen. Refer to Table 11 on page 56. Enter the value for that option in the *Option Value* window to the right. In Network Example 3, the administrator selects options 1, 3, 6, and 15. The administrator specifies these options at the global level because they apply to all of the clients in the sample network. The above graphic shows the administrator specifying the IP address of the router.

Network Example 3, Global Parameters Summary:

- DHCP Options:
  - Subnet Mask: 255.255.255.0
  - Router: 192.168.1.1
  - Domain Name Server address: 192.168.1.5
  - Domain Name: mycompany.com
- Click **Ok** to go back to the main screen.

__ b. Next, the administrator of Network Example 3 creates a subnet. To create a subnet, carry out the following steps:

__ 1) From the main eNOD DHCP configuration window, make sure that *Global* is highlighted.

__ 2) From the menu pulldown, select **Configure->Add Subnet**.

__ 3) The *Subnet Parameters* window appears with the **Subnet Definition** tab selected:

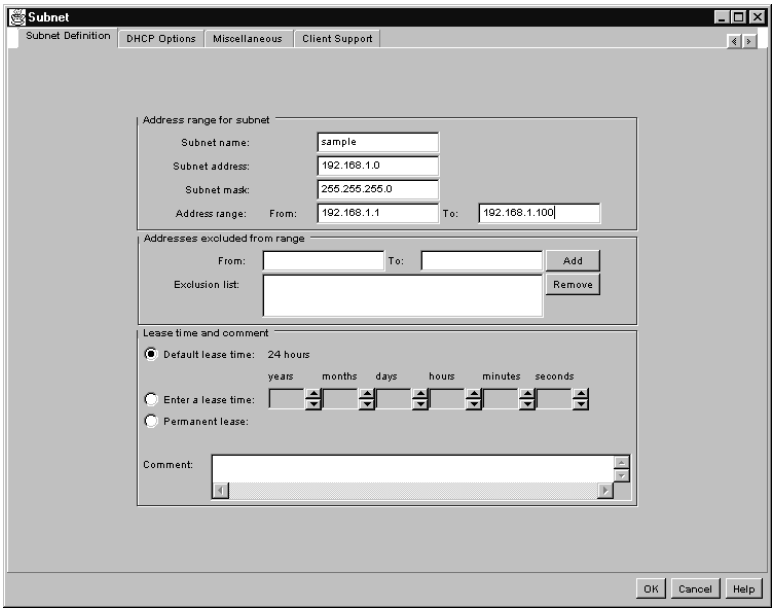


Figure 12. Defining a Subnet

__ 4) Enter the information from Table 11 on page 56 on the screen. You need to create a range of IP addresses from which the DHCP server draws from when it allocates addresses to your clients. You may enter a descriptive subnet name in the top field.

A lease is the duration of time in which a client may use an IP address. The default least time is sufficient for most DHCP configurations. DHCP clients automatically renew their leases when half of the lease time has expired. If you set a non-default lease time, the DHCP utility automatically sets Option 51 for you. Network Example 3 shows a lease time of 24 hours.

You have the option of using the *Comment* field to enter miscellaneous notes that will help you to administer the subnet. No comments appear in Network Example 3.

__ 5) Select the **DHCP Options** tab.

__ 6) Configure the remaining DHCP options 66, 67, and 211 from Table 11 on page 56. You may also redefine the DHCP options that you set at the global level. Remember that these values will override the ones that you specified at the global level.

__ 7) Click on **OK** at the bottom of the screen once you have finished configuring your subnet.

__ 8) When you return to the main window, you will see the information you have specified reflected in the graphical display at the bottom of the screen. If you highlight *Global* at the top of the screen, the display at the bottom of the screen shows the options that you

specified globally. That display also indicates on what level (global, subnet, class, or client) each option was specified.

Network Example 3, Subnet Definition Summary

- Subnet address: 192.168.1.0
- Subnet mask: 255.255.255.0
- IP address range: 192.168.1.2 to 192.168.1.3
- Addresses excluded from range: None
- Lease Time: 24 hrs.
- Comment: None
- DHCP Options:
  - Router: 192.168.1.1

__ c. The simple IBM DHCP installation is now complete. To use IBM DHCP, you must select **File->Save** to save your settings. You may simply use the default IBM DHCP configuration file or rename it as you choose. Refer to “Starting and Stopping Servers and Services on Windows NT Server 4.0” on page 76 and stop your DHCP service and start your DHCP service for your changes to take effect.

If you have a mixed network, you may need to configure classes and clients. For example, a mixed network might include Network Stations, personal computers, and UNIX workstations. Most DHCP clients ignore DHCP options that do not apply to them so configuring clients and classes may not be necessary.

Next, the administrator of the sample network creates a class of clients. Because Network Stations must access a server in order to receive their operating system, there are two DHCP options that apply only to them. DHCP option 66 specifies the location of the computer from which the Network Station must download its operating system. Option 67, boot file name, is the name of the operating system kernel file.

The way to avoid configuring these options for PCs is to specify them at the class level. You can create a class of clients that is based on the hardware model of the Network Station. Every Network Station in your network belongs to a class that is based on its hardware model. For all Network Station hardware models, the boot file name is ″kernel.″ Thus, when a client that belongs to a Network Station class reaches the DHCP server, it receives the necessary information to access its kernel.

You must create a separate class for each hardware model of the Network Station.

To create a class within a subnet, carry out the following steps:

__ 1) Find out the proper class value by referring to “Determining DHCP Classes” on page 22.

__ 2) In the main eNOD DHCP Configuration window, highlight the subnet.

__ 3) From the menu pulldown, choose **Configure->Add class**. The following screen appears:

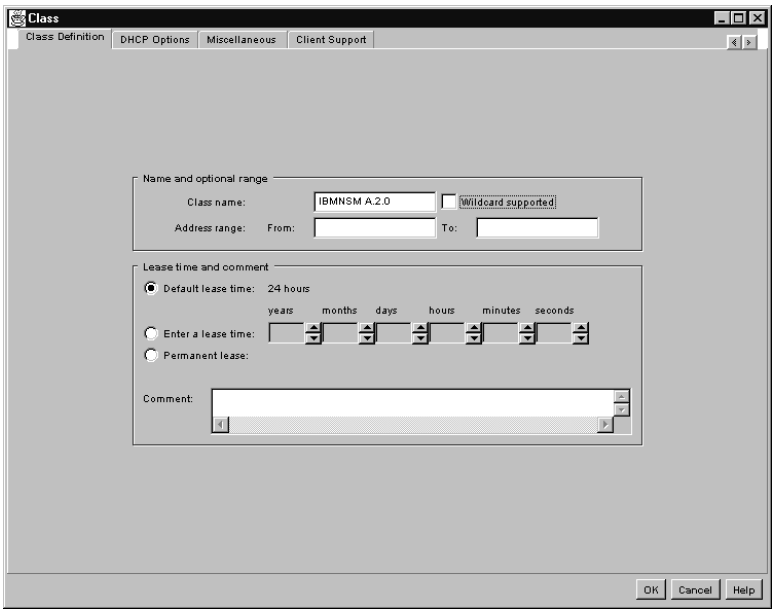


Figure 13. Adding a Class

__ 4) Refer to 3.c.1 on page 63 and enter the correct class value in the text field.

__ 5) Enter the range of IP addresses from which the server may draw to serve clients in this class.

__ 6) Click on the **DHCP Options** tab.

__ 7) In the new window, select DHCP option 66. Enter the IP address of the server which will deliver the kernel to Network Stations that belong to this class.

Note: You may change previously entered DHCP Option values at this point.

__ 8) Select DHCP option 67. Enter the value `/netstation/prodbase/kernel`.

__ 9) Save your changes by clicking on **OK** at the bottom of the screen.

As the above graphic shows, the administrator of the sample network configures a class of Network Stations that is called IBMNSM A.2.0.

To create a class outside of a subnet, highlight *Global* in the main window and then carry out the above steps. You do not need to provide a range of addresses unless you create the class within a subnet.

For more guidance in configuring classes, refer to “Determining DHCP Classes” on page 22.

Network Example 3, Class Definition Summary

- Address Range: 129.168.1.1 — 192.168.1.100
- Class Name: IBMNSM A.2.0
- DHCP Option 66: 192.168.1.4
- DHCP Option 67: /netstation/prodbase/kernel

__ d. The administrator of Network Example 3 creates two clients which do not receive their IP addresses dynamically. The two clients are ns3 and ns4.

If you want DHCP to give a static IP address to a client, you need create the client at either the global level or the subnet level. To create an individual client at the global level, carry out the following steps:

__ 1) From the main configuration window, highlight *Global*.

__ 2) From the menu pulldown, select **Configure->Add Client**.

__ 3) The *Client Parameters* window appears with the **Client Definition** tab selected:

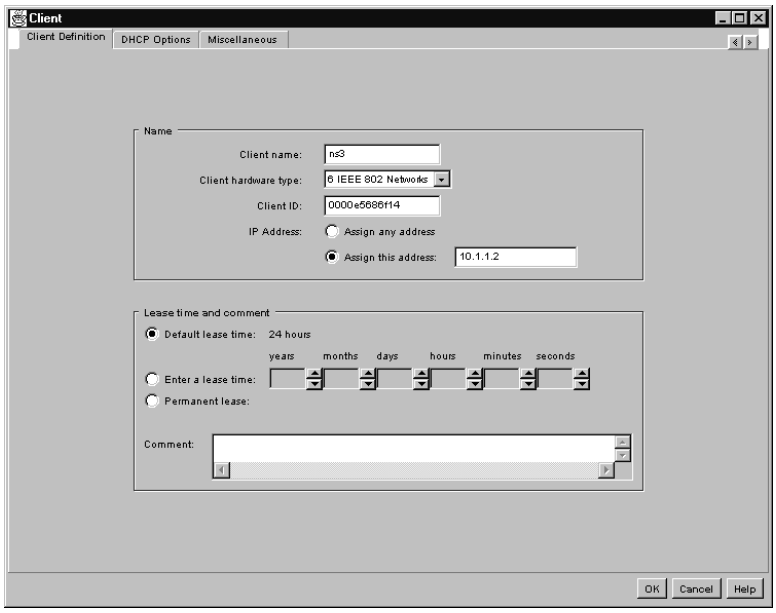


Figure 14. Defining a Client that Does Not Receive its IP Address Dynamically

__ 4) Fill in the information on the screen.

In the *Client name* field, enter the computer name of the Network Station. In Network Example 3, the computer name of the first Network Station is ns3.

For *Client hardware type*, choose *1 Ethernet (10 Mb)* for Ethernet machines or *6 IEEE 802 Networks* for token-ring machines.

The client ID is the MAC address of the Network Station. See “Working With MAC Addresses” on page 305 for more information about MAC addresses.

If you specify a client at the client level because it has a fixed IP address, select *Assign this address* and supply an address for the client. The administrator in the sample network supplies a fixed address for the client ns3.

__ 5) Select the **DHCP Options** tab.

__ 6) You may enter or change any of the previously defined DHCP options at this point. Refer to Table 11 on page 56. The administrator of Network Example 3 must specify a different router for ns3 and ns4:

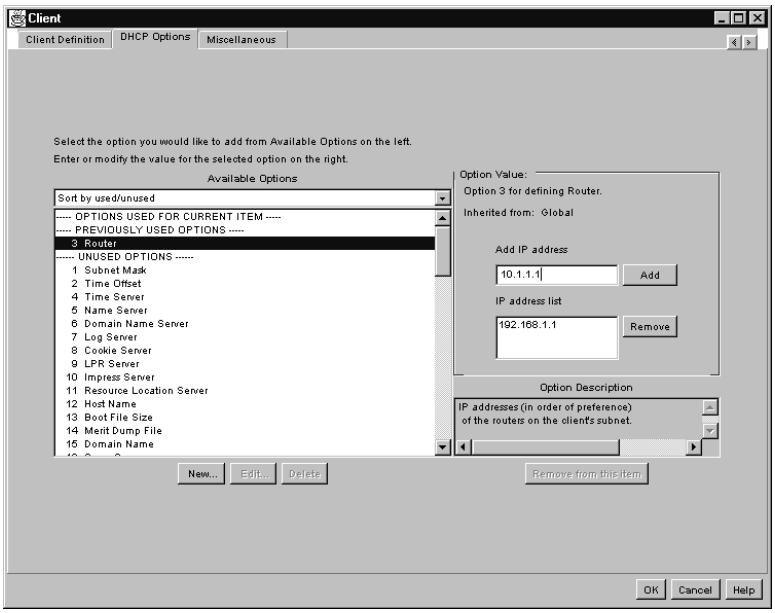


Figure 15. Specifying DHCP Options for a Client with a Fixed IP Address

Network Example 3, Client Definition Summary for ns3

- Client Name: ns3
- Client Hardware Type: 6 IEE 802 Networks
- Client ID: 0000e586f14
- IP Address: Assign this address: 10.1.1.2
- Lease Time: Default Lease (24 hrs.)
- Comment: None
- DHCP Options
  - Router: 10.1.1.1

__ 4. Click on **File->Save**(or)**Save As** and save your changes.

You have finished configuring IBM DHCP. Refer to “Starting and Stopping Servers and Services on Windows NT Server 4.0” on page 76 and stop your DHCP service and start your DHCP service for your changes to take effect.

When you make changes to your network, you must enter the configuration utility to reflect those changes in DHCP. To make global changes or to change an existing subnet, class, or client, highlight the object in the main window and choose **Configure->Modify selected item**.

Go to “Before You Continue . . .” on page 90.

Creating DHCP Options on IBM DHCP

For advanced configurations, you may need to configure DHCP options which do not appear in the list of options on the DHCP interface. To create an option, carry out the following steps:

1. Open the DHCP Server Configuration window by selecting **Start->Programs->eNetwork On-Demand Server->DHCP Server Configuration**.
2. Highlight *Global*.
3. From the pulldown menu, choose **Configure->Modify selected item**.
4. Select the *DHCP Options* tab.
5. Click the **New** button.
6. Fill in the *Create New Option* screen.
7. Once you have created your DHCP option, click **OK** to return to the main DHCP configuration page.
8. Highlight *Global* or the class, subnet, or client for which you want to configure your new DHCP option.
9. Select the new DHCP option that you created and enter the appropriate information.
10. When you are finished, click **OK** to save your changes and then exit the DHCP configuration utility.

Configuring Microsoft DHCP on Windows NT Server 4.0

This section explains how to configure the Microsoft version of DHCP. If you are planning to use Microsoft DHCP, you should have already installed it on your server. If you have not yet done so, refer to page 42.

Configure Microsoft DHCP by carrying out the following steps:

__ 1. If you have not yet done so, complete Table 11 on page 56.

__ 2. From the NT desktop, select **Start->Programs->Administrative Tools->DHCP Manager**.

__ 3. In the DHCP Manager window, select **Server** from the pulldown menu and choose **Add**.

__ 4. Enter the IP address of the server which will act as the DHCP server.

__ 5. In the lefthand sector of the main DHCP Manager window, highlight your server by clicking on it once.

__ 6. In the *DHCP Manager* window menu bar, select **Scope->Create**.

__ 7. In the *Create Scope* window, enter the pool of available IP addresses for a group of Network Stations. You may want the range to include enough addresses for all of your Network Stations, or create two or more scopes to accommodate your clients. In Microsoft DHCP, a scope is similar to a subnet. Enter the following information in the *Create Scope* window:

   - Start Address: This is the first address in the range of available IP addresses for the scope. It is part of the range.
   - End Address: This is the last address in the range of available IP addresses for the scope. It is also part of the range.
   - Subnet Mask: Enter the subnet mask for this scope. For more information about subnet masks, refer to “Subnets and Subnet Masks” on page 9.
   - Exclusion Range: If any addresses within the scope (the range of available IP addresses) belong to a device with a fixed IP address, you must exclude this IP address from the scope. Examples of devices whose IP addresses are fixed include the DHCP server, DNS servers, routers, and Network Stations that do not use DHCP to start. If you leave those addresses in the range, the DHCP server might assign them to a client. Enter the following two values under the Exclusion Range:
     – Start Address: Type the first IP address to exclude from your scope. Click on **Add** to enter it in the *Excluded Addresses* box. If you make an error and would like to remove an address from the *Excluded Addresses* box, highlight it and then click the **Remove** button.

       Note: If you want to enter a single address (or several individual addresses that do not form a range), use the *Start Address* box for each address. Type the address and then click on **Add**.

     – End Address: Type the last IP address to exclude from your scope. Click on **Add** to enter it in the *Excluded Addresses* box.

- Lease Duration: You can specify the length of time your Network Stations use their assigned IP addresses. Do not give your Network Stations unlimited lease times. Choose a workable lease time. Even if you give your Network Stations a lease time of only a few hours, you do not need to do any work to keep them running. They will automatically renew their own leases when half of the lease time has expired.
- Name: This is an optional field. You can fill in a value that you can use to refer to the scope.
- Comment: This field is also optional. Use it to enter any special information about the scope. An example of a comment might be ″Used by third-floor administrative staff.″

__ 8. When you have entered all of the appropriate information on the *Create Scope* screen, click on **OK**.

__ 9. When asked if you want to activate the scope, choose **Activate Now**.

__ 10. In the main DHCP Manager window, highlight the scope that you just created.

__ 11. Select **DHCP Options** from the menu bar and choose from among **Scope**, **Global**, or **Defaults**. What you are deciding is the group to which you want to apply the DHCP options that you are about to configure. If you select **Global**, the options apply to every client on your network. If you select **Scope**, the options apply to all of the clients in the scope that you have highlighted. Do not select **Default**. If you do, a standard set of options will take effect which will not allow you to start your Network Stations.

__ 12. Once you select a group of clients to which to apply the options, you must specify which options you want to configure. To configure DHCP options, carry out the following steps:

__ a. Select an option from the *Unused Options* box at the left of the screen. You must configure the following options:

- Router
- Boot file name
- Host name

__ b. Once you have highlighted an option, click on the **Add** button.

__ c. If you have selected an option that requires some value (like an IP address), click on the **Value** button. You can then enter the value for that option in a text box. If the option requires an array of values (such as a range of IP addresses), click on **Edit Array**. Enter the required information, click on **Add**, and then click on **OK**.

Note: If you try to add an option, but the value box appears greyed out; click on **OK** and return to the main DHCP Manager window. From there, select **DHCP Options** and choose from **Scope**, **Global**, and **Default** again. Once you reenter the *DHCP Options* window, highlight the option you were working on in the *Active Options* box. The **Value** button should no longer appear greyed out.

__ d. Once you have configured the three required options as well as any additional options, click on **OK**.

__ 13. Repeat this process for as many scopes as you would like to create.

__ 14. If you want to reserve an IP address for an individual client, you can do so by carrying out the following steps:

__ a. In the *DHCP Manager* window, highlight the scope in which you want the new client to exist.

__ b. From the DHCP Manager window menu bar, select **Scope->Add Reservations**.

__ c. Enter the following information in the *Add Reserved Clients* window:

- IP Address: Enter the IP address that you want to reserve for this Network Station. The address may be outside the range of the scope that you highlighted.
- Unique Identifier: The unique identifier is the MAC address of the Network Station. For more information about MAC addresses, refer to "Working With MAC Addresses" on page 305.
- Client Name: Enter the computer name of the Network Station.
- Client Comment: Use this optional field to enter an administrative comment.

__ d. Click **Add**.

__ e. If you want to reserve another IP address for another client, do so now. Otherwise, click on **Close** to return to the main DHCP Manager window.

__ f. From the menu bar, select **Scope->Active Leases**.

__ g. The client that you just created should now appear in the *Active Leases* window.

__ h. Highlight the client that you just created.

__ i. Click on the **Properties** button.

__ j. Select **Options**.

__ k. Enter options for this client as you did before for the scope.

__ l. Click on **OK**.

__ 15. Your Microsoft DHCP server is ready to start Network Stations. Make sure that you set each Network Station to the ″Network″ setting in the Setup Utility. See "Configuring an IBM Network Station to Boot from the Network Setting" on page 308 for guidance.

Once you have configured your DHCP server, go to "Before You Continue . . ." on page 90.

Creating DHCP Options on Microsoft DHCP

For advanced DHCP configurations, you may need to configure DHCP options which do not exist on the Microsoft DHCP interface. To create a DHCP option, carry out the following steps:

1. Open the DHCP interface by selecting **Start->Programs->Administrative Tools->DHCP Manager**.
2. Highlight the group of clients to which you want the new option to apply (global, scope, or client).

3. Select **DHCP Options** from the pulldown menu.
4. Choose **Defaults**.
5. In the *Option Class* list, select **Standard Option Types**.
6. In the *Name* box, type a new option name. The name should be descriptive of the function that the option adds to your configuration.
7. In the *Data Type* list, click the data type for the option. The data type is the way that the system reads the option value information.
8. In the *Identifier* box, type a unique number to associate with the option.
9. In the *Comment* box, enter information that will guide you or other users who need to configure the option. For example, a comment might read, ″Protocol to use for terminal configuration information.″
10. From the *DHCP Options: Default Values* dialog box, type the value for the option in the *Value* box.
11. When you have configured your new option, click **OK** to save your changes and exit the configuration utility.

Configuring DHCP for Multiple Servers on Windows NT Server 4.0

You can configure DHCP so that the client obtains its IP address from the DHCP server, loads the kernel from a base code server, and loads terminal configuration from a terminal configuration server, and authenticates from an authentication server. “Load Balancing Example” on page 19 explains the concept of using multiple servers in detail.

Note: To simplify DHCP administration in your network, you should give your IBM Network Station Manager servers permanent IP addresses instead of making them DHCP clients.

This section provides specific instructions for configuring DHCP for the example that is found in Figure 8 on page 20.

To configure your network for multiple servers, you must set DHCP options 211, 212, 213, and 214. To configure these options on IBM DHCP, refer to “Configuring IBM DHCP for Multiple Servers”. To configure them on Microsoft DHCP, refer to “Configuring Microsoft DHCP for Multiple Servers” on page 73.

Configuring IBM DHCP for Multiple Servers

Many of the DHCP options that are required for multiple servers do not exist on the IBM DHCP interface. However, IBM DHCP comes with a DHCP starter file that contains the class information and the options that are missing from the main interface. The simplest way to configure IBM DHCP for multiple servers is to open this template file from the DHCP configuration utility. If you are upgrading from a previous version of the IBM Network Station Manager and you used DHCP before, the name of the file is r3dhcpsd.cfg. For all other users, the default name of the starter file is dhcpsd.cfg.

If you choose not to run the DHCP starter file, you must create DHCP options 212, 213, and 214. You must also configure DHCP option 66, the base code server IP address. To do so, carry out the following steps:

__ 1. Open the *DHCP Server Configuration* window by selecting **Start->Programs->eNetwork On-Demand Server->DHCP Server Configuration**.

__ 2. Highlight *Global*.

__ 3. From the pulldown menu, choose **Configure->Modify selected item**.

__ 4. Select the *DHCP Options* tab.

__ 5. Click the **New** button.

__ 6. Fill in the *Create New Option* screen once for each of the options in Table 13. Use the information in Table 13 as a reference for the options that you create.

Table 13. Options to Create for multiple servers

Value Format	Option Name	Option number	Brief description of option	Option value description	Value you should specify
String	Terminal Configuration Server	212	IP address of server to deliver terminal configuration data	IP address of terminal configuration server	
String	Terminal Configuration path	213	The path to access terminal configuration information for option 212 (terminal configuration server)	Path name	
String	Terminal Configuration Protocol	214	Protocol to use for option 212 (terminal configuration server)	NFS or TFTP	NFS

__ 7. Once you have created all four DHCP options, click **OK** to return to the main DHCP configuration page.

__ 8. Highlight *Global* or the class, subnet, or client for which you want to configure your new DHCP options.

__ 9. When the parameters screen appears, select option 66, base code server. Enter the IP address of the server from which you want this client or group of clients to download the kernel.

__ 10. Select each of the four DHCP options that you created and enter the appropriate value that uses the last column of Table 13.

__ 11. When you are finished, click **OK** to save your changes and then exit the DHCP configuration utility.

Configuring Microsoft DHCP for Multiple Servers

Because DHCP options 211, 212, 213, and 214 do not exist on the Microsoft DHCP interface, you must create them manually. To do so, carry out the following steps:

__ 1. Open the DHCP interface by selecting **Start->Programs->Administrative Tools->DHCP Manager**.

__ 2. Highlight the group of clients to which you want the new options to apply (global, scope, or client).

__ 3. Select **DHCP Options** from the pulldown menu.

__ 4. Select DHCP option 66, base code server.

__ 5. Enter the IP address of the server from which you want this client or group of clients to download the kernel.

__ 6. Click **OK** to save your changes.

__ 7. From the main DHCP Manager window, select **DHCP Options** from the pulldown menu and choose **Defaults**.

__ 8. In the *Option Class* list, select **Standard Option Types**.

__ 9. In the *Name* box, type a new option name. Refer to Table 14 for the names of the options you must create.

__ 10. In the *Data Type* list, click the data type for the option. The data type is the way that the system reads the option value information. Refer to Table 14 for the proper data type for each value.

__ 11. In the *Identifier* box, type a unique number to associate with the option. Again, use Table 14.

__ 12. In the *Comment* box, enter the appropriate information from Table 14.

__ 13. From the *DHCP Options: Default Values* dialog box, type the value for the option in the *Value* box.

Table 14. Options to Create for Microsoft DHCP on Multiple Servers

DHCP Option Name	Data Type	Identifier	Comment	Value
Base Code Server Protocol	String	211	Protocol to use for Option 66 (base code server)	NFS
Terminal Configuration Server	String	212	IP address of server to deliver terminal configuration information	
Terminal Configuration Path	String	213	Path to access terminal configuration information	\netstation\prodbase\configs\

Table 14. Options to Create for Microsoft DHCP on Multiple Servers (continued)

DHCP Option Name	Data Type	Identifier	Comment	Value
Terminal Configuration Protocol	String	214	The protocol used to access terminal configuration information	NFS

__ 14. When you have configured all of the above options, click **OK** to save your changes and exit the configuration utility.

Managing Users and Groups for IBM Network Station Users

When you add Network Stations to an existing Microsoft Windows NT Server 4.0 environment, you must complete two tasks:

- Add a user account for the user of the Network Station. See “Managing User Groups on a Stand-Alone Server That Is in a Domain” on page 75.
- Make the necessary DHCP configuration changes. See “Configuring DHCP on the Windows NT Server Platform” on page 55.

IBM Network Station Manager assigns administrative control and sets directory permissions by using Windows NT local groups. The IBM Network Station Manager installation program creates NSMUser and NSMAdmin local groups on your server.

You must define each Network Station user in your network and add each Network Station user to the NSMUser group. To limit administrative control, you should put the user in the NSMUser group only. To assign full administrative control, put the user in both the NSMUser and the NSMAdmin groups.

You may also use Windows NT groups to organize preferences. You can only use local groups that exist on the server with IBM Network Station Manager installed on it for this purpose.

When you add either a user account or create a group and add users to it, use the following restrictions for user names, group names, and passwords:

- User names and group names must not be identical to Windows NT Server 4.0 domain names or server names.
- Names cannot be more than 20 characters long.
- Names must be subsets of ″invariant ASCII″ or the English alphanumeric set. In other words, they may not contain any of the following elements:
  - Double-byte characters
  - Characters above ASCII 33 and below ASCII 127
  - Control characters
  - Spaces or tabs
  - Any of the following characters:
    - Forward slash (/)

- Backward slash (\)
- Colon (:)
- Semicolon (;)
- Asterisk (*)
- Question mark (?)
- Quotation mark (″)
- ″Greater than″ symbol (>)
- ″Less than″ symbol (<)
- Brackets ([), (])
- ″Plus sign″ (+)

Managing User Groups on a Stand-Alone Server That Is in a Domain

If you install IBM Network Station Manager on a Stand-Alone Server that is in a domain, use the following instructions to manage Network Station users on the domain.

Before you create a user, decide where user data will be stored, whether on the Primary Domain Controller of a network or on another server. On a Stand-Alone Server that is a member of a domain, the IBM Network Station Manager logon service searches for the user name on the local machine. If the user name is found, the logon service attempts to log the user in and stops searching for the user even if the logon attempt is unsuccessful. You need to add domain users to the NSMUser group on the Stand-Alone Server.

To eliminate duplication of users and make future expansion of your network easier, you should create your users on a Primary Domain Controller and add them to the NSMUser group on the Stand-Alone Server.

To add domain users or global groups to the local NSMUser group, complete the following instruction:

1. On the local server select **Start->Programs->Administrative Tools (Common)->User Manager for Domains**.
2. Double click on the **NSMUser** group.
3. Click on **Add**.
4. Make sure the domain is visible in the **List Names From** box.
5. Highlight the user or global group and click on **Add**.
6. Click on **OK** to close the **Add Users and Groups** panel.
7. Repeat these steps to add users or groups to the **NSMAdmin** group.

If you would like a user with full administrative authority, you need to add the user id to the **Domain Admins** global group. You can add this group to your user id from the PDC.

Starting and Stopping Servers and Services on Windows NT Server 4.0

So that your network runs smoothly, ensure that you start your servers and services. There are several servers and services that must be running:

- Lotus Domino Go Webserver or Microsoft Internet Information Server
- IBM or Microsoft DHCP server
- IBM TCP/IP Services
- NFS server or TFTP server
- Ethernet adapter or token-ring adapter

To start the Lotus Domino Go Webserver, Microsoft Internet Information Server, Microsoft DHCP, IBM DHCP, or IBM TCP/IP, carry out the following steps:

__ 1. From the Windows NT desktop, choose the following path: **Start->Settings->Control Panel->Services**.

__ 2. Select the server or service which you want to start.

__ 3. Click on **Start**.

To enable your Ethernet adapter or token-ring adapter, carry out the following steps:

__ 1. From the Windows NT desktop, choose the following path: **Start->Settings->Control Panel->Network->Adapters**.

__ 2. Select the network adapter that is installed on your computer.

__ 3. Click on **Start** to enable the adapter or **Stop** to disable it.

Configuring Printers on Windows NT Server 4.0

You can configure printers for your Network Stations with the IBM Network Station Manager unless the datastream generated by the application does not match a datastream that your printer understands. Table 62 on page 242 describes which datastreams the common Network Station applications produce.

Configuring Basic Printer Scenarios

Using Figure 16 on page 77 as an example, Table 15 on page 77 explains the basic steps to configure printers for your Network Stations.

Note: You should review the online help information text for IBM Network Station Manager Printer Settings to become more familiar with the Print function for Network Stations.

Identify the scenario that best meets your needs and follow the steps to configure your printers.

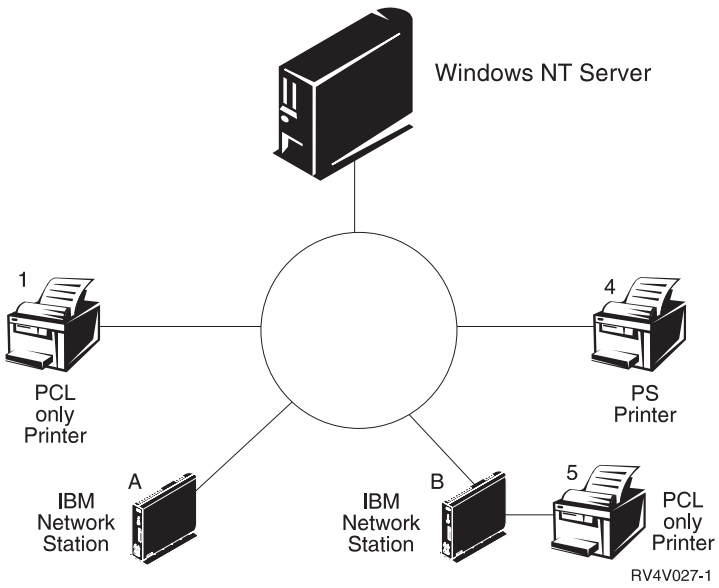


Figure 16. Possible Network Station Printing Scenarios

Table 15. Configuration Descriptions for Basic Printer Scenarios

Desired Print Scenario	**Print Job Flow in Figure 16**	**Configuration Instructions**
Network Station to a LAN printer	Network Station A to Printer 1	1. In the IBM Network Station Manager software, configure an entry in the *Remote Printer Server* field for the LAN printer.
Network Station to a locally attached printer	Network Station B to Printer 5	1. In the IBM Network Station Manager software, configure an entry in the *Local Parallel Printer* or the *Local Serial Printer* field, depending on how the printer connects to the Network Station.
Network Station to another Network Station with an attached printer	Network Station A to Network Station B to Printer 5	1. In the IBM Network Station Manager software, configure an entry in the *Remote Printer Server* field with the IP address of the Network Station to which the printer is attached. In the *Queue name* field, type `PARALLEL1` or `SERIAL1`, depending on how the printer connects to the Network Station.

Table 15. Configuration Descriptions for Basic Printer Scenarios (continued)

Desired Print Scenario	Print Job Flow in Figure 16 on page 77	Configuration Instructions
Windows NT Server 4.0 to a Network Station with an attached printer	Windows NT Server 4.0 to Network Station B to printer 5	You must use the Windows NT Server 4.0 CD to install LPD/LPR on the Windows NT Server 4.0 machine. Carry out the following steps: 1. Insert the CD. 2. Select **Control Panel->Network->Services**. 3. Click **Add**. 4. Highlight *Microsoft TCP/IP Printing* and press Enter twice. 5. Restart the Windows NT server. **Note:** You may need to reinstall Service Pack 3. Refer to 56 on page 38. 6. Boot the Network Station from the Windows NT server. 7. On the Windows NT desktop, select **My Computer->Printers->Add Printer**. 8. Select *My Computer* and click **Next**. 9. Select **Add Port**. 10. Highlight *LPR Port* and click on **New Port**. 11. In the *Add LPR Compatible Printer* window, enter the name or IP address of the Network Station to which the printer is attached. Then enter the name of the printer or print queue (SERIAL1 or PARALLEL1) on that server. 12. Click **OK**. 13. You must specify PCL, ASCII, or PostScript in the Network Station Manager for this printer. The default is PostScript. 14. Choose **Close->Next**. 15. In the Add Printer wizard window, select the manufacturer and model of the printer that is attached to the Network Station. 16. Click **Next**. 17. Select whether you want the printer to be shared by users. 18. Print a test page to confirm proper setup.

Printer Administration Techniques

Administrating a printer environment is a difficult task. You should create a printer network diagram. Based on your printing needs and your diagram, you should develop a printing strategy. Under the right conditions, Network Stations can print to most types of printers.

One technique to consider is to have a server control the printers for your Network Stations. In Figure 16 on page 77, the Windows NT 4.0 server could control a LAN printer like Printer 4. If Network Station A and B always sent their print jobs to the

Windows NT server, the Windows NT server controls the flow of print jobs to the printer. This scenario reduces the work load on the Network Stations when the printer buffer is full, because the Windows NT server negotiates print jobs with the printer. However, handling these print jobs would likely draw on the central processing unit (CPU) of the Windows NT server. This technique will likely hinder the server's performance depending on the size and frequency of your print jobs. Since you would send the print job from a Network Station, to a server, and then to a printer, this technique would increase network traffic too.

Having a server control your Network Station printing is also advantageous in an environment with mixed printer datastreams. Since Network Station applications only generate certain datastreams, you may have to send print jobs to a server, which transforms the job into a datastream for your printer. Depending on which application generates the job, you may or may not need to transform your print jobs. This may require more administration in the Network Station Manager software and on the server. Your end users would also need to have a better understanding of printing and networking. To eliminate confusion, you should consider having all print jobs sent to the server regardless of whether the job needs to be transformed or not. In the end, you will have fewer printer entries in the IBM Network Station Manager software and fewer printer device descriptions on the server.

When you have a server that controls the printers for your Network Stations, you perform less administration, but you sacrifice speed. When a server controls your print jobs, its CPU works harder, possibly slowing performance. Your end users will notice that it takes longer for them to receive their printouts. If you set up your printing strategy so that your Network Stations send their jobs directly to the printer (whenever datastream transformation is unnecessary), you reduce printing time. Since the print job goes directly to the printer, your server does not bear the load of controlling print jobs. Sending your print jobs directly to the printer also reduces the chance of the server misinterpreting your print job. When a server misinterprets a print job, the job may become lost or damaged.

Updating IBM Network Station Manager Software and Migrating IBM Network Station Manager Preference Files

When you install your IBM Network Station Manager software, the installation program checks to see if you installed a previous IBM Network Station Manager software release. If your IBM Network Station Manager software is an older version, a dialog box prompts you to install the new IBM Network Station Manager software. Depending on your current software version, the dialog box asks you to apply a Service Update or upgrade to a new IBM Network Station Manager release. These Service Updates include only updated IBM Network Station Manager software and updated eNetwork On-Demand software.

You should read this entire section before you take any steps to migrate your files. Preference file migration and client migration is a complex process. Do not try to migrate your preference files without following the instructions in this section.

Note: If you manually modified any configuration files instead of using the IBM Network Station Manager in the past, refer to http://www.ibm.com/nc/pubs and read the Advanced User Information located there.

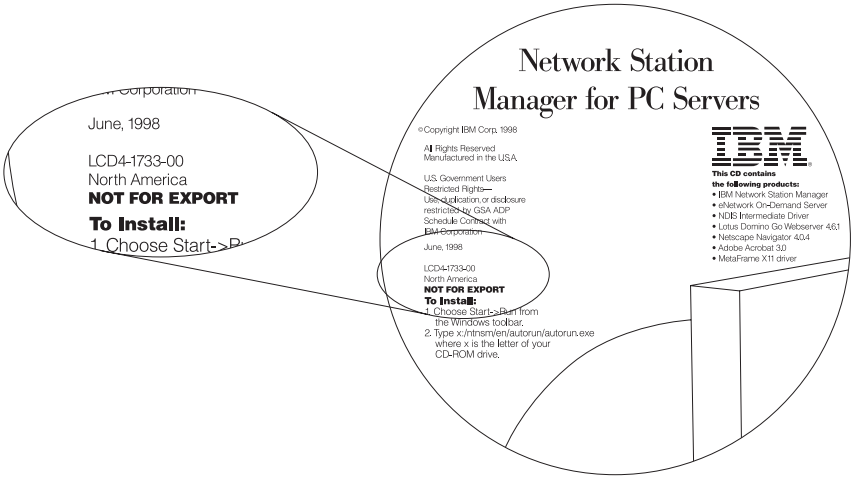


Figure 17. IBM Network Station Manager for PC Server CD

Note: Refer to Figure 17. You can identify the IBM Network Station Manager Service Update release by looking on the face of your CD. If you downloaded the Service Update from the Internet, refer to the download website for the release information and version information. Every service update is cumulative. The service update is not a patch or a fix. It is a complete stand-alone software product that includes the latest enhancements to the IBM Network Station software.

There are three steps involved in updating your IBM Network Station Manager software. First, you need to preserve your user information so that you can re-use (or migrate) your user information. Second, you need to replace the old IBM Network Station Manager software with updated software. Lastly, test one Network Station from the new IBM Network Station Manager software before you move all of your Network Stations to the new platform.

User information includes user preference files, terminal configuration preference files, and other information specific to individual Network Stations and Network Station users. The user preference files do not include your browser preference files.

Note: If you installed both the IBM Browser and the Navio Browser prior to migrating to Release 3, see “Moving from an Older Version?” on page 24 for further information.

Several factors affect your migration strategy. However, in all migration strategies, you must move all of your IBM Network Station Manager preference files and user files from your old software to your new software. To perform a single-server update method, you

need one IBM Network Station Manager server. To perform a dual-server update method, you need a second server that will become your primary IBM Network Station Manager server after you complete the update.

Release 3.0 IBM Network Station Manager supports most Windows NT Server 4.0 languages locales.

Table 16. Upgrade Path For IBM Network Station Manager Software: Server Software

Previous IBM Network Station Manager Release	**New IBM Network Station Manager Release 3.0**
Windows NT Server 4.0, US English	Windows NT Server 4.0, All supported languages
English WinCenter 3.x	Windows NT Server, Terminal Server Edition 1.0

You may change from any previously supported version of Windows NT Server type to the ones that are listed below. However, the recommended platform is a Stand-Alone server type or a Stand-Alone server that is attached to a domain.

Table 17. Upgrade Path For IBM Network Station Manager Software: Server Type

Previous IBM Network Station Manager Release	**New IBM Network Station Manager Release 3.0**
Primary Domain Controller (PDC)	Stand Alone (SA) (recommended) Stand Alone Server attached to a Domain (SAD) (recommended) Primary Domain Controller (PDC) Backup Domain Controller (BDC)
Backup Domain Controller (BDC)	Stand Alone (SA) (recommended) Stand Alone Server attached to a Domain (SAD) (recommended) Primary Domain Controller (PDC) Backup Domain Controller (BDC)

The Single-Server Software Upgrade and Single-Server Migration Method

If you have one IBM Network Station Manager server that you wish to update, you should perform a single-server software upgrade and single-server migration. Use these upgrade instructions to apply a service update to your server or to update your software from one release to a new one.

There are two types of single-server software update methods. The first method is a standard single-server update. The second method is a media-assisted single-server update. If you are not going to change your server type, you may use the standard single-server update method. If you need to reinstall your Windows NT Server software

or change server types (for example, from a PDC to a Stand-Alone server), you need to follow the media-assisted, single-server update method.

Before you start either update method, all users must log off the system because you need to restart the server to complete the update. If a Network Station user is logged into the server, they may lose their applications and data if they do not log off.

To use the single-server migration method, carry out the following steps:

__ 1. There are two methods of migrating preference files during a single-server migration. Table 18 explains the two methods and outlines the necessary steps:

Table 18. Software Update Methods for Single-Server Upgrades and Single-Server Migrations

Software Update Method	Use in this Situation	Steps
Standard	Simple upgrade of IBM Network Station Manager.	a. Install the IBM Network Station Manager. b. Enter the path to the user preference information that you wish to migrate as prompted.
Media-assisted	• When you change the server type (for example, from a PDC to a Stand-Alone server). • When you reinstall the operating system.	a. Before you install the IBM Network Station Manager, copy all of your user preference information files onto a diskette or other storage media. **Note:** Do not use the hard drive that you will reinstall the Windows NT Server software on. b. Reinstall the operating system if necessary. c. Install the IBM Network Station Manager. When Setup asks for a migration path, enter a path to the migration files on the diskette or other storage media.

__ 2. If you are using the standard update method as described in Table 18, go to Step 3 on page 83. If you are using the media-assisted method as described in Table 18, copy all of the files in the following directories in the Table 19 onto a diskette or other storage media:

Table 19. Directory Structures for Saving User Preference Files

Release 2.x IBM Network Station Manager paths	Release 3.x IBM Network Station Manager paths

Table 19. Directory Structures for Saving User Preference Files (continued)

x:\users	
x:\nstation\userdata	x:\{float}\nstation\USERBASE
x:\nstation\configs	x:\{float}\nstation\PRODBASE\configs
x:\nstation\esuite\registry	x:\{float}\nstation\PRODBASE\esuite\registry
Where x:\ is the subdirectory where your Release 2.x IBM Network Station Manager software is installed. Where x:\{float}\ is the subdirectory where your Release 3.x IBM Network Station Manager software is installed.	

__ 3. Begin the installation process by following the instructions in Step 1 on page 30. A setup dialog box prompts you to enter the migration path to access the user information preference files. If you use the media-assisted update method as described in Table 18 on page 82, enter the disk drive letter and the subdirectory where the setup program can access the preference files. If you use the standard update method as described in Table 18 on page 82, the default location is c:\nstation\. If that location is correct for your server, click **Next**. If not, enter the proper path.

Note: When prompted for a migration path, only enter the root x:\{float}\nstation subdirectory for Release 3.x or the root x:\nstation subdirectory for Release 2.x. You do not need to enter multiple subdirectories.

__ 4. Return to 61 on page 43 and complete the installation instructions. After you finish, return here.

Once the new software installs and you migrate the configuration files, you must move your existing Network Station computers to your new IBM Network Station Manager software. To do so, carry out the following steps:

__ a. If you plan to use DHCP with your new IBM Network Station Manager software, you must configure the DHCP server to handle Network Station boot requests. Refer to “Configuring IBM DHCP on Windows NT Server 4.0” on page 57 or “Configuring Microsoft DHCP on Windows NT Server 4.0” on page 68 if you have not done so already.

__ b. Select one Network Station first to test your new IBM Network Station Manager software. This test client should be close to your IBM Network Station Manager server.

__ c. If your clients use NVRAM to start from your old server, go to Step 4.d. If your clients used DHCP to start from your old server, go to Step 4.h on page 84.

__ d. Restart the test client without making any changes to the Network Station. The Network Station starts from the new IBM Network Station Manager software and the server may automatically update the Network Station boot PROM and the Network Station restarts automatically.

Note: Do not touch the Network Station during the boot PROM update process. If you interrupt the boot PROM update, you have to replace the Network Station.

__ e. If your Network Station has a token-ring adapter, it updates again and restarts automatically.

__ f. Each time you restart the test Network Station it starts from the new IBM Network Station Manager software. Test the user preference files on the test client. IF everything appears correctly, repeat the instructions from step 4.d on page 83 for all of the clients that you want to migrate.

__ g. Once you migrate all of the clients so that they start from the new server, test the preference files. If you are sure that you want to use NVRAM to start your clients, your migration is complete. If you want to use DHCP to start your clients, continue to Step 4.h.

__ h. If you have not yet done so, install and configure DHCP as instructed in “Configuring DHCP on the Windows NT Server Platform” on page 55.

__ i. In your current DHCP configuration, you should have already set the following DHCP options so that the following values apply to all of your Network Stations:

- Option 66: The IP address of the boot server.
- Option 67: /netstation/prodbase/kernel

If you have not set the above options, do so now.

__ j. Configure the following option as a global parameter with the following value:

- Option 211: ″nfs″ or ″tftp″

Note: If you select ″tftp″ as your boot protocol, the kernel downloads via the TFTP protocol and then the Network Station switches to the NFS protocol for all other data transfers.

Option 211 does not exist on the Microsoft DHCP interface. To create a new DHCP option while using Microsoft DHCP, refer to “Creating DHCP Options on Microsoft DHCP” on page 70.

__ k. Restart the test client. The server automatically updates the boot PROM of the Network Station and the client restarts automatically.

Note: Do not touch the Network Station while the Network Station boot PROM updates. If you interrupt the boot PROM update, you have to replace the Network Station.

__ l. If the test client has a token-ring adapter, it updates again and restarts automatically.

__ m. Restart the test client to check the DHCP configuration.

__ n. If everything appears correctly on your test client, restart all of the remaining Network Stations that you wish to move over to the new server.

__ o. Test your Network Stations to see if the user profile information is correct.

The Dual-Server Software Upgrade and User Preference Information Migration Method

If you have more than one Windows NT Server in your network, you can use a dual-server migration method to re-use your current user preference information and update your IBM Network Station Manager software. Your current Network Station users can operate off the old server until you configure and test the new server. Use these update instructions to apply a service update to your IBM Network Station Manager software or to update your IBM Network Station Manager software from an old release to a new one.

To perform the dual-server update method, you need to install a copy of the updated IBM Network Station Manager software on one server, test the software installation, and gradually move all of your Network Station users and Network Station clients to the new server. While you prepare the new server, current Network Station users can use the old IBM Network Station Manager server until the new server is ready.

There are two types of dual-server update methods. One is for NVRAM clients, and the other is for DHCP clients.

Figure 18 illustrates the steps that you must take to perform a dual-server migration. More detailed instructions follow.

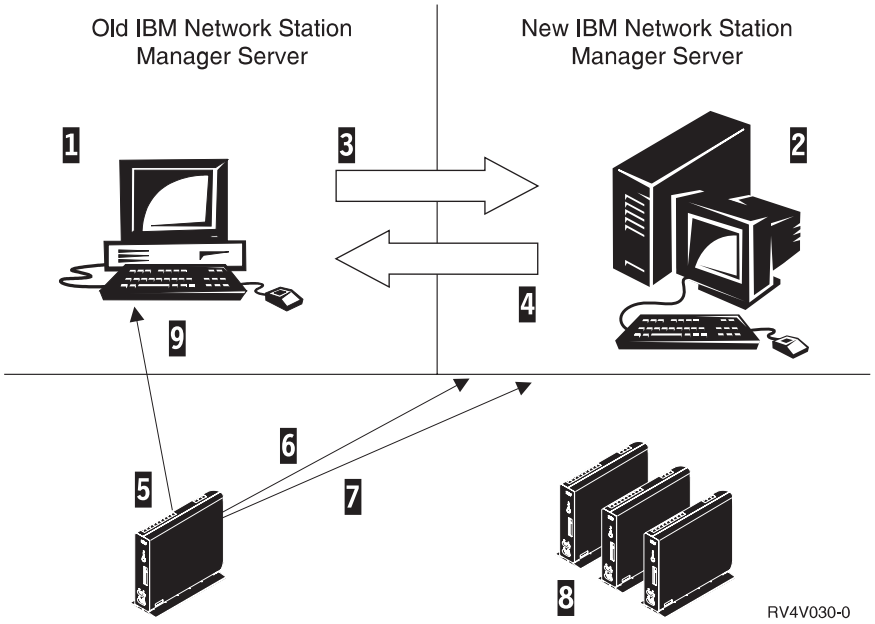


Figure 18. Quick Overview of the Dual-Server Migration Process.

1. **1** Start with your old server that contains your preference files.
2. **2** Prepare your new server.

3. 3 Determine a dual-server migration configuration and migrate your preference files to the new server.
4. 4 Move the file x:\nstation\configs\defaults.r2 from the new server to the old server.
5. 5 Start a test client from the old server that uses NVRAM.
6. 6 Start the test client from the new server that uses NVRAM.
7. 7 Start the test client from the new server that uses DHCP.
8. 8 Migrate remaining clients.
9. 9 Decommission the old server and run the clean up utility.

To perform a dual-server migration, carry out the following steps:

__ 1. On your new server, install Windows NT Server 4.0 or Windows NT Server 4.0, Terminal Server Edition with the necessary prerequisites. Refer to 1 on page 30

__ 2. On your new server, map a drive to your old server as an unused drive letter (for example, o:).

Note: If you cannot map a network drive between your new server and your old server, refer to “The Single-Server Software Upgrade and Single-Server Migration Method” on page 81 for instructions on how to perform a media-assisted update method.

a. Right click on **Network Neighborhood**.
b. Select **Map Network Drive...**.
c. Enter the letter you wish to assign to the mapped drive (for example, o:)
d. Enter the directory for the mapped drive (for example, \\oldnetwork\drive).
e. Select **Ok**.

Note: You may need to enter a user name and password to map the drive to the old server.

__ 3. Create (or replicate) users from your old server to your new server by following these instructions:

a. You need to create the NSMUser and NSMAdmin groups on the new server. Refer to “Managing Users and Groups for IBM Network Station Users” on page 74.

b. If you are migrating from a PDC to a Stand-Alone server attached to a domain, copy all of the users in NSMUser and NSMAdmin to your new system.

You may also add global groups from the PDC to the NSMUser and NSMAdmin groups on your new system.

c. If you are migrating to a Stand-Alone server, you need to manually re-create all of your users on the new server. Following which, you must add them to the NSMUser and NSMAdmin groups as appropriate. Refer to “Managing Users and Groups for IBM Network Station Users” on page 74.

__ 4.

Begin the installation process by following the instructions in Step 1 on page 30 .A setup dialog box prompts you to enter the migration path to access the user information preference files. Enter the path to your old IBM Network Station Manager user preference information. For example, o:\nstation where o: is the mapped drive to your old server. Click **Next**.

Note: When prompted for a migration path, only enter the root x:\{float}\nstation subdirectory for Release 3.x or the root x:\nstation subdirectory for Release 2.x. You do not need to enter multiple subdirectories.

Note: You may need to remap the drive to the old server to complete the instructions. Refer to Step 2 on page 86.

After you install the IBM Network Station Manager software on your new server, you need to prepare the old server for the dual-server update, test a single Network Station, and move all of your Network Stations over to the new server. After you successfully move all of your Network Stations, you may run a cleanup utility to erase the old IBM Network Station software from your old server.

Follow these instructions to prepare your old server and test one Network Station on your new IBM Network Station Manager software by using NVRAM:

1. Copy the file x:\nstation\configs\defaults.r2 from your new server to the following subdirectory on your old IBM Network Station Manager server (where x:\nstation is the location of your new IBM Network Station Manager installation):

Table 20. Subdirectory for defaults.r2 Migration File

Release 2.x subdirectory	**Release 3.x subdirectory**
o:\nstation\configs	o:\{float}\nstation\PRODBASE\configs
Where o:\nstation\configs is the mapped drive to your old Release 2.x server and o:\{float}\nstation\PRODBASE\configs is the mapped drive to your old Release 3.x server.	

2. On your test Network Station, set the Boot Parameter option to read the defaults.r2 instead of defaults.dft by performing the following instructions:

Table 21. Instructions for Updating the Boot Monitor to Start Up from a New Server

Release 2.x Boot Monitor instructions	**Release 3.x Boot Monitor instructions**
a. Power on the Network Station.	a. Power on the Network Station
b. Hit the escape key when the NS0500 Searching for Host System message appears.	b. Hit the escape key when the NS0500 Searching for Host System message appears.
c. Press F6 to enter the Boot Parameters screen.	c. Press F5 to enter the Configuration Parameters screen.
d. Replace defaults.dft with defaults.r2	d. Highlight the Configuration File line.
e. Press Enter to save.	e. Enter defaults.r2.
f. Press Enter to restart your Network Station.	f. Press Enter twice to save your changes and restart your Network Station.

Your Network Station restarts, the boot PROM may update, and then it restarts again.

Note: Do not touch the Network Station during the boot PROM update process. If you interrupt the boot PROM update, you have to replace the Network Station.

3. Refer to Step 2 on page 87 and erase the file name in 2.d on page 87 on your test Network Station client.
4. Restart the test Network Station.

If your test Network Station displays a logon screen and all of your user preferences are correct, read the next section and start to move all of your Network Stations to the new server.

Follow these instructions to move your remaining Network Station clients from the old server to your new server:

1. On your old server, rename the file defaults.dft in the o:\nstation\configs (Release 2.x server) or o:\{float}\nstation\PRODBASE\configs (Release 3.x server) subdirectory to defaults.old.

   Note: The setup utility moved the defaults.dft file to the new server during the new server installation.
2. Rename the defaults.r2 file to defaults.dft on the old server.
3. Restart your remaining Network Stations.

   Note: The Network Stations restart twice and may update their boot PROM. Do not interrupt the boot PROM update. If you do, you have to replace the Network Station.
4. Your software upgrade and user preference file migration is complete.

If you use DHCP, perform the following instructions to move your Network Station clients over to the new IBM Network Station Manager software.

1. Set the following DHCP options on your old server:
   - Option 66: new server IP address
   - Option 67: /nstation/kernel
   - Option 211: tftp
   - Option 213: /netstation/prodbase/configs/
   - Option 214: nfs
2. Power on your test Network Station client.

   Note: The test Network Station should restart twice and update its boot PROM. Do not touch the Network Station during the boot PROM update. If you interrupt the boot PROM update, you have to replace the Network Station.
3. Verify that your preferences, such as your menu bar buttons and wallpaper color, from the test Network Station client.

4. If the preferences are correct, restart all of your Network Stations so that they update their boot PROM and start from the new server.

   Note: Update all of your Network Station boot PROMs before you continue.
5. Change the following options in the DHCP configuration of your old server:
   - Option 67: /netstation/prodbase/kernel
   - Option 211: nfs

     Note: You may specify TFTP for Option 211. If you specify TFTP, the kernel downloads to the Network Station via TFTP, but the file transfer protocol switches over to NFS after the kernel downloads.
6. Configure DHCP on the new server.
7. Turn off the DHCP service on the old server.

After you complete the dual-server update method, you may wish to clean up the old IBM Network Station Manager software. Look for the cleanup utility program included on your IBM Network Station Manager software to do this.

Copy the clean up utility from x:\ntnsm\en\utility\ntnsmrr2.exe on your IBM Network Station Manager licensed program CD (where x is your CD-ROM drive) to your old server. From a command line enter the following command:

- **{float:}\ntnsmrr2.exe** where {float:} is the location you copied the clean utility to on the old server. (You may run the utility from a floppy diskette.)

Moving Network Station Files from an Old Server to a New Server

If you installed an updated copy of IBM Network Station Manager, you may manually move your existing user preference files from your old IBM Network Station Manager server to your new one. You may repeat this process as many times as necessary to move user preferences files. The process will not affect the old preference files, but each time that you migrate the preference files to the new server, the current preference files are overwritten.

This process is useful if you slowly convert over to your new IBM Network Station Manager environment as a test platform. You can run the migration whether you used a single-server update method, dual-server update method, or if you installed a fresh copy of IBM Network Station Manager.

You need to do the following before you move your user preference files from the old server to the new server.

- Your server must have access to the old user preference files. This access can be a backup directory on your local hard drive, media such as a floppy diskette, or a mapped network drive to another server. Look for a list of user preference file directories in Table 19 on page 82.
- Each user accounts that you migrate must exist in the NSMUser group on the new IBM Network Station Manager server. Only those accounts that are in NSMUser will be moved.

Note: You may gradually migrate select users from your old server to your new server by creating them in the NSMUser group on your new server. Only create the users that you wish to move to the new server and follow the procedure below. If they are not in NSMUser, the user preference files will not migrate.

To move user preference files from your old server to your new server, follow the commands below:

__ 1. Select **Start->Program->Command Prompt**.

__ 2. Enter **x:\{float}\nstation\servbase\bin\nsmmigr.exe <migration path>** where x:\{float}\ is the location of your IBM Network Station Manager software and <migration path> is the location of the old user preference files.

Note: You only need to specify the root x:\nstation\ subdirectory. You do not need to enter all of the subdirectories that are listed in Table 19 on page 82.

If the migration succeeds, a **Migration Successful** message displays when the migration process completes.

Test your user preferences and repeat the process to move your user preferences as needed.

Before You Continue . . .

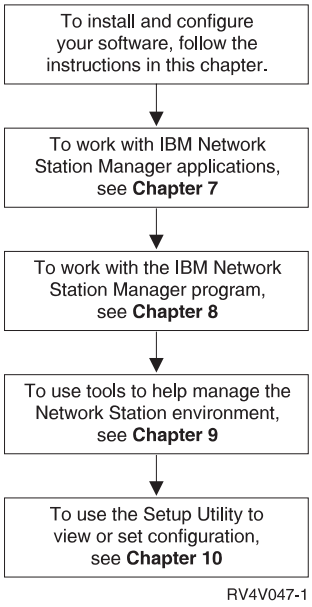
- Verify that the Network Parameters that are configured in the Setup Utility of each Network Station agree with your start up method. For example, to serve IP addresses to an IBM Network Station through a DHCP server, you need to set the *IP Address From* field in the Setup Utility to Network. The factory sets new IBM Network Stations to Network during the manufacturing process. See “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301 for more information.
- Verify that your DHCP server, NFS server or TFTP server, and HTTP server are started. See “Starting and Stopping Servers and Services on Windows NT Server 4.0” on page 76.
- Verify that you excluded any statically addressed devices in your DHCP addressing range.
- If you use DHCP and you have a router between your IBM Network Stations and your boot server, verify that the router handles DHCP requests.
- For more information about using the IBM Network Station Manager software, refer to “Chapter 8. Using the IBM Network Station Manager Program” on page 245.

Chapter 3. Installing and Configuring an IBM Network Station Environment on an AS/400 Server

About this Chapter

This chapter contains instructions for planning, installing, and configuring a Network Station environment on an AS/400 server. It also contains the setup procedure for twinaxial Network Stations. While completing the installation procedure and the configuration procedure, do not deviate from the order of the steps. The following figure

demonstrates the flow of this manual.



Installation

This section describes the preparation and installation of the IBM Network Station Manager (5648-C05) licensed program.

Attention: If you have manually changed any configuration files instead of using the IBM Network Station Manager in the past, refer to http://www.ibm.com/nc/pubs for Advanced User Information.

__ 1. Review the Informational authorized program analysis report (APAR)

Use Table 22 to identify the Informational APAR. You should review the APAR to see the latest information about 5648-C05. You should also verify that you have the CD labeled *AS/400 Network Station PTFs*. This CD contains PTFs for OS/400 and the IBM Network Station Manager product. Do not apply the PTFs until later in this procedure.

Table 22. Informational APARs and PTFs for 5648-C05

Informational APAR for 5648-C05	**Latest Group PTF package for 5648-C05**
II11118	SF99082[3]

__ 2. Verify prerequisite OS/400 software.

3. The group PTF package SF99082 is on the CD labeled *AS/400 Network Station PTFs.*

Your AS/400 server must meet the following minimum software requirements:

- OS/400 Version 3 Release 7, Version 4 Release 1, Version 4 Release 2, or Version 4 Release 3.
- OS/400 TCP/IP Connectivity Utilities (5769-TC1)
- For V4R3 and later, IBM HTTP Server for AS/400 (5769–DG1)

__ 3. Verify Network Station Memory Requirements.

Network Stations download each of their appplications including their base systems into memory. You should verify that your Network Stations have enough memory to run their applications. Use the table at http://www.pc.ibm.com/networkstation/support/memrec_data.html to determine how much memory your Network Stations need.

__ 4. Verify Security Authority

Your user profile must have the following authorities:

- *SECADM
- *ALLOBJ
- *IOSYSCFG

To check your security authorities, type the following command at the AS/400 command line to view your user profile:

```
DSPUSRPRF youruserid
```

__ 5. Change Library QSYSLIBL

If you have never installed the IBM Network Station Manager licensed program on your system, skip to step 6.

a. At an AS/400 command line, type `DSPSYSVAL QSYSLIBL`, and the *Display System Value* display appears.

b. If you cannot find the value QSYS2924, go to step 6. Otherwise, type `WRKSYSVAL QSYSLIBL` at an AS/400 command line.

c. Next to the QSYSLIBL system value, enter option 2.

d. Space over the QSYSLIBL system value, and press the Enter key.

e. Press the F3 key to exit.

__ 6. Apply the latest PTFs for OS/400.

__ a. Insert the CD that is labeled *AS/400 Network Station PTFs* into your AS/400 CD drive (for example OPT01).

__ b. At an AS/400 command line, type `GO PTF`.

__ c. Select option 8, and the Install Options for Program Temporary Fixes display appears.

```
                Install Options for Program Temporary Fixes
                                                        System:   AS400TEST
Type choices, press Enter.

  Device  . . . . . .  .              Name, *SERVICE

  Automatic IPL . . . . . .  N        Y=Yes
                                      N=No

  Restart type  . . . . . .  *SYS     *SYS, *FULL

  PTF type  . . . . . .  .  1         1=All PTFs
                                      2=HIPER PTFs and HIPER LIC fixes
                                        only
                                      3=HIPER LIC fixes only
                                      4=Refresh Licensed Internal Code

  Other options . . . . . .  N        Y=Yes
                                      N=No



F3=Exit   F12=Cancel
```

__ d. Enter the device name where the *AS/400 Network Station PTFs* CD is located (for example OPT01).

Note: You may receive a message that no PTFs were installed. This message means that your operating system did not need any PTFs. That does not exclude you from applying PTFs later in step 14 on page 96. Also, you may have received messages that some PTFs did not install. You can ignore these messages, because it pertains to the PTFs on the CD that are not pertinent to your system.

__ 7. Add QTODSYS to library list (OS/400 V3R7 only)

If you are not using OS/400 V3R7, skip to step 8.

__ a. At an AS/400 command line, type `WRKSYSVAL QSYSLIBL`.

__ b. Next to the QSYSLIBL system value, enter option 2.

__ c. In the *Library* field, type QTODSYS, and press the Enter key.

__ d. Press the F3 key to exit.

__ 8. Perform an IPL.

The PTFs that you just installed require that you perform an IPL of the AS/400 system before you install the IBM Network Station Manager program. You must perform this step for the IBM Network Station Manager program to function correctly.

__ a. Ensure that the system IPL mode is in the normal mode.

__ b. Use the following command to perform the IPL:

```
PWRDWNSYS *IMMED RESTART(*YES) IPLSRC(B)
```

__ 9. If TCP/IP is active, you must end the HTTP server. Type `ENDTCPSVR *HTTP` at an AS/400 command prompt. You cannot complete this procedure while the HTTP server is active.

__ 10. Delete previous versions of all browsers.

Table 23. Licensed Product Numbers for Previous Browsers

Product	License Program Numbers of Previous Versions
IBM Network Station Browser	5648B08 and 5648B18
Navio NC Navigator Browser	5648B10 and 5648B20

Use the `DLTLICPGM LICPGM(license program number)` command to delete all previous versions (see Table 23) of the IBM Network Station Browser and Navio NC Navigator browsers. This command does not delete the user preferences and bookmarks for the Navio products.

Note: Release 3.0 of IBM Network Station Manager (NSM) does not support the IBM Network Station Browser. If you install Release 3.0 of NSM, your IBM Network Station Browser bookmarks will be migrated to the integrated NC Navigator. You must delete the IBM Browser from your server. Network Stations will continue to ship with authorizations to use the IBM Network Station Browser. This allows Network Stations that use prior releases of NSM to use the IBM Browser. Network Stations using Release 3.0 of NSM cannot use the IBM Network Station Browser, even though they may ship with authorizations to use the product.

__ 11. If you have installed the IBM Browser and the Navio NC Navigator for a previous version of the IBM Network Station Manager licensed program, see “Moving from an Older Version?” on page 24.

__ 12. Delete previous versions of the IBM Network Station Manager program.

Use the `DLTLICPGM LICPGM(5733A07)` command to delete any previous versions of the IBM Network Station Manager program.

__ 13. Install the IBM Network Station Manager program (5648-C05)

The IBM Network Station Manager for AS/400 licensed program product is available for AS/400 systems with Version 3 Release 7 levels or later of OS/400.

__ a. Insert the CD that contains the IBM Network Station licensed program into your AS/400 CD drive (for example OPT01).

__ b. Install the licensed program.

To install a new licensed program, type the following command on any AS/400 command line:

```
RSTLICPGM LICPGM(5648C05) DEV(OPT01) OPTION(*BASE)
```

Note: If your server’s primary language is not the language you wish to install, then specify `LNG (language number)` on the `RSTLICPGM` command.

The install program automatically installs the 40-bit NC Navigator browser, which is part of the IBM Network Station Manager licensed program.

__ c. Verify that the restore and migration was successful.

Use the DSPJOBLOG command to view the AS/400 job log. Look for any installation or migration errors and take the appropriate action.

- If you find any migrations errors, correct the error and run the migration program again. See Table 71 on page 334 for information about specific migration errors. Issue the command CALL PGM(QYTC/QYTCMIMP).

__ 14. Apply the PTFs for IBM Network Station Manager

To avoid an unnecessary IPL, you must follow these steps in the exact order they are presented.

__ a. Insert the CD labeled *AS/400 Network Station PTFs* into your AS/400 CD drive (for example OPT01).

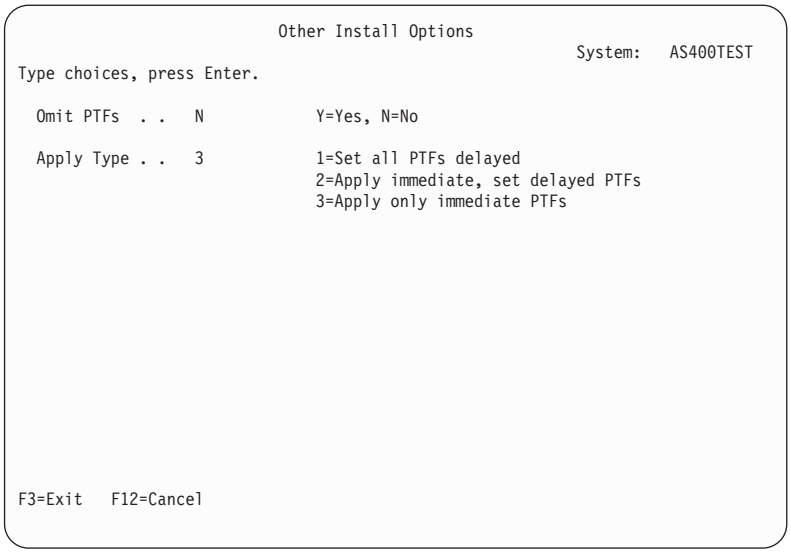
__ b. At an AS/400 command line, type GO PTF.

__ c. Select option 8, and the Install Options for Program Temporary Fixes display appears.

```
                Install Options for Program Temporary Fixes
                                                          System:   AS400TEST
Type choices, press Enter.

  Device  . . . . . .                Name, *SERVICE

  Automatic IPL . . . . . .  N       Y=Yes
                                     N=No

  Restart type  . . . . . .  *SYS    *SYS, *FULL

  PTF type  . . . . . .  1           1=All PTFs
                                     2=HIPER PTFs and HIPER LIC fixes
                                       only
                                     3=HIPER LIC fixes only
                                     4=Refresh Licensed Internal Code

  Other options . . . . . .  Y       Y=Yes
                                     N=No



F3=Exit   F12=Cancel
```

__ d. Enter the device name where the *AS/400 Network Station PTFs* CD is located (for example OPT01). In the *Automatic IPL* field, select **N**, because you do not need to IPL your system after applying these PTFs.

__ e. In the *Other options* field, select YES. The *Other Install Options* display appears.



__ f. Enter option 3 for the *Apply Type* field, and Press the Enter key.

__ 15. Install optional software

The following describes the installation of **optional** software for Network Stations.

__ a. Install the 128 bit NC Navigator (5648-C20)

For installation instructions, consult the Informational APAR II11283.

__ b. Install eSuite Workplace (5648-KN2) for OS/400 V4R2 or later only

For installation instructions, consult the README on the CD of 5648-KN2 or the product literature.

__ c. Install Omron, Japanese Input Method (5648-OMR)

For installation instructions, consult the README on the CD of 5648-OMR or the product literature.

__ 16. Installation Complete.

You have installed all the required software for the IBM Network Station Manager program. Continue to “Configuration” to configure your TCP/IP environment and boot server.

Configuration

This checklist helps you configure your TCP/IP environment and boot server. Do not deviate from the checklist’s order.

__ 1. Administer twinaxial Network Stations.

- If you want to administer twinaxial Network Stations, read and complete “Appendix B. Twinaxial Network Stations” on page 347.
- Otherwise, continue to step 2 on page 98.

__ 2. Choose a boot and configuration method.

You must determine which boot method your Network Stations will use, and how you will configure your Network Station environment. Use Chapter 1, specifically sections “Boot Methods” on page 13 and “What Do I Need To Know About TCP/IP Networks?” on page 4, to learn more about boot methods and TCP/IP. Then use Table 24 to determine which boot method fits your needs and operating system. Record your boot method in Table 25.

Table 24. Available Boot and Configuration Methods by OS/400 Version

Boot Method	V3R7 and V4R1 OS/400 Configuration Method	V4R2 OS/400 Configuration Method
BOOTP	Green screen	Green screen or Operations Navigator[4]
DHCP	Not available	Operations Navigator[4]
NVRAM	Perform configuration on each client.	Perform configuration on each client.

Table 25. Boot Method

Field	Description	Write Boot Method Here
Boot Method	The method by which the Network Station will obtain its IP address and boot files.	

__ 3. Gather host information with Table 26.

Stop: If you already have TCP/IP installed and configured, please skip to step 4 on page 99. Otherwise, complete the following table.

The Setup Assistant, a green screen wizard, prompts you to enter this information later.

Table 26. AS/400 Host Information

Field	Description	Write Value Here
1 AS/400 IP Address	In Figure 5 on page 7, the AS/400 IP Address is 192.168.1.4. The AS/400 IP address is the address that uniquely identifies this AS/400 to TCP/IP. This address will be associated with the local host name to create a name entry in the Host Names table.	

4. Operations Navigator is a powerful graphical interface for Windows 95/NT clients. With Operations Navigator, you can use your Windows 95/NT skills to manage and administer your AS/400 systems. You can work with database administration, file systems, Internet network administration, and users and users groups. For more information about Operations Navigator, see *Client Access for Windows 95/NT - Setup*, SC41-3512.

Table 26. AS/400 Host Information (continued)

Field	Description	Write Value Here
2 Next Hop IP Address (Default Route)	The next hop address is the address of the IP router (if any) that your local LAN uses to route network traffic to other networks within and outside of your organization. In Figure 5 on page 7, the next hop address is `192.168.1.1`. The next hop address creates a default route for all network traffic that does not terminate on this host. You need this information only if your local LAN attaches to one or more IP routers.	
3 Remote Name Server IP Address	The remote name server (Domain name server (DNS)) IP address is the address of the system (if any) that will act as primary name server in this domain. In Figure 5 on page 7, the DNS is `192.168.1.5`.	
4 AS/400 Local Host Name	The local host name is the name that is used to uniquely identify this system in a TCP/IP domain. In the example `server.mycompany.com`, the Local Host Name is `server`.	
5 AS/400 Local Domain Name	Remote servers use the domain name to identify the local host to other systems. In the example `server.mycompany.com`, the Local Domain Name is `mycompany.com` Domain names consist of labels that are separated by periods. Your local domain name should describe your organization. The last portion of the local domain name should follow Internet conventions. Use COM for commercial enterprises, GOV for government organizations, and EDU for educational institutions.	

__ 4. Gather LAN information with Table 27 on page 100.

Stop: If you have configured the LAN that will serve the Network Stations, skip to step 5 on page 100. Otherwise, complete the following table.

For each LAN that is attached to your AS/400, you will need to duplicate and complete a copy of Table 27 on page 100. The Setup Assistant prompts you for this information later.

Table 27. AS/400 LAN Information Chart

Field	Description	Write Value Here

1 Line Description	You must create a line on your AS/400 Server. First, you must determine which resource you will use. To view the communications resources for your system, on any command line, type:
	`WRKHDWRSC *CMN`
	
	After you have selected a resource from this list, you must create the line description by using one of the following commands:
	`CRTLINTRN LIND(TRNLINE) RSRCNAME(CMN03) ADPTADR(*ADPT) SSAP(*SYSGEN) TEXT('Token-Ring Line') AUTOCRTCTL(*YES)`
	`CRTLINETH LIND(ETHLINE) RSRCNAME(CMN03) ADPTADR(*ADPT) SSAP(*SYSGEN) TEXT('Ethernet Line') AUTOCRTCTL(*YES)`
	
	where:
	• CMN03 is the resource name.
	• TRNLINE or ETHLINE is the line description's name.
	
	Record the name of the line description you just created.	

2 LAN IP Address	The LAN IP Address is the address that uniquely identifies each AS/400 communication line to the LAN. Each LAN should have a unique IP address assigned. In Figure 5 on page 7, the LAN IP Address is `192.168.1.4`, because the example AS/400 has only one LAN.	
3 LAN Subnet Mask	A subnet mask is a configuration value that allows you to specify how your system determines what are the network and host parts of an IP address. For example, the subnet mask (255.255.255.0) indicates that the first three parts of the IP address relate to the network and the fourth part identifies unique hosts on this subnetwork.	

__ 5. Gather IP router/gateway information.

Stop: IP Router/Gateway information is necessary only if you have a router between your server and its clients. If you do not have this condition, skip to step 6 on page 101. Otherwise, complete the following table.

For each router that is attached to your AS/400, duplicate and complete a copy of Table 28 on page 101. The Setup Assistant prompts you for this information later.

Table 28. AS/400 IP Router/Gateway Information Chart

Field	Description	Write Value Here
1 Route (Remote LAN) IP Address	The network portion of the IP address of the remote LAN. In Figure 5 on page 7, the Route (Remote LAN) IP Address is 10.1.1.1.	
2 Route (Remote LAN) Subnet Mask	The subnet mask for the route.	
3 Next Hop Address	The IP address of the router that will handle any requests that match the route IP address. In Figure 5 on page 7, the Next Hop Address is 192.168.1.1.	

__ 6. Based on your decision in Table 25 on page 98, perform the appropriate action.

- If you choose to use the BOOTP protocol, go to step 7.
- If you choose to use the DHCP protocol, go to step 8 on page 103.
- If you choose to use the NVRAM boot method, go to step 9 on page 106.

__ 7. Gather information for a new BOOTP environment.

Use this section to gather information to configure a new BOOTP environment. Use Table 29 to record the specific information that is needed to identify each Network Station in your network environment.

Note: Twinaxial Network Stations do not require BOOTP table entries. If you have twinaxial Network Stations, do not make any BOOTP entries in the Setup Assistant. Continue to step 9 on page 106.

You will use this information to create a BOOTP entry for each Network Station in the Setup Assistant. You should complete one copy of Table 29 for each LAN adapter with attached Network Stations.

Table 29. BOOTP Network Station Information

Field	Description	Write Value Here
1 Client Host Name	The host name identifies the Network Station as a unique destination within a TCP/IP environment. In Figure 5 on page 7, the host name for one of the Network Stations is ns1.mycompany.com.	
2 MAC Address	The Media Access Control (MAC) address is a unique hardware-specific identifier for each Network Station. The address is located on the box of the Network Station. To find the MAC address without the box, follow this procedure: a. Power on the Network Station. b. After the keyboard controller test, press Escape. c. In the Setup Utility, press F4. d. Record the MAC address.	

Table 29. BOOTP Network Station Information (continued)

Field	Description	Write Value Here
3 IP Address	Each Network Station requires a unique IP address. In Figure 5 on page 7, `NS1.mycompany.com` has an IP Address of `192.168.1.2`.You must assign a specific address to each Network Station. You should ensure that the IP address is valid for your organization and that no other device in the network uses it.	
4 Hardware Type	Your Network Stations can attach to either a token-ring or Ethernet LAN. • Record a hardware type of 6 for token-ring or IEEE (802.3) Ethernet networks. • Record a hardware type of 1 for a Version 2 (802.2) Ethernet network.	
5 Gateway IP Address for Remote LANs	If you do not use a gateway IP address for remote LANs, disregard this field and leave it blank in the Setup Assistant. If the LAN that you are attaching Network Stations to is not directly attached to your AS/400, it is referred to as a remote LAN. You need to specify the IP Address of the IP router/gateway that your Network Station will use to reach the server. In Figure 5 on page 7, the gateway IP address for Network Station `ns3.mycompany.com` is `10.1.1.1`.	
6 Subnet Mask for Remote LANs	If you do not use a gateway IP address for remote LANs, disregard this field and leave it blank in the Setup Assistant.	
7 Boot Type	The boot type is a constant. *IBMNSM* identifies this network device as a Network Station.	*IBMNSM*
8 Boot File Name	The boot file name is the name of the file that the Network Station downloads and uses to boot the remote device. The value, *kernel*, is a constant.	*kernel* The Boot File Name is case sensitive.
9 Boot File Path	The boot file path is the path name that is used to access the boot file on the host and is a constant.	*/QIBM/ProdData/NetworkStation/* The Boot File Path is case sensitive.

Use Table 30 on page 103 to define any additional Network Stations for the BOOTP table.

Table 30. Additional BOOTP Network Stations

7 Host Name	8 MAC Address	9 IP Address	10 Printer Type

You have completed gathering information for a BOOTP environment. Go to step 9 on page 106.

__ 8. Gather information for a new DHCP environment.

This section helps you collect information for the DHCP setup wizard. When you first set up a DHCP environment, you will configure its global attributes. Table 31 collects the necessary data for the DHCP global information.

Table 31. DHCP Global Information

Field	Description	Write Value Here
1 Migrate BOOTP	If your AS/400 serves BOOTP clients, you have entries in the BOOTP table. If you would like to migrate your existing clients, select the Yes radio button. These migrated clients will use the DHCP server to obtain their IP addresses, but the addresses will be static as they are in BOOTP.	Yes or No
2 Global Bootstrap Address	The Bootstrap server delivers the boot files to the Network Stations. Enter the Bootstrap server's IP address. In Figure 5 on page 7, the Bootstrap server address for subnet `192.168.1.0` is `192.168.1.4`. For the subnet `10.1.1.0`, the Bootstrap server address is still `192.168.1.4`, but you must pass a gateway address of `10.1.1.1` on line 12. In most cases, the Bootstrap server address is the same IP address as your DHCP server.	
3 Default Lease Time	This refers to the amount of time a server lets clients keep an IP address.	

Table 31. DHCP Global Information (continued)

Field	Description	Write Value Here
4 Network Station Class Numbers	For each model of Network Station in your subnet, you must define a class that represents it. A Network Station class is a three digit number, prefaced by IBMNSM. To define Network Station class numbers, see “Determining DHCP Classes” on page 22. Record the class names here.	

Table 32 helps you collect the values to define a subnet in your DHCP environment. For each subnet you wish to define, copy and complete Table 32.

Table 32. DHCP Subnet Information

Field	Description	Write Value Here
1 Support Twinaxial Devices	If you intend to support twinaxial Network Stations, answer yes. Then, read “Planning for Your Twinaxial TCP/IP Network” on page 347 for twinaxial considerations and “Subnets and Subnet Masks” on page 9. Then complete “Configuring Twinaxial Network Stations Checklist” on page 353.	Yes or No
2 Subnet based on range or entire subnet **Note:** For subnets supporting twinaxial Network Stations, you must choose entire subnet.	In the DHCP wizard, subnet IP addresses are defined two different ways—based on an entire subnet or on a restricted range. The entire subnet option allocates every possible address for DHCP. In Figure 3 on page 5, the entire subnet option allocates `192.168.1.1` through `192.168.1.255`. If you base the subnet’s addresses on a range, you control the beginning and ending IP addresses.	Range or Entire
3 Subnet name	This value is for descriptive use only. It does not affect the performance of DHCP, but you should use a value that is easily recognizable. In Figure 5 on page 7, the subnet name could be `192.168.1.0`.	
4 Subnet description	This value is also for descriptive use only. An example subnet description for Figure 5 on page 7 could be `Token-Ring Subnet`.	

Table 32. DHCP Subnet Information (continued)

Field	Description	Write Value Here
5 Subnet Address **Note:** The Subnet Address is only for subnets in which the entire subnet is reserved for DHCP addressing.	The IP address associated with a particular subnet. For a Class C network whose subnet mask is 255.255.255.0, the subnet address is the same as the network address. In Figure 5 on page 7, the subnet IP address is `192.168.1.0`. If you are creating a twinaxial subnet, copy the value from line **1** in Table 80 on page 355.	
6 Starting address range **Note:** Twinaxial subnets can ignore this field. It is only for subnets based on a range.	The first IP address in the range which you have specified for your pool of available addresses. For the subnet 192.168.1.0 in Figure 5 on page 7, the starting address could be `192.168.1.2`.	
7 Ending address range **Note:** Twinaxial subnets can ignore this field. It is only for subnets based on a range.	The last IP address in the range which you have specified for your pool of available addresses. For the subnet 192.168.1.0 in Figure 5 on page 7, the ending address range could be `192.168.1.3`. The specified range (192.168.1.2 – 192.168.1.3) allows for only two clients on the subnet.	
8 Subnet Mask	A value that enables network devices to direct packets of information accurately in a subnetted environment. In Figure 5 on page 7, the subnet mask is 255.255.255.0. For more information about subnet masks, refer to “Subnets and Subnet Masks” on page 9. If you are creating a twinaxial subnet, copy the value from line **3** in Table 80 on page 355.	
9 Excluded IP Address **Note:** This field is not applicable to twinaxial subnets.	If any routers, gateways, or statically addressed servers are within your subnet range, you must exclude those IP addresses. If you have migrated BOOTP clients, you do not need to exclude their IP addresses. If the DHCP range was 192.168.1.1 through 192.168.1.50 in Figure 5 on page 7, you would exclude `192.168.1.4` and `192.168.1.5`. They are the static IP addresses of the domain name server and the client server.	
The following values are delivered to the Network Stations.		

Table 32. DHCP Subnet Information (continued)

Field	Description	Write Value Here
10 Deliver gateway IP addresses	The IP address of the default router to which TCP/IP packets not addressed for your network are sent. In Figure 5 on page 7, for the subnet 10.1.1.0, the default gateway IP address for client `ns3.mycompany.com` is `10.1.1.1`.	Yes or No
	If yes, enter the gateway IP address or addresses.	
11 Deliver Domain Name Server (DNS) address to clients in their subnet	Delivering the Domain Name Server IP address to clients allows them to use either fully qualified host names or IP addresses when they communicate with other devices. In Figure 5 on page 7, the IP address of the Domain Name Server is `192.168.1.5`.	Yes or No
	If yes, enter the DNS IP address or addresses.	
12 Deliver domain name to client	The domain name allows the Network Station to specify its domain to other devices. In Figure 5 on page 7, where the fully qualified host name is `server.mycompany.com`, the domain name is `mycompany.com`.	Yes or No
	If Yes, enter domain name.	
13 Subnet Mask	A value that enables network devices to direct packets of information accurately in a subnetted environment. This subnet value is delivered to the Network Stations and is usually the same value that you recorded on line **8** of Table 32 on page 104. For Figure 5 on page 7, the subnet mask is 255.255.255.0. For more information about subnet masks, refer to "Subnets and Subnet Masks" on page 9.	
14 Append domain name to host name	The Append domain name option specifies whether the DHCP server should append a domain name to client responses that omit a domain name. Inherited means that it uses the values defined on the global level.	Yes, No, or Inherited

__ 9. Preparation for the Setup Assistant

The Setup Assistant is a green screen wizard. You **must** run the Setup Assistant even if you are migrating from a previous release of the IBM Network Station Manager program.

If you choose not to use the Setup Assistant or want more information about its function, see "What the Setup Assistant Does" on page 145.

If you want to change any values after completing the Setup Assistant, you must make the changes manually.

Stop: Read each of these list items before using the Setup Assistant.

- Run the Setup Assistant from the AS/400 system console rather than a PC. Setup Assistant's Task 5000 might stop and start the TCP/IP server. If you are on a PC, you will be disconnected when TCP/IP ends.
- Verify that your user profile has the following special authorities:
  - *SECADM
  - *ALLOBJ
  - *IOSYSCFG

  To check your security authorities, type the following command at the AS/400 command line to view your user profile:

  ```
  DSPUSRPRF youruserid
  ```

__ 10. Start the Network Station Setup Assistant by typing the following command at any command line:

```
STRNSSA
```

The Setup Assistant introductory display appears.

```
F3=Exit
                     IBM Network Station Setup Assistant
                                                          System:   AS400TEST
Welcome to the IBM Network Station Setup Assistant for the AS/400.

This setup assistant will guide you through the process of preparing
your AS/400 to service IBM Network Station network computers, hereafter
refered to as Network Stations.

To successfully complete all the steps in the setup process you must
first work through the planning and preparation steps in the IBM Network
Station Installation and Use manual.  This manual will guide you through
the installation of required software and help you gather the necessary
information to describe your network environment.

Press F3 at this time if you need to complete the planning and
preparation tasks.




                                                                      Bottom
Press Enter to continue with the setup process.

F3=Exit
```

__ 11. Press Enter to continue with the setup process. The *IBM Network Station Setup Tasks* display appears.

```
                    IBM Network Station Setup Tasks
                                                          System:   AS400TEST
Type option, press Enter.
  1=Select

        Task
Opt     ID       Description                                    Completed
        2000     Install Required Software                         YES
        3000     Configure TCP/IP for IBM Network Stations          NO
        4000     Select Boot Protocol                              NO
        5000     Start and Verify Required Servers                 NO









                                                                  Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F10=Display job log   F12=Cancel
```

This display shows the main IBM Network Station Setup Assistant task IDs, a description of the task, and a completion status. The Setup Assistant follows these basic rules:

a. A completion status of YES means that the task finished. NO means that the task is not finished.

b. Subsequent tasks are dependent on the successful completion of previous tasks.

c. Select the tasks in order. Do not deviate from the checklist unless directed.

d. You must complete every task, including tasks that you do not have values to enter.

e. If a task does not complete, you will see an error message on the bottom line. For more information about the error, and to find out how to recover, press F10 (Display job log). Press F10 again to see the detailed messages. Then press F1 (Help) with the cursor on the error message to find out what recovery actions to take.

f. You should review the job log as you complete these main tasks. If any errors occur, the Setup Assistant records them in the job log.

g. To start a task, type 1 (to select) next to the task.

__ 12. Task 2000 - Install the Required Software

Task 2000 will have a completion status of YES if you installed the correct PTFs and TCP/IP products on your system. If the completion status is YES, go to step 14 on page 109. Otherwise, go to step 13.

__ 13. Task 2000 recovery

Type 1 next to Task 2000 and press the Enter key. The following display appears.

```
                          Install Required Software
                                                                 System:   AS400TEST
Type option, press Enter.
  1=Select

        Task
Opt     ID       Description                                          Completed
        2100     Install TCP/IP Connectivity Utilities/400               YES
        2200     Display Missing Required PTFs                           YES
        2300     Install OS/400 - Host Servers                           YES









                                                                          Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F10=Display job log   F12=Cancel
Task 2100 was ended by user.
```

- If the completion status of task 2100 is NO, type 1 next to task 2100 and press the Enter key.
  - __ a. After The Restore Licensed Program display appears, load the licensed program CD or tape in your AS/400.
  - __ b. Fill in the type of media in the Device field.
  - __ c. Press Enter to start the installation.
- If the completion status of task 2200 is NO, type 1 next to task 2200 and press the Enter key.
  - __ a. After the Setup Assistant displays the missing PTFs, record the missing PTFs.
  - __ b. Exit the Setup Assistant by pressing F3.
  - __ c. Load and apply the missing PTFs.
  - __ d. Restart the Setup Assistant by using the STRNSSA command.
- If the completion status of task 2300 is NO, type 1 next to task 2300 and press the Enter key.
  - __ a. After the Restore Licensed Program display appears, load the licensed program CD or tape in your AS/400.
  - __ b. Fill in the type of media in the Device field.
  - __ c. Press Enter to start the installation.

__ 14. Task 3000 - Configure TCP/IP for IBM Network Stations

On the IBM Network Station Setup Tasks screen, type 1 next to task 3000 and press Enter. The *Configure TCP/IP for IBM Network Stations* display appears.

```
                Configure TCP/IP for IBM Network Stations
                                                          System:   AS400TEST
Type option, press Enter.
  1=Select

        Task
Opt     ID       Description                                    Completed
        3100     Identify AS/400 to the Local Networks             NO
        3200     Create TCP/IP Routes to Remote Networks           NO
        3300     Set TCP/IP Servers to Autostart                   NO
        3400     Add HTTP Server Directives                        NO









                                                                  Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F10=Display job log   F12=Cancel
```

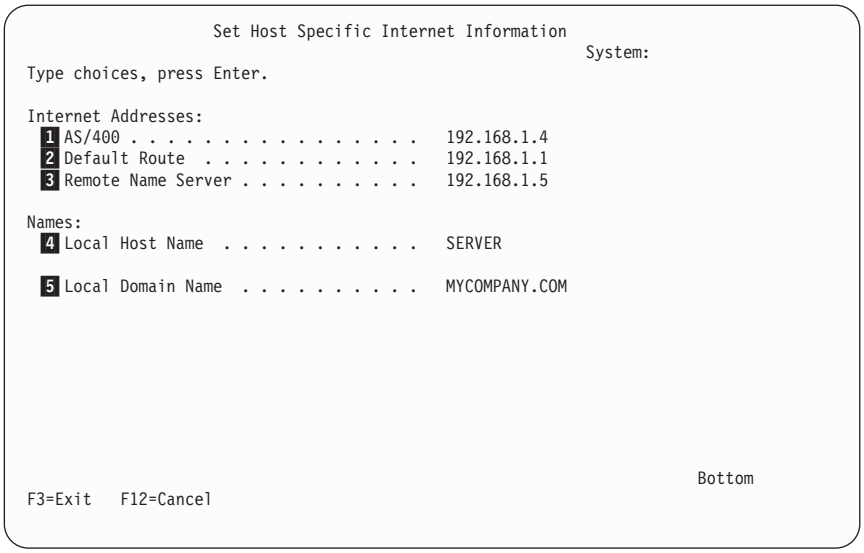
__ 15. Task 3100 - Identify AS/400 to the Local Networks

Type 1 next to task 3100 and press Enter. The *Identify AS/400 to the Local Networks* display appears.

```
                  Identify AS/400 to the Local Networks
                                                          System:   AS400TEST
Type option, press Enter.
  1=Select

        Task
Opt     ID       Description                                    Completed
        3110     Set Host Specific Internet Information            NO
        3120     Create or Verify TCP/IP Interfaces                NO









                                                                  Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F10=Display job log   F12=Cancel
```

__ 16. Task 3110 - Set Host Specific Internet Information

On the Identify AS/400 to the Local Network display, type 1 next to task 3110 and press Enter. The *Set Host Specific Internet Information* display appears.



__ 17. Enter the Host Specific Internet information

- If you have an existing TCP/IP environment, the Setup Assistant displays your host information. Verify that the names and addresses are correct. Then, go to step 18.
- Otherwise, fill in the data on this display from Table 26 on page 98, where:
  - **1** is the AS/400 Internet Address.
  - **2** is the Default Route/Next Hop Internet Address.
  - **3** is the IP Address of the Remote Server.
  - **4** is the Local Host Name.
  - **5** is the Domain Name.

  Press Enter and the Setup Assistant returns to the *Identify AS/400 to the Local Networks* display. If the task ran successfully, Task 3110 has a completion status of YES.

__ 18. Task 3120 - Create New TCP/IP Interfaces

On the *Identify AS/400 to the Local Network* display, type 1 next to task 3120 and press Enter. The *Define or Verify TCP/IP Interface(s)* display appears.

```
                    Create or Verify TCP/IP Interface(s)
                                                              System:
Type choices, press Enter:

First Interface:
  1 Line Description . . . . . . . . . . .   TRNLINE
  2 Internet Address . . . . . . . . . . .   192.168.1.4
  3 Subnet Mask  . . . . . . . . . . . . .   255.255.255.0

Second Interface:
  Line Description . . . . . . . . . . .              Name
  Internet Address . . . . . . . . . . .
  Subnet Mask  . . . . . . . . . . . . .

Third Interface:
  Line Description . . . . . . . . . . .              Name
  Internet Address . . . . . . . . . . .
  Subnet Mask  . . . . . . . . . . . . .




                                                                    Bottom
F3=Exit   F12=Cancel
```

__ 19. Enter the TCP/IP Interface Information

- If you have an existing LAN and are not adding additional LANs, verify that the displayed information is correct. Press Enter and go to step 20.
- Otherwise, use the information in Table 27 on page 100 to create LANs, where:
  - **1** is the Line Description.
  - **2** is the Internet Address.
  - **3** is the Subnet Mask.

  Remember, that each LAN must have a different IP address, but one LAN's IP address must match the IP address of your AS/400 host.

  Press Enter to create a TCP/IP interface and to return the *Identify AS/400 to the Local Networks* display. If the task ran successfully, Task 3120 will have a completion status of YES.

__ 20. Press Enter to return to the *Configure TCP/IP for IBM Network Stations* display.

__ 21. Task 3200 - Create TCP/IP Routes to Remote Networks

On the *Configure TCP/IP for IBM Network Stations* display, type 1 next to task 3200 and press Enter. The *Create TCP/IP Routes to Remote Networks* display appears.

```
                  Create TCP/IP Routes to Remote Networks
                                                          System:   AS400TEST
This screen is optional----Type choices, and press Enter:

Route 1:
  1 Internet Address . . . . . . . . . . .10.1.1.1
  2  Subnet Mask  . . . . . . . . . . . . .255.255.255.0
  3  Next Hop Address . . . . . . . . . . .192.168.1.1

Route 2:
  Internet Address . . . . . . . . . . .
  Subnet Mask  . . . . . . . . . . . . .
  Next Hop Address . . . . . . . . . . .

Route 3:
  Internet Address . . . . . . . . . . .
  Subnet Mask  . . . . . . . . . . . . .
  Next Hop Address . . . . . . . . . . .




                                                                      Bottom
F12=Cancel
```

__ 22. Enter TCP/IP Routes Information

- If you do not want to use, add, or create new routes, press Enter and proceed to step 23.
- Otherwise, use the information from Table 28 on page 101 to create new routes, where:
  - **1** is the Internet Address.
  - **2** is the Subnet Mask.
  - **3** is the Next Hop Address.

  Press Enter to return to the *Configure TCP/IP for IBM Network Stations* display. If the task ran successfully, Task 3200 has a completion status of YES.

__ 23. Task 3300 - Set TCP/IP Servers to Autostart

On the *Configure TCP/IP for IBM Network Stations* display, type 1 next to task 3300 and press Enter. The *Confirm Autostart of Servers* display appears.

Verify that each of the following lines appear:

CHGTFTPA AUTOSTART(*YES)

CHGHTTPA AUTOSTART(*YES)

CHGTELNA AUTOSTART(*YES)

After pressing Enter, you return to the *Configure TCP/IP for IBM Network Stations* display. If the task ran successfully, Task 3300 has a completion status of YES.

__ 24. Task 3400 - Add HTTP Server Directives

On the *Configure TCP/IP for IBM Network Stations* display, type 1 next to task 3400 and press Enter. The *Confirm Addition of HTTP Server Directives* display appears.

Press Enter and if the task ran successfully, Task 3400 has a completion status of YES.

__ 25. Press Enter to return to the *IBM Network Station Setup Tasks* screen. Task 3000 will have a completion status of YES.

__ 26. Task 4000 - Configure IBM Network Stations

Type 1 next to task 4000 on the *Network Station Setup Task List* display and press Enter. The *Select Boot Protocol* display appears.

```
                          Select Boot Protocol
                                                          System:   AS400TEST
Type choice:

Select boot protocol . . . . . . . . . . . . . . .   *BOOTP       *DHCP,
                                                                    *BOOTP,
                                                                    *NVRAM

If you select *DHCP, the following command will be run:

===>    CHGDHCPA AUTOSTART(*YES)

If you select *BOOTP, the following command will be run:

===>    CHGBPA AUTOSTART(*YES)

Press enter to select boot protocol and run these commands.




                                                                        Bottom
F3=Exit   F12=Cancel
```

__ 27. Select your boot protocol

Based on your decision in Table 25 on page 98, select your boot protocol and press the Enter key.

- If you choose *DHCP or *NVRAM, go to step 34 on page 116.
- Otherwise, the *Work with BOOTP Table* display appears.

__ 28. The *Work with BOOTP Table* display

```
                          WORK WITH BOOTP TABLE
                                                              SYSTEM:   AS400TEST
TYPE OPTIONS, PRESS ENTER.
  1=ADD   2=CHANGE   4=REMOVE   5=DISPLAY

     CLIENT
     HOST                                MAC                IP
OPT  NAME                                ADDRESS            ADDRESS

 _   ________________________________

                                                                          BOTTOM
F3=EXIT      F5=REFRESH   F6=PRINT LIST   F11=SET BOOTP TABLE DEFAULTS
F12=CANCEL   F17=TOP      F18=BOTTOM
```

If you press F11 on this display, you can set the BOOTP table defaults for when you add BOOTP table entries. You can set defaults for the hardware type, subnet mask, gateway IP address, boot file name, and boot file path. These settings save time and typing if you are setting up multiple Network Stations. To change the defaults, press F11 from this display.

Note: If you have twinaxial Network Stations, you do not need to make BOOTP entries in the BOOTP table. Press the F3 key to continue.

__ 29. Type 1 (Add) on the empty first line to add an entry for Network Station. The *Add BOOTP Table Entry* display appears.

```
                          ADD BOOTP TABLE ENTRY
                                                              SYSTEM:   AS400TEST
NETWORK DEVICE:
  1  CLIENT HOST NAME  . . .  ns1.mycompany.com



  2  MAC ADDRESS . . . . . .  00.00.A5.45.C2.62
  3  IP ADDRESS  . . . . . .  192.168.1.2
  4  HARDWARE TYPE . . . . .  1
NETWORK ROUTING:
  5  GATEWAY IP ADDRESS  . .
  6  SUBNET MASK . . . . . .
BOOT:
  7  TYPE  . . . . . .  . .  IBMNSM
  8  FILE NAME . . . . . .  KERNEL

  9  FILE PATH . . . . . .  /QIBM/PRODDATA/NETWORKSTATION/



F3=EXIT   F4=PROMPT   F12=CANCEL
```

__ 30. Enter BOOTP information.

Stop: Some of the fields on this display are case sensitive, such as the MAC address. You should type all information in upper case.

Use the information from Table 29 on page 101 to fill in the *Add BOOTP Table Entry* display, where:

- **1** is the Fully Qualified Host Name.
- **2** is the MAC Address.
- **3** is the IP Address.
- **4** is the Hardware Type.
- **5** is the Gateway IP Address for Remote LANs.
- **6** is the Subnet Mask for Remote LANs.
- **7** is the Type.
- **8** is the Boot File Name.
- **9** is the Boot File Path.

__ 31. Verify that no duplicate host names, MAC addresses, or IP addresses are in the table. If an address is incorrect, the Network Station will not start correctly.

__ 32. Repeat step 29 on page 115 through step 31 for each Network Station listed on Table 30 on page 103.

__ 33. Press Enter to return to the *IBM Network Station Setup Tasks* screen.

__ 34. Task 5000 - Start and Verify Required Servers

Type 1 next to task 5000 on the *Network Station Setup Tasks* display and press Enter. The *Confirm Start and Verify of Required Servers* display appears.

```
                Confirm Start and Verify of Required Servers
                                                        System:   AS400TEST
Type choice:

End TCP/IP . . . . . . . . . . . . . . . . . . . .   *NO          *NO, *YES


If you configured new lines and/or added new TCP/IP interfaces, you have
to end TCP/IP for the changes made to take affect.

The following commands are needed to start the required servers:

===>    STRTCP

===>    STRSBS QSERVER

===>    STRHOSTSVR SERVER(*ALL)

Press enter to run these commands.


                                                                      Bottom
F3=Exit   F12=Cancel
```

__ 35. Initiate Task 5000.

- If TCP/IP is active, task 5000 gives you the option to end TCP/IP.
- If you have created new lines or TCP/IP interfaces, you must select *YES.

__ 36. Complete Task 5000.

Note: The Setup Assistant turns on the Network Station Login Server . If you end your TCP/IP or IPL your system, you must restart the Network Station Login Server. To start the Network Station Login Server, type `CALL QYTC/QYTCUSVR ('STRTCPSVR ')` at an AS/400 command line. If you are using OS/400 V4R3 or later, you can start and stop the Network Station Login Daemon with Operations Navigator. Locate the Network Station Login Daemon using the path: `Network/Servers/TCPIP`.

- If task 5000 successfully completes, read the exit screen and press Enter. Press the F3 key to exit the Setup Assistant.
- If task 5000 fails, retry the task and choose not to end TCP/IP. If the task fails again, check the job log (F10) and take appropriate action.

__ 37. Setup Assistant configuration complete

- If you choose the BOOTP protocol, you have completed the configuration of the BOOTP server. To add Network Stations later, see “Adding Network Stations to an Existing BOOTP Environment” on page 129. Go to “Before You Continue” on page 128.
- If you choose the DHCP protocol, go to step 38.
- If you choose the NVRAM boot method, go to “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301 and then return to “Before You Continue” on page 128.

__ 38. Use the values that you gathered earlier to complete the DHCP wizard, which helps you define a new DHCP environment.

Note: In the DHCP wizard, screen titles are in the upper left-hand corner of each window. In the checklist below, each step title shares the name of the screen from the DHCP wizard. Throughout the upcoming procedure, samples screens demonstrate the configuration of Figure 5 on page 7.

__ 39. Use Figure 19 on page 118 to locate the DHCP server.

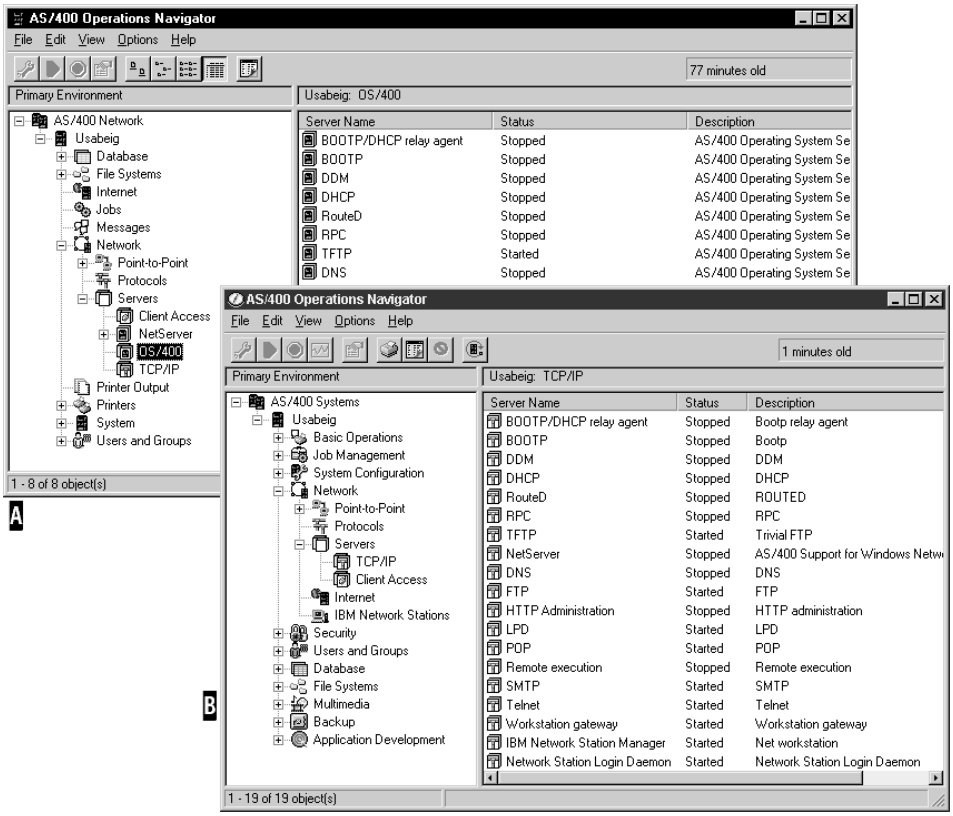


Figure 19. Directory Path to the DHCP Server. **A** *V4R2* **B** *V4R3 and later*

__ 40. In Operations Navigator on your PC, double-click the **DHCP** server to start the New Configuration wizard.

__ 41. New Configuration

Read the welcome message and click **Next**.

__ 42. Migrate BOOTP

- If your screen title is *Default Lease Time*, go to step 44 on page 119.
- If your screen title is *Disable BOOTP server*, go to step 43 on page 119.
- Otherwise, do the following:

  __ a. Check the **Yes** radio button.

Why migrate now?

The BOOTP and DHCP servers cannot run simultaneously. To support your existing BOOTP clients in the new DHCP environment, you must migrate them. They will appear as clients and keep their BOOTP values. To migrate at a later time, click No (see “Migrating BOOTP Clients to a DHCP Environment” on page 133).

__ b. Enter the Bootstrap server's IP address from line **2** of Table 31 on page 103. The Bootstrap server address you enter is defined on the global level.

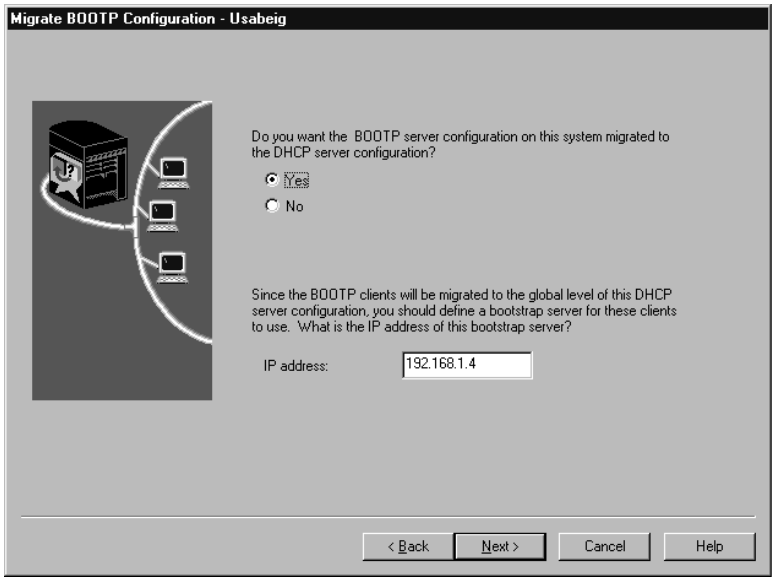


Figure 20. Migrate BOOTP Configuration. In Figure 5 on page 7, the Bootstrap server is 192.168.1.4

__ 43. Disable BOOTP server

- If this screen title is *Default Lease Time*, go to 44.
- Otherwise, read the screen and check the **Yes** radio button.

__ 44. Default Lease Time

Enter the value from line **3** of Table 31 on page 103. Remember that this is a global value.

__ 45. Create a New Subnet

Read the screen and check the **Yes** radio button.

__ 46. Subnet Manages Twinaxial Devices

Check the appropriate radio button.

- If you do not want to support twinaxial Network Stations, go to step 48 .
- Otherwise, continue to step 47.

__ 47. Twinaxial Workstation Controller Address

a. Enter the value from line **2** of Table 80 on page 355.

b. Go to step 49.

__ 48. Address Range or Subnet

Use the value from line **2** of Table 32 on page 104 to make a decision.

- If you choose to define a subnet that is based on an address range, go to step 50 on page 121.
- Otherwise, continue to step 49.

__ 49. Define Subnet Based on Entire Physical Subnet

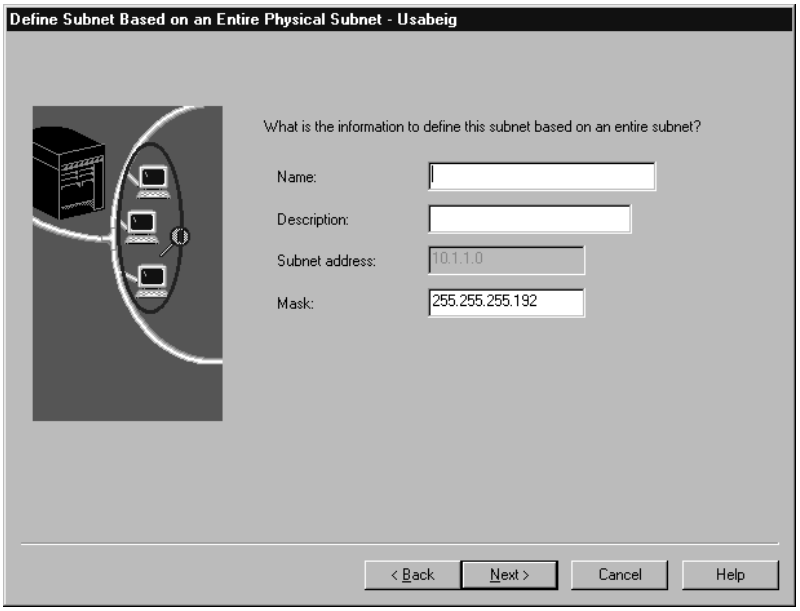


Figure 21. Defining an Entire Subnet. Sample configuration for Figure 5 on page 7 if NS3 and NS4 are twinaxial Network Stations.

__ a. Enter the values on lines **3** , **4** , and **5** from Table 32 on page 104 to define a new subnet.

Twinaxial Support: If your new subnet will support twinaxial Network Stations, the wizard defines your subnet based on the workstation controller address. The wizard also calculates your mask address. You can alter the mask address.

__ b.

- If you are configuring a twinaxial subnet, go to 52 on page 122.
- Otherwise, go to step 51.

__ 50. Define Subnet Based on an Address Range.

Use lines **3** , **4** , **6** , **7** , and **8** from Table 32 on page 104 to define a new subnet.

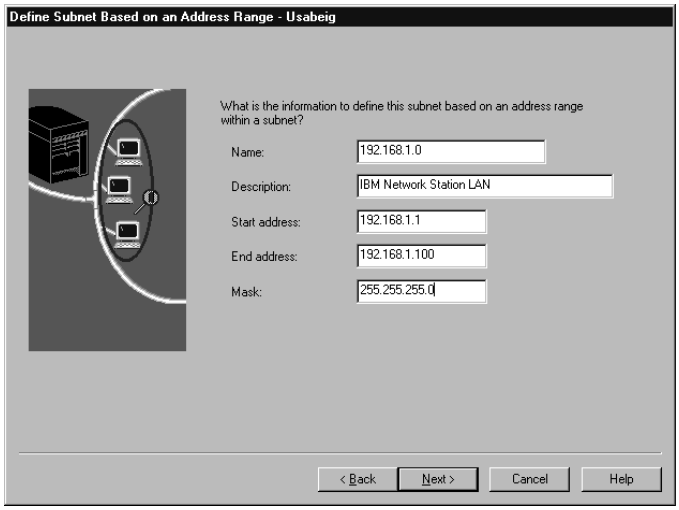


Figure 22. Define Subnet Based on an Address Range. Sample configuration for Figure 5 on page 7.

__ 51. Exclude Addresses

Use the **Add** button to enter any values from line **9** in Table 32 on page 104.

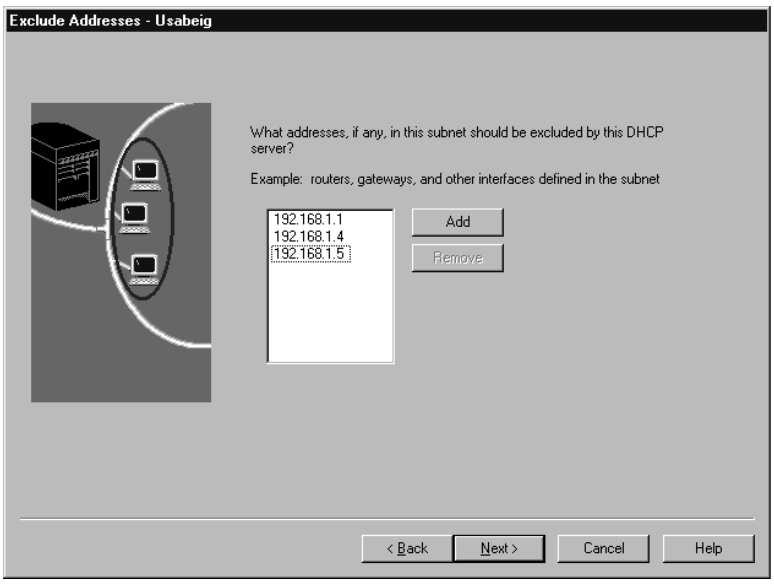


Figure 23. Exclude Addresses. In the Figure 5 on page 7, subnet 9.5.67.0 would exclude the router, server, and the domain name server.

__ 52. Subnet Lease Time

Click the radio button labeled **Inherit the server's default lease time**. This subnet will assume the value defined in step 44 on page 119. You can change default lease times later..

__ 53. Subnet Gateways

Use the value from line **10** in Table 32 on page 104.

__ 54. Subnet Domain Name Server

Use the **Add** button to enter any values from line **11** in Table 32 on page 104.

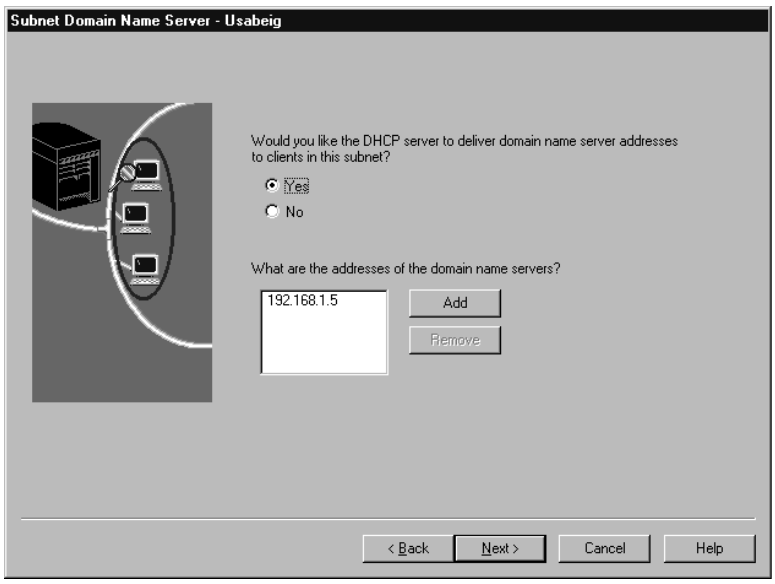


Figure 24. Domain Name Server. Sample configuration for Figure 5 on page 7.

__ 55. Subnet Domain Name

Use the **Yes** radio button to enter any values from line **12** in Table 32 on page 104.

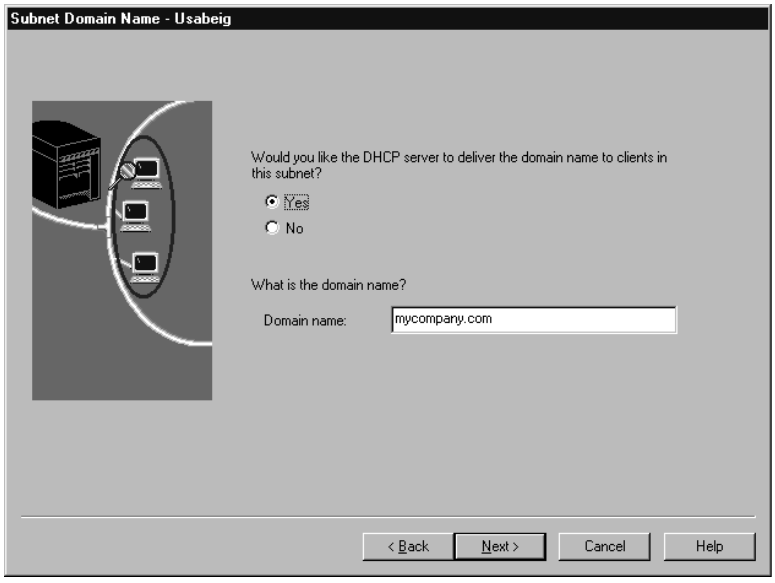


Figure 25. Subnet's Domain Name.

__ 56. More Subnet Options

Click the **Yes** radio button.

__ 57. Subnet Options

Using the **Add** button, move and define the following mandatory options in the Selected Options window.

- Tag 1 Subnet mask—Use the value from line **13** in Table 32 on page 104.

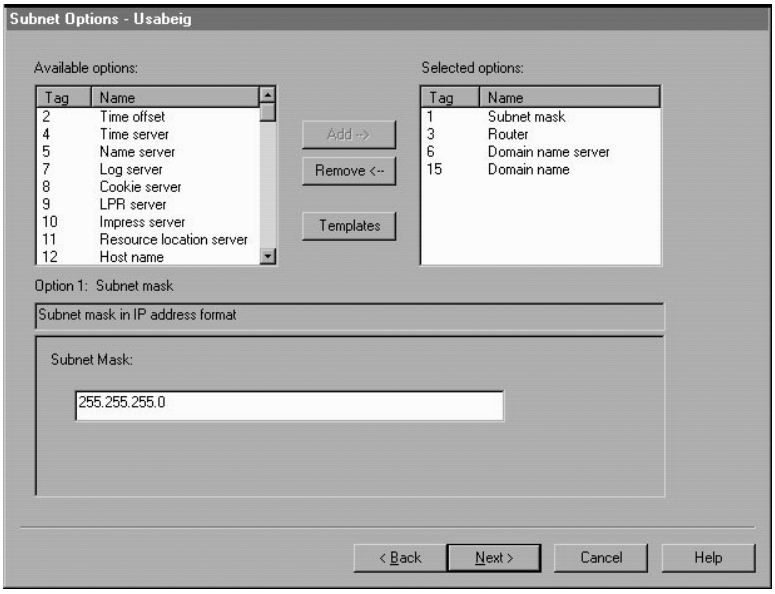


Figure 26. Additional Subnet Options

Additional Options

The server sends these options to the Network Station. Add and define any other options applicable to your network. Consult the online help information for additional options.

__ 58. Subnet Options

In the second Subnet Options screen (see Figure 27 on page 125), make the following decisions:

__ a. Append Domain to Host Name–Use the value from line **14** of Table 32 on page 104.

__ b. Bootstrap server–Use the inherited value.

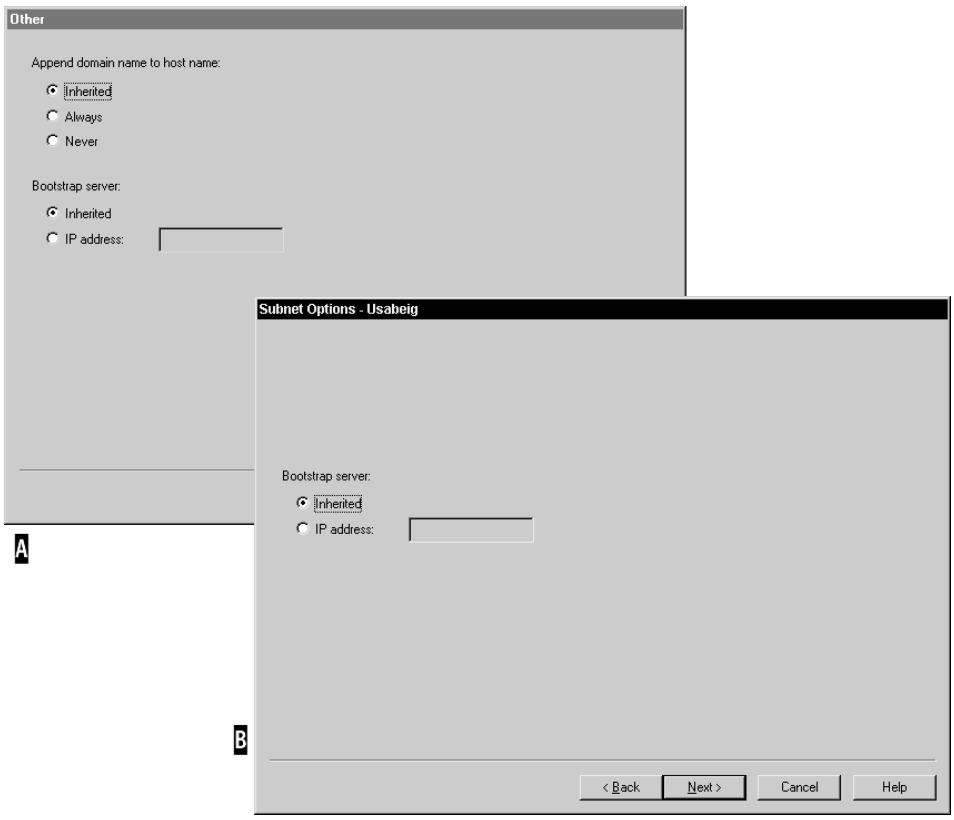


Figure 27. More Subnet Options. **A** *V4R2* **B** *V4R3 and later*

__ 59. Support Unlisted Clients

When you enable the Support Unlisted Clients option, the DHCP server will issue an IP address to any Network Station that requests an IP address. If you do not want to support unlisted clients, the DHCP server will only issue IP addresses to Network Stations that are statically defined. See “Adding Network Stations to an Existing DHCP Environment” on page 131 if you want to define Network Stations statically.

__ 60. Start DHCP

You should start DHCP only if you do not need to make additional subnets or clients. You can start the DHCP server by using Operations Navigator later.

__ 61. New DHCP Configuration Summary

Verify that you configured the subnet correctly, and then click the **Finish** button. The wizard will configure the DHCP server with the information you entered.

__ 62. Define the bootstrap server

__ a. In the DHCP Configuration screen, right mouse click on the **Global** icon and choose Properties.

__ b. Click on the **Other** tab.

__ c. In the *Bootstrap server* field, enter the value from line **2** in Table 31 on page 103 .

Note: If you migrated your BOOTP clients, you have already defined the bootstrap server address. Verify that the address is correct.

__ d. Click the **OK** button.

__ e. From the File menu, choose **Update Server**.

__ 63. Define Network Station Classes

Note: The DHCP server automatically adds the classes IBMNSM 1.0.0, 2.0.0, and 3.4.1. If you are defining one of these classes, right mouse click on that class and choose Properties. Then skip to 63.d.

__ a. In the DHCP Server Configuration screen, right mouse click on the **Global** icon and choose New Class.

__ b. After the *New Client Properties* screen appears, enter the value from line **4** of Table 31 on page 103 in the **Name** field. Figure 28 is an example class description for an Ethernet, Series 1000 Network Station.

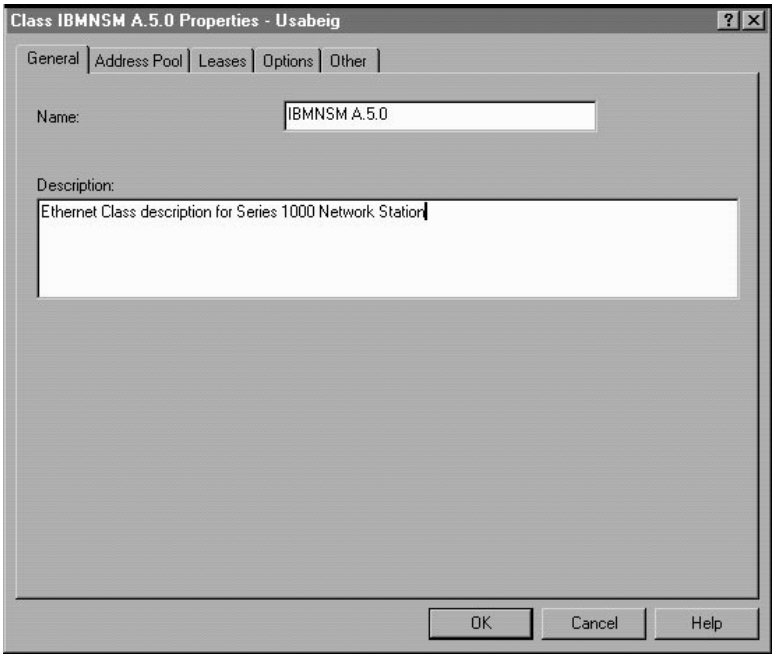


Figure 28. Class description for Series 1000 Ethernet Network Station.

__ c. You can enter a description of the class in the **Description** field.

__ d. Click on the **Options** tab.

__ e. In the *Available Options* window, locate Tag 67 (Boot file name) and click the **Add** button.

Note: If the DHCP wizard preconfigured any of your classes, it already defined Tag 67. You should verify that the boot path and filename are correct and skip to 63.g.

__ f. In the *File name* field, enter `/QIBM/ProdData/NetworkStation/kernel`.

__ g. Click the **Other** tab.

__ h. In the *Bootstrap server* field, enter the IP address from line **2** of Table 31 on page 103.

__ i. Click the **OK** button.

__ j. From the File menu, choose **Update Server**.

__ k. Repeat step 63.a on page 126 through 63.j for each Network Station class that you defined in line **4** of Table 31 on page 103.

__ 64. Configuration of DHCP server complete

You have completed the configuration of the DHCP server.

- If you have a subnet with twinaxial Network Stations and want to associate that subnet with another subnet (like "Twinaxial Subnet Associated with a LAN" on page 349), you must complete the following:

  __ a. Power one of your twinaxial Network Stations on. While the Network Station loads its kernel, the AS/400 server creates a twinaxial line description and TCP/IP interface.

  __ b. Turn on IP forwarding.

  Type: `CHGTCPA`, and set the value for IP datagram forwarding to `*YES`. Then press the Enter key.

  __ c. At an AS/400 command prompt, type `CFGTCP`. Then choose option 1.

  __ d. Locate and end the twinaxial interface.

  __ e. Use option 2 to change the twinaxial interface. The *Change TCP/IP Interface* display appears.

  __ f. In the *Associated local interface* field, enter the value in field **4** of Table 80 on page 355.

  __ g. Press the Enter key and start the twinaxial interface. To take advantage of the associated interface, you must restart your twinaxial Network Station.

- If you want to add new subnets to your DHCP server, click on the **Global** icon in the DHCP Server Configuration screen. Then under the File menu, choose **New** and **Subnet-Basic**.
- If you want to add statically addressed clients to your DHCP server, see "Adding Network Stations to an Existing DHCP Environment" on page 131.
- If you choose not to start the DHCP server earlier, remember to start the DHCP before you attempt to start your Network Stations. To start the DHCP server, locate the DHCP server in Operations Navigator. Right-click on the **DHCP** server and choose **Start**.

Go to the section “Before You Continue”.

Before You Continue

Before you begin using your Network Stations, read and complete (when applicable) each of the following items:

- To take advantage of new functionality, you must update the boot monitor on your Network Stations. Each of your Network Stations must have a minimum boot monitor version of 3.0.0. Even if you have purchased new Network Stations, you should verify and update the boot monitors of your Network Stations. For information about updating boot monitors, see “Updating the Boot Monitor Code” on page 265.
- The Setup Assistant turns on the Network Station Login Server . If you end your TCP/IP or IPL your system, you must restart the Network Station Login Server. To start the Network Station Login Server, type `CALL QYTC/QYTCUSVR ('STRTCPSVR ')` at an AS/400 command line. To end the Network Station Login Server, type `CALL QYTC/QYTCUSVR ('ENDTCPSVR ')`. Notice the space after the single quotation mark. If you are using OS/400 V4R3 or later, you can start and stop the Network Station Login Daemon (NSLD) with Operations Navigator. Locate the NSLD using the path: `Network/Servers/TCPIP`.

  Tip: In OS/400 V4R3 or later, you can set the NSLD to autostart when TCP/IP starts. Double click the NSLD, and check the *Start when TCP/IP is started* option.
- If you use the BOOTP or NVRAM boot method, you must enable DNS support through the Network Station Manager program. To enable DNS support, see “Updating the Domain Name Server (DNS) Configuration on the Network Station” on page 267.
- Verify that the Network Parameters in the Setup Utility of your Network Stations agree with your boot method. For example, if you want a Network Station to obtain its IP address through a DHCP server, ensure that the IP Address from field is Network. See “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301 for more information about the Setup Utility. In the Setup Utility, the factory default boot method is Network.
- Verify that you started your BOOTP or DHCP server, NFS or TFTP server, and HTTP server.
- Verify that you excluded any statically addressed devices in your DHCP addressing range.
- If you have a router between your Network Station and your boot server, verify that your router can handle BOOTP and DHCP requests.
- If you move a twinaxial Network Station to a different port, change its station address, or delete its device description, the twinaxial Network Station will receive a different IP address.
- For more information about setting up Network Stations, see the following sections:
  - “Chapter 7. Logging On and Working With IBM Network Station Manager Applications” on page 223

– “Chapter 8. Using the IBM Network Station Manager Program” on page 245

– “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301

Adding Network Stations to an Existing BOOTP Environment

This section describes how to add Network Stations to an existing BOOTP environment. There are two methods to add Network Stations:

- To add Network Stations with the green screen, go to “Adding Network Stations with the Green Screen”.
- To add Network Stations with Operations Navigator, go to “Adding Network Stations with Operations Navigator”.

Adding Network Stations with the Green Screen

This procedure describes how to add Network Stations to an existing BOOTP environment.

__ 1. For each new Network Station, fill out a new row of information on Table 29 on page 101.

__ 2. At an AS/400 command prompt, type:

```
WRKBPTBL
```

__ 3. In the options field, enter 1 to add a Network Station.

__ 4. Enter the newly recorded information from Table 29 on page 101.

Note: Remember to enter the information in rows 1, 2, 3, and when applicable, rows 5 and 6.

__ 5. Press Enter to exit the Configure TCP/IP BOOTP menu.

Adding Network Stations with Operations Navigator

The procedure adds Network Stations to an existing BOOTP environment. Operations Navigator requires OS/400 V4R2 or later.

__ 1. For each new Network Station, fill out a new row of information on Table 29 on page 101.

__ 2. In Operations Navigator, locate the BOOTP server with the path: `Network object/Servers/OS/400`.

__ 3. Double click the **BOOTP** server.

__ 4. Click the **Add** button.

__ 5. Fill in the Network Device information, where:

- Host Name is line **1** of Table 29 on page 101.
- MAC address is line **2** of Table 29 on page 101.
- IP address is line **3** of Table 29 on page 101.

- Hardware type is line **4** of Table 29 on page 101.

__ 6. If you do not use Gateway IP addresses for remote LANs, leave this field blank. Otherwise, enter the value from line **5** of Table 29 on page 101.

__ 7. If you do not use a Subnet Mask for remote LANs, leave this field blank. Otherwise, enter the Subnet Mask value as recorded on line **6** of Table 29 on page 101.

__ 8. Verify that the following default values are correct:
   - Type is `IBM Network Station Manager`.
   - Filename and directory are `/QIBM/ProdData/NetworkStation/kernel`.

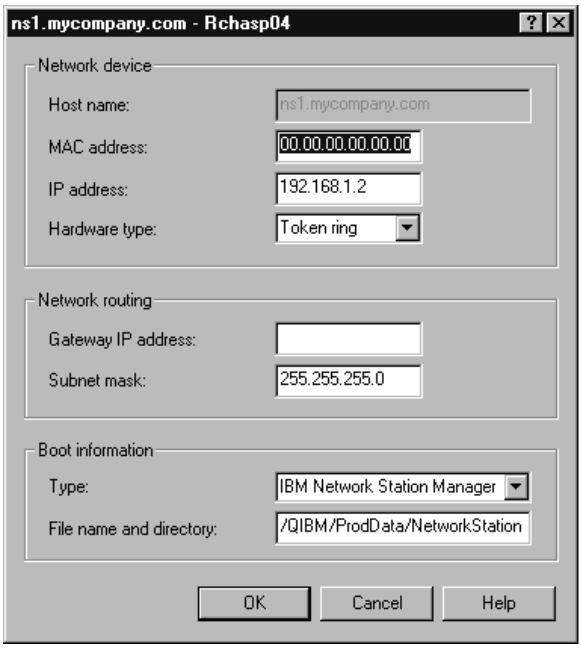


Figure 29. Add BOOTP Client. Sample Configuration for a Network Station in Example Figure 3 on page 5.

__ 9. Click the **OK** button.

__ 10. Repeat steps 4 on page 129 through 9 for each additional Network Station.

__ 11. Click the **OK** button to update the BOOTP server.

Adding Network Stations to an Existing DHCP Environment

A DHCP environment can support individually defined clients. A client definition is useful because you can define an IP address for clients. When the clients request an IP address from the server, the server always returns the defined address.

Use Table 33 to gather the necessary values to define a client.

Table 33. Information to Define DHCP Clients

Field	Description	Write Value Here
1 Client Name	Record a name for your client.	
2 Unique Identifier	The MAC address is a unique hardware-specific identifier for each Network Station. The address is located on the box of the Network Station. To find the MAC address without the box, follow this procedure: __ 1. Power on the Network Station. __ 2. After the keyboard controller test, press the Escape key. __ 3. In the Setup Utility, press the F2 key. __ 4. Record the MAC address.	
3 Hardware Type	Identify the Network Station's hardware type to the server.	The possibilities are: • Ethernet (100 MB) • IEEE 802 Networks
4 Description	Describe the client. This value is not mandatory and does not affect the performance of the client.	
5 IP Address	Assign a valid and unused IP address to your Network Station. In Figure 5 on page 7, the IP address of `ns1.mycompany.com` is `192.168.1.2`.	Assign address from pool or defined
	If defined, enter IP address.	
6 Lease Time	This refers to the amount of time a server lets clients keep an IP address. The lease time has three options: • Inherit means that the client uses the value of the global lease time. • User-defined value. • Never expire.	Inherit, user-defined, or never expire

Table 33. Information to Define DHCP Clients (continued)

Field	Description	Write Value Here
7 Subnet Mask	A value that enables network devices to direct packets of information accurately in a subnetted environment. This subnet value is delivered to the Network Stations. In Figure 5 on page 7, the subnet mask is 255.255.255.0. For more information about subnet masks, refer to "Subnets and Subnet Masks" on page 9	
8 Append domain name to host name	The Append domain name option specifies whether the DHCP server should append a domain name to client responses that omit a domain name.	Yes or No
9 Bootstrap Server	The Bootstrap server delivers the boot files to the Network Stations. Enter the Bootstrap server's IP address. In Figure 5 on page 7, the Bootstrap server address for subnet `192.168.1.0` is `192.168.1.4`. Inherited means that the value is inherited from the global level.	Inherited or defined
	If defined, enter Bootstrap server IP Address.	

__ 1. Clients can be defined on a global or subnet level, depending on which properties you want the clients to inherit.
   - To define a client on a global level, right mouse click on the **Global** icon.
   - To define a client on a subnet level, right mouse click on the subnet for which the client should belong.

__ 2. Click **New Client**, and the *New Client Properties* display appears.

__ 3. Click on the **General** tab.

__ 4. Enter the values **1**, **2**, **3**, and **4** from Table 33 on page 131 into their respective fields.

__ 5. Click the **IP Address** tab.

__ 6. Click the appropriate radio button and use any values from line **5** of Table 33 on page 131.

__ 7. Click the **Leases** tab.

__ 8. Enter the value from line **6** of Table 33 on page 131.

__ 9. Click the **Options** tab.

__ 10. In the *Available options* window, add tags 1 and 67 to the *Selected options* window.

__ 11. Define Tag 1–Subnet mask–with the value on line **7** of Table 33 on page 131.

__ 12. Define Tag 67–Boot file name–with the value `/QIBM/ProdData/NetworkStation/kernel`

__ 13. Add and define any additional options applicable to your network environment.

__ 14. Click on the **Other** tab.

__ 15. Use the values on lines **8** and **9** of Table 33 on page 131 and check the appropriate radio buttons.

__ 16. Click the **OK** button.

The DHCP server will define a client with the name from line **1** of Table 33 on page 131.

__ 17. From the File menu, choose **Update Server**. The DHCP server will update itself with the client you just defined.

Migrating BOOTP Clients to a DHCP Environment

DHCP can support BOOTP clients. If you want your existing BOOTP entries to remain statically addressed (versus dynamically addressed), you can migrate them into your DHCP environment. The migration program defines the BOOTP clients as Clients.

- If you have not configured your DHCP environment, go to step 38 on page 117 and migrate the BOOTP clients during the setup procedure.
- If you have configured your DHCP and you choose not to migrate, follow the procedure below.

  __ 1. In the *DHCP Server Configuration* screen, choose **Migrate BOOTP** from the File menu.

  __ 2. Enter the Bootstrap server IP address.

  The Bootstrap server serves the boot files to the Network Station. In Figure 3 on page 5, the Bootstrap server IP address is `192.168.1.4`.

Configuring Printers on an AS/400

You can configure printers for your Network Stations with the IBM Network Station Manager program unless the datastream generated by the Network Station application does not match a datastream that your printer understands. Table 62 on page 242 describes which datastreams the common Network Station applications produce. If your Network Station application does not produce a datastream that your printer understands, you must send the print job to an AS/400 server. The AS/400 server transforms the print job into the datastream of your choice.

Note: Transforming print jobs requires OS/400 Version 4 Release 2 or later.
For example, if Network Station A in Figure 30 on page 134 generates a print job from NC Navigator for Printer 1 (a Printer Control Language (PCL) printer), the Network Station cannot send its print job directly to the printer. Because NC Navigator can only generate PostScript (PS) datastreams, the Network Station must send its print job to the AS/400 server, which will transform the print job into a PCL datastream. A queue on the AS/400 server then sends the transformed print job to Printer 1.

For server-based applications, such as a 5250 session, you must configure a printer on the server where the application is running. In this case, think of the Network Station as only a window to the server, in that server still performs the ″work″. In Figure 30 on page 134

page 132, if Network Station A is running a 5250 session on the AS/400 server and you want to print to Printer 4, you must create a printer device description on the AS/400 server. The AS/400 server will send the print job to Printer 4. To create a printing device description on your AS/400 system, see “The CRTDEVPRT Command” on page 137.

Configuring Basic Printer Scenarios

Using Figure 30 as an example, Table 34 explains the basic steps to configure printers for your Network Stations.

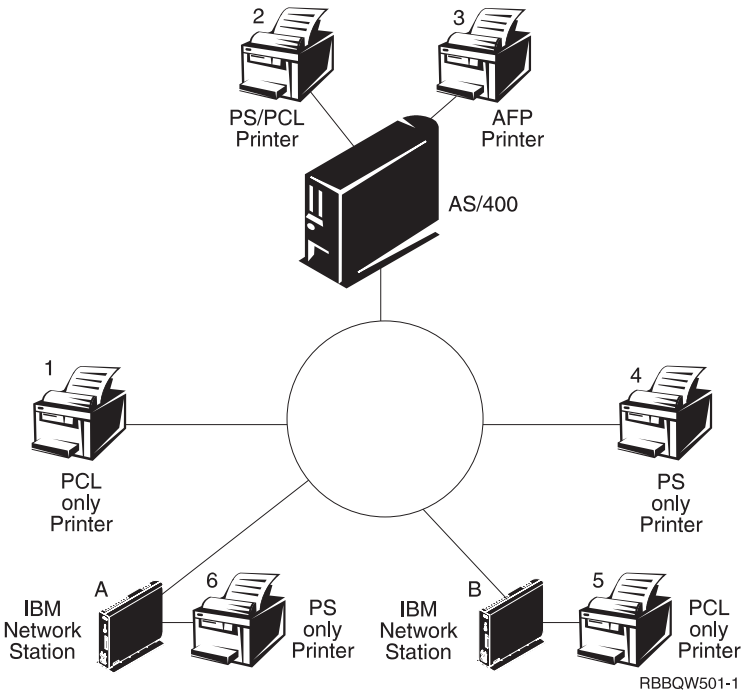


Figure 30. Possible Network Station Printing Scenarios

Identify the scenario that best meets your needs and follow the steps to configure your printers.

Table 34. Configuration Descriptions for Basic Printer Scenarios

Desired Print Scenario	**Print Job Flow in Figure 30**	**Configuration Instructions**
Network Station to a LAN printer	Network Station A to Printer 4	1. In the Network Station Manager program, configure an entry in the *Remote Printer Server* field for the LAN printer.

Table 34. Configuration Descriptions for Basic Printer Scenarios (continued)

Desired Print Scenario	Print Job Flow in Figure 30 on page 134	Configuration Instructions
Network Station to a LAN printer with a different datastream	Network Station A to AS/400 server to Printer 1	1. On the server that will transform the print job, create a printer device description and queue. The printer device description must contain the IP address or host name of the LAN printer. For more information on configuring a printer device description, see “The CRTDEVPRT Command” on page 137. 2. In the Network Station Manager program, configure an entry in the *Remote Printer Server* field with the IP address or host name of the transform server and its queue name.
Network Station to a locally attached printer	Network Station A to Printer 6	1. In the Network Station Manager program, configure an entry in the *Local Parallel Printer* or the *Local Serial Printer* field, depending on how the printer connects to the Network Station.
Network Station to a locally attached printer with different datastream	Network Station B to AS/400 Server to Printer 5	1. On the server that will transform the print job, create a printer device description and queue. The printer device description must contain the IP address or host name of the Network Station to which the printer is attached. For more information on configuring a printer device description, see “The CRTDEVPRT Command” on page 137. 2. In the Network Station Manager program, configure an entry in the *Remote Printer Server* field with the IP address or host name of the transform server and its queue name.
Network Station to another Network Station with an attached printer	Network Station B to Network Station A to Printer 6	1. In the Network Station Manager program, configure an entry in the *Remote Printer Server* field with the IP address of the Network Station to which the printer is attached. In the *Queue name* field, type `PARALLEL1` or `SERIAL1`, depending on how the printer connects to the Network Station.
Network Station to another Network Station with an attached printer and a different datastream	Network Station A to AS/400 server to Network Station B to Printer 5	1. On the server that will transform the print job, create a printer device description and queue. The printer device description must contain the IP address or host name of the Network Station to which the printer is attached. For more information on configuring a printer device description, see “The CRTDEVPRT Command” on page 137. 2. In the Network Station Manager program, configure an entry in the *Remote Printer Server* field with the IP address or host name of the transform server and its queue name.

Table 34. Configuration Descriptions for Basic Printer Scenarios (continued)

Desired Print Scenario	Print Job Flow in Figure 30 on page 134	Configuration Instructions
Network Station to a server controlled printer	Network Station A to AS/400 server to Printer 2 or 3	1. In the Network Station Manager program, configure an entry in the *Remote Printer Server* field with the host name or IP address of the server that controls the printer. In the *Queue name* field, enter the name of the queue that controls the printer. In this scenario, it does not matter if the datastreams do not match. If you used the `CRTDEVPRT` command (as specified in "The CRTDEVPRT Command" on page 137), the server will automatically transform the job if necessary.

Printer Administration Techniques

Administrating a printer environment is a difficult task. You should create a printer network diagram. Based on your diagram and printing needs, you should develop a printing strategy. Under the right conditions, Network Stations can print to most types of printers.

One technique to consider is to have a server control the printers for your Network Stations. In Figure 30 on page 134, the AS/400 server could control a LAN printer like Printer 4. If Network Station A and B always sent their print jobs to the AS/400 server, the AS/400 server could control the flow of print jobs to the printer. This scenario would reduce the work load on the Network Stations when the printer's buffer is full, because the AS/400 would negotiate print jobs with the printer. However, handling these print jobs would likely draw on the central processing unit (CPU) of the AS/400 server. This technique will likely hinder the server's performance depending on the size and frequency of your print jobs. Since you would send the print job from a Network Station, to a server, and then to a printer, this technique would increase network traffic too.

Having a server control your Network Station printing is also advantageous in an environment with mixed printer datastreams. Since Network Station applications only generate certain datastreams, you may have to send print jobs to a server, where the print job can be transformed into a datastream that your printer understands. Depending on which application generates the job, you may or may not need to transform your print jobs. This may require more administration in the Network Station Manager program and on the server. Your end users would also need to have a better understanding of printing and networking. To eliminate confusion, you should consider having all print jobs sent to the server regardless of whether the job needs to be transformed. In the end, you will have fewer printer entries in the Network Station Manager program and fewer printer device descriptions on the server.

When you have a server that controls the printers for your Network Stations, you perform less administration, but you sacrifice speed. When a server controls your print jobs, its CPU works harder, possibly slowing performance. Your end users will notice that it takes longer for them to receive their printouts. But if you set up your printing strategy so that your Network Stations send their jobs directly to the printer (whenever

datastream transformation is unnecessary), you can reduce printing time. Since the print job goes directly to the printer, your server does not bear the load of controlling print jobs. Sending your print jobs directly to the printer also reduces the chance of the server misinterpreting your print job. When a server misinterprets a print job, the job may become lost or damaged.

The CRTDEVPRT Command

The `CRTDEVPRT` command creates a printer device description on your AS/400 server.

__ 1. From an AS/400 command prompt, type `CRTDEVPRT`, and specify the following parameters:
   - Device description
   - Device Class = *LAN
   - Device Type = 3812
   - Device Model= 1
   - LAN attachment = *IP
   - Activation Timer = 1-2550 seconds
   - Inactivity Timer = 1-30 seconds, or *NOMAX
   - Host Print Transform = *YES
   - Image Configuration = Obtain a value from Table 35 on page 138.
   - Manufacturing/Type/Model = Prompt (F4) and match value
   - Remote Location = Name or IP address of the LAN attached printer(or server) or IP address of a Network Station with an attached printer
   - Port Number = TCP/IP port number that is used by printer
     – 2501-IBM network printers
     – 6464-printer attached to a Network Station
     – 9100-most other network printers
   - System Driver Program
     – *NETSTNDRV for printers attached to Network Station
     – *IBMPJLDRV for IBM network printers
     – *HPPJLDRV for HP PJL-compatible printers attached directly to the TCP/IP network

   The AS/400 system automatically creates an output queue with the name of the device description. For more information about AS/400 printing, see the publication *Printer Device Programming*, SC41-5713.

__ 2. Activate the device.
   - Type: `WRKCFGSTS CFGTYPE(*DEV) CFGD(device description)`, and vary the device on.

__ 3. Start a printer writer.
   - Type: `STRPRTWTR DEV(device description)`

Table 35. Common Printers and Their Image Configuration Values. For more values, see the publication Printer Device Programming, SC41-5713.

Image Configuration Value	Printer
Compaq Pagemarc 20	*IMGD01
Epson EPCL-4 Printer	*IMGA01
Epson EPCL-5 Printer	*IMGA02
Epson Stylus Photo with PostScript	*IMGB10
Epson Stylus Color 600, 800 with PostScript	*IMGB11
HP Color Laserjet 5	*IMGA04
HP Color Laserjet 5M	*IMGD04
HP Deskjet 560C, 820C, 1200C	*IMGA04
HP Deskjet 500, 600, 1200	*IMGA01
HP Deskjet 1600C, 1600CN	*IMGA04
HP Deskjet 1600CM	*IMGD04
HP Laserjet II, IID, IIP	*IMGA09
HP Laserjet II, IID, IIP with PostScript	*IMGB01
HP Laserjet III, IIID, IIISi, 4L	*IMGA01
HP Laserjet III, IIID, IIISi, 4L with PostScript	*IMGD01
HP Laserjet 4, 4P, 4V, 4Si, 4 Plus	*IMGA02
HP Laserjet 4M, 4MP, 4MV, 4Si MX, 4M Plus	*IMGD02
HP Laserjet 5, 5P, 5Si	*IMGA02
HP Laserjet 5M, 5MP, 5Si MX	*IMGD02
HP Laserjet 6, 6P, 6L	*IMGA02
HP Laserjet 6M, 6MP	*IMGD02
IBM 3112, 3116 Page Printer with IPDS feature	*IMGD02
IBM 3112, 3116 Page Printer (ASCII/LAN)	*IMGA02
IBM 3112, 3116 Page Printer with PostScript	*IMGD02
IBM 3130, 3160-1 AF Printer (240-pel mode)	*IMGC01
IBM 3130 AF Printer (300-pel mode)	*IMGC02
IBM 3825, 3827, 3828 AF Printer	*IMGC09
IBM 3825, 3827, 3828 AF Printer (with AFIG)	*IMGC01
IBM 3829 AF Printer	*IMGC01
IBM 3835-001 AF Printer	*IMGC10
IBM 3835-001 AF Printer (with AFIG)	*IMGC05
IBM 3835-002, 3900 AF Printer	*IMGC05
IBM 3912, 3916 Page Printer (ASCII/LAN)	*IMGA01
IBM 3912, 3916 Page Printer with IPDS feature (twinax)	*IMGC06
IBM 3930-03 Page Printer	*IMGA01

Table 35. Common Printers and Their Image Configuration Values (continued). For more values, see the publication Printer Device Programming, SC41-5713.

Image Configuration Value	Printer
IBM 3930-03 Page Printer with PostScript	*IMGD01
IBM 3935 AF Printer	*IMGC02
IBM 4019 LaserPrinters (HP mode)	*IMGA09
IBM 4019 LaserPrinters with PostScript	*IMGB01
IBM 4028 LaserPrinters	*IMGC06
IBM 4029 LaserPrinters	*IMGA01
IBM 4029 LaserPrinters with PostScript	*IMGB02
IBM 4039 LaserPrinters	*IMGA01
IBM 4039 LaserPrinters with PostScript	*IMGD07
IBM 4049 LaserPrinters	*IMGA02
IBM 4049 LaserPrinters with PostScript	*IMGD02
IBM 4079 Color Jetprinter PS	*IMGB09
IBM 4303 Network Color Printer	*IMGB05
IBM 4312, 4317, 4324 NP with IPDS feature (twinax)	*IMGC06
IBM 4312, 4317, 4324 NP with IPDS feature (LAN)	*IMGC06
IBM 4312, 4317, 4324 NP (ASCII/LAN)	*IMGA02
IBM 4312, 4317, 4324 NP with PostScript (ASCII/LAN)	*IMGD02
IBM InfoPrint 60	*IMGC03
IBM InfoPrint 62 Model 2	*IMGC05
IBM InfoPrint 62 Model 3	*IMGC06
IBM InfoColor 70	*IMGB05
IBM InfoPrint 4000	*IMGC05
IBM InfoPrint 4000 High Resolution	*IMGC06
Lexmark 4039Plus	*IMGB02
Lexmark Optra C Color Printer	*IMGD11
Lexmark Optra E, E+	*IMGA02
Lexmark Optra N	*IMGD02
Lexmark Optra R+, Rx+, Lx+, Lxn+	*IMGD02
Lexmark Optra S Printers	*IMGD02
Lexmark Optra SC Color Printer	*IMGD05
Okidata OL400 LED Page Printer	*IMGA01
Okidata OL800, OL810 LED Page Printers	*IMGA02
QMS 2025, 3225	*IMGB12

Table 35. Common Printers and Their Image Configuration Values (continued). For more values, see the publication Printer Device Programming, SC41-5713.

Image Configuration Value	Printer
QMS Magicolor CX	*IMGD04
Tektronix Phaser 140	*IMGB09
Tektronix Phaser 400	*IMGB05
Tektronix Phaser 300	*IMGB04
Tektronix Phaser 540, 550	*IMGB05
Tektronix Phaser 560	*IMGB06
Xerox 4219/MRP	*IMGA01
Xerox 4220/MRP	*IMGA02
Xerox 4230 DocuPrinter	*IMGA02
Xerox 4512, 4517 Network Printer	*IMGA02
Xerox 4520mp Printer	*IMGB13
Xerox 4700 II Color Document Printer	*IMGD04
Xerox 4915 Color Laser Printer	*IMGB08
Xerox 4920, 4925 Color Laser Printer	*IMGB05

Collecting Hardware Information Using the Inventory Server

You can collect Network Station hardware information through the use of the IBM Network Station Manager inventory server and SNMP services. The inventory server collects and stores information in a DB2 for AS/400 database.

For OS/400 Version 4 Release 2 and later, enter the command `STRTRPMGR` to start the trap manager. The command `STRTCPSVR SERVER (*NSMI)` starts the inventory server, and the `ENDTCPSVR SERVER (*NSMI)` command ends the inventory server. In Version 4 Release 1 and Version 3 Release 7, start the inventory server by calling the `QYTC/QYTCSSTR` program. End the inventory server by calling the `QYTC/QYTCSEND` program. The logical file QAYTCSNC1 in library QUSRSYS contains the data.

Examples of how to extract the information that is stored in the DB2 for AS/400 database follows. These examples assume that you have installed the IBM DB2 Query Manager and SQL Development Kit for AS/400.

__ 1. Start an SQL session by entering the following CL command:

```
STRSQL
```

__ 2. Run a query that returns the system ID, hardware ID, system memory, host name, and last scan time for all Network Stations in the database file that have more than 8 MB of memory by entering the following SQL command:

```
SELECT SYSTEM_ID, SYSTEM_HARDWARE_ID, SYSTEM_MEMORY_SIZE,
HOST_NAME_NET FROM QUSRSYS/QAYTCSNC1 WHERE SYSTEM_MEMORY_SIZE > 8
```

__ 3. Run a query that returns the same fields for all of the current inventory entries by entering the following SQL command:

```
SELECT SYSTEM_ID, SYSTEM_HARDWARE_ID, SYSTEM_MEMORY_SIZE,
HOST_NAME_NET FROM QUSRSYS/QAYTCSNC1 WHERE
CONFIG_CHANGE_TYPE = "*CURRENT"
```

__ 4. Run a query that shows the change history for a given system (that is selected by the network host name ns1.mycompany.com) by entering the following SQL command:

```
SELECT SYSTEM_ID, SYSTEM_HARDWARE_ID, CONFIG_CHANGE_TYPE,
CONFIG_CHANGE_TIME, SYS_OBJ_ID, IP_ADDRESS, SYSTEM_MEMORY_SIZE,
VIDEO_MEMORY_SIZE, BOOT_SOFTWARE_ID, OS_LANG_ID, PCMCIA_CARD_ID,
DISPLAY_ID, KEYBD_ID, PROCESSOR_ID, NET_INTERFACE_TYPE,
SYSTEM_LOCATION, SYSTEM_CONTACT FROM QUSRSYS/QAYTCSNC1 WHERE
HOST_NAME_NET = "ns1.mycompany.com"
```

The database field names of file QAYTCSNC1 in library QUSRSYS are as follows:

Table 36. QAYTCSNC1 Values

Field Name Alias	Field Name	Description
SYSTEM_ID	YTCSSYID	The unique identifier of the Network Station. This identifier ties the workstation specific configuration preferences set and collected by the Network Station Manager to the Network Station. This value is shipped with the same value as SYSTEM_HARWARE_ID. (NCD MIB object: ncdSysLocalMACAddress)
SERVER_ID	YTCSSVID	The unique identifier of the inventory server system that collected the configuration data. A value of *LOCAL indicates that the server on which the data resides collected the data.
SYSTEM_HARDWARE_ID	YTCSHSID	The burned-in MAC address of the Network Station. (NCDMIB object: ncdSysPhysicalMACAddress)
CONFIG_CHANGE_TYPE	YTCSCHTY	This value indicates whether this entry is current (*CURRENT) or replaced (* REPLACED). Replaced entries effectively become a change history log.
CONFIG_CHANGE_TIME	YTCSCHTI	The date and time that the inventory data in this entry was last changed.
FIRST_SCAN_TIME	YTCSCHFS	The date and time of the first configuration scan.
LAST_SCAN_TIME	YTCSCHLS	The date and time of the most recent configuration scan.
LAST_START_TIME	YTCSCHST	The date and time the operating system kernel of the Network Station last started.
SYS_OBJ_ID	YTCSOBJI	The authoritative identifier of the management agent residing in the Network Station. (MIB-II object: SysObjectID)
IP_ADDRESS	YTCSIPAD	The IP address of the Network Station.
HOST_NAME_NET	YTCSHSTN	The IP host name of the Network Station as known by its inventory server system.
HOST_NAME_SYS	YTCSHSTS	The IP host name of the Network Station as known to itself. (MIB-II object: sysName)
SYSTEM_VENDOR_ID	YTCSVENI	The name of the vendor of the Network Station. (MIB-II object: sysDescr)

Table 36. QAYTCSNC1 Values (continued)

Field Name Alias	Field Name	Description
SYSTEM_MODEL_ID	YTCSMODI	The model number of the Network Station. (MIB-II object: sysDescr)
SYSTEM_MEMORY_SIZE	YTCSSYSM	The system memory size (in bytes) of the Network Station. (NCD MIB object: ncdSysMemTotal)
VIDEO_MEMORY_SIZE	YTCSVIDM	The video memory size (in Megabytes) of the Network Station. (NCD MIB object: ncdSysVideoMemTotal)
BOOT_SOFTWARE_ID	YTCSBTSW	The boot monitor software version of the Network Station. (NCD MIB object: ncdSysBootPromVersion)
BOOT_LANG_ID	YTCSBTLI	The national language configured for the boot monitor of the Network Station. Possible values are: • 1 = English • 2 = French • 3 = German • 4 = Italian • 5 = Spanish • 6 = Japanese (NCD MIB object: ncdBootPromLanguage)
OS_SOFTWARE_ID	YTCSOSSW	The operating system kernel software version of the Network Station. (MIB-II object: sysDescr)
OS_LANG_ID	YTCSOSLI	The national language locale configured for the operating system kernel of the Network Station. See Table 81 on page 357 for language values. (NCD MIB object: ncdSystemInitialLocale)
PCMCIA_CARD_ID	YTCSPCMI	The identification information for a PCMCIA card installed in the Network Station. The information includes the vendor, type, and model of the card. (NCD MIB object: ncdSysPCMCIAAttributes)
DISPLAY_ID	YTCSDSPI	The identification information for a display attached to the Network Station. (NCD MIB object: ncdSysDisplayType)
OS_DISPLAY_RESOLUTION	YTCSDSPR	The display resolution used by the operating system on the Network Station. (NCD MIB object: ncdSysDisplayResolution)
KEYBD_CNTRL_ID	YTCSKBCI	The keyboard controller version number of the Network Station. (NCD MIB object: ncdSysKeyboardControllerVersion)
KEYBD_ID	YTCSKBID	The hardware ID associated with the keyboard attached to the Network Station. (NCD MIB object: ncdXserverKeyboardHardwareID)
KEYBD_LANGUAGE_ID	YTCSKBLN	Identifies the number of keys and the keyboard language selected by the Network Station user. (NCD MIB object: ncdXserverKeyboardMappingName)

Table 36. QAYTCSNC1 Values (continued)

Field Name Alias	Field Name	Description
PROCESSOR_ID	YTCSPROI	The identification information for the processor of the Network Station. (NCD MIB object: ncdSysProcessorVersion)
NET_INTERFACE_TYPE	YTCSNITY	The identification information for the type of network interface of the Network Station. Possible values are: • 6 = Ethernet • 9 = token-ring • 116 = TDLC (twinaxial data link control) (NCD MIB-II object: ncdSysMicrocodeVersion)
NET_INTERFACE_SPEED	YTCSNISP	The network interface speed (in bytes per second) for the Network Station. (MIB-II object: ifSpeed)
NET_INTERFACE_ADDRESS	YTCSNIAD	The MAC address of the network interface for the Network Station. (MIB-II object: ifAddr)
NET_INTERFACE_ID	YTCSNIID	The identification information for the network interface firmware of the Network Station. (NCD MIB object: ncdSysMicrocodeVersion)
SYSTEM_LOCATION	YTCSSYSL	The `Terminal location` value set in the Network Station Manager. (MIB-II object: sysLocation)
SYSTEM_CONTACT	YTCSSYSC	The `Contact person` value set in the Network Station Manager. (MIB-II object: sysContact)
BOOT_IPA	YTCSBSIP	The IP address of the boot file server used by the Network Station. This value is only applicable when the BOOT_SOURCE value is trivial file transfer protocol (TFTP) or network file system (NFS). (NCD MIB object: ncdBootActualServer)
BOOT_SOURCE	YTCSBSRC	The boot file source used by the Network Station. Possible values are: • 1 = boot source was either a PROM, flash memory card, or OTP (one-time programmable) card. • 2 = boot source used the TCP/IP protocol TFTP. • 4 = boot source was NFS. (NCD MIB object: ncdBootActualSource)
BOOTP_IPA	YTCSBPIP	The IP address of the BOOTP or DHCP server used by the Network Station. (NCD MIB object: ncdSysBootpServerIPAddress)
CONFIG1_IPA	YTCSCSA1	The IP address of the first configuration server used by the Network Station to obtain configuration information. (NCD MIB object: ncdFileInitialFileServer1)
CONFIG2_IPA	YTCSCSA2	The IP address of the second configuration server used by the Network Station to obtain configuration information. (NCD MIB object: ncdFileInitialFileServer2)

Optimizing Your AS/400 Server for Network Stations

By configuring some components of your TCP/IP, you can increase the network performance of your Network Stations. The numbers listed below are recommendations only. You may need to experiment with these values to optimize your system.

__ 1. Increase your line description's maximum frame size.

- For a token-ring line, type: `CHGLINTRN LIND(YY) MAXFRAME(ZZ)`

  The value `YY` is the line description's name, and `ZZ` is maximum frame size (recommended minimum size of 4096 for token-ring lines and 1496 for ethernet lines).

- For an Ethernet line, type: `CHGLINETH LIND(YY)` and press the F4 key.

  Scroll down and change the maximum frame size values to best fit your system with a maximum value less than 1496.

__ 2. Enlarge the Send/Receive buffer sizes.

Type: `CHGTCPA TCPRCVBUF (64000) TCPSNDBUF (64000)`.

__ 3. Change TFTP Attributes

Type: `CHGTFTPA` and press F4. The *Change TFTP Attributes* screen appears.

```
                     Change TFTP Attributes (CHGTFTPA)

Type choices, press Enter.

Autostart server . . . . . .   *NO           *YES, *NO, *SAME
Enable subnet broadcast  . . .   *YES          *YES, *NO, *SAME
Number of server jobs:
  Minimum  . . . . . . . . . . > X              1-20, *SAME, *DFT
  Maximum  . . . . . . . . . . > Y              1-250, *SAME, *DFT
Server inactivity timer  . . .   30           1-1440, *SAME, *DFT
ASCII single byte CCSID:
  Coded character set identifier   00819        1-65532, *SAME, *DFT
Maximum block size . . . . . .   YY           512-65464, *SAME, *DFT
Connection response timeout  . .   60           1-600, *SAME, *DFT
Allow file writes  . . . . . .   *NONE         *DFT, *NONE, *CREATE...
Alternate source directory . . .   '*NONE'




                                                                    More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

__ a. Increase the number of TFTP jobs that are started on the host.

The value **X** is the minimum number, and **Y** is the maximum number of server jobs. Determine the appropriate values for your AS/400 server and network environment.

__ b. Set TFTP Maximum block size the same as the line description's maximum frame size.

The value **YY** is the same as value **ZZ** entered on step 1.

What the Setup Assistant Does

You should use the Setup Assistant to configure your AS/400 for use with Network Stations. If you choose not to use the Setup Assistant, you must manually perform the functions of the Setup Assistant as described in Table 37.

Table 37. Functional Description of the Setup Assistant

Task Number	Function of the Setup Assistant
Task 2000	Verify required PTFs and software

Task 3000	• Configure or verify TCP/IP information, including:
	– local domain and host name
	– host table entries
	– name server
	– TCP/IP interfaces
	– routes
	• Set servers to autostart
	– `CHGTFTPA AUTOSTART (*YES)`
	– `CHGHTTPA AUTOSTART (*YES)`
	– `CHGTELNA AUTOSTART (*YES)`
	• Add HTTP directives
	`HostName xxxx`
	`Enable POST`
	`Enable GET`
	`Map /QIBM/NetworkStation/Admin /QYTC/QYTCMAIN.PGM`
	`Map /networkstation/admin /QYTC/QYTCMAIN.PGM`
	`Pass /QIBM/NetworkStation/* /QIBM/ProdData/HTTP/Protect/NetworkStation/*`
	`Pass /networkstation/* /QIBM/ProdData/HTTP/Protect/NetworkStation/*`
	`Exec /QYTC/* /QSYS.LIB/QYTC.LIB/*`

Task 4000	Choose Boot Protocol
	• If you choose *BOOTP:
	`CRTDUPOBJ OBJ(QATODBT) FROMLIB(QSYS) OBJTYPE(*FILE)`
	`TOLIB(QUSRSYS) NEWOBJ(QATODBTP) DATA(*YES)`
	`CHGBPA AUTOSTART(*YES)`
	The setup assistant then calls the WRKBPTBL.
	• If you choose *DHCP:
	`CHGDHCPA AUTOSTART(*YES)`
	`RMVLNK OBJLNK('\QIBM\UserData\NetworkStation\StationConfig\hosts.nsm')`

Table 37. Functional Description of the Setup Assistant (continued)

Task Number	Function of the Setup Assistant

Task 5000	Start and Verify Required Servers
	
	The Setup Assistant executes the following commands:
	`CRTUSRPRF USRPRF(QTFTP)`
	`PASSWORD(*NONE)`
	
	`CHGAUT OBJ('/QIBM/Service/NetworkStation/FFDC') +`
	`USER(QTFTP) DTAAUT(*RWX)`
	
	`CHGAUT OBJ('/QIBM/ProdData/NetworkStation/kernel') +`
	`USER(QTFTP) DTAAUT(*RX)`
	
	`CHGSYSVAL SYSVAL(QRETSVRSEC) VALUE('1')`
	
	`STRTCP`
	`STRSBS QSERVER`
	`STRHOSTSVR SERVER(*ALL)`
	`CALL QYTC/QYTCUSVR 'STRTCPSVR '`

Depending on your system's language, the Setup Assistant also adds some HTTP directives. For more information about HTTP directives, see "HTTP Directives for the IBM Network Station Manager Program".

HTTP Directives for the IBM Network Station Manager Program

When you used the Setup Assistant to configure your Network Station environment, it used a table similar to Table 38 to configure your HTTP directives. If you are using a web browser to access your HTTP server and it is sending garbled characters, verify that your HTTP directives are correct. You should also use this section if you did not use the Setup Assistant to configure your Network Station environment.

Table 38. Primary Languages and Their DefaultFsCcsid and DefaultNetCcsid Values

Language	Primary Language Value	DefaultFsCcsid Value	DefaultNetCcsid Value
Belgian Dutch	2963	500	819
Belgian English	2909	500	819
Brazilian Portuguese	2980	37	819
Canadian French	2981	500	819
Czech	2975	870	912
Danish	2926	277	819
Dutch Netherlands	2923	37	819
English Uppercase	2950	37	819
English Uppercase and Lowercase	2924	37	819

Table 38. Primary Languages and Their DefaultFsCcsid and DefaultNetCcsid Values (continued)

Language	Primary Language Value	DefaultFsCcsid Value	DefaultNetCcsid Value
English Uppercase DBCS	2938	37	819
Finnish	2925	278	819
French	2928	297	819
German	2929	273	819
Greek	2957	875	813
Hungarian	2976	870	912
Italian	2932	280	819
Japanese (Katakana) DBCS	2962	5026	932
Korean DBCS	2986	933	949
Norwegian	2933	277	819
Polish	2978	870	912
Portuguese	2922	37	819
Russian	2979	1025	915
Spanish	2931	284	819
Swedish	2937	278	819
Traditional Chinese	2987	937	950
Turkish	2956	1026	920

- To view and change your HTTP directives on a V3R7 system, see “HTTP Directives for a V3R7 System”.
- To view and change your HTTP directives on a V4R1 or later system, see “HTTP Directives for V4R1 and Later Systems”.

HTTP Directives for a V3R7 System

In addition to the HTTP directives in Table 37 on page 145, you have to do change a HTTP attribute. At an AS/400 command prompt, type `CHGHTTPA CCSID(XXXXX)`, where XXXXX is the DefaultNetCcsid value for your language in Table 38 on page 146. Then, you must start and stop the HTTP server. Use the `ENDTCPSVR *HTTP` and `STRTCPSVR *HTTP` commands.

HTTP Directives for V4R1 and Later Systems

__ 1. At an AS/400 command prompt, type `WRKHTTPCFG`.

__ 2. After the Work with HTTP Configuration screen appears, scroll down to the entries that were added by the Setup Assistant. The following screen is an example of HTTP directives for a Turkish V4R1 or later system.

```
02110     Map   /QIBM/NetworkStation/Admin /QYTC/QYTCMAIN.PGM
02120     Map   /networkstation/admin /QYTC/QYTCMAIN.PGM
02130     Pass  /QIBM/NetworkStation/* /QIBM/ProdData/HTTP/Protec   >
02140     Pass  /networkstation/* /QIBM/ProdData/HTTP/Protect/Net   >
02150     Exec  /QYTC/* /QSYS.LIB/QYTC.LIB/*
02160     DefaultNetCcsid 00920
02170     DefaultFsCcsid 01026
```

__ 3. Verify that the DefaultNetCcsid and DefaultFsCcsid values match the values in Table 38 on page 146 for your language. If the values do not match or do not exist, add the statements with the correct values.

__ 4. Verify that the following statements are also in your HTTP directives.

```
Map  /networkstation/admin /QYTC/QYTCMAIN.PGM
Pass  /networkstation/* /QIBM/ProdData/HTTP/Protect/NetworkStation/*
```

If the statements are not in your directives, you must add them.

__ 5. At an AS/400 command prompt, type `WRKHTTPCFG *ADMIN`. Verify that the following statements are in the directives for your HTTP ADMIN server.

```
Map  /networkstation/admin /QYTC/QYTCMAIN.PGM
Pass  /networkstation/* /QIBM/ProdData/HTTP/Protect/NetworkStation/*
```

If the statements are not in your directives, you must add them.

__ 6. At an AS/400 command prompt, use `ENDTCPSVR *HTTP` to end the HTTP server. Then restart the HTTP server with `STRTCPSVR *HTTP`.

TFTP Subnet Broadcast

When multiple Network Stations start up at the same time, they can create heavy network usage, sometimes called boot storms. TFTP Subnet Broadcast (or Broadcast Boot) is a solution to balancing your network traffic during these boot storms.

These boot storms occur because the AS/400 server is trying to deliver each Network Station its own boot file. When the TFTP Subnet Broadcast option is enabled and multiple Network Stations request their boot files, the server stages the boot file download and only distributes it once to all Network Stations.

You must enable the TFTP Subnet Broadcast option on both the AS/400 server and the Network Stations. By default, the TFTP Subnet Broadcast option is enabled. To verify this value, type `CHGTFTPA`. The Enable Subnet Broadcast value must be `*YES`.

Attention

Before you use TFTP Subnet Broadcast, you must verify or apply the PTFs described in Table 39 to **every** AS/400 server in your network. These PTFs prevent unpredictable results, including possible data loss.

Table 39. PTFs Necessary for TFTP Subnet Broadcast

OS/400 Operating System	PTF Number
V3R7	MF18144
V4R1	MF18175
V4R1.4	MF18176
V4R2	MF18143

To enable the TFTP Subnet Broadcast (Broadcast Boot) option on the clients, use the IBM Network Station Manager program. See the online help information for assistance.

For more information about TFTP Subnet Broadcast, see the *TCP/IP Configuration and Reference* manual, SC41-5420.

Using Simple Network Management Protocol (SNMP) with Your Network Station

Simple Network Management Protocol (SNMP) is an industry-standard protocol for network management. SNMP provides the mechanisms to monitor Network Stations from an SNMP manager at a central location. IBM provides SNMP manager support through the Tivoli Management Environment (TME) 10 NetView product.

The Network Station contains an SNMP agent as part of its operating system. The SNMP manager communicates with the SNMP agent on the Network Station. The SNMP agent represents a Management Information Base (MIB) that contains many different MIB objects or variables. Figure 31 on page 150 shows how SNMP manages certain aspects of Network Stations.

Note: An SNMP manager can only read MIB objects from the Network Station. This does not support SNMP write .

TME 10 NetView provides the following functions, which you can use to monitor and manage Network Stations:

- MIB browser
- MIB monitor
- MIB application builder
- Event desk

Figure 31 provides a view of a sample network with the TME 10 NetView product that is installed on a PC.

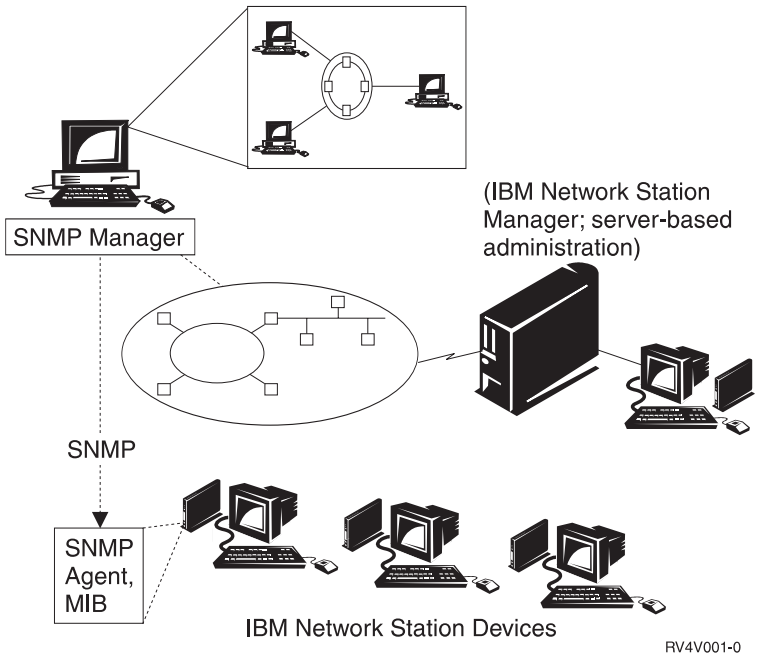


Figure 31. Network Station - SNMP Management

Benefits of Using SNMP

Accessing and viewing MIB objects provides valuable information to manage your Network Stations.

The following list contains common MIB objects and a description of their function:

- Amount of memory that is installed (ncdSysMemTotal)

  This MIB object reports the installed memory in a Network Station.
- Amount of free memory (ncdSysMemAvail)

  This MIB object reports the amount of free memory in a Network Station.
- CPU-idle time (ncdSysIdleTime)

  This MIB object reports the amount of time when the CPU is idle (not working).
- Elapsed time since the device was started (SysUpTime)

  This MIB object reports the date and time the Network Station was last IPLed.

For a complete list of MIB objects you can use, see “Retrieving the SNMP MIB File” on page 151.

Retrieving the SNMP MIB File

The SNMP MIB file ships with the IBM Network Station Manager licensed program. To view the MIB file, obtain and place it on a PC or AIX workstation.

1. Retrieve the SNMP MIB file from your AS/400 server by using FTP (File Transfer Protocol) or other file transfer methods. The SNMP MIB file is: /QIBM/ProdData/NetworkStation/snmpmib.txt.
2. Use the MIB loader tool, located in NetView on your workstation, to load the SNMP MIB file on your workstation.

For additional information on SNMP, see the documentation that comes with the TME 10 NetView product.

Configuring DHCP for Load Balancing

You must complete the following steps in order to configure DHCP for load balancing on an AS/400 server. In the first set of steps, you create the templates to define options 211 through 214.

Later in these instructions, you define DHCP classes on the subnet level. Since you configure the load balancing values on the DHCP class, only Network Stations can use them. If you have any other devices that use DHCP on that same subnet, they will not be affected. Before you complete this section, read “Taking Advantage of Multiple Server Environments” on page 18.

Table 40. Gathering for Load Balancing

Value	Description	Write Value Here
Basecode Server	The IBM Network Station Manager program on this server provides the operating system and the application programs that are downloaded to the Network Stations. You do not use this server to configure Network Stations.	
Terminal Configuration Server	The IBM Network Station Manager program on this server provides terminal-based configuration settings. The IBM Network Station Manager program manages these settings. Examples of items to configure on this server are a printer that is attached to the Network Station or the Network Station’s keyboard language. The address of the terminal configuration server is the same as the address of the base code server by default. The inventory server (AS/400 only) runs on this server.	

Table 40. Gathering for Load Balancing (continued)

Value	Description	Write Value Here
Authentication Server	The IBM Network Station Manager program on this server provides user authentication (where the user logs in) and user-based configuration settings. The IBM Network Station Manager program manages these settings. Examples of what you might configure on this server are a user's start-up programs or a user's browser preferences. The address of the authentication server is the same as the address of the base code server by default. See "Roaming User Example" on page 19 for an example of how to specify a different address for the authentication server.	
Bootstrap Server	The bootstrap server delivers the boot files to the Network Station.	

__ 1. In Operations Navigator, double-click **DHCP**. You should see a screen similar to Figure 32.

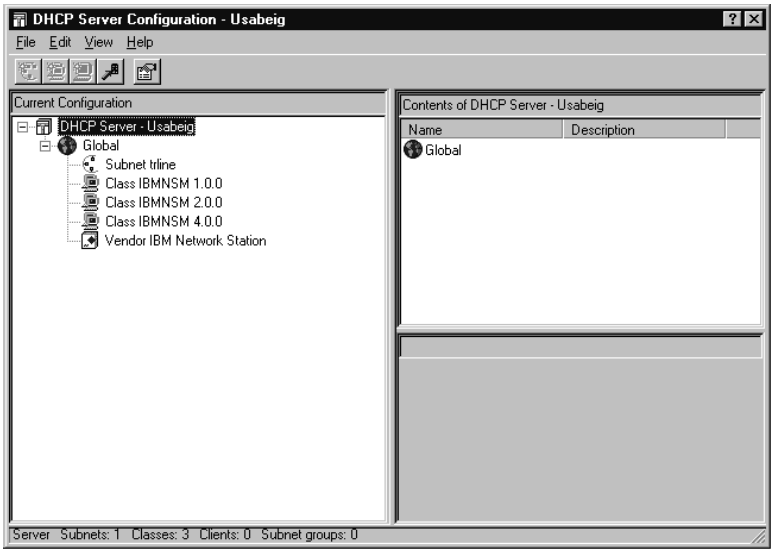


Figure 32. DHCP Server Configuration

__ 2. Click **File**.

__ 3. Click **Option Templates**. You should see a screen similar to Figure 33 on page 153.

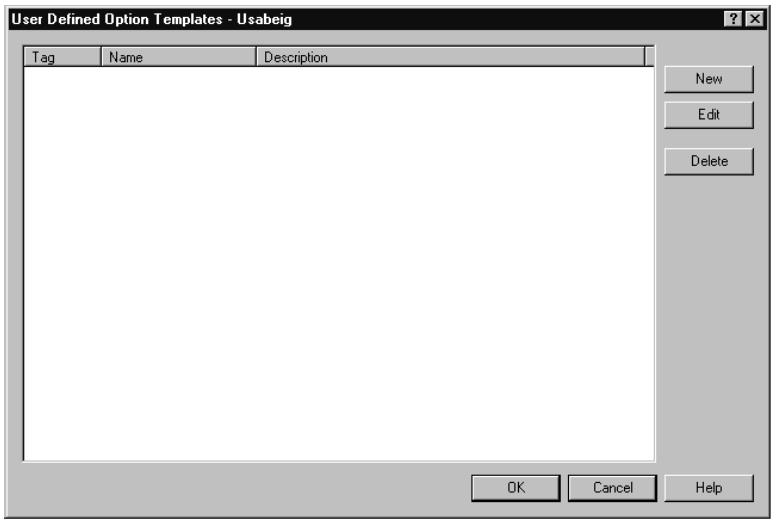


Figure 33. User Defined Option Templates

__ 4. Click the **New** button.

__ 5. Enter the following:

- Tag: `211`
- Name: `Base Code Server Protocol`
- Value label: `Enter the protocol for the Base Code Server`
- Description: `Protocol to use for Base Code Server.`

You should see a screen similar to Figure 34.

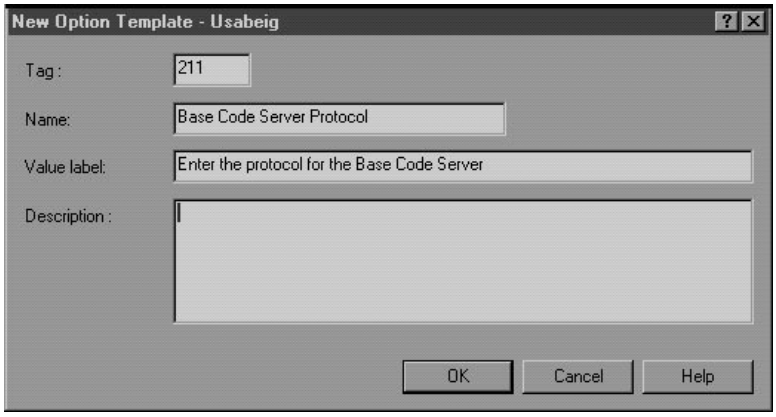


Figure 34. New Option Template

__ 6. Click the **OK** button.

__ 7. Click the **New** button.

__ 8. Enter the following:

- Tag: `212`
- Name: `Terminal Configuration Server`
- Value label: `Enter the IP address for the Terminal Configuration Server`
- Description: `Terminal configuration server IP address or name.`

__ 9. Click the **OK** button.

__ 10. Click the **New** button.

__ 11. Enter the following:

- Tag: `213`
- Name: `Terminal Configuration Path`
- Value label: `Enter the path for the Terminal Configuration.`
- Description: `Configuration file path name for option 212 (terminal configuration server).`

__ 12. Click the **OK** button.

__ 13. Click the **New** button.

__ 14. Enter the following:

- Tag: `214`
- Name: `Terminal Configuration Protocol`
- Value label: `Enter the protocol for the Terminal Configuration`
- Description: `Protocol to use for option 212 (terminal configuration server).`

__ 15. Click **OK**.

__ 16. Click **OK**.

__ 17. Right mouse click on the subnet that you want to load balance and click **New Class**.

Note: For each model of Network Station in your subnet, you must define a class that represents it. A Network Station class is a three digit number, prefaced by IBMNSM. To define Network Station class numbers, see "Determining DHCP Classes" on page 22.

__ 18. After the *New Class Properties* screen appears, enter the DHCP class name in the **Name** field. For example, the DHCP class name of a Series 1000 Ethernet Network Station is `IBMNSM A.2.0`.

__ 19. Click **Options**.

__ 20. Click **211** in the *Available options* list, then click **Add**. Enter `rfs/400`. You should see a screen similar to Figure 35 on page 155.

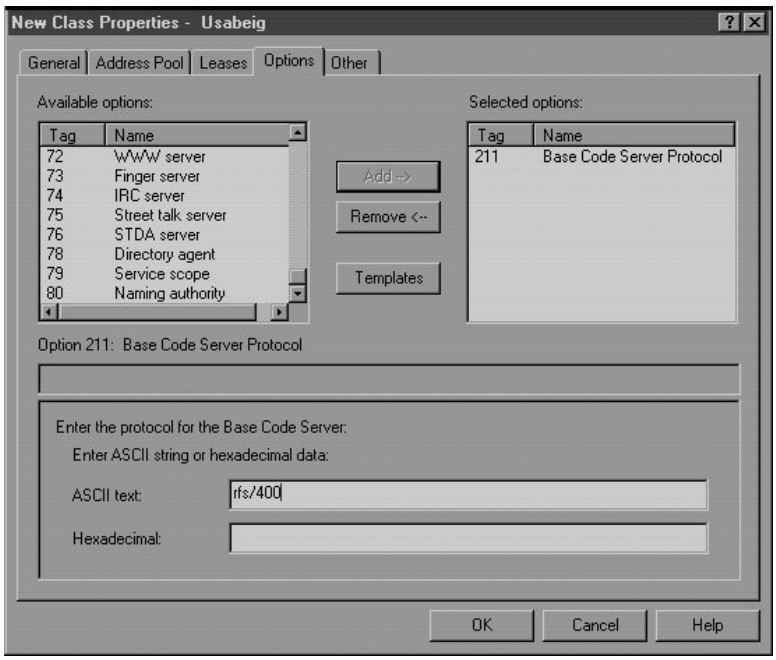


Figure 35. Subnet Properties Option 211

__ 21. Click **212** in the *Available options* list, then click **Add**. Enter the terminal configuration server IP address. For example, `10.1.1.2`. You can specify up to two addresses, separating them by a blank.

__ 22. Click **213** in the *Available options* list, and then click **Add**. Enter the configuration files path name. For example, `/QIBM/ProdData/NetworkStation/configs/`. You can specify up to two paths, separating them by a blank.

__ 23. Click **214** in the *Available options* list, then click **Add**. Enter `rfs/400`.

__ 24. Click **OK**.

__ 25. Click **File**, then **Update Server**, to update the server with the changes that you just made.

__ 26. Click the **Other** tab.

__ 27. In the *Bootstrap server* field, enter the IP address of the base code (Bootstrap) server. For example, `10.1.1.4`. You should see a screen similar to Figure 36 on page 156.

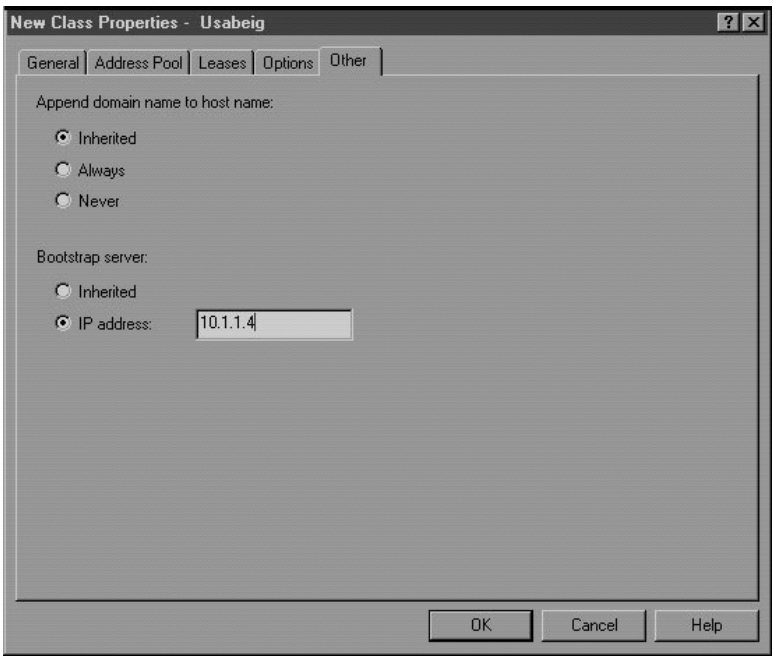


Figure 36. Subnet Properties for Bootstrap Server

__ 28. Click the **OK** button.

__ 29. From the File menu, choose **Update Server.**

__ 30. Repeat step 17 on page 154 through step 29 for each DHCP class.

Chapter 4. Installing and Configuring an IBM Network Station Environment on an RS/6000 Server

This chapter describes how to install and configure the IBM Network Station Manager software on a RS/6000, hereafter called Network Station.

Note: To view the latest updates on installing and configuring the Network Station type the following URL address in your Internet browser:

`http://service.boulder.ibm.com/nc`

This URL gives you access to the Network Station Software screen. From this screen select the following:

- *AIX*
- *IBM R3.0 Network Station Software for AIX*
- *Read/Print Documentation*
- *R3.0 NSM Software Installation Instructions and README*

For additional information after you have installed the Network Station see **http://*ServerName*/networkstation/admin**. Where the servername is the hostname of the server on which the Netstation Manager is installed.

Attention

If you have manually changed any configuration files instead of using the IBM Network Station Manager in the past, refer to http://www.ibm.com/nc/pubs then select **Advanced User Information**.

Use the following procedure to verify that you have the required prerequisite hardware and software, and to install Network Station Manager filesets:

__ 1. Verify prerequisite hardware.

To install a Network Station server environment on an RS/6000, you need the following hardware:

- An RS/6000 server that runs AIX 4.2.1 or later
- One or more Network Stations

__ 2. Verify prerequisite software.

Before you install the Network Station Manager filesets, you must have installed the following software which can be found on the *AIX V4.2.1* (or later) *Volume 1* CD:

- AIX Version 4.2.1 for servers or later. These are the specific required AIX filesets:
  - **bos.rte**
  - **bos.net.tcp.server** (If DHCP is to be used.)
  - **bos.iconv**

  Note: All of the above commands can have their AIX level verified by issuing the following command: **lslpp -h *fileset name***. An example would be `lslpp -h bos.rte` The **bos.iconv** package level can be determined issuing the command: **lslpp -h bos.iconv.***
- A web server, such as the *Internet Connection Server* or *domino GO Webserver*. Install the following filesets from the **internet_server.base** V4.2.1 or later package:
  - **internet_server.base.admin**
  - **internet_server.base.httpd**
  - **internet_server.base.doc**

  You must install a web server to use the IBM Network Station Manger.
- The **bos.net.nfs.client** fileset to provide Network File System (NFS) support required by the Network Station.
- A web browser, such as Netscape (the **netscape** fileset). You must install a web browser to use the IBM Network Station Manager, which configures Network Stations.

Note: Expect the **bos.iconv** fileset to include all subsets of the installed AIX supported languages.

__ 3. Verify network requirements.

LAN connectivity through Ethernet or token-ring must be installed, configured, and running.

Although NFS is recommended as the exclusive means of communication with your Network Station, you may still desire to utilize **tftp** for downloading the kernel and configuration information. If you choose to do this , you MUST do the following.

Before Installation

a. Become the **root** user

b. Enter the following: `'touch /etc/tftpaccess.ctl'`

c. Enter the following: `'chmod 644 /etc/tftpaccess.ctl'`

__ 4. Filesystem Requirements

Network Station Manager filesystem installation requires at least one physical partition of free DASD, with DASD in the **rootvg** volume group.

__ 5. Install the Network Station Manager filesets on the RS/6000 server.

After signing on as **root** use the following procedure to install the filesets:

__ a. Use the fast path shortcut below to open the System Management Interface Tool (SMIT) Install/Update From All Available Software menu:

```
smitty install_selectable_all
```

Use the List function (F4) and select an input device or directory from the list that is displayed.

__ b. Use the List function to display a list of all available software on the selected input device or directory.

__ c. Use the Find function to search for `netstation`, then highlight and install the following filesets.

netstation.base

netstation.msg.*lang* (where *lang* is mixed case)

netstation.msg.*lang* (where *lang* is all uppercase)

Note: You must select both **netstation.msg.***lang* datasets, for example en_US and EN_US. The Unicode datasets (all uppercase) support more languages than the mixed case datasets.

__ d. **End of Installation Procedure.**

- You do not have to restart the system if you only installed the **netstation** filesets.
- The software installation process runs the **/usr/netstation/bin/nsconf** script, which sets up and enables the following on the RS/6000 server:
  - RS/6000 host-specific configuration
  - BOOTP
  - NFS
  - Trivial File Transfer Protocol (TFTP)

– Internet Connection Server (ICS) or domino Go Webserver

For more information about the **/usr/netstation/bin/nsconf** script, see “Understanding the nsconf Script” on page 175.

Migrating Server Software

- If you installed a previous version of Network Station Manager and you are installing version 3, the migration happens automatically during the install. Refer to the following URL **www.ibm.com/nc/pubs** then select **Advanced User Information** for more detailed information.
- During the code migration from version 2 to version 3, the migration program saves a subset of the **config** file.
- During the migration process, all files in the **/usr/netstation/configs/** directory are saved in **/usr/lpp/save.conf/usr/netstation/configs/**.

  Notes:

  1. Remove the list of files saved.
  2. **local nsm** has been replaced by **default dft**. Do not edit any file without first referring to **http://www.ibm.com/nc/pubs**. See **Advanced User Information** for more detailed information.
- If you are migrating from a prior release of Network Station (prior to release 2.x or release 2.x without NSM), your preferences will not be migrated. You must use release 3.0 of **NSM** exclusively to re-create your prior configuration.

Installing Components After the Initial Installation

You may want to install certain software components after you have installed the IBM Network Station Manager software.

128-Bit NC Navigator Browser

If you are in Canada or the United States, you may choose to obtain and install the 128-bit NC Navigator browser for AIX.

Note: After installing the NC Navigator browser you must set an environment variable through the IBM Network Station Manager to make it functional.

To install the NC Navigator browser do the following:

__ 1. Use the fast path shortcut to open the SMIT Install/Update From All Available Software menu:

```
smitty install_selectable_all
```

__ 2. Select an input device or directory by choosing from the selections that are displayed when you use the List function

__ 3. Use the List function to display a list of all available software on the selected input device or directory.

__ 4. Use the Find function to search on netstation, then highlight the following fileset and select to install:

```
netstation.navigator-us.rte
```

__ 5. When the installation is complete, open the IBM Network Station Manager.

__ 6. Under *Setup Tasks*, choose **Startup**.

__ 7. Under *Startup*, choose **Environment Variables**.

__ 8. If you want all users to access the 128–bit browsers, select the **System** button. If you only want one group to use the browser, select the **Group** button.

__ 9. Above the **Add an Environment Variable** button, type `NAV_128SSL` in the empty text field on the left.

__ 10. Type `True` in the empty text field on the right.

__ 11. At the bottom of the Screen, click on **Finish** to save the variable. The browser is now ready for use.

Configuring an RS/6000 Server for Network Stations

Configuring an RS/6000 server for Network Stations requires the following tasks:

- Choosing a boot method
- Gathering configuration information
- Configuring the RS/6000 server

Gathering Configuration Information

Table 41 lists the information you need to configure your RS/6000 server and Network Stations. Use this table to record information for your system:

Table 41. RS/6000 Configuration Information Chart

Field	Description	Write Value Here
1 RS/6000 server IP Address	The RS/6000 server IP address is the address that uniquely identifies this RS/6000 to Transmission Control Protocol/Internet Protocol (TCP/IP). This address is associated with the local host name to create a name entry in the Host Names table.	

Table 41. RS/6000 Configuration Information Chart (continued)

Field	Description	Write Value Here
2 Media Access Control (MAC) address (hardware address) of each Network Station	The (Media Access Control) MAC address for BOOTP and DHCP is a unique hardware-specific identifier for each Network Station. The address is located on the Network Station's box. To find the MAC address without the box, follow this procedure: 1. Power the network station on. 2. After the keyboard controller test, press the Escape key. 3. In the Setup Utility, press F2. 4. Record the MAC address.	
3 IP address of each Network Station or IP address range needed for a DHCP environment where IP addresses are being assigned dynamically.	Ensure all IP addresses and IP address ranges are valid and unique for your network.	
4 Host name of each Network Station	The host name identifies the Network Station as a unique destination within a TCP/IP network.	
5 Subnet mask	The subnet mask is a value that enables network devices to direct packets of information accurately in a subnetted environment.	
6 IP address for the Gateway (if one exists in your network)	If the local area network (LAN) that you are attaching Network Stations to is not directly attached to the RS/6000, you need to specify the IP address of the IP Router/Gateway that the Network Stations use to access the server.	
7 IP address for the Domain Name server (if one exists for your network and you are using the BOOTP or DHCP)	The Domain name sever IP address is the address of the system (if any) that will act as primary name server in this domain.	

Choosing a Boot Method and Configuring the Server

You must configure each Network Station so that the server recognizes it when it attempts to connect during the boot process. You can configure the Network Stations *centrally* (using BOOTP from the server), or you can configure them *locally* (using NVRAM on each unit). You can also configure an RS/6000 to use Dynamic Host Configuration Protocol (DHCP). Choose one of the following methods to configure your Network Stations:

- If you choose to use BOOTP, go to "Configuring BOOTP Protocol" on page 163.

- If you choose to use DHCP, go to “Configuring Dynamic Host Configuration Protocol (DHCP)” on page 165.
- If you choose to use NVRAM, go to “Configuring Network Stations Locally — NVRAM” on page 169.

Configuring BOOTP Protocol

The ″Internet Protocol (IP) Addressed From″ parameter on each Network Station must be set to `network` before you can configure the Network Stations from the server. See “Configuring an IBM Network Station to Boot from the NVRAM Setting” on page 309.

Each Network Station must have an entry in the BOOTP table on the server. Use the procedure that is described below to add a line to the server **/etc/bootptab** file for each Network Station:

__ 1. Use the following fast path command to open the SMIT BOOTP Device menu:

```
smitty bootp
```

An example of the BootP Device menu is in Figure 37:

```
                          BootP Device


Move cursor to desired item and press Enter.


List All BootP Devices
Add a new BootP Device
Change / Show Characteristics of a BootP Device
Duplicate a new BootP Device from an existing Device
Remove a BootP Device




F1=Help          F2=Refresh       F3=Cancel         F8=Image
F9=Shell         F10=Exit         Enter=Do
```

Figure 37. RS/6000 BootP Device Menu

__ 2. Select **Add a new BOOTP Device**. The Add a new BootP Device dialog box displays as shown in Figure 38 on page 164:

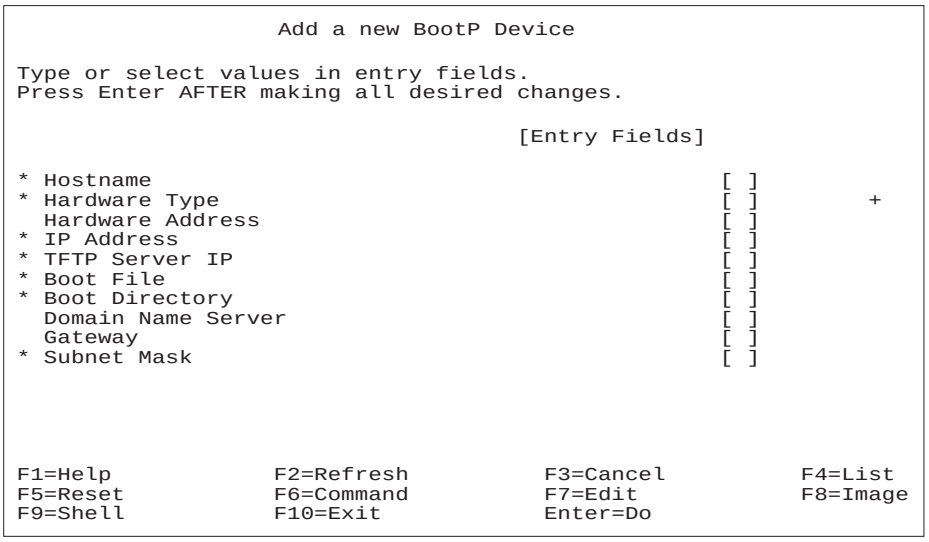


Figure 38. RS/6000 Add a New BootP Device Dialog Box

__ 3. In the Add a new BOOTP Device dialog box, type or select the following information:

__ a. The host name of the Network Station

Type the value that is recorded on line **4** in Table 41 on page 161.

__ b. The hardware Type of the Network Station (Choose from the list)

__ c. The hardware Address (the MAC address for the Network Station that you are configuring)

Use the value that is recorded on line **2** in Table 41 on page 161. Type the value without the : colon separators. Either type the string with no separators or with period separators.

__ d. The IP Address of the Network Station

Type the value that is recorded on line **3** in Table 41 on page 161.

__ e. The TFTP Server IP address

This is typically the IP address of the RS/6000 being configured, type the value recorded on line **1** in Table 41 on page 161.

__ f. The boot file

Type `kernel` in this field.

__ g. The boot directory

Type `/usr/netstation/` in this field. Type the directory path as shown including the trailing /.

__ h. The IP Address for the Domain Name Server

Type the value that is recorded on line **7** in Table 41 on page 161.

Note: This field is optional. If your environment does not require this, leave it blank:

__ i. The IP Address for the Gateway

Type the value that is recorded on line **6** in Table 41 on page 161.

Note: This field is optional. If your environment does not require this field, leave it blank.

__ j. The subnet mask

Type the value that is recorded on line **5** in Table 41 on page 161.

__ k. If all fields and selections are correct, press the Enter key to add this Network Station to the BOOTP table.

Repeat these steps for each Network Station.

Note: If you are configuring more than one Network Station, select **Duplicate a new BootP Device from an Existing Device** in the BootP Device Menu as a starting point to configure the next Network Station. Many fields contain the same information for all Network Stations.

__ l. **This completes the BOOTP Configuration Procedure.** Go to "Before You Continue" on page 169.

- You can also configure Network Stations by using the **chbootptab** script (see "Configuring Network Stations Using the chbootptab Script" on page 173) or by manually editing the **/etc/bootptab** file (see "Configuring Network Stations Manually" on page 174).

Configuring Dynamic Host Configuration Protocol (DHCP)

Note: To assist you in making the decision on whether to use DHCP, refer to "Taking Advantage of Multiple Server Environments" on page 18, and "Determining DHCP Classes" on page 22.

The DHCP and BOOTP daemons cannot run on the same machine at the same time because both daemons use the same protocol and the same UDP port. DHCP replaces BOOTP, and supports all features of BOOTP. There is no need to run both daemons on the same machine.

It is also possible to setup a relay DHCP daemon. This server forwards DHCP requests to another DHCP server. Use this relay feature if you want to use a DHCP server in another network because the broadcast requests from a Network Station will not cross subnets.

DHCP configuration is more advanced than BOOTP. If you already have a running BOOTP configuration, convert the entries in the **/etc/bootptab** file into the**/etc/dhcpsd.cnf** file automatically with the **/usr/sbin/bootptodhcp** command. This command appends the proper client entries to the DHCP configuration file. You can find more information within the file **/etc/dhcpsd.cnf** and in the *AIX Version 4 System*

Management Guide: Communications and Networks. You can also see *AIX Version 4.3 System Management Guide: Communications and Networks*.

Use the following procedure to set up the **/etc/dhcpsd.cnf** file for your network and start DHCP.

__ 1. Edit the **/etc/dhcpsd.cnf** file by using the example in 166 as a guide.

The configuration file example and description shows configuration file entries for a variety of configurations, such as:

- Variable IP address, variable host name
- Variable IP address, static host name
- Static IP address inside managed IP range
- Static IP address outside managed IP range
- BOOTP address records

It is likely that your configuration file is less complex since this example contains all possibilities of how DHCP can assign IP addresses or host names. See "Taking Advantage of Multiple Server Environments" on page 18 and "Determining DHCP Classes" on page 22.

__ 2. After you set up the configuration file, use the following procedure to start the DHCP server:

__ a. Disable the start of BOOTP

To disable the start of BOOTP, edit the **/etc/inetd.conf** file and place a # in the first column of the bootps line. Then enter the following command to restart the **inetd** subsystem:

```
refresh -s inetd
```

__ b. Enter the following command to check for any active BOOTP daemons:

```
ps -eaf | grep bootp
```

__ c. If any BOOTP processes are running, enter the following command to stop them:

```
kill -9 PID
```

Where *PID* is the process ID of the BOOTP process that is listed by the **ps** command.

__ d. Enter the following command to start DHCP :

```
startsrc -s dhcpsd
```

When you start DHCP for the first time, be sure to check the log files for errors in your server or client configuration. It is a good idea to enable all events for logging.

__ 3. **This completes the DHCP configuration.** Go to "Before You Continue" on page 169.

```
        #global declaration of the log files
1 numLogFiles 4
  logFileSize 100
  logFileName /tmp/dhcp.log
```

```
2  logItem SYSERR
   logItem OBJERR
   logItem PROTERR
   logItem WARNING
   logItem EVENT
   logItem ACTION
   logItem INFO
   logItem ACNTING
   logItem TRACE
   #how long is IP address valid
3    leaseTimeDefault           30 minutes
   leaseExpireInterval        10 minutes
   #BOOTP should be supported
4    supportBOOTP yes
   #All clients will be served
5    supportUnlistedClients yes
   #declare global options
6    option 28 9.3.1.255                       #broadcast address
   option 3   9.3.1.74                       #default gateway
   option 6   9.3.1.74                       #domain name server
   option 15 austin.ibm.com             #Domain name
   option 12 "bootserv.austin.ibm.com"
   #special BOOTP options
7    option sa 9.3.1.116                       #bootserver
   option hd "/usr/netstation/"              #boot directory
   option bf "kernel"                        #kernel file
   #our network with subnetmask
   #this must be the first statement
8    network 9.0.0.0 255.255.255.0
    {
     #BOOTP clients
9      client 6 0000E568D75E 9.3.1.199
     client 6 0000E5E8EC76 9.3.1.202
     #DHCP clients outside managed subnet
10     client 6 0000E568D739 9.3.1.201
     {
        option 51 0xffffffff    #infinite address lease time
     }
     #subnet with variable IP addresses
11     subnet 9.3.1.0      9.3.1.135-9.3.1.139
      {
         #hosts with variable IP addresses
         #need not to be mentioned explicitly, since
         #supportUnlistedClients=yes
         #hosts with fixed IP addresses within managed subnet
12         client 6 0000e568f5f0 9.3.1.135
         #hosts with variable IP address, but fixed host name
         #this needs DDNS enabled (last two lines)
13         client 6 0000e568f5ee  "any"
         {
           option 12 "sv2040b" #hostname
         }
         #To support multi server environments the following is suggested
         # hosts with class identifier for Network Station  Model 8361-200
14         class "IBMNSM 1.0.0" 9.3.1.138-9.3.1.139
           {
             option 66 "9.3.1.116"   # Network Station Class Boot
                                     #  Server IP address
             option 67 "/usr/netstation/kernel"    # Boot Image file
             option 211  "nfs"       # Boot Server TCPIP access protocol
             option 212 "9.3.1.117"  # Terminal Configuration Server(s)
                                     #  IP address(es) (two may be defined)
```

```
          option 213 "/usr/netstation/configs"  # Configuration file
                                    #  (two may be defined)
          option 214  "nfs"         # Terminal Server TCPIP  access protocol
                                    #  (two may be defined)
        } #end class definition
      } #end subnet
    } #end network
15  #Actions for updating DNS
    updateDNS
    "/usr/sbin/dhcpaction '%s' '%s' '%s' '%s' PTR NONIM >>/tmp/rmdns.out 2>&1"
    removeDNS
    "/usr/sbin/dhcpremove '%s' PTR NONIM >>/tmp/rmdns.out 2>&1"
```

The following list describes the entries in the example configuration file in 166:

1 The declaration of the log files.

DHCP should use four log files with a 100KB maximum file size and base name **/tmp/dhcp.log**. These log files are important, and the only source of information for error messages and debugging.

2 The events to be logged by DHCP

During setup, you should enable all events. Once DHCP is running, you can decrease the amount of logging.

3 Declaration of the lease time interval

After 30 minutes, the client has to renew the lease interval. In the case where the client cannot renew its IP address because the DHCP server cannot be contacted, the IP will expire in 10 minutes.

4 This DHCP server should answer BOOTP requests.

5 If set to `no` you have to declare all MAC addresses of your clients in the configuration file to serve them by DHCP. If set to `yes`, DHCP serves any incoming requests.

6 These are global options that are transmitted to the client when it requests start-up information.

You should (at a minimum) declare these four, if available. For additional options, refer to the comments in the original AIX **/etc/dhcpsd.cnf** file.

7 Special options for BOOTP

The Network Station uses these options to load the kernel file and configuration files. The Network Station reads these options even when using the DHCP protocol.

8 Here is the declaration of the network

You must adhere to the TCP/IP network conventions. Be sure to use the right network address and mask.

9 These lines declare the BOOTP clients.

As with the BOOTP setup, you have to register every client with its MAC address and the corresponding IP address. If you want to specify different BOOTP options for a client, you have to put these options into brackets right after the client statement.

10 An example for a DHCP client outside of the subnet managed by DHCP

This looks similar to the BOOTP client definition. Because DHCP cannot renew any IP addresses outside its managed range, you have to specify an infinite lease time for these clients. This results in the same behavior as BOOTP clients. They will get an IP address assigned and do not have to renew it.

11 This is the declaration of the subnet managed by DHCP and the range of the IP addresses for the address pool of DHCP.

Unless otherwise specified, any client requesting an IP address from DHCP will get an address out of this pool, if possible. Because the option `supportUnlistedClients` is `yes`, you do not have to specify any MAC addresses of your clients.

12 With statements similar to this, you can assign fixed IP addresses to special clients, in the case where the software depends on a fixed address.

13 If you use DDNS, the IP address of your host can vary, but it will always have the same host name. To specify the host name, you have to assign a host name with `option 12` to this client.

14 It is recommended that Release 3 clients be defined/isolated by class instead of MAC address within a DHCP managed network. If you want to configure a multi server environment, see “Taking Advantage of Multiple Server Environments” on page 18 and “Determining DHCP Classes” on page 22.

15 These commands update the DNS database if DHCP assigns or releases IP addresses.

Configuring Network Stations Locally — NVRAM

Note: This approach is practical only if you’re configuring a very small number of IBM Network Stations.

Use the procedure in “Configuring an IBM Network Station to Boot from the NVRAM Setting” on page 309 to configure Network Stations locally.

Note: Reverse Address Resolution Protocol (RARP) is a choice in the Network Station NVRAM boot choices; however, the RS/6000 platform does not support RARP for booting Network Stations.

Before You Continue

- Verify that you started your DHCP, or HTTP server, and that the BOOTP, TFTP, and NFS daemons are running (biod, nfsd, rpc.mountd, rpc.statd, and rpc.lockd).

  Note: TFTP and BOOTP daemons are transient daemons. Unless you run the **ps -ef** command while they are actually running you will not be able to verify that they have run successfully. Also, the TFTP daemon is used only with AIX V4.3.1 and later.
- If you are using DHCP, and you have a router between your IBM Network Stations and your boot server, verify that the router is configured to handle DHCP requests.
- Use a web browser to access the IBM Network Station Manager at URL http://*ServerName*/networkstation/admin to administer local client applications,

including the NC Navigator web browser and terminal emulators. You need root user authority to perform this task on the server. See “Chapter 8. Using the IBM Network Station Manager Program” on page 245 for information on using the Network Station Manager.

- To take advantage of new functionality, you must update the boot monitor on your Network Stations. Each of your Network Stations must have a minimum boot monitor version of 3.0.0. Even if you have purchased new Network Stations, you should verify and update the boot monitors of your Network Stations. For information about updating boot monitors, see “Updating the Boot Monitor Code” on page 265.
- Verify that the Network Parameters that are configured in the Setup Utility of each Network Station agree with your boot method. For example, if you want an IBM Network Station to obtain its IP address through a DHCP server, ensure that the IP Address From field in the Setup Utility is set to Network. IBM Network Stations are set to Network when they are shipped from the factory. See “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301 for more information.
- For more information about setting up Network Stations, see the following sections:
  - “Chapter 7. Logging On and Working With IBM Network Station Manager Applications” on page 223
  - “Chapter 8. Using the IBM Network Station Manager Program” on page 245
  - “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301

Suppressed Login

In order to keep the login window from being displayed, perform the following steps. Remember that the userid you are creating will automatically login without a password, so these userids must have very limited authority.

1. Create a text file to add the Network Station IP address or hostname, userid, and password. The values should be separated by one or more spaces. For example:

   ```
   10.9.99.99      userid1    password1
   netstationName  userid2    password2
   ```

   You can use wild cards (UNIX regular expressions) to specify the IP address or hostname.
2. Run the **/usr/netstation/bin/createKIOSKS** text file from the command in step 1. A file **/usr/netstation/configs/kiosks.nsl** is created. This is an encrypted version of the text file.
3. Delete or hide the text file created in step 1 for security.

Printing from AIX to a Printer Attached to a Network Station

In the RS/6000 environment, printing from an RS/6000 AIX application is done through the AIX print spooler subsystem. You can use the print spooler subsystem to print to a printer attached to the Network Station. To print, you define a remote queue for the printer attached to the Network Station and submit jobs to be printed using standard AIX print commands. For example, **qprt** and **enq**. Local Network Station clients do not use a local spooler subsystem for printing.

Refer to *AIX Version 4 Guide to Printers and Printing* for general AIX printer installation and configuration information.

Setting up AIX to print to a printer attached to the Network Station includes these tasks:

- Defining an AIX remote print queue
- Connecting a printer to the Network Station
- Verifying printer operation

Refer to “Appendix G. Serial Port Printer Connection” on page 381 for information on connecting a printer to the Network Station.

Defining the AIX Remote Print Queue

Use the following procedure to define the AIX remote print queue:

__ 1. As root, use the fast path shortcut to open the SMIT Add a Print Queue menu **smitty mkpq**. If you prefer to work in the graphical SMIT interface, type **smit mkpq**.

__ 2. From the Add a Print Queue menu, select **remote** and press Enter.

__ 3. From the Type of Remote Printing menu, select **Local filtering before sending to print server** and press Enter.

__ 4. From the Remote Printer Type menu, select your printer type and press Enter.

__ 5. From the Remote Printer Type list, select your printer model and press Enter. If your printer is not listed, select **Other** to use a generic printer definition.

The Add a Remote Print Queue with Local Filtering dialog box displays as shown in Figure 39 on page 172:

```
                        Add a Remote Print Queue with Local Filtering

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                                      [Entry Fields]
  Description                                        Hewlett-Packard LaserJ>

* Name of new PRINT QUEUE to add                    []

  Remote server characteristics
*    HOSTNAME of remote server                      []
*    Name of QUEUE on remote server                 []
     TYPE of print spooler on remote server          AIX Version 3 or 4    +
     Send PASS-THROUGH FLAG to queue                 yes                   +
        on remote server?




F1=Help             F2=Refresh          F3=Cancel           F4=List
F5=Reset            F6=Command          F7=Edit             F8=Image
F9=Shell            F10=Exit            Enter=Do
```

Figure 39. RS/6000 Add a Remote Print Queue with Local Filtering Dialog Box

__ 6. In the Add a Remote Print Queue with Local Filtering dialog box, type or select the following:

   __ a. Type the name **SERIAL1** or **PARALLEL** depending on which one of the remote print queues you are adding.

   __ b. Type the host name of the Network Station in the HOSTNAME of remote server field.

   __ c. Type the name of the Network Station remote print queue in the Name of QUEUE on remote server field.

   __ d. Select **BSD** for the TYPE of print spooler on remote server.

   __ e. Press the Enter key to create the queue.

End of remote print queue setup.

Verifying printer operation

To verify printer operation, enter the following command to submit a job to a printer queue:

```
enq -Pname_of_print_queue /etc/motd
```

If you need additional printer support information, please see *AIX Version 4 Guide to Printers and Printing*.

RS/6000 Administration: Alternative Methods

This section includes the following RS/6000 system administration tasks. These tasks are either optional configuration methods or alternative methods of configuring an RS/6000 server Network Station environment:

- "Configuring Network Stations Using the chbootptab Script"
- "Configuring Network Stations Manually" on page 174
- "Understanding the nsconf Script" on page 175
- "Setting Up AIX Server Routing" on page 176
- "Setting Up BOOTP Relay Configuration" on page 176

Configuring Network Stations Using the chbootptab Script

To configure Network Stations centrally using the chbootptab script, at the command line, enter the following information on one line:

```
/usr/netstation/bin/chbootptab -A -h hostname -t hardware_type
-s tftp_server_ip -a hardware_address -b boot_file -i ip_address
-d boot_directory
```

You can also use these optional flags:

```
-n domain_name_server
-g gateway_ip
-m subnet_mask
```

Where:

- *hostname* is the value that is recorded on line **4** in Table 41 on page 161.
- *hardware_type* is the Hardware Type of the Network Station.
- *tftp_server_ip* is the TFTP Server IP address.

  This is typically the IP address of the RS/6000 that you are configuring. See the value that is recorded on line **1** in Table 41 on page 161.
- *hardware_address* is the hardware address (the MAC address for the Network Station that you are configuring).

  Use the value recorded on line **2** in Table 41 on page 161. Enter the value without the colon separators. Either enter the string with no separators or with period separators.
- *boot_file* is `kernel`.
- *ip_address* is the IP address of the Network Station.

  Enter the value that is recorded on line **3** in Table 41 on page 161.
- *boot_directory* is `/usr/netstation/`.

  Note: Type the path as shown including the trailing /.
- *domain_name_server* is the IP address for the Domain Name Server.

Enter the value that is recorded on line **7** in Table 41 on page 161.

- *gateway_ip* is the IP address for the gateway.
  Enter the value that is recorded on line **6** in Table 41 on page 161.
- *subnet_mask* is the subnet mask.
  Enter the value that is recorded on line **5** in Table 41 on page 161.

Repeat the script for each Network Station that you are configuring.

For information about additional flags that are available with the **chbootptab** script, enter at the command line:

```
/usr/netstation/bin/chbootptab -?
```

Configuring Network Stations Manually

Use the following procedure to configure Network Stations manually by editing the **/etc/bootptab file**. For each Network Station that you want your server to boot, copy the template below and replace the labels in uppercase with the appropriate values. Enter on one line:

```
 NC_HOST_NAME:ht=NETWORK_TYPE:ha=MAC_ADDRESS:ip=IP_ADDRESS:bf=kernel
hd=/usr/netstation/:sm=SUBNET_MASK:gw=GATEWAY_IP:ds=NAMESERVER_IP:
```

Note: When you edit the **/etc/bootptab** file manually, each entry is longer than one line of text can display in your editor. Do not put a manual return (line feed) in the entry ,or the entry will fail. (Your editor may be set up to wrap lines automatically; if this is the case, the entry will work. Just do not manually press the Enter key to force a return.)

Replace...	with...
NC_HOST_NAME	network name of the Network Station (for example, hostname)
NETWORK_TYPE	ethernet, ieee802, or tokenring
MAC_ADDRESS	hardware address of the Network Station
IP_ADDRESS	IP address of the Network Station

The following fields are optional and can be left blank (for example, :sm=:gw=:) if they do not exist in your network.

Replace...	with...
SUBNET_MASK	subnet mask of the network
GATEWAY	gateway IP of the network
NAMESERVER_IP	domain name server IP of the network

Note: Each Network Station that you want your AIX system to boot using BOOTP must have an entry in the **/etc/bootptab** file.

Understanding the nsconf Script

These are the tasks that the **nsconf** script performs for you during software installation (*you do not need to perform these tasks*).

- The **nsconf** script enables TFTP access from the IBM Network Stations by performing these tasks on the server:
  - In the **/etc/inetd.conf** file, removing the # in the leftmost column for the 'tftp' entry.
  - Running **/usr/bin/refresh -s inetd**
  - Adding the following line to the **/etc/tftpaccess.ctl** file:

    ```
    allow:/usr/netstation
    ```

    Note: The existence of the **/etc/tftpaccess.ctl** file limits TFTP access to only the directories explicitly listed in this file. You may want to add additional 'allow' statements to support other TFTP activity on the server. You might also want to remove the **/etc/tftpaccess.ctl** file if you want to allow unlimited TFTP access to the server. See the **tftp** man page for additional information.
  - Adding the entry '/usr/netstation -ro' to the **/etc/exports** file.
  - Running **/usr/sbin/exportfs -a**, which exports all the directories listed in the **/etc/exports** file for NFS client access.
  - Running **/usr/sbin/mknfs -B**. The **mknfs** command configures the system to run the Network File System (NFS) daemons. The **mknfs** command adds an entry to the **inittab** file so that the **/etc/rc.nfs** file is run on system restart. The **mknfs** command also executes the **/etc/rc.nfs** file immediately to start the NFS daemons.
- The **nsconf** script enables NFS access from the IBM Network Stations by changing the IP entry in the 'file-service-table' stanza of the **/usr/netstation/configs/defaults.dft** file to the IP address of your AIX server.
- The **nsconf** script enables the IBM Network Stations to dynamically load X11 fonts from an AIX font server. The script changes the IP entry in the 'xserver-default-font-path' stanza of the **/usr/netstation/configs/defaults.dft** file to the IP address of your AIX font server. The script checks for the existence of the**X11.fnt.fontServer** fileset and if it finds the fileset, runs **/usr/lpp/X11/bin/fsconf**.

If at any time you need to disable the server code, enter the following command:

```
/usr/netstation/bin/nsconf -d
```

Running the **nsconf** script with the **-d** flag comments out references to the Network Stations in the **/etc/bootptab** file. This keeps the Network Stations from booting using the BOOTP protocol. Configuration information is not erased from the system, and the server code can be reactivated by running the **nsconf** script again with no flags.

Note: Running **nsconf -d** does *not* turn off BOOTP, TFTP, and NFS. These processes must be shut down manually.

Setting Up AIX Server Routing

If you set up your server as a gateway between your Network Stations and other networks, you must configure the **/etc/rc.net** file to do IP forwarding. Add the following line to the end of the **/etc/rc.net** file:

```
/usr/sbin/no -o ipforwarding=1
```

Note: If you would like your server to begin forwarding packets immediately, run the same command manually at the command prompt.

Setting Up BOOTP Relay Configuration

If you set up your RS/6000 server to be a gateway between your Network Stations and the Network Station boot server and you wish to use BOOTP or DHCP, you must configure the **/etc/dhcprd.cnf** file to do direct broadcast forwarding. Once configured, the RS/6000 will forward the Network Station BOOTP or DHCP broadcast message to a specific boot server on another network.

The RS/6000 can function as only one of the following:

- BOOTP server (**bootpd** enabled)
- DHCP server (**dhcpsd** enabled)
- BOOTP/DHCP Relay (**dhcprd** enabled)

This is the procedure to configure BOOTP relay:

__ 1. Disable **bootp** in the **/etc/inetd.conf** file by placing a # in the first column of the `bootps` line. Save the file and refresh the inetd subsystem by entering the following command:

```
refresh -s inetd
```

__ 2. Check for any active BOOTP daemons by entering:

```
ps -ef | grep bootp
```

If any **bootp** processes are running, stop them by entering:

```
kill -9 PID
```

The PID is the process ID of the **bootpd** command listed in the previous **ps** command output.

__ 3. Make sure that **dhcpsd** is not running by entering:

```
ps -ef | grep dhcpsd
```

If it is running, disable it by entering:

```
smit spdhcpsd
```

and selecting **NOW** or **BOTH** to disable **dhcpsd**.

__ 4. Edit the **/etc/dhcprd.cnf** file to specify the IP address of each server to which the Network Station BOOTP or DHCP broadcast should be forwarded. Entries are in this form:

```
server  IP_address
```

where *IP_address* is the IP address of the destination server. To have the Network Station BOOTP or DHCP broadcast forwarded to multiple BOOTP or DHCP servers, add additional '`server`' lines.

__ 5. Start the **dhcprd** daemon by entering the following command:

```
smit stdhcprd
```

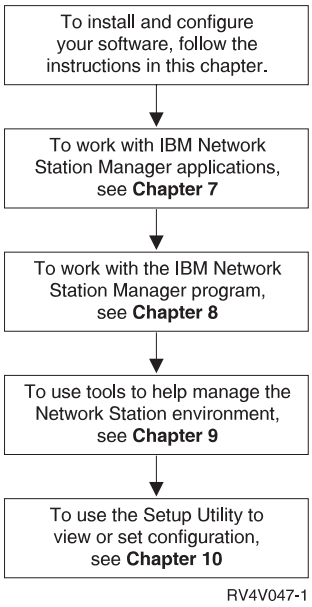
and select **NOW** or **BOTH** to start **dhcprd**.

Chapter 5. Installing and Configuring an IBM Network Station Environment on an OS/390 Server

About this Chapter

This chapter contains instructions for planning, installing, and configuring a Network Station environment on an OS/390 server. When necessary, you will be pointed to the *Program Directory for the Network Station Manager Release 3.0 for OS/390* for installation information. The program directory ships with the IBM Network Station Manager for OS/390 licensed program.

While completing the installation procedure and the configuration procedure, do not deviate from the order of the steps. The following figure demonstrates the flow of this manual.



Installation Steps

This section describes the preparation and installation of the IBM Network Station Manager (5648-C05) licensed program.

Attention: If you have manually modified any configuration files instead of using the IBM Network Station Manager program in the past, refer to `http://www.ibm.com/nc/pubs` for Advanced User Information.

__ 1. Review the information authorized program analysis report (APAR) described in the *Program Directory for the Network Station Manager Release 3.0 for OS/390*.

__ 2. Verify prerequisite OS/390 software.

Your OS/390 server must have the following installed:

- OS/390 Version 2 Release 5 or OS/390 Version 2 Release 4 (5647-A01)

  With OS/390 Version 2 Release 5:

  – TCP/IP 3.4 (FMID HTCP340 and JTCP349)

  With OS/390 Version 2 Release 4:

  – TCP/IP 3.2 for MVS with OE MVS Application Feature (FMID JTCP327) or OS/390 TCP/IP UNIX Services (FMID JTCP329)

  – TCP/IP Network Station Manager for OS/390 (FMID JTCP32N). This includes Dynamic Host Configuration Protocol (DHCP), TimeD, and Trivial File Transfer Protocol (TFTP).

UNIX System Services enabled system with the Hierarchical File System (HFS) (to contain kernel code for Network Station). The Shell & Utilities ships with the UNIX System Services.

- Domino Go Webserver
  - Domino Go Webserver 4.6.1 (5697-C58). You can use this with OS/390 Version 2 Release 4, but it is not included in the product. You must order it separately. However, Domino Go Webserver 4.6.1 is included in OS/390 Version 2 Release 5.
  - Domino Go Webserver 5.0 (5697-D43). This must be ordered separately and can only be used with OS/390 Version 2 Release 5.
- JavaScript capable browser.
- Network File System (NFS).

  Note: The Network File System SAF or SAFEXP option requires the level of NFS that is included in OS/390 Version 2 Release 6. If you (as an OS/390 V2R4 or OS/390 V2R5 customer) require this function at this time, contact your IBM representative to discuss possible special arrangements to install OS/390 V2R6 NFS for a limited time, under additional terms and conditions.

  If the use of the EXPORTS option is sufficient for your security environment, you may avoid the need for OS/390 V2R6 NFS. The Network File System included with OS/390 V2R4 and OS/390 V2R5 supports this security environment.

__ 3. Verify IBM Network Station memory requirements.

Network Stations download each of their appplications including their base systems into memory. You should verify that your Network Stations have enough memory to run their applications. Use the table at http://www.pc.ibm.com/networkstation/support/memrec_data.html to determine how much memory your Network Stations will need.

__ 4. Install the IBM Network Station Manager program (5648-C05).

The IBM Network Station Manager for OS/390 licensed program is available for OS/390 Version 2 Release 5 or OS/390 Version 2 Release 4 systems. The IBM Network Station Manager for OS/390 licensed program consists of the following:

- Network Station client
- Network Station Manager
- 40-bit NC Navigator browser

The *Program Directory for the Network Station Manager Release 3.0 for OS/390* that ships with the IBM Network Station Manager licensed program describes the procedure for installing the IBM Network Station Manager from the distribution tape. The program directory contains the following information:

- Basic and optional program materials and documentation
- IBM support available
- Program and service APARs and PTFs
- Installation requirements and considerations

- Migration instructions
- Installation instructions

You should also review the Preventive Service Planning (PSP) bucket for any changes to the installation information.

__ 5. Install **optional** software.

__ a. Install the 128-bit NC Navigator (5648-C20)

For installation instructions, see the *Program Directory for the 128-bit NC Navigator Browser for Network Station Manager*.

__ b. Install eSuite Workplace (5648-KN2) (CD-ROM only)

For installation instructions, refer to the README file that is shipped with the product.

__ c. Install Omron, Japanese Input Method (5648-OMR)

For installation instructions, refer to the README file that is shipped with the product.

__ 6. Installation complete.

You have installed all the required software for the IBM Network Station Manager program. At the end of the installation instructions in the *Program Directory for Network Station Manager Release 3.0 for OS/390*, you have a Network Station running that is using NVRAM as the boot method, NFS as the boot file protocol, and the Domino Go Webserver as your server. If you want to use DHCP as your boot method, use TFTP as your boot file protocol, change your Domino Go Webserver configuration settings, or change login information, continue to "Configuration Steps". Otherwise, go to "Before You Continue" on page 198.

Configuration Steps

__ 1. Verify that you installed the required software that is listed in step 2 on page 180.

__ 2. Choose the boot file protocol you want to use. You have already configured and started NFS. However, you can use TFTP, in addition to NFS.

You can use either NFS or TFTP to load the base code files from the base code server. However, you must use NFS to save and retrieve user configuration files, such as those pointed to by the NSLD.

Also, using NFS allows users to save preferences, such as bookmarks, and allows the NC Navigator browser proxy or socks server settings to be saved across logins.

You may want to use TFTP if you are migrating from a previous release of Network Station Manager that used TFTP.

Note: The TFTP server uses well-known port 69. The TFTP server has no user authentication. Any client that can connect to port 69 on the server has access to TFTP. If the TFTP server is started without a directory, it

allows access to the entire HFS. To restrict access to the HFS, start the TFTP server with a list of directories.

__ 3. Configure and start the Network File System (NFS).

You have already configured and started the port mapper server and NFS using the instructions in the *Program Directory for the Network Station Manager Release 3.0 for OS/390*. However, if you want to change your configuration, continue with this step. Otherwise, go to step 4 on page 184.

To configure and start NFS, follow these steps:

a. Update the attribute data set file, for example, `nfsattr`, to include the following settings (refer to the `NFSATTR DD` statement in the NFS startup job stream to find this data set):

```
binary
hfs(/hfs)
security(exports)
nomaplower
writetimeout(120)
```

`binary` is the setting of the transfer mode.

`/hfs` sets the prefix for the Hierarchical File System.

`security(exports)` specifies the type of security checking you are using to provide access to your NFS data.

`nomaplower` turns off mapping of lowercase to uppercase for file names. Therefore, mixed cased is recognized.

`writetimeout(120)` specifies the number of seconds before a data set is released after a write operation. The default value is 30 seconds. Normally, writetimeout values should be kept short because write operations result in exclusive locking. However, NFS involves relatively slow client machines that may have long pauses between write operations, so a larger value is appropriate.

b. Update the export data set, for example, `exports` (refer to the `EXPORTS DD` statement in the NFS startup job stream to find this data set). This data set contains entries for directories that may be exported to Network File System clients. The server uses this data set to determine which data sets and prefixes may be accessed by a client, and to write protect data sets on the server provided that the SECURITY site attribute is set to either SECURITY(EXPORTS) or SECURITY(SAFEXP). This file is not used for SECURITY(SAF) or SECURITY(NONE). You should specify READ ONLY access to the boot kernel directory for all users. The following is an example of an export data set:

```
/hfs/usr/lpp/nstation/ -ro
/hfs/etc/nstation/
```

c. Start NFS.

To start NFS, run the proc by using the following command from the operator's console:

```
start mvsnfs
```

For details about configuring NFS, see the *OS/390 NFS Customization and Operation*, SC26-7029 and the *OS/390 NFS User's Guide*, SC26-7028.

Note: Both the port mapper server and NFS can be automatically started by including the information in PROFILE.TCPIP.

__ 4. If you decided to use the Trivial File Transfer Protocol (TFTP) server, continue with this step, otherwise go to step 5.

Note: The TFTP server uses well-known port 69. The TFTP server has no user authentication. Any client that can connect to port 69 on the server has access to TFTP. If the TFTP server is started without a directory, it allows access to the entire HFS. To restrict access to the HFS, start the TFTP server with a list of directories.

To start the TFTP server, use one of the following methods:

- Issue the following `tftpd` command:

  ```
  tftpd -l -a /usr/lpp/nstation/standard
  -a /etc/nstation /usr/lpp/nstation/standard /etc/nstation
  ```

  In OS/390 V2R4, `tftpd` is located in the `/usr/lpp/tcpip/nsm/sbin/` directory. In OS/390 V2R5, `tftpd` is located in the `/usr/lpp/tcpip/sbin/` directory.
- Use a JCL procedure (proc). The procedure named TFTPD is installed in the SEZAINST library.

  Before running TFTPD, you must change the PARM= parameter of the tftpd command that is called in the proc.

  – Edit the TFTPD proc
  – Change `-a /usr/lpp/tcpip/nstation/standard` to `-a /usr/lpp/nstation/standard`

  To start TFTP, run the proc by using the following command from the operator's console:

  ```
  start tftpd
  ```

For more information about TFTP in TCP/IP 3.2, refer to the *Network Station Manager for S/390*, SC31-8546. For more information about TFTP in TCP/IP 3.4, refer to *OS/390 eNetwork Communications Server IP Configuration*, SC31-8513.

__ 5. Choose a boot protocol and configuration method.

You have already set up your Network Station to use NVRAM. However, you can use DHCP instead. Use Chapter 1, specifically sections "Boot Methods" on page 13 and "What Do I Need To Know About TCP/IP Networks?" on page 4, to learn more about boot methods and TCP/IP.

Notes:

a. Although BOOTP clients are supported, use the DHCP server to respond to BOOTP requests.

b. If you use the DHCP boot method and use the DHCP options 67, 211, 212, 213, or 214, these options override the settings specified on the Set Boot Parameters Panel of the Network Station Setup Utility.

Table 42. Available Boot Protocols and Boot Methods by Level of OS/390

Boot Method	OS/390 V2R4 and V2R5 Configuration Method
DHCP or BOOTP	Edit the boot server configuration file (dhcpsd.cfg).
NVRAM	No boot server configuration necessary.

If you choose to use a DHCP boot protocol, go to step 6.

If you choose to use a NVRAM boot protocol, go to step 9 on page 192.

__ 6. Gather information for setting up your DHCP environment.

When you set up a DHCP environment, first you will define its global attributes, then you will define the subnets in your DHCP environment. Table 43 and Table 44 on page 186 describe global and subnet information you will need to set up your DHCP environment.

After reviewing this information, you will fill in the worksheets in Table 45 on page 187 and Table 46 on page 188 with your own DHCP environment values. Refer to *OS/390 eNetwork Communications Server IP Configuration*, SC31-8513, for more information on DHCP.

Table 43. DHCP Global Information

Field	Description
number_of_log_files	This provides the logging information for the server. Specify the number of log files you need, the size of the log file, and name of the log file, and at least one type of log item.
size_of_log_file	
name_of_log_file	
type_of_log_item	
supportBootP [YES|NO]	If your OS/390 serves BOOTP clients and if you would like to migrate your existing clients, these migrated clients will use the DHCP server to obtain their IP addresses, but the addresses will be static like BOOTP.
supportUnlistedClients [YES|NO]	Determines whether the server responds to requests from DHCP clients other than those whose client IDs are listed in the configuration file.
address_of_bootstrap	If you migrate BOOTP clients, you must define their bootstrap server. The bootstrap server delivers the boot files to the IBM Network Stations.
base_code_server_protocol	The protocol of the base code server (NFS or TFTP).
terminal_configuration_address	The address of the terminal configuration server.
terminal_configuration_path_name	The path name for the terminal configuration server.
terminal_configuration_server_protocol	The protocol of the terminal configuration server (NFS or TFTP).

Table 43. DHCP Global Information (continued)

Field	Description
boot_file_name	The name of the boot file that is passed to a DHCP client. This name must contain the fully-qualified path name and be less than 128 characters in length.
amount_of_default_lease_time	The amount of time a server lets clients keep an IP address.
hw_type	These fields are used to define a client outside of a subnet. *clientID* can be a MAC address, a domain name, or a host name.
clientID	
client_ipaddr	
host_name	The host name of the client.

Table 44. DHCP Subnet Information

Field	Description
subnet_addr **Note:** The subnet address is only for subnets in which the entire subnet is reserved for DHCP addressing.	The IP address associated with a particular subnet. For a Class C network whose subnet mask is 255.255.255.0, the subnet address is the same as the network address. In Figure 5 on page 7, the subnet IP address is `192.168.1.0`. If the subnet mask of your network is not 255.255.255.0, refer to "Subnets and Subnet Masks" on page 9 for more information.
subnet_mask	A value that enables network devices to direct packets of information accurately in a subnetted environment. In Figure 5 on page 7, the subnet mask is 255.255.255.0. For more information about subnet masks, refer to "Subnets and Subnet Masks" on page 9.
subnet_start **Note:** Only for subnets based on a range.	The first IP address in the range that you have specified for your pool of available addresses. For the subnet 192.168.1.0 in Figure 5 on page 7, the starting address could be `192.168.1.2`.
subnet_end **Note:** Only for subnets based on a range.	The last IP address in the range that you have specified for your pool of available addresses. For the subnet 192.168.1.0 in Figure 5 on page 7, the ending address range could be `192.168.1.3`. The specified range (192.168.1.2 – 192.168.1.3) allows for only two clients on the subnet.
address_of_excluded_client	If any routers, gateways, statically addressed clients (not using BOOTP or DHCP) or servers are within your subnet range, you must exclude those IP addresses. If you have migrated BOOTP clients, you do not need to exclude their IP addresses. If the DHCP range was 192.168.1.1 through 192.168.1.50 in Figure 5 on page 7, you would exclude `192.168.1.4` and `192.168.1.5`. They are the static IP addresses of the Domain Name Server and the Client Server.
amount_of_default_lease_time	The amount of time a server lets clients keep an IP address.
address_of_router	The IP address of the default router to which TCP/IP packets not addressed for your network are sent. In Figure 5 on page 7, for the subnet 10.1.1.0, the default router IP address for client `ns3.mycompany.com` is `10.1.1.1`.
address_of_domain_name_server	Delivering the domain name server IP address to clients allows them to use either fully qualified host names or IP addresses when they communicate with other devices. In Figure 5 on page 7, the IP address of the domain name server is `192.168.1.5`.

Table 44. DHCP Subnet Information (continued)

Field	Description
name_of_domain_name_server	The domain name allows the IBM Network Station to specify its domain to other devices. In Figure 5 on page 7, where the fully qualified host name is `server.mycompany.com`, the domain name is `mycompany.com`.
boot_file_name	The name of the file that contains the IBM Network Station's operating system. This value is a constant and has been entered for you on the table.
address_of_bootstrap	The bootstrap server delivers the boot files to the IBM Network Stations. Enter the bootstrap server's IP address. In Figure 5 on page 7, the bootstrap server address for subnet `192.168.1.0` is `192.168.1.4`. For the subnet `10.1.1.0`, the bootstrap server address is still `192.168.1.4`, but you must pass a router address of `10.1.1.1` (see the router IP address identified previously).

Now, make one copy of the DHCP global worksheet, make a copy of the DHCP subnet worksheet for each subnet you want to define. Using the information that is described in Table 43 on page 185 and Table 44 on page 186, fill in the worksheets with your own DHCP environment values. You will use this information in step 7 on page 188 when you configure DHCP.

Table 45. DHCP Global Worksheet

Field	Value
number_of_log_files	
size_of_log_file	
name_of_log_file	
type_of_log_item	
supportBootp [YES|NO]	
supportUnlistedClients [YES|NO]	
address_of_bootstrap	
base_code_server_protocol	
terminal_configuration_address	
terminal_configuration_path_name	
terminal_configuration_server_protocol	
boot_file_name	/usr/lpp/nstation/standard/kernel
amount_of_default_lease_time	
hw_type	
clientID	
client_ipaddr	
host_name	

Table 46. DHCP Subnet Worksheet

Field	Value
subnet_addr	
subnet_mask	
subnet_start – subnet_end (subnet_range)	
address_of_excluded_client	
address_of_router	
address_of_domain_name_server	
name_of_domain_name_server	
boot_file_name	
address_of_bootstrap	

__ 7. Configure DHCP.

The IBM DHCP server provides IP addresses and configuration information to clients that are based on statements that are contained in the DHCP server configuration file and information that is provided by the client.

The name of the configuration file is `dhcpsd.cfg`.

The sample DHCP configuration file on page 189 is based on the values in "What Do I Need To Know About TCP/IP Networks?" on page 4. To build your configuration file, follow these steps by using the values you gathered in Table 45 on page 187 and Table 46. For details on the statements that are used in the following steps, refer to the *OS/390 eNetwork Communications Server IP Configuration*, SC31-8513.

__ a. Declare log files.

```
numLogFiles number_of_log_files
logFileSize size_of_log_file
logFileName name_of_log_file
logItem type_of_log_file
```

__ b. Migrate and serve BOOTP.

```
supportBootP [YES | NO]
```

The default value is `NO`.

__ c. Support all clients (both registered and unregistered).

```
supportUnlistedClients [YES | NO]
```

The default value is `YES`.

__ d. Define your global bootstrap server.

```
bootStrapServer address_of_bootstrap
```

__ e. Configure for load balancing.

```
option 211 base_code_server_protocol
option 212 terminal_configuration_address
option 213 terminal_configuration_path_name
option 214 terminal_configuration_server_protocol
```

__ f. Specify the global boot file name.

```
option 67 boot_file_name
```

__ g. Specify the default lease time of the leases that are issued by the server.

```
leaseTimeDefault amount_of_default_lease_time
```

The default value is 1440 minutes.

__ h. Define the Domain Name Server IP address and name related to all the subnets that are served by this server.

```
option 6 address_of_domain_name_server
option 15 name_of_domain_name_server
```

__ i. For each clients you want to define outside of a subnet, use a Client statement and option similar to the following:

```
client hw_type clientID client_ipaddr
{
option 12 host_name
}
```

__ j. For each subnet:

1) Define the subnet.

```
subnet subnet_addr subnet_mask subnet_start
subnet_end
```

2) Define an IP router address for this subnet.

```
option 3 address_of_router
```

3) Define the bootstrap server address for this subnet.

```
bootStrapServer address_of_bootstrap
```

4) Exclude addresses from the range of IP addresses you defined for this subnet.

```
client 0 0 client_address
```

The following is a sample DHCP configuration file that is based on the values that are used in “What Do I Need To Know About TCP/IP Networks?” on page 4.

```
#------------------------------------------------------------------
# Global Server data:
#   Overrides for server defaults and globally defined options
#------------------------------------------------------------------
logFileName dhcpsd.log
logFileSize 100
numLogFiles 4
logItem SYSERR
```

```
logItem ACNTING
logItem EVENT
logItem PROTERR
logItem WARNING
logItem INFO
logItem TRACE
logItem ACTION
supportBootp YES
supportUnlistedClients NO
bootStrapServer 192.168.1.4

option 211 "nfs"
option 212 "10.1.1.2"
option 213 "/hfs/etc/nstation/StationConfig/"
option 214 "nfs"
option 67  /hfs/usr/lpp/nstation/standard/kernel


#-------------------------------------------------------------------
# Lease time values
#-------------------------------------------------------------------
leaseTimeDefault 12 HOURS

#-------------------------------------------------------------------


#-------------------------------------------------------------------
# Time Server data:
#   option 2 -> offset of the time server from UTC in seconds
#   option 4 -> IP address of an RFC 868 time server
#-------------------------------------------------------------------
option 2   -14400
option 4   192.168.1.4


#-------------------------------------------------------------------
# Options related to all subnets served by this server.
#   option 6  -> Domain Name Server IP addresses
#   option 15 -> Domain Name
#-------------------------------------------------------------------
option 6   192.168.1.5
option 15  mycompany.com

#-------------------------------------------------------------------
# IBM Network Station manager data:
#   option 67 -> Name of the boot file for the client to request
#-------------------------------------------------------------------
class "IBMNSM 1.0.0"
{
  option 67  /hfs/usr/lpp/nstation/standard/kernel
}

#-------------------------------------------------------------------
# Client Definitions:
#-------------------------------------------------------------------
```

```
#------------------------------------------------------------------
# Token Ring
#------------------------------------------------------------------
# Model 100
client 6 0000E580FCA8 ANY
{
}

# Model 1000
client 6 0000E5D40047 10.1.1.2
{
option 12 ns3.mycompany.com
}

#------------------------------------------------------------------
# Ethernet
#------------------------------------------------------------------
# Model 100
client 1 0000A7013F27 ANY
{
  option 12 ns4.mycompany.com
}



#------------------------------------------------------------------
# Subnet sections.
#   option 3  -> Router IP addresses
#   option 1  -> subnet mask (This option is generated by the
#                SUBNET statement. It should not be specified
#                as an option.
#
# Subnet 192.168.1.00
#
#------------------------------------------------------------------
SUBNET 192.168.1.00 255.255.255.0 192.168.1.1-192.168.1.100
 {
  option 1   255.255.255.0
  option 3   10.1.1.1

#------------------------------------------------------------------
# RESTRICT ADDRESSES THAT WE DO NOT CONTROL.
#------------------------------------------------------------------
client 0 0 192.168.1.4
client 0 0 192.168.1.5
}
```

__ 8. Start the DHCP server.

To start the DHCP server, use one of the following methods:

- Issue the following `dhcpsd` command:

  `dhcpsd [-q|-v] [-f` *configFile*`]`

  -q starts the server in quiet mode, which means that no banner is displayed when the server starts.

-v starts the server in verbose mode. This causes messages that deal with client communication to display.

-f *configFile*
is the name of the DHCP server configuration file. By default, the server searches for a file called `dhcpsd.cfg` in the directory that is specified by the `etc` environment variable.

In OS/390 V2R4, `dhcpsd` is located in the `/usr/lpp/tcpip/nsm/sbin/` directory. In OS/390 V2R5, `dhcpsd` is located in the `/usr/lpp/tcpip/sbin/` directory.

- Use a JCL procedure (proc). The procedure named DHCP is installed in the SEZAINST library. Run the proc by using the following command from the operator's console:

  ```
  start dhcp
  ```

__ 9. Start the TIMED server.

You have already configured the TIMED server using the instructions in the *Program Directory for the Network Station Manager Release 3.0 for OS/390*. However, if you want to change your configuration, continue with this step. Otherwise, go to step 10.

The TIMED daemon provides the time. TIMED gives the time in seconds since midnight January 1, 1900.

To start the TIMED server, issue the following `timed` command:

```
timed [-l] [-p port]
```

-l logs all the incoming requests and responses to the system log. Logged information includes the IP address of the requestor.

-p *port*
identifies the port. The TIMED server usually receives requests on well-known port 37. You can specify the port in which requests are to be received.

In OS/390 V2R4, `timed` is installed in `/usr/lpp/tcpip/nsm/sbin` directory. In OS/390 V2R5, `timed` is installed in the `/usr/lpp/tcpip/sbin` directory

__ 10. Configure and start the Domino Go Webserver.

You have already configured and started the Domino Go Webserver using the instructions in the *Program Directory for the Network Station Manager Release 3.0 for OS/390*. However, if you want to change your configuration, continue with this step. Otherwise, go to step 11 on page 195.

To configure the Domino Go Webserver, follow these steps:

- Modify the Domino Go Webserver configuration file
- Update and verify the NLSPATH variable
- Verify the configuration of the Domino Go Webserver.

__ a. Add the following directives to the Domino Go Webserver configuration file, `httpd.conf`, at the end of the Protection directives, but before the Service directives. These directives are provided in sample file `/usr/lpp/nstation/samples/progdir.dgw.txt`.

These directives set up basic authentication to protect the programs for the IBM Network Station Manager.

```
Protection  PROT_NSM {
    Userid       %%SERVER%%
    PasswdFile   %%SAF%%
    PostMask     All@(*)
    PutMask      All@(*)
    GetMask      All@(*)
    Mask         All@(*)
    AuthType     Basic
    ServerId     NetworkStation_Manager
}

Protect /networkstation/cgi-bin/* PROT_NSM
```

Figure 40. Protection with ICS Server interfacing to RACF (or equivalent system)

- `Protect /networkstation/cgi-bin/` requests activate protection. The protection setup is defined on the Protection directive that has a label of `PROT_NSM`. The Protect directive points to a Protection directive. This Protect directive must be placed after the Protection directive to which it points.
- The `Userid` directive identifies the user name the server changes to before accessing files. This user ID must have root authority.
- The text associated with `ServerId` is displayed by most browsers on the screen and enables the user to verify that the user ID and password being entered are for the Network Station Manager program.

  By specifying a unique `ServerId` for the Network Station Manager program, only IBM Network Station Manager program requests will be processed by the authenticated user. Because applications authenticated will be run as superusers, only IBM Network Station Manager program applications should be installed in the library that is specified by the URL mapping `/networkstation/cgi-bin/*`.

Refer to the *Domino Go Webserver Webmaster's Guide* for information on updating the Domino Go Webserver configuration file.

__ b. Add the following mapping directives to the Domino Go Webserver configuration file (`httpd.conf`) in the Mapping Rules section, but before the Pass directives. These directives MUST be in the order in which they appear, and they MUST be placed before the `Pass /*` statement. These directives are provided in sample file `/usr/lpp/nstation/nsm/samples/progdir.dgw.txt`.

   These statements allow the Domino Go Webserver to access the IBM Network Station Manager program and its resources.

```
Exec /networkstation/admin/*  /usr/lpp/nstation/nsm/cgi-bin/QYTCMAIN
Exec /networkstation/cgi-bin/*.PGM  /usr/lpp/nstation/nsm/cgi-bin/*

AddType .htm-813  text/html 8bit 1.0 IBM-813
AddCharSet .htm-813  IBM-813
AddType .htm-819  text/html 8bit 1.0 IBM-819
AddCharSet .htm-819 IBM-819
AddType .htm-912  text/html 8bit 1.0 IBM-912
AddCharSet .htm-912  IBM-912
AddType .htm-920  text/html 8bit 1.0 IBM-920
AddCharSet .htm-920  IBM-920
AddType .htm-943  text/html 8bit 1.0 IBM-943
AddCharSet .htm-943  IBM-943
AddType .htm-949  text/html 8bit 1.0 IBM-949
AddCharSet .htm-949  IBM-949
AddType .htm-950  text/html 8bit 1.0 IBM-950
AddCharSet .htm-950  IBM-950
AddType .htm-1250 text/html 8bit 1.0 IBM-1250
AddCharSet .htm-1250 IBM-1250
AddType .htm-1251 text/html 8bit 1.0 IBM-1251
AddCharSet .htm-1251 IBM-1251
AddType .htm-1253 text/html 8bit 1.0 IBM-1253
AddCharSet .htm-1253 IBM-1253
AddType .htm-1381 text/html 8bit 1.0 IBM-1381
AddCharSet .htm-1381 IBM-1381



MAP /networkstation/CS_CZ/x*.htm    /networkstation/CS_CZ/*.htm-1250
MAP /networkstation/CS_CZ/*.htm   /networkstation/CS_CZ/x*.htm-912
MAP /networkstation/EL_GR/x*.htm    /networkstation/EL_GR/*.htm-1253
MAP /networkstation/EL_GR/*.htm   /networkstation/EL_GR/x*.htm-813
MAP /networkstation/HU_HU/x*.htm    /networkstation/HU_HU/*.htm-1250
MAP /networkstation/HU_HU/*.htm   /networkstation/HU_HU/x*.htm-912
MAP /networkstation/JA_JP/*.htm    /networkstation/JA_JP/*.htm-943
MAP /networkstation/KO_KR/*.htm    /networkstation/KO_KR/*.htm-949
MAP /networkstation/PL_PL/x*.htm    /networkstation/PL_PL/*.htm-1250
MAP /networkstation/PL_PL/x*.htm   /networkstation/PL_PL/x*.htm-912
MAP /networkstation/RU_RU/x*.htm    /networkstation/RU_RU/*.htm-1251
MAP /networkstation/RU_RU/*.htm   /networkstation/RU_RU/x*.htm-1251
MAP /networkstation/TR_TR/*.htm    /networkstation/TR_TR/*.htm-920
MAP /networkstation/ZH_CN/*.htm    /networkstation/ZH_CN/*.htm-1381
MAP /networkstation/ZH_TW/*.htm    /networkstation/ZH_TW/*.htm-950
MAP /networkstation/*.htm          /networkstation/*.htm-819

Pass /networkstation/*              /usr/lpp/nstation/nsm/*
```

__ c. Update the NLSPATH setting by adding the following to the NLSPATH variable in the `/etc/httpd.envvars` file:

```
/usr/lib/nls/msg/%L/%N.cat
```

`/usr/lib/nls/msg/%L/%N.cat` is the name that is associated with the Network Station Manager program catalog.

Note: In the list of files that are defined for `NLSPATH=` do not code the real name of the IBM Network Station Manager program catalog (nsmmsg.cat). The file name should be represented by %N. Specifying the real file name for the IBM Network Station Manager message catalog (or any other catalog) may result in a failure by the application to access the catalog.

__ d. Verify the NLSPATH settings.

Verify the Domino Go Webserver NLSPATH setting by calling a Domino Go Webserver script. This script displays a list of all environment variables and their current settings. Call this script with the following URL:

`http://`*`yourservername`*`:`*`portnumber`*`/cgi-bin/environ.sh`

- *yourservername* is the host name or TCP/IP address of the Domino Go Webserver.
- *portnumber* is the port that is configured for use with the IBM Network Station program.
- The name of the script is `/usr/lpp/internet/server_root/cgi-bin/environ.sh`

__ e. Verify the configuration of the Domino Go Webserver.

Verify basic authentication to ensure that the IBM Network Station Manager program functions properly. From a user ID having UID=0 authority, start the IBM Network Station Manager program by using the following URL:

`http://`*`yourservername`*`:`*`portnumber`*`/networkstation/admin`

For detailed information on the Domino Go Webserver, refer to the *Domino Go Webserver for OS/390 Webmaster's Guide*.

__ 11. Configure and start the Network Station Login daemon (NSLD) server.

You have already configured NSLD by using the instructions in the *Program Directory for the Network Station Manager Release 3.0 for OS/390*. However, if you want to change your configuration or your logging setting, continue with this step. Otherwise, go to step "Before You Continue" on page 198.

The NSLD server responds to Network Station Login client requests for login information about the user ID that is logging into an IBM Network Station. The NSLD server first determines whether the user ID and password combination that are passed are valid on this system. If it is not valid, an error response is sent to the client. If it is valid, the information passed back to the IBM Network Station includes the user's user ID and group ID, home directory, and Network Station Manager preference directory.

The NSLD server reads a configuration file (NSLD CONFIG) that contains information necessary to mount the product defaults, user configuration, and user's home directories.

The NSLD CONFIG file is located in `/usr/lpp/nstation/nsm/samples`.

__ a. If you are not changing any user configuration server, product defaults, or user's home directory definitions, go to step 11.b on page 197. If you are changing definitions, follow these steps:

1) Copy the contents of the NSLD CONFIG file into another file to save the default settings. Now, edit the NSLD CONFIG file to make your changes. The file will look similar to the following:

```
! User Configuration server
nsm_userconfig_mount_type = MOUNT_NFS
nsm_userconfig_server = xx.xx.xx.xx
nsm_userconfig_directory = /hfs/etc/nstation/
!
! Product defaults
! The server and mount_type for the product defaults will be the
same as the user configuration server.
nsm_prod_sysdefaults_directory = /hfs/usr/lpp/nstation/standard/SysDef/
!
! User's home directory
home_mount_type = MOUNT_NFS
home_directory = /hfs/etc/nstation/users/%s
```

Figure 41. Sample NSLD CONFIG File

`nsm_userconfig_mount_type` defines the mount type. MOUNT_NFS is the only value.

`nsm_userconfig_server` is the name or IP address of the server where you defined the user information. If a null string follows the =, the authentication server is used.

`nsm_userconfig_directory` is the directory path name of the user configuration server, which contains the user- specific information. For OS/390, `/hfs/etc/nstation/` is the standard location.

`nsm_prod_sysdefaults_directory` is the directory path name of the product defaults. For OS/390, `/hfs/usr/lpp/nstation/standard/SysDef/` is the standard location.

`home_mount_type` defines the mount type.

MOUNT_NFS is the only value.

`home_directory` is the directory path name of the user's home directory. If a null string follows the =, the user's home directory that is defined on the authentication server is used.

The directory path names must consist of an absolute path to the mountpoint. The path name must use a forward slash (/) as a directory delimiter.

2) Make any changes to this new CONFIG file.

__ b. Verify that the NSLD environment variable NLSPATH includes the following:

```
/usr/lib/nls/msg/%L/%N.cat
```

__ c. Because you have already started NSLD, you must stop NSLD before restarting it with different settings. To stop NSLD, issue the following command from the operator's console:

```
cancel nsld
```

__ d. Start the NSLD server.

Start the NSLD server by using the following `inscnsld` command. INSCNSLD is located in the `/usr/lpp/nstation/nsm/sbin` directory.

```
inscnsld [-l] [-f filename] [-t timeout] [-c concurrency_limit]
```

-l Logs the requests and replies. Information about each logon request and reply is logged to the system log. This information includes the type of the request or reply, the success or failure of requests, and the destination of the replies. Errors and important events always are logged, even when this option is not specified.

NSLD writes data to the user facility of the SYSLOGD daemon. For more information on the SYSLOGD daemon, refer to the *OS/390 TCP/IP OpenEdition Configuration Guide*, SC31-8304, for OS/390 V2R4, and *OS/390 eNetwork Communication Server: IP Configuration Guide*, SC31-8513, for OS/390 V2R5.

-f *filename*
Identifies the name of the configuration file that is read when the NSLD server is started.

-t *timeout*
Sets the packet timeout. The NSLD server usually waits 5 seconds before presuming that a transmitted packet has been lost. You can specify a different timeout period in seconds.

-c *concurrency_limit*
Sets the concurrency limit. The NSLD server spawns both threads and processes to handle incoming requests. You can specify the limit for the number of threads that may be concurrently processing requests under a single process. When the limit is exceeded, a new process is spawned to handle requests. The default is 200 threads.

The NSLD server preforks a child process to handle incoming requests when the concurrency limit is exceeded. Consequently, immediately after the NSLD server is started, two NSLD processes exist.

If there are many concurrent NSLD requests, the NSLD server may fork additional processes. When the number of concurrent requests being processed drops below the concurrency limit, the number of NSLD processes is decreased back to two.

Before You Continue

Before you begin using your Network Stations, read and complete (when applicable) each of the following items:

- Update the boot monitor code on your Network Stations to be at least Version 3.0. Even if you have purchased new Network Stations, you should update the boot monitors of your Network Stations. For information about updating boot monitors, see “Updating the Boot Monitor Code” on page 265.
- Verify that the Network Parameters in the Setup Utility of your Network Stations agree with your boot method. For example, if you want a Network Station to obtain its IP address through a DHCP server, ensure that the IP Address from field is Network. See “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301 for more information about the Setup Utility. Network Stations are set to start from the Network when they are shipped from the factory.
- Verify that your BOOTP or DHCP server, NFS or TFTP server, and Domino Go Webserver are started.
- Verify that you excluded any statically addressed devices in your DHCP addressing range.
- If you have a router between your Network Station and your boot server, verify that the router is configured to handle BOOTP and DHCP requests.
- For more information about setting up Network Stations, see the following sections:
  - “Chapter 7. Logging On and Working With IBM Network Station Manager Applications” on page 223
  - “Chapter 8. Using the IBM Network Station Manager Program” on page 245
  - “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301

Configuring Printers on OS/390

You can configure printers for your Network Stations with the IBM Network Station Manager program unless the datastream generated by the Network Station application does not match a datastream that your printer understands. Table 62 on page 242 describes which datastreams the common Network Station applications produce. If your Network Station application does not produce a datastream that your printer understands, you will not be able to print.

Configuring Basic Printer Scenarios

Table 47 explains the basic steps to configure printers for your Network Stations. Identify the scenario that best meets your needs and follow the steps to configure your printer.

Table 47. Configuration Descriptions for Basic Printer Scenarios

Desired Print Scenario	Configuration Instructions
Network Station to a LAN printer	In the Network Station Manager program, configure an entry in the *Remote Printer Server* field for the LAN printer.
Network Station to a locally attached printer	In the Network Station Manager program, configure an entry in the *Local Parallel Printer* or the *Local Serial Printer* field, depending on how the printer connects to the Network Station.
Network Station to another Network Station with an attached printer	In the Network Station Manager program, configure an entry in the *Remote Printer Server* field with the IP address of the Network Station to which the printer is attached. In the *Queue name* field, type `PARALLEL1` or `SERIAL1`, depending on how the printer connects to the Network Station.

Printing Support

The 3270 emulator for Network Station Manager 3.0 supports print screen function.

TN3270E support for LU1/LU3 printing will be available soon. In the meantime, until the TN3270E functions become available, applications residing on OS/390 can use NetSpool and IP PrintWay to print to a Network Station Manager printer. NetSpool and IP Printway are separately orderable products, which are also priced separately.

LPR/LPD support is now provided. This allows the Network Station Manager to act as either a printer client or printer server. That is, local client applications on the Network Station Manager can send print jobs to remote printer servers or remote printers, and remote print clients can send print jobs to either a serial port or parallel port on the Network Station Manager. LPR support is available on all version of OS/390. LPD support is available on OS/390 Version 2 Release 5 or on a later release.

LPR/LPD streaming mode is also supported. This allows a print client to send a print request to a print server while a print data file is still being generated. Previously the print data file had to be generated completely before submitting the job to the printer server. This method required alot of memory to completely spool the data file. For the Network Station Manager, streaming mode support is very useful because it does not requires a large amount of memory.

Using NetSpool and IP PrintWay

Using NetSpool and IP PrintWay, you can intercept the VTAM LU1/LU3 traffic, convert it to ASCII, and send it to an IBM Network Station through the LPR client. NetSpool converts the LU1/LU3 printer stream to line mode data. Using IP PrintWay, the LPR client sends the print data to the Network Station Manager LPD.

IP PrintWay also supports LPR streaming.

For more information on NetSpool and IP PrintWay, refer to *IBM NetSpool Guide*, G544-5301, and *IBM IP PrintWay Guide*, S544-5379, respectively.

NLS Considerations

There are two server configuration tasks you must complete if you want your Network Station to use a language other than US English. First, you must configure the Network Station Login daemon to set the appropriate language and locale values for users that do not have explicit settings. Second, you must configure the Network Station Manager to serve web browsers using language and locale values other than US English.

During Network Station login, environment variables are set on the Network Station client machine to establish the user's preferred settings for language and locale. The value of the LANG environment variable in the environment of the Network Station Login daemon is used as the default value for users of a network station. The value of the LANG environment variable must be set to one of the OS/390 supported values that are listed in Table 48. The Network Station Login daemon itself does not have any NLS considerations. All logging is done to the system log in US. English.

Table 48. LANG Environment Variable Settings

LANG Value	**Language**
En_Us	US English
C	Default locale
Cs_CZ	Czech
Da_DK	Danish
De_CH	German (Swiss)
De_DE	German
El_GR	Greek
En_GB	English (UK)
Es_ES	Spanish
Fi_FI	Finnish
Fr_BE	Belgian French MNCS
Fr_CA	Canadian French MNCS
Fr_CH	French (Swiss)
Fr_FR	French
Hu_HU	Hungarian
It_CH	Italian MNCS (Swiss)
It_IT	Italian
Ja_JP	Japanese (Katakana)
Ko_KR	Korean DBCS

Table 48. LANG Environment Variable Settings (continued)

LANG Value	**Language**	
Nl_BE	Belgian Dutch	
Nl_NL	Dutch Netherlands	
No_NO	Norwegian	
Pl_PL	Polish	
POSIX	Default locale	
Pt_BR	Brazilian Portuguese	
Pt_PT	Portuguese	
Ru_RU	Russian	
SAA	Default locale	
Sv_SE	Swedish	
S390	Default locale	
Tr_TR	Turkish	
Zh_CN	Simplified Chinese	
Zh_TW	Traditional Chinese	
The following set of LANG values are accepted values, but they are not translated to the specified language. They are translated to US English.		
Sq_AL	Albanian	
Ar_AA	Arabic	
Bg_BG	Bulgarian	
Hr_HR	Croatian	
En_BE	Belgian English	
Et_EE	Estonian	
Fa_IR	Farsi	
Iw_IL	Hebrew	
IS_IS	Icelandic	
Lt_LT	Lithuanian	
Lv_LV	Latvian	
Mk_MK	Macedonian	
Ro_RO	Romanian	
Sr_SP	Serbian (Cyrillic)	
Sk_SK	Slovakian	
Sl_SL	Slovenian	
Th_TH	Thai	
The following set of LANG values specified in the first column are mapped to the LANG values specified in the second column and translated to the specified language. The values in the second column are preferred.		
FRAN	Fr_FR	French

Table 48. LANG Environment Variable Settings (continued)

LANG Value	Language	
GERM	De_DE	German
ITAL	It_IT	Italian
SPAI	Es_ES	Spanish
UK	En_GB	English (UK)
USE	En_US	US English

The Network Station Manager runs as a set of CGI interface programs that are driven by the Domino Go Webserver. This means that the Network Station manager is dependent on the configuration of the webserver. Specifically, the Network Station manager is dependent on the setting of the LANG environment variable and the defaultFsCp and that are defined in the webserver configuration file. The LANG environment variable, which is inherited by using an InheritEnv directive, determines which language the Network Station manager will use to display data for the clients. The LANG environment variable must be set to one of the OS/390 locales that are listed in Table 48 on page 200. Because the Domino Go Webserver only supports a limited subset of these locales, the LANG environment variable set for the webserver must be overridden for the Network Station Manager using an InheritEnv directive. See the *Domino Go Webserver Webmaster's Guide* for details on the configuration directives.

Note: Using an InheritEnv directive in the webserver configuration file overrides the default inheritance of environment variables from the webserver to the CGI. You should also use an InheritEnv statement for the standard environment variables (such as PATH, NLSPATH, etc) so their values will be set in the Network Station Manager's environment.

Set the defaultFsCp and defaultNetCp directives to the values that are shown in Table 49. Clients accessing the Network Station Manager from Microsoft Windows based platforms can use the alternate Windows value for defaultNetCp. This only applies for the languages Cs_CZ, El_GR, Hu_HU, Pl_PL, and Ru_RU.

Table 49. defaultFsCp and defaultNetCp Directive Settings

LANG Value	defaultFsCp Value	defaultNetCP Value	Alternate Windows defaultNetCp Value	Language
C	IBM-1047	ISO8859-1		Default locale
POSIX	IBM-1047	ISO8859-1		Default locale
SAA	IBM-1047	ISO8859-1		Default locale
S390	IBM-1047	ISO8859-1		Default locale
En_US	IBM-1047	ISO8859-1		US English
Sq_AL	IBM-1047	ISO8859-1		Albanian
Ar_AA	IBM-1047	ISO8859-1		Arabic

Table 49. defaultFsCp and defaultNetCp Directive Settings (continued)

LANG Value	defaultFsCp Value	defaultNetCP Value	Alternate Windows defaultNetCp Value	Language
Bg_BG	IBM-1047	ISO8859-1		Bulgarian
Nl_BE	IBM-1047	ISO8859-1		Belgian Dutch
Fr_BE	IBM-1047	ISO8859-1		Belgian French MNCS
Pt_BR	IBM-1047	ISO8859-1		Brazilian Portuguese
Fr_CA	IBM-1047	ISO8859-1		Canadian French MNCS
Hr_HR	IBM-1047	ISO8859-1		Croatian
Cs_CZ	IBM-870	ISO8859-2	IBM-1250	Czech
Da_DK	IBM-1047	ISO8859-1		Danish
Nl_NL	IBM-1047	ISO8859-1		Dutch Netherlands
En_GB	IBM-1047	ISO8859-1		English (UK)
En_BE	IBM-1047	ISO8859-1		Belgian English
Et_EE	IBM-1047	ISO8859-1		Estonian
Fa_IR	IBM-1047	ISO8859-1		Farsi
Fi_FI	IBM-1047	ISO8859-1		Finnish
Fr_FR	IBM-1047	ISO8859-1		French
Fr_CH	IBM-1047	ISO8859-1		French (Swiss)
De_DE	IBM-1047	ISO8859-1		German
De_CH	IBM-1047	ISO8859-1		German (Swiss)
El_GR	IBM-875	ISO8859-7	IBM-1253	Greek
Iw_IL	IBM-1047	ISO8859-1		Hebrew
Hu_HU	IBM-870	ISO8859-2	IBM-1250	Hungarian
IS_IS	IBM-1047	ISO8859-1		Icelandic
It_CH	IBM-1047	ISO8859-1		Italian MNCS (Swiss)
It_IT	IBM-1047	ISO8859-1		Italian
Ja_JP	IBM-939	IBM-942		Japanese (Katakana)
Ko_KR	IBM-933	IBM-949		Korean DBCS
Lt_LT	IBM-1047	ISO8859-1		Lithuanian
Lv_LV	IBM-1047	ISO8859-1		Latvian

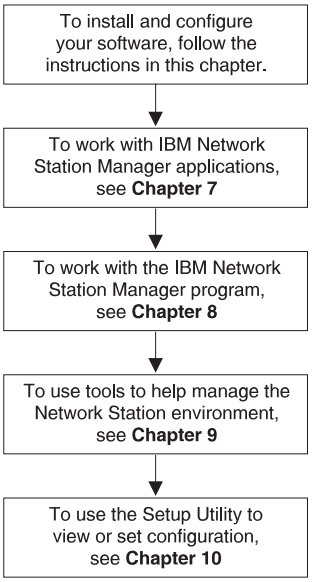
Table 49. defaultFsCp and defaultNetCp Directive Settings (continued)

LANG Value	defaultFsCp Value	defaultNetCP Value	Alternate Windows defaultNetCp Value	Language
Mk_MK	IBM-1047	ISO8859-1		Macedonian
No_NO	IBM-1047	ISO8859-1		Norwegian
Pl_PL	IBM-870	ISO8859-2	IBM-1250	Polish
Pt_PT	IBM-1047	ISO8859-1		Portuguese
Ro_RO	IBM-1047	ISO8859-1		Romanian
Ru_RU	IBM-1025	ISO8859-5	IBM-1251	Russian
Sr_SP	IBM-1047	ISO8859-1		Serbian (Cyrillic)
Sk_SK	IBM-1047	ISO8859-1		Slovakian
Sl_SL	IBM-1047	ISO8859-1		Slovenian
Es_ES	IBM-1047	ISO8859-1		Spanish
Sv_SE	IBM-1047	ISO8859-1		Swedish
Th_TH	IBM-1047	ISO8859-1		Thai
Zh_CN	IBM-935	IBM-1381		Simplified Chinese
Zh_TW	IBM-937	IBM-950		Traditional Chinese
Tr_TR	IBM-1026	ISO8859-9		Turkish
GERM	IBM-1047	ISO8859-1		Obsolete German
FRAN	IBM-1047	ISO8859-1		Obsolete French
UK	IBM-1047	ISO8859-1		Obsolete English (UK)
ITAL	IBM-1047	ISO8859-1		Obsolete Italian
SPAI	IBM-1047	ISO8859-1		Obsolete Spanish
USE	IBM-1047	ISO8859-1		Obsolete US English

Chapter 6. Installing and Configuring an IBM Network Station Environment on a VM/ESA Server

About this Chapter

This chapter contains instructions for planning, installing, and configuring a Network Station environment on a VM/ESA server. While completing the installation procedure and the configuration procedure, do not deviate from the order of the steps. The following figure demonstrates the flow of this manual.



Installation

This section describes the preparation and installation of the IBM Network Station Manager (5648-C05) licensed program.

Attention: If you have manually modified any configuration files instead of using the IBM Network Station Manager program in the past, refer to `http://www.ibm.com/nc/pubs` for Advanced User Information.

__ 1. Verify prerequisite software.

Your VM/ESA server must have the following:

- VM/ESA Version 2 Release 3.0
- TCP/IP Function Level 310
- Network File System (NFS), which is included with TCP/IP Function Level 310
- OpenEdition with Byte File System (BFS) (to contain kernel code for Network Station)
- Web server (for VM/ESA)
- JavaScript capable browser.

__ 2. Verify IBM Network Station memory requirements.

Network Stations download each of their appplications including their base systems into memory. You should verify that your Network Stations have enough memory to run their applications. Use the table at http://www.pc.ibm.com/networkstation/support/memrec_data.html to determine how much memory your Network Stations will need.

__ 3. Install the IBM Network Station Manager program (5648-C05).

The IBM Network Station Manager for VM/ESA licensed program product is available for VM/ESA Version 2 Release 3.0. You can install the IBM Network Station Manager for VM/ESA from tape.

The *Program Directory for Network Station Manager Release 3 for VM/ESA* ships with the IBM Network Station Manager. It describes the procedure for installing the IBM Network Station Manager from the distribution tape. The *Program Directory for Network Station Manager Release 3 for VM/ESA* contains the following information:

- Basic and optional program materials and documentation
- IBM support available
- Program and service APARs and PTFs
- Installation requirements and considerations
- Installation instructions

Use the Virtual Machine Serviceability Enhancements Staged with Extended (VMSES/E) to install the IBM Network Station Manager. For information about VMSES/E, see *VMSES/E Introduction and Reference*, GC24-5837.

__ 4. Install optional software.

__ a. Install the 128-bit NC Navigator (5648-C20)

For installation instructions, consult the product's program directory.

__ 5. Installation complete.

You have installed all the required software for the IBM Network Station Manager program. Continue to “Configuration” to configure your TCP/IP environment and boot server.

Configuration

__ 1. Choose a boot protocol and configuration method.

You must determine which boot protocol your Network Stations will use, and how you will configure your Network Station environment. Use Chapter 1, specifically sections “Boot Methods” on page 13 and “What Do I Need To Know About TCP/IP Networks?” on page 4, to learn more about boot methods and TCP/IP. Then use Table 50 to determine which boot method fits your needs and operating system.

Table 50. Available Boot Protocols and Boot Methods by Level of VM/ESA

Boot Method	V2R3 VM/ESA Configuration Method
BOOTP	Edit the configuration file.
DHCP	Edit the configuration file.
NVRAM	No boot server configuration necessary.

Table 51. Boot Method

Field	Description	Write Value Here
Boot Method	The method by which the Network Station will obtain its IP address and boot files.	

__ 2. Gather host information.

Stop: If you already have TCP/IP installed and configured, skip to step 3 on page 208. Otherwise, complete the following table.

Table 52. VM/ESA Host Information Chart

Field	Description	Write Value Here
1 VM/ESA IP Address	Each node on a network is known as a host and has a unique address called an Internet Protocol (IP) address. This address is a 32-bit integer that is expressed in the form nnn.nnn.nnn.nnn. In the example Figure 5 on page 7, the VM/ESA IP address is `192.168.1.4`. The VM/ESA IP address is the address that uniquely identifies this VM/ESA to TCP/IP. This address will be associated with the local host name to create a name entry in the Host Names table.	

Table 52. VM/ESA Host Information Chart (continued)

Field	Description	Write Value Here
2 Next Hop IP Address (Default Route)	The next hop address is the address of the IP router (if any) that your local LAN uses to route network traffic to other networks within and outside of your organization. In Figure 5 on page 7, the next hop address is `192.168.1.1`. The next hop address creates a default route for all network traffic that does not terminate on this host. You need this information only if your local LAN attaches to one or more IP routers.	
3 Remote Name Server IP Address	The remote name server (domain name server) IP address is the address of the system (if any) that will act as primary name server in this domain. In Figure 5 on page 7, the DNS is `192.168.1.5`.	
4 VM/ESA Local Host Name	The local host name is the name that is used to uniquely identify this system in a TCP/IP domain. In the example `server.mycompany.com`, the local host name is `server`.	
5 VM/ESA Local Domain Name	Remote servers use the domain name to identify the local host to other systems. In the example `server.mycompany.com`, the local domain name is `mycompany.com` Domain names consist of labels that are separated by periods. Your local domain name should be descriptive of your organization. The last portion of the local domain name should follow Internet conventions; that is, use COM for commercial enterprises, GOV for government organizations, and EDU for educational institutions.	

__ 3. Gather LAN information.

Stop: If you have already configured the LAN that will serve the Network Stations, skip to step 4 on page 209. Otherwise, complete the following table.

For each LAN that is attached to your VM/ESA, you should duplicate and complete a copy of Table 53.

Table 53. VM/ESA LAN Information Chart

Field	Description	Write Value Here
1 Line Description	You must create a line for your IBM Network Stations.	
2 LAN IP Address	The LAN IP address is the address that uniquely identifies each VM/ESA communication line to the LAN. Each LAN should have a unique IP address assigned. In Figure 5 on page 7, the LAN IP address is `192.168.1.4`. The example VM/ESA has only one LAN.	

Table 53. VM/ESA LAN Information Chart (continued)

Field	Description	Write Value Here
3 LAN Subnet Mask	A subnet mask is a configuration value that allows you to specify how your system determines what are the network and host parts of an IP address. For example, the subnet mask (255.255.255.0) indicates that the first three parts of the IP address relate to the network and the fourth part identifies unique hosts on this subnetwork.	

__ 4. Gather IP router/gateway information.

Stop: IP router/gateway information is necessary only if you have a router between your server and its clients. If you do not have this condition, skip to step 1 on page 207. Otherwise, complete the following table.

For each router that is attached to your VM/ESA system, you should duplicate and complete a copy of Table 54.

Table 54. VM/ESA IP Router/Gateway Information Chart

Field	Description	Write Value Here
1 Route (Remote LAN) IP Address	The network portion of the IP address of the remote LAN. In Figure 5 on page 7, the route (remote LAN) IP address is 10.1.1.1.	
2 Route (Remote LAN) Subnet Mask	The subnet mask for the route.	
3 Next Hop Address	The IP address of the router that will handle any requests that match the route IP address. In Figure 5 on page 7, the next hop address is 192.168.1.1.	

__ 5. Based on your decision in Table 50 on page 207, perform the appropriate action:

- If you choose to use the BOOTP protocol, go to step 6.
- If you choose to use the DHCP protocol, go to step 7 on page 211.
- If you choose to use the NVRAM boot method, go to step 8 on page 215.

__ 6. Gather information for a new BOOTP environment.

Use this section to gather information to configure a new BOOTP environment. Use Table 55 on page 210 to record the specific information that is needed to identify each Network Station in your network environment. You will use this information to create a BOOTP entry for each Network Station. You should complete one copy of Table 55 on page 210 for each LAN adapter with attached Network Stations.

Table 55. BOOTP Network Station Information

Field	Description	Write Value Here
1 Client Host Name	The host name identifies the Network Station as a unique destination within a TCP/IP environment. In Figure 5 on page 7, the host name for one of the Network Stations is `ns1.mycompany.com`.	
2 MAC Address	The Media Access Control (MAC) address is a unique hardware-specific identifier for each Network Station. The address is located on the box of the Network Station. To find the MAC address without the box, follow this procedure: a. Power on the Network Station. b. After the keyboard controller test, press Escape. c. In the Setup Utility, press F4. d. Record the MAC address.	
3 IP Address	Each Network Station requires a unique IP address. In Figure 5 on page 7, `NS1.mycompany.com` has an IP address of `192.168.1.2`.You must assign a specific address to each Network Station. You should ensure that the IP address is valid for your organization and that no other device in the network uses it.	
4 Hardware Type	Your Network Stations can attach to either a token-ring or Ethernet LAN. • Record a hardware type of 6 for token-ring or IEEE (802.3) Ethernet networks. • Record a hardware type of 1 for a Version 2 (802.2) Ethernet network.	
5 Gateway IP Address for Remote LANs	If you do not use a gateway IP address for remote LANs, disregard this field. If the LAN that you are attaching Network Stations to is not directly attached to your VM/ESA system, it is referred to as a remote LAN. You need to specify the IP address of the IP router/gateway that your Network Station will use to reach the server. In Figure 5 on page 7, the gateway IP address for Network Station `ns3.mycompany.com` is `10.1.1.1`.	
6 Subnet Mask for Remote LANs	If you do not use a gateway IP address for remote LANs, disregard this field.	

Table 55. BOOTP Network Station Information (continued)

Field	Description	Write Value Here
7 Boot Type	The boot type is a constant. *IBMNSM* identifies this network device as a Network Station.	*IBMNSM*
8 Boot File Name	The boot file name is the name of the file that the Network Station downloads and uses to boot the remote device. The value, *kernel*, is a constant.	*kernel* The boot file name is case sensitive.
9 Boot File Path	The boot file path is the path name that is used to access the boot file on the host and is a constant.	*/../VMBFS:VMSYSU:QIBM/ProdData/ NetworkStation/* The boot file path is case sensitive.

Use Table 56 to define any additional Network Stations for the BOOTP table.

Table 56. Additional BOOTP Network Stations

7 Host Name	8 MAC Address	9 IP Address	10 Printer Type

You have completed gathering information for a BOOTP environment. Go to step 8 on page 215.

__ 7. Gather information for a new DHCP environment.

When you first set up a DHCP environment, you must configure its global attributes. Fill in the information in Table 57 to collect the necessary data for the DHCP global information.

Table 57. DHCP Global Information

Field	Description	Write Value Here
1 Migrate BOOTP	If your VM/ESA serves BOOTP clients, you have entries in the BOOTP table. If you would like to migrate your existing clients, these migrated clients will use the DHCP server to obtain their IP addresses, but the addresses will be static like BOOTP.	Yes or No

Table 57. DHCP Global Information (continued)

Field	Description	Write Value Here
2 Global Bootstrap Address	If you migrate BOOTP clients, you must define their Bootstrap server. The Bootstrap server delivers the boot files to the IBM Network Stations. Enter the Bootstrap server's IP address. In Figure 5 on page 7, the Bootstrap server address for subnet `192.168.1.0` is `192.168.1.4`. For the subnet `10.1.1.0`, the Bootstrap server address is still `192.168.1.4`, but you must pass a gateway address of `10.1.1.1` on line 12. In most cases, the Bootstrap server address is the same IP address as your DHCP server.	
3 Default lease time	This refers to the amount of time a server lets clients keep an IP address.	
4 Network Station Class Numbers	For each model of Network Station in your subnet, you must define a class that represents it. A Network Station class is a three digit number, prefaced by IBMNSM. To define Network Station class numbers, see "Determining DHCP Classes" on page 22. Record the class names here.	

Table 58 helps you collect the values to define a subnet in your DHCP environment. For each subnet you wish to define, copy and complete Table 58.

Table 58. DHCP Subnet Information

Field	Description	Write Value Here
1 Support Twinaxial Devices	If you intend to support twinaxial IBM Network Stations, answer yes. Then, read "Planning for Your Twinaxial TCP/IP Network" on page 347 for twinaxial considerations and "Subnets and Subnet Masks" on page 9.	Yes or No

Table 58. DHCP Subnet Information (continued)

Field	Description	Write Value Here
3 Subnet based on range or entire subnet? **Note:** For subnets supporting twinaxial IBM Network Stations, you must choose entire subnet.	Subnet IP addresses are defined two different ways—based on an entire subnet or on a restricted range. The entire subnet option allocates every possible address for DHCP. In Figure 3 on page 5, the entire subnet option allocates `192.168.1.1` through `192.168.1.255`. If you base the addresses of the subnet on a range, you control the beginning and ending IP addresses.	Range or Entire
4 Subnet Name	This value is for descriptive use only. It does not affect the performance of DHCP, but you should use a value that is easily recognizable. In Figure 5 on page 7, the subnet name could be `192.168.1.0`.	
5 Subnet Description	This value is also for descriptive use only. An example subnet description for Figure 5 on page 7 could be `Token-Ring Subnet`.	
6 Subnet Address **Note:** The subnet address is only for subnets in which the entire subnet is reserved for DHCP addressing.	The IP address associated with a particular subnet. For a Class C network whose subnet mask is 255.255.255.0, the subnet address is the same as the network address. In Figure 5 on page 7, the subnet IP address is `192.168.1.0`.	
7 Starting Address **Note:** Only for subnets based on a range.	The first IP address in the range that you have specified for your pool of available addresses. For the subnet 192.168.1.0 in Figure 5 on page 7, the starting address could be `192.168.1.2`.	
8 Ending Address **Note:** Only for subnets based on a range.	The last IP address in the range that you have specified for your pool of available addresses. For the subnet 192.168.1.0 in Figure 5 on page 7, the ending address could be `192.168.1.3`. The specified range (192.168.1.2 – 192.168.1.3) allows for only two clients on the subnet.	
9 Subnet's Mask	A value that enables network devices to direct packets of information accurately in a subnetted environment. In Figure 5 on page 7, the subnet mask is 255.255.255.0. For more information about subnet masks, refer to "Subnets and Subnet Masks" on page 9.	

Table 58. DHCP Subnet Information (continued)

Field	Description	Write Value Here
10 Excluded IP Address	If any routers, gateways, or statically addressed servers are within your subnet range, you must exclude those IP addresses. If you have migrated BOOTP clients, you do not need to exclude their IP addresses. If the DHCP range was 192.168.1.1 through 192.168.1.50 in Figure 5 on page 7, you would exclude `192.168.1.4` and `192.168.1.5`. They are the static IP addresses of the domain name server and the client server.	
11 Subnet Lease Time	The subnet lease time has three options. Choose one: • Inherit means that the subnet uses the value of the global lease time. • User-defined is a value defined by you. • Never expire.	inherit, user-defined, or never expire
The following values are delivered to the IBM Network Stations.		
12 Deliver gateway IP addresses?	The IP address of the default router to which TCP/IP packets not addressed for your network are sent. In Figure 5 on page 7, for the subnet 10.1.1.0, the default gateway IP address for client `ns3.mycompany.com` is `10.1.1.1`.	Yes or No
	If yes, enter the gateway IP address or addresses.	
13 Deliver domain name server (DNS) address to clients in their subnet?	Delivering the domain name server IP address to clients allows them to use either fully qualified host names or IP addresses when they communicate with other devices. In Figure 5 on page 7, the IP address of the domain name server is `192.168.1.5`.	Yes or No
	If yes, enter the DNS IP address or addresses.	
14 Deliver domain name to client?	The domain name allows the IBM Network Station to specify its domain to other devices. In Figure 5 on page 7, where the fully qualified host name is `server.mycompany.com`, the domain name is `mycompany.com`.	Yes or No
	If Yes, enter domain name.	

Table 58. DHCP Subnet Information (continued)

Field	Description	Write Value Here
15 Subnet Mask	A value that enables network devices to direct packets of information accurately in a subnetted environment. This subnet value is delivered to the IBM Network Stations and is usually the same value that you recorded on line **9** of Table 58 on page 212. For Figure 5 on page 7, the subnet mask is 255.255.255.0. For more information about subnet masks, refer to "Subnets and Subnet Masks" on page 9.	
16 Boot File Name	The name of the file that contains the IBM Network Station's operating system. This value is a constant and has been entered for you on the table.	*/QIBM/ProdData/NetworkStation/kernel* The boot file name is case sensitive.
17 Append domain name to host name?	The Append domain name option specifies whether the DHCP server should append a domain name to client responses that omit a domain name.	Yes, No, or inherited.

__ 8. Preparation for setup.

As system administrator, you need to plan the integration of IBM Network Stations into your computing environment. A system administrator is a user that has root authority. A user ID with root authority (UID=0) installs and configures your system for Network Station use.

__ 9. Verify your TCP/IP configuration for IBM Network Stations.

__ a. Verify that TCP/IP is enabled. If it is not enabled, refer to the *TCP/IP Feature for VM/ESA Function Level 310 Program Directory* for information on how to enable TCP/IP.

__ b. Browse the PROFILE TCPIP configuration file and the TCPIP DATA file to verify the following information:

- VM/ESA IP address
- Default route/next hop IP address
- Remote name server IP address
- VM/ESA local host name
- VM/ESA local domain name
- TCP/IP interfaces

  For each LAN:
  - Line description
  - LAN IP address
  - LAN subnet mask
- TCP/IP routes to remote networks

  For each router:
  - Remote LAN IP address

– Remote LAN subnet mask
– Next hop address

__ 10. Configure your Web server.

To configure your Web server, refer to the product documentation that is shipped with the Web server you are using.

__ 11. Select your boot protocol.

Based on your decision in step 1 on page 207, select your boot protocol:

- If you choose the BOOTP protocol, continue to step 12.
- If you choose the DHCP method, continue to step 13.
- If you choose the NVRAM boot method, go to “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301, then return to step 14 on page 217.

__ 12. Configure the BOOTP server.

Two files contain the information necessary to run the BOOTP server. The machine file contains the mapping between the client hardware address and IP address. The machine file also contains the BOOTP data that is passed to the client. The configuration file lists adapters on the host that should be monitored. The configuration file also determines whether to forward BOOTP requests and when and where the requests are sent.

To configure the BOOTP server, follow these steps:

__ a. Update the TCP/IP server configuration file to specify any BOOTP startup parameters.

__ b. Update the DTCPARMS file for BOOTPD.

__ c. Configure the ETC BOOTPTAB file to add or remove BOOTP entries for each IBM Network Station physically present in your network.

__ d. Issue the BOOTPD command.

For more information, see the *TCP/IP Function Level 310 Planning and Customization* manual.

__ 13. Configure the DHCP server.

Two files contain the information necessary to run the DHCP server. The machine file defines the information returned to clients as configuration parameters and determines how addresses are to be assigned. The configuration file lists adapters on the host that should be monitored. The configuration file also determines whether to forward BOOTP or DHCP requests and when and where the requests are sent.

To configure the DHCP server, follow these steps:

__ a. Update the TCP/IP server configuration file to specify any DHCP startup parameters.

__ b. Update the DTCPARMS file for DHCPD.

__ c. Configure the ETC DHCPTAB file to add or remove entries for each IBM Network Station physically present in your network.

__ d. Issue the DHCPD command.

For more information, see the *TCP/IP Function Level 310 Planning and Customization* manual. For information about the options that are used to configure DHCP for load balancing, refer to “Configuring DHCP for Load Balancing” on page 220.

__ 14. Configure the Trivial File Transfer Protocol daemon (TFTPD) server.

The TFTPD server transfers files between the Byte File System (BFS) and the TFTP clients. TFTPD supports access to files in a BFS directory structure that are mounted during initialization.

To configure the TFTPD server, follow these steps:

__ a. Update the TCP/IP server configuration file.

__ b. Update the DTCPARMS file for TFTPD.

__ c. Review and address additional configuration considerations.

__ d. Create the TFTPD PERMLIST data file.

__ e. Create the TFTPF USERLIST data file.

For details on configuring the TFTPD server and using the TFTPD command and associated subcommands, see the *TCP/IP for VM/ESA Function Level 310 Planning and Customization.*

__ 15. Configure the Network File System (NFS) server.

NFS provides clients access to files and directories.

To configure the NFS server, follow these steps:

__ a. Enable the NFS feature. You must enable NFS before you can use it. For information on enabling NFS, see the *TCP/IP Feature for VM/ESA Function Level 310 Program Directory.*

__ b. Update the TCPIP server configuration file.

__ c. Update the DTCPARMS file for VMNFS.

__ d. Perform advanced configuration steps as needed.

For details on configuring the NFS server, see the *TCP/IP for VM/ESA Function Level 310 Planning and Customization.*

__ 16. Configure the Network Station Login daemon (NSLD) server.

The NSLD server responds to Network Station Login client requests for login information about the user ID logging into an IBM Network Station. The NSLD server first determines if the user ID and password combination are valid on this system. If it is not valid, an error response in sent to the client. If it is valid, the information passed back to the IBM Network Station includes the user’s user ID and group ID, home directory, and Network Station Manager preference directory.

Note: The NSLD code must be in an authorized library to determine user ID and password validity. When you are using IBM Network Station Manager, the `/usr/lpp/nsm/sbin/` directory contains the NSLD code.

The NSLD server reads a configuration file (NSLD CONFIG) that contains information necessary to mount the product defaults, user configuration, and user's home directories.

__ a. If you are not changing the user configuration server, product defaults, or user's home directory definitions, go to step 16.d on page 219 to start the NSLD server. If you are changing definitions, continue to the following step.

__ b. Copy the contents of the NSLD CONFIG file into another file. The file will look similar to the following:

```
! User Configuration server
nsm_userconfig_mount_type = MOUNT_NFS
nsm_userconfig_server = xx.xx.xx.xx
nsm_userconfig_directory = /../VMBFS:VMSYSU:QIBM/UserData/NetworkStation
!
! Product defaults
! The server and mount_type for the product defaults will be the
same as the user configuration server.
nsm_prod_sysdefaults_directory = /../VMBFS:VMSYSU:QIBM/ProdData/NetworkStation/SysDef/
!
! User's home directory
home_mount_type = MOUNT_NFS
home_directory = /../VMBFS:VMSYSU:QIBM/UserData/NetworkStation/users/$USERID
```

nsm_userconfig_mount_type
defines the mount type as MOUNT_NFS.

nsm_userconfig_server
is the name or IP address of the server. If a null string follows the =, `nsm_userconfig_server` is the authentication server.

nsm_userconfig_directory
is the directory path name of the user configuration server.

nsm_prod_sysdefaults_directory
is the directory path name of the product defaults.

home_mount_type
defines the mount type as MOUNT_NFS.

home_directory
is the directory path name of the user's home directory. If a null string follows the =, `home_directory` is the user's HOME directory defined by the authentication server. The home path name can include a $USERID format string to allow substitution with user specific data.

The directory path names must consist of an absolute path to the mount point. The path name must use a forward slash (/) as a directory delimiter.

__ c. Update the NSLD CONFIG file.

__ d. Start the NSLD server by adding the nsld command to the PROFILE EXEC:

`nsld [`*port*`] [([STAYUP|TRACE]`

port
specifies the port that receives requests. The NSLD server usually receives requests on well-known port 256.

STAYUP
indicates that the NSLD server should continue to operate if subsequent VM/ESA TCP/IP failures occur.

TRACE
indicates that the NSLD server should display trace information while processing requests.

__ e. Use the NSLD subcommands.

You must be logged on to the NSLD server to use the NSLD subcommands. Table 59 provides the shortest abbreviation and a description for each NSLD subcommand.

Table 59. NSLD Subcommands

Subcommand	Minimum Abbreviations	Description
CMS	CMS	Passes a command to CMS for execution.
EXIT	EXIT	Stop the NSLD server and its processing. EXIT is equivalent to QUIT and STOP.
HELP	HELP	Displays a summary of NSLD subcommands.
QUIT	QUIT	Stops the NSLD server and its processing. QUIT is equivalent to EXIT and STOP.
STAYUP	STAYUP	Toggles the STAYUP mode of the NSLD server.
STOP	STOP	Stops the NSLD Server and its processing. Stop is equivalent to EXIT and QUIT.

Notes:

1) Do not issue any CMS command that would take considerable time to run, for example, XEDIT. While the CMS command runs, the server does not respond to requests.
2) The CMS keyword is usually not required because the server passes any command string that is not recognized as a NSLD subcommand to CMS. The CMS keyword identifies commands that are normally interpreted as subcommands, for example TRACE.

After completion of any command, the following ready prompt displays:
`NSLD Ready;.`

Before You Continue

Before you begin using your Network Stations, read and complete (when applicable) each of the following items:

- To take advantage of new functionality, you must update the boot monitor on your Network Stations. Each of your Network Stations must have a minimum boot monitor version of 3.0.0. Even if you have purchased new Network Stations, you should update the boot monitors of your Network Stations. For information about updating boot monitors, see “Updating the Boot Monitor Code” on page 265.
- Verify that the Network Parameters in the Setup Utility of your Network Stations agree with your boot method. For example, if you want a Network Station to obtain its IP address through a DHCP server, ensure that the *IP Addressed from* field is Network. See “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301 for more information about the Setup Utility. Network Stations are ready to start when they ship from the factory.
- Verify that your BOOTP or DHCP server, NFS or TFTP server, and web server are started.
- Verify that you excluded any statically addressed devices in your DHCP addressing range.
- If you have a router between your Network Station and your boot server, verify that the router handles BOOTP and DHCP requests.
- For more information about setting up Network Stations, see the following sections:
  - “Chapter 7. Logging On and Working With IBM Network Station Manager Applications” on page 223
  - “Chapter 8. Using the IBM Network Station Manager Program” on page 245
  - “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301

Configuring DHCP for Load Balancing

To configure DHCP for load balancing on an VM/ESA server, you must define Options 211 through 214 in the ETC DHCPTAB file. You define DHCP classes on the subnet level. Because you configure the load balancing values on the DHCP class, only Network Stations can use them. If you have any other devices using the DHCP on that same subnet, they will not be affected. Before you complete this section, read “Taking Advantage of Multiple Server Environments” on page 18.

Table 60 on page 221 lists and describes the DHCP load balancing options. Refer to *TCP/IP for VM/ESA Function Level 310 Planning and Customization* for more information on DHCP options.

Table 60. DHCP Load Balancing Options

Option Number (Name)	Description	Data Format
211 (Base Code Server Protocol)	Protocol to use for Option 66 (Base Code Server).	Character String
212 (Terminal Configuration Server)	Terminal configuration server IP address of name. You can specify up to two addresses separated by a blank.	IP Addresses
213 (Terminal Configuration Path)	Configuration file path name for Option 212 (Terminal Configuration Server). You can specify up to two paths separated by a blank.	Character String
214 (Terminal Configuration Protocol)	Protocol to use for Option 212 (Terminal Configuration Server). You can specify up to two values separated by a blank.	Character String

For example:

```
subnet __line
 {
  option 211 "nfs"
  option 212 "192.5.179.25"
  option 213 "/../VMBFS:VMSYSU:QIBM/ProdData/NetworkStation/configs/"
  options 214 "nfs"
 }
 class IBMNSM 1.0.0
 class IBMNSM 2.0.0
 class IBMNSM 4.0.0
 vendor IBM Network Station
```

Configuring Printers on VM/ESA

You can configure printers for your Network Stations with the IBM Network Station Manager program unless the datastream generated by the Network Station application does not match a datastream that your printer understands. Table 62 on page 242 describes which datastreams the common Network Station applications produce. If your Network Station application does not produce a datastream that your printer understands, you will not be able to print.

Configuring Basic Printer Scenarios

Table 61 on page 222 explains the basic steps to configure printers for your Network Stations. Identify the scenario that best meets your needs and follow the steps to configure your printers.

Table 61. Configuration Descriptions for Basic Printer Scenarios

Desired Print Scenario	Configuration Instructions
Network Station to a LAN printer	1. In the Network Station Manager program, configure an entry in the *Remote Printer Server* field for the LAN printer.
Network Station to a locally attached printer	1. In the Network Station Manager program, configure an entry in the *Local Parallel Printer* or the *Local Serial Printer* field, depending on how the printer connects to the Network Station.
Network Station to another Network Station with an attached printer	1. In the Network Station Manager program, configure an entry in the *Remote Printer Server* field with the IP address of the Network Station to which the printer is attached. In the *Queue name* field, type `PARALLEL1` or `SERIAL1`, depending on how the printer connects to the Network Station.

Chapter 7. Logging On and Working With IBM Network Station Manager Applications

Logging On

After you power on your IBM Network Station network computer, the login screen appears. Figure 42 on page 224 shows the initial login screen. You can sign on by typing your user ID and password in the appropriate entry box.

Note: The mouse pointer must be inside the window to make the window active.

Figure 42. Network Station Login Screen

Roam Button

The Roam button allows a user to log in to a server other than the server that is displayed on the login screen.

To log in to a server other than the server name that is displayed on the login screen, take the following steps:

1. Click the **Roam** button on the login screen. A screen similar to the one that is shown in Figure 43 appears.
2. Type in the name or IP address of the host where your user ID account is established and click **OK**. Your personal desktop will appear on the Network Station that you are using.

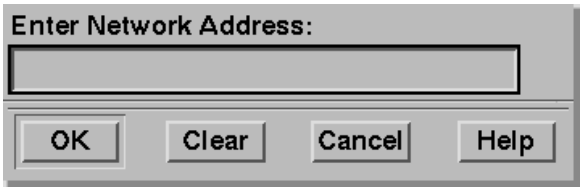


Figure 43. Network Address Screen used for Roaming

For more information about roaming and working with multiple servers, see “Taking Advantage of Multiple Server Environments” on page 18.

After You Log In

Whether you log in as usual or log in using the Roam button, your regular set of Network Station applications appear.

Figure 44 shows the Network Station Menu bar, which contains the applications available to select. The applications will appear on your screen if the IBM Network Station Manager program specified them to autostart. See “Chapter 8. Using the IBM Network Station Manager Program” on page 245 for more information. If no applications autostart, you can select an application from the Menu bar. Available default application buttons are 5250, 3270, and NC Navigator (a browser).

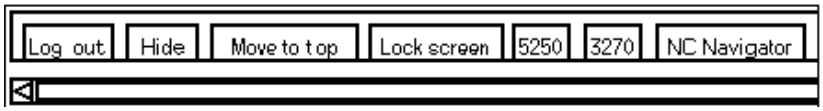


Figure 44. Network Station Menu Bar

The buttons within the Menu bar are as follows:

- Log out

  Clicking **Log out** logs you off the Network Station.
- Hide or Show

  Clicking **Hide** makes the Menu bar float out of view when you move the mouse pointer off the Menu bar. To retrieve the Menu bar, move your mouse pointer to the very bottom of your screen. (If you clicked the **Move to top** button, go to the very top of the screen instead.) The **Hide** button or **Show** button is useful if the Menu bar covers part of an application window. Click the **Show** button to display the Menu bar.
- Move to top or Move to bottom

  Clicking **Move to top** moves the Menu bar to the top of the screen. The **Move to top** button changes to read **Move to bottom** after the Menu bar moves to the top. Clicking the **Move to bottom** moves the Menu bar back to the bottom.
- Other buttons

  Other buttons on the Menu bar represent applications you can use.
- Lock screen

  The **Lock screen** button allows you to lock the screen when you leave the workstation. Clicking the **Lock screen** button enables a prompt for the password.

Note: You can control the presentation of buttons on the Menu bar. In your environment, you may or may not want users to have access to various applications (for example, additional 5250 sessions). The IBM Network Station Manager program allows you the flexibility of controlling access to various applications through Menu Bar Options. See “Working with Menu Bar Options” on page 272 for more information about working with Menu Bar Options.

Working with the 5250 Emulation Application

The 5250 application provides access to an AS/400 system. How each 5250 session is presented on the Network Station depends on how you configured the session using the IBM Network Station Manager program.

If, using the IBM Network Station Manager program, the 5250 session was set to autostart, a 5250 session appears on your Network Station as shown in Figure 45.

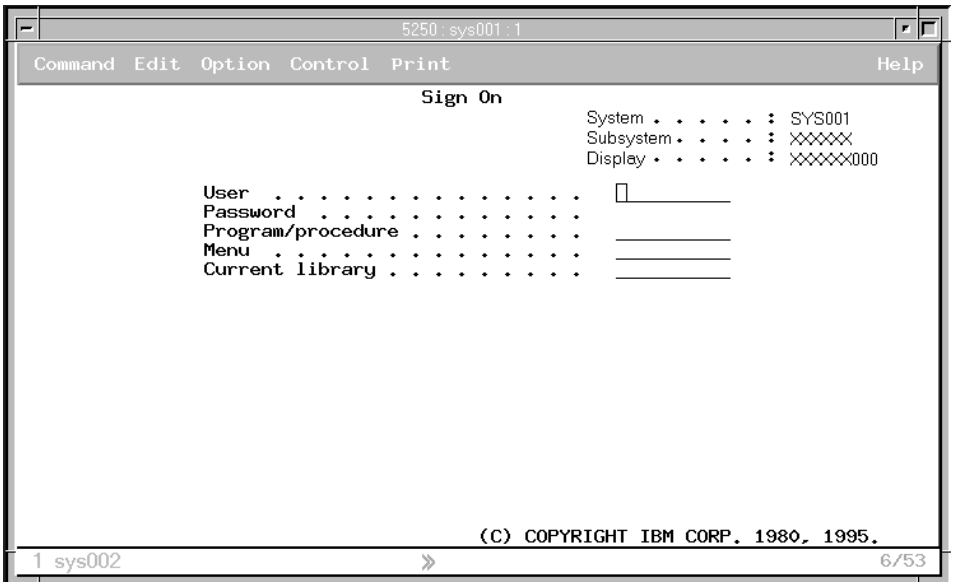


Figure 45. 5250 Session Display

If you click the 5250 button within the Network Station Menu bar, a New 5250 Session window appears. See Figure 46.

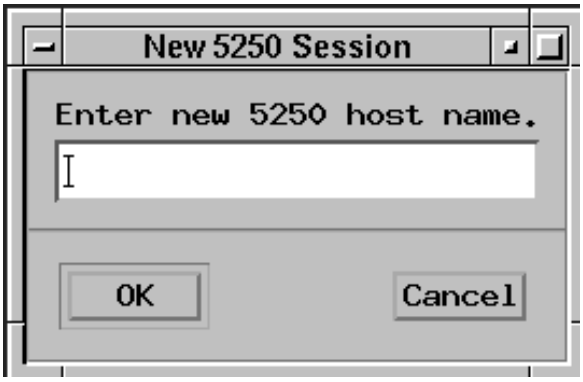


Figure 46. New 5250 Session Dialog Box

Note: You can use the name of the system or the IP address of the system to connect to or start a session. To use a system name, you must set up name translation (using the Domain Name Server (DNS)) information in your TCP/IP configuration.

Depending on the volume of network traffic, it can take from several seconds to a minute to see the sign-on display.

Learning About the 5250 Emulation Function

5250 emulation provides AS/400 system users with greater function than they normally receive if they use only a nonprogrammable work station (NWS) to access the system. This additional function is available by clicking various pulldown options from the 5250 Menu bar. See Figure 47.

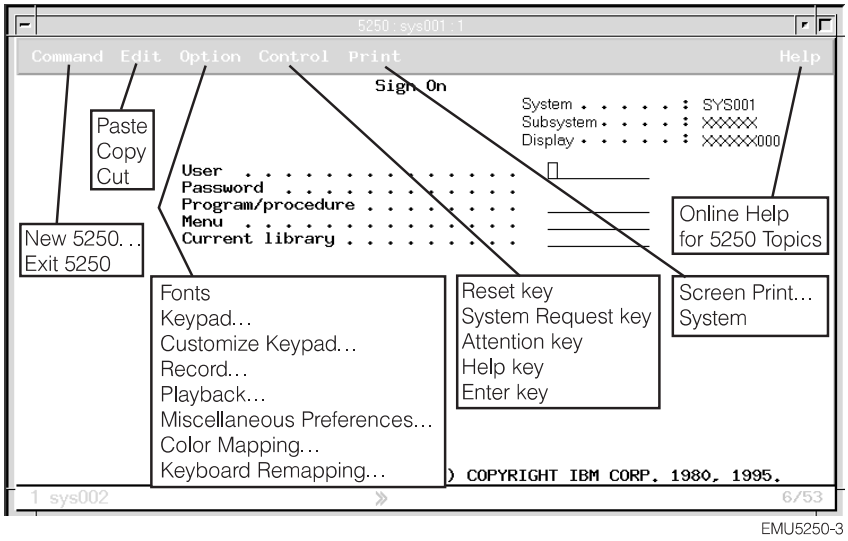


Figure 47. 5250 Emulation Session with Expanded Pulldowns

Pulldowns are available to allow you to quickly access 5250 emulation functions. See Figure 47. For example, multi-session support (Command pulldown), font selection by session (Option pulldown), screen print (Print pulldown), and online help (Help) information.

The following list shows additional 5250 emulation support:

- Keyboard remapping[5]
- Color mapping (basic and advanced)[5]
- Record/playback capability[5]
- Autostart of playback file (from the Record/playback function)[5]
- Auto-logon[5]

5. The IBM Network Station Manager program controls these 5250 Emulation functions. See “Chapter 8. Using the IBM Network Station Manager Program” on page 245 for more information. The online help information in the IBM Network Station Manager program provides more information along with all default settings.

- User customized keypads[5]
- Enter/Field Exit key locations (you can specify your choice of keys to be used for the Enter and Field Exit keys)
- Multiple screen size support (for example: 24 X 80, 27 X 132)
- Office Vision/400 controller text assist
- Cut, copy, paste function[5]
- Hotspot support
- Cursor style options (Cursor style options are block, underscore, blink, and no blink.)
- Rule line support
- Row indicator and column indicator
- Customizable window title[5]
- Column separator function

All the 5250 emulation functions have shipped defaults. Those functions that are managed by the IBM Network Station Manager program also have IBM-supplied defaults. See “Appendix D. IBM Network Station Manager Program Shipped Default Settings” on page 361 for a listing of all 5250 emulation defaults controlled by the IBM Network Station Manager program.

Accessing the online 5250 Emulation Help (by clicking the Help button) provides more information about how to make each of these 5250 Emulation functions work.

Eliminating the 5250 Emulator New Session Dialog Box for Japanese Users

The IBM Network Station Manager program (by default) displays a New Session Dialog box coupled with a Language ID Selection Dialog box for Japanese users. The New Session Dialog box and Language ID Selection box are shown in Figure 48 and Figure 49 on page 229.

Figure 48. Japanese New Session Dialog Box

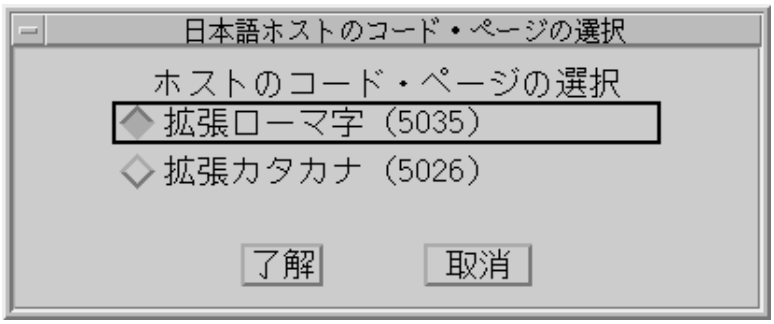


Figure 49. Language ID Selection Dialog Box

These dialog boxes are presented because the IBM Network Station Manager program needs to know which language ID to use. Japanese users have two language options: Japanese Extended Katakana and Japanese Extended Latin.

Having to choose the language option makes Japanese users go through the extra steps of selecting their host and language ID.

These extra steps (New Session Dialog box and Language ID Selection Dialog box) can be eliminated by adding the LANGID parameter value to the 5250 Startup configurations. Figure 50 shows the configuration information needed to eliminate the New Session Dialog box and Language ID Selection Dialog box.

Figure 50. Network Station Manager Program with 5250 -LANGID used.

Following is an example of the -LANGID coding for the two language options:

```
Japanese Extended Katakana:  -LANGID JA_JP.IBM930
Japanese Extended Latin:     -LANGID JA_JP.IBM939
```

Notes:

1. You can configure the LANGID parameter in either the Program or Menu functions of Startup.
2. You must type the parameter values in uppercase

Accessing Help

You can access help for the 5250 Emulator or your AS/400 session.

For 5250 emulator help, click Help in the emulator's Task bar. To access help for AS/400, sign on to AS/400 and press F1.

Working with the 3270 Application

The 3270 application provides access to a System/390. How a 3270 session is presented on the Network Station depends on how you configured the session using the IBM Network Station Manager program.

If you have set the 3270 session to autostart, a 3270 session appears on the screen of your Network Station. See Figure 51.

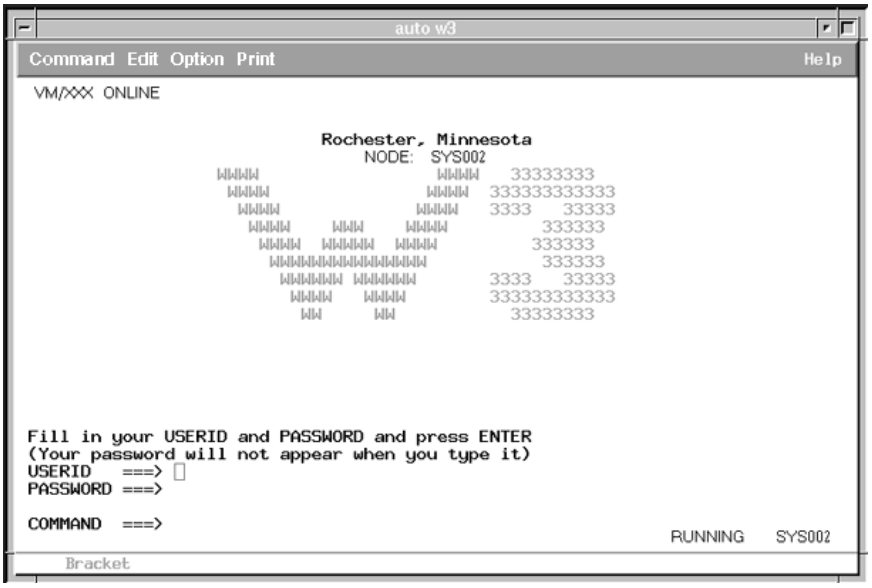


Figure 51. 3270 Session Display

If the 3270 session is configured not to autostart, and you click the 3270 button on the Menu bar, a New 3270 Session window appears. See Figure 52 on page 231.

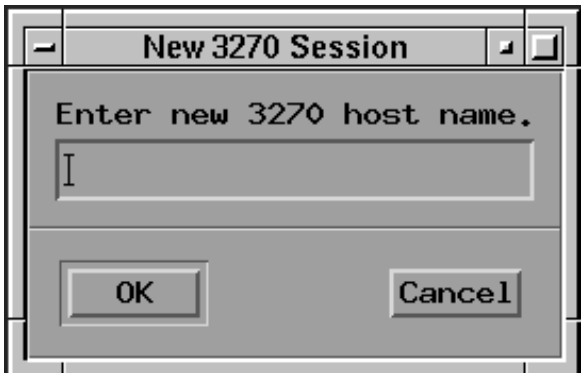


Figure 52. New 3270 Session Dialog Box

Note: You can use the system's name or IP address to log on. To use a system name, you must set up name translation information (using the Domain Name Server (DNS)) in your TCP/IP configuration.

Depending on the volume of network traffic, it can take from several seconds to a minute for the *Host Login Session* screen to appear.

Learning About the 3270 Emulation Function

3270 emulation provides users with greater function than they normally receive using a 3270 nonprogrammable work station (NWS) to access a System/390. This additional function is available by clicking various pulldown options from the 3270 Menu bar. See Figure 53 on page 232:

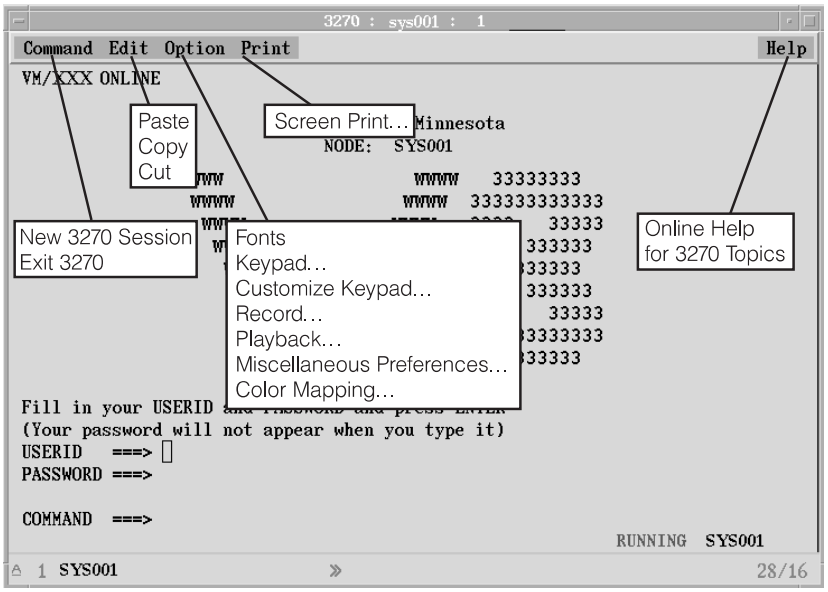


Figure 53. 3270 Emulation Session with Expanded Pulldowns

Figure 53 shows the pulldowns that are available to allow you to quickly access 3270 emulation functions such as the following:

- Multi-session support (Command pulldown)
- Font selection by session (Option pulldown)
- Print support (Print pulldown)
- Edit support (Edit pulldown)
- Online help (Help) information

The following list shows some of the 3270 emulation support:

- Keyboard remapping[6]
- Color mapping[6]
- Record/playback[6]
- Autostart of playback file (from the Record/playback function)[6]
- Auto-logon[6]
- User customized keypads[6]
- Graphics support[6]
- Choosing an Enter key location[6]

6. The IBM Network Station Manager program controls these 3270 emulation functions. See “Chapter 8. Using the IBM Network Station Manager Program” on page 245 for more information. Also, the online help information in the IBM Network Station Manager program provides information along with all default settings for 3270 emulation.

- Screen size support (for example: 24 x 80, 32 x 80, 43 x 80, and 27 x 132)[6]
- Cut/Copy/Paste function[6]
- Auto action (hotspot support)
- Cursor style options (The cursor style options are block or underscore and blink or no blink.)[6]
- Rule line[6]
- Row and column indicator[6]
- Customizable window title[6]

All the 3270 emulation functions have shipped defaults. Those functions that are managed by the IBM Network Station Manager program also have IBM-supplied defaults. See “Appendix D. IBM Network Station Manager Program Shipped Default Settings” on page 361 for a listing of all 3270 emulation defaults controlled by the IBM Network Station Manager program.

Accessing the 3270 emulation Help (clicking the Help button) provides more information about how to make each of these 3270 emulation functions work.

Eliminating the 3270 Emulator New Session Dialog Box for Japanese Users

The IBM Network Station Manager program (by default) displays a New Session Dialog box coupled with a Language ID Selection Dialog box for Japanese users. The New Session Dialog box and Language ID Selection box are shown in Figure 54 and Figure 55 on page 234.

Figure 54. Japanese New Session Dialog Box

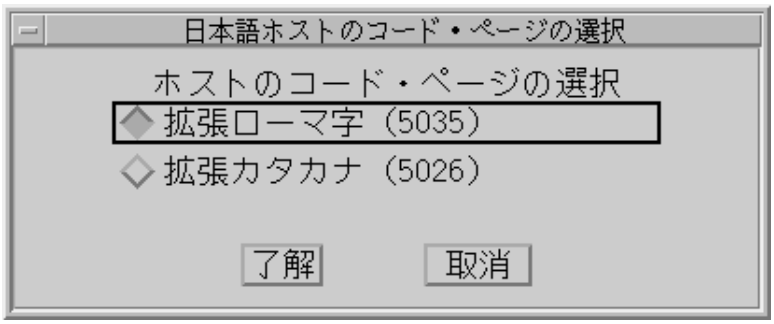


Figure 55. Language ID Selection Dialog Box

These dialog boxes are presented because the IBM Network Station Manager program needs to know which language ID to use. Japanese users have two language options: Japanese Extended Katakana and Japanese Extended Latin.

Having to choose the language option makes Japanese users go through the extra steps of selecting their host and language ID.

These extra steps (New Session Dialog box and Language ID Selection Dialog box) can be eliminated by adding the LANGID parameter value to the 3270 Startup configurations. Figure 56 shows the configuration information needed to eliminate the New Session Dialog box and Language ID Selection Dialog box.

Figure 56. Network Station Manager Program with 3270 -LANGID used.

Following is an example of the -LANGID coding for the two language options:

```
Japanese Extended Katakana:  -LANGID JA_JP.IBM930
Japanese Extended Latin:     -LANGID JA_JP.IBM939
```

Notes:

1. You can configure the LANGID parameter in either the Program or Menu functions of Startup.
2. You must type the parameter values in uppercase

Accessing Help

You can access help for the 3270 Emulator or your Host session.

You can access 3270 emulator help by clicking **Help** in the emulator tool bar. In general, to access help for the 3270 application, place your mouse pointer inside the *Host session* window and press F1.

Working with the NC Navigator Browser

You can use NC Navigator to access the Internet and the IBM Network Station Manager program. See “Chapter 8. Using the IBM Network Station Manager Program” on page 245 for more information.

If you configured the NC Navigator session to autostart, a NC Navigator session will appear on the screen of your Network Station. See Figure 57.

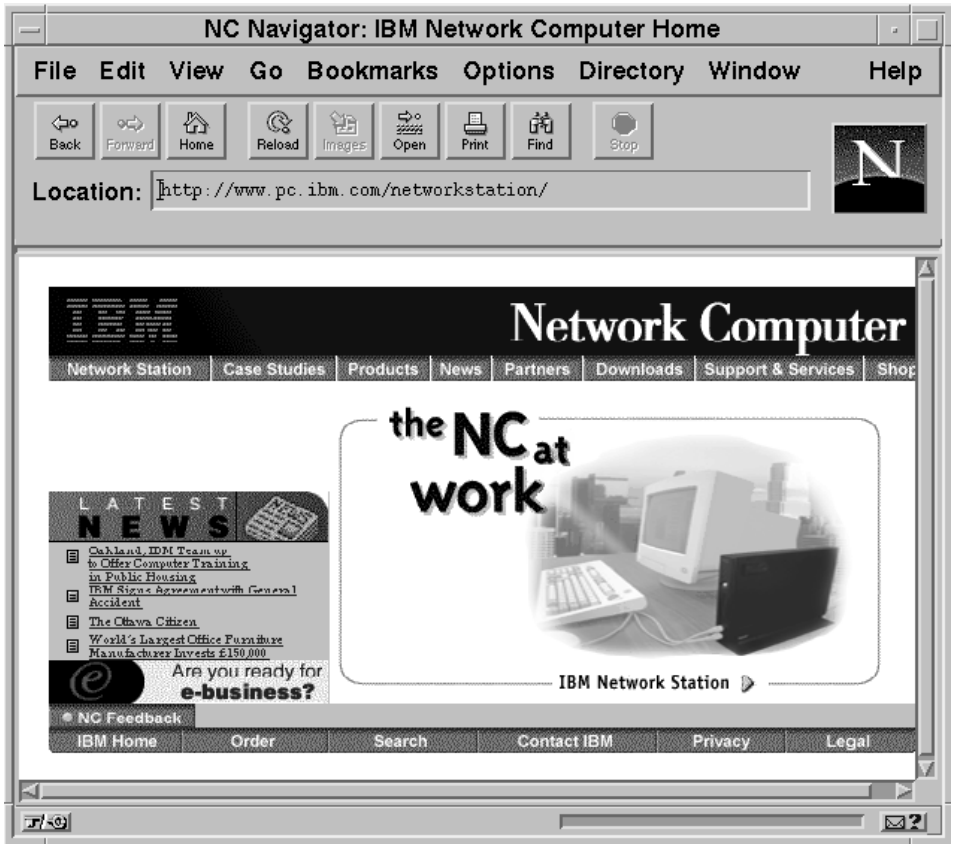


Figure 57. NC Navigator Browser Session Display

If you did not configure NC Navigator to autostart, and you click the **NC Navigator** button within the Menu bar, an NC Navigator session will appear. Depending on the volume of network traffic, you can expect it to take from several seconds to a minute for the *NC Navigator* screen to appear.

Some of the NC Navigator functions have defaults that are managed by the IBM Network Station Manager program. For example, you can configure proxies, SOCKS, mail servers, and news servers by using the IBM Network Station Manager program. See “Working with Your Network Proxies” on page 286 for more information.

Many of the NC Navigator functions, including those functions that are managed by the IBM Network Station Manager program, have shipped or IBM-supplied defaults. See “Appendix D. IBM Network Station Manager Program Shipped Default Settings” on page 361 for a listing of all NC Navigator defaults controlled by the IBM Network Station Manager program.

Learning About NC Navigator Browser Functions

The NC Navigator browser has many capabilities to help you manage Internet access and quick connection to the IBM Network Station Manager program. These functions and others are available by clicking various pulldown options from the browser Menu bar. See Figure 58 on page 237.

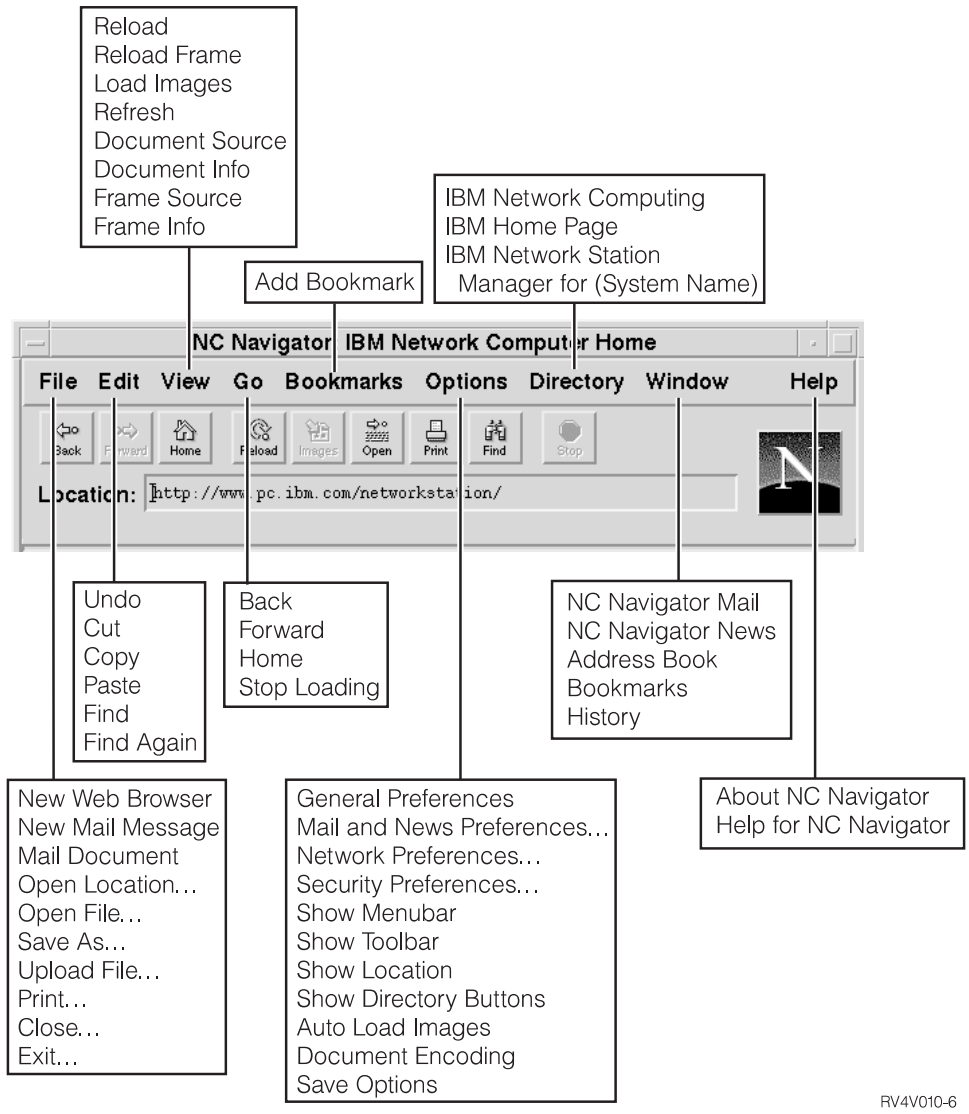


Figure 58. NC Navigator Browser with Extended Pulldowns

Figure 58 shows the pulldowns that are available to allow you to quickly access NC Navigator functions. For example:

- Multiple NC Navigator session support (New Web Browser in the File pulldown)
- E-mail (Netscape Mail in the Window pulldown)
- Font selection by user (General Preferences in the Option pulldown)
- Online help (Help) information

Creating NC Navigator Directory Buttons

Directory buttons provide quick access to frequently used URLs.

The directory buttons appear (when configured) below the URL input field of the NC Navigator.

Use the Network Station Manager program to administer the directory buttons. See Figure 93 on page 286 for additional information.

Learning About NC Navigator Mail Functions

NC Navigator mail has many capabilities to help you read and manage E-mail messages. These functions, and others, are available by clicking various pulldown options from the NC Navigator Mail menu bar. See Figure 59 on page 239.

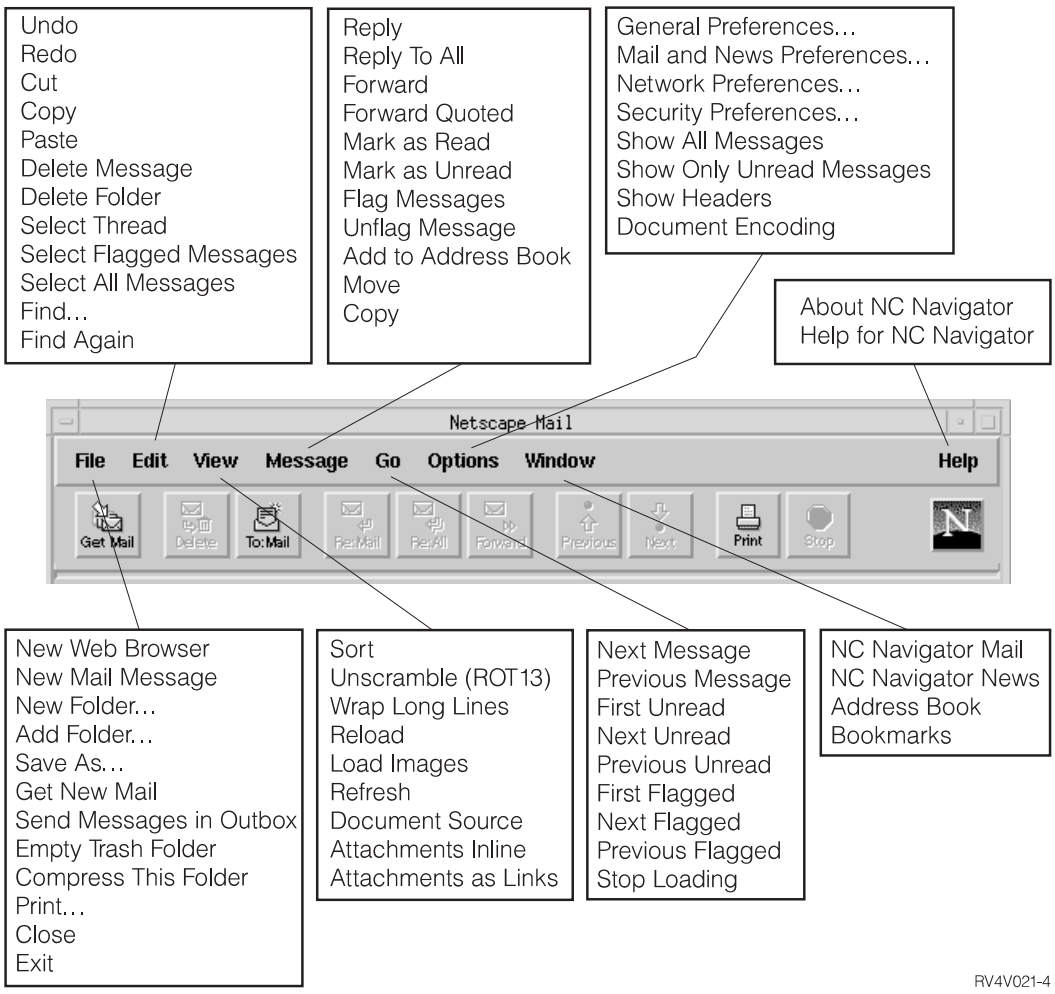


Figure 59. NC Navigator Mail with Extended Pulldowns

Figure 59 shows the pulldowns that are available to allow you to quickly access NC Navigator functions. For example:

- Reply to mail (Reply in the Message pulldown)
- News reader (Netscape News in the Window pulldown)
- Online help (Help) information

Learning About NC Navigator News Functions

NC Navigator news has many capabilities to help you read and manage newsgroup messages. These functions and others are available by clicking various pulldown options from the NC Navigator Mail menu bar. See Figure 60 on page 240.

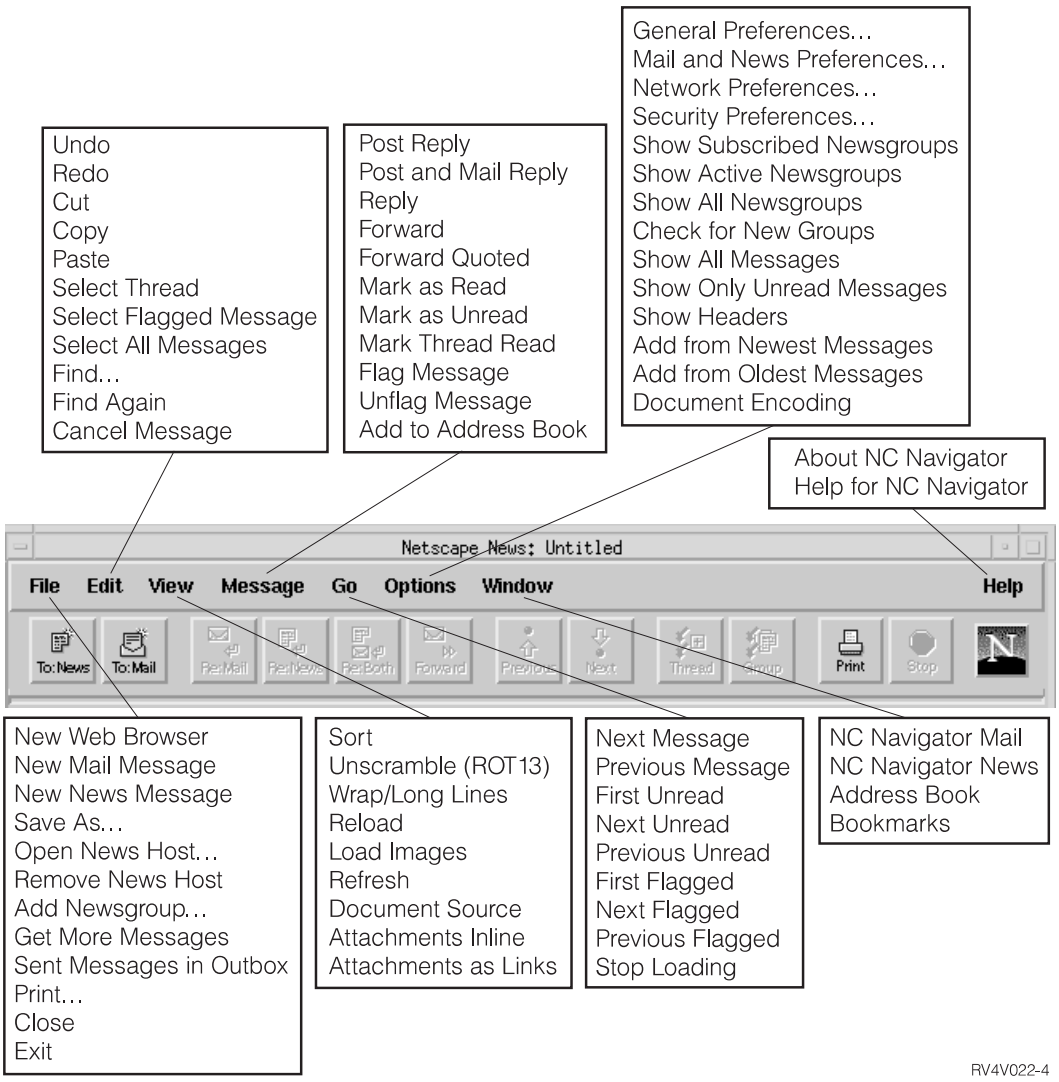


Figure 60. NC Navigator News with Extended Pulldowns

Figure 60 shows the pulldowns that are available to allow you to quickly access NC Navigator functions. For example:

- Reply to news message (Reply in the Message pulldown)
- E-mail (Netscape Mail in the Window pulldown)
- Online help (Help) information

Accessing Help

You can access help for the NC Navigator by using the **Help** menu option. The help includes a Frequently Asked Questions (FAQ) section and an addendum for last-minute changes.

For NC Navigator help, place your mouse pointer in the NC Navigator Menu bar and click **Help**.

JAVA Virtual Machine

You can set up Java applets and applications by using the IBM Network Station Manager program. You can configure applets and applications to autostart on your workstation, or configure them as menu items (buttons in the Menu bar).

Note: Only a single Java application can run within the Network Station and, if running, also precludes applets from running in both the desktop and the browser. Many applets can run simultaneously.

Starting an Application

You must install applications on the file system of the server.

Notes:

1. Only a single Java application can run on the Network Station. No Java applets can run if a Java application is running. However, you can run many Java applets simultaneously.
2. You must use the IBM Network Station Manager program to run a Java application. You can set the Java application to autostart, or (if a button exists for the application) you can click the button).

Starting an Applet

You can install Applets on the file system of your boot host, or downloaded from a remote system with a Universal Resource Locator (URL). You can load the applet by specifying tags on an HTML page.

You can run applets three different ways:

- By creating a button on the Menu bar for an applet
- By creating a button for a browser URL
- By starting a browser and then loading an HTML page which contains an applet

You manage configuration of the applet through parameter tags within the HTML file (the applet vendor determines the specific parameter names). Applets that load from the file system of your boot host should be well-known and trusted applets (the source of the applet is reliable). There are no security restrictions for Applets running on the local file system. The applet may write to files and communicate with other machines. Writing

to other machines may be desirable if you are saving your spreadsheet. However, writing to other machines could be a problem if a malicious applet erased your files.

Working with the Time Zone Environment Variable

The TZ environment variable is important in the sending and receiving of mail, running applications, and time-stamping documents. Setting the TZ environment variable becomes even more important when you work across multiple time zones.

You should set the time zone (TZ) environment variable by using the Network Station Manager program.

See “Setting the Time Zone (TZ) Environment Variable” on page 275 for an example.

Learning About Printer Datastreams

You need to know the datastream your default applications (applications shipped with the IBM Network Station Manager licensed program) produce. Knowing which datastream the applications produce allows you to choose a printer capable of processing and printing the files your applications create. Table 62 shows the supported datastreams for each application.

Table 62. Applications and Datastreams

Default Application Name	PostScript Datastream	PCL Datastream	ASCII Datastream
5250 Session	X	X	X
3270 Session	X	X	X
NC Navigator	X		
Lotus eSuite WorkPlace	X		

Each platform (AS/400, Microsoft NT, RS/6000, OS/390, VM/ESA) has a process for managing printers. The following list directs you where to go for information on how each platform manages printers for use with Network Stations.

- See “Configuring Printers on VM/ESA” on page 221 for VM/ESA.
- See “Configuring Printers on an AS/400” on page 133 for AS/400.
- See “Configuring Printers on Windows NT Server 4.0” on page 76 for Windows NT.

Use the IBM Network Station Manager program to administer printers for your Network Station users.

“Chapter 8. Using the IBM Network Station Manager Program” on page 245 contains two examples about using printers with Network Stations:

1. “Configuring a Local Area Network Attached Printer” on page 269

2. “Configuring a Network Station-Attached Printer for Other Users” on page 270

Chapter 8. Using the IBM Network Station Manager Program

IBM Network Station Manager Program - an Overview

The IBM Network Station Manager program is a browser-based application program. This application program allows you to perform the setup tasks and management tasks that are associated with the following:

- All IBM Network Station Network Computers or all Network Station users
- A group of Network Stations users
- A specific (one) Network Station or Network Station user

Figure 61 on page 247 shows the main screen of the IBM Network Station Manager program. The left-most frame of the screen contains a selection list of the Setup Tasks. Setup Tasks are selected functions of various applications that are managed with the IBM Network Station Manager program. For example, 5250 and 3270 emulation sessions, NC Navigator sessions, and Lotus eSuite WorkPlace.

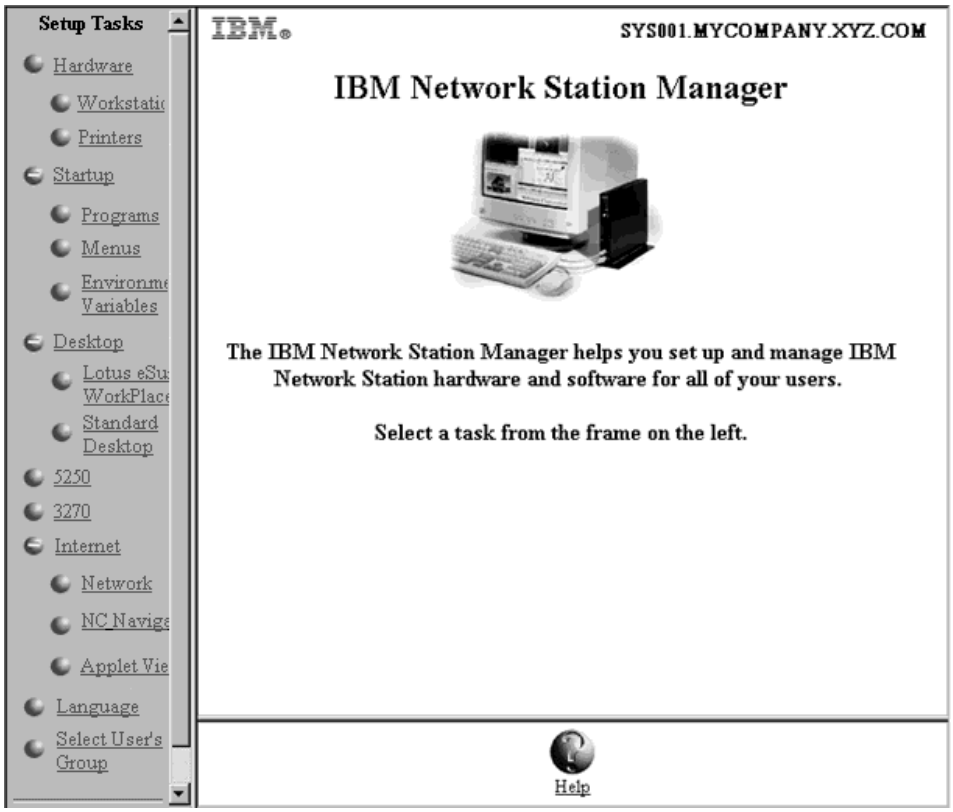


Figure 61. Network Station Manager Program Main Screen

Figure 62 on page 248 provides an expanded list of Setup Tasks that you can manage with the IBM Network Station Manager program:

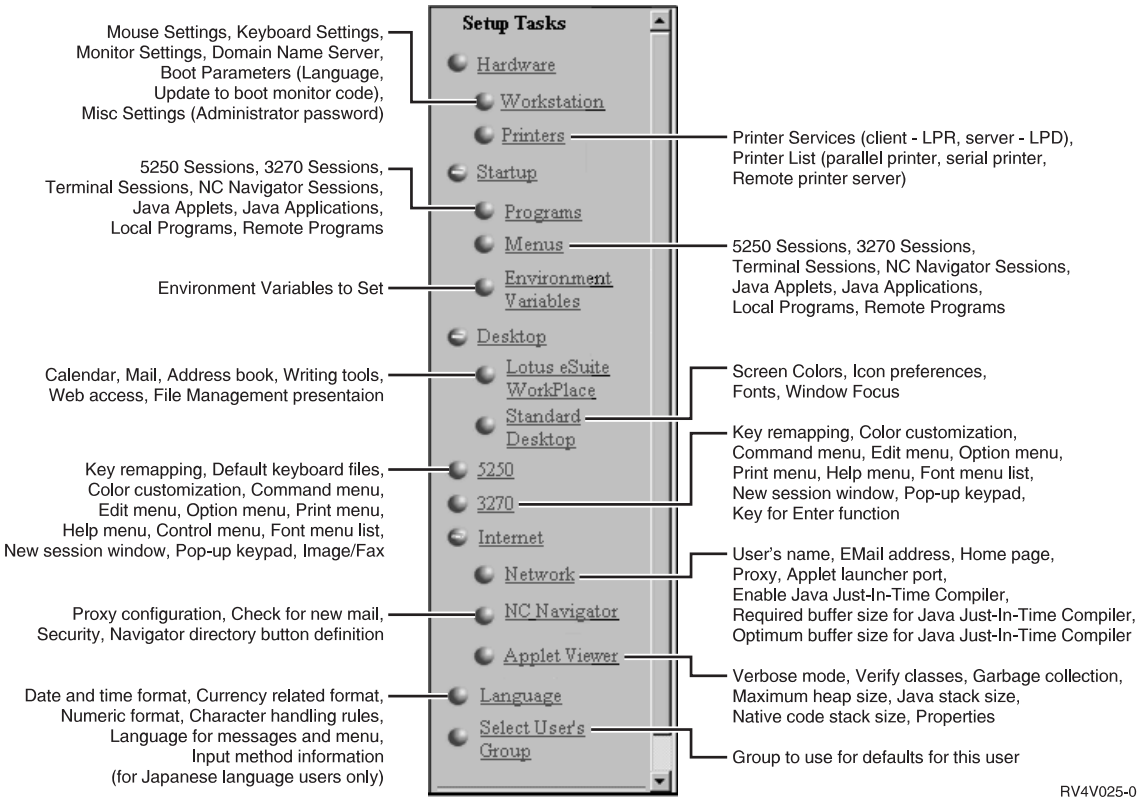


Figure 62. Setup Tasks Supported by the IBM Network Station Manager Program

IBM Network Station Manager Program Flow

Figure 63 on page 249 provides a graphical view of how the IBM Network Station Manager program flows. Take a moment to study Figure 63 on page 249; it highlights the differences between the defaults and setup tasks that a system administrator and end user can work with.

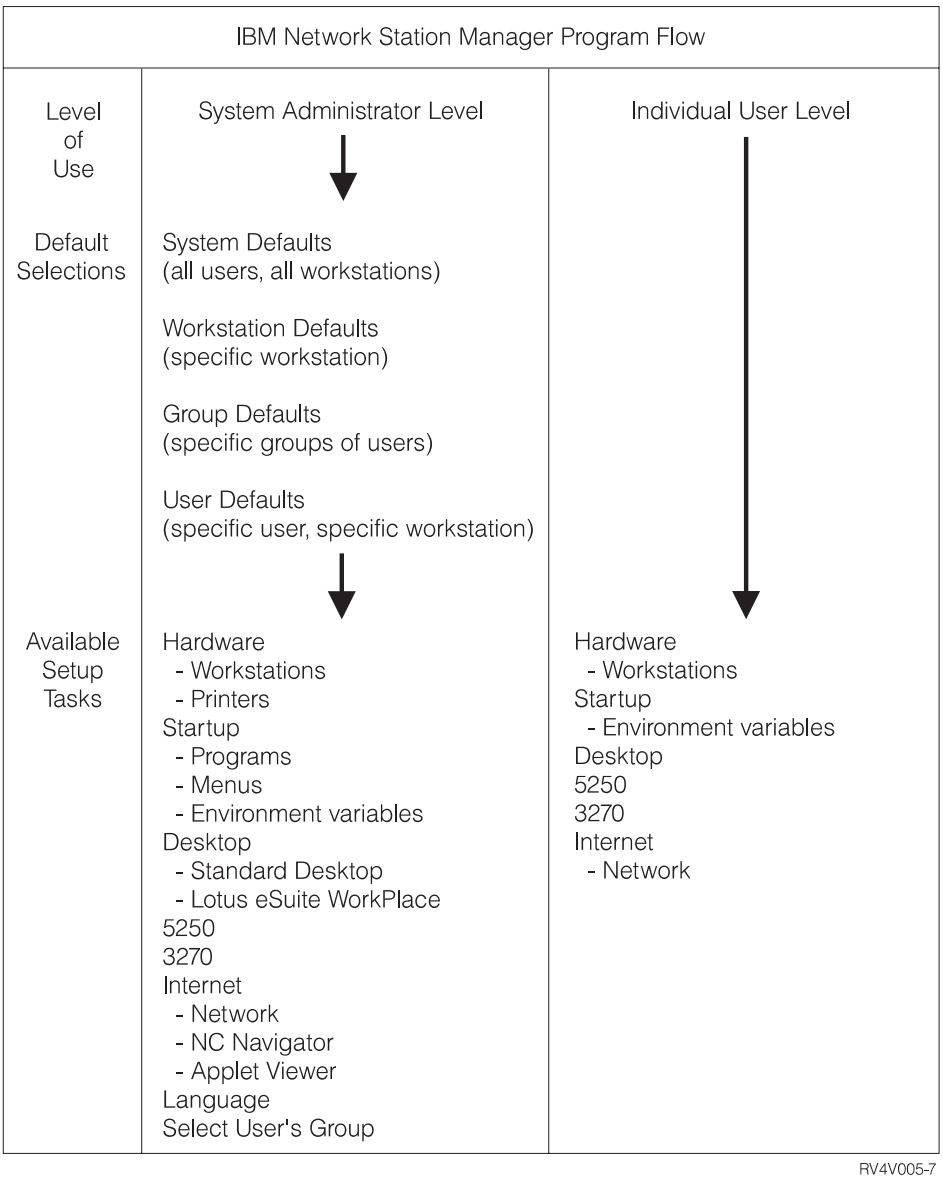


Figure 63. IBM Network Station Manager Program Flow

Who Can Use the IBM Network Station Manager Program?

Figure 63, shows that both system administrators and individual end users can access and use the program.

The special authorities defined on the Host server determine the level of function a user can access.

For example, on an AS/400, the system administrators must have special authorities (SPCAUT (*SECADM and *ALLOBJ) authority). Other users should have a level of authority less than *SECADM and *ALLOBJ.

System Administrators

System administrators have full use of the program. System administrators can work at a level that is either system-wide, for a specific group, for a specific user, or for a workstation. For example, an administrator could specify that all Network Station users have one 5250 emulation session available and that one particular user could have an additional 5250 emulation session.

For information about how to sign on to the IBM Network Station Manager program, see “Starting the IBM Network Station Manager Program Using a Browser” on page 257.

Figure 64 on page 251 shows the screen a system administrator sees after signing onto the IBM Network Station Manager program. Look at the range of functions that are presented in the *Setup Tasks*frame.

Note: This screen can vary in how it appears depending on the Web browser you are using.

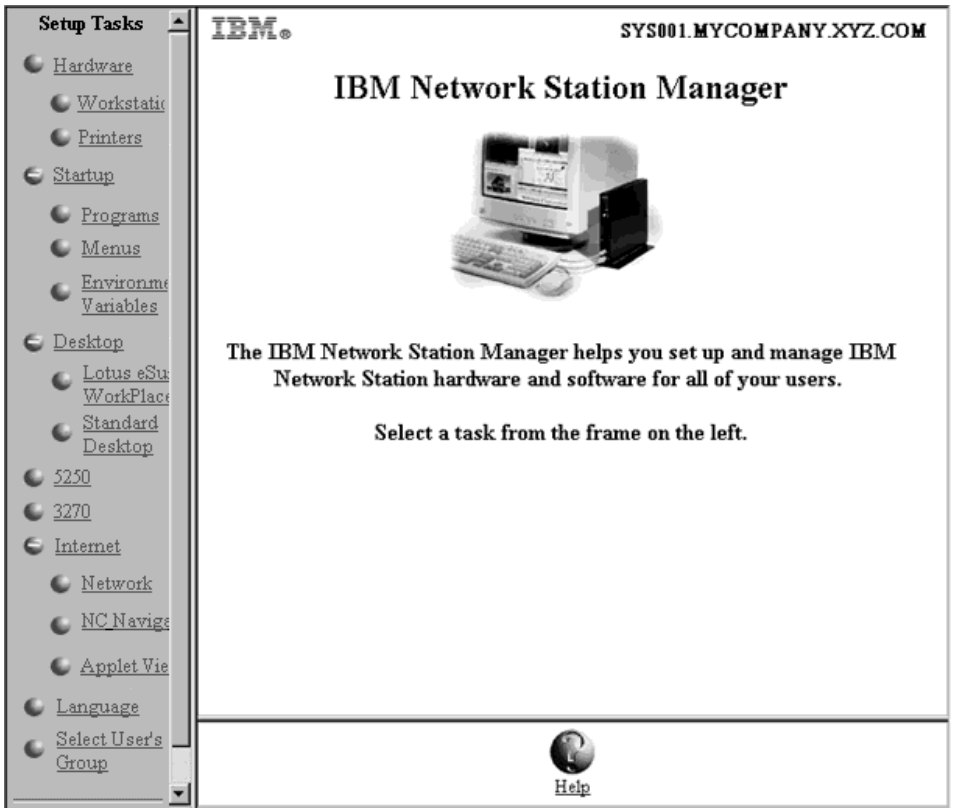


Figure 64. System Administrator Level

Figure 65 on page 252 compares these functions to the range of functions that are available to individual end users.

Individual End Users

End users also have access to the IBM Network Station Manager program. However, the functions that an end user can work with are limited.

Figure 65 on page 252 shows the screen that an end user would see after signing on to the IBM Network Station Manager program. Look at the range of functions that are presented in the *Setup Tasks*frame.

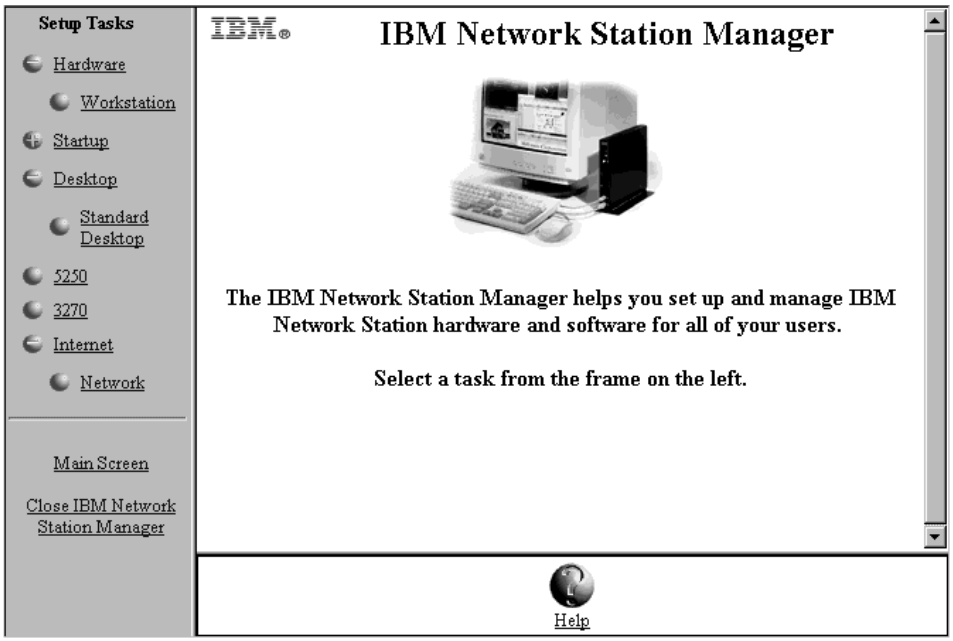


Figure 65. End-User Level

As you can see, the program's flexibility allows broad system-wide settings management by the administrator and individual settings management by the end user.

Working with IBM Network Station Manager Program Defaults

There are four levels of defaults. They are:

- IBM-supplied defaults. The IBM-supplied defaults provide settings that are supported by the IBM Network Station Manager program.

  You can not change IBM-supplied defaults. You can override IBM-supplied defaults by using the IBM Network Station Manager program feature of System defaults or User level defaults.

  See "Appendix D. IBM Network Station Manager Program Shipped Default Settings" on page 361 for a complete list of all IBM-supplied default values for the IBM Network Station Manager program.

- System defaults. You can use system defaults to change settings for all users or all workstations. System defaults take precedence over IBM-supplied defaults.
- Group defaults. You can use group defaults to change settings for all users that are in a specific group. Group defaults take precedence over system-wide defaults and IBM-supplied defaults.
- User defaults. You can use user defaults to change settings for an individual user. User defaults take precedence over IBM-supplied defaults, system defaults, and group defaults.

- Workstation defaults. You can use workstation defaults to change settings for workstations. Workstation defaults take precedence over IBM-supplied defaults and System Defaults.

Note: Settings work differently in the Startup function of Setup Tasks. For Programs, Menus, and Environment Variables, the IBM-supplied, System-specified, and User-specified, are additive. However, for the same environment variable, the value set at the user level takes precedence over the value set at the system or IBM-supplied levels. (The values for a given environment variable are not additive.) Any settings that are specified at the system or user level are added to those that are specified in the IBM-supplied default settings.

For example, every Network Station user has one 5250 session specified as the IBM-supplied default. If the administrator used the System defaults function to assign all users an additional 5250 session, then all users would have two 5250 sessions available. If the administrator then used the User level defaults to assign USERXYZ another 5250 session, then USERXYZ would have three 5250 sessions. The origin of these sessions would be one each from IBM-supplied defaults, System defaults, and User defaults.

IBM Network Station Manager Program Defaults - Example

This example uses the Desktop background setting. You can locate the Desktop background setting in the Workstations function of Hardware Setup Tasks.

The IBM-supplied setting for Desktop background is the IBM bitmap.

At this point, the administrator sets all Desktop backgrounds to dark red. Using the IBM Network Station Manager program, the administrator applies the change by working through the System Defaults level. This change, to the color dark red, overrides the IBM-supplied value of the IBM bitmap for Desktop background.

After viewing the color of dark red, a user determines that dark red is too difficult to look at for long periods of time. The user then requests his Desktop background color be changed to green. The user can either change the Desktop background color or request the administrator to do it.

The administrator can make the change by selecting the Hardware Setup Task, Workstations, User defaults and specify the user ID of the person who is requesting the change. The administrator can then scroll to the Desktop background field, specify green, and then click **Finish** to apply the change. This change, to a User default setting, overrides the IBM-supplied default and the administrator set System Default value of dark red.

Notes:

1. If a user changes the background setting, they go directly to the *Hardware* and *Workstation* settings panel. You will bypass the *Default selection* panel.
2. To see the Desktop background change, you must log off and then log on to the workstation.

Working with System-Wide Defaults

Figure 66 is representative of the panel that appears when a selection occurs from the *Setup Tasks* frame. This example uses the *Workstation Defaults* panel.

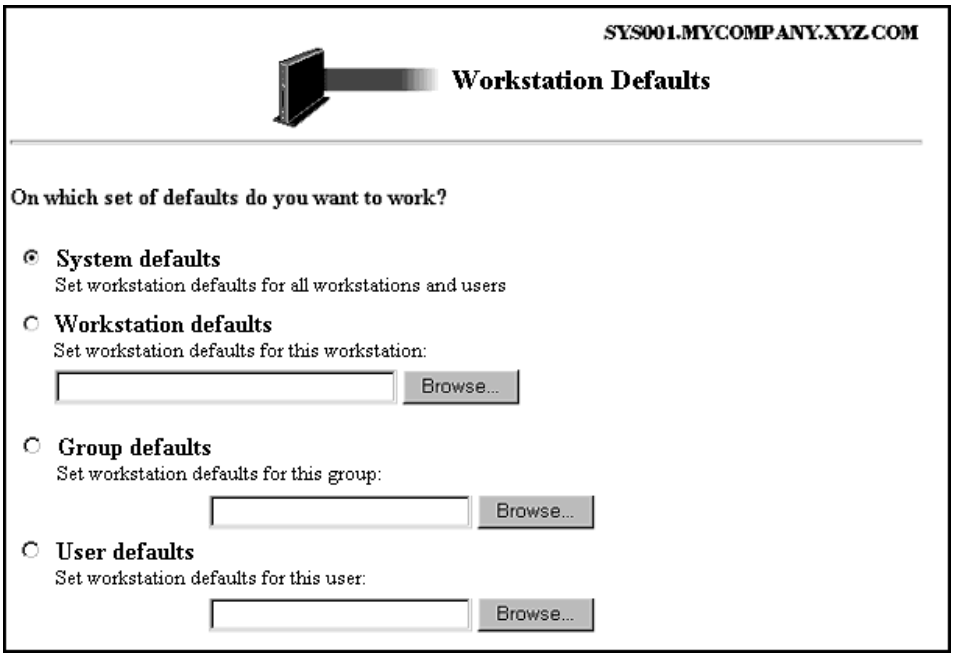


Figure 66. Hardware Defaults

As you can see, the *Workstation Defaults* panel allows you to work with the following:

- System defaults for all workstations and users
- Workstation defaults for a particular workstation
- Workstation defaults for a specific group
- Workstation defaults for a particular user

Note: The *Workstation Defaults* panel is unique in that it allows you to specify settings for workstations in addition to specific groups or users.

System defaults have settings that are not available when working with an individual user, a specific group, or specific workstation.

Working with Workstation Defaults

You may configure each Network Station using either DHCP, BOOTP, or NVRAM.. You can identify each Network Station by TCP/IP hostname, IP address, or MAC address. If TCP/IP hostname is entered it must exactly match what the Network Station is told that its hostname is (lower case). BOOTP or DHCP tell each Network Station their

hostname. Only include the hostname option specified on the Network Station's client statement in BOOTP or DHCP. If you specify a separate domain name option in BOOTP or DHCP, do not include that in the workstation name. You must type MAC addresses separated by colons (for example, 00:00:e5:80:7c:8f). You must type IP addresses as dotted decimals (for example, 9.1.2.3).

Tips on Identifying or Referring to your Network Station: Following are some tips for addressing your Network Station:

IP addressing
: You can use the IP address when you are booting the Network Station using NVRAM, BOOTP, or DHCP. When you use the IBM Setup Utility you can type the IP address you configured using DHCP, BOOTP, or NVRAM. However, be aware that the Network Station's IP address may change on every boot if you use the address pool feature of DHCP.

TCP/IP hostname
: You can use the TCP/IP host name when you are booting the Network Station using BOOTP or DHCP. It is unlikely that the Network Station knows its hostname when it boots using NVRAM. Type the hostname you configured into DHCP or BOOTP as instructed above. By using the TCP/IP hostname or IP address you can replace a Network Station and have the new Network Station pick up the old Network Station's configuration. You would set up the new Network Station with the old Network Station's hostname or IP address.

MAC address
: You can use the MAC address when you are booting the Network Station using NVRAM, BOOTP, or DHCP. The MAC address is tied to the physical Network Station and will not change if your network is reconfigured. The MAC address only changes if you decide to reprogram it on the Network Station. The MAC address can be found using the IBM Setup Utility and by selecting F2. d.

Using the Workstation Browse Button: The Workstation Browse button, when clicked, provides a list of all workstations configured using the IBM Network Station Manager program.

Working with Group Defaults

Use group defaults to add or change settings on a group-by-group basis.

Any group that you want to work with must already exist on the host server. You can not create groups by using the IBM Network Station Manager program. The user must already be in a group.

Note: For example, with OS/390, groups are defined by the administrator of the external security manager installed on your OS/390 system.

To get started, do the following:

- Click **Select User's Group** from the *Setup Tasks* frame.

- Type the name of the user whom you want to inherit a particular group's settings and click **Next**.
- Type the name of the group and click **Next**.

  Note: If you do not know a group name, click the **Browse** button and a list of groups is presented for you to choose from.

Working with Individual User Defaults

Use user defaults to change settings on a user-by-user basis, one user at a time. Using user defaults gives you flexibility that allows customization of individual sessions.

From any of the Default panels, select **User defaults**, type the user ID name, and press the **Next** button.

Note: If you do not know a user ID name, you can click a **Browse** button for a list of users.

Working with Settings

Settings are fields that you see after you have selected the defaults (System, Workstation, Group, or User) that you want to use. For example, Figure 67 shows the *Standard Desktop Settings* fields for Screen colors, Icon preferences, Fonts, and Window focus.

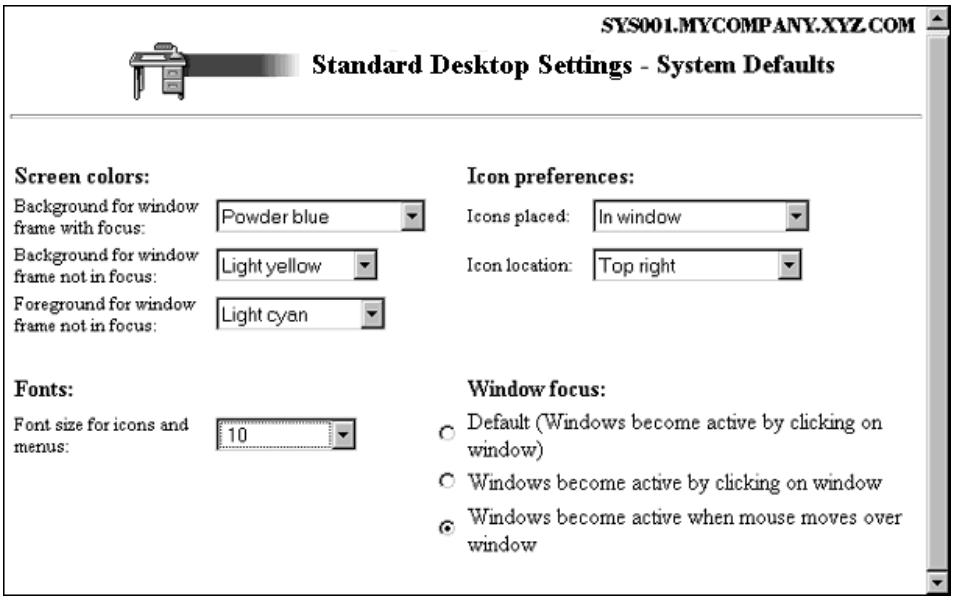


Figure 67. Desktop Manager Settings Fields

Figure 67 on page 256 shows that Standard Desktop settings that are being worked with from the System Defaults level. Choosing System Defaults settings changes applies changes to **ALL** users.

Starting the IBM Network Station Manager Program Using a Browser

To best understand and learn how the IBM Network Station Manager program works, you should sign on and follow the examples in this chapter.

To start working with the IBM Network Station Manager program, power on your Network Station. Click **NC Navigator** from the Menu bar on your Network Station. See Figure 68.

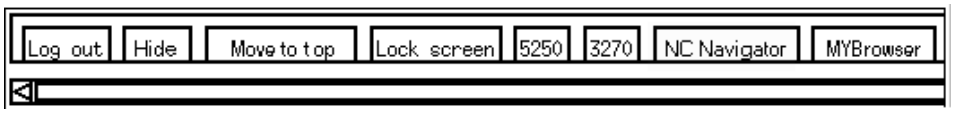


Figure 68. IBM Network Station Menu Bar

Notes:

1. You can also use the following Web browsers to sign on to the IBM Network Station Manager program:
   - Netscape 4.0 or later:
     - Windows 95
     - Windows NT
     - AIX
   - Microsoft Internet Explorer 4.0 or later
2. To access the IBM Network Station Manager program using NC Navigator, click the **Directory** pulldown and select **IBM Network Station Manager for (Your Server Name)**. Your server name is the name of the system where your Network Stations get their boot file.

The NC Navigator browser appears. See Figure 69 on page 258.

Figure 69. NC Navigator Browser

Click the **Directory** pulldown and select **IBM Network Station Manager for (Your Server Name)**. See Figure 70 on page 259.

Figure 70. NC Navigator Browser with Directory Pulldown

The IBM Network Station Manager sign on screen appears:

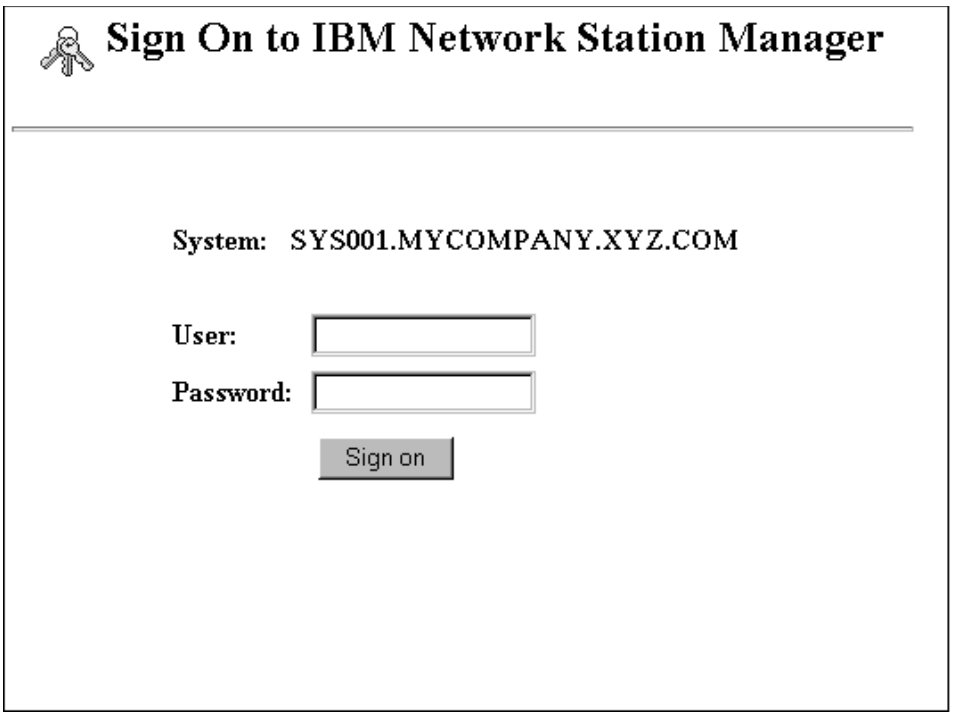


Figure 71. Sign on Screen

Note: An alternative way to reach the sign-on screen is to enter the following case-sensitive URL in your browser's URL field:

http://yourservername/networkstation/admin

Where *yourservername* is the Host name or TCP/IP address.

If you are using a VM/ESA system, the URL you specify depends on the location of the Network Station Manager program. Use the following URL if the Network Station Manager program is in the root directory of the server:

http://yourservername:port/admin.htm

Use the following URL if the Network Station Manager program is located in a subdirectory of the root directory of the server:

http://yourservername:port/nsmhtml/admin.htm

Type your user ID and password, then click **Sign on**.

The main screen of the IBM Network Station Manager appears.

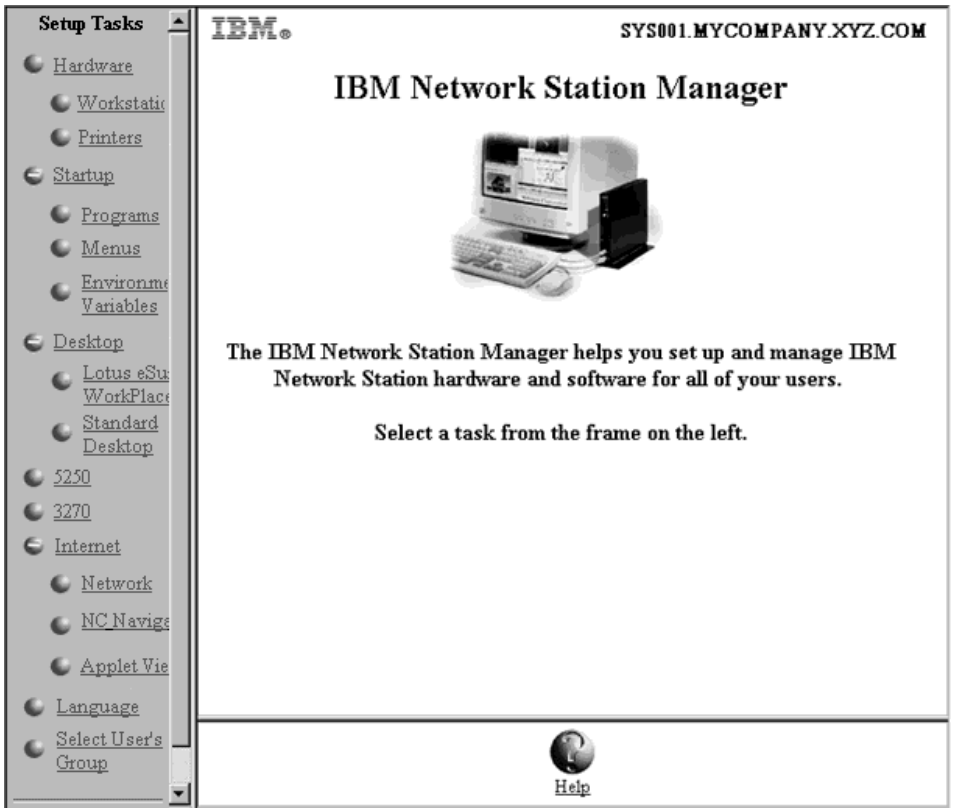


Figure 72. System Administrator Level

Working with the IBM Network Station Manager Program Setup Tasks - Examples

Note: You must be a system administrator to work with these examples.

Figure 72 shows that radio buttons represent Setup Tasks and text in the left-most frame of the screen.

Clicking on any radio button or text presents a panel from which you select a set of defaults you want to work with.

When working with these examples, select **User defaults** and use your own user ID. Then, when you are finished with the examples, you can see the results on your workstation.

To see the changes you make using the IBM Network Station Manager program, you must log off and then log on to your workstation.

Notes:

1. Not shown in most examples are the *main* panel and the *Default selection* panel.
2. See “Additional IBM Network Station Manager Program Examples” on page 291 for information about working with remote programs, such as AIX sessions and WinCenter Pro for PC applications.

Changing your Desktop Style to Lotus eSuite WorkPlace

Notes:

1. Lotus eSuite WorkPlace is not available for VM/ESA systems.
2. You must use an IBM Network Station Series 1000 with 64 MB of memory to run Lotus eSuite WorkPlace.
3. This example, when complete, changes your desktop style from Standard desktop with menu bar (the default) to Lotus eSuite WorkPlace with menu bar.

Complete the following steps to change your desktop style:

__ 1. From the *Setup Tasks* frame, click **Startup** and then click **Menus**.

__ 2. Select **User defaults** and type in your user ID (`USER001` in this example). Click **Next** to continue.

__ 3. In the *Desktop and Menu Bar Options* section, click the **Desktop Style** list box and select *Lotus eSuite WorkPlace with or without menu bar support*. See Figure 73 on page 263.

Note: If you choose eSuite WorkPlace without Menu bar, eSuite Workplace uses the whole display. Additionally, when you log out of eSuite WorkPlace, you also log off your Network Station.

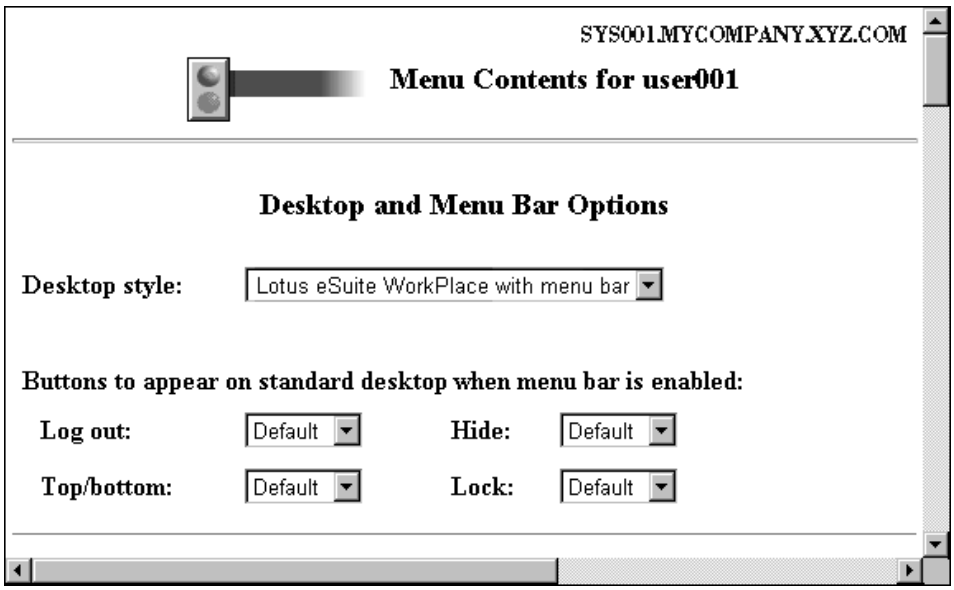


Figure 73. Desktop Style Selection

__ 4. Click **Finish** to apply the change.

Changing Your Desktop Background

You may have requirements for providing different desktop backgrounds; for example, your company logo. Complete the following steps to see how to change desktop backgrounds:

__ 1. From the *Setup Tasks* frame, click **Hardware** and then click **Workstations**.

__ 2. Select **User defaults**, and type in your user ID (`USER001` in this example). See Figure 74 on page 264.

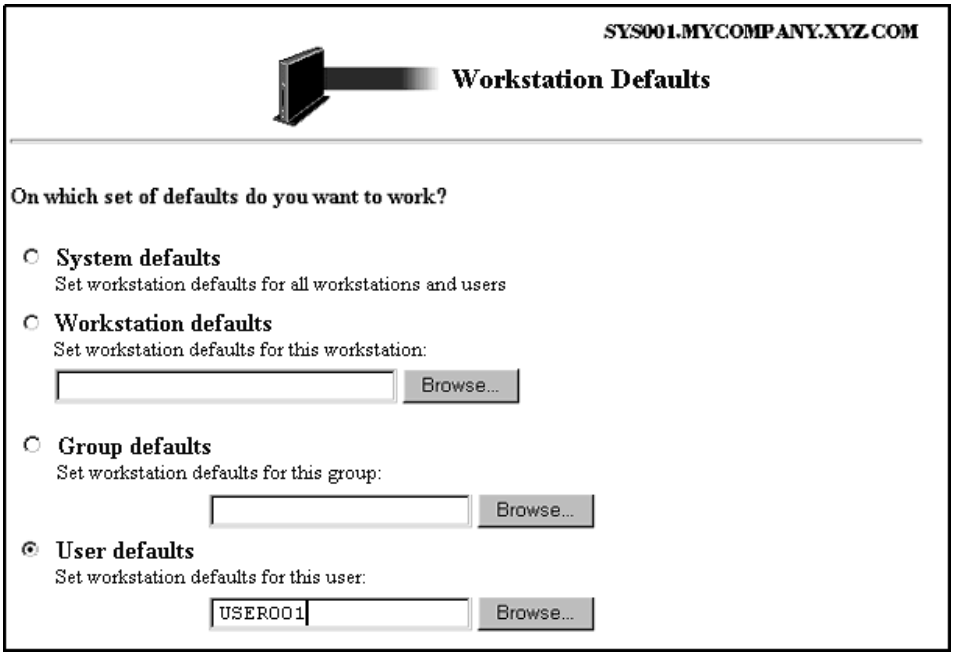


Figure 74. Workstation Defaults Panel with User Defaults Selected

__ 3. In the bottom frame, click **Next** to continue.

The *Workstation Settings* frame appears as shown (scrolled-down) in Figure 75 on page 265.

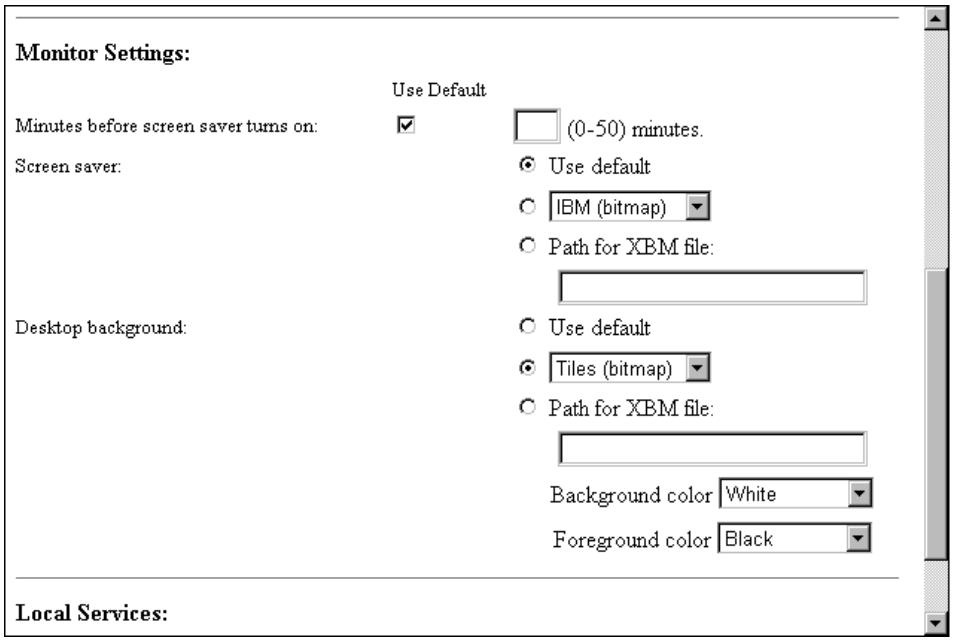


Figure 75. Hardware Settings Example

__ 4. Scroll to *Desktop background* and select **Tiles (bitmap)**.

__ 5. Click **Finish** to apply the change.

Tips for working with the screen saver fields and the desktop background fields:

1. You can use your own bitmaps for a screen saver or your desktop background.
2. Place the bitmap in a directory where the IBM Network Station Manager program can find it. For AS/400, place these bitmaps in:

   `/QIBM/ProdData/NetworkStation/SysDef/`

Updating the Boot Monitor Code

Update your boot monitor code to ensure that the boot monitor code on your Network Stations matches the boot monitor code on your boot server. Updating the boot monitor code provides access to the latest function of the IBM Network Station Manager licensed program. You must update any Network Station that has a boot monitor code version less than 3.0.0.

You may want to alert your users that a warning message will appear, on their workstation, during the boot monitor code update. The warning indicates not to power off the workstation during the update. To power off the workstation could cause physical damage to the workstation.

You do not have to use the update boot monitor function if you are working with Windows NT. Windows NT performs the boot monitor code update automatically.

__ 1. From the *Setup Tasks* frame, click **Hardware** and then click **Workstations**.

__ 2. Select **System defaults** or **Workstation defaults**, and type in the workstation name or click the **Browse** button for a list of configured Network Stations .

__ 3. In the bottom frame, click **Next** to continue.

__ 4. Scroll to the *Update to boot monitor installed on the boot server* field. Select **Update**. See Figure 76.

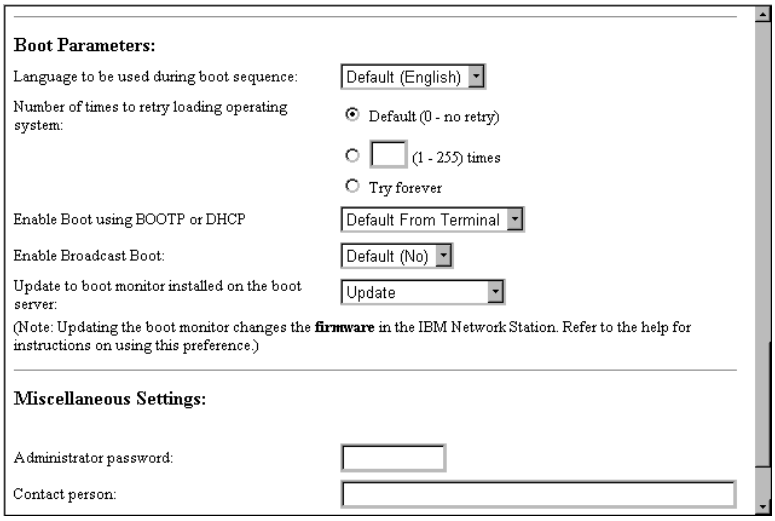


Figure 76. Updating the Boot Monitor

__ 5. Click **Finish** to apply the change.

Overriding the Network Station Boot Setting

__ 1. From the *Setup Tasks* frame, click **Hardware** and then click **Workstations**.

__ 2. Select **System defaults** or **Workstation defaults**, and type in the workstation name or click the **Browse** button for a list of configured Network Stations .

__ 3. In the bottom frame, click **Next** to continue.

__ 4. Scroll to the *Enable boot using BOOTP or DHCP* field as shown in Figure 77 on page 267.

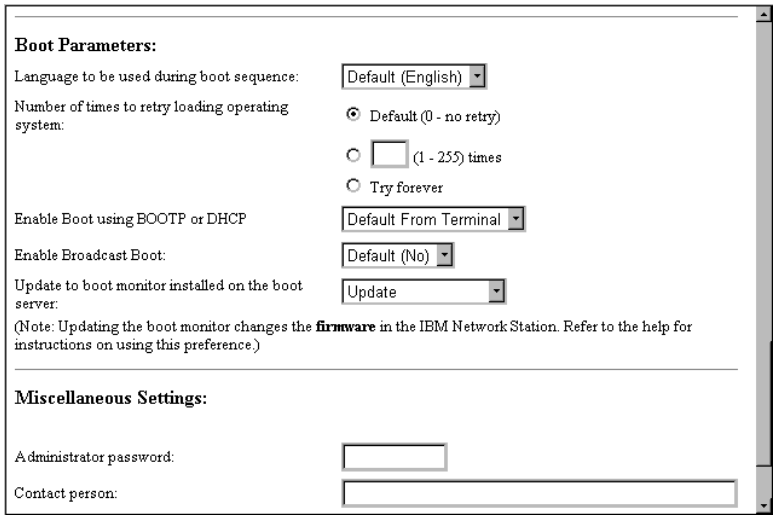


Figure 77. Overriding the Network Station Boot Setting

__ 5. Click the **Drop box**The possible choices are:

Default from terminal
Selecting this choice means the boot is determined by the value set in the IBM Network Station Setup Utility under the *Set Network Parameters* function. The value can be either Network or NVRAM.

Yes
Selecting this choice means the boot method is Network.

This means that the boot method is either DHCP or BOOTP and is determined on how you configured the Network Stations.

No Selecting this choice means the boot method is NVRAM.

The Network Station boots from the server specified in the *Boot Host IP Address* field in the Set Network Parameters function in the IBM Network Station Setup Utility.

__ 6. Click **Finish** to apply the change.

Updating the Domain Name Server (DNS) Configuration on the Network Station

You can use the Network Station Manager program to update the DNS information on a Network Station.

The domain name server (DNS) or host name table on the host keeps track of all hosts in a particular domain. You can also store this information on the Network Station.

There are two fields from which to select DNS support. They are:

- DNS Configuration from BOOTP or DHCP server

If you select this field, the Network Station gets its DNS and domain name configuration from a BOOTP or DHCP server.

You must use BOOTP or DHCP to configure your Network Stations. DHCP allows you to specify the IP address of your domain name server. DHCP also resolves BOOTP requests from Network Stations.

You must use DHCP to configure your Network Stations. DHCP allows you to specify the IP address of your domain name server. DHCP also resolves BOOTP requests from Network Stations.

- DNS Configuration created by Network Station Manager

  If you select this field, the Network Station gets its DNS and domain name configuration from a file created by Network Station Manager. The Network Station Manager copies the DNS and domain name configuration of the server where it is running to the file. The Network Station reads this file on its next boot to pick up the DNS and domain name.

  In addition, if you select this field, the Network Station Manager copies the Host table from the server where it is running to the configuration file. The Host table contains names and their corresponding IP addresses. The Host table information is also picked up by the Network Station on its next boot. Placing Host table information on the Network Station allows the Network Station to resolve network names when there is no DNS.

  You can update the file on the Network Station when changes occur to the DNS, domain name, or Hosts table. You do this by checking the *Update Network Station Manager DNS file* field.

  Placing the Host Table information on the Network Station allows network name resolution to occur on the Network Station rather than on the Host Table on the server.

  For AS/400 Users:

  1. If you are at V4R2 and have PTF SF47482 applied, you do not have to use the *Update Network Station Manager DNS file* function. The update of the Network Station Manager DNS configuration file takes place automatically when you change the DNS, domain name, or Hosts table of the AS/400.
  2. You need all object authority (*ALLOBJ) to update the Host Table. If you have authorities less than *ALLOBJ you can update the Host table. However, your changes are not passed to the Network Station.

  To work with DNS configuration follow the steps below:

__ 1. From the *Setup Tasks* frame, click **Hardware** and then click **Workstations**.

__ 2. Select a **default**.

__ 3. In the bottom frame, click **Next** to continue.

__ 4. Scroll to the *Domain Name Server* field. Select the method you want to use for network name resolution. See Figure 78 on page 269.

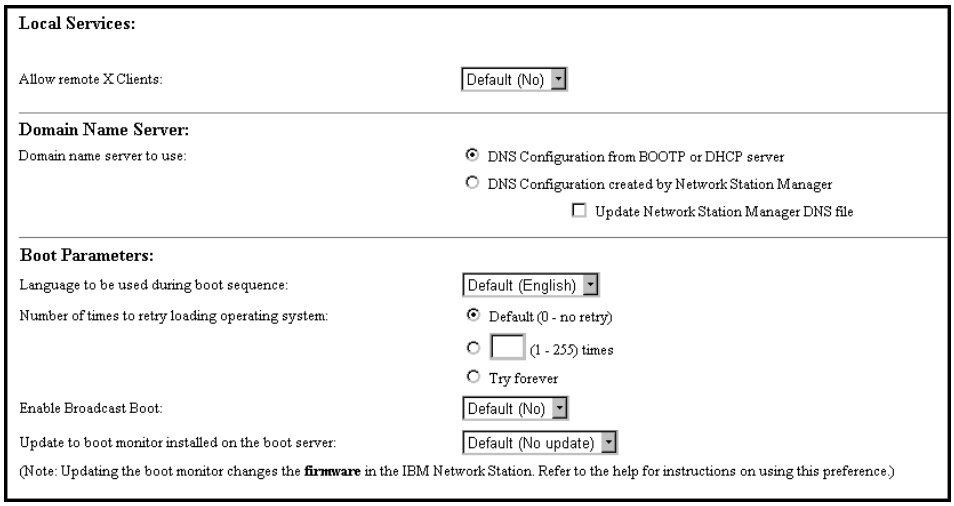


Figure 78. Updating the Domain Name Server Code

__ 5. Click **Finish** to apply the change.

Configuring a Local Area Network Attached Printer

Local Area Network (LAN)-attached printers are printers not necessarily attached to a Network Station or other devices. They typically have their own host name or IP address.

__ 1. From the *Setup Tasks* frame, click **Hardware** and then click **Printers**.

__ 2. Select **User defaults**, and type in your user ID (USER001 in this example).

__ 3. In the bottom frame, click **Next** to continue.

__ 4. Scroll to *Printer List*. For all users, you must define LAN-attached printers as remote printers. Therefore, scroll (if necessary) to the *Remote Printer Server* section. Fill out the Remote Printer Server section with the following information:

Remote Printer Server
The Host name or IP address of the LAN-attached printer.

Queue Name
The name of the queue associated with the LAN-attached printer.

Some LAN-attached printers require queues for their configuration, and some LAN-attached printers do not. If the LAN-attached printer has a queue name associated with it, place that name in the Queue Name field. Leave the Queue Name field blank if you do not have a queue associated with the LAN-attached printer.

When you make print requests, the Print Selector List displays the queue name. The Print Selector List displays the @ sign that is followed by either the host name or the IP address. If you did not use a queue name the Print

Selector List displays a @ sign followed by the IP address. For example, in the queue name field could be @ 10.1.12.34.

Stream Type
The type of printer data stream the LAN-attached printer supports.

Description
You can type anything in this field. Important information to put in the Description field could be the physical location of the printer.

Figure 79 shows you how to describe a LAN-attached printer.

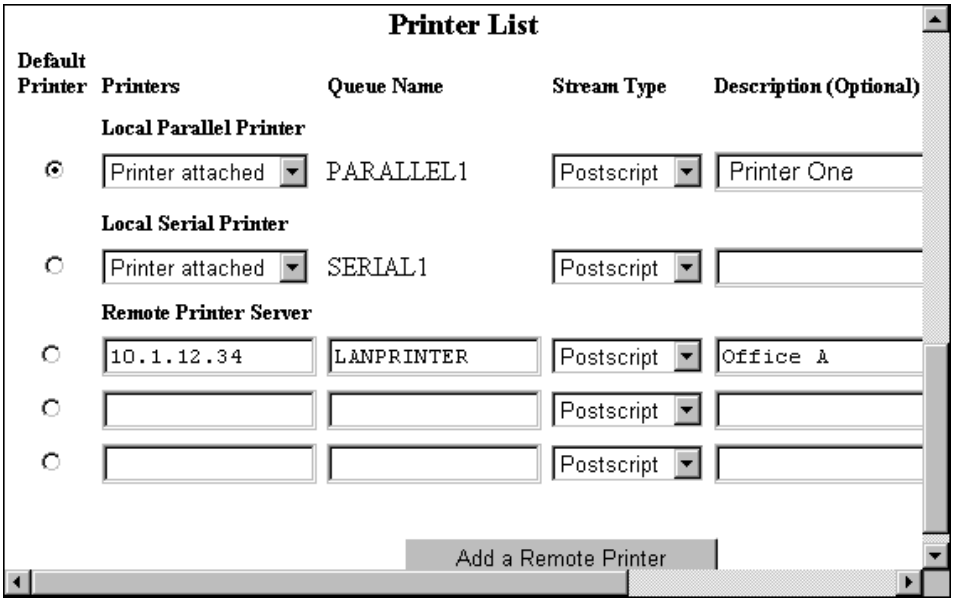


Figure 79. Configuring a LAN-attached Printer

__ 5. Click **Finish** to apply the change.

When you type information in the Remote Print Server section, that information constructs fields in the Print Selector List. The Print Selector List appears when users request a print action. The Queue Name and Description fields are the most useful fields. You can use the Queue Name to identify the print queue and the IP address. Description can be anything you typed in when configuring the printer. The physical location of the printer may be something users need to know.

Configuring a Network Station-Attached Printer for Other Users

Complete the following steps to configure a Network Station-attached printer:

__ 1. From the *Setup Tasks* frame, click **Hardware** and then click **Printers**.

__ 2. Select **User defaults**, and type in your user ID (USER001 in this example).

__ 3. Scroll to *Printer List*. Your Network Station-attached printer is considered a remote printer for all users except the user to whose Network Station the printer is attached. Therefore, scroll (if necessary) to the *Remote Print Server* section. Fill out the Remote Printer Server section with the following information:

Remote Printer Server
The Host name or IP address of the Network Station to which the printer is attached.

Queue Name
The name of the queue associated with the Network Station-attached printer.

Stream Type
The type of printer data stream the Network Station-attached printer supports.

Description
You can type anything in this field. Important information to put in the Description field could be the physical location of the printer.

You can configure a Network Station-attached printer. See Figure 80.

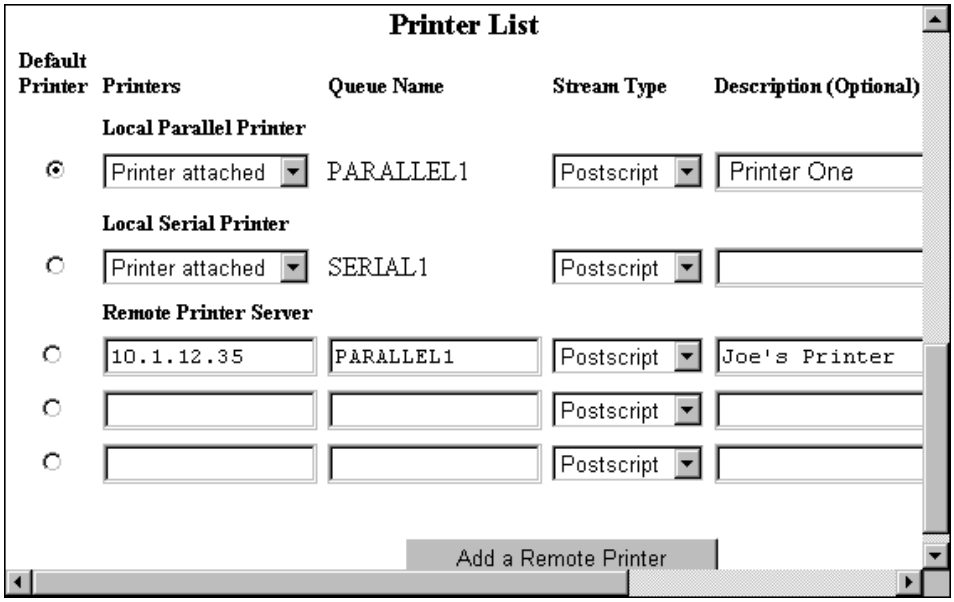


Figure 80. Configuring a Network Station-Attached Printer as a Remote Printer for Other Users

In the example where a locally-attached printer is configured as a remote printer for other users, you must pay close attention to the following:

Queue name field

On locally attached printers the Queue name is, by default, either PARALLEL1 or SERIAL1. When you configure a locally attached printer for others use, the Print Selector List contains a queue name of either PARALLEL1 or SERIAL1 for that printer. The resulting Print Selector Lists for a user could then contain two Queue name entries, each reading PARALLEL1.

Description field

In this example, where a user's Print Selector List could have two identical Queue name entries, the Description field can determine which printer to choose.

__ 4. Click **Finish** to apply the change.

Working with Menu Bar Options

This example discusses default Menu bar buttons, hiding Menu bar buttons, and customizing Menu bar buttons.

__ 1. From the *Setup Tasks* frame, click **Startup**, click **Menus**, and select **System defaults**. In the bottom frame, click **Next** to continue.

The Desktop and Menu Bar Options frame appears. See Figure 81.

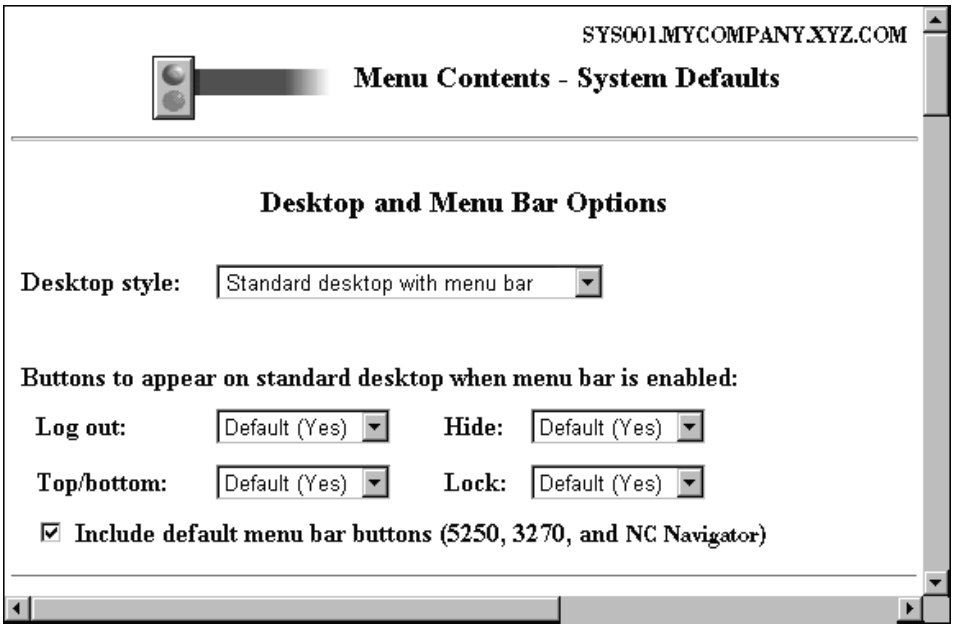


Figure 81. Startup Settings Example Working With Desktop and Menu Bar Options

__ 2. Scroll to the *Buttons to appear on standard desktop when menu bar is enabled* field.

__ 3. The Menu bar options that are shipped from IBM. See Figure 81 on page 272.

__ 4. Make any changes that are appropriate for your working environment.

If you do not change the Menu bar options fields, each of your Network Station users will have a fully populated Menu bar displayed on their workstation. Fully populated means the Menu bar on each workstation has the following buttons:

- Log out
- Hide
- Move to top or Move to bottom
- Lock screen
- 5250
- 3270
- NC Navigator (browser)

__ 5. Click **Finish** to apply the change.

Hiding the Menu Bar

Using the IBM Network Station Manager program, you can hide the presence of the Menu bar from your Network Station users.

You may have situations in which you do not want the Menu bar to be available. For example, you may not want anyone to be able to log out or end any applications that may be running on the Network Station. Or you might not want to provide an opportunity for someone to lock the screen. You may have a Network Station publicly available, and if the Lock Screen button is available, anyone could lock the screen with a password known only to them.

You can hide the Menu bar from all Network Station users by making the Desktop style field value *Standard desktop without menu bar*. See Figure 82 on page 274.

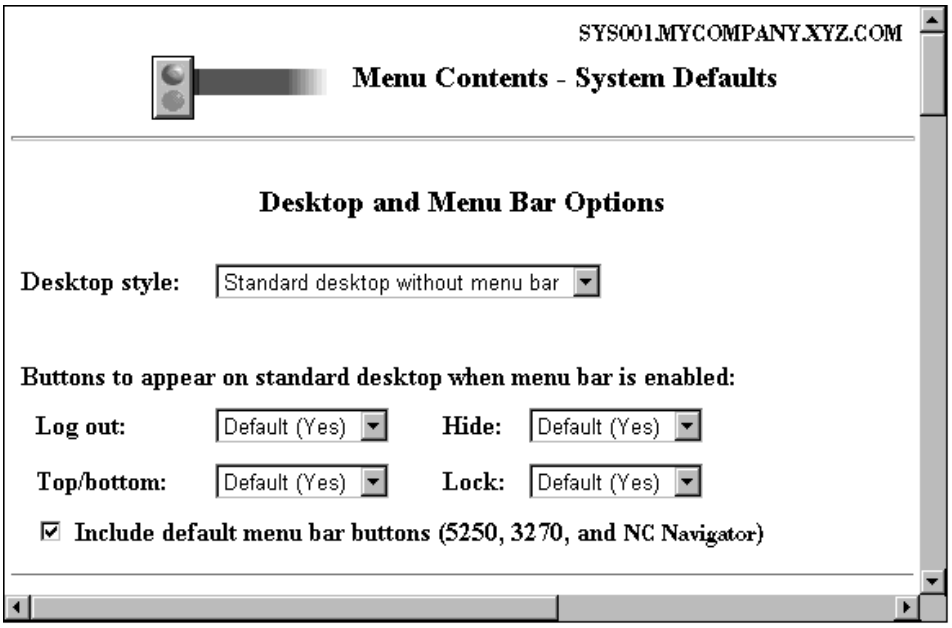


Figure 82. Hiding the Menu Bar

Customizing the Menu Bar Buttons

You can customize the Menu bar, selectively specifying values for the Menu bar options.

For example, Figure 83 on page 275 shows the fields and their values that would exclude the following Menu bar buttons:

- Log out - The value changes to No.
- Lock - The value changes to No.
- Buttons for 5250, 3270, and NC Navigator. You receive these buttons with the IBM Network Station Manager program. The check box is now deselected.

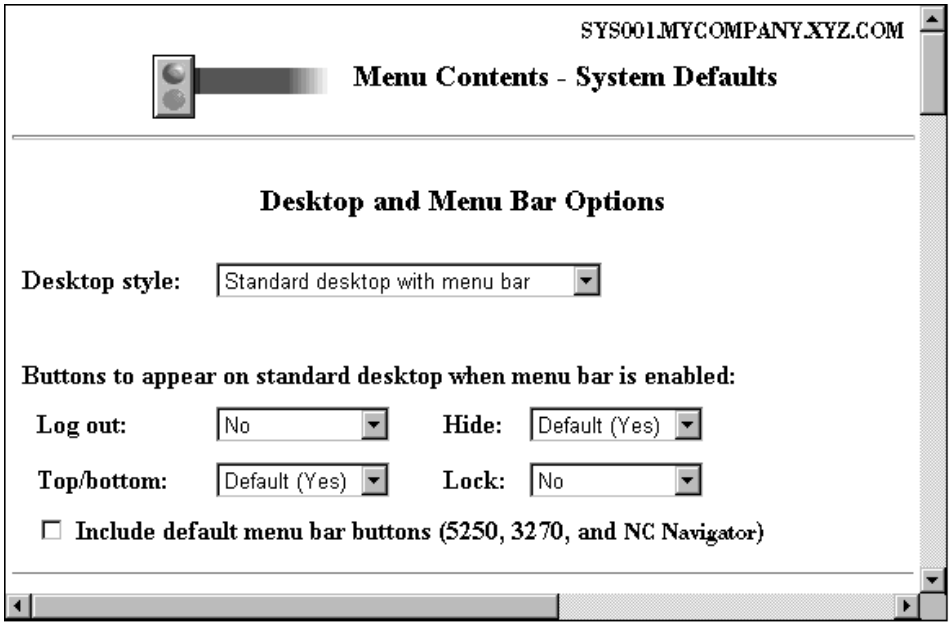


Figure 83. Customizing the Menu Bar Buttons

Menu Bar Options Summary

If you hide the Menu bar (using System defaults, Group defaults, or User defaults), only applications that are specified to automatically start appear on the workstations of users. You manage automatically starting applications in Setup Tasks using the Programs function.

The User level (individual user preferences) does not support enabling or disabling the shipped menu bar buttons for 5250, 3270, or browser buttons.

If you have created customized Menu bar settings but have hidden the Menu bar, no buttons from the customization are available.

Setting the Time Zone (TZ) Environment Variable

Setting the TZ environment variable is important when working across multiple time zones and in particular if you use Java applications.

You must be aware of the following requirements:

- All characters must be typed in upper case
- The time zone value on your server must be set correctly
- You must use standard time (for example, Central Standard Time (CST) not Central Daylight Time (CDT)

Complete the following steps to set the TZ environment variable:

__ 1. From the *Setup Tasks* frame, click **Startup**, click **Environment Variable**, and select **System defaults**. In the bottom frame click **Next** to continue.

__ 2. The Environment Variable Settings frame appears. See Figure 84.

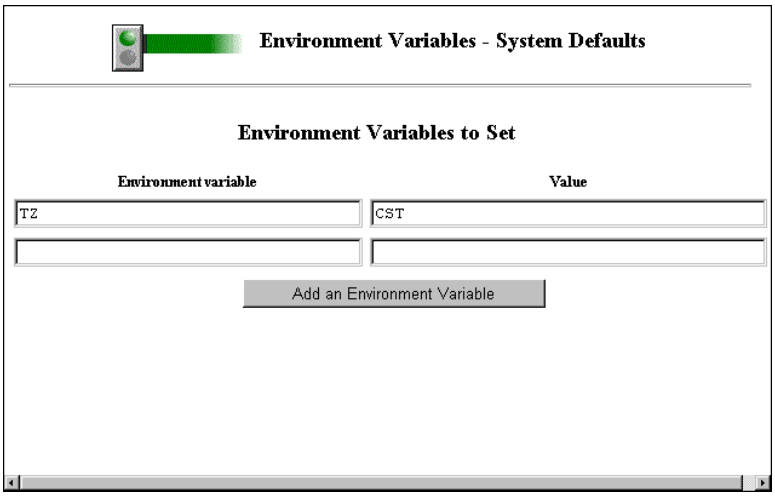


Figure 84. Setting the Time Zone (TZ) Environment Variable

__ 3. Scroll to *Environment Variables*. This setting, when completed, sets the time zone environment variable. Complete the following fields:

Environment Variable
Type 'TZ'. TZ means time zone.

Value
Type CST. This means Central Standard Time. Following are other possible values for the TZ environment variable:

Hours From Greenwich Mean Time (GMT)	Value	Description
0	GMT	Greenwich Mean Time
+1	ECT	European Central Time
+2	EET	Eastern European Time
+2	ART	(Arabic) Egypt Standard Time
+3	EAT	Eastern African Time
+3.5	MET	Middle East Time
+4	NET	Near East Time
+5	PLT	Pakistan Lahore Time
+5.5	IST	India Standard Time
+6	BST	Bangladesh Standard Time

Hours From Greenwich Mean Time (GMT)	Value	Description
+7	VST	Vietnam Standard Time
+8	CTT	China Taiwan Time
+9	JST	Japanese Standard Time
+9.5	ACT	Australia Central Time
+10	AET	Australia Eastern Time
+11	SST	Solomon Standard Time
+12	NST	New Zealand Standard Time
-11	MIT	Midway Islands Time
-10	HST	Hawaii Standard Time
-9	AST	Alaska Standard Time
-8	PST	Pacific Standard Time
-7	PNT	Phoenix Standard Time
-7	MST	Mountain Standard Time
-6	CST	Central Standard Time
-5	EST	Eastern Standard Time
-5	IET	Indiana Eastern Standard Time
-4	PRT	Puerto Rico and US Virgin Islands Time
-3.5	CNT	Canada Newfoundland Time
-3	AGT	Argentina Standard Time
-3	BET	Brazil Eastern Time
-1	CAT	Central African Time

__ 4. Click **Finish** to apply the change.

Automatically Starting a 5250 Session on a Network Station

You can automatically start a 5250 session (sign on display) on a Network Station. This eliminates using the default 5250 button on the Menu bar. Using the 5250 button requires you to specify the host or IP address before the 5250 sign on screen is available. Complete the following steps to automatically start a 5250 session on a Network Station:

__ 1. From the *Setup Tasks* frame, click **Startup**, click **Programs**, and select **User defaults**. In the bottom frame click **Next** to continue.

__ 2. The Programs Settings frame appears. See Figure 85 on page 278.

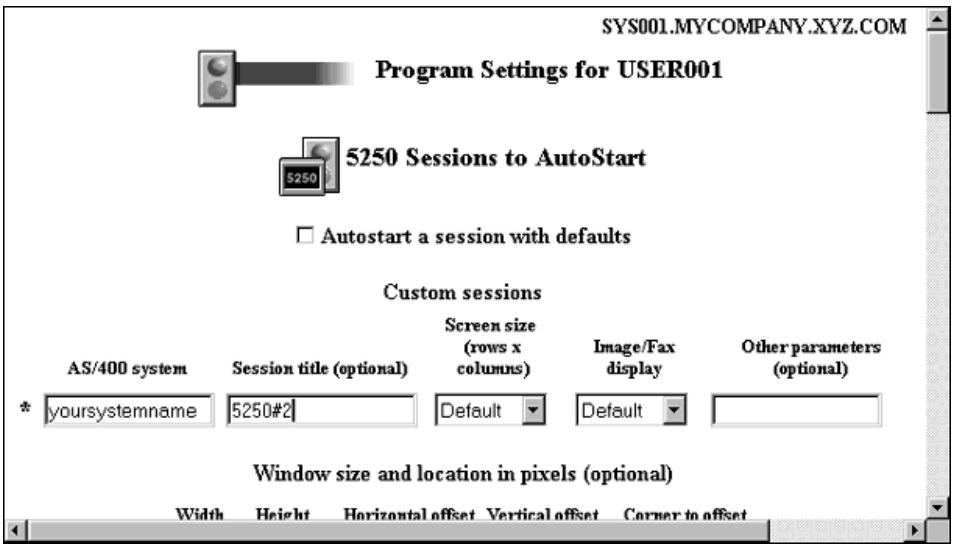


Figure 85. Automatically Starting a 5250 Session on an IBM Network Station

__ 3. Scroll to *5250 Sessions to Autostart*. This setting, when completed, automatically starts a 5250 session for you when you sign on to your workstation. Complete the following fields:

AS/400 system
Type the name or TCP/IP address of the AS/400 from which your workstation receives its boot file.

Session title
Type in a text string that represents your 5250 session, for example, 5250#2. This text string will appear in the Title bar of your 5250 session. This field is optional, and you do not need a value. However, if you work with multiple 5250 sessions, the title helps the session.

Other fields
Use the default settings.

__ 4. Click **Finish** to apply the change.

Configuring a Local (ICA) Client Session Menu Button for a Network Station

Note: Independent Computing Architecture (ICA) is a general-purpose presentation services protocol. You can use ICA to access Microsoft Windows applications from a Network Station or PC client.

Complete the following steps to configure a local (ICA) client session Menu button:

__ 1. From the *Setup Tasks* frame, click **Startup**, click **Menus**, and select **User defaults**. In the bottom frame, click **Next** to continue.

__ 2. The Menu Contents frame appears (scrolled forward to Local Program Menu Items). SeeFigure 86.

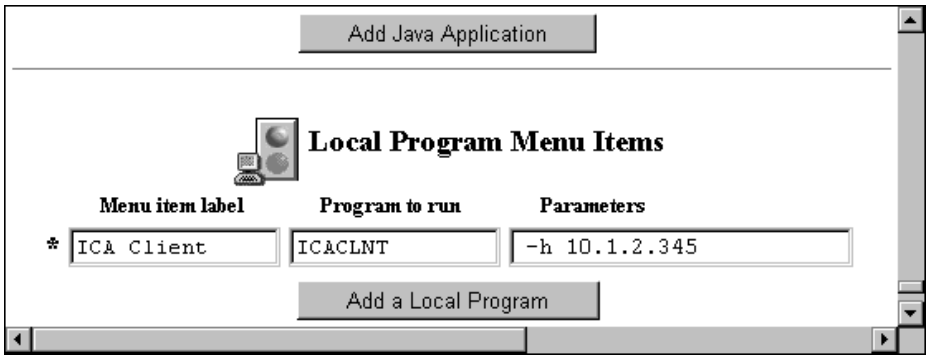


Figure 86. Starting a Local Client Session on an IBM Network Station

__ 3. This setting, when completed, creates a menu button that, when clicked, starts the specified Local program. Complete the following fields:

Menu item label
The text you type in this field appears in the menu button on your Network Station.

Program to run
Type the name of the local program that runs when you click the Menu button.

Parameters
In this field you can use parameters that can be passed to the local program. Following is a list of parameters and their descriptions:

-h(ost) Identifies the PC server the ICA client connects to. You can use the PC server IP address or host name if you have domain name server support.

This is a required parameter.

-ti(tle) Specifies the text to be displayed by the window manager. The text string must be enclosed with quotation marks. For example, -ti 'ICA Client'.

-c(olor)
Specifies the number of colors the ICA client may use. This value can be either 16 or 256.

-g(eometry)
Specifies the position (location) on the display where the window is placed. The value is expressed in the form: width x height.

-ca(che)
Specifies the size of the memory cache for video display. The possible choices are: 0, 512, 1024, 2048 (default), 3072, 4096, and 8192.

-w(orkdir)
The directory specified becomes the logged on user's default directory on the PC server. You must insert additional slashes into the directory name (for example, \users\sdh must be specified as \\users\\sdh).

-domain
Specifies the domain that is automatically entered into the PC Login menu.

-username
Specifies the user name that is automatically entered into the PC Login menu.

-password
Specifies the password that is automatically entered into the PC Login menu.

-lb Specifies to turn on load balancing for this connection.

-en(cryption)
Turns off the simple encryption protocol driver (The -en parameter has nothing to do with Secure ICA option pack).

Note:
The encryption parameter must have two consecutive dashes preceding the en. It is also must be the last parameter specified. You must insert additional slashes into the directory name (for example, \users\sdh must be specified as \\users\\sdh).

__ 4. Click **Finish** to apply the change.

Implementing ICA Load Balancing

You implement load balancing by specifying the -lb parameter in the Other parameters field of the Local (ICA) Client Session configuration. Load balancing provides the client access to a quantity or 'FARM' of PC servers in a PC server network. The load balancing function determines which PC server is doing the least amount of work. When the Local (ICA) client that requests an application be served, the client receives it from the PC server identified as performing the least amount of work.

Configuring ICA Virtual Printing for Network Stations

See "Appendix E. Configuring ICA Virtual Printing for Network Stations" on page 367 for detailed information on printer configuration.

Configuring a Terminal Session for a Network Station

Terminal sessions, when configured, provide the function to have a X session on your Network Station. Complete the following steps to configure a X session:

__ 1. From the *Setup Tasks* frame, click **Startup**, click **Programs**, and select **User defaults**. In the bottom frame click **Next** to continue.

__ 2. The Program Contents frame appears (scrolled forward to Terminal Sessions). SeeFigure 87.

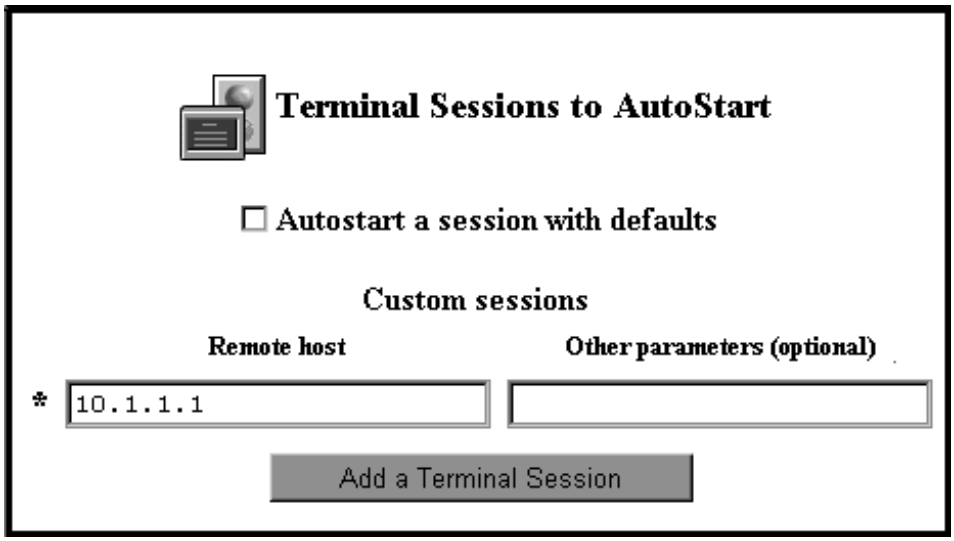


Figure 87. Starting a Terminal (X) Session on an IBM Network Station

__ 3. This setting, when completed, allows the user to initiate a X session on the Network Station.

__ 4. Click **Finish** to apply the change.

Note: You can use the Menus function of Startup to give users a Menu bar button. Clicking that Menu bar button allows them to type in the name of the host to which they want to Telnet.

Choose a name for the Menu item label and leave the Host field blank. Click Finish to complete the task. The next time the user logs on the Network Station they will have a button that, when clicked, prompts for the remote host name.

Using Debug Log in a Terminal Session

The debug log can assist in isolating problems in a Terminal Session. Use the following steps to setup a debug log:

1. From the *Setup Tasks* frame, click **Startup**, click **Menus**. In the bottom frame click **Next** to continue.
2. Scroll forward to **Terminal Sessions**.
3. In the **Other Parameters** field type:

   ```
   -xrm '"NCDterm*logDirectory: <directory_name>"'
   ```

4. The directory must already exist. Make sure to type the single quote mark followed by the double quote mark where indicated.

5. Following is a complete example that shows the debug log being created in the user's directory:

```
-xrm '"NCDterm*logDirectory:
           /QIBM/UserData/NetworkStation/users/${USER}"'
```

Changing Your Icon Location

Complete the following steps to change icon locations:

__ 1. From the *Setup Tasks* frame, click **Desktop**, click **Standard Desktop**, and select **User defaults**. In the bottom frame, click **Next** to continue.

__ 2. The Standard Desktop Settings frame appears. See Figure 88.

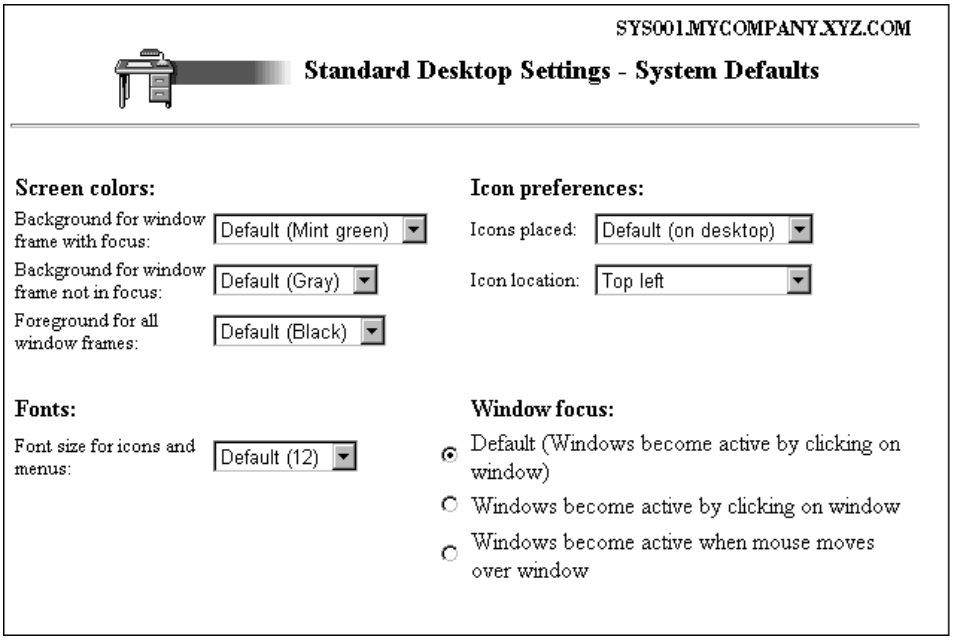


Figure 88. Desktop Settings Example

__ 3. Scroll to *Icon preferences*. In the Icon location field, select **Top left**.

__ 4. Click **Finish** to apply the change.

Disabling the Control Menu for a 5250 Session

Disabling the Control Menu prevents users from accessing the 5250 emulator functions available through the Control pulldown.

__ 1. From the Setup Tasks frame, click **5250** and select **User defaults**. In the bottom frame, click **Next** to continue.

__ 2. The 5250 Settings appear. See Figure 89.

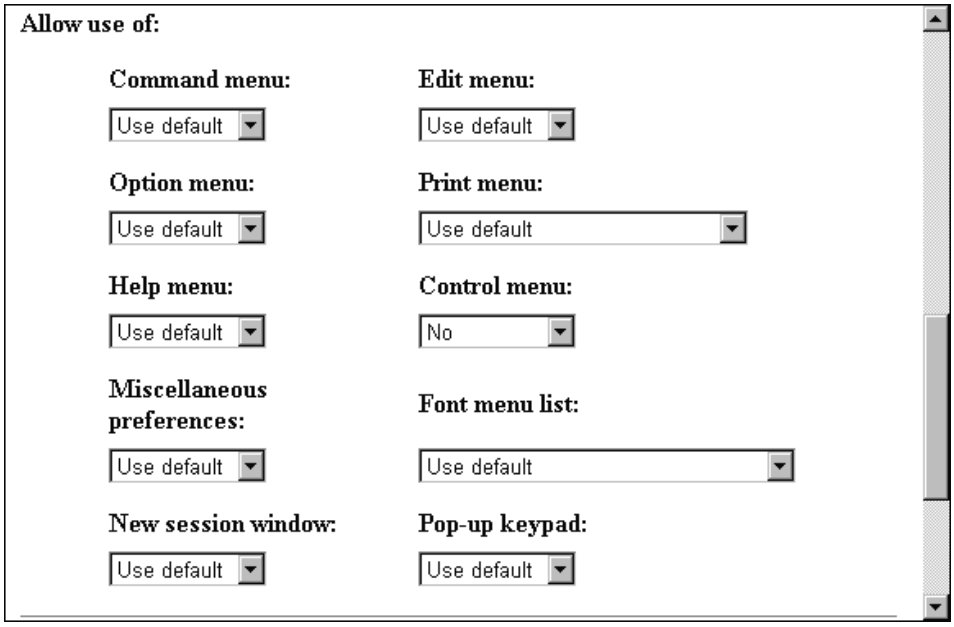


Figure 89. 5250 Setting Example

__ 3. Scroll to the *Allow use of* section.

__ 4. In the Control menu drop box, select **No** to disable the Control menu. (The default is Yes, meaning that you can use the Control menu).

By disabling use of the Control menu, your 5250 sessions will not have the Control pulldown displayed for use.

__ 5. Click **Finish** to apply the change.

Enabling the 5250 or 3270 Emulator for Euro Currency Support

5250 or 3270 emulation can support access to the Euro currency symbol. Follow the steps below to implement the Euro currency support:

__ 1. From the Setup Tasks frame, click **Startup**. Click **Menus or Programs**(this example uses Menu Items) and click your choice of default. In the bottom frame, click **Next** to continue.

__ 2. Scroll to either the *3270 or 5250 Menu Items* (this example uses 5250 Menu Items) section.

__ 3. The 5250 Menu Items appear. See Figure 90 on page 284.

Figure 90. Enabling the Euro Currency Symbol

__ 4. Type in the values for Menu Item Label, AS/400 or OS/390 system name, and -EURO in the Other parameters field as shown in Figure 90.

Note: The Other parameter value of -EURO must be typed in upper case characters.

__ 5. Click **Finish** to apply the change.

Changing the Screen Size of a 3270 Session

Your organization may have requirements for varying 3270 session screen sizes. Complete the following steps to change screen sizes of your 3270 emulation sessions:

__ 1. From the *Setup Tasks* frame, click **3270** and select **User defaults**. In the bottom frame, click **Next** to continue.

__ 2. The 3270 Settings panel appears. See Figure 91.

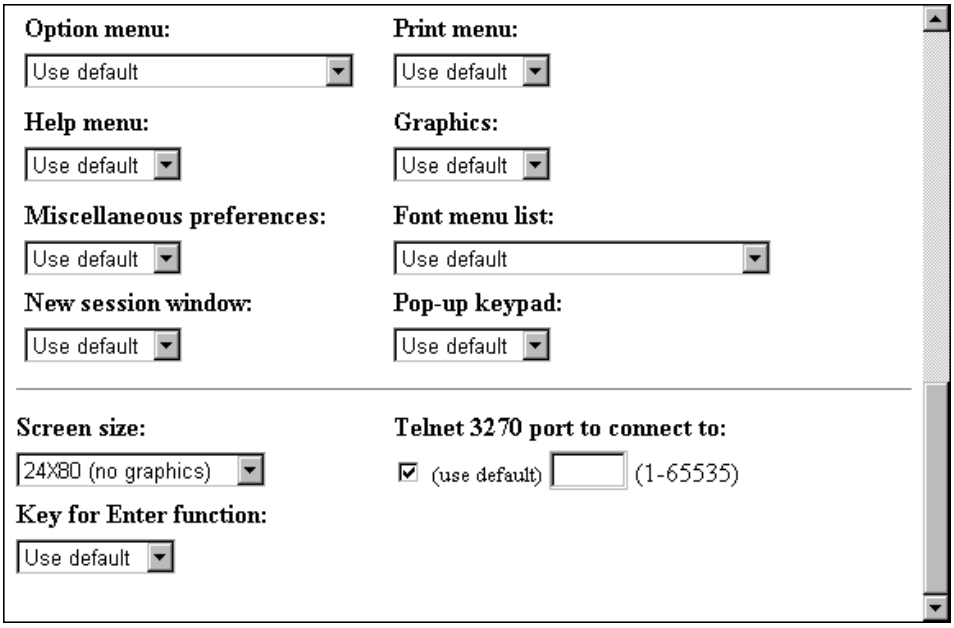


Figure 91. 3270 Settings Example

__ 3. Scroll to the *Screen size* field. Select **24 x 80**.

This action changes your 3270 session screen size from 32 x 80 (the default) to 24 x 80.

__ 4. Click **Finish** to apply the change.

Enabling Java Applets for NC Navigator

Java applets can add function to your browser sessions if your browsers are allowed to run them. Complete the following steps to enable Java applets on your browser:

__ 1. From the *Setup Tasks* frame, click **Internet**, click **NC Navigator**, and select **User defaults**. In the bottom frame, click **Next** to continue.

__ 2. The NC Navigator Settings frame appears. See Figure 92.

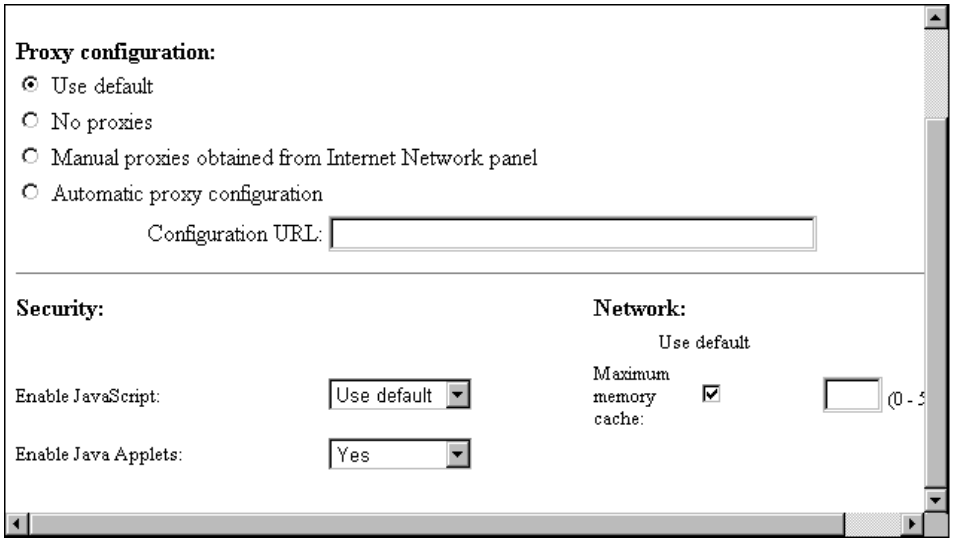


Figure 92. NC Navigator Browser - Enabling Java Applets

__ 3. Scroll to the *Security* section. In the *Enable Java Applets* field, select **Yes** as the value.

Selecting this value enables Java applets to run on user001's workstation.

__ 4. Click **Finish** to apply the change.

Creating Directory Buttons for NC Navigator

Directory buttons provide quick access to specified URLs. As administrator, you can control the creation and access to directory buttons. Complete the following steps:

__ 1. From the *Setup Tasks* frame, click **Internet**, click **NC Navigator**, and select one of the available **defaults**. In the bottom frame, click **Next** to continue.

__ 2. The NC Navigator Settings frame appears. See Figure 93 on page 286.

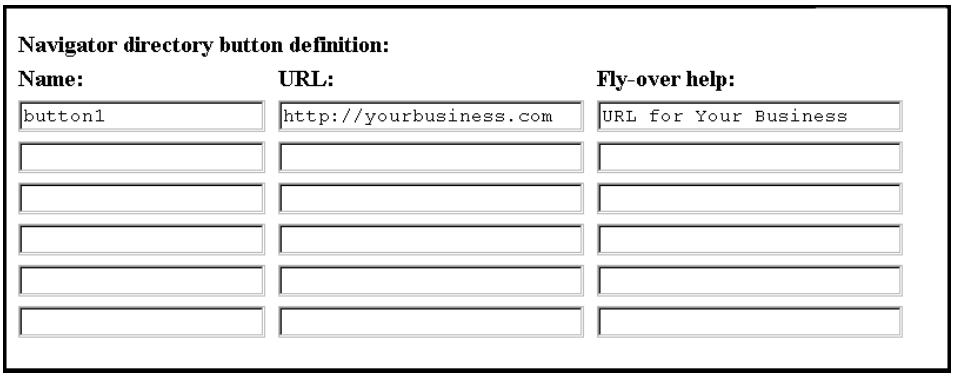


Figure 93. NC Navigator Browser - Creating Directory Buttons

__ 3. Scroll to the *Navigator directory button definition* section.

__ 4. Type in the values you want to use for each directory button. In this example Figure 93 shows:

Name Button1

URL http://yourbusiness.com

Fly-over help
URL or name for YourBusiness

__ 5. Click **Finish** to apply the change.

Working with Your Network Proxies

Following are Network proxies you can work with when using the IBM Network Station Manager program:

- File Transfer Protocol (FTP)
- HTTP
- GOPHER
- Security
- SOCKS
- Outgoing mail (Simple Mail Transfer Protocol (SMTP))
- Incoming mail (POP3)
- News (NNTP)

__ 1. From the *Setup Tasks*frame, click **Internet**, click **Network**, and select **User defaults**. In the bottom frame, click **Next** to continue.

__ 2. Scroll to the *Proxy* section.

__ 3. The Network Settings frame appears. See Figure 94 on page 287.

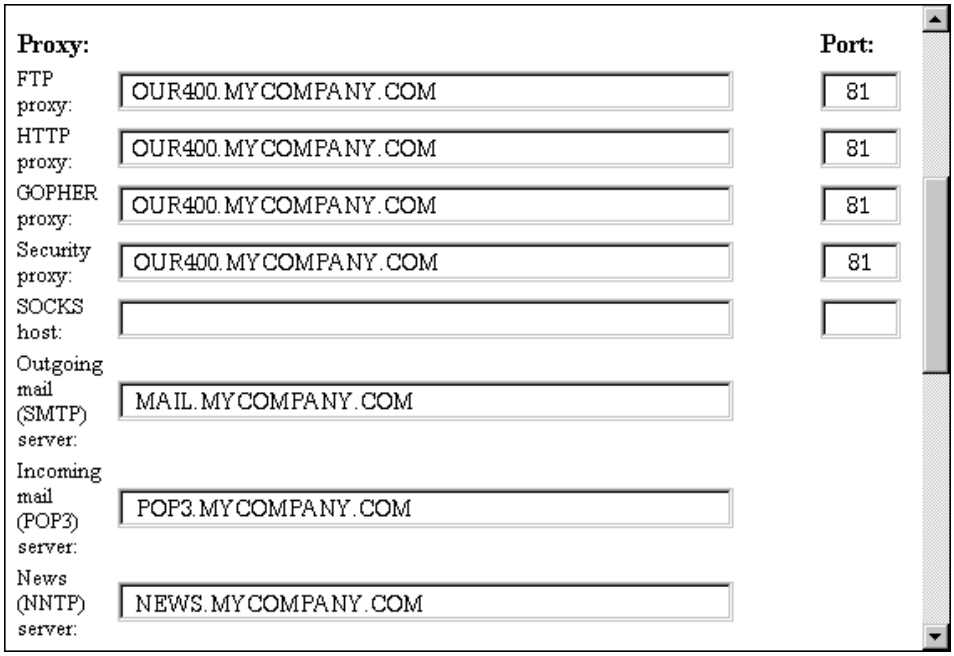


Figure 94. Working with Your Network Proxies

The values in Figure 94 are examples only. You must know the names, (and in some cases port numbers) to be used for these proxies. If you do not know the names, you may have to work with your network administrator or your network service provider.

__ 4. Click **Finish** to apply the change.

Changing the Menus and Messages Language Type

There may be times when you want to have some users work in a language other than the primary language of the host. Complete the following steps to change the language for messages and menus:

__ 1. From the *Setup Tasks* frame, click **Language**, and then select **User defaults** using user ID user001. In the bottom frame, click **Next** to continue.

__ 2. The Language Settings frame appears. See Figure 95 on page 288.

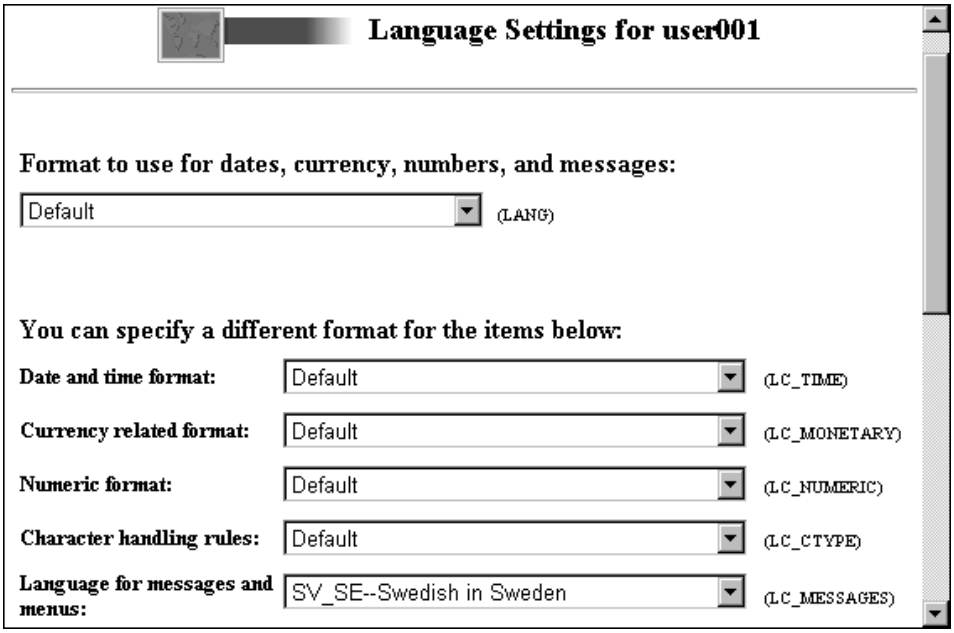


Figure 95. Changing the Menus and Messages Language Type

__ 3. Scroll to the *LC_MESSAGES* field. In the *LC_MESSAGES* field, select **SV_SE** (Swedish in Sweden) as the value.

Selecting this value makes all menus, and messages appear in Swedish for user001.

Note: If you change the LANG parameter values, the keyboard mapping language for a user's keyboard should also be the same. You can find the keyboard mapping language parameter in the Workstations function under the Hardware Setup Task.

__ 4. Click **Finish** to apply the change.

Assigning Group Settings to a User

Note: A user must belong to the group before you can specify that the user inherit that group's settings. Also, the group must have settings before you can assign those settings to a user.

You create groups on the Host server. Associating users with groups is also done on the Host server.

__ 1. From the *Setup Tasks* frame, click **Select User's Group**. Type in **user001** in the *For which user do you want to select a group* field. See Figure 96 on page 289.

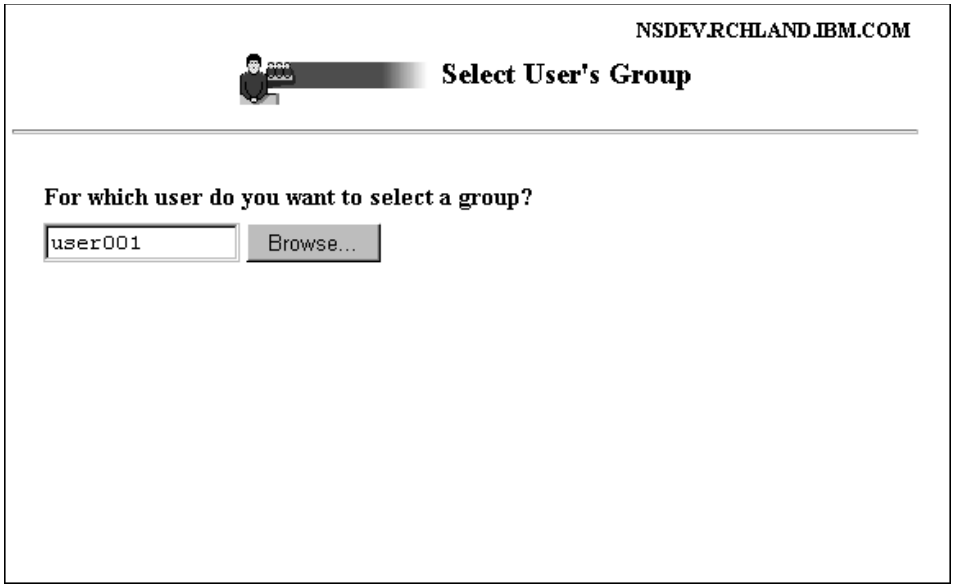


Figure 96. Selecting a User to be Associated with a Group

__ 2. In the bottom frame, click **Next** to continue.
The *Select Group for user001* panel appears. See Figure 97.

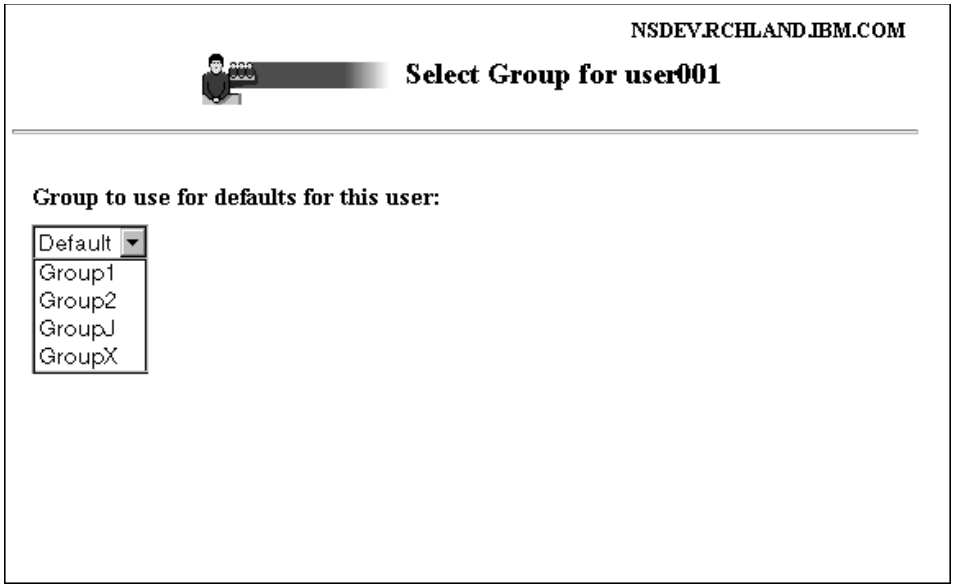


Figure 97. Selecting a Group to Use for Defaults

__ 3. Click the **Group to use for defaults for this user** drop box. Select the group whose settings you want user001 to inherit. In this example that is GROUPX.

When user001 logs on next time, user001 will have any settings configured for GROUPX.

__ 4. Click **Finish** to apply the change.

IBM Network Station Manager Program Education

You should provide some hands-on education, similar to what you just experienced, for your users of the Network Stations.

Practice choosing and applying settings within the various Setup Tasks to build skills among your users.

Accessing and Using How To... Help

The IBM Network Station Manager program contains a How To... help category.

The How To... category is organized by the tasks you can perform while using the IBM Network Station Manager program. For example, it contains instructions about how to create 5250 sessions, change your desktop to Lotus eSuite WorkPlace, and configure NC Navigator sessions.

How To... help can be accessed by clicking the Help button at any time. Figure 98 on page 291 shows a view of the Help Contents where How To... is located.

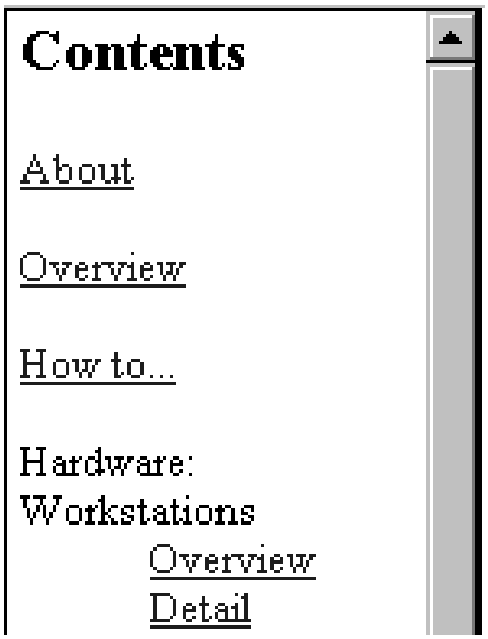


Figure 98. Finding How To... Help

Additional IBM Network Station Manager Program Examples

Following are examples that use the IBM Network Station Manager program:

- Setting up an AIX session on your IBM Network Station by using Remote Program support
- Setting up a Windows NT session on your IBM Network Station by using Remote Program support

Setting Up an AIX Session Using the IBM Network Station Manager Program

Complete the following steps to set up an AIX session using the IBM Network Station Manager program:

__ 1. Verify that the user ID and password on the Host system match the user ID and password on the authentication server.

__ 2. You must create a .rhosts file on the AIX server. This file must contain the Network Station's name and the name that the user logs into AIX with. This file resides on the AIX server under the user's directory. An example for a user ID of user001 would be:

Location and name of file

/home/user001/.rhosts

Contents of .rhosts file

```
NWS1.mycompany.ABC.com user001
```

The .rhosts file can contain multiple lines. Each line should have one Network Station name and one user name on it. If a user will be working from more than one Network Station, create an entry for each Network Station. Following is an example of the contents of a .rhosts file that allows user001 to sign on to multiple Network Stations:

Location and name of file
/home/user001/.rhosts

Contents of .rhosts file

```
NWS1.mycompany.ABC.com user001

NWS2.mycompany.ABC.com user001

NWS2.mycompany.ABC.com user001
```

If you want to allow user001 to sign-on to any Network Station, the path name and contents of the .rhosts file would be as follows:

Location and name of file
/home/user001/.rhosts

Contents of .rhosts file

```
+ user001
```

__ 3. On the RS/6000, run the following command:

```
CHMOD 600 .rhosts
```

Running the CHMOD command changes the access permissions to the .rhosts file. Changing the access permissions allows checking of the .rhosts file to verify that a user (user001 in this example) is listed in the .rhosts file.

__ 4. You can verify that the access permissions worked by running the following command:

```
ls -al .rhosts
```

You should see **-rw - - - - - - - 1 user001 system**.

__ 5. Sign on to the IBM Network Station Manager program.

__ 6. From *Setup Tasks*, click **Startup**, then click **Menu**.

__ 7. From *Program Defaults*, click **User defaults**.

If you are setting this up for someone else, type the **user ID** of that user or click **Browse** to select the user ID.

__ 8. Click **Next** to continue.

__ 9. Scroll ahead to *Remote Programs Menu Items* and type in the information. See Figure 99 on page 293.

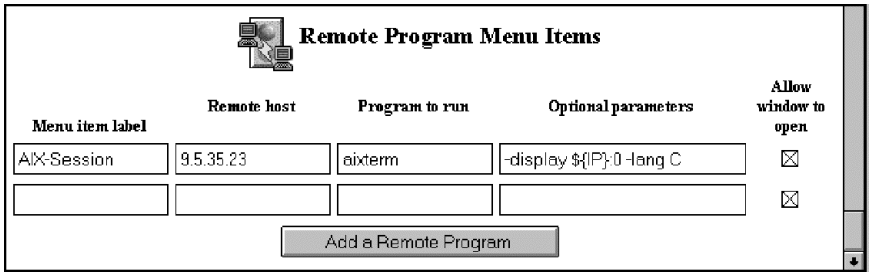


Figure 99. Remote Program Example for AIX

Where:

Menu item label
This text string appears in the Menu bar on the Network Station.

Remote host
The name or IP address of the AIX server.

Program to run
This identifies the program to run on the AIX server.

Optional parameters
-display is an AIX requirement that causes the program to display on the Network Station rather than on the remote host. ${IP} is an IBM-supplied environment variable that is replaced with the IP address of the Network Station. -lang C is an AIX requirement that is used by programs such as Netscape on AIX.

The required parameters for AIX-Session are:

```
-display
${IP}:0
```

__ 10. Click **Finish** to apply the AIX remote program setting.

__ 11. Log off and then log on your Network Station. The Menu bar should have a button labeled AIX-Session. See Figure 100.

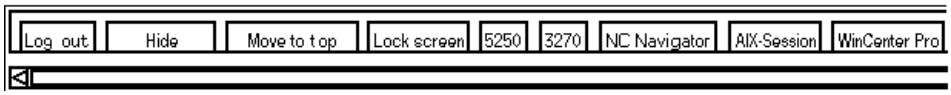


Figure 100. Menu Button for Remote Program Example for AIX

__ 12. Click **AIX-Session**. A window opens with your X-station session.
From the Aixterm window, you can run additional programs.

Setting Up a Windows NT Session Using the IBM Network Station Manager Program

The following steps create a button on the Network Station for both WinCenter Pro and WinCenter UIS sessions. Complete the following steps using the IBM Network Station Manager program:

__ 1. Verify that you have a Windows NT machine in your network that has the WinCenter application loaded on it.

__ 2. Verify that the user has a valid user profile and password on the Windows NT server. When you request a session from the Windows NT server (for the Network Station), the user must sign on.

__ 3. Sign on to the IBM Network Station Manager program.

__ 4. From *Setup Tasks*, click **Startup**, then click **Menu**.

__ 5. From *Program Defaults*, click **User defaults**.

If you are setting this up for someone else, type that user's ID or click **>Browse** to select the user ID.

__ 6. Click **Next** to continue.

__ 7. Scroll ahead to *Remote Programs Menu Items* and type in the information. See Figure 101.

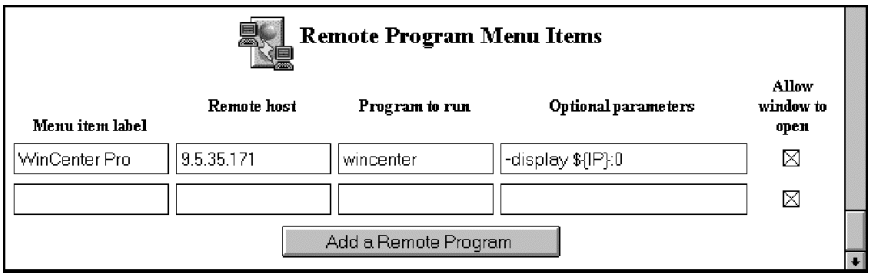


Figure 101. Remote Program Example for Windows NT

Where:

Menu item label
This text string appears in the Menu bar on the Network Station.

Remote host
The name or IP address of the Windows NT server.

Program to run
This identifies the program to run on the Windows NT server. For WinCenter Pro and WinCenter UIS, enter the value **wincenter**.

Optional parameters
-display is a WinCenter requirement that causes the program to display on the Network Station rather than on the remote host. **${IP}** is an IBM-supplied environment variable that gets replaced with the IP address of the Network Station.

You must enter the following parameters for your WinCenter application:

```
-display
${IP}:0
```

__ 8. Click **Finish** to apply the WinCenter Pro remote program setting.

__ 9. Log off and then log on your Network Station. The Menu bar should have a button labeled WinCenter Pro or WinCenter UIS. See Figure 102.

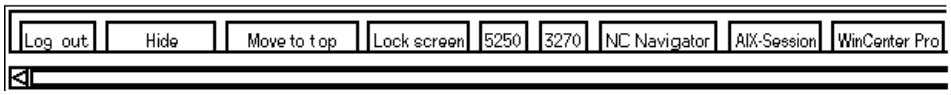


Figure 102. Menu Button for Remote Program Example for NT

__ 10. Click **WinCenter Pro** or **WinCenter UIS** and a window opens with your WinCenter session.

Chapter 9. Working with User Services

User services are programs that provide administrators with tools to manage the IBM Network Station's environment. You can work with User Services whenever you want, including when an application is running. Following are a list of User Services:

- Console
- Login (The Login User Service is not available.)
- Terminals (The Terminals User Service is not available.)
- WindowMgr
- Utilities
- Setup (The Setup User Service is not available.)
- Statistics

Accessing User Services

Access User Services by pressing the Shift, Alt, and Home keys all at the same time.

Figure 103 shows the User Services window with all the service programs that are displayed within the menu bar.

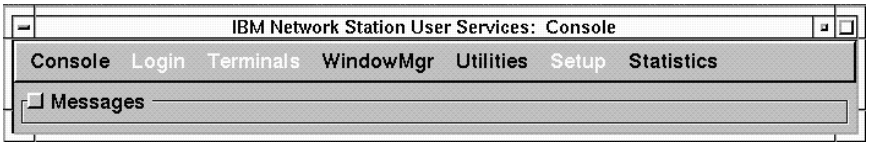


Figure 103. User Services Window

Console

This function provides a menu bar option (Console) for handling messages. Figure 104 on page 298 shows the tools available through the Console services option.

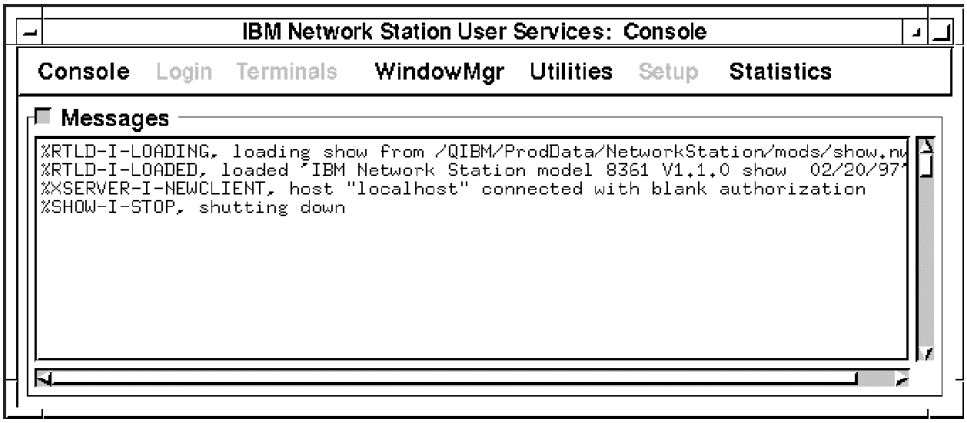


Figure 104. User Services: Console View

Click the button by Messages to display messages that record Network Station activity.

The list below contains the name of the tool and a description of its function.

Clear Messages
Selecting this option clears all the current messages from the console display.

Rescan Messages
Selecting this option refreshes messages in the console window. Messages that are not displayed appear in the refreshed window.

Close Selecting this option closes the console function of User Services.

Login

The Login services option is disabled. The IBM Network Station Manager licensed program provides a login capability.

Terminals

The Terminal services option is disabled. The IBM Network Station Manager Program provides terminal or workstation management.

WindowMgr

Figure 105 on page 299 shows the tools available through the WindowMgr services option.

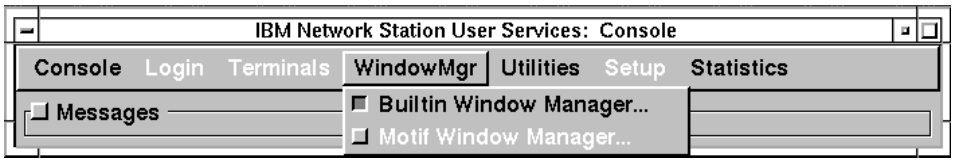


Figure 105. User Services: Window Manager View

The list below contains the name of the tool and a description of its function:

Builtin Window Manager
Selecting this option starts the Builtin Window Manager (an OSF or Motif-style). Deselecting this option ends the Builtin Window Manager.

The Builtin Window Manager function provides you with the ability to size, move, and make active (clicking) all the windows open on your monitor.

Utilities

Figure 106 shows the tools available through the Utilities services option.

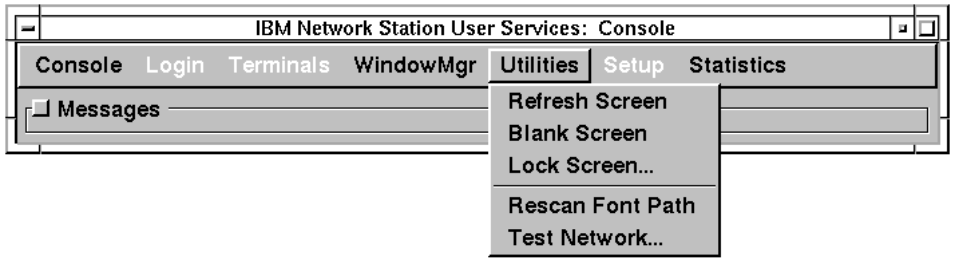


Figure 106. User Services: Utilities View

The list below contains the name of the tool and a description of its function.

Refresh Screen
Selecting this option refreshes the active window.

Blank Screen
Selecting this option starts the screen-saver program.

Lock Screen
Selecting this option locks the screen after prompting for a password. The Lock Screen function keeps anyone without the password from using the workstation.

Rescan Font Path
Selecting this option refreshes any font changes that are provided by the system administrator.

For example, if the font used is so large, you can not display an entire 5250 session, have the administrator provide a smaller font. Select the smaller font by clicking the Option pulldown, clicking Font, and selecting the smaller font.

Another use of fonts would be to make your windows smaller. Using smaller fonts enables several full windows on a screen.

Note: The 5250 Emulation program provides multiple fonts. From the 5250 Tool bar, select the Option pulldown and click Fonts.

Test Network
Selecting this option runs the network test, similar to the Transmission Control Protocol/Internet Protocol (TCP/IP) command PING.

Setup

The Setup services option is disabled.

Statistics

Figure 107 shows the tools available through the Statistics services option.

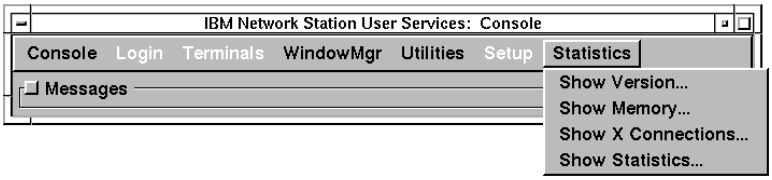


Figure 107. User Services: Statistics View

The list below contains the name of the tool and a description of its function within the statistics services function.

Show version
Selecting this option displays version numbers and other information about the current state of the IBM Network Station.

Show Memory
Selecting this option displays information about free and installed memory in the IBM Network Station.

Show Connections
Selecting this option displays information about all the current X clients that are connected to the IBM Network Station.

Show Statistics
Selecting this option displays statistics that pertain to the IBM Network Station.

Chapter 10. Working With the IBM Network Station Setup Utility

This chapter contains information about using the Setup Utility of the IBM Network Station network computer, hereafter referred to as the Network Station. The Setup Utility menu allows you to **View** or **Set** (change) configuration settings that relate to a particular IBM Network Station. The Setup Utility is primarily a tool for administrators to find and correct problems on the network. You can use the IBM Network Station Manager to restrict a user's privileges in the Setup Utility.

Accessing the IBM Network Station Setup Utility

Access the Setup Utility by carrying out the following steps:

1. Power on the Network Station.
2. When the NS0500 *Search for Host System* message appears on the black screen, press the Escape key.
3. If password control is active, you must enter the case-sensitive administrator password.

   Note: You can specify the administrator password through the IBM Network Station Manager in the Hardware setup tasks under *Miscellaneous Settings*.

The following screen appears:

```
SCRN02                IBM Network Station
                          Setup Utility

F2 = View Hardware Configuration
F3 = Set Network Parameters
F4 = Set Boot Parameters
F5 = Set Configuration Parameters
F6 = Set Monitor Parameters
F7 = Set Language Parameters


F10 = Set Verbose Diagnostic Messages Disabled









Enter=Reboot
```

Notes:

1. If the administrator has not set the password in the IBM Network Station Manager, any user can access the configuration settings in the IBM Setup Utility.
2. If you attempt the password three times without success, you can only view the hardware configuration.
3. If you changed the administrator password by using IBM Network Station Manager, you must boot the Network Station up to the Login window. This enables the new administrator password at the system unit.

Users who are granted limited access by the administrator in IBM Network Station Manager do not see the complete screen shown above. They see only the first option, which allows only for viewing the hardware configuration.

IBM Network Station Setup Utility Tasks

You can find information about Setup Utility tasks in Table 63 on page 303 and Table 64 on page 303, in the text-based instructions which follow, or in both sources.

Table 63 on page 303 and Table 64 on page 303 divide Setup Utility tasks into two categories: Tasks that deal with configuration settings and tasks that deal with appearances. The tables point you to the steps you need to take to perform each task. You can reach many of the required screens simply by pressing one key, and many of the tasks consist of a single keystroke. When the task is more complicated or bears explanation, the tables direct you to the text-based instructions in the remainder of the chapter.

Note: For specific instructions about configuring a Network Station to boot from NVRAM settings, refer to “Configuring an IBM Network Station to Boot from the NVRAM Setting” on page 309.

Table 63. Common Configuration Tasks in Setup Utility

Configuration Item	To View	To Set
Network Station IP Address	F3, select NVRAM.	F3, select NVRAM.
Subnet Mask	F3, select NVRAM.	F3, select NVRAM.
Default MAC Address	See “Finding the Default MAC Address” on page 306.	N/A.
User-configurable MAC Address	See “Viewing the User-Configurable MAC Address” on page 307.	See “Specifying a User-Configurable MAC Address” on page 307.
Gateway IP Address	F3, select NVRAM.	F3, select NVRAM.
IP Addressed From (Is NVRAM or a Network setting being used to boot?)	F3.	F3.

Table 64. Common Appearance Tasks in Setup Utility

Appearance Item	To View	To Set
Keyboard Language	F7.	F7. See “Selecting a Keyboard Language” on page 305.
Monitor Resolution	F6.	F6. See “Setting Monitor Resolution”.
Verbose Diagnostic Messages (activity and messages displayed during boot)	F10.	F10. See “Using Verbose Diagnostic Messages” on page 305.
Blanking Pedestal	F6.	See “Working With the Blanking Pedestal” on page 304.

Setting Monitor Resolution

You can change the resolution of the monitor that is attached to a Network Station to improve a screen image that is not clear.

CAUTION:
Setting a resolution that is not supported by your monitor can permanently damage the monitor.

Note: For the best video image, you should power on the monitor before you start the logic unit.

__ 1. Enter the Setup Utility by powering on the Network Station and pressing the Escape key after the NS0500 *Search for Host System* message displays during system startup.

__ 2. Press the F6 key.

__ 3. Press the F2 key.

__ 4. Select a new monitor resolution by using the Up and Down arrow keys.

__ 5. After selecting your resolution, press Enter.

__ 6. Test the resolution by pressing Enter again. A properly resolved monitor clearly displays the resolution setting in the center of a full-screen grid.

Working With the Blanking Pedestal

The Blanking Pedestal allows you to increase the contrast between black and white on your monitor. To activate the Blanking Pedestal, carry out the following instructions:

__ 1. Enter the Setup Utility by pressing the Escape key after the NS0500 *Search for Host System* message displays during system startup.

__ 2. Press F6.

__ 3. Press the F9 key to enable or disable the Blanking Pedestal. The F9 key acts as a toggle switch.

Once you have enabled the Blanking Pedestal, your display changes immediately.

Setting the Twinaxial Station Address

Note: You should read this section only if you are using twinaxial connectivities in your Network Station environment.

The twinaxial station address is a logical address that is assigned to particular physical outlet along a twinaxial cable. It is not an IP address. The twinaxial station address may range from 0 through 6.

You can specify the twinaxial station address that a Network Station uses. To set the twinaxial station address, carry out the following steps:

__ 1. Enter the Setup Utility by powering on the Network Station and pressing the Escape key after the NS0500 *Search for Host System* message displays during startup.

__ 2. Press F8 to access the Set Twinax Station Address screen.

__ 3. Enter an address value between 0 and 6.

__ 4. Press Enter to save the new twinaxial address.

Selecting the Startup Language

The first time you start a Network Station, a screen prompts you to select a Startup Language. The Startup Language is the language that the Network Station uses in its own interface. For example, the screens that you see in the Setup Utility appear in the language that you select. The Startup Language is not the same as the keyboard language or the language that the IBM Network Station Manager interface uses. For information about setting the keyboard language for a Network Station, see “Selecting a Keyboard Language” on page 305.

To change the Startup Language after the first time the Network Station is started, complete the following steps:

__ 1. Enter the Setup Utility by pressing the Escape key after the NS0500 *Search for Host System* message displays during system startup.

__ 2. Press F7, *Set Language Parameters*.

__ 3. Press F3, *Select Startup Language*.

__ 4. Select the language of your choice.

__ 5. Press Enter. The language that you see on screen changes immediately.

Selecting a Keyboard Language

Warning: You should use the IBM Network Station Manager program to change keyboard languages. If you change the language in the Setup Utility, you might specify a different language than what is in the IBM Network Station Manager. The value in the IBM Network Station Manager overides any value in the Setup Utility.

You can select a keyboard language to use with this Network Station. Selecting a different language changes the mapping of keys. By changing the mapping of keys, you could cause a different character to display when a certain key is pressed.

To select a keyboard language, carry out the following steps:

__ 1. Enter the Setup Utility by powering on the Network Station and pressing the Escape key after the NS0500 *Search for Host System* message displays during the startup process.

__ 2. In the main Setup Utility screen, press the F7 key.

__ 3. Press the F2 key to select a keyboard language.

__ 4. Use the Up and Down arrow keys to select a language from the options displayed.

__ 5. Press Enter to save your selection.

Using Verbose Diagnostic Messages

You have the choice of whether or not to monitor boot activity from the boot host on an individual Network Station. When you enable Verbose Diagnostic Messages in Setup Utility, messages appear on the monitor during the boot process as files are loaded.

__ 1. Enter the Setup Utility by powering on the Network Station and pressing the Escape key after the NS0500 *Search for Host System* message displays during the startup process.

__ 2. Press the F10 key to change the status of Verbose Diagnostic Messages. The F10 key acts as a toggle switch. Verbose Diagnostic Messages are currently disabled when the display reads ″F10 = Set Verbose Diagnostic Messages Disabled.″ When the display reads, ″F10 = Set Verbose Diagnostic Messages Enabled, it means that Verbose Diagnostic Messages are currently enabled.

Working With MAC Addresses

You use a MAC address (which is an alpha-numeric value) to identify a computer.

Network Stations can have two kinds of MAC addresses: Default MAC addresses, and user-configurable MAC addresses.

Default MAC Addresses

The default MAC address is a unique identifier that corresponds permanently to a particular Network Station. The Network Station receives its default MAC address in the factory where the machine is manufactured. The default MAC address does not change, even when you specify a user-configurable MAC address.

Finding the Default MAC Address: You can find the default MAC address by viewing the MAC address label in the Network Station packaging. See Figure 6 on page 8 for guidance.

On a new Network Station which has no user-configurable MAC address, you can view the default MAC address in the Setup Utility. To do so, carry out the following steps:

__ 1. Enter the Setup Utility by pressing the Escape key after the *Search for Host System* message displays during the startup process.
__ 2. Press the F2 key to view the MAC address.

Note: Remember, that the default MAC address will only appear here if no user-configurable MAC address is active. See “Recovering the Default MAC Address” for information about recovering the default MAC address once you have specified a user-configurable MAC address.

Recovering the Default MAC Address: Once you have entered a user-configurable MAC address, you can reset the MAC address to the default by carrying out the following steps:

__ 1. Enter the Setup Utility by restarting the Network Station and pressing the Escape key after the *Search for Host System* message displays during system startup.
__ 2. In the Setup Utility, press **Control+Alt+Shift+F1**.
__ 3. On the command line, type the following command: `ma default`.
__ 4. To return to the Setup Utility, type `SE` and press the Enter key or type `RS` to restart the Network Station.

User-Configurable MAC Addresses

You may wish to configure your own MAC addresses for Network Stations. By configuring your own MAC addresses, you can create a sequence of identifiers that has meaning to you as an administrator. Your own MAC addresses will be more memorable than the randomly produced default MAC addresses that reside in the Network Stations.

By configuring a MAC address, you do not permanently delete or overwrite the default MAC address. You can retrieve it from the memory of the Network Station at any time. For instructions about how to reset the default MAC address, see “Recovering the Default MAC Address”.

If you are using DHCP in your network to dynamically allocate IP addresses, you should not configure your own MAC addresses. User-configurable MAC addresses are

most useful for the kind of tracking and close administrative scrutiny that are usually associated with small, static, stable networks.

The user-configurable MAC address must follow the conventions of the default MAC address. It must consist of 12 digits, in pairs that are sectioned off by colons. When you create a user-configurable address, you can use the numbers 0 through 9 and the letters A through F. The first digit in the MAC address must always be 4, 5, 6, 7, 8, C, D, E, or F. After the first digit, you may enter any values you wish, as long as they follow the conventions that have already been discussed.

Specifying a User-Configurable MAC Address:

__ 1. Enter the Setup Utility by restarting the Network Station and pressing the Escape key after the *Search for Host System* message displays during system startup.

__ 2. In the Setup Utility, press **Control+Alt+Shift+F1**.

__ 3. On a Network Station command line, type the following command: `ma XX:XX:XX:XX:XX:XX`, where `XX:XX:XX:XX:XX:XX` is your user-configurable MAC address.

__ 4. To return to the Setup Utility, type `SE` and press the Enter key or type `RS` to restart the Network Station.

Viewing the User-Configurable MAC Address: You can view the active MAC address on an IBM Network Station by carrying out the following steps:

__ 1. Enter the Setup Utility by restarting the Network Station and pressing the **Escape** key after the *Search for Host System* message displays during system startup.

__ 2. In the Setup Utility, press **Control+Alt+Shift+F1**.

__ 3. On a Network Station command line, type the following command: `ma`.

__ 4. Press Enter.

__ 5. To return to the Setup Utility, type `se` and press Enter.

Resetting an IBM Network Station to the Factory Defaults

Even if you have already configured your Network Station, you may wish to clear all of the settings and restore the factory defaults. To do this, carry out the following steps:

__ 1. Enter the Setup Utility by restarting the Network Station and pressing the Escape key after the *Search for Host System* message displays.

__ 2. In the Setup Utility, press **Ctrl+Alt+Shift+F1**.

__ 3. Type `nv` to enter the NVRAM utility. Press Enter.

__ 4. Type `l` to load the default values. Press Enter.

__ 5. Type `s` to save the new values. Press Enter.

__ 6. Type `y` to verify that you want to save the values. Press Enter.

__ 7. Type `q` to quit the NVRAM utility.

__ 8. To return to the Setup Utility, type `se` and press Enter.

Viewing the Boot PROM Version of an IBM Network Station

You may want to ensure that you have a certain version of boot PROM (also called the boot monitor) loaded on your Network Station. You can learn what version you have currently installed on your Network Station by carrying out the following steps:

__ 1. Enter the Setup Utility by powering on the Network Station and pressing the Escape key after the *Search for Host System* message displays.

__ 2. Press F2, *View Hardware Configuration*.

The Boot Monitor version appears as the third categorized item. The Boot Monitor version is the same thing as the boot PROM version.

Configuring an IBM Network Station to Boot from the Network Setting

For your Network Stations to boot using BOOTP or DHCP, you must set each logic unit to *Network* in the Setup Utility. *Network* is the factory default setting. You can also set this value in the IBM Network Station Manager. For more information about setting boot preferences in the IBM Network Station Manager, see “Overriding the Network Station Boot Setting” on page 266. To change or verify the Network Station’s boot setting, carry out the following steps:

__ 1. Enter the Setup Utility by powering on the Network Station and pressing the Escape key after the *Search for Host System* message displays during the startup process.

__ 2. Press F3, *Set Network Parameters*.

__ 3. On the line *IP Addressed from*, use the right and left arrow keys to highlight *Network*.

__ 4. Once you have highlighted *Network* on the *IP Addressed from* line, you must configure the following parameters:

- DHCP IP Addressing Order
- BOOTP IP Addressing Order

Choose whether you want DHCP or BOOTP to be the primary boot method of this Network Station. For guidance in making that decision, refer to “Boot Methods” on page 13. If you want to use both DHCP and BOOTP, type `1` next to your first choice and `2` next to your second choice. If you want to use only one boot method, type `1` beside your selection. Type `D` for ″Disabled″ beside the method that you do not want to use.

__ 5. If you have an Ethernet Network Station, choose the appropriate Ethernet standard for your network/

__ 6. Press Enter to save your changes.

__ 7. Your individual Network Station is now ready to boot using the Network setting. However, you must make sure that you have configured your server to process boot requests from BOOTP or DHCP clients. To configure your server to use BOOTP or DHCP, refer to your platform-specific installation chapter of this book.

Configuring an IBM Network Station to Boot from the NVRAM Setting

This section contains information about setting up a Network Station to boot from the NVRAM setting.

Note: If you make an error during the following procedure, recover the default information that you have overwritten by pressing F11.

__ 1. Enter the Setup Utility by powering on the Network Station and pressing the Escape key after the *Search for Host System* message displays during the startup process.

__ 2. Press F3, *Set Network Parameters*.

__ 3. On the line *IP Addressed from*, use the right and left arrow keys to highlight NVRAM.

__ 4. On the lines beneath *IP Addressed from*, fill in the requested information concerning your network's topology. Refer to your network topology diagram for your network's configuration information.

Notes:

a. To replace existing text, you must backspace to delete the text and then type your values. You cannot type over existing values.

b. Do not press Enter at the end of a line. Instead, use the arrow keys to move from one line to the next. Press Enter only when you are finished with the whole screen.

Table 65. Boot and Configuration Parameters for NVRAM Booting. Table 65 explains the configuration items and refers you to the sample values for Figure 4 on page 6.

Configuration Item	Description	Value for Network Examples
Network Station IP Address	The IP address for this individual IBM Network Station.	Network Example 2 = 192.168.1.2 or 192.168.1.3
First Boot Host IP Address	The IP address of the primary server that you will use to boot this Network Station.	Network Example 2 = 192.168.1.4
Second Boot Host IP Address	The server that you will use to boot this IBM Network Station should the first boot host fail. If you have no backup server, you may enter the value 0.0.0.0 or the same IP address as that of the first boot host.	Network Example 2 = 0.0.0.0
Third Boot Host IP Address	The server that you will use to boot this individual Network Station should the first and second boot hosts fail. If you have no third boot host, you may enter 0.0.0.0 or the same IP address as that of your first or second boot host.	Network Example 2 = 0.0.0.0

Table 65. Boot and Configuration Parameters for NVRAM Booting (continued). Table 65 on page 309 explains the configuration items and refers you to the sample values for Figure 4 on page 6.

Configuration Item	Description	Value for Network Examples
First Configuration Host IP Address	The IP address of the server from which the Network Station downloads its workstation configuration information. This may or may not be the same server as the boot host. See “Taking Advantage of Multiple Server Environments” on page 18, for information. If you do not specify a configuration host, the Network Station goes to the boot host as a default configuration server. If you do not want to specify a separate configuration host, you may enter 0.0.0.0 or the IP address of the boot host.	Network Example 2 = 0.0.0.0
Second Configuration Host IP Address	The IP address of the configuration host that you want the Network Station to use should the first configuration host fail. If you do not want to specify a second configuration host, you may enter 0.0.0.0 or the IP address of the first configuration host.	Network Example 2 = 0.0.0.0
Gateway IP Address	The IP address of the principle router of the Network Station’s network.	Network Example 2 = 192.168.1.1
Subnet Mask	See “Subnets and Subnet Masks” on page 9 for a discussion of subnet masks. If the Network Station will never need to access anything that does not reside on its subnet, you can use the value 0.0.0.0.	Network Example 2 = 255.255.255.0
Broadcast IP Address	The broadcast IP address is the address that is used to communicate with every host on the network. For Class C networks whose subnet mask is 255.255.255.0, the broadcast address is the first three portions of the network address with 255 in the final portion.	Network Example 2 = 192.168.1.255

__ 5. Press Enter to save your changes.

__ 6. You must now specify the proper paths for the Network Station to follow to reach its boot and configuration files. From the Setup Utility main screen, press F4, *Set Boot Parameters*. Go to the next step for information about what parameters to enter.

__ 7. Specify the boot parameters that are explained in Table 66. Make sure that you use forward slashes, as indicated in the table. If you use backslashes, the Network Station may not boot.Type in the values that are specified for your platform.

Notes

- Directory, file, and protocol values are case-sensitive.
- You can access the default values for the **OS/390** and **OS/400** platforms by deleting the ones that appear on the screen and then pressing Enter. The proper values take effect even though they do not appear on screen.

Table 66. Boot Parameters for NVRAM Booting

Boot Parameter	Description	Platform	Type this value
Boot File	The file that contains the operating system for the Network Station.	OS/390	kernel
		VM	kernel
		OS/400	kernel
		AIX	kernel
		NT	kernel
TFTP Boot Directory	The path that the Network Station uses to access the Boot File in the boot server when using TFTP to download the operating system.	OS/390	/hfs/usr/lpp/nstation/standard/
		VM	/QIBM/ProdData/NetworkStation/
		OS/400	/QIBM/ProdData/NetworkStation/
		AIX	/usr/netstation/
		NT	/nstation/prodbase/
NFS Boot Directory	The path that the Network Station uses to access the Boot File from the boot server when using NFS to download the operating system.	OS/390	/hfs/usr/lpp/nstation/standard/
		VM	/../VMBFS:VMSYSU:QIBM/ProdData/NetworkStation/
		OS/400	/QIBM/ProdData/NetworkStation/
		AIX	/usr/netstation/
		NT	/netstation/prodbase/

__ 8. Specify the Boot Host Protocol

In the *Set Boot Parameters* display, you can specify the order of the boot protocols for the Network Station. The supported protocols are:

- TFTP
- NFS
- Local

Use the numbers `1` through `3` for the boot host protocol order or use a `D` to disable the protocol. The Local boot host protocol is for booting from a flash card only. The Network Station will attempt to use the first protocol and if unsuccessful, it will attempt to use the next if specified.

__ 9. Press Enter to save your changes.

Note: If you have made a mistake and you want to recover the default boot parameter values, backspace over the current values and restart the Network Station.

__ 10. Press F5, *Set Configuration Parameters*.

__ 11. Enter your network's configuration information by using Table 67.

Table 67. Configuration Parameters for NVRAM Booting

Configuration Parameter	Description	Platform	Type this value
Configuration file	The name of the file that contains the Network Station's configuration information.	OS/390	See 312
		VM	
		OS/400	
		AIX	
		NT	
First Configuration Directory	The path name that the configuration host uses to locate the configuration file of the Network Station.	OS/390	/hfs/etc/nstation/StationConfig/
		VM	/QIBM/ProdData/NetworkStation/configs/
		OS/400	/QIBM/ProdData/NetworkStation/configs/
		AIX	/usr/netstation/configs/
		NT (NFS)	/netstation/prodbase/configs/
		NT (TFTP)	/nstation/prodbase/configs/
Second Configuration Directory	The path name that the second configuration host uses to locate the configuration file of the Network Station. If you have not configured a second configuration host, you may leave this line blank.	OS/390	/hfs/etc/nstation/StationConfig/
		VM	/QIBM/ProdData/NetworkStation/configs/
		OS/400	/QIBM/ProdData/NetworkStation/configs/
		AIX	/usr/netstation/configs/
		NT (NFS)	/netstation/prodbase/configs/
		NT (TFTP)	/nstation/prodbase/configs/
Configuration Host Protocol	The protocol that the Network Station uses to access its configuration files from the configuration host. Use the left and right arrow keys to change the host protocols. The available protocols are NFS, RFS/400, Local, Default, and TFTP. **Note:** You can also specify a second Configuration Host Protocol. The Network Station will use the second host protocol if the first host protocol fails.	OS/390	First: NFS
		VM	First: NFS
		OS/400	First: TFTP
		AIX	First: NFS
		NT	First: NFS

Note: It is recommended that you not enter a configuration file on the F5 Setup screen. The Network Station normally searches for its configuration file

based on its TCP/IP host name, IP address or MAC address. If you enter a configuration file you prevent the Network Station from performing this search.

If you do not plan to configure a Network Station individually then you should type **standard.nsm** as the configuration file on the F5 screen. This causes the Network Station to read the standard configuration file without taking extra time to search for its individual file.

__ 12. Press Enter to save your changes.

__ 13. If you have not yet done so, you must install the IBM Network Station Manager software on the servers in your network. Refer to your platform's installation chapter of this book for instructions.

End of Procedure.

Appendix A. Problem Resolution

Problem Resolution Tables

This appendix contains information to help you resolve error situations. Error situations that are specified in Table 68 are common across all server platforms. Other error situations are specific to individual operating systems. If you do not find the error in Table 68, refer to the table of contents above for the operating system on your server.

If you are unable to solve the problem, request software service for your Network Station. Refer to your local telephone listings to contact your IBMhelpcenter. In the United States, call 1-800-237-5511 for software service. For hardware problems, refer to the IBM Network Station Setup and Use book (SA41-0036) that is shipped with individual Network Stations.

Common Error Situations

The following error situations are common across all Network Station platforms.

Table 68. Common Problem Resolution Table

Symptom	***What you should do***
BOOTP Problems	
BOOTP table cannot be read	This problem may occur if the information in your BOOTP table is incorrect. Verify the accuracy of your BOOTP settings in your BOOTP table. You may need to restore the BOOTP table from a backup copy.
Browser Problems	

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Error message 404 - *file not found*	This error indicates a URL that is not entered correctly. Verify the spelling and case sensitivity of the URL you used to access the IBM Network Station Manager licensed program. If the spelling and case of the URL are correct, you can check the directives specified in the HTTP server configuration. Directives are statements in the HTTP server configuration that allow access to the HTTP server.
Color Problems	
Colors appear incorrectly in applications	Color capabilities are fixed at 256 available colors. Some applications use as many colors as possible, thus leaving no colors for additional applications. Try to start other applications before starting an application that uses a large number of colors. Applications that do not use 256 colors may have to be changed to use 256 color support.
Cursor Problems	
Busy cursor (cursor seems busy trying to perform a task)	The first time you open an application from the Network Station menu bar, the cursor stays busy until the application finishes loading. Additional requests for another session of the same application show the cursor being busy for only 3 seconds. Depending on network traffic, the application may take longer than 3 seconds to appear. The application is loading; however, the cursor is not busy for more than 3 seconds.
Cursor in wrong position within an application	When you leave one application to go to another application using the mouse, the cursor may not be at the same position when you return. The cursor probably repositioned itself to the place where you clicked the mouse to restart the application. You can reposition the cursor using the directional arrow keys.
DHCP Problems	
Duplicate address conflict	You may have a duplicate address conflict when DHCP pings the network if a device (such as a printer, server, or other workstation) with a static Internet Protocol (IP) address is off. This occurs only if the static IP address is within the range of DHCP addresses in your DHCP configuration. Explicitly exclude the static IP address from your DHCP address range to resolve the duplicate address conflict.
Rogue DHCP server	If you have two DHCP servers in your network, ensure the ranges of IP addresses in the servers do not overlap.
Migration problems from BOOTP to DHCP	When you completely migrate from BOOTP to DHCP, disable BOOTP on the server.
DHCP broadcasts do not pass through entire network	Check the relay agent configuration in all of your routers and gateways.
Suspected class problem in DHCP configuration	DHCP needs correct class values in the DHCP configuration. If the classes are corrupt for any reason, you need to restore the classes from a backup.

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Timing problems when BOOTP and DHCP run at the same time	BOOTP requires two packets for each transmission and DHCP requires four. This presents possible timing problems if both run at the same time. BOOTP and DHCP may begin communication simultaneously, but BOOTP establishes protocol before DHCP. BOOTP assigns a permanent IP address, which DHCP does not recognize due to the delay. DHCP tries to assign the BOOTP-allocated address which presents duplicate address conflicts. Disable BOOTP on the server.
Environment Variables - Java Applet Viewer	
Environment variable not replaced	Environment variables cannot be used when you work with properties in the Java Applet Viewer section of the IBM Network Station Manager licensed program. The property value is not replaced with the Environment Variable value. For example, if you declared **name=${IP}** in the properties box, you might expect to get the Internet Protocol (IP) address of the Network Station user. Instead, you get **${IP}**.
Host Unknown or Unknown Host Message	

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Host Unknown message appears on the Network Station	This message could appear for several reasons: • You specified a wrong system name or IP address in the program or menu functions of *Startup Tasks* in the IBM Network Station Manager program. • You specified a wrong system name or IP address in a 3270 or 5250 session. • Transmission Control Protocol/Internet Protocol (TCP/IP) names do not resolve in the menu functions of *Startup Tasks* in the IBM Network Station Manager program. • You specified the wrong server host name in the language panel or it cannot be resolved. • The hostnames in the *NC Navigator Options Network* preferences or *Network* panel are incorrect or they cannot be resolved. • The remote print server on the Printers panel is incorrect or it cannot be resolved. You should validate the system name or IP address. You should also access the *Hardware-Workstation Setup Task* and specify the correct Domain Name Server (DNS) to use. This configures the Network Station DNS so that the DNS resolves host names into IP addresses. You may configure a DNS using DHCP or have the Network Station Manager configure your DNS. If you choose DHCP, ensure that option 6 is correct for the Network Station. If you choose to let the Network Station Manager configure the DNS, Network Station Manager uses the server DNS information. Verify that the server DNS is correct for the Network Station and press **Update Network Station Manager DNS** file to refresh the DNS configuration. You must power down your Network Station and power on your Network Station for the name information to become available.
IBM Network Station Manager Program	
Changed hardware Network Station settings not being applied	Some changes require the Network Station to be restarted before they take effect. If you restart the Network Station and the changes are still not applied, use the IBM Setup Utility, Select F5 (*Set Network Parameters*) and make sure the **IP Addressed from** parameter value is Network. See “Chapter 10. Working With the IBM Network Station Setup Utility” on page 301 for more information.
Changed keyboard setting has not been applied	Restart your Network Station in order for the changed keyboard setting to take effect.
Changes made to 5250, or 3270 have not been applied	Log out and log back in for changes to take effect.

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Inactive navigational buttons in Help	In Help text, the navigational buttons (**Back** and **Next**) are not active until you have linked to other topics. Once you have moved, by linking other topics, you establish a history of that movement. The buttons use this history to determine whether the **Back** and **Next** buttons can be used.
Microsoft Internet Explorer windows are displayed behind the main window	In the IBM Network Station Manager program, if you request help or a list of users or terminals, a popup window contains the requested information. Internet Explorer may open the popup window behind the larger main window from which you made the request. To find the popup, you may need to move or minimize the larger window.
Pulldown box does not stay open to accept hardware setting changes	Try one of the following three options: • If you are running a browser in a Windows environment, change the screen size to something other than 640 X 480. • Try resizing your current window and then open the pulldown again. • Try scrolling the window to change the initial position of the pulldown. This may make room to display more of the pulldown list.
Resizing the NC Navigator window causes problems	When you run IBM Network Station Manager from NC Navigator on a Network Station and you resize the window, you go back to the main IBM Network Station Manager screen. After signing on, on your server, increase the memory cache setting for the NC Navigator browser to a value greater than the default 1K (1000).
Resizing the Netscape window causes problems	If you resize the Netscape window while the IBM Network Station Manager program is being loaded, Netscape may stop the load and you will not get a sign-on screen. You must close the IBM Network Station Manager browser window and restart the program; wait until after the logon screen is displayed before you resize the window. After signing on, resizing the Netscape window may cause the server name or name of the user whose defaults you are displaying to disappear. If cache is set to 0, resizing the window may cause unpredictable results.
Update of boot monitor has not been applied	Restart your Network Station in order for the updated boot monitor to take effect.
Java Problems	
If the Java applet or application does not start, examine the messages that are displayed in the User Services console. These should give an indication of any problems that are found by the Java Virtual Machine (JVM) in running the program. In addition, you can determine whether the JVM is loaded by noting a change in the amount of memory currently being used, as found in *User Services Statistics*. See “Chapter 9. Working with User Services” on page 297, for more information. The following Java error messages describe the error and give problem resolution information.	

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Cannot find class or Class not found	The JVM cannot find the class file requested by the Java applet or application. If the error is returned while you are running a Java application, inspect the class path that is specified in the startup programs or menus. Confirm that the directories with program class files are in the class path and that they have the correct format. Also ensure that the name in the Network Station Manager's *Application (Class) Name* field does not contain the .class file name extension. If the classes are provided in a zip file, the fully qualified zip file name must explicitly appear within the class path. In addition, due to differences in the file systems, the classes may not be found since they are referred to in a case-sensitive manner. It may be possible to rename the class to the name that is indicated in the console message. Some systems use mount points with different names than the actual directory structure leading to the class file. If you use a server with mount points, ensure the mount point name is correct in the class path specification. For an applet, the codebase portion of the applet tag within the HTML file lists the locations where classes are found. Also check the file access permissions on the directories and files to make sure that users are allowed to read the files.
IO exception while reading (a file name)	Ensure that you specified a valid HTML file name as the startup program or menu URL name in the IBM Network Station Manager licensed program. Also ensure that the file is readable by the user.
IO exception while reading (a remote server name)	An HTTP address rather than a file system location was passed to the applet viewer. *AppletViewer* is essentially a browser that needs to have a defined proxy server and port before it can load HTTP files. To do this, you need to set the HTTP proxy or Socks Host parameter by using the IBM Network Station Manager licensed program. Select the *Internet Setup Task* and then the *Network* section. If you are loading the applet from your host server, you do not need to use an HTTP address. Instead, you can simply fill in the local path and HTML file name.
Launcher Shutdown Monitor	If your applet does not start and the next message in the console is *Launcher Shutdown Monitor*, ensure that you specified a valid HTML file name as the startup program or menu URL name in the IBM Network Station Manager licensed program. Also ensure that the file is readable by the user.

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Out of memory	The Network Station may not have enough memory to run the application or applet. Possible causes include the following: • Other applications are using memory, and not enough memory is left for the Java application or applet to run. • The stack size and heap size parameters need to be adjusted. The stack and heap sizes can be set with the IBM Network Station Manager licensed program. For applications, the parameters are set in the *Startup Tasks* (programs or menus) section. For an applet, the parameters are set in the *Internet Tasks* (Applet Viewer section).
Unusable class name (name)	Check the name in the *Application (Class) Name* field in the startup program or menu section in the IBM Network Station Manager licensed program. Do not include a path or the .class file name extension in this field.
Other	If you do not see any messages in the *User Services Console* window that explain your problem, activate *Verbose Diagnostic Messages* by using the IBM Network Station Manager licensed program. For applications, Verbose messages can be set in the *Startup Tasks* (programs or menus) section. For an applet, Verbose messages can be set in the *Internet Tasks* (*AppletViewer* section). Additional messages are displayed when your application or applet is run.
The following Java error conditions are not related to specific Java error messages:	
Applet cannot read *Properties* or get a *Security Exception* while trying to read the *System Properties*	Applets may only read properties which are explicitly allowed by the system configuration. A property can be configured to be accessible by defining a new property of the form .applet and assigning it a value of true. This may be done through the Network Station Manager licensed program in the *AppletViewer* configuration section. The default properties that may be read by an applet are as follows: • java.vendor • java.version • java.vendor.url • java.class • os.name • os.version • os.arch • file.separator • path.separator • line.separator If the class sun.applet.AppletViewer is used to view applets, the accessible property list differs from above and depends on the property file defined within your home directory.
Cannot close Java error message box	Scroll to the end of the error message box and click **OK**.

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Cursor does not appear in text field or Window layout (for example, button positions) appears different from the way it appears when the applet is run on another platform	The *Java Abstract Window Toolkit* (AWT) is designed to create a development environment independent of the underlying windowing mechanisms. These classes use the native window calls to do the work, but provide a uniform interface to programmers. However, *Java Abstract Window Toolkit* cannot hide all the differences. Thus appearances may change from one Java Virtual Machine on one platform to another Java Virtual Machine on a different platform.
Data written to a file does not appear in the file	Make sure the Java applet or application closes the file to force all data to be written to the file.
Text does not appear or is a different style	Check the font sizes and styles. They may need to be changed to a different setting. Not all fonts are available on all Java Virtual Machines.
Keystrokes	
Unwanted keystrokes appear in applications	If the screen saver comes on while you are in an application and you press a key to end the screen saver, that keystroke appears in your application. Remove the unwanted keystroke.
Language Problems	
Wrong language appears on the Network Station when you power on the logic unit	You must reset the keyboard language to your language from the Setup Utility. • Power on the Network Station. • When the NS0500 *Search for Host System* message appears, press the Escape key to start the Setup Utility. • Press F1 (if necessary). • Enter your password (if necessary). • Press F7. • Press F3 to select language. • Choose one of the following options for the appropriate language: – 1 for English (US) – 2 for French – 3 for German – 4 for Italian – 5 for Japanese – 6 for Spanish • Press Enter three times to save your selection and restart the Network Station.
Login Problems	

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Network Station displays a light blue screen and the Network Station does not log in properly	This problem normally occurs when the required.nsm file could not be read during power on. If you boot from NVRAM check the following items to correct this problem: • Make sure that the Configuration line in the F5 screen is accurate. • On an AS/400, OS/390, and Virtual Machine (VM) server, the Network Station automatically looks for the required.nsm file if the Configuration File value is blank. **Note:** If you need to enter the required.nsm file manually, make sure that the path and the file name are entered correctly. • Ensure the accuracy of the Configuration Directory. • Select the correct Configuration Host Protocol. If you boot from DHCP, look for the correct configuration information in “Taking Advantage of Multiple Server Environments” on page 18.
Host xxx.xxx.xxx.xxx (IP address) not responding to ICMP Echo error message followed by NS0090 *Press a key to continue* message	This error message indicates that two devices in your network are trying to use the same IP address. Verify that the IP address you assigned to the Network Station is not used by a different device in your network. If all of your IP addresses are assigned to Network Stations (or other devices using a media access control (MAC) address, the error will be NS0600 *IP address xxx.xxx.xxx.xxx in use by (MAC address) xx:xx:xx:xx:xx:xx*. This error message also indicates a conflict in which two devices try to use the same IP address.

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Login stops at NS0500 *Search for Host System* message	There are several reasons this message appears: • Your server may not be running. • Your network cable connections may not be tight. If you are running IBM Operating System/400 Version 3 (OS/400), OS/390, or VM, you may need to reset the NVRAM to the factory defaults if you boot from NVRAM. Following the NVRAM reset, you must reenter the NVRAM values for the Network Station and power off and power on the Network Station. • When the NS0500 *Search for Host System* message appears, press the Escape key. • From the Setup Utility screen, press the following keys at the same time: (left)Ctrl - (left)Alt - (left)Shift - F1, to start the Boot Monitor command prompt. • Type NV to start the NVRAM Utility. • Type L to load factory defaults. • Type S to save factory defaults. • Type Y to confirm save. • Type Q to exit the NVRAM Utility. • Type SE to restart the Setup Utility. • Re-enter the correct NVRAM values in the Setup Utility. • Press Enter to restart your Network Station.
Monitor Problems	
Display image too large to fit on monitor	Your Network Station may be set to automatically detect which monitor you are using. For autodetect to work correctly, you must power on the monitor before you power on the Network Station.
Network Station Directory Problem	

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
File not found	When the Network Station reads files, it sends information to the message area of the console. This information includes the path of the file being read. This is useful to figure out why the Network Station is not finding its files. The Network Station uses a local-remote file table to search for files. The Network Station looks for the file in the local area first, and then uses the table to map to the network directory. In the console message area, sometimes the path is the local path and sometimes it is the remote path. The local path is the path in the local directory structure on the Network Station. The remote path is the path exported by the server to the Network Station. For example, on an AS/400 server, /netstation/prodbase/ is a local Network Station client path. The corresponding remote server directory is /QIBM/ProdData/NetworkStation. Sometimes the console message log records /netstation/prodbase/ and sometimes it shows /QIBM/ProdData/NetworkStation when searching for a file.
Out of Memory Problems	
'*Out of Memory*' message appears	When applications load in Network Station memory, they use a block of available free memory large enough to start the application. After an application closes, its memory frees up, but this freed block may not be large enough for an additional application. When you calculate memory requirements, you may find that you have enough memory to run a number of applications, but there may not be a large enough block of unallocated memory to start an additional application. Power off and power on your Network Station to clear all random access memory (RAM). Start your applications in order of largest to smallest memory requirement. If this process does not work, you may need to upgrade your Network Station RAM to run all of your applications.
PANIC Appears on Your Network Station	
P A N I C appears on your Network Station and you are given a **>** cursor or Screen turns reverse video (mostly black) and you are given a **>** cursor	The Network Station operating system stopped unexpectedly. See “PANIC Mode at an IBM Network Station” on page 326 for more information about recovering from a *PANIC* situation.
Resource File Does Not Exist Error	

Table 68. Common Problem Resolution Table (continued)

Symptom	***What you should do***
Error messages *Resource file does not exist* and *Unable to open resource* appear in the console log, but your Network Station network operates normally.	The Network Station Manager licensed program source code operates on multiple operating system platforms. Due to this complexity, the licensed program will occasionally make multiple searches throughout your network to find Network Station hardware and Network Station servers. The Network Station Manager licensed program does this to identify which type of server operating system you are using. Some of the searches succeed because they are designed for your operating system. Searches for other operating systems do not succeed. Every time the Network Station Manager licensed program unsuccessfully searches for a different operating system, it records a *Resource file does not exist* and *Unable to open resource* console log error message.
Screen Flashes	
Screen flashing or crackling sound	Screen flashes, along with some crackling sounds, can occur when you are logging out of the Network Station. The flashing does not harm hardware or applications.

PANIC Mode at an IBM Network Station

When the Network Station operating system stops unexpectedly, a *PANIC* error condition occurs. The *PANIC* situation sends you out of the normal graphical user interface to the boot monitor command prompt.

To recover from a *PANIC*, simply power off your Network Station and power it back on.

Occasionally, a *PANIC* error situation persists. If this occurs, contact IBM support for help in determining the cause of the recurring *PANIC* error condition.

Error Codes

This table lists error codes that are found while powering on your system.

Table 69. Network Station Error Codes

Message Number	***Message Description***	***Status and or Recovery***
NS0070	Boot Monitor Resolution	Shows the boot monitor screen resolution. Go to the IBM Network Station Setup Utility to change resolution settings.
NS0080	Server Resolution	Shows the server screen resolutions. Go to the IBM Network Station Setup Utility to change resolution settings.

Table 69. Network Station Error Codes (continued)

NS0090	Press a key to continue Note: Message is displayed with yellow text.	Look for other Network Station messages on the screen to assist in problem determination. Record the message number and refer to this table. Press a key to go to the IBM Network Station Setup Utility and take appropriate action to correct the problem.
NS0091	No input device detected. Startup will continue in 1 minute. Note: Message is displayed with yellow text.	If no keyboard or mouse is detected, the startup process will continue in one minute. If the message is displayed when keyboard and mouse are connected, you may need to replace the Network Station.
NS0200	NVRAM checksum error	Bad NVRAM settings. Use the NV utility Boot Monitor command prompt to return to the default settings. To reach the Boot Monitor command prompt (>), press the Escape key after the Network Station displays the NS0500 *Search for Host System* message during the startup sequence. Then, press (Left)Alt - (Left)Ctrl - (Left)Shift - F1 from the IBM Network Station Setup Utility. Type NV and press Enter. Then, in the order that they are listed, use NV command functions: L, S, Y (yes), and then Q. Type RS and press enter to reboot the system.
NS0240	Keyboard status timeout	Keyboard error. Ensure that your keyboard cable connections are tight.
NS0250	Keyboard BAT failure	Keyboard error. Ensure that your keyboard cable connection is tight.
NS0260	Keyboard initialization timeout	Keyboard error. Ensure that your keyboard cable connection is tight.
NS0270	Mouse status timeout	Mouse error. Ensure that your mouse cable connection is tight.
NS0280	Resolution is not supported on this hardware	Choose a different monitor resolution.
NS0500	Search for Host System...	
NS0503	Host IP addresses are all 0.0.0.0	Invalid IP address of 0.0.0.0 is configured. Correct the IP address and retry.

Table 69. Network Station Error Codes (continued)

NS0505	Host not responding to ICMP Echo	Server not found. Check the server IP address settings. Correct if necessary and retry.
NS0570	Connection cancelled by user	User pressed the Esc key to cancel the kernel download. Press Enter to reboot.
NS0580	File cyclic redundancy check (CRC) data error	A damaged kernel file was downloaded.
NS0590	Check network connection	Your token-ring or Ethernet cable is not connected, not functional, or not active.
NS0610	Searching for Subnet Mask	n/a
NS0620	Invalid IP address 0.0.0.0	An invalid IP address of 0.0.0.0 is configured. Correct the IP address and retry.
NS0630	Boot Server IP address = 0.0.0.0	An invalid boot server IP address of 0.0.0.0 is configured. Correct the boot server IP address and retry.
NS0660	Illegal Block Size	Server problem. The server is responding with an illegal block size less than 128 bytes or greater than 8192 bytes.
NS0670	Illegal Option	Server problem. The server is returning an option that is not valid.
NS0700	Twinax timeout, unable to contact host	To correct this problem try the following items: • Ensure the twinaxial cable connection is good. • Check the workstation controller. • Run Wrap test. If test fails, replace the Network Station.
NS0710	Twinax timeout, host connection lost	Try the following: • Ensure that the twinaxial cable connection is good. • Check the workstation controller.
NS0711	Station address in use	Select a different address that is not currently used by an active device on that port.
NS0720	No twinaxial activity detected	Check to see if the cable is properly connected to the Network Station and the workstation controller.
NS0850	Twinaxial hardware failed	Replace the Network Station.

PC Server Error Situations

The errors in this table are specific to a PC Server that runs the Windows NT operating system.

Table 70. PC Server Problem Resolution Table

Symptom	***What you should do***
Boot Problems	
Extremely slow client boot times	If you use graphics-intensive Open GL three dimensional screen savers, you may experience extremely slow boot times. Select a different screen saver for your PC Server or disable the screen saver.
Unable to log in as administrator while roaming from an AS/400 server to a PC Server	If you are roaming from an AS/400 server to an PC Server, the PC Server only accepts 10 character administrator userids. An AS/400 server userid can be 12 characters. You need to select an AS/400 server userid of 10 characters or less.
DHCP Problems	
DHCP changes do not seem to take effect	You need to stop DHCP services and restart DHCP services for the changes to take effect.
DHCP Configuration Utility	
Error message: *Multiple instances of the Configuration Utility cannot be run while running the DHCP Configuration Utility*	If the DHCP Configuration Utility ends abnormally, it may leave some registry entries, which prevent you from starting the utility again. From a command line, type **tcpcfg -f**. This command clears the unwanted registry and allows you to start the configuration tool.
Installation Problems	

Table 70. PC Server Problem Resolution Table (continued)

Symptom	***What you should do***
Generic error message: *An unrecoverable error occurred during setup.*	Several error conditions can occur during installation of the IBM Network Station Manager licensed program. They are: **Cannot find location of eNod install** You can install the licensed program using the NSM C. (This may require you to reinstall your operating system.) **Required PTF not installed on NTAP** This PTF fixes a registry compatibility problem with the Wedge install. See the readme.txt file for further information. After you have applied the PTF, try the installation again. **Not enough space on your Install disk** You need at least 800 MB of free space on your hard drive to install the Network Station Manager licensed program on a Windows NT Server 4.0 server. You need 1000 MB of free space on your hard drive to install the IBM Network Station Manager licensed program on a Windows NT Server 4.0, Terminal Server Edition server. **The install drive is not formatted for NTFS** You must select an install drive that is formatted for NTFS. You may start setup again and choose another NTFS formatted drive. You may also convert your drive to the NTFS file system. **During a Migration Update, Unable to rename NSMAdmin** **and NSMUser groups** Delete the groups NSMAdminTemp and NSMUserTemp. Then recreate all users to the NSMAdmin and NSMUser groups.

Table 70. PC Server Problem Resolution Table (continued)

Symptom	***What you should do***
Error message: *An error occurred while configuring eNetwork On-Demand Server.*	The install program could not configure the eNetwork On-Demand (eNOD) server. Perform the following steps and configure eNOD manually. You may also configure eNOD to run on a stand-alone DHCP server without installing the Network Station Manager licensed program code. If you need to manually install eNOD services, perform the following steps: 1. Insert your IBM Network Station Manager licensed program CD for PC Server into your CD-ROM drive. 2. Select the Start button. 3. Select Run. 4. Enter the following information in the data entry box where X is your CD-ROM drive letter. 5. **X:\ntnsm\en\products\enod\tcpip\setup.exe** 6. Select Ok. 7. Follow the steps in the Installation wizard.
Error Message: *An error occurred while installing the NC Navigator (North American).*	This error only pertains to the North American version of the Network Station Manager licensed program. The installation program could not install the NC Navigator. You need to manually install NC Navigator from a North American Network Station Manager licensed program CD. Refer to “Installing the 128–Bit NC Navigator Browser” on page 55 and install the NC Navigator program.
Error message: *An error occured while trying to create the user directory for the IBM Network Station Manager.*	The installation program did not create some or all of the following directories: • \..\nstation\userbase • \..\nstation\userbase\groups • \..\nstation\userbase\sysdef • \..\nstation\userbase\home • \..\nstation\userbase\users • \..\nstation\AppBase The installation program did not create some or all of the following base permissions: • \nstation = NSMAdmin, Administrators, SYSTEM = Full Control, NSMUser = Change • \nstation\userbase\home = NSMAdmin, Administrators, SYSTEM = Full Control, NSMUser = Change • \nstation\userbase\users = NSMAdmin, Administrators, SYSTEM = Full Control, NSMUser = Change

Table 70. PC Server Problem Resolution Table (continued)

Symptom	***What you should do***
Error message: *IBM Network Station Manager could not install the IBM Network Station Manager Login Services.*	Ensure that your network cable is plugged in and ensure that your Network Adapter is operating properly. If you configure the wrong drivers for your Network Adapter card or if your Network Adapter is not working properly before you install IBM Network Station Manager, the installation fails.
Error message: *This machine does not have Windows NT Server 4.0 or Windows NT Server 4.0, Terminal Server Edition installed.*	You must run Windows NT Server 4.0 or Windows NT Server 4.0, Terminal Server Edition to operate the Network Station Manager licensed program. Install one of these operating systems and try the setup again.
Error message: *This program requires a monitor with VGA or better resolution.*	The Network Station Manager licensed program installation requires screen resolution of 640 x 480 or greater. Reset your screen resolution to a minimum 640 x 480 resolution by performing the following steps: 1. Select the Start button. 2. Select Settings. 3. Select Control Panel. 4. Double click on Display in the control panel dialog box. 5. Select the Settings tab. 6. On Desktop Area slider bar, left click and hold the left button down. 7. Drag the slider bar to the right until the screen resolution is greater than 640 x 480. 8. Select Ok. After you make these changes, try your setup again.
Error message: *Unable to create one of the IBM Network Station Manager user groups.*	The installation program could not create one or more IBM Network Station Manager licensed program user groups. You will need to create these user groups manually. See, “Managing Users and Groups for IBM Network Station Users” on page 74 for instructions on how to create the following groups: • Local groups • Network Station Manager Administrator • Network Station Manager User
Error message: *Unable to install the NDIS Intermediate Driver 3.0.*	The install shield setup could not properly install the NDIS Intermediate Driver 3.0. You need to manually install this driver to complete your Network Station Manager licensed program installation. See, “Resolving Installation Problems” on page 45 for instructions.

Table 70. PC Server Problem Resolution Table (continued)

Symptom	***What you should do***
Error message: *Unable to load InServe.dll for installation and configuration of the Network Station Manager.*	Your installation requires the InServe.dll that could not be loaded into memory. Reboot your PC Server and try to run the installation again.
Error message: *Unable to obtain the Domain Controller name.*	The install shield could not find the Domain controller for your Windows NT server name. Ensure that your Windows NT server Domain name is correct. Try the setup again.
Internet Explorer Problem	
Microsoft Internet Explorer windows are displayed behind the main window	If you request help or a list of users and terminals in the IBM Network Station Manager program, a popup window opens that contains the requested information. Internet Explorer may open the popup window behind the larger main window from which you made the request. To find the popup, you may need to move or minimize the larger window.
Network Interface Card Problem	
Incompatible network interface card drivers	If you install an older network interface card (NIC) and NIC driver in your PC Server, you may experience problems. Generally, the IBM Intermediate Support Driver works best with NIC drivers that use NDIS 3.0 or later. If you experience problems after you load the IBM Intermediate Support Driver, try to find a miniport NIC driver for your PC Server NIC. Install this new driver before you try to isolate other networking problems. The following drivers have known problems: • Replace the NIC driver AMDPCN.SYS with PCNTN4M.SYS from AMD on an IBM PC 325. Download Disk 2 for the updated driver from the AMD web site at the following URL: http://www.amd.com/ • Driver IBMENIIN.SYS will not work properly when controlling the Ethernet/A adapter for MCA. There is currently no updated driver.
Windows NT Associated Processor Problems	
A generic error message appears when you try to run the IBM Network Station Manager on a Windows NT Associated Processor installed in an AS/400 server	Your Windows NT Associated Processor creates a virtual token-ring network with the AS/400 server. At the time of this writing, the IBM DHCP driver does not work with this virtual network in your AS/400 server. Contact IBM service to request a PTF to correct this IBM DHCP problem. You may also try using Microsoft DHCP to correct this problem. Uninstall IBM DHCP and install Microsoft DHCP.

OS/400 Error Situations

The errors in this table are specific to an AS/400 server that runs the IBM Operating System/400 (OS/400) operating system.

Table 71. OS/400 Problem Resolution Table

Symptom	***What you should do***
IBM Network Station Manager Program	
IBM Network Station Manager program will not start	This could be because the Retain Server Security Data `QRETSVRSEC`) system value was not set to 1. To verify, from any AS/400 system command line, type: `DSPSYSVAL QRETSVRSEC`. The value will be displayed. If the value is not 1, you can change it using the following command from any AS/400 command line: `CHGSYSVAL SYSVAL(QRETSVRSEC) VALUE('1')`.
User Defaults browse button does not work	To activate the browse button do the following: 1. Enter `WRKLIB QYTC` 2. In front of the `QYTC` library, enter option 12 to work with objects 3. Locate the `QYTCMCLS` object. 4. Enter option 2. 5. Press F6 to add new users. 6. Add a line where user=`QTMHHTP1` and object authority=`*USE`.
IBM Setup Assistant Problems	
Task 5000 of the IBM Setup Assistant does not complete successfully	In task 5000, if you selected to end TCP/IP, it is possible that all of the server jobs might not have ended before task 5000 starts TCP/IP. If this is the case, you will receive the message that task 5000 did not complete successfully. You can select task 5000 again, choose not to end TCP/IP, and press Enter to start the required servers. At this time all of the server jobs should have had time to end so that the start is successful.
Login Problems	

Table 71. OS/400 Problem Resolution Table (continued)

Symptom	***What you should do***
Communication error in a Network Station dialog box and Network Station users cannot log in or *Catch-all for comm error* in a Network Station dialog box and Network Station users cannot log in	This error message indicates a variety of communication errors. If you receive this message, check the console. If you see Error 17, typically this indicates that your authentication server login daemon is down. Follow the corrective action below: Determine if the Network Station login daemon on your AS/400 authentication server is running by one of the following two methods: • From the AS/400 console, type `NETSTAT *CNN`. • Look for an active local port 256. If local port 256 is active, the Network Station login daemon is running. OR • For V3R7 to V4R2, type the command `CALL QYTCUSVR ('STRTCPSVR ')` on the console. • For V4R3 or higher, use Operations Navigator to `STRTCPSVR`.
Login is successful but no applications appear on the task bar	Restart the QServer subsystem on the AS/400 server. Enter the `QPWFSERVSD` command.
System hangs at NS0500 *Search for Host System* message	For twinaxial Network Stations, vary on the device or the workstation controller.
'**Unable to connect to Login Server, See System Administrator**' message appears at login.	There may be a problem with your network. The authentication server may be down or there is something wrong with the authentication server. You may need to restart the authentication server on your AS/400. Verify IP addresses and names in the authentication server.
Migration Problems	
Unable to determine list of files for migration	The list of files in the 'directory name' directory could not be determined. If this directory contains any files, the files have not been migrated as required by the current version of the IBM Network Station Manager licensed program. They may be unusable by the IBM Network Station Manager licensed program. Correct the error and run the migration again by issuing the command `CALL PGM(QYTCMIMP)`.
Unable to migrate file	The file 'old file name' could not be migrated to the file 'new file name'. This migration is required by the current version of the IBM Network Station Manager licensed program. These files may not be usable by the IBM Network Station Manager licensed program. The problem occurred either accessing the file 'old file name' or creating or updating the file 'new file name'. Correct the error and run the migration program again by issuing the command `CALL PGM(QYTC/QYTCMIMP)`.

Table 71. OS/400 Problem Resolution Table (continued)

Symptom	***What you should do***
Unable to retrieve list of users	The list of users with IBM Network Station Manager licensed program files could not be retrieved. The user level files have not been migrated and are not compatible with the current version of the IBM Network Station Manager licensed program. Correct the error and run the migration program again by issuing the command `CALL PGM(QYTC/QYTCMIMP)`.
Unable to delete file	The file 'file name' could not be deleted. This file has been successfully migrated or is no longer needed by the current version of the IBM Network Station Manager. The failure of the deletion will have no effect on the operation of the IBM Network Station Manager licensed program. Correct the error and delete the file using the Remove Link (DEL) command.
Migration problem did not complete successfully	The program to migrate the IBM Network Station Manager licensed program files as required by the current version of the IBM Network Station Manager licensed program did not complete successfully. One or more files may not be usable by the IBM Network Station Manager licensed program. Correct the error and run the migration program again by issuing the command `CALL PGM(QYTC/QYTCMIMP)`.
Error occurred while determining the national language ID and locale	The IBM Network Station Manager licensed program was determining the correct national language ID and locale when the error occurred. The feature code was 'feature code'. This was caused by a software problem. Use the Work with Problems `WRKPRB`) command to collect the appropriate information and contact IBM Support to report this error. This message and any previous messages have been written to the job log of 'job number'.
Unable to determine the national language version of the system	The IBM Network Station Manager licensed program was in the process of determining the national language version of the system when the error occurred. The national language version is determined by using the `QLANGID` system value. The IBM Network Station Manager licensed program uses the system national language version to establish the language used on the Network Station before a user logs in. The IBM Network Station Manager licensed program has defaulted to United States English as the language of the Network Stations. If you wish to reset this value, see "Selecting the Startup Language" on page 304.
No Login Window	

Table 71. OS/400 Problem Resolution Table (continued)

Symptom	***What you should do***
No Login window on monitor - User Services window appears instead	The most likely cause is an incorrect entry for this Network Station in the BOOTP table. Another possible cause is that the default configuration file on the server has been corrupted or deleted. The default configuration file, standard.nsm, is located in the /configs subdirectory of the directory indicated in the hd tag of the BOOTP table entry. You may need to reinstall the IBM Network Station Manager licensed program.
OS/400 Console Error and Log Messages	
While configuring and running IBM Network Station Manager licensed program on your server, several messages are sent to the console and to the log. These messages record several server events such as invalid passwords, Portable Operating System Interface for Computer Environments (POSIX) messages, and startup information. The error messages below help you resolve common IBM Network Station Manager errors.	
NSM9505, NSM9507, NSM9508, NSM9509, NSM9510, and NSM9511 File transfer and network errors	This series of errors indicates network transmission problems. Try some or all of the following to diagnose and correct these errors: • Ensure cable connections are tight. • Vary on all networking bridges, routers, gateways, switches, workstation controllers, and other hardware. • Ensure that Ethernet and token-ring lines are configured and operating properly. • Ensure that frame sizes are correct on all networking bridges, routers, gateways, switches, workstation controllers and other hardware.
NSM9530 Exiting abnormally, error code: xx	Refer to the error code 'xx' in your error message and take appropriate corrective action. • Error 3: Malloc failed. You may need to free up some server memory. • Error 5: Listen failed on socket. Check the preceding error message to correct the problem. • Error 6: Accept failed. Check the preceding error message to correct the problem. • Error 7: Server data error. The server could not read your configuration file. Verify the accuracy of the configuration file and retry. You may need to restart the network authentication server to correct the errors listed above.
NSM9537 Memory allocation failed	There is not enough free memory on your server for the Network Station Manager licensed program to operate. Check your storage pool allocations and allocate more memory for your server storage pool.

Table 71. OS/400 Problem Resolution Table (continued)

Symptom	***What you should do***
NSM9549 Error retrieving server data	The server needs a working Network Station configuration file. The configuration file is either corrupt, the configuration file is unusable, or the configuration file is not found. Verify that all configuration files are not corrupt. Verify accuracy of configuration file information and configuration file syntax. Look in the displayed path to figure out where the configuration file should be.
Printer Problems	
Printer not available to other applications	The AS/400 system locks the printer if someone started a printer writer to that printer. To release the printer and make it available, run the End Printer Writer (`ENDPRTWTR`) command for that printer on the AS/400 system.
Program Temporary Fix (PTF) Problems	
PTFs not working	If the PTFs being installed are for the IBM Network Station Manager for AS/400 product, you may have to restart the IBM Network Station Manager system unit. This causes a new software download to the system unit. The new downloaded software contains the program fixes for the Network Station.
Problem communicating using Host names	
Some Network Stations unable to communicate with some Hosts using the Host names table	The IBM Network Station Manager licensed program checks the authority level of the person making the Host Table updates. You need to make sure the person who adds names to the Host Table has all object authority (*ALLOBJ) . If you have authorities less than *ALLOBJ you can update the Host table but the changes are not passed to the Network Station.
Twinaxial Problems	
Network Station does not boot	If you are using BOOTP with twinaxial Network Stations, the twinaxial Network Station defines itself in the BOOTP table. If the twinaxial Network Station does not boot, you need to apply PTF SF47202.
No twinaxial activity detected	Ensure that the cable is plugged into the Network Station and the twinaxial workstation controller.

Table 71. OS/400 Problem Resolution Table (continued)

Symptom	***What you should do***
Twinaxial timeout or Unable to connect to host	Ensure that the twinaxial cable is plugged into the Network Station and the twinaxial workstation controller. Replace the cable if necessary. Ensure that the workstation controller is powered on and the workstation controller is varied on. If you suspect bad Network Station hardware, run the Wrap test to determine if your Network Station hardware is bad. To run the Wrap test, do the following: • Restart the Network Station. • At the NS0500 *Search for Host System* message, press the escape key. • Press (left)Alt - (left)Ctrl - (left)Shift - F1. • Enter EX. • Enter 1. • Enter 5. • Press the Enter key to test one iteration or type E to loop until error. If the message returned during the Wrap test says 'the wrap test was not successful', contact your local IBM your Network Station.
Station address in use	Change the twinaxial address to one not assigned to an active device on that port. To change the twinaxial address from the individual Network Station do the following: • Restart your Network Station. • At the NS0500 *Search for Host System* message, press the escape key. • Press F8. • Enter an address value between 0 and 6. • Press the Enter key. • Restart the Enter key to restart your logic unit.

AIX Error Situations

The errors in this table are specific to an RS/6000 server that runs the AIX operating system.

Table 72. AIX Problem Resolution Table

Symptom	***What you should do***
BOOTP in Debug Mode	

Table 72. AIX Problem Resolution Table (continued)

Symptom	***What you should do***
Logging errors in debug mode to diagnose BOOTP problems	If you start BOOTP from inetd, you will log the BOOTP startup events for your server and Network Station. This information is useful to debug BOOTP problems. Start debug mode by performing the following steps: 1. Enter **vi /etc/inetd.conf** 2. Place a # character in column one in front of bootps. 3. Save the changed file. 4. Enter **refresh -s inetd** 5. Enter **ps -ef | grep bootp** 6. Find the PID, and use **kill <pid_no>** 7. Start bootpd in debug mode by entering **bootpd -d -d -d -d -s /etc/bootptab** Power on the Network Station and look for errors on the RS/6000 screen where you started bootpd in debug mode from. After you finish debugging, turn off the bootpd program by entering pressing Ctrl - C. Remove the # character in front of bootpd in the /etc/inetd.conf file. Enter **refresh -s inetd** to refresh.
Fonts Missing	
Missing fonts	The fonts.dir file on your server font directories may not accurately reflect the correct number of fonts. To solve this problem perform the following tasks: 1. On the font server, change to the main font directory by typing **cd /usr/netstation/pcf** 2. Change into the 100dpi subdirectory by typing **cd 100dpi** 3. Look at the size of the fonts.dir file by typing **ls -l fonts.dir** 4. Run the mkfontdir command by typing **mkfontdir** 5. Look at the size of the new fonts directory by typing **ls -l fonts.dir** 6. Change to the /misc subdirectory by typing **cd ../misc** 7. Run the mkfontdir command by typing **mkfontdir** 8. Power down the Network Station 9. Power on the Network Station
Keyboard Mapping problem in XDM	

Table 72. AIX Problem Resolution Table (continued)

Symptom	***What you should do***
Keyboard map does not work under XDM	XDM assumes that the Network Station is a local graphics terminal because it is not an xstation. The keyboard is remapped for a graphic terminal. Set the XSTATION environment variable to the display name by adding the following lines in the /usr/lib/X11/xdm/Xsession file before any executable code: **if [-z ″$EXT_NCD_SETUP″]** Then enter this string: **export XSTATION=′echo $DISPLAY | cut -f1 - d\;′** **fi** **Note:** You need to use accent grave marks (′) in the export command above. The commands above check to see if your device is a Network Station and then the XSTATION variable displays the Network Station name. Power down your Network Station and power on your Network Station for the changes to take effect.
Network Traffic	
Network traffic when CDE dtterm is in focus	When a CDE tterm session is in focus, you will see network traffic. This is due to the default tterm cursor that blinks in your CDE tterm window. Each time it blinks, it sends a request to the RS/6000. You may change to aixterm as your standard window or change the default tterm cursor to reduce this network traffic by performing the following steps: 1. Select **Option**s from the dtterm menu bar. 2. Select **Global**. 3. In the Global window change the blinking cursor selection box to **Disabled**. **Note:** You may also wish to change the cursor blink rate from this window.
No DNS Entry	
No DNS Entry for server error message appears	Add the following line at the bottom of the /etc/httpd.conf file to solve this problem: **HostName host.full.domain.path**
No Login Window	

Table 72. AIX Problem Resolution Table (continued)

Symptom	***What you should do***
No Login window on monitor - User Services window appears instead	The most likely cause is an incorrect entry for this Network Station in the BOOTP table. Verify that you entered a forward slash '/' at the end of your boot directory entry. A corrupt default configuration file also may cause this problem. The default configuration file, standard.nsm, is located in the /configs subdirectory of the directory indicated in the hd tag of the BOOTP table entry. You may need to reinstall the IBM Network Station Manager licensed program.
NVRAM Setting Reverts to Network setting	
NVRAM setting only works for initial boot and NVRAM setting reverts to Network setting	When you set an individual Network Station to boot via NVRAM, the settings may only take effect for the first time you power on your Network Station. You need to modify required.nsm to repeatedly boot from NVRAM. Change the ip-use-address-discovery variable in your required.nsm file to one of the following values: • **true** for network setting • **false** for NVRAM setting Change the value to true to boot via the Network setting and change the value to false to boot via NVRAM.
PANIC situation in AIX	
PANIC caused by missing $HOME environment variable	If you are using IBM Network Station Browser code and your Network Station PANICs, you may not have the $HOME environment variable set on the Network Station. This variable should be set automatically when you run the /usr/netstation/bin/Xstartup.ibm8361 script through CDE. Verify the environment variable by performing the following steps: • Press the Pause key to start the **Console Monitor** • Select **Setup** • Select **User Setup** • Select **Environment Variables** • Verify your $HOME environment variable If the $HOME environment variable is not set, run the Xstartup.ibm8361 script again.
Printing Problems	

Table 72. AIX Problem Resolution Table (continued)

Symptom	***What you should do***
Stairstep, misaligned printouts	In the UNIX operating system, the lines in files end in line feeds without carriage returns. Some print queues add a carriage return to the end of each line feed. This is what causes the misaligned, stairstep printing. Format your print file locally and print remotely. OR Prepend a command to the print file to add the carriage returns if your printer requires them. For a PCL printer this command is ESC&k2G. Create the ESC character in vi by pressing Ctrl - V and then the ESC key.
Program Manager Problems	
Error message *403 error, access denied by rule* appears	Verify all of your permissions. Verify the accuracy of your name servers. Verify the spelling of the URL for the http://../NetworkStation/Admin
Resizing the Netscape window when using AIX causes loss of data input on IBM Network Station Manager program panels	Do not resize the window after you have entered data. Resizing the window resets the values.
Unable to find messages	Ensure that your locale values such as LANG, NLSPATH and so on are set correctly for the Network Station Manager licensed program and the HTTPD server.
Syslogd to Resolve AIX Network Station Manager Problems	
Use syslogd to record system events when debugging problems	Use the syslogd command to collect information on problem situations including booting, ftp, nfs, and so forth. Add the following line to the /etc/syslog.conf file: ***.debug /usr/spool/mqueue/syslog.out** This line collects system events and it records them in the file syslog.out. Read the syslog.out file messages to diagnose problems.

OS/390 Error Situations

The errors in this table are specific to the OS/390 operating system.

Table 73. OS/390 Problem Resolution Table

Symptom	***What you should do***
Browser problems	

Table 73. OS/390 Problem Resolution Table (continued)

Symptom	***What you should do***
The IBM Network Station Browser will not start	You may have deleted the IBM Network Station Manager for the OS/390 licensed program and then reinstalled it. In deleting the licensed program, some of the files that support the IBM Network Station Browser were also deleted. Reinstall the IBM Network Station Browser licensed program.
Browser hangs or presents the message ″Document contains no data″.	The following are potential causes: • Domino Go Webserver directive is not mapped to the proper executable. • Executable does not exist. • Executable is not readable by the Domino Go Webserver. • Browser is not Java-script enabled. • Browser is not frames-capable. • Executable does not have the″sticky-bit″ on. For OpenEdition, executables which are to be executed from a partitioned data set must have the ″sticky-bit″ turned on. All the executables in /usr/lpp/nstation/nsm/cgi-bin/* for the Network Station Manager program must have this bit turned on. The contents of this file contains text similar to the following:`This file is not executable. MVS loads the actual program from the partitioned data set because the stick bit is on.` • The library containing the actual Network Station Manager program executables is not in the link list. • C++ DLL not in Link or LPA List For systems that do not have the C++ Program Product installed, the C++ DLL Library is required for the Network Station Manager program to execute. Correct the problem and retry the application.
Error Message: EZZ7354 (User:) Error during authentication for user.	Basic Authentication is not being performed by the Domino Go Webserver. IBM Network Station Manager program requires that Basic Authentication be performed before allowing any IBM Network Station Manager program functions to be performed. This error is caused by the Domino Go Webserver returning a null user ID and is usually caused by errors in the Domino Go Webserver configuration file (`httpd.conf`).

Table 73. OS/390 Problem Resolution Table (continued)

Symptom	***What you should do***
Error Message: Retrieval failed for the message PSA_4_NSM_ AUTHENTICATION_ ERROR_MSG {1,5} (User:) Error during authentication for user.	This response is the result of two configuration errors. • Basic Authentication is not being performed by the Domino Go Webserver. IBM Network Station Manager requires that Basic Authentication be performed before allowing any IBM Network Station Manager functions to be performed. There are probably errors in the Domino Go Webserver configuration files. • IBM Network Station Manager program could not access its catalog to properly display a message for the authentication failure. An internal representation of the message identifier is displayed beginning with PSA_. Sufficient information should be provided to enable the user to identify the error being reported. Verify that the IBM Network Station message catalog resides in a library specified by the NLSPATH variable of the ICS server and validate user preferences (read/write) that can be accessed by all (read only) for this file. __ 1. From the Setup Tasks listed in the frame on the left, select the NSM Error Messages task at the bottom. This task enables the Administrator to key in a message number and obtain a message description. __ 2. Key in a valid IBM Network Station Manager message number, such as 7350, and select the Submit key. If you receive a response similar to the following, the Network Station Manager program was able to access the message catalog: `EZZ7350 (User: <User_name>) Unable to access HTML file <File_Name>` If you receive a response similar to following, this indicates that the IBM Network Station Manager program could not access the message catalog:`Retrieval failed for the message PSA_0_NSM_NO_TEMPLATE_MSG:{1,1} ...` Verify that the message catalog has been placed in a directory which is accessible by the ICS server and contained in the NLSPATH variable and validate user preferences (read/write) that can be accessed by all (read only) for this file. See step10.c on page 194 information on setting the NLSPATH variable.
Network Station Manager Problems	
IBM Network Station Manager program will not start	Check to see if the ICS server is running and configured properly.
Syslog to Resolve OS/390 Problems	

Table 73. OS/390 Problem Resolution Table (continued)

Symptom	***What you should do***
Problems occurred and debugging information is needed.	Use the export command to set the environment variable SYSLOG to YES. This provides you with extended debugging information to help you diagnose the problem. To stop producing extended debugging information, set the environment variable SYSLOG to NO.

VM/ESA Error Situations

The errors in this table are specific to the VM/ESA operating system.

Table 74. VM/ESA Problem Resolution Table

Symptom	***What you should do***
No Login Window	
No Login window on monitor - User Services window appears instead	The most likely cause is an incorrect entry for this Network Station in the BOOTP table. Another possible cause is that the default configuration file on the server has been corrupted or deleted. The default configuration file, standard.nsm, is located in the /configs subdirectory of the directory indicated in the hd tag of the BOOTP table entry. A reinstallation of the IBM Network Station Manager licensed program may be required.
Network Station Manager Debug Tool	
Any problem that occurs in the Network Station Manager.	After a problem occurs, specify a user ID on the DEBUG statement (DEBUG: *userid*) in the NSM SETUP file. Then, rerun the problem. Debug files will be sent to the user ID specified on the DEBUG statement. The debug files contain information that will help you solve the problem that occurred. See the *Program Directory for Network Station Manager Release 3 for VM/ESA* for information about the NSM SETUP file.

Appendix B. Twinaxial Network Stations

Planning for Your Twinaxial TCP/IP Network

On an AS/400 server, you can set up your network environment so that some or all of the Network Stations use twinaxial connectivities. A special type of TCP/IP runs over the twinaxial network. You can create a relationship between the workstation controller and the TCP/IP interface. A TCP/IP interface identifies your workstation controller to your AS/400 server and Network Stations. Each TCP/IP interface must have a unique IP address. As a result, the server assigns IP addresses to your twinaxial Network Stations.

The Network Stations attached to the workstation controller act as if they were a TCP/IP subnet. Therefore, the subnet represented by the TCP/IP interface has a network address and a subnet mask. The twinaxial subnet can also use a Domain Name Server (DNS), just like any other subnet.

The twinaxial interface acts just like any other local area network (LAN) interface. It can interact with the other LAN cards on your server in much the same way as a router's multiple interfaces work together. The interface can pass packets from your twinaxial Network Stations to a LAN card on the same server. The LAN card can forward the packets to a router and out to the Internet, just like "Twinaxial Subnet Associated with a LAN" on page 349.

Simple Twinaxial Subnet

Figure 108 on page 348 shows an example of an isolated twinaxial Network Station subnet. The AS/400 server does not connect to a LAN.

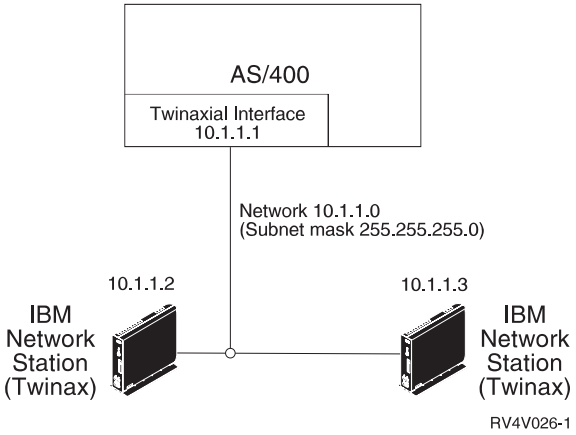


Figure 108. Simple Twinaxial Network Station Subnet

Since this example has no LAN and the IP addresses are never externalized, you can assign any IP addresses to the twinaxial Network Stations. You should use private IP addresses (10.x.x.x), so that if you add a LAN interface later, your IP addresses will not conflict with other IP addressed devices.

With this ″closed″ environment, your Network Stations can only communicate with the AS/400 server and any other devices that are connected to workstation controllers. For example, you can use the 5250 emulation to communicate with the server. You can also use the NC Navigator to browse the Web server on the AS/400 system.

Isolated Twinaxial Subnet with an Unassociated LAN

Refer to Figure 109 on page 349 for an example of an environment in which the Network Stations are still isolated, but the AS/400 server has a LAN attached network. The Network Stations can still communicate with the server and devices on other workstation controllers ,but they cannot communicate beyond the AS/400 server.

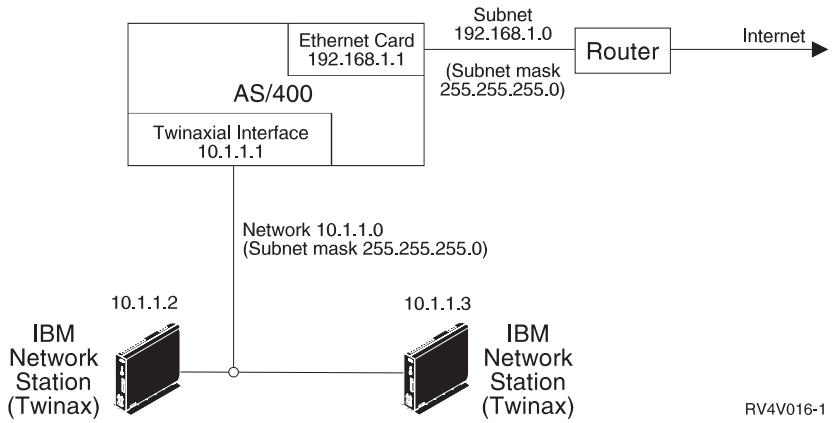


Figure 109. Isolated Twinaxial Network Station Subnet with an Unassociated LAN

In this example, the network 192.168.1.0 connects the AS/400 system to the Internet through a router. The address of the Ethernet card is 192.168.1.1. The network 10.1.1.0 connects the AS/400 system to the Network Stations. You can assign any IP addresses that you like on this network, because the addresses are not externalized beyond the AS/400 server. The address of the twinaxial interface is 10.1.1.1. The addresses of the Network Stations are 10.1.1.2 and 10.1.1.3. The subnet mask for both networks is 255.255.255.0.

The network 192.168.1.0 has no association with the internal network 10.1.1.0. The 10.1.1.0 network has no gateway or router, so it cannot communicate with devices beyond those that are attached to the workstation controller.

The Network Stations in this example can perform the same tasks that are illustrated in Figure 108 on page 348. However, these Network Stations can use NC Navigator to send and receive Internet e-mail if the AS/400 server is the mail server. Since the AS/400 server can act as a mail server, it would use the Ethernet card to distribute the e-mail to the Internet. The Network Stations would have to communicate only with the AS/400 server to obtain e-mail.

Twinaxial Subnet Associated with a LAN

Figure 110 on page 350 shows an environment in which the Network Stations can communicate beyond the workstation controller (such as the Internet).

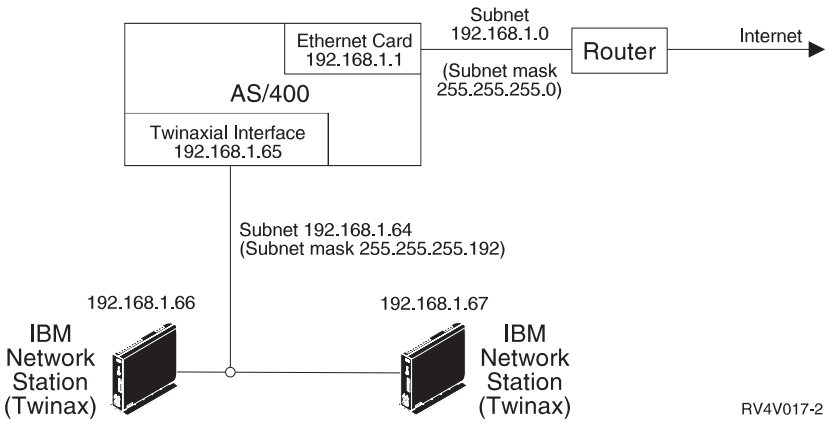


Figure 110. Network Stations associated with a LAN

In this example, the Network Stations connect to the Internet, so they have real, external IP addresses. The LAN network has an association with the twinaxial network. In order to do that, you must split the network 192.168.1.0 into two subnets by applying a subnet mask of 255.255.255.192.

The first subnet is 192.168.1.0. The address of the Ethernet card is 192.168.1.1. This subnet could contain devices with addresses ranging from 192.168.1.1 through 192.168.1.63.

The second subnet is 192.168.1.64 and attaches twinaxial Network Stations. This subnet contains devices with addresses ranging from 192.168.1.65 through 192.168.1.128. In fact, the twinaxial Network Stations treat the IP address of their interface as their gateway IP address to the AS/400 server. The AS/400 server automatically passes the IP address of the twinaxial interface as a gateway to the twinaxial Network Stations.

You must then associate the twinaxial interface with the Ethernet interface. Both the Ethernet and twinaxial subnets must be in the same subnet to work correctly. The AS/400 system can then act as a router, passing information packets from the twinaxial interface to the Ethernet card and out to the Internet.

Subnetting for Your Twinaxial Network

To create a twinaxial subnet like “Twinaxial Subnet Associated with a LAN” on page 349, you must create subnets. This section describes how to subnet your network so you can create a twinaxial subnet with an associated LAN. These twinaxial Network Stations have the opportunity to take advantage of the Internet.

The following tables show the relationship between the number of Network Stations that a subnet and its subnet mask can support. After you determine how many Network Stations you will add to your Network, use the corresponding table to determine the range of IP addresses that you need.

For example, if you wanted to support 25 twinaxial Network Stations, you would use Table 77 on page 353. The subnet mask of your subnet is 255.255.255.224. You could then use the IP address range of A.B.C.32 through A.B.C.63 and assign A.B.C.33 to the TCP/IP interface. If you use these values, your twinaxial Network Stations can receive IP addresses of A.B.C.34 through A.B.C.62.

Table 75 shows the address ranges for a subnet that can support up to 5 Network Stations. These subnets use the subnet mask address of 255.255.255.248. Each range is a block of 8 IP addresses, where the first address of the range is the subnet address. You should use the second address to define the TCP/IP interface.

Table 75. Subnets Supporting Up to 5 Network Stations. The numbers in this table are the fourth segment of an IP address. Each of these subnets uses a subnet mask address of 255.255.255.248.

Range	Subnet Address	Interface Address	Available IP Addresses	Broadcast Address
0-7	0	1	2-6	7
8-15	8	9	10-14	15
16-23	16	17	18-22	23
24-31	24	25	26-30	31
32-39	32	33	34-38	39
40-47	40	41	42-46	47
48-55	48	49	50-54	55
56-63	56	57	58-62	63
64-71	64	65	66-70	71
72-79	72	73	74-78	79
80-87	80	81	82-86	87
88-95	88	89	90-94	95
96-103	96	97	98-102	103
104-111	104	105	106-110	111
112-119	112	113	114-118	119
120-127	120	121	122-126	127
128-135	128	129	130-134	135
136-143	136	137	138-142	143
144-151	144	145	146-150	151
152-159	152	153	154-158	159
160-167	160	161	162-166	167
168-175	168	169	170-174	175

Table 75. Subnets Supporting Up to 5 Network Stations (continued). The numbers in this table are the fourth segment of an IP address. Each of these subnets uses a subnet mask address of 255.255.255.248.

Range	Subnet Address	Interface Address	Available IP Addresses	Broadcast Address
176-183	176	177	178-182	183
184-191	184	185	186-190	191
192-199	192	193	194-198	199
200-207	200	201	202-206	207
208-215	208	209	210-214	215
216-223	216	217	218-222	223
224-231	224	225	226-230	231
232-239	232	233	234-238	239
240-247	240	241	242-246	247
248-255	248	249	250-254	255

To create subnets that support up to 13 Network Stations, use Table 76. The subnets use a subnet mask of 255.255.255.240. The address ranges are in blocks of 16. The format is similar to Table 75 on page 351.

Table 76. Subnets Supporting Up to 13 Network Stations. The numbers in this table are the fourth segment of an IP address. Each of these subnets uses a subnet mask address of 255.255.255.240.

Range	Subnet Address	Interface Address	Available IP Addresses	Broadcast Address
0-15	0	1	2-14	15
16-31	16	17	18-30	31
32-47	32	33	34-46	47
48-63	48	49	50-62	63
64-79	64	65	66-78	79
80-95	80	81	82-94	95
96-111	96	97	98-110	111
112-127	112	113	114-126	127
128-143	128	129	130-142	143
144-159	144	145	146-158	159
160-175	160	161	162-174	175
176-191	176	177	178-190	191
192-207	192	193	194-206	207
208-223	208	209	210-222	223
224-239	224	225	226-238	239
240-255	240	241	242-254	255

Table 77 shows the address ranges for a subnet that can support up to 5 Network Stations. Each subnet uses a subnet mask address of 255.255.255.224. Each subnet is a block of 32 IP addresses. The format is similar to Table 76 on page 352.

Table 77. Subnets Supporting Up to 29 Network Stations. The numbers in this table are the fourth segment of an IP address. Each of these subnets uses a subnet mask address of 255.255.255.224.

Range	Subnet Address	Interface Address	Available IP Addresses	Broadcast Address
0-31	0	1	2-30	31
32-63	32	33	34-62	63
64-95	64	65	66-94	95
96-127	96	97	98-126	127
128-159	128	129	130-158	159
160-191	160	161	162-190	191
192-223	192	193	194-222	223
224-255	224	225	226-254	255

In Table 78, each subnet contains 61 available IP addresses. The subnets use a subnet mask address of 255.255.255.192. The address ranges are in blocks of 64. However, this twinaxial subnet is different from the previous subnets. Even though this subnet can support 61 IP addresses, you can connect a maximum of 56 Network Stations to the workstation controller. Furthermore, this subnet can support only 40 concurrently active Network Stations. Just like the other tables, the subnet address is the first IP address in the range. You should define the interface with the second address of the range. The broadcast address is the last address in the range.

Table 78. Subnets Supporting Up to 61 Available IP Addresses. The numbers in this table are the fourth segment of an IP address. Each of these subnets uses a subnet mask address of 255.255.255.192.

Range	Subnet Address	Interface Address	Available IP Addresses	Broadcast Address
0-63	0	1	2-62	63
64-127	64	65	66-126	127
128-191	128	129	130-190	191
192-255	192	193	194-254	255

Configuring Twinaxial Network Stations Checklist

Use this checklist to determine how to set up your twinaxial Network Stations.

__ 1. Read “Planning for Your Twinaxial TCP/IP Network” on page 347.

__ 2. Verify prerequisites.

   a. OS/400 V4R2 or later

b. PTF SF47202—A fix that allows the BOOTP server to serve twinaxial Network Stations

__ 3. Choose which scenario matches your needs.

a. If you want a scenario like “Simple Twinaxial Subnet” on page 347, in which the twinaxial Network Stations are isolated on an Intranet, you need to create and identify the line description for the workstation controller. Complete Table 79. You should use the BOOTP protocol to serve your Network Stations in this environment. In the Setup Assistant, choose `*BOOTP` for a boot protocol. Unlike configuring for non-twinaxial Network Stations, you do not need to make BOOTP entries in the BOOTP table. When the twinaxial Network Station first communicates with the host system, the AS/400 server automatically creates BOOTP entries. Return to step 2 on page 98 and write BOOTP in Table 25 on page 98.

Table 79. Twinaxial TCP/IP Information. Use this table for “Simple Twinaxial Subnet” on page 347 and “Isolated Twinaxial Subnet with an Unassociated LAN” on page 348 only.

Field	Description	Write Value Here
1 Line Description Name	The first twinaxial Network Station to use a workstation controller automatically creates a line description on your AS/400 server. To create and identify the line description, use the following procedure: __ 1) Connect a twinaxial Network Station to its workstation controller. **Note:** Make sure the workstation controller is active. __ 2) Power the Network Station on. **Note:** If this is the first time you have powered on the Network Station, it will request a twinaxial port address. __ 3) Allow the Network Station to complete its POST test and begin searching for a host server (NS0500). The AS/400 server automatically creates a line description and device description for the twinaxial Network Stations. Continue with the procedure to identify the name of the line description. __ 4) After the Network Station has begun looking for a host server, type `DSPMSG MSGQ(*SYSOPR)` at an AS/400 command prompt. __ 5) In the message log, look for the message `"DSPxx cannot connect. TCP/IP interface not added for line QTDLxxxxxx,"` where QTDLxxxxxxx is the name of the line description for the twinaxial Network Stations.	

Table 79. Twinaxial TCP/IP Information (continued). Use this table for "Simple Twinaxial Subnet" on page 347 and "Isolated Twinaxial Subnet with an Unassociated LAN" on page 348 only.

Field	Description	Write Value Here
2 Interface IP Address	The IP address of your interface is the address that identifies your workstation controller to your AS/400 server and Network Stations. Each interface should have a unique IP address. The interface's IP address determines the IP addresses of your Network Stations. You should use the second available address in your subnet as the interface IP address. For example, in a subnet of `10.1.1.0`, you should define the interface address as `10.1.1.1`. Your twinaxial Network Stations will then have IP addresses of `10.1.1.x`. If your needs match "Simple Twinaxial Subnet" on page 347 or "Isolated Twinaxial Subnet with an Unassociated LAN" on page 348, then you should use a private (10.x.x.x) IP address to identify your interface.	
3 Subnet Mask	A value that enables network devices to direct packets of information accurately in a subnetted environment. This subnet value is delivered to the Network Stations. If your needs match "Simple Twinaxial Subnet" on page 347 or "Isolated Twinaxial Subnet with an Unassociated LAN" on page 348, then you should use a subnet mask value of `255.255.255.192`. For more information about subnet masks, refer to "Subnets and Subnet Masks" on page 9.	

b. If you want a scenario like "Isolated Twinaxial Subnet with an Unassociated LAN" on page 348, complete Table 79 on page 354. In this scenario, the twinaxial Network Stations are isolated on a subnet,but the AS/400 server has a LAN connection. You should use the BOOTP protocol to serve your Network Stations in this environment. In the Setup Assistant, choose `*BOOTP` for a boot protocol. Unlike non-twinaxial Network Stations, you do not need to make BOOTP entries in the BOOTP table. The twinaxial Network Station will automatically create BOOTP entries. Return to step 2 on page 98 and write BOOTP in Table 25 on page 98.

c. If you have a scenario like "Twinaxial Subnet Associated with a LAN" on page 349, where the twinaxial Network Stations have real IP addresses, you will use the DHCP boot protocol.

Table 80. DHCP Twinaxial Information

Field	Description	Write Value Here
1 Subnet Address	The IP address associated with a particular subnet. Use Table 75 on page 351, Table 76 on page 352, Table 77 on page 353, or Table 78 on page 353 to determine the range of IP addresses that you will need to obtain. The first IP address of the range is the subnet address.	

Table 80. DHCP Twinaxial Information (continued)

Field	Description	Write Value Here
2 Interface IP Address	The IP address of your interface is the address that identifies your workstation controller to your AS/400 server and Network Stations. Each interface should have a unique IP address. The interface's IP address determines the IP addresses of your Network Stations. The interface is the second IP address of the range.	
3 Subnet Mask Address	A value that enables network devices to direct packets of information accurately in a subnetted environment. • If you used Table 75 on page 351 to determine your address range, then your subnet mask address is 255.255.255.248. • If you used Table 76 on page 352 to determine your address range, then your subnet mask address is 255.255.255.240. • If you used Table 77 on page 353 to determine your address range, then your subnet mask address is 255.255.255.224. • If you used Table 78 on page 353 to determine your address range, then your subnet mask address is 255.255.255.192.	
4 Associated Local Interface	Since you want your twinaxial IBM Network Stations to connect to a LAN, you must associate your twinaxial interface with the LAN interface. In Figure 110 on page 350, the associated local interface address for the twinaxial interface is `192.168.1.1`.	

For each subnet that you want to define, complete a copy of Table 80 on page 355. Return to step 2 on page 98 and write DHCP in Table 25 on page 98.

Appendix C. National Language Support

Locale Information

Table 81 lists all of the possible locales that are supported by the IBM Network Station Manager.

Table 81. Locale Information

Locale ID	Language / Locale
AR_AA	Arabic / Arabic Speaking
BE_BY	Byelorussia / Belarus
BG_BG	Bulgarian / Bulgaria
CA_ES	Catalan / Spain
CS_CZ	Czech / Czech Republic
DA_DK	Danish / Denmark
DE_CH	German / Switzerland
DE_DE	German / Germany
EL_GR	Greek / Greece
EN_GB	English / UK
EN_US	English / US
ES_ES	Spanish / Spain
ES_LA	Spanish / Latin America
ET_EE	Estonian / Estonia
FI_FI	Finnish / Finland
FR_BE	French / Belgium
FR_CA	French / Canada
FR_CH	French / Switzerland
FR_FR	French / France
IW_IL	Hebrew / Israel
HR_HR	Croatian / Croatia
HU_HU	Hungarian / Hungary
IS_IS	Icelandic / Iceland
IT_CH	Italian / Switzerland
IT_IT	Italian / Italy

Table 81. Locale Information (continued)

Locale ID	Language / Locale
JA_JP	Japanese / Japan
KO_KR	Korean / Korea
LT_LT	Lithuanian / Lithuania
LV_LV	Latvian / Latvia
MK_MK	Macedonian / Macedonia
NL_BE	Dutch / Belgium
NL_NL	Dutch / Netherlands
NO_NO	Norwegian / Norway
PL_PL	Polish / Poland
PT_BR	Portuguese / Brazil
PT_PT	Portuguese / Portugal
RO_RO	Romanian / Romania
RU_RU	Russian / Russia
SQ_AL	Albanian / Albania
SR_SP	Serbian Cyrillic / Serbia
SV_SE	Swedish / Sweden
TH_TH	Thai / Thailand
TR_TR	Turkish / Turkey
UK_UA	Ukranian / Ukraine
VI_VN	Vietnamese / Vietnam
ZH_CN	Chinese / PRC (Simplified)
ZH_TW	Chinese / ROC (Traditional)

DBCS Unique Support

Input Methods

The IBM Network Station supports the following double-byte input methods:

- Chinese (Simplified)
  - PinYin
  - English to Chinese
  - Intelligent ABC
- Chinese (Traditional)
  - Tsang-Jye
  - Phonetic Symbols
- Japanese
  - Kana to Kanji Conversion

  - Romanji to Kana Conversion
- Korean
  - ASCII
  - Hangul
  - Hanja

Printers

The following printer data streams can be printed to an IBM Network Station locally attached printer:

Printer Data Stream	Chinese (Simplified)	Chinese (Traditional)	Japanese	Korean
Adobe PostScript (PS) Level 2			x	
Epson ESC/P	x	x	x	x
IBM Pages	x	x	x	x
IBM PS55 (5575/5577)	x	x	x	x
HP PCL	x	x	x	x
Canon LIPS			x	
NEC PC-PR 201			x	

Appendix D. IBM Network Station Manager Program Shipped Default Settings

The following tables contain all of the IBM Network Station Manager default settings. The settings are in the same order as found in the Setup Tasks frame of the IBM Network Station Manager program.

Table 82. IBM Network Station Workstation Default Settings

Workstation Default Settings	
Item:	**Default Value:**
Mouse settings:	
• Mouse button configuration	• Right-handed
• Mouse pointer speed	• Medium
Keyboard settings:	
• Keyboard Repeat rate	• Medium
• Keyboard Repeat delay	• Medium delay
• Keyboard mapping language	• Default from terminal
Monitor settings:	
• Minutes before screen saver turns on	• 10
• Screen saver	• IBM bitmap
• Minutes before monitor standby	• 20
• Minutes before monitor suspend	• 40
• Minutes before monitor power down	• 60
• Desktop background	• IBM bitmap
Local Services settings:	
• Allow remote X clients	• No
Boot Parameters settings:	
• Language to be used during boot sequence	• English
• Number of times to try reloading operating system	• 0
• Update to boot monitor installed on the boot server	• No update except on Windows NT server
Miscellaneous settings:	
• Allocate memory to speed window refresh	• No

Table 83. IBM Network Station Printer Default Settings

Printer Default Settings	
Item:	**Default Value:**
Print Client settings:	
• Maximum LPR buffer size	• 10%

Table 83. IBM Network Station Printer Default Settings (continued)

Printer Default Settings	
Item:	**Default Value:**
Print Server settings: • Maximum LPD buffer size • Stream jobs if buffer overflows • Remote systems allowed to print on this IBM Network Station	 • 10% • Yes • All systems

Table 84. IBM Network Station Startup Menu Contents Default Settings

Startup Menu Contents Default Settings	
Item:	**Default Value:**
Desktop and Menu Bar option settings: • Desktop style	 • Standard desktop with menu bar
Buttons to appear on standard desktop when menu bar is enabled: • Log out • Hide • Top/Bottom • Lock	 • Yes • Yes • Yes • Yes

Table 85. IBM Network Station Standard Desktop Setting Default Values

Standard Desktop Setting Default Values	
Item:	**Default Value:**
Screen colors: • Background color for window frame in focus • Background color for window frame not in focus • Foreground color for all window frames	 • Mint green • Gray • Black
Icon preferences: • Icons placed • Icon location	 • On desktop • Bottom left
Fonts: • Font size for icons and menus	 • 12
Window focus	Windows become active by clicking on the window

Table 86. 5250 Default Settings

5250 Default Settings	
Item:	**Default Value:**
Key remapping capability	Disabled

Table 86. 5250 Default Settings (continued)

5250 Default Settings	
Item:	**Default Value:**
Default keyboard file for:	
• PC Keyboard (101 keys)	• None
• PC Keyboard (102 keys)	• None
• 5250 Keyboard (122 keys)	• None
Color Settings:	
• Color customization capability	• Basic
• Default color scheme	• None
• Additional color schemes to make available	• None
Record/Playback Settings:	
• Record/Playback capability	• Enabled
• Playback sequences to make available	• None
Allow Use of Settings:	
• Command menu	• Yes
• Option menu	• Yes
• Print menu	• Yes
• Miscellaneous preferences	• Yes
• New Session window	• Yes
• Edit menu	• Yes
• Control menu	• Yes
• Help menu	• Yes
• Font menu list	• Yes
• Pop-up keypad	• Yes
Screen settings:	
• Screen size	• 27 rows, 132 columns
• Column separators	• Disabled
• Image/Fax Display	• Disabled

Table 87. 3270 Default Settings

3270 Default Settings	
Item:	**Default Value:**
Key remapping capability	Disabled
Default keyboard file for:	
• PC Keyboard (101 keys)	• None
• PC Keyboard (102 keys)	• None
Color Settings:	
• Color customization capability	• Basic
• Default color scheme	• None
• Additional color schemes to make available	• None

Table 87. 3270 Default Settings (continued)

3270 Default Settings	
Item:	**Default Value:**
Record/Playback Settings:	
• Record/Playback capability	• Enabled
• Playback sequences to make available	• None
Allow Use of:	
• Command menu	• Yes
• Option menu	• Yes
• Help menu	• Yes
• Miscellaneous preferences	• Yes
• New Session window	• Yes
• Edit menu	• Yes
• Print menu	• Yes
• Graphics	• No
• Font Menu list	• Yes
• Pop-up keypad	• Yes
Miscellaneous settings:	
• Screen size	• 32 X 80
• Key for Enter function	• Control key
• Telnet 3270 port to connect to	• 23

Table 88. Internet Network Default Settings

Internet Network Default Settings	
Item:	**Default Value:**
Web server port on the boot host	80
Applet launcher port	5555

Table 89. NC Navigator Browser Defaults

NC Navigator Browser Defaults	
Item:	**Default Value:**
Proxy configuration	Manual proxies obtained from Internet Network panel
Security Settings:	
• Enable JavaScript	• Yes
• Enable Java Applets	• No
• Enable SSL 2	• Yes
• Enable SSL 3	• Yes
Network Settings:	
• Maximum memory cache	• 1024 KB
• Maximum TCP/IP connections	• 4
• Network buffer size	• 32 KB

Table 90. Java Applet Viewer Settings

Java Applet Viewer Settings	
Item:	**Default Value:**
Verbose mode	Off
Verify classes	Remote only
Maximum heap size	3 MB
JAVA stack size	256 KB
Native code stack size	32 KB
Garbage collection: • Verbose • Only when needed	 • Off • Off (garbage collection runs as an asynchronous thread in parallel with other threads)
NOTE: The Java Applet Viewer setting defaults are also the defaults for the Java Applications found on the Startup Programs and Menus screens.	

Table 91. Language Default Settings

Language Default Settings	
Item:	**Default Value:**
Format to use for dates, currency, numbers, and messages	Default from server

Appendix E. Configuring ICA Virtual Printing for Network Stations

Note: The ICA virtual Print support is only available for AS/400 and Windows NT 4.0.

For Windows NT 4.0 you must have IBM Network Station for Windows NT 3.0 and Service Update 3.

For AS/400 you must have certain PTFs installed. Access INFO APAR II11118 to obtain the program temporary fix (PTF) numbers for your operating system level.

Independent Computing Architecture (ICA) is software that provides connections to servers that in turn allow access to Windows-based applications. ICA support is available with Windows NT 3.51 and for Windows NT 4.0 Terminal Server Edition (TSE).

Understanding Software Combinations

Citrix is a company that supplies software products. The products are bundled with NT 3.51 and NT 4.0, and allow you to load an NT desktop session from the server onto your IBM Network Station. With the NT session you can access your Windows-based applications as if you were on your server. The Citrix software products are:

- Citrix WinFrame

  Citrix WinFrame is a bundled combination of WinFrame and ICA used with Windows NT 3.51 as a Windows application server. WinFrame is orderable from Citrix. When you order WinFrame 1.7, you receive Windows NT 3.51 with WinFrame built on to it.
- Citrix MetaFrame

  MetaFrame is a bundled combination of MetaFrame and ICA. MetaFrame is separately orderable software that is installed on Windows NT 4.0 Terminal Server Edition (TSE) .

Configuring a Local (ICA) Client Session for Your Network Station

You have to configure an ICA session in the IBM Network Station Manager program regardless of your print environment. Complete the following steps to configure the ICA client:

__ 1. Open the *IBM Network Station Manager program*.
__ 2. Click **Startup**.
__ 3. Click **Menus**.
__ 4. Scroll to *Local Program Menu Items*.
__ 5. Type the following values in the Local Program Menu Items fields:

Menu item label field
The name you want to appear on the Menu bar button for this ICA client session.

Program to run field
Type ICACLNT.

Parameters field
Type -H <IP address of PC Server or PC Server host name>. For example: -H 10.1.2.245

__ 6. Click **Finish**.

__ 7. Close the *IBM Network Station Manager program*.

You have now created a Menu bar button that will appear on your Network Station the next time you log on to it.

Clicking this Menu bar button will launch an ICA client session on your Network Station.

Continue with these configuration steps before you start work on your Network Station.

__ 8. Select one of the printer configuration scenarios and complete the configurations steps on the NT server.

ICA Virtual Print Configuration Scenarios for NT 4.0

The following list describes the NT 4.0 printer configuration scenarios:

- NT 4.0 printer configuration for Network Station users printing to a PC server (NT) attached printer

  See “NT 4.0 Printer Configuration for a PC Server-Attached Printer”.

- NT 4.0 printer configuration for a locally (Network Station) attached printer

  See “NT 4.0 Printer Configuration for a Locally (Network Station) Attached Printer” on page 369.

  The IBM Network Station Manager program also offers administrators and users the ability to configure locally attached (to a Network Station) serial or parallel printers. See “Configuring a Network Station-Attached Printer for Other Users” on page 270 for more information.

- NT 4.0 printer configuration for a printer attached to another PC Server (Remote Printing)

  See “NT 4.0 Printer Configuration for a Printer Attached to another PC Server (Remote Printing)” on page 370.

NT 4.0 Printer Configuration for a PC Server-Attached Printer

You must have MetaFrame installed on NT 4.0. From your NT desktop complete the following configuration steps:

__ 1. Double-click **My Computer** from your NT desktop.

__ 2. Double-click **Printers** from the My Computer folder.

__ 3. Double-click **Add Printer** from the Printers folder.

The Add Printer Wizard appears.

__ 4. Select, from the Add Printer Wizard, **My Computer** and click **Next**.

__ 5. Click the **box** before either the LPT1 or COM1 port you want to use for this printer configuration and click **Next**.

__ 6. Select the *printer manufacturer* and *printer* you are configuring. Click **Next**.

__ 7. Type, in the *Printer name* field, a name that you want to use to identify this printer and then click **Next**.

__ 8. Select **Not Shared** and click **Next**.

__ 9. Select **Yes** to print a test page or select **No** if you do not want to print a test page.

__ 10. Click **Finish**.

Your Printer is now configured and ready for use.

NT 4.0 Printer Configuration for a Locally (Network Station) Attached Printer

Note: You have to have Microsoft TCP/IP print services installed. You need the ″Microsoft NT 4.0″ CD to install TSE TCP/IP print services. To add the TSE TCP/IP print services:

__ 1. Insert the NT TSE 4.0 compact disk.

__ 2. Right mouse click on *Network Neighborhood*.

__ 3. Click **Properties**.

__ 4. Click the **Services** tab.

__ 5. Select **Microsoft TCP/IP Printing**.

__ 6. Click **Add**.

__ 7. Click **Microsoft TCP/IP Printing**.

__ 8. Click **OK**.

The *Windows NT Setup* panel appears. Follow the instructions and click **Continue**.

__ 9. Follow the instructions until the install is complete.

From your NT desktop complete the following configuration steps:

__ 1. Double-click **My Computer** from your NT desktop.

__ 2. Double-click **Printers** from the My Computer folder.

__ 3. Double-click **Add Printer** from the Printers folder.

The Add Printer Wizard appears.

__ 4. Select, from the Add Printer Wizard, **My Computer** and click **Next**.

__ 5. Click **Add Port**.

__ 6. Select **Client Printer Port** and click **New Port**.

__ 7. Type the **Port Name** and click **OK**.

For a parallel-attached printer type in *client\LPT1:*

For a serial-attached printer type in *client\COM1:*

__ 8. On the Port Name panel Click **OK** and you are returned to the Add Printer Wizard panel.

__ 9. Click **Next**.

__ 10. Select a port by clicking the **box** next to the port you want to work with and click **Next**.

__ 11. Select the *printer manufacturer* from the left column and *printer* from the right column. Click **Next**.

__ 12. Type, in the *Printer name* field, the NT **Client name** assigned to your Network Station followed by ″#LPT1:″ (do not use the quote marks (″).

To obtain the NT client name complete the following steps:

__ a. Click the **Start button** on your Desktop.

__ b. Click **Programs**.

__ c. Click **MetaFrame Tools (Common)**.

__ d. Click **MetaFrame Administration**. The MetaFrame Administration panel appears.

__ e. In the left frame, click your **NT user ID**.

__ f. Click the **Information** tab.

__ g. Locate the **Client name** field.

The Client Name field will be the IP address of the Network Station.

__ 13. In the Printer name field copy or type the **Client name** exactly as it appeared in the MetaFrame Administration tool followed by *#LPT1:*. For example: 10.1.2.33#LPT1:

__ 14. Select **Not Shared** and click **Next**.

__ 15. Select **Yes** to print a test page or select **No** if you do not want to print a test page.

__ 16. Click **Finish**.

Your Printer is now configured and ready to use.

NT 4.0 Printer Configuration for a Printer Attached to another PC Server (Remote Printing)

The following configuration steps must be performed on the PC server to which you are not physically connected but has the printer you want to print to attached to it.

__ 1. Double-click **My Computer** from your NT desktop.

__ 2. Double-click **Printers** from the My Computer folder.

__ 3. Double-click **Add Printer** from the Printers folder.

The Add Printer Wizard appears.

__ 4. Select, from the Add Printer Wizard, **My Computer** and click **Next**.

__ 5. Click the **box** before either the LPT1 or COM1 port you want to use for this printer configuration and click **Next**.

__ 6. Select the *printer manufacturer* and *printer* you are configuring. Click **Next**.

__ 7. Type, in the *Printer name* field, a name that you want to use to identify this printer and then click **Next**.

Remember the share name you choose. You need the share name when you configure a printer session on a different server.

__ 8. Select **Shared** and select the **computer operating systems** that will be printing to this printer.

__ 9. Click **Next**.

__ 10. Select **Yes** to print a test page or select **No** if you do not want to print a test page.

__ 11. Click **Finish**.

Your Printer is now configured and ready to use.

The following configuration steps must be performed on the PC server to which you are attached. These configuration steps will add the printer attached to a different server as a shared network printer.

__ 1. Double-click **My Computer** from your NT desktop.

__ 2. Double-click **Printers** from the My Computer folder.

__ 3. Double-click **Add Printer** from the Printers folder.

The Add Printer Wizard appears.

__ 4. Select, from the Add Printer Wizard, **Network printer server** and click **Next**.

The Connect to Printer panel appears.

__ 5. Under *Shared Printer*, find your network you belong to and double click it.

__ 6. Double click the group on the server the sharing printer belongs to.

__ 7. Click the PC server name to which the shared printer belongs.

__ 8. Select that shared printer from the list and click **OK**.

__ 9. Click **Finish**.

The shared printer from the other PC server is now available to you when you make print requests from your applications.

ICA Virtual Print Configuration Scenarios for NT 3.51

Following are three ICA virtual print configuration scenarios. The scenarios are:

- NT 3.51 Printer Configuration for a Printer Attached to Your Server

  See “NT 3.51 Printer Configuration for a Printer Attached to Your Server” on page 372.

- NT 3.51 Printer Configuration for a Locally (Network Station)-Attached Printer

  See “NT 3.51 Printer Configuration for a Locally (Network Station)-Attached Printer” on page 372.

  The IBM Network Station Manager program also offers administrators and users the ability to configure locally attached (to a Network Station) serial or parallel printers. See “Configuring a Network Station-Attached Printer for Other Users” on page 270 for more information.

- NT 3.51 Printer Configuration for a Printer Attached to Another PC Server (Remote Printing)

  See “NT 3.51 Printer Configuration for a Printer Attached to Another PC Server (Remote Printing)” on page 373.

NT 3.51 Printer Configuration for a Printer Attached to Your Server

You must have WinCenter installed on NT 3.51. The CD you will need is ″Microsoft NT 3.5.1″. From your NT desktop complete the following configuration steps:

__ 1. From the *Main* program group double click **Control Panel**.

__ 2. From the *Control Panel* double click **Printers**.

__ 3. From the *Main Menu Bar* click **Printer** and then click **Create Printer**.

The *Create Printer* panel appears. From the *Create Printer* panel complete the following steps:

__ a. Type in the *Printer Name* field the name you want to give this PC server-attached printer.

You might consider using the name of the printer as identification. For example: IBM ExecJet. Using this type of name makes it easy to identify the printer to which you want your jobs sent.

__ b. In the *Driver* field select the correct printer driver for the printer attached to the boot server.

__ c. In the Print to field use one of the following values:

- For a parallel printer type **LPT1:**
- For a serial printer type **COM1:**

__ d. Click **OK**.

The *Printer Setup* panel appears.

__ e. Choose your printer setup options you want to use. Click **OK**.

Your printer is now configured.

NT 3.51 Printer Configuration for a Locally (Network Station)-Attached Printer

From your NT desktop complete the following configuration steps:

__ 1. From the *Main* program group double click **Control Panel**.

__ 2. From the *Control Panel* double click **Printers**.

__ 3. From the *Main Menu Bar* click **Printer** and then click **Create Printer**.

The *Create Printer* panel appears. From the *Create Printer* panel complete the following steps:

__ a. Leave the *Printer Name* field blank. This field is complet when the *Print to* field receives a value.

__ b. In the *Driver* field select the correct printer driver for the printer attached to the Network Station.

__ c. In the Print to field use one of the following values:

- For a parallel printer type **CLIENT\LPT1:**
- For a serial printer type **CLIENT\COM1:**

__ d. Click **OK**.

The name of the printer will be a composite of the Network Station's IP address and the parallel or serial type you selected in 3.c. For example: 10.1.2.33#LPT1.

Your printer is now configured and ready to use.

NT 3.51 Printer Configuration for a Printer Attached to Another PC Server (Remote Printing)

The following configuration steps must be performed on the PC server to which you are not physically connected but has the printer you want to print to attached to it. From that PC server's desktop complete the following configuration steps:

__ 1. From the *Main* program group double click **Control Panel**.

__ 2. From the *Control Panel* double click **Printers**.

__ 3. From the *Main Menu Bar* click **Printer** and then click **Create Printer**.

The *Create Printer* panel appears. From the *Create Printer* panel complete the following steps:

__ a. Type in the *Printer Name* field the name you want to give this PC server-attached printer.

You might consider using the name of the printer as identification. For example: IBM ExecJet. Using this type of name makes it easy to identify the printer to which your jobs are sent.

__ b. In the *Driver* field select the correct printer driver for the printer attached to the server.

Remember the driver name you use for this configuration. You will use the same driver name when you configure this printer on another server in your network.

__ c. In the Print to field use one of the following values:

- For a parallel printer type **LPT1:**
- For a serial printer type **COM1:**

__ d. Click the **Share this printer on the network** field.

The *Share Name* field and the *Location* field are now active.

The *Share Name* field assumes the name you typed in the *Printer Name* field. You can change the Share name to be anything you like.

The name in the *Share Name* field is important. It is the name you must use when you configure this printer on another server in your network.

It is recommended that you use the Location field to show where the printer is physically located. For example, LASER PRINTER - BLDG1.

__ e. Click **OK**.

The *Printer Setup* panel appears.

__ f. Choose your printer setup options you want to use. Click **OK**.

Your printer is now configured.

Next, the following configuration steps must be performed on the PC server to which you are attached. These configuration steps add the printer attached to a different server as a shared network printer.

__ 1. From the *Main* program group double click **Control Panel**.

__ 2. From the *Control Panel* double click **Printers**.

__ 3. From the *Main Menu Bar* click **Printer** and then click **Create Printer**.

The *Create Printer* panel appears. From the *Create Printer* panel complete the following steps:

__ a. Type in the *Printer Name* field the Share Name you assigned during the configuration of the shared printer on the other server.

__ b. In the *Driver* field select the same driver you choose during the configuration of the shared printer on the other server.

__ c. In the *Description* field it is recommended to put the printer's shared name and the physical location.

__ d. In the *Print to* field use one of the following values:

- For a parallel printer type select an **LPT:** value.
- For a serial printer type select an **COM:** value.

__ e. Click **OK**.

The *Printer Setup* panel appears.

__ f. Choose your printer setup options you want to use and click **OK**.

Your printer is now configured.

Note: Depending on the applications you use, you may need to change the printer on the other server to be your default printer. To change your default printer:

a. Double click **Print Manager** from the *Main* panel.

b. Click the **down arrow** in the *Default* field.

c. Select the printer you want to be your default printer.

Appendix F. Using TN3270E Display Support and Printer Support

TN3270E support provides:

- Persistent 3270 logical unit (LU) session names
- General printer support (that is not connected to specific application programs)
- Application-dependent printer support (When an application runs, print requests from that application are routed to a specific printer.)

Configuring Persistent 3270 LU Session Names

You can specify the virtual LU display name for 3270 sessions by using the IBM Network Station Manager program.

The -DISPLAY_NAME parameter options:

- Give a user access to the 3270 applications authorized for the user's display LU name.
- Limits application access to specifically named Network Stations.
- Provide enhanced 3270 application security.
- Control the number of 3270 sessions that can be started on the target System/390.
- Associate a 3270 application printer with a specific 3270 session.

Complete the following steps to configure persistent 3270 LU session names:

__ 1. Open the IBM Network Station Manager program.

__ 2. From Setup Tasks, click Startup.

__ 3. Click Programs or Menus.

The Programs function of Startup automatically starts a 3270 session or sessions after login. The Menus function of Startup controls the Menu bar buttons; one or more menu bar buttons can start 3270 sessions.

__ 4. Scroll to 3270 Sessions to AutoStart if using Programs or scroll to 3270 Menu Items if using Menus.

This example uses the Menus function.

__ 5. Type, in the Menu item label field, a name you want to appear on the button.

__ 6. Type in the System/390 field, the name or IP address of the host.

__ 7. Type in the Other parameters field, the following parameters and values:

-DISPLAY_NAME

See "Valid Types of -DISPLAY_NAME Parameters" on page 376 to view possible values you can use with the -DISPLAY_NAME parameter.

-DISPLAY_NAME and the parameter value are case sensitive and must be typed in upper-case.

Valid Types of -DISPLAY_NAME Parameters

Following are valid types of -DISPLAY_NAME parameters:

Note: The first five -DISPLAY_NAME parameter types associate the user with the IBM Network Station being used.

The last two -DISPLAY_NAME parameter types depend on the IBM Network Station hardware.

″**XXXXXX**″
Where XXXXXX is a 2 through 8 upper-case character name of the 3270 session. You must use quotes with the parameter. The user only has a single session.

″**XXXXXXX+n**″
″XXXXXXX+n″ allows the user to start n 3270 sessions, where n is a number from 1 through 9. The LU session name is the 2 through 7 character name XXXXXXX followed by a number.

For example:

```
-DISPLAY_NAME "DCLNEA+5"
```

″DCLNEA+5″ allows the user to have up to five 3270 sessions with session names of DCLNEA1, DCLNEA2, DCLNEA3, DCLNEA4, and DCLNEA5.

″**XXXXXX YYYYYY ZZZZZZ** ″
″XXXXXX YYYYYY ZZZZZZ ″ allows an attempt to launch one of multiple 3270 sessions (three for this example) with the specified names. The quotes must be used, and a single space separates names. The maximum number of names is limited by the size of the Other parameters field (256 characters).

TN3270E support attempts to provide a 3270 session that is based on the first parameter value (XXXXXX in this example). If that 3270 session is not available, the next parameter value is tried (YYYYYY in this example). Only one 3270 session defined as a -DISPLAY_NAME parameter value is started.

USE_USER_ID
USE_USER_ID allows the user to start a single 3270 session where the LU session name is the same as the user's User ID (2 through 8 characters).

USE_USER_ID+n
USE_USER_ID+n allows the user to start n 3270 sessions. N is a number from 1 through 9. The LU session name is the same as the user's Network Station User ID (7 characters maximum) with the number n appended to the end. For example: USE_USER_ID+4 and a User ID of JUAN would have session names of JUAN1, JUAN2, JUAN3, and JUAN4.

TN3270E support does not automatically start each session as represented by the value assigned to n. You can click the 3270 Menu bar button on the Network Station four times to start each of the four 3270 sessions.

USE_MAC_ADDRESS
USE_MAC_ADDRESS allows the user to start a single 3270 session where

the session name is created starting with an alpha character. The alpha character indicates the type of communication card. The T represents token ring, the X represents Twinax, and the E represents Ethernet and is followed by the lower three bytes of the Media Access Control (MAC) address. The MAC address is displayed on the IBM Network Station ″View Hardware Configuration″ screen (boot monitor screen). For example: USE_MAC_ADDRESS with a token ring Network Station and MAC address of 00.00.E5.68.D5.99 would result in a session name of T68D599.

USE_MAC_ADDRESS+n

USE_MAC_ADDRESS+n allows the user to start n 3270 sessions where the session name is created as above but with n appended to the end. For example: USE_MAC_ADDRESS+3 with a token ring Network Station and MAC address of 00.00.E5.68.D5.99 would result in session names of T68D5991, T68D5992, and T68D5993.

Configuring Printers Using the IBM Network Station Manager Program

You must use the IBM Network Station Manager program to configure printers for use with the TN3270E print support. For locally attached (to a Network Station) printers the configuration is already done. Queues named PARALLEL1 and SERIAL1 already exist. You can configure remotely attached printers by completing the following steps to access the printer configuration support:

__ 1. Open the IBM Network Station Manager program.

__ 2. From Setup Tasks, click Hardware.

__ 3. Click Printers.

__ 4. Scroll to Remote printer.

__ 5. Type in the name or IP address of the remote printer server.

__ 6. Type in the queue name associated with the printer you want to use.

You will use the queue name when configuring printer support for TN3270E support. You also need to remember which type case (upper-case or lower-case) you used.

After you have completed the IBM Network Station Manager program printer configuration, you can continue with:

- Configuring TN3270E General Printer Support
- Configuring TN3270E Application-Specific Printer Support

Configuring TN3270E General Printer Support

TN3270E general printer support allows you to configure an association of specific printers with specific 3270 sessions. Complete the following steps:

__ 1. Open the IBM Network Station Manager program.

__ 2. From Setup Tasks, click Startup.

__ 3. Click Programs or Menus.

The Programs function of Startup automatically starts a 3270 session or sessions after login. The Menus function of Startup controls the Menu bar buttons; one or more menu bar buttons can start 3270 sessions.

__ 4. Scroll to 3270 Sessions to AutoStart if using Programs or scroll to 3270 Menu Items if using Menus.

This example uses the Menus function.

__ 5. Type, in the Menu item label field, a name you want to appear on the button.

__ 6. Type in the System/390 field, the name or IP address of the host.

__ 7. Type in the Other parameters field, the following parameters and values:

-PRINTER_GENERAL XXXXXX

Where XXXXXX is the parameter value and is the queue name of the printer as defined in the IBM Network Station Manager program. The queue name must be typed in the same case (upper or lower) that you used in the IBM Network Station Manager program

-PRINTER_GENERAL must be typed in upper-case. No quotation marks are required because there is only one parameter value.

-PRINTER_NAME YYYYYY

Where YYYYY is the value for this parameter and is the name of one or more printer LU names that you want to make available to this 3270 session.

-PRINTER_NAME and the parameter value are case sensitive and must be typed in upper-case.

See “Valid Types of -DISPLAY_NAME Parameters” on page 376 for a list of values used with the -PRINTER_NAME parameter.

Following is an example of the Other parameters field:

```
-PRINTER_GENERAL hpqueue -PRINTER_NAME POSTSCRIPT1
```

These values result in making available:

- The printer associated with hpqueue
- The printer named POSTSCRIPT1
- The 3270 display session

Configuring TN3270E Application-Specific Printer Support

TN3270E application-specific printer support allows you to configure an association of specific applications, printers, and 3270 sessions. The applications themselves must have programming support that is built in to point to specific printers and 3270 sessions. Complete the following steps:

__ 1. Open the IBM Network Station Manager program.

__ 2. From Setup Tasks, click Startup.

__ 3. Click Programs or Menus.

The Programs function of Startup automatically starts a 3270 session or sessions after login. The Menus function of Startup controls the Menu bar buttons; one or more menu bar buttons can start 3270 sessions.

__ 4. Scroll to 3270 Sessions to AutoStart if using Programs or scroll to 3270 Menu Items if using Menus.

In this example the Menus function is used.

__ 5. Type, in the Menu item label field, a name you want to appear on the button.

__ 6. Type in the System/390 field, the name or IP address of the host.

__ 7. Type in the Other parameters field, the following parameters and values:

-PRINTER_APP

-PRINTER_APP must be typed in upper-case.

The parameter value is the queue name of the printer as defined in the IBM Network Station Manager program. The queue name must be typed in the same case (upper or lower) that you used in the IBM Network Station Manager program.

-DISPLAY_NAME

The value for this parameter is the name of one or more display LU names on which you want to allow certain applications to run.

-DISPLAY_NAME and the parameter value are case sensitive and must be typed in upper-case..

-DISPLAY_NAME is an optional parameter. However, you probably want to use this parameter most of the time to identify the 3270 display to the application program.

You can get the names of these displays from your System/390 administrator.

See “Valid Types of -DISPLAY_NAME Parameters” on page 376 for a list of values that can be used with the -DISPLAY_NAME parameter.

Following is an example of how the Other parameters field could be typed:

```
-PRINTER_APP hpqueue -DISPLAY_NAME "D3270PJL D3270MAP"
```

The user gets either display D3270PJL or display D3270MAP.

If the display LU session D3270PJL is available when the command is run, the user gets a display session to D3270PJL. The physical printer hpqueue is associated with D3270PJL.

If D3270PJL is not available, display session D3270MAP is used and the physical printer hpqueue is associated with D3270MAP.

Appendix G. Serial Port Printer Connection

If you are connecting a serial port printer to a Network Station, you should use one of the following:

- A 9 (female) to 25 (male) pin cable (Cable AR or equivalent) through a db25-db25 null modem interposer (Cable E or equivalent).
- A 9 (female) to 25 (male) pin null modem cable (electrically equivalent to the description in Table 94 on page 382).

For additional information about cable characteristics, please see *Adapters, Devices, and Cable: Information for Micro Channel Bus Systems* (SA23-2764).

Using a 9 to 25 pin cable through a db25-db25 null modem interposer

Cable AR (recommended)

This Serial Port cable (Async Cable EIA-232) is for systems that have a nine pin serial port connector.

Table 92. Pin-out for Modem (Non-Interposer) Cable

Pin no. (9 Pin) Female	Signal Name (9 Pin)	Pin No. (25 Pin) Male	Signal Name (25 Pin)
1	Data Carrier Detect	8	Data Carrier Detect
2	Receive Data	3	Receive Data
3	Transmit Data	2	Transmit Data
4	Data Terminal Ready	20	Data Terminal Ready
5	Signal Ground	7	Signal Ground
6	Data Set Ready	6	Data Set Ready
7	Request to Send	4	Request to Send
8	Clear to Send	5	Clear to Send
9	Ring Indicator	22	Ring Indicator

Cable E Interposer (recommended)

Table 93. Pin-out for Cable E, Printer/Terminal Interposer-EIA-232

System End Connector Socket (Female)	Signal	Device End Connector Pin (Male)
1	Shield Ground	shell
2	TxD	3
3	RxD	2
4	RTS	5
5	CTS	4

Table 93. Pin-out for Cable E, Printer/Terminal Interposer-EIA-232 (continued)

System End Connector Socket (Female)	Signal	Device End Connector Pin (Male)
6,8	DSR, CD	20
7	Signal Ground	7
20	DTR	6,8

Using a 9 to 25 pin null modem cable

The hardware interface uses the 9 pin D-shell female connector and pin assignments defined for RS-232-C. The voltage levels are EIA only. Current loop interface is not supported. There are two identical connectors.

Table 94. Pin-out for Terminal (Interposer Cable)

Pin No. (9 Pin) Female	Signal Name (9 Pin)	Pin No. (25 Pin) Male	Signal Name (25 Pin)
1	Data Carrier Detect	20	Data Terminal Ready
2	Receive Data	2	Transmit Data
3	Transmit Data	3	Receive Data
4	Data Terminal Ready	6	Data Set Ready
5	Signal Ground	7	Signal Ground
6	Data Set Ready	20	Data Terminal Ready
7	Request to Send	5	Clear to Send
8	Clear to Send	4	Request to Send
9	Ring Indicator		

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Index

Numerics

A

B

C

D

E

F

G

H

I

R

S

T

U

V

W

X

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