



IBM Network Station

IBM Network Station Manager Installation and Use June 15, 1998 Beta Version

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Note

Before using this information and the product it supports, be sure to read the information in "Appendix F. Notices" on page 379.

First Edition (June 1998)

This edition applies to version 1, release 3, modification 0 of IBM Network Station Manager (product number 5648-C05) and to all subsequent releases and modifications until otherwise indicated in new editions.

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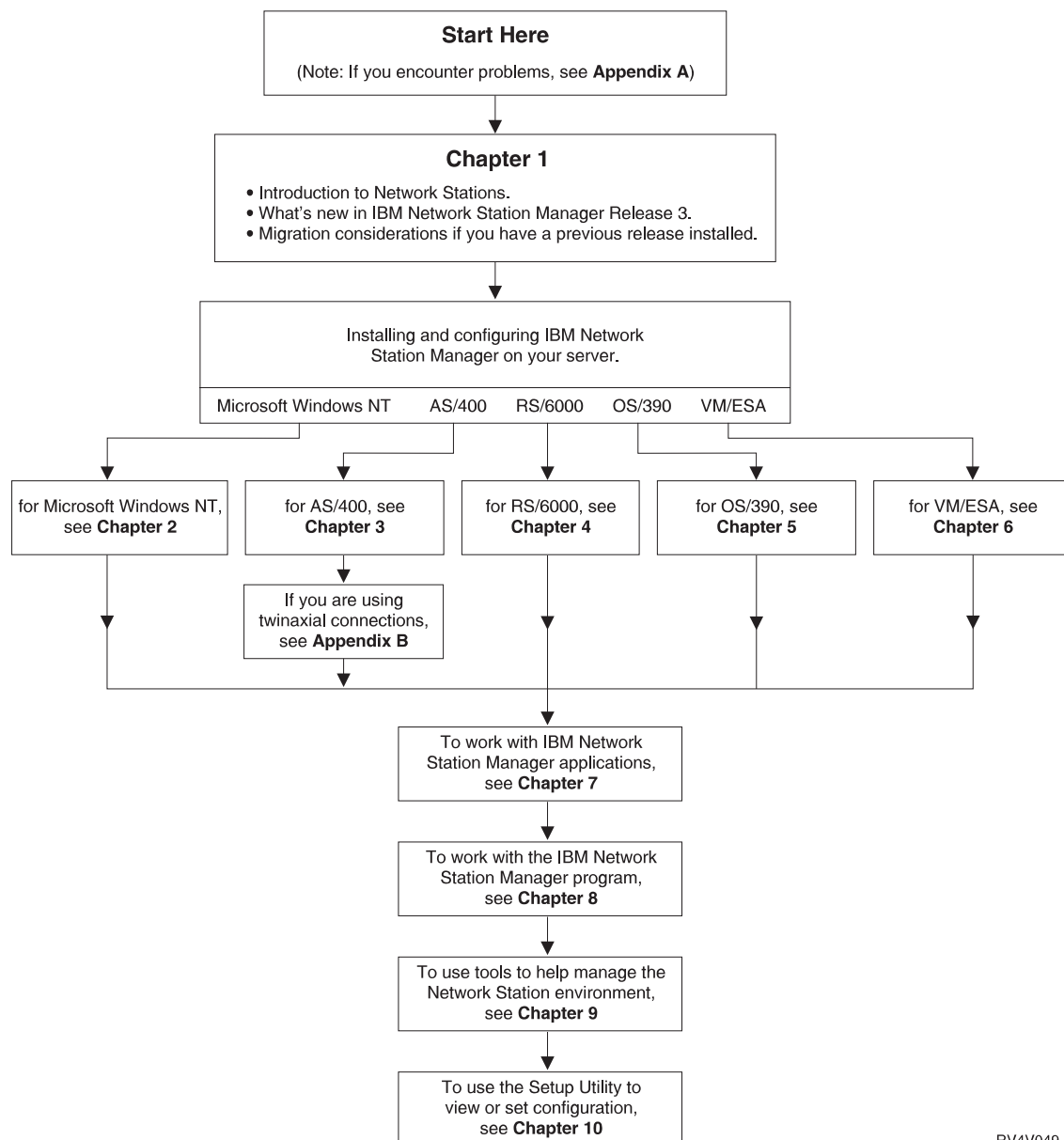
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About IBM Network Station Manager Installation and Use (SC41-0664)

This manual is an early version of SC41-0664-01. To obtain the latest version of this book, contact your Marketing Representative or visit:

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How to Use this Book



RV4V049-1

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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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.

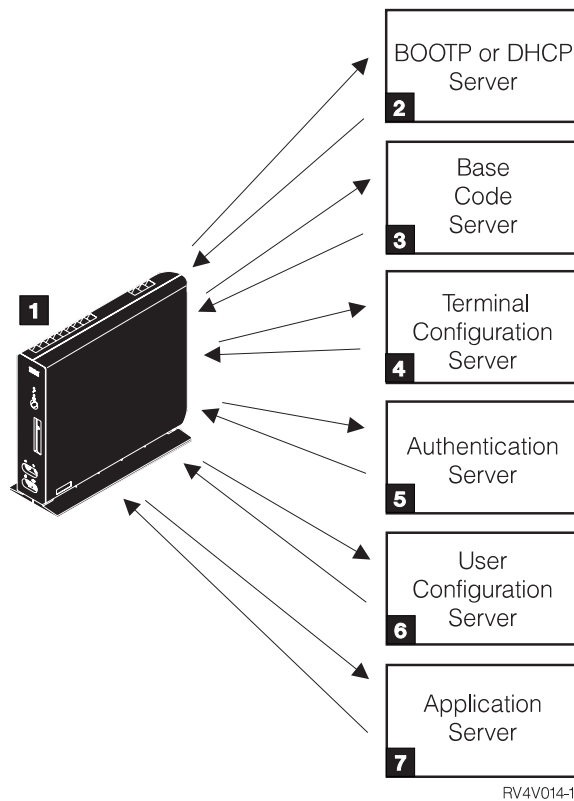


Figure 2. Network Station Power-On Sequence

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 255 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 with the agent on a Network Station and exchange information. 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 133 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 309 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 305 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. Understanding your TCP/IP network makes installing and configuring your Network Station and IBM Network Station Manager program 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 355.

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).

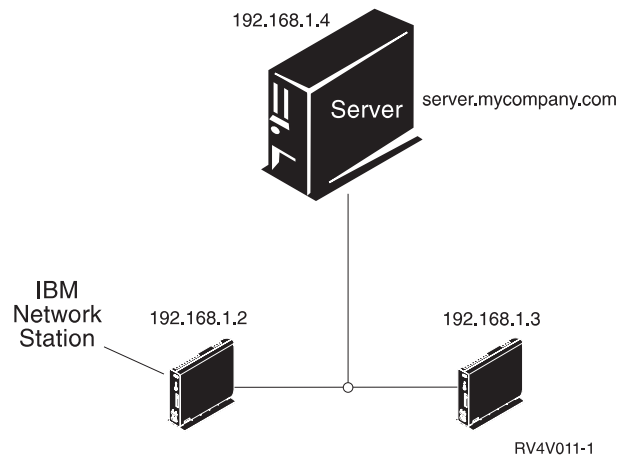


Figure 3. Two Network Stations Connected to the Server over a Simple LAN

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.

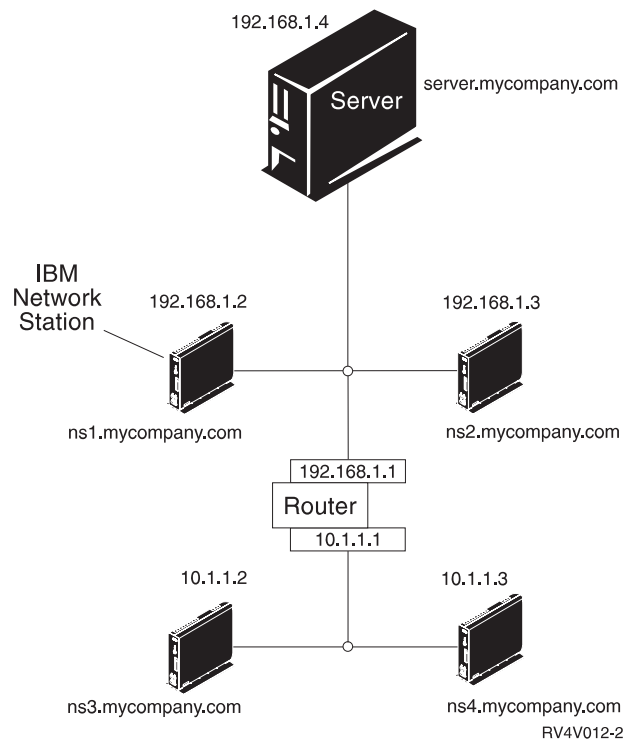


Figure 4. Two Network Stations Connected to the Server over a Local LAN and Two Network Stations Connected to the Server through a Router over a Remote LAN

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.

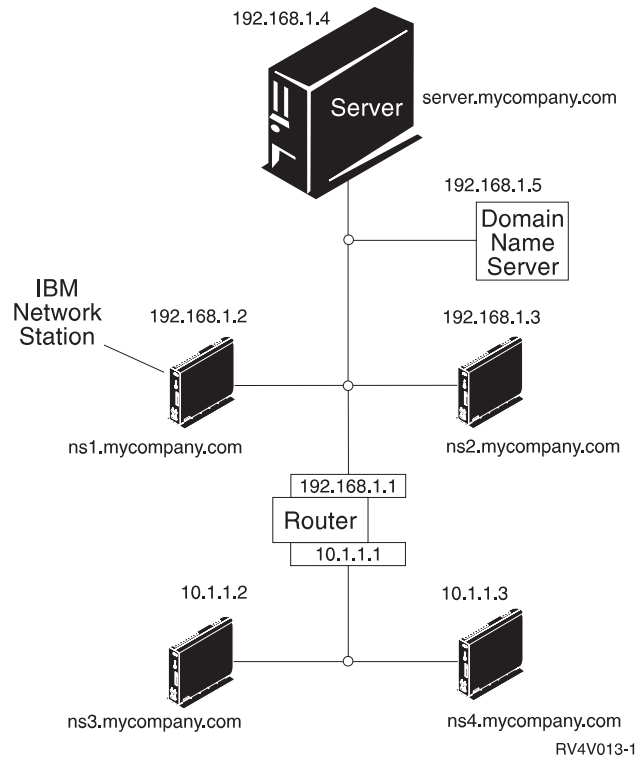


Figure 5. Four Network Stations Connected to a Network Using a Router and a Domain Name Server

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 314 for instructions on how to find the MAC address.

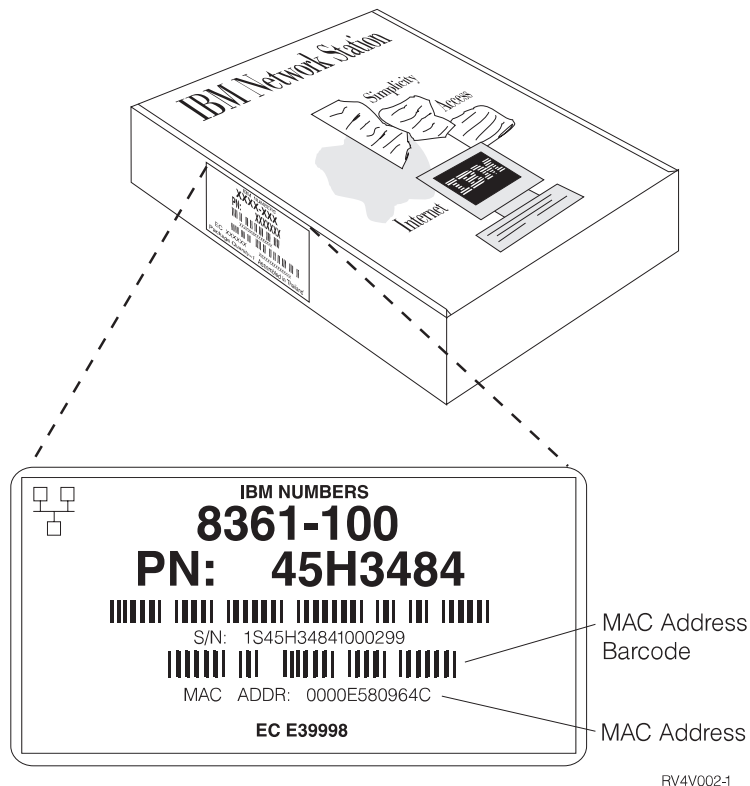


Figure 6. MAC Address on the Box

You can override the burned-in MAC address with a customer-assigned MAC address. See “Specifying a User-Configurable MAC Address” on page 315 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 given not just to computers such as Network Stations, but to 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) for 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 and some bits that 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 (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 addresses 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 and cannot be assigned 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

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

Subnet Mask	Binary Value	Number of Subnets	Number of Hosts Per Subnet
255.255.255.192	11000000	4	62
255.255.255.224	11100000	8	30
255.255.255.240	11110000	16	14
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

Table 3. Subnet Mask 255.255.255.192 Example (continued)

Subnet	IP Address	Comments
3rd Subnet	192.168.1.130	Network Station #126
.	.	.
.	.	.
3rd Subnet	192.168.1.190	Network Station #186
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*, GG224-3376.

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 must 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)

Each platform supports a different set of boot methods. Table 4 shows the boot methods that are available for each platform.

Table 4. Boot Methods Supported by Various Operating Systems

	OS/390	VM/ESA	OS/400	AIX	NT
Boot Methods	NVRAM, BOOTP, DHCP	NVRAM, BOOTP, DHCP	NVRAM, BOOTP, DHCP	NVRAM, BOOTP, DHCP	NVRAM, 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 317.

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, and assign 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>

Network Station Memory Requirements

Each of the applications that are downloaded to the Network Station require memory. Use Table 6 as a guide in determining how much memory each Network Station requires.

Table 6. Minimum Memory Requirements for Network Stations

Item Requiring Memory	Languages With Non-extended Fonts (MB)	Languages with Extended Fonts ¹ (MB)	Double Byte Character Set Languages ² (MB)
Base System	8.0	14.0	12.0
ICA client, if used	2.0	2.0	2.0
For JAVA applets or applications			
• Minimum buffer size	• 5.0	• 5.0	• 5.0
• Recommended buffer size	• 7.0	• 7.0	• 7.0
• Minimum buffer size for eSuite	• 14	• 14	• 14
• Recommended buffer size for eSuite	• 18	• 18	• 18
• Recommended buffer size for JITC	• 18	• 18	• 18
3270 Emulator (1st session)	4.0	9.6	7.5
each additional 3270 session	1.0	1.5	1.5
5250 Emulator (1st session)	4.2	10.3	7.5

Table 6. Minimum Memory Requirements for Network Stations (continued)

Item Requiring Memory	Languages With Non-extended Fonts (MB)	Languages with Extended Fonts ¹ (MB)	Double Byte Character Set Languages ² (MB)
each additional 5250 session	1.1	1.0	1.0
x-Terminal Client	0.3	0.3	.3
each additional x-Terminal session	0.12	0.12	0.12
NC Navigator Browser	7.2	8.0	17
Lotus eSuite Desktop	4.6	4.6	4.6
• Web Browser	• 2.4	• 2.4	• 2.4
• Calendar	• 3.0	• 3.0	• 3.0
• Mail	• 2.2	• 2.2	• 2.2
• Address book	• 1.4	• 1.4	• 1.4
• Work Files	• 0.9	• 0.9	• 0.9
• Instructions	• 0.3	• 0.3	• 0.3
• Word Processor	• 1.9	• 1.9	• 1.9
• Spreadsheet	• 1.1	• 1.1	• 1.1
• Presentation	• 1.8	• 1.8	• 1.8
VTxxx emulation (first session)	0.6	0.6	0.6
each additional VTxxx session	0.2	0.2	0.2
Notes: 1. SBCS and extended fonts: Bulgarian, Byelorussian, Croatia, Macedonian, Russian, Serbian and Ukrainian 2. DBCS: Traditional Chinese, Simplified Chinese, Japanese, and Korean 3. Invokes Java applets. You must include Java memory requirement (from above) too.			

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 20 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" 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".
- 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 20.

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 on page 20 shows how multiple servers can allow visiting users to obtain their home configurations.

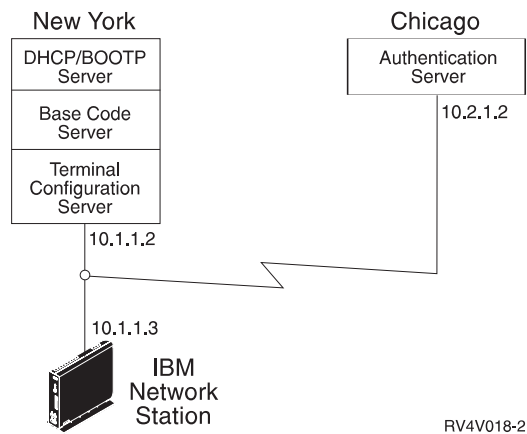


Figure 7. Roaming User Example

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 21 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.

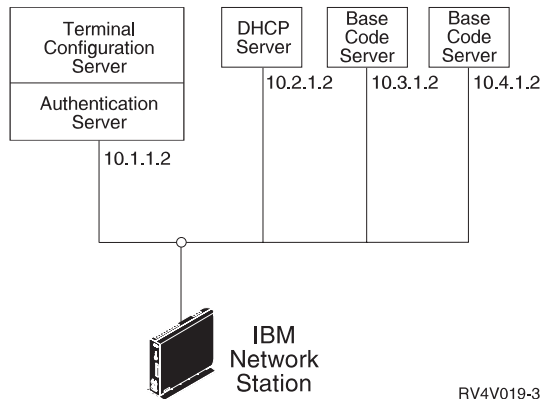


Figure 8. Load Balancing Example

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 7 on page 22 in the DHCP server settings.

Table 7. 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
<p>Notes:</p> <ol style="list-style-type: none"> 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" on page 23. 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. 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 316 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 144
- OS/390, see "DHCP Load Balancing Options" on page 211
- RS/6000, see "Configuring Dynamic Host Configuration Protocol (DHCP)" on page 158
- VM/ESA, see "Configuring DHCP for Load Balancing" on page 235
- Windows NT, see "Configuring DHCP for Load Balancing on Windows NT" on page 62

Configuring DHCP to Avoid Conflicts

The DHCP options in Table 7 on page 22 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 8 to determine the Network Station classes.

Determining DHCP Classes

Table 8 lists the DHCP classes assigned to each IBM Network Station type and model.

Table 8. 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:	
<ol style="list-style-type: none">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 248 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 245, “Learning About the 5250 Emulation Function” on page 241, 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 296 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 287 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 278 and “Configuring a Network Station-Attached Printer for Other Users” on page 279 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 271 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 141 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 133 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 355 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, and may be installed 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 248 and the NC Navigator online help for more information.

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 274 for instructions on how to update the boot monitor code.

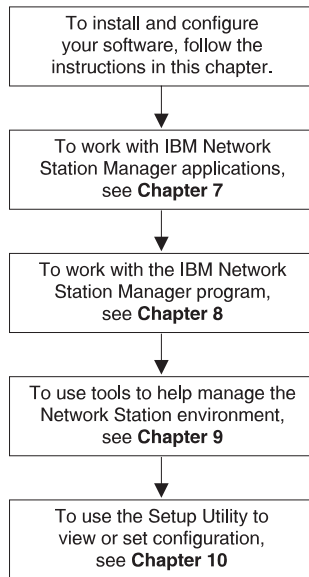
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About this Chapter

This chapter contains instructions for planning, installing, and configuring a Network Station environment on a Windows NT server. New users who are not upgrading from an earlier version of the IBM Network Station Manager can begin by reading "Prerequisites and Installation" on page 28. Readers who need to migrate preference files should refer to "Migrating Files from an Existing Windows NT Server Environment"

on page 65 . The following figure demonstrates the flow of this manual.



RV4V047-1

The Lotus Domino Go Webserver 4.6.x product name recently changed to IBM HTTP Server for Windows NT. This document refers to the IBM HTTP Server for Windows NT product as Lotus Domino Go Webserver 4.6.1. Future releases of the IBM Network Station Manager software will refer to the product only as IBM HTTP Server for Windows NT.

The Windows Terminal Server 1.x product name recently changed to Terminal Server Edition (TSE) for Windows NT Server. This document refers to the Terminal Server Edition (TSE) for Windows NT Server as Windows Terminal Server. Future releases of the IBM Network Station Manager software will refer to the product only as Terminal Server Edition (TSE) for Windows NT Server.

Prerequisites and Installation

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 were no users logged onto your server. If you need to restart your server, any active Network Station users will lose their applications.
- Read the readme file on the IBM Network Station for PC Server compact disk (CD). 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 42.

Complete the following checklist, marking off each item as you complete it. The checklist has three underlying stages. In completing the checklist, you will do the following:

- Verify prerequisites—hardware, software, and memory requirements.
- Install the IBM Network Station Manager software, including TCP/IP and other dependencies.
- Configure DHCP on your server if you plan to use DHCP to boot your IBM Network Stations.

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

___ 1. Verify IBM Network Station memory requirements:

Use Table 6 on page 17 as a guide in determining how much memory each IBM Network Station on your network needs to run the applications that your users require.

Notes:

- a. If some users will be using multiple applications on different Network Stations, you must 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 Microsoft Windows NT 4.0 is properly installed with all prerequisites:

The instructions which follow are for installing and preparing the Windows NT 4.0 operating system. Consult Table 9 to make sure that your system is ready for the installation. If you are lacking any of the prerequisites, you may enter the procedure as directed by the column titled "Where Can I Find Instructions?".

Table 9. 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.	<ul style="list-style-type: none"> ___ a. Determine if you have enough hard disk space for the IBM Network Station Managersoftware after you install Windows NT Server. From the Windows NT desktop, double-click on the <i>My Computer</i> 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 MBs of free space. 	You must reinstall the operating system beginning with Step 3 on page 32.
Windows NT 4.0	<ul style="list-style-type: none"> ___ a. Click Start->Settings->Control Panel->System. ___ b. Select the <i>General</i> tab if it is not currently selected. ___ c. Read the information under <i>System</i>: at the top of the page to make sure that Windows NT 4.0 is installed. 	Step 3 on page 32.

Table 9. Operating System Prerequisites (continued)

Prerequisite	How Do I Know If the Prerequisite Is In Place?	Where Can I Find Instructions?
Configure Regional Settings	<ul style="list-style-type: none"> ___ 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 36.
Service Pack 3	<ul style="list-style-type: none"> ___ a. Choose Start->Programs->Administrative Tools->Windows NT Diagnostics. ___ b. Select the <i>Version</i> 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 36.
NTFS (not FAT) file system	<ul style="list-style-type: none"> ___ a. From the Windows NT desktop, double-click on the <i>My Computer</i> 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 <i>file system</i>: to ensure that the drive uses NTFS instead of FAT. 	<p>You can convert a FAT partition to NTFS by carrying out the following steps</p> <ul style="list-style-type: none"> ___ a. Open a command prompt. ___ b. Type the following command: <code>convert x: /fs:ntfs</code>, where x is the partition that you want to convert.

Table 9. Operating System Prerequisites (continued)

Prerequisite	How Do I Know If the Prerequisite Is In Place?	Where Can I Find Instructions?
Proper MTU size	<ul style="list-style-type: none"> ___ 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 <i>Maximum Packet Size</i> text field. In a pure token-ring LAN, the maximum packet size should be 4048. In a mixed Ethernet and token-ring network, the maximum packet size should be 1400. 	Step 54 on page 36.
Stand-Alone Server (recommended)	<ul style="list-style-type: none"> ___ 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. Stand-Alone server is the recommended server type. 	To change the server type to Stand-Alone, you must reinstall the operating system beginning with Step 3.

If all of the prerequisites are in place, go to 57 on page 37.

- ___ 3. To install Windows NT Server 4.0 on your machine, begin here: With the machine off, insert the diskette labeled "Microsoft Windows NT Server Setup Disk 1" and start the machine.

- ___ 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" and 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. If Setup finds existing partitions on your drive, you need to either create a partition, delete an existing partition and create a new one, or install Windows NT on an existing partition.

Notes:

- a. Windows NT Server 4.0 requires at least 500 MBs of free space.
- b. 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. Press **F** to format the drive.
- ___ 17. After Setup formats the new partition, press Enter to accept the highlighted location where the Windows NT Server 4.0 operating system will install. You may choose the default x:\WINNT directory where x is the letter of your bootable drive.
- ___ 18. To perform an exhaustive examination of the hard disk, press Enter. To skip the exhaustive examination, press the Escape key. Either choice is acceptable.
- ___ 19. 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.

- ___ 20. When Setup continues, insert the CD and click **OK** as directed.
- ___ 21. Click **Next** to begin the Setup program.
- ___ 22. Enter your name and organization. Click **Next**.
- ___ 23. Enter the CD key as directed. Click **Next**.
- ___ 24. Choose the correct licensing model. If you choose *Per Server*, select only the number of licenses that you have purchased. Click **Next**.
- ___ 25. Type a computer name and click **Next**.
- ___ 26. Select a server type and then click **Next**. The recommended server type is Stand-Alone server. The server type options are as follows:

Primary Domain Controller (PDC) (not recommended)

The server that contains the master copy of the security accounts database for a domain. Each domain contains only one PDC. The PDC should not be on the same machine as the IBM Network Station Manager.

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. The BDC should not be on the same machine as the IBM Network Station Manager.

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 configure it to be part of a domain.

- ___ 27. Create an administrator password as prompted, then click **Next**.
- ___ 28. Choose whether or not to create an emergency repair disk, then click **Next**.
- ___ 29. 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.
- ___ 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 Service and then click **Next**. This version of Internet Information Service is not recent enough to work as a Web server for the IBM Network Station Manager. If you install this version, you must uninstall it 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**.
- ___ 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 you are prompted 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 higher level of network adapter card.

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

Note: You must choose TCP/IP.

- ___ 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 and DNS Server IP address(es).
- ___ 43. If you use WINS, select the WINS Address tab. Enter your WINS Server IP address(es).
- ___ 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 type the name of the NT domain to which the server will belong (for example, my company). 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.
 - In the *Testing Mode* window, click **OK**.
 - 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 and check to make sure that the MTU size is correct by carrying out the following steps:
 - ___ 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 9 on page 30 for the correct packet size information for your network.
 - ___ f. Enter the correct packet size and click **Ok** and then **Close**.
- ___ 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" 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 Microsoft Windows NT Service Pack 3. Obtain it from Microsoft or download it from <http://www.microsoft.com>.

Note: You can find out if the service pack is already installed by carrying out the following steps:

- ___ 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 4.0 with Service Pack 3, you may continue.

___ 57. Verify prerequisite software:

Besides ensuring proper installation of Windows NT, you must make three decisions before you install the IBM Network Station Manager:

Table 10. Three Prerequisite Component Decisions

Component	IBM Option	Microsoft Option
1. Choose a Web browser. You use this Java enabled Web browser on your Windows NT Server 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 Service Web server. See Step 58 for instructions.
2. Choose a Web server.	Lotus Domino Go 4.6.1. Included on CD. See Step 59 on page 38 for instructions.	Microsoft Internet Information Service 4.0. This Web server requires Microsoft Internet Explorer 4.0.1 browser. Do not use a down-level version. Obtain from Microsoft. See Step 59 on page 38 for instructions.
3. Choose a DHCP server (not required if using NVRAM boot method).	IBM DHCP. Included on CD. See Step 60 on page 40 for instructions and a discussion of the advantages of choosing IBM DHCP.	Microsoft DHCP. Included on Windows NT 4.0 installation CD. See Step 60 on page 40 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 may already have such a browser installed. If not, 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 Service 4.0 requires Internet Explorer 4.0.1, so make sure that you install that browser if you are using Internet Information Service 4.0. Do not try to use a down-level version of the browser.

If you want to install Internet Explorer 4.0.1, skip to Step 58.I on page 38.

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.

- ___ 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 **Explore CD**.
- ___ 2) Open the file /ntnsm/en/products/netscape/readme.txt. Follow the instructions that are contained in the readme.
- ___ 3) Go to Step 58.g.

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

Note: If you previously configured your server to access Web pages, you may not see this error.

- ___ 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 4.6.1 or Microsoft Internet Information Service 4.0:
Choose a Web server from which to run the IBM Network Station Manager. IBM's Lotus Domino Go Webserver 4.6.1 is included on the installation CD.

To install Microsoft Internet Information Service, go to Step 59.j on page 40.
To install IBM's Lotus Domino Go Webserver 4.6.1 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 4.6.1 in a language that does not appear on the screen, carry out the following steps:

- ___ 1) Select **Explore CD**.
 - ___ 2) Open the file /ntnsm/en/products/lotusgo/readme.txt. Follow the instructions that are contained in the readme.
 - ___ 3) Go to Step 59.e.
- ___ c. Select **Install Additional Products** if you have not yet done so.
 - ___ d. Select **Lotus Domino Go 4.6.1**.
 - ___ 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. You must select Java Servlet because it is not a default:
 - Lotus Domino Go Webserver 4.6.1
 - Security File
 - NT Service
 - Java Servlet
 - ___ 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 administrator password to use on your Web server. When you open the IBM Network Station Manager through Lotus Domino Go, you will use this administrator ID and password.
 - ___ h. After the installation, you may choose not to restart your server machine if you plan to 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 4.6.1. 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.
 - ___ j. If you choose to use Microsoft Internet Information Service 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 Service requires this level of the browser. Do not use a down-level 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 Service 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. IBM DHCP is included 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. Once you run the installation of the IBM Network Station Manager, you can select to have IBM DHCP installed automatically for you. Choose Yes at that time.
- If you choose to use IBM DHCP, go to Step 61 on page 41.
- 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. Refer to 56 on page 36 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:
 - ___ a. If you are planning on upgrading from an older version of the IBM Network Station Manager, read the information in "Migrating Files from an Existing Windows NT Server Environment" on page 65. 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. Follow the prompts of the Setup program, keeping the following points in mind:
 - If Setup detects that you have previous versions of the software installed, immediately refer to "Migrating Files from an Existing

Windows NT Server Environment” on page 65. The information there can guide you in choosing a strategy for successfully migrating your server and your clients.

- If you are not certain of which paths or folders to enter, simply accept the defaults that appear.
- If you plan to use IBM DHCP, choose **Yes** to have the DHCP server installed automatically for you.

Note: While the IBM DHCP software installs, you will see the configuration screen dialog boxes appear consecutively on your display. **Do not interrupt these dialog boxes** when they appear on your screen. If you press cancel, ok, or any other keystroke; you may have to reinstall the IBM DHCP software manually.

- Select the **Programs** folder.
 - Setup automatically installs the 40-bit NC Navigator Web browser. However, customers in the United States and Canada must choose whether or not to have the 128-bit version of the browser installed. The 128-bit version is more secure than the 40-bit. If you choose to have the 128-bit browser installed, you must configure an environment variable after the installation in order to activate the browser. For information about configuring the environment variable, refer to “128-Bit NC Navigator Browser” on page 45.
 - Click **Yes**, click **Next**, verify the NC Navigator components, and click **Ok** to install NC Navigator
 - Choose a destination folder.
 - If any problems occur during the installation, refer to “Resolving Installation Problems”.
- ___ k. You may choose whether or not to create a shortcut to the IBM Network Station Manager on your desktop.
- ___ l. After the installation, click on **Finish** to restart your computer, or wait until a more convenient time. The installation will not be complete until you have restarted the machine.

Note: To find out more about the components that are installed with the IBM Network Station Manager, refer to “Installed Components” on page 43 .

Now that you have finished installing the IBM Network Station Manager, continue to “Configuring DHCP” on page 45.

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 41.
- 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 41.
- 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").

Installed Components

When you run the IBM Network Station Manager Setup program, you install the following components:

- The IBM Network Station Manager licensed program
- The 40-bit NC Navigator browser
- The following IBM TCP/IP services:
 - NFS

- TFTP
- TimeD

There are also several optional components which you may choose to install. You can install some of these products during the installation of the IBM Network Station Manager. You can install others by using the installation CD after the installation of the IBM Network Station Manager:

- The Adobe Acrobat PDF viewer, for viewing an electronic version of this book. The viewer is available as a separately installable product on the CD.
- The 128-bit NC Navigator browser, for customers in the United States and Canada only. You can choose to have the browser installed automatically during installation of the IBM Network Station Manager, or you can install it separately after the installation. To install the browser during the installation, simply make the selection as prompted. To install the browser after the installation, refer to “128-Bit NC Navigator Browser” on page 45.
- IBM DHCP, including the NDIS Intermediate Driver and Dynamic DNS.

Installing Components After the Initial Installation

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

Installing IBM DHCP

To install the IBM DHCP server after you have already installed the IBM Network Station Manager software, carry out the following steps:

- ___ 1. Insert the CD labeled “IBM Network Station Manager for PC Server” 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 e-Network On-Demand server.
- ___ 6. During the installation, choose to install only the DHCP component.

Installing Microsoft DHCP

To install the Microsoft DHCP server after you have installed the IBM Network Station Manager software, refer to Step 60 on page 40.

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 automatically 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

When you installed the IBM Network Station Manager software, Setup configured your Web server for you. However, you must make other configuration changes in order to boot Network Stations on your network.

If you have not yet done so, you must decide what boot method you want to use for booting the IBM Network Stations in your network. Refer to "Boot Methods" on page 14 for guidance in choosing a boot method, and then return to this page.

If you plan to boot your IBM Network Stations by using the NVRAM method, refer to "Configuring an IBM Network Station to Boot from the NVRAM Setting" on page 317.

If you plan to boot your IBM Network Stations by using DHCP, you must configure DHCP to match the layout of your network. You should have already decided between IBM DHCP and Microsoft DHCP. You also should have already drawn a diagram that represents the layout of your network. If you have not yet done so, refer to "What Do I Need To Know About TCP/IP Networks?" on page 4. The Network Examples found in that section will help you to plan your network. Throughout the following discussions on configuring DHCP on your server, each step refers to Figure 5 on page 7.

In order to configure DHCP, you must gather information about your network. Using the Network Examples and your network topology, fill in Table 11.

Table 11. Gathering DHCP Information

DHCP Option Number	Field	Description	Write Your Network's 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's Value Here
Option 66	Base Code Server (TFTP or NFS)	The server from which the Network Station downloads its operating system. 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
Option 211	Base Code Server Protocol	Specify this option to enable Option 66 to serve the kernel using NFS.	nfs

To configure Microsoft DHCP, go to "Configuring Microsoft DHCP on Windows NT" on page 59 .

To configure IBM DHCP, continue with "Configuring IBM DHCP on Windows NT".

Configuring IBM DHCP on Windows NT

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 46 for the values for your DHCP configuration.

You may wish to set up an advanced DHCP configuration by adding classes, clients, and load balancing options. The sample DHCP configuration walks you through an advanced DHCP configuration.

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.

To configure IBM DHCP, carry out the following steps:

- ___ 1. If you have not yet done so, complete Table 11 on page 46.
- ___ 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:

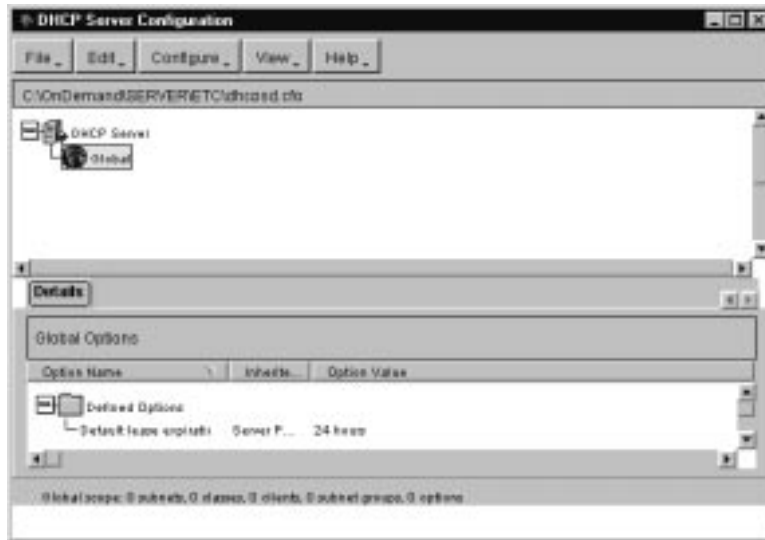


Figure 9. Main eNOD DHCP Configuration Window

3. Once you have opened the eNetwork On-Demand (eNOD) DHCP Server Configuration window, you may proceed to change the options to describe your own network structure. Refer to Table 11 on page 46 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 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
Boot File Name (DHCP Option 67)	/netstation/prodbase/kernel

Table 12. Sample DHCP Information for Network Example 3 (continued)

Field	Value
Domain Name (DHCP Option 15)	mycompany.com
DNS Address (DHCP Option 6)	192.168.1.5
Subnet Number (subnet address)	192.168.1.0
Subnet Mask (DHCP Option 1)	255.255.255.0
Router (DHCP Option 3)	192.168.1.1 and 10.1.1.1
Start DHCP Pool Address (IP Range From)	192.168.1.1
Last DHCP Pool Address (IP Range To)	192.168.1.100
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. The more general the level, the more widespread are the options you define there. If you configure an option at the global level, it applies to every client unless it is overridden at a more specific level, such as the subnet level. 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, not the first, as their own.

Refer to your network diagram to decide how to configure your network. Usually, you will begin by declaring some global options, and then setting 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 eNOD DHCP Configuration interface, 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:

- The subnet's broadcast address, which administrators use to communicate messages to every device on the subnet. For Class C networks, the broadcast address is always the first three portions of the subnet IP address with 255 in the final (fourth) place.
- Any device whose address is fixed, including:
 - Boot servers, configuration servers, http servers, domain name servers
 - Routers and bridges
 - Network Stations that boot using NVRAM

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

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). To exclude IP addresses, like the router in Network Example 3, enter them in the leftmost field and click on **Add**. The administrator in Network Example 3 does not need to exclude the broadcast address because it does not fall within the range of available IP addresses.

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

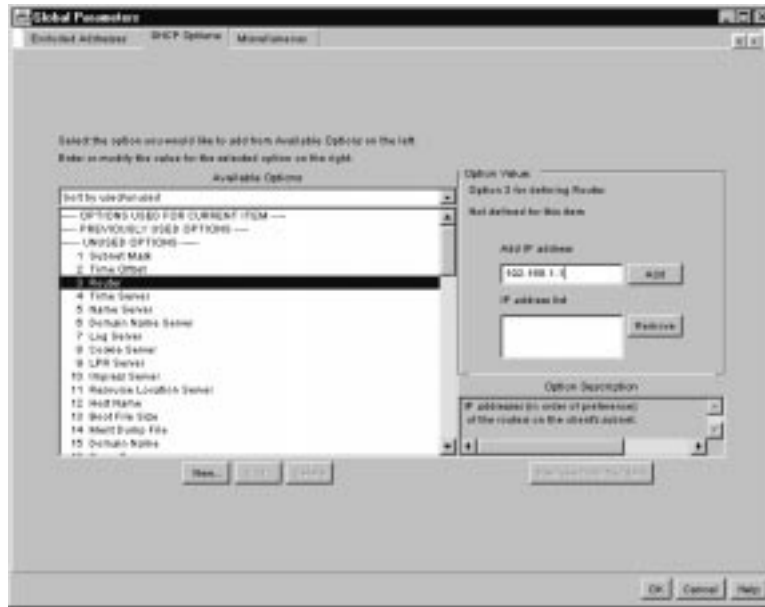


Figure 10. Defining Global DHCP Options

- ___ 6) In the new window, select a DHCP option from the field on the left of the screen. 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:

- Excluded Addresses:
 - DHCP Server: 192.168.1.4
 - Router: 192.168.1.5
 - Domain Name Server: 192.168.1.1

DHCP Options:

- Domain Name: mycompany.com
- Domain Name Server address: 192.168.1.5
- Subnet Mask: 255.255.255.0
- Router: 192.168.1.1

- 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 11. Defining a Subnet

- ___ 4) Fill in the information on the screen. You need to create a range of IP addresses from which the DHCP server will draw when it allocates addresses to your clients.

Again, you must exclude certain addresses from your range. Refer to the discussion of global parameters for information about what addresses to exclude from the DHCP range. In the above graphic, the administrator does not exclude any addresses on the subnet level because they have already been excluded at the global level. Since the subnet mask is the same for this subnet as for the rest of the network, this subnet will inherit that value from the global parameters. The administrator does not need to specify the subnet mask here.

You can use the *Lease Time and Comment* field to set lease characteristics for clients on this subnet. A lease is the duration of time in which a client may use an IP address. DHCP clients automatically renew their leases when half of the lease time has expired.

Do not give your clients an unlimited lease time. Give them a fairly short lease time. It requires very little network traffic and no effort to renew the leases. 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 whatever DHCP options you would like to specify at the subnet level. Remember that these values will override the ones that you specified at the global level.
- ___ 7) Select the **Client Support** tab.
- ___ 8) The **Client Support** window allows you to specify whether or not your DHCP server will respond to the address requests of clients whose MAC addresses are unknown. Choose from the available options.
- ___ 9) Click on **OK** at the bottom of the screen once you have finished configuring your subnet.
- ___ 10) 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. Next, the administrator of the sample network creates a class of clients. You might want to create a class of clients if you have a mixed network, consisting of both Network Stations and PCs. 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 file that contains the operating system of the Network Station.

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.

IBM DHCP comes with a starter file in which all of the Network Station classes are defined. One way to create classes in your network is to configure DHCP by opening the starter file, called `starter.cfg`. You can then simply add Network Stations to the classes that have been pre-defined in the file. For more information about the starter file, refer to "Configuring IBM DHCP" on page 62.

You can either create a class on its own or within a subnet. If you create a class within a subnet, you must specify a range of IP addresses for the class.

If you choose not to use the DHCP starter file as described above, 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 23.
- ___ 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 12. Adding a Class

- ___ 4) Type 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.
- ___ 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 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 23.

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. To create a client which does not receive its IP address dynamically, you can create it at the global or 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 13. 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 314 for more information about MAC addresses.

If you are specifying a client at the client level because its IP address is fixed, 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) Configure whatever DHCP options you need to specify for this client. The administrator of Network Example 3 must specify a different router for ns3 and ns4:

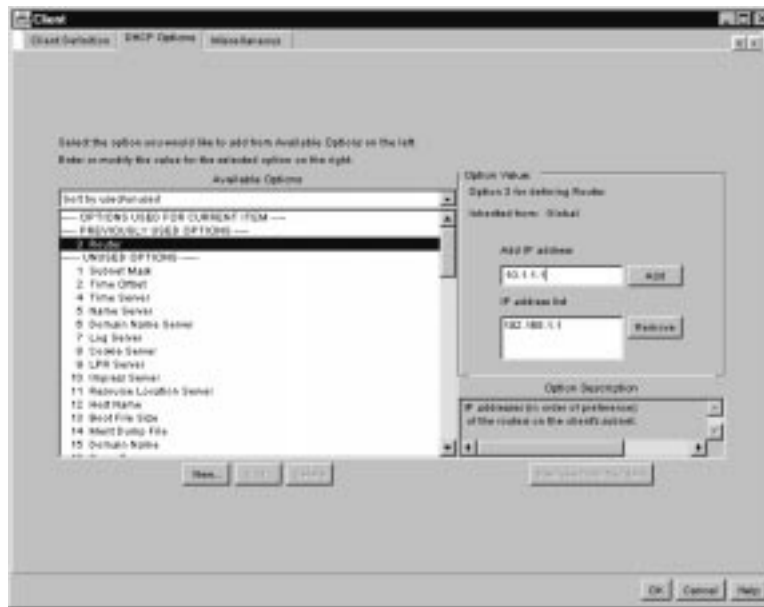


Figure 14. Specifying DHCP Options for a Client with a Fixed IP Address

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. Whenever 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 82.

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

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 40.

Configure Microsoft DHCP by carrying out the following steps:

- ___ 1. If you have not yet done so, complete Table 11 on page 46.
 - ___ 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 devices whose IP addresses are fixed, you must exclude them 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 boot. 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 only 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 boot your Network Stations.
- ___ 12. Once you have selected 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 and the value box appears greyed out, click on **OK** and go back 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 314.
 - Client Name: Enter the computer name of the Network Station.
 - Client Comment: You can 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 boot Network Stations. Make sure that each Network Station is set to the "Network" setting in the Setup Utility. See "Configuring an IBM Network Station to Boot from the Network Setting" on page 316 for guidance.

Once you have configured your DHCP server, go to "Before You Continue . . ." on page 82 .

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 Load Balancing on Windows NT

You can configure DHCP so that the client obtains its IP address from the DHCP server, loads the kernel from a second server, and loads configuration from a third server. "Load Balancing Example" on page 20 explains the concept of load balancing 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 found in Figure 8 on page 21.

To configure your network for load balancing, you must set DHCP options 211, 212, 213, and 214. To configure these options on IBM DHCP, refer to "Configuring IBM DHCP". To configure them on Microsoft DHCP, refer to "Configuring Microsoft DHCP" on page 64.

Configuring IBM DHCP

Many of the DHCP options that are required for load balancing 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 load balancing 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 Load Balancing

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 using the last column of Table 13 on page 63.
- ___ 11. When you are finished, click **OK** to save your changes and then exit the DHCP configuration utility.

Configuring Microsoft DHCP

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 Load Balancing

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	

Table 14. Options to Create for Microsoft DHCP Load Balancing (continued)

DHCP Option Name	Data Type	Identifier	Comment	Value
Terminal Configuration Path	String	213	Path to access terminal configuration information	\\netstation\prodbase\configs\
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.

Migrating Files from an Existing Windows NT Server Environment

This section describes how to migrate preference files and clients within your Windows NT Server environment. Migration is a complex process. Do not try to migrate without following the instructions in this section. You should read this entire section before you take any steps to migrate files.

Note: If you have manually modified 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.

Several factors affect your migration strategy. However, whatever server migration method you decide to use, user preference files move from your old server to your new server. When certain files are moved, eSuite preferences, browser bookmarks, and other information migrate to your new server.

There are two main stages of migration:

- Server migration, in which you migrate preference files from your old server to your new server. There are two main types of server migration which will be discussed later.
- Client migration, in which you move Network Stations from your old server environment to your new server environment.

Both stages are equally important. In order to plan and execute your migration strategy, carry out the following steps:

___ 1. Choose between the single-server and dual-server migration methods:

In single-server migration, you only need one server machine to perform the migration. The Setup program copies your preference files for you during the installation of the IBM Network Station Manager software on one machine.

In dual-server migration, you need two machines to perform the migration. You must enter a valid migration path during the installation to move preference files from one machine to another. You can leave both servers running so that your clients can continue to run during the migration.

Two factors determine whether you should perform a single-server or dual-server migration. One of these factors is server software. The other is language and locale. "Server software" refers to the operating system that you use on the server, for example, Windows NT 4.0 or WinCenter Pro. "Language and locale" refers to the language version of the IBM Network Station Manager software that you use. Table 15 indicates what type of migration you should perform based on these two factors. Make a note of which type of migration Table 15 indicates that you should perform.

Table 15. Migration Methods According to Server Software and Locale

From	To	Action
Windows NT 4.0 Server	U.S. English Windows NT 4.0 Server	You do not need to obtain another computer to act as a Windows server. However, you may choose to use two servers to perform your migration. If you want to perform a single-machine migration, refer to "The Single-Server Migration Method" on page 67. If you want to use two machines to migrate, go to "The Dual-Server Migration Method" on page 70.
Windows NT 4.0 Server	Non-U.S. English Windows NT 4.0 Server	Obtain an additional machine with the NT 4.0 Server software installed. To prepare your new server, refer to Step 2 on page 29.
WinCenter Pro Server	Windows NT 4.0 Server	Obtain an additional machine with the NT 4.0 Server software installed. To prepare your new server, refer to Step 2 on page 29.
Windows NT 4.0 Server	Windows Terminal Server	Obtain an additional machine with the Windows Terminal Server software installed. To prepare your new server, refer to Step 2 on page 29.
WinCenter Pro Server	Windows Terminal Server	Obtain an additional machine with the Windows Terminal Server software installed. To prepare your new server, refer to Step 2 on page 29.

IBM Network Station Manager supports single and dual server migrations from primary domain controllers (PDC) and backup domain controller (BDC) to stand alone servers (SA), a stand alone server connected to a domain (SAD), PDC or BDC servers. The preferred migration is from a PDC or BDC to a stand alone server (SA) or to a stand alone server connected to a domain (SAD). A migration from a PDC or BDC to a PDC

or BDC requires some manual configuration. Refer to "The Dual-Server Migration Method" on page 70 for detailed manual configuration instructions.

All migrations require that all users are members of the local NSMAdmin or NSMUser groups before migration. To migrate old data, including NSM preferences, from your old server to the new server, you may need to create the local groups, NSMUser and NSMAdmin, manually on the new server. You need to create the local groups, NSMUser group and NSMAdmin, manually if they do not exist on your new PDC.

If you wish to uninstall the current release before installing the new release, you need to use the utility `ntnsmrr2.exe` located in the `x:\ntnsm\en\utility` directory on the CD. This utility preserves the NSMAdmin and NSMUser groups while uninstalling the current release.

The Single-Server Migration Method

When you use the single-server migration method, you install a new copy of the IBM Network Station Manager on a server where it was previously installed. You may or may not have to reinstall the operating system. Of course, reinstalling the operating system is a way of ensuring that you know what components exist on your server.

You might use the single-server method to migrate both to and from a U.S.-English version of IBM Network Station Manager for Windows NT 4.0.

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

- ___ 1. Advise your users to log off the system. The migration process involves at least one server restart, and users will lose their applications if they do not log off.

There are two methods of migrating preference files during a single-server migration. Table 16 explains the two methods and outlines the necessary steps:

Table 16. File Transfer Methods for Single-Server Migration

File Transfer Method	Use in this Situation	Steps
In-place	Simple upgrade of IBM Network Station Manager.	<ol style="list-style-type: none">a. Install the IBM Network Station Manager.b. Enter the path to the configuration files that you wish to migrate as prompted.

Table 16. File Transfer Methods for Single-Server Migration (continued)

File Transfer Method	Use in this Situation	Steps
Media	When reinstalling the operating system.	<ol style="list-style-type: none"> Before you install the IBM Network Station Manager, copy the configuration files onto a diskette. Reinstall the operating system if necessary. Install the IBM Network Station Manager. When Setup asks for a migration path, enter a path to the migration files on the diskette.

- ___ 2. Begin the installation process by following the instructions in Step1 on page 29.
- ___ 3. If you are using the in-place method as described in Table 16 on page 67, go to Step 4. If you are using the media method as described in Table 16 on page 67 , copy the following directories onto diskette:
 - x:\users
 - x:\nstation\userdata
 - x:\nstation\configs
 - x:\nstation\esuite\registry,

where x: is the drive where the IBM Network Station Manager is installed.
- ___ 4. Setup prompts you to enter the proper path to access the preference files. If you are using the media method as described in Table 16 on page 67, point to the disk drive where Setup can access the preference files. If you are using the in-place method as described in Table 16 on page 67, the default location is c:\nstation\. If that location is correct for your server, click **Next**. If not, enter the proper path.
- ___ 5. Once the new software is installed and you have migrated the configuration files, you must migrate each of your existing clients. To do so, carry out the following steps:
 - ___ a. If you are planning on using DHCP in your new environment, you must configure the DHCP server to handle the boot requests of Network Station clients. Refer to "Configuring IBM DHCP on Windows NT" on page 47 or "Configuring Microsoft DHCP on Windows NT" on page 59.
 - ___ b. Choose one Network Station to undergo the migration first. It is helpful if this test client is in close physical proximity to your server.
 - ___ c. If your clients used NVRAM to boot from your old server, go to Step 5.d. If your clients used DHCP to boot from your old server, go to Step 5.l on page 69 .
 - ___ d. Restart the test client. The server will automatically reflash the boot PROM of the Network Station and the client will restart automatically.

- ___ e. If the test client has a token-ring adapter, it will reflash again and restart automatically.
 - ___ f. Now you can continue to use NVRAM to boot the test client from the new server. Repeat the process for all of the clients that you want to migrate.
 - ___ g. Once all of your clients use NVRAM to boot from your upgraded server, you should continue the recommended process of upgrading your clients to use DHCP. To convert your NVRAM environment to a DHCP environment, continue with Step 5.h. If you are sure you want your clients to boot from NVRAM in your new environment, go to Step 5.k.
 - ___ h. If you have not yet done so, install and configure DHCP as instructed in "Configuring DHCP" on page 45.
 - ___ i. Instead of entering DHCP information in every Network Station's NVRAM, you can switch your whole network to DHCP through the IBM Network Station Manager. To do so, carry out the following steps:
 - ___ 1) Open the IBM Network Station Manager.
 - ___ 2) From the main window, select *Setup Tasks*.
 - ___ 3) Choose *Hardware*.
 - ___ 4) Select *Workstations*.
 - ___ 5) Under Boot Parameters, select **Yes** in the field Enable Boot Using BOOTP or DHCP.
 - ___ 6) Save your change and exit the IBM Network Station Manager.
 - ___ j. Your Network Stations are ready to use DHCP. Restart the Network Stations to boot from DHCP. The client migration is complete.
 - ___ k. Once you have migrated all of the clients so that they boot from the new server, test the preference files. If you are sure that you want to use NVRAM to boot your clients, your migration is complete. If you want to use DHCP to boot your clients, continue to Step 5.l.
 - ___ l. 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.
- ___ m. Create a custom DHCP entry for your test client. This means configuring the Network Station as an individual client whose MAC address is known to the server.
 - ___ n. Configure the following option as a global parameter with the following value:
 - Option 211: "tftp"

Note: Make sure to use the quotes when you specify this option. Option 211 does not exist on either the IBM or the Microsoft DHCP

interface. To create a new DHCP option, refer to "Creating DHCP Options on IBM DHCP" on page 58 or "Creating DHCP Options on Microsoft DHCP" on page 61.

- ___ o. Restart the test client. The server will automatically reflash the boot PROM of the Network Station and the client will restart automatically.
- ___ p. If the test client has a token-ring adapter, it will reflash again and restart automatically.
- ___ q. Make sure that your server is the default boot server by carrying out the following steps:
 - ___ 1) In your DHCP configuration utility, make sure that option 66 is configured as the IP address of the server. Do not use the computer name of the server.
 - ___ 2) Remove the fixed IP address of the test client.
- ___ r. Restart the test client to check the DHCP configuration.
- ___ s. Restart all of the remaining clients.
- ___ t.

Important: Do not carry out this step until every client has restarted and updated its boot PROM.

In the DHCP configuration utility, configure the following options with the following values:

- Option 67: /netstation/prodbase/kernel
- Option 211: "nfs"

Note: Make sure to use the quotes when you specify this option.

- ___ u. At this time, you may also want to review the following options to make sure that they are set correctly:
 - Option 6 (Domain Name Server IP address)
 - Option 15 (Domain Name, such as mycompany.com)
- ___ v. To configure more advanced options, read "Taking Advantage of Multiple Server Environments" on page 18.

The Dual-Server Migration Method

When you use the dual-server migration method, you keep your old server running while you move preference files to a different computer containing the new software. The dual-server method allows you to migrate without interrupting service to your Network Stations. Clients can access the preference files on your old server, since you are only copying them onto your new server. You do not delete your old preference files until the whole migration is complete.

The dual-server migration method is designed so that you can move gradually to your new environment. While your old server is still running, you can test booting a single client off your new server.

Figure 15 illustrates the steps that you must take to perform a dual-server migration. More detailed instructions follow.

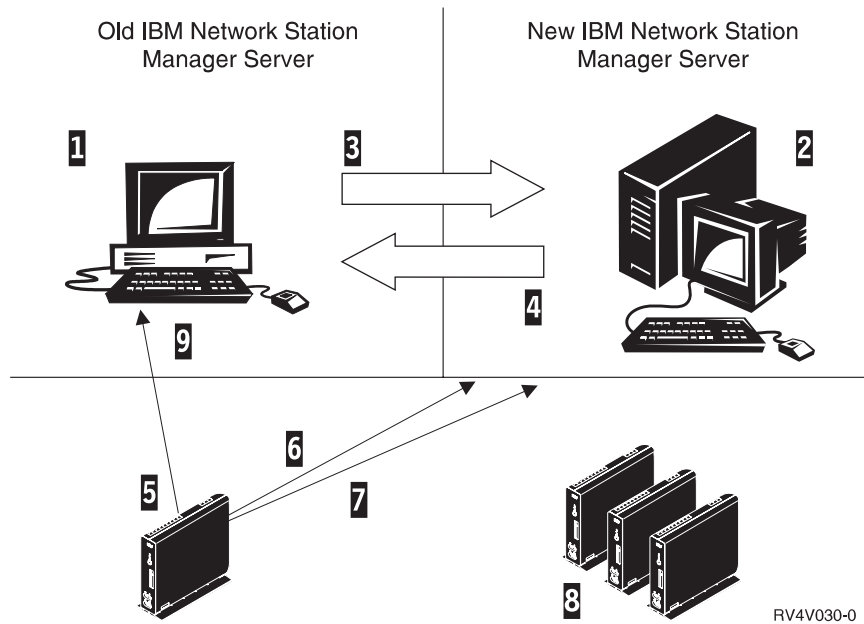


Figure 15. Quick Overview of Dual-Server Migration Process:.

1. Start with old server containing preference files.
2. Prepare new server.
3. Determine dual-server migration configuration.
4. Migrate preference files to new server.
5. Move the file `x:\nstation\configs\defaults.r2` from the new server to the old server.
6. Boot test client from old server using NVRAM.
7. Boot test client from new server using NVRAM.
8. Boot test client from new server using DHCP.
9. Migrate remaining clients.
10. Decommission old server and run clean up utility.

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

- ___ 1. Start with your old server that contains an operating system (Windows NT or WinCenter Pro), the IBM Network Station Manager, and some preference files.
- ___ 2. Install Microsoft Windows NT Server 4.0 on your new server, using the instructions beginning with Step 2 on page 29. Then install the IBM Network Station Manager according to the instructions in "Prerequisites and Installation" on page 28. The installation includes a file called `x:\nstation\configs\defaults.r2` that is used in dual-server NVRAM migration.

- ___ 3. Choose one Network Station to undergo the migration before the others. It is helpful if this Network Station is in close physical proximity to the new server. Leave the other Network Stations to boot from the old server.
- ___ 4. If you are planning to use NVRAM to boot all of the Network Stations in your network, go to Step 8.
- ___ 5. If you are planning to use DHCP and you have not yet configured the DHCP server, do so now, using "Configuring DHCP" on page 45 for guidance.
- ___ 6. For the first Network Station only, make sure that you configure DHCP option 66 as the IP address of the new server. Do not use the computer name of the new server. Configure DHCP option 67 as /nstation/kernel. Do not configure these DHCP options globally. They must apply only to the first client to undergo the migration.
- ___ 7. Configure the following option as a global parameter with the following value:
 - Option 211: "tftp"

Note: Make sure to use the quotes when you specify this option. Option 211 does not exist on either the IBM or the Microsoft DHCP interface. To create a new DHCP option, refer to "Creating DHCP Options on IBM DHCP" on page 58 or "Creating DHCP Options on Microsoft DHCP" on page 61.

- ___ 8.

If you can map a network drive between the old server and the new server go to step "Using a 9 to 25 pin cable through a db25-db25 null modem interposer" on page 377. If you need to manually copy the preference files from the old server to the new server, refer to the following directory list. You need to copy the preference files from the old server to the new server.

 - x:\users\ (if present)
 - x:\nstation\userdata\ **OR** x:\{float}\nstation\userbase\
 - x:\nstation\configs\ **OR** x:\{float}\nstation\prodbase\configs\
 - x:\nstation\esuite\registry\ **OR** x:\{float}\nstation\prodbase\esuite\registry\

The letter x is the drive where the IBM Network Station Manager is installed on the old server. The word {float} is the subdirectory you installed the old Network Station Manager files. The files \nstation\configs and \nstation\userdata must be placed under the same directory.

Note: You can repeat the migration process as many times as is necessary. Repeating the process will not affect the old server in any way. However, each time you move preference files onto the new server, its preference files will be overwritten.

- ___ 9. Determine your server migration path in the list below and go to the corresponding step:
 - From a primary domain controller (PDC) to a backup domain controller (BDC), go to step 12 on page 73.

- From a PDC to a stand alone server connected to a domain (SAD), go to step 11.
- From all other Windows NT server configurations (for example, a PDC to a PDC, or a PDC to a stand alone (SA) server not attached to a domain), go to step 10.

Note: Do not erase any old Network Station Manager values. Following the migration, you will run a clean up utility (nsnsmrr2.exe) that erases all of the old values. The migration program relies on the old values until migration is complete.

- ___ 10. Create user accounts and global groups (if desired) that you wish to migrate from the old server to your new server.
 - Open **Start -> Programs -> Administrative Tools (Common) -> User Manager for Domains**
- ___ 11. Add the user accounts and global groups (if desired) from your old server to the local NSMUser and NSMAdmin or NSMUser groups on your new server. Previous Network Station Manager releases did not require all user accounts to be in the NSMUser group.
 - Open **Start -> Programs -> Administrative Tools (Common) -> User Manager for Domains**
- ___ 12. Run the following migration utility:
 - x:\nstation\servbase\bin\nsmmigr.exe <migration path>

The letter x is the installation drive and <migration path> is the location of your old preference files. The old preference files may be on a your local hard drive, a mapped network drive, or hard media (diskette, zip disk, or CD).
- ___ 13. Copy the file x:\nstation\configs\defaults.r2 from the new server to the old server. Copy the file to x:\nstation\configs\defaults.r2 on the old server. This file will direct clients to boot from the new server.
- ___ 14. If in your old environment, clients boot using NVRAM, go to Step 15. If in your old environment, clients boot using DHCP, go to Step 26 on page 74.
- ___ 15. To boot a single test client from the new server, carry out the following steps:
 - ___ a. Enter the Network Station Setup Utility by powering on the Network Station and pressing the Escape key after the NS0500 *Search for Host System* message displays.
 - ___ b. Press F6, *Set Configuration Parameters*.
 - ___ c. On the line, *Configuration file*, type defaults.r2.
 - ___ d. Press Enter to save the change.
 - ___ e. Press Enter to restart the test client. When the client accesses the old server using NVRAM, it automatically loads the boot settings for the new server.
 - ___ f. Restart the client once more.
- ___ 16. The test client performs an NVRAM boot from the new server for the first time. The new server forces the client to update its boot PROM.

- ___ 17. If the test client has a token-ring adapter, it will reflash again and restart automatically.
- ___ 18. The test client is now able to use NVRAM to boot from the new server.
- ___ 19. Now you must migrate your remaining clients: On the old server, rename the file `x:\nstation\configs\defaults.r2` to `x:\nstation\configs\defaults.dft`. As you boot the remaining clients from the old server, they will be automatically redirected to the new server.
- ___ 20. Restart each of the remaining clients. Once all of the clients have been restarted, they will continue to access files from the new server.
- ___ 21. Once all of the clients use NVRAM to boot from the new server, you should continue the suggested process by moving to a DHCP environment. To do so, continue with Step 22. If you are sure that you want to use NVRAM, you may stop here.
- ___ 22. If you have not yet done so, install and configure DHCP as instructed in "Configuring DHCP" on page 45.
- ___ 23. Instead of entering DHCP information in every Network Station's NVRAM, you can switch your whole network to DHCP through the IBM Network Station Manager. To do so, carry out the following steps:
 - ___ a. Open the IBM Network Station Manager.
 - ___ b. From the main window, select **Setup Tasks**.
 - ___ c. Choose **Hardware**.
 - ___ d. Select **Workstations**.
 - ___ e. Under Boot Parameters, select **Yes** in the field *Enable Boot Using BOOTP or DHCP*.
 - ___ f. Save your change and exit the IBM Network Station Manager.
- ___ 24. Once you have migrated all of the clients so that they boot from DHCP on the new server, test the preference files and decommission the old server.

After you completely migrate from the old server to the new server and the new server operates properly, you may wish to clean up your old server. If you wish to clean up your old server, 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.

Enter `ntnsmrr2.exe` on a command prompt on your old server to run the clean up utility.
- ___ 25. This concludes the procedure for migrating from an NVRAM environment.
- ___ 26. Migrating from a DHCP environment:

In your current DHCP configuration, you should have already set the following DHCP options with the following values applying to all of your Network Stations:

 - Option 66: The IP address of the boot server. Do not use the computer name of the server.
 - Option 67: `/netstation/prodbase/kernel`

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

- ___ 27. Create a custom DHCP entry for your test client. This means configuring the Network Station as an individual client whose MAC address is known to the server.
- ___ 28. Configure the following option as a global parameter with the following value:
 - Option 211: "tftp"
- Note:** Make sure to use the quotes when you specify this option. Option 211 does not exist on either the IBM or the Microsoft DHCP interface. You must therefore create the option. For information about how to create DHCP options, refer to "Creating DHCP Options on IBM DHCP" on page 58 or "Creating DHCP Options on Microsoft DHCP" on page 61.
- ___ 29. Restart the test client. The server automatically reflashes the boot PROM of the Network Station and the client restarts automatically.
- ___ 30. If the test client has a token-ring adapter, it will reflash again and restart automatically.
- ___ 31. Instead of moving your remaining clients into the new DHCP environment one at a time, make the new server the default boot server by carrying out the following steps:
 - ___ a. In your DHCP configuration utility, make sure that option 66 is configured as the IP address of the new server. Do not use the computer name of the server.
 - ___ b. Remove the fixed IP address of the test client.
- ___ 32. Restart the test client to check the DHCP configuration.
- ___ 33. Restart all of the remaining clients.
- ___ 34.

Important: Do not carry out this step until you have restarted all of your clients and their boot PROMs have reflashed.

In the DHCP configuration utility, configure the following options with the following values:

- Option 67: /netstation/prodbase/kernel
- Option 211: "nfs"

Note: Make sure to use the quotes when you specify this option.

- ___ 35. At this time, you may also want to review the following options to make sure that they are set correctly:
 - Option 6 (Domain Name Server IP address)
 - Option 15 (Domain Name, such as mycompany.com)
- ___ 36. To configure more advanced options, read "Taking Advantage of Multiple Server Environments" on page 18.
- ___ 37. Once you have migrated all of the clients so that they boot from DHCP on the new server, test the preference files and decommission the old server.

After you completely migrate from the old server to the new server and the new server operates properly, you may wish to clean up your old server. If you wish to clean up your old server, 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.

Enter `ntnsmrr2.exe` on a command prompt on your old server to run the clean up utility.

- ___ 38. This concludes the procedure for migrating from a DHCP environment.

Adding IBM Network Stations to Your Windows NT Environment

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

- Add a user account for the user of the Network Station. See "Adding User and Group Accounts".
- Make the necessary DHCP configuration changes. See "Making Configuration Changes to DHCP" on page 77.

Adding User and Group Accounts

You can either add a user account or create a group and add users to it. The following restrictions apply to both user and group names and passwords:

- User and group names must not be identical to Windows NT domain 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 127 and below ASCII 33
 - 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" (+)

Before you create a user, you must 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 connected to a domain, the IBM Network Station login service searches for the user name on the local machine first. If the user name is found, the login service attempts to log the user in and stops searching for the user even if the login attempt is unsuccessful. If the login service does not find the user on the local machine, it searches on the Primary Domain Controller.

Note: Primary Domain Controllers replicate their user information to Backup Domain Controllers at regular intervals. Therefore, the user information on the Backup Domain Controller may not always be as recent as the information on the Primary Domain Controller.

To add a user account for an IBM Network Station user, carry out the following steps:

- ___ 1. From the Windows NT desktop, select **Start->Programs->Administrative Tools->Administrative Wizards->Add User Accounts**.
- ___ 2. Follow the prompts and instructions in the wizard.

To create a group and add users to it, carry out the following steps:

- ___ 1. From the Windows NT desktop, select **Start->Programs->Administrative Tools->Administrative Wizards->Group Management**.
- ___ 2. Follow the prompts and instructions in the wizard.

Note: When prompted for password input, you must select **Password Never Expires** because the users cannot change their Windows NT password from the Network Station.

To make changes to an existing user account, carry out the following steps:

- ___ 1. Select **Start->Programs->Administrative Tools->User Manager for Domains**.
- ___ 2. Follow the on-screen instructions.

Making Configuration Changes to DHCP

Whenever you make changes to your network's configuration, you must ensure that the DHCP configuration reflects those changes. When you add an IBM Network Station to your network, you must ask yourself the following questions:

- Does the addition of this Network Station cause a shortage of available IP addresses?
- Will this Network Station belong to a particular subnet?
- Will this Network Station receive its address dynamically, or will it have a permanently assigned address?
- Is there any configuration information which is unique to this particular Network Station?

If you decide that you must make any changes to the DHCP configuration, refer to “Configuring IBM DHCP on Windows NT” on page 47 and “Configuring Microsoft DHCP on Windows NT” on page 59.

Starting and Stopping Servers and Services on Windows NT

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

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

To start the Lotus Domino Go Webserver, Microsoft Internet Information Service, 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 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

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 69 on page 253 describes which datastreams the common Network Station applications produce.

Configuring Basic Printer Scenarios

Using Figure 16 on page 79 as an example, Table 17 on page 79 explains the basic steps to configure printers for your Network Stations.

Note: You should review the help 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.

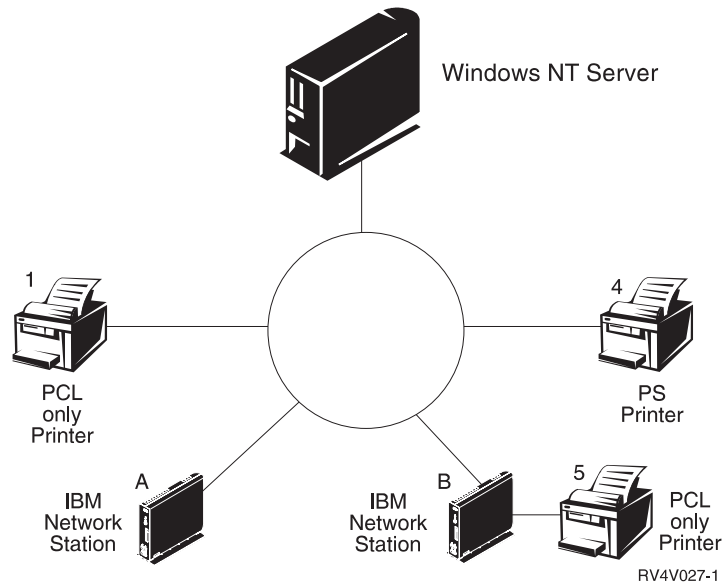


Figure 16. Possible Network Station Printing Scenarios

Table 17. 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 Network Station Manager program, configure an entry in the <i>Remote Printer Server</i> field for the LAN printer.
Network Station to a locally attached printer	Network Station B to Printer 5	1. In the Network Station Manager program, configure an entry in the <i>Local Parallel Printer</i> or the <i>Local Serial Printer</i> 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 Network Station Manager program, configure an entry in the <i>Remote Printer Server</i> field with the IP address of the Network Station to which the printer is attached. In the <i>Queue name</i> field, type PARALLEL1 or SERIAL1, depending on how the printer connects to the Network Station.

Table 17. Configuration Descriptions for Basic Printer Scenarios (continued)

Desired Print Scenario	Print Job Flow in Figure 16 on page 79	Configuration Instructions
Windows NT server to a Network Station with an attached printer	Windows NT server to Network Station B to printer 5	<p>You must use the Windows NT 4.0 CD to install LPD/LPR on the Windows NT machine. Carry out the following steps:</p> <ol style="list-style-type: none"> 1. Insert the CD. 2. Select Control Panel->Network->Services. 3. Click Add. 4. Highlight <i>Microsoft TCP/IP Printing</i> and press Enter twice. 5. Restart the Windows NT server. Note: You may need to reinstall Service Pack 3. Refer to 56 on page 36. 6. Boot the Network Station from the Windows NT server. 7. On the Windows NT desktop, select My Computer->Printers->Add Printer. 8. Select <i>My Computer</i> and click Next. 9. Select Add Port. 10. Highlight <i>LPR Port</i> and click on New Port. 11. In the <i>Add LPR Compatible Printer</i> 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

Administering 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 16 on page 79, the Windows NT 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 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 Windows NT server would negotiate print jobs with the printer. However, handling these print jobs would likely draw on the 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 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 or not. 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.

Updating Your IBM Network Station Manager Software

When you install your IBM Network Station Manager software, a dialog box may prompt you to install a service pack update. You may download the latest IBM Network Station Manager software update from the web at any time or you may order the update on CD. These updates are only for IBM Network Station Manager software and eNetwork On-Demand software.

If you order an update on hard media, look on the face of your CD to determine which service update you acquired. Use the installation instructions found in "Migrating Files from an Existing Windows NT Server Environment" on page 65 for a Release 3 to Release 3 software migration. This migration preserves the configuration files from your previous release of the IBM Network Station Manager software.

Every service update is cumulative. The service update is not a patch or a fix, it is a complete standalone software product that includes the latest enhancements to the IBM Network Station software.

Before You Continue . . .

- Verify that the Network Parameters that are configured in the Setup Utility of each Network Station agree with your boot method. For example, for 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 309 for more information.
- Verify that your DHCP server, NFS or TFTP server, and HTTP server are started. See "Starting and Stopping Servers and Services on Windows NT" on page 78.
- Verify that you excluded any statically addressed devices in your DHCP addressing range.
- 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.
- For more information about using the IBM Network Station Manager program, refer to "Chapter 8. Using the IBM Network Station Manager Program" on page 255.

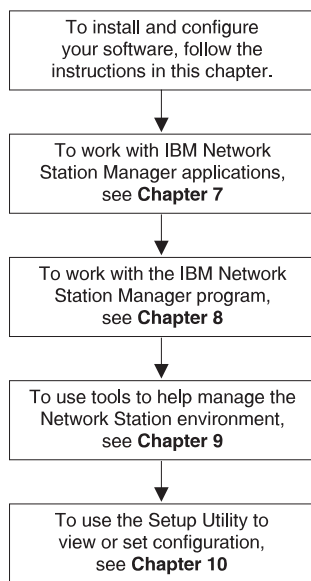
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About this Chapter

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.



RV4V047-1

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 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 18 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 label *AS/400 Network Station PTFs*. Do not apply the PTFs until later in this procedure.

Table 18. Informational APARs and PTFs for 5648-C05

Informational APAR for 5648-C05	Latest Group PTF package for 5648-C05
II11118	SF99082 ¹

- ___ 2. Verify prerequisite OS/400 software.

1. The group PTF package SF99082 is included 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, or Version 4 Release 2. If your OS/400 software is later than Version 4 Release 2, go to <http://www.ibm.com/nc/pubs>. If there is an update to this publication, use the install procedure in the new publication to install your software.
- OS/400 TCP/IP Connectivity Utilities (5769-TC1)

___ 3. Verify Network Station Memory Requirements.

Verify that your Network Stations have the amount of memory they will need to run the applications your users expect.

Each of the applications that are downloaded to the Network Station requires memory. Use Table 6 on page 17 as a guide to determine how much memory each Network Station should have. Each Network Station must download the Base System.

___ 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, 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 labeled *AS/400 Network Station PTFs* into your AS/400 CD drive (for example OPT01).
- ___ b. At an AS/400 command line, type G0 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 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. You must complete 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:

PWRDWSYS *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 19. 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 19) 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. 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.

- ___ 12. 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 78 on page 342 for information about specific migration errors. Issue the command CALL PGM(QYTC/QYTCMIMP).

___ 13. 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 G0 PTF.
- ___ c. Select option 8, and the Install Options for Program Temporary Fixes display appears.

System: AS400TEST

Install Options for Program Temporary Fixes

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).
- ___ e. In the *Other options* field, select YES. The *Other Install Options* display appears.

Other Install Options System: AS400TEST

Type choices, press Enter.

Omit PTFs . . . N	Y=Yes, N=No
Apply Type . . . 3	1=Set all PTFs delayed 2=Apply immediate, set delayed PTFs 3=Apply only immediate PTFs

F3=Exit F12=Cancel

___ f. Enter option 3 for the *Apply Type* field, and Press the Enter key.

___ 14. 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 README on the CD of 5648-C20 or the product literature.

___ 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.

___ 15. 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 355.

- Otherwise, continue to step 2.
- ___ 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 14 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 20 to determine which boot method fits your needs and operating system.

Table 20. 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 ²
DHCP	Not available	Operations Navigator ²
NVRAM	Perform configuration on each client.	Perform configuration on each client.

Table 21. Boot Method


Field	Description	Write Value Here
Boot Method	The method by which the Network Station will obtain its IP address and boot files.	

- ___ 3. Gather host information with Table 22.

Stop: If you already have TCP/IP installed and configured, please skip to step 4 on page 91. Otherwise, complete the following table.

The Setup Assistant, a green screen wizard, prompts you for this information later.

Table 22. AS/400 Host Information

Field	Description	Write Value Here
 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.	

2. 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 SC41-3512, *Client Access for Windows 95/NT - Setup*.

Table 22. 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 of 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 23 on page 92.

Stop: If you have configured the LAN that will serve the Network Stations, skip to step 5 on page 92. 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 23 on page 92. The Setup Assistant prompts you for this information later.

Table 23. AS/400 LAN Information Chart

Field	Description	Write Value Here
1 Line Description	<p>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:</p> <pre>WRKHDWRSC *CMN</pre> <p>After you have selected a resource from this list, you must create the line description by using one of the following commands:</p> <pre>CRTLINTRN LIND(TRNLINE) RSRNAME(CMN03) ADPTADR(*ADPT) SSAP(*SYSGEN) TEXT('Token-Ring Line') AUTOCRTCTL(*YES) CRTLINETH LIND(ETHLINE) RSRNAME(CMN03) ADPTADR(*ADPT) SSAP(*SYSGEN) TEXT('Ethernet Line') AUTOCRTCTL(*YES)</pre> <p>where:</p> <ul style="list-style-type: none"> • CMN03 is the resource name. • TRNLINE or ETHLINE is the line description's name. <p>Record the name of the line description you just created.</p>	
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 2 on page 90. Otherwise, complete the following table.

For each router that is attached to your AS/400, duplicate and complete a copy of Table 24 on page 93. The Setup Assistant prompts you for this information later.

Table 24. 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 21 on page 90, 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 95.
 - If you choose to use the NVRAM boot method, go to step 9 on page 99.

- ___ 7. Gather information for a new BOOTP environment.

Use this section to gather information to configure a new BOOTP environment. Use Table 25 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 99.

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 25 for each LAN adapter with attached Network Stations.





Table 25. 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.	

Table 25. BOOTP Network Station Information (continued)





Field	Description	Write Value Here
2 MAC Address	<p>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:</p> <ol style="list-style-type: none"> Power on the Network Station. After the keyboard controller test, press Escape. In the Setup Utility, press F4. Record the MAC address. 	
3 IP Address	<p>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.</p>	
4 Hardware Type	<p>Your Network Stations can attach to either a token-ring or Ethernet LAN.</p> <ul style="list-style-type: none"> 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	<p>If you do not use a gateway IP address for remote LANs, disregard this field and leave it blank in the Setup Assistant.</p> <p>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.</p> <p>In Figure 5 on page 7, the gateway IP address for Network Station ns3.mycompany.com is 10.1.1.1.</p>	

Table 25. BOOTP Network Station Information (continued)

Field	Description	Write Value Here
 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.	
 Boot Type	The boot type is a constant. <i>IBMNSM</i> identifies this network device as a Network Station.	<i>IBMNSM</i>
 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, <i>kernel</i> , is a constant.	<i>kernel</i> The Boot File Name is case sensitive.
 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.	<i>/QIBM/ProdData/NetworkStation/</i> The Boot File Path is case sensitive.

Use Table 26 to define any additional Network Stations for the BOOTP table.

Table 26. Additional BOOTP Network Stations

 Host Name	 MAC Address	 IP Address	 Printer Type

You have completed gathering information for a BOOTP environment. Go to step 9 on page 99.

___ 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 27 collects the necessary data for the DHCP global information.

Table 27. DHCP Global Information


Field	Description	Write Value Here
 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

Table 27. DHCP Global Information (continued)

Field	Description	Write Value Here
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.	
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 23 . Record the class names here.	

Table 28 helps you collect the values to define a subnet in your DHCP environment. For each subnet you wish to define, copy and complete Table 28.

Table 28. 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 355 for twinaxial considerations and "Subnets and Subnet Masks" on page 9. Then complete "Configuring Twinaxial Network Stations Checklist" on page 362.	Yes or No

Table 28. DHCP Subnet Information (continued)

Field	Description	Write Value Here
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.	
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 87 on page 364.	
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.	

Table 28. DHCP Subnet Information (continued)

Field	Description	Write Value Here
8 Subnet Mask	<p>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.</p> <p>If you are creating a twinaxial subnet, copy the value from line 8 in Table 87 on page 364.</p>	
9 Excluded IP Address Note: This field is not applicable to twinaxial subnets.	<p>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.</p>	
The following values are delivered to the Network Stations.		
10 Deliver gateway IP addresses	<p>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.</p> <p>If yes, enter the gateway IP address or addresses.</p>	Yes or No
11 Deliver Domain Name Server (DNS) address to clients in their subnet	<p>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.</p> <p>If yes, enter the DNS IP address or addresses.</p>	Yes or No
12 Deliver domain name to client	<p>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.</p> <p>If Yes, enter domain name.</p>	Yes or No

Table 28. DHCP Subnet Information (continued)

Field	Description	Write Value Here
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 28 on page 96 . 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. It is for first-time configuration of the AS/400 for Network Stations only. If you choose not to use the Setup Assistant or want more information about its function, see "What the Setup Assistant Does" on page 138.

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
referred 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

Opt   Task
      ID      Description
      2000    Install Required Software
      3000    Configure TCP/IP for IBM Network Stations
      4000    Select Boot Protocol
      5000    Start and Verify Required Servers
                                Completed
                                YES
                                NO
                                NO
                                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 do not apply to your network.
- 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 102. 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

Opt	Task 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.

System: AS400TEST

Configure TCP/IP for IBM Network Stations

Type option, press Enter.
1=Select

Opt	Task 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

Opt	Task 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.

Set Host Specific Internet Information

System:

Type choices, press Enter.

Internet Addresses:

<input type="checkbox"/> AS/400	192.168.1.4
<input checked="" type="checkbox"/> Default Route	192.168.1.1
<input checked="" type="checkbox"/> Remote Name Server	192.168.1.5

Names:

<input checked="" type="checkbox"/> Local Host Name	SERVER
<input checked="" type="checkbox"/> Local Domain Name	MYCOMPANY.COM

Bottom

F3=Exit F12=Cancel

___ 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 on page 104.
- Otherwise, fill in the data on this display from Table 22 on page 90, where:
 - ☒ 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 on page 105 .
- Otherwise, use the information in Table 23 on page 92 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:

☒ Internet Address10.1.1.1

☒ Subnet Mask255.255.255.0

☒ Next Hop Address192.168.1.1

Route 2:

Internet Address

Subnet Mask

Next Hop Address

Route 3:

Internet Address

Subnet Mask

Next Hop Address

F12=Cancel
Bottom

- ___ 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 24 on page 93 to create new routes, where:
 - ☒ is the Internet Address.
 - ☒ is the Subnet Mask.
 - ☒ 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 *Set TCP/IP Servers to Autostart* display appears.
Verify that each of the following lines appear:
- ```
CHGTFTP AUTOSTART(*YES)
CHGHTTP 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.

- On the *Configure TCP/IP for IBM Network Stations* display, type 1 next to task 3400 and press Enter. The *Add HTTP Server Directives* display appears. Press Enter and if the task ran successfully, Task 3400 has a completion status of YES.

- Type 1 next to task 4000 on the *Network Station Setup Task List* display and press Enter. The *Select Boot Protocol* display appears.

Based on your decision in Table 21 on page 90, select your boot protocol and press the Enter key.

- \_\_\_ 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

| OPT | CLIENT<br>HOST<br>NAME | MAC<br>ADDRESS | IP<br>ADDRESS |
|-----|------------------------|----------------|---------------|
| -   |                        |                |               |

F3=EXIT F5=REFRESH F6=PRINT LIST F11=SET BOOTP TABLE DEFAULTS  
F12=CANCEL F17=TOP F18=BOTTOM

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 25 on page 93 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 107 through step 31 for each Network Station listed on Table 26 on page 95 .

\_\_\_ 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.

F3=Exit F12=Cancel

Bottom

- \_\_\_ 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 QYTCUSVR 'STRTCPSVR' at an AS/400 command line.

  - 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 122. Go to “Before You Continue” on page 121.
  - 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 309 and then return to “Before You Continue” on page 121.
- \_\_\_ 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 17 to locate the DHCP server.

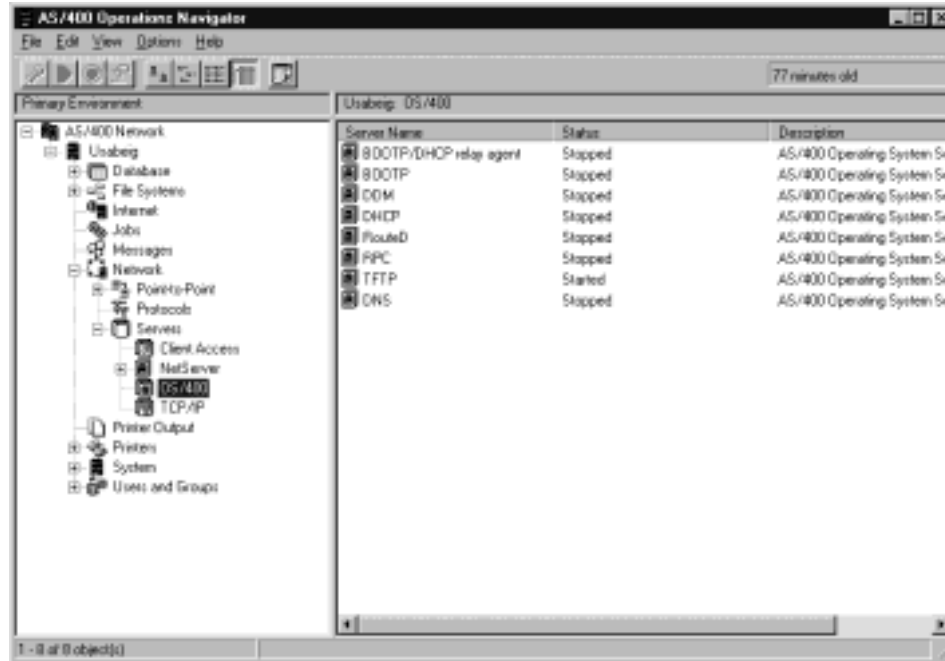


Figure 17. Directory Path to the DHCP Server.

- \_\_\_ 40. 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 111.
  - If your screen title is *Disable BOOTP server*, go to step 43 on page 111.
  - 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 126 ).

- \_\_\_ b. Enter the Bootstrap server's IP address from line 2 of Table 27 on page 95 . The Bootstrap server address you enter is defined on the global level.

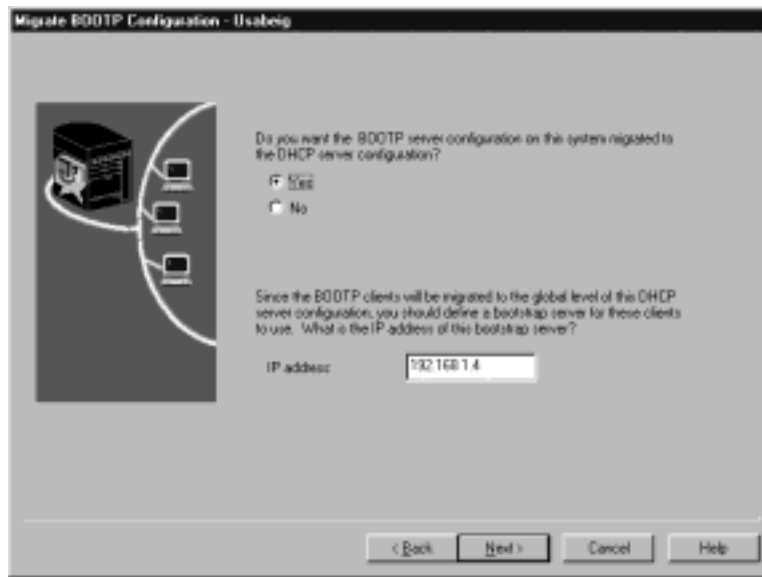


Figure 18. Migrate BOOTP Configuration. In Figure 5 on page 7, the Bootstrap server is 192.168.1.4

- \_\_\_ 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 27 on page 95. 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 87 on page 364.
- b. Go to step 49.

\_\_\_ 48. Address Range or Subnet

Use the value from line 2 of Table 28 on page 96 to make a decision.

- If you choose to define a subnet that is based on an address range, go to step 50 on page 113.
- Otherwise, continue to step 49.

\_\_\_ 49. Define Subnet Based on Entire Physical Subnet

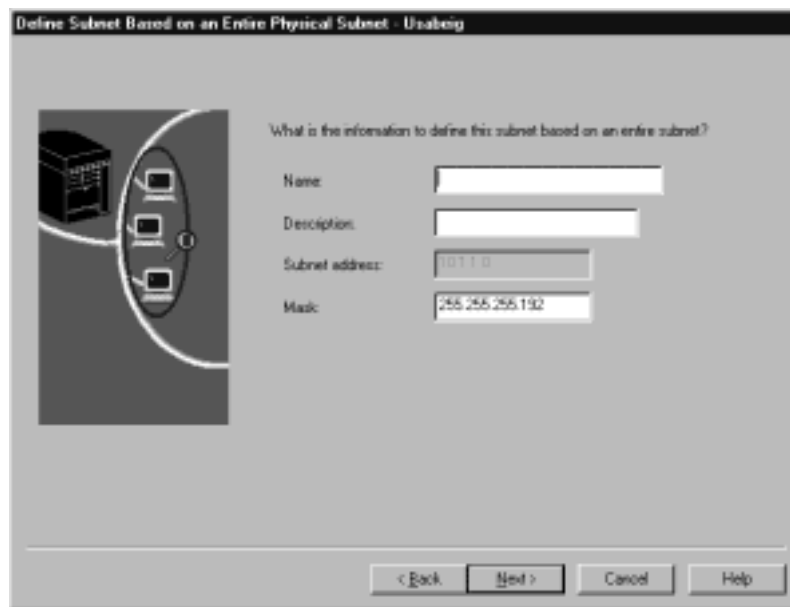


Figure 19. Defining an Entire Subnet. Sample configuration for Figure 5 on page 7 if NS3 and NS4 are twinaxial Network Stations.

- a. Enter the values on lines 3, 4, and 5 from Table 28 on page 96 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 114.
- Otherwise, go to step 51.

\_\_\_ 50. Define Subnet Based on an Address Range.

Use lines **3**, **4**, **6**, **7**, and **8** from Table 28 on page 96 to define a new subnet.

Define Subnet Based on an Address Range - Unisys

What is the information to define this subnet based on an address range within a subnet?

Name: TS21801.0

Description: S3M Network Station-LSM

Start address: TS21801.1

End address: TS21801.100

Mask: 255.255.255.0

< Back Next > Cancel Help

Figure 20. 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 28 on page 96.



Figure 21. 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 111. You can change default lease times later..
- \_\_\_ 53. Subnet Gateways  
Use the value from line **10** in Table 28 on page 96.
- \_\_\_ 54. Subnet Domain Name Server  
Use the **Add** button to enter any values from line **11** in Table 28 on page 96.





Figure 22. 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 28 on page 96 .

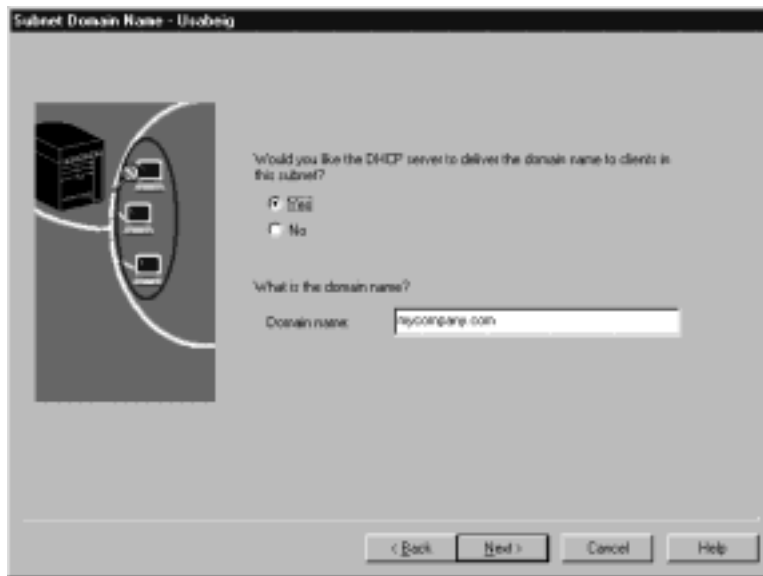


Figure 23. Subnet's Domain Name.

- \_\_\_ 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 28 on page 96.

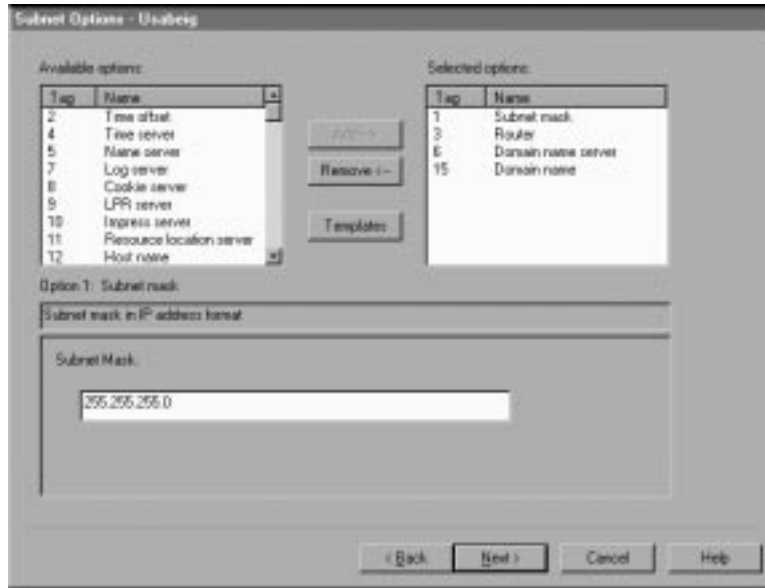


Figure 24. Additional Subnet Options

#### 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 25 on page 118), make the following decisions:

- \_\_\_ a. Append Domain to Host Name—Use the value from line **14** of Table 28 on page 96 .
- \_\_\_ b. Bootstrap server—Use the inherited value.

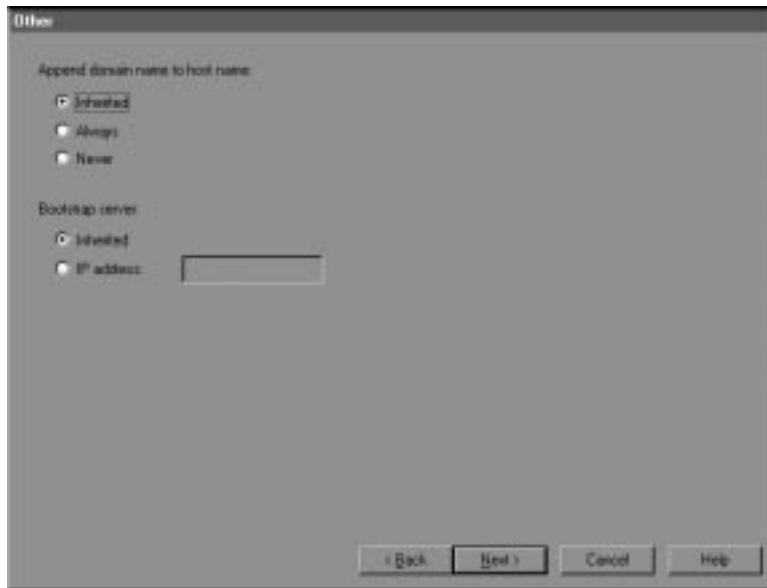


Figure 25. More Subnet Options

\_\_\_ 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 123 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 27 on page 95 .

**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 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 24 of Table 27 on page 95 in the **Name** field. Figure 26 is an example class description for an Ethernet, Series 1000 Network Station.

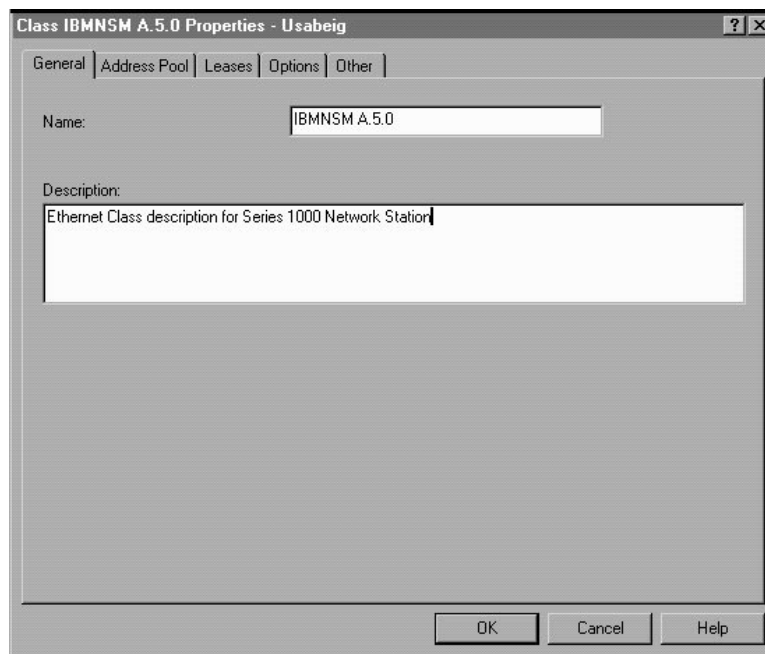


Figure 26. Class description for Series 1000 Ethernet Network Station.

- \_\_\_ 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 27 on page 95.
  - \_\_\_ i. Click the **OK** button.
  - \_\_\_ j. From the File menu, choose **Update Server**.
  - \_\_\_ k. Repeat step 63.a on page 119 through 63.j for each Network Station class that you defined in line 4 of Table 27 on page 95.
- \_\_\_ 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 357), 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 87 on page 364.
    - \_\_\_ 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 123.
  - 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” on page 121.

---

## 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 274.
- 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 ')`.
- 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 276 .
- 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 309 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 237
  - “Chapter 8. Using the IBM Network Station Manager Program” on page 255
  - “Chapter 10. Working With the IBM Network Station Setup Utility” on page 309

---

## 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 25 on page 93 .
- \_\_\_ 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 25 on page 93.

**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 25 on page 93 .
- \_\_\_ 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 25 on page 93.
  - MAC address is line **2** of Table 25 on page 93.
  - IP address is line **3** of Table 25 on page 93.
  - Hardware type is line **4** of Table 25 on page 93.
- \_\_\_ 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 25 on page 93.



- \_\_\_ 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 25 on page 93 .
- \_\_\_ 8. Verify that the following default values are correct:
  - Type is IBM Network Station Manager.
  - Filename and directory are /QIBM/ProdData/NetworkStation/kernel.

ns1.mycompany.com - Rchasp04

Network device

Host name: ns1.mycompany.com

MAC address: 00.00.00.00.00.00

IP address: 192.168.1.2

Hardware type: Token ring

Network routing

Gateway IP address:

Subnet mask: 255.255.255.0

Boot information

Type: IBM Network Station Manager

File name and directory: /QIBM/ProdData/NetworkStation

OK Cancel Help

Figure 27. 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 122 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 29 on page 124 to gather the necessary values to define a client.

Table 29. Information to Define DHCP Clients

| Field               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Write Value Here                                                                                                                 |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1 Client Name       | Record a name for your client.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                  |
| 2 Unique Identifier | <p>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:</p> <ol style="list-style-type: none"> <li>___ 1. Power on the Network Station.</li> <li>___ 2. After the keyboard controller test, press the Escape key.</li> <li>___ 3. In the Setup Utility, press the F2 key.</li> <li>___ 4. Record the MAC address.</li> </ol> |                                                                                                                                  |
| 3 Hardware Type     | Identify the Network Station's hardware type to the server.                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>The possibilities are:</p> <ul style="list-style-type: none"> <li>• Ethernet (100 MB)</li> <li>• IEEE 802 Networks</li> </ul> |
| 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        | <p>This refers to the amount of time a server lets clients keep an IP address. The lease time has three options:</p> <ul style="list-style-type: none"> <li>• Inherit means that the client uses the value of the global lease time.</li> <li>• User-defined value.</li> <li>• Never expire.</li> </ul>                                                                                                                                                                              | Inherit, user-defined, or never expire                                                                                           |
| 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                                                                                                                                                                 |                                                                                                                                  |

Table 29. Information to Define DHCP Clients (continued)

| Field                             | Description                                                                                                                                                                                                                                                                  | Write Value Here     |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 3 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 29 on page 124 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 29 on page 124 .
- \_\_\_ 7. Click the **Leases** tab.
- \_\_\_ 8. Enter the value from line 6 of Table 29 on page 124.
- \_\_\_ 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 29 on page 124.
- \_\_\_ 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 29 on page 124 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 29 on page 124 .

- \_\_\_ 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 109 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 69 on page 253 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 28 on page 127 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 28 on page 127, 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 130.

## Configuring Basic Printer Scenarios

Using Figure 28 as an example, Table 30 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

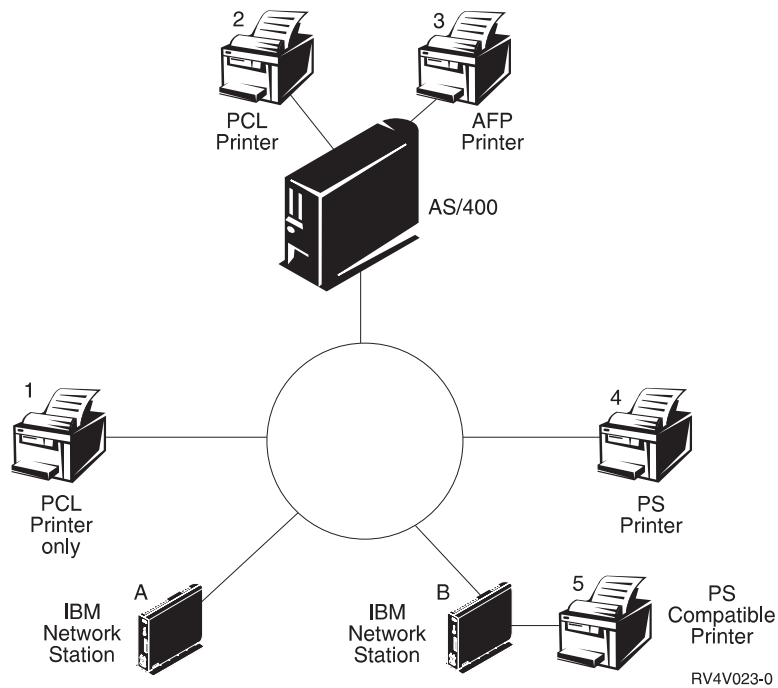


Figure 28. Possible Network Station Printing Scenarios

printers.

Table 30. Configuration Descriptions for Basic Printer Scenarios

| Desired Print Scenario           | Print Job Flow in Figure 28    | Configuration Instructions                                                                                                   |
|----------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Network Station to a LAN printer | Network Station A to Printer 1 | 1. In the Network Station Manager program, configure an entry in the <i>Remote Printer Server</i> field for the LAN printer. |

Table 30. Configuration Descriptions for Basic Printer Scenarios (continued)

| Desired Print Scenario                                                                         | Print Job Flow in Figure 28 on page 127                              | Configuration Instructions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Network Station to a LAN printer with a different datastream                                   | Network Station A to AS/400 server to Printer 1                      | <ol style="list-style-type: none"> <li>1. On the server that will transform the print job, create a printer device description and queue.<br/>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 130.</li> <li>2. In the Network Station Manager program, configure an entry in the <i>Remote Printer Server</i> field with the IP address or host name of the transform server and its queue name.</li> </ol>                                      |
| Network Station to a locally attached printer                                                  | Network Station B to Printer 5                                       | <ol style="list-style-type: none"> <li>1. In the Network Station Manager program, configure an entry in the <i>Local Parallel Printer</i> or the <i>Local Serial Printer</i> field, depending on how the printer connects to the Network Station.</li> </ol>                                                                                                                                                                                                                                                                                                                                       |
| Network Station to a locally attached printer with different datastream                        | Network Station B to AS/400 Server to Printer 5                      | <ol style="list-style-type: none"> <li>1. On the server that will transform the print job, create a printer device description and queue.<br/>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 130.</li> <li>2. In the Network Station Manager program, configure an entry in the <i>Remote Printer Server</i> field with the IP address or host name of the transform server and its queue name.</li> </ol> |
| Network Station to another Network Station with an attached printer                            | Network Station A to Network Station B to Printer 5                  | <ol style="list-style-type: none"> <li>1. In the Network Station Manager program, configure an entry in the <i>Remote Printer Server</i> field with the IP address of the Network Station to which the printer is attached. In the <i>Queue name</i> field, type PARALLEL1 or SERIAL1, depending on how the printer connects to the Network Station.</li> </ol>                                                                                                                                                                                                                                    |
| 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 | <ol style="list-style-type: none"> <li>1. On the server that will transform the print job, create a printer device description and queue.<br/>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 130.</li> <li>2. In the Network Station Manager program, configure an entry in the <i>Remote Printer Server</i> field with the IP address or host name of the transform server and its queue name.</li> </ol> |

Table 30. Configuration Descriptions for Basic Printer Scenarios (continued)

| Desired Print Scenario                         | Print Job Flow in Figure 28 on page 127              | Configuration Instructions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Network Station to a server controlled printer | Network Station A to AS/400 server to Printer 2 or 3 | <ol style="list-style-type: none"> <li>1. In the Network Station Manager program, configure an entry in the <i>Remote Printer Server</i> field with the host name or IP address of the server that controls the printer. In the <i>Queue name</i> field, enter the name of the queue that controls the printer.<br/><br/>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 130), the server will automatically transform the job if necessary.</li> </ol> |

## Printer Administration Techniques

Administering 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 28 on page 127, 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 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 31 on page 131.
  - 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 PJP-compatible printers attached directly to the TCP/IP network
- \_\_\_ 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)

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.



Table 31. 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 |

Table 31. 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                            | *IMGA01 |
| 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 |

Table 31. Common Printers and Their Image Configuration Values (continued). For more values, see the publication *Printer Device Programming*, SC41-5713.

| Image Configuration Value            | Printer |
|--------------------------------------|---------|
| QMS 2025, 3225                       | *IMGB12 |
| 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.

In Version 4 Release 2, the STRTCPSVR SERVER (\*NSMI) command starts the inventory server, and the ENDTCPSPVR 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/QYTCSND 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 32. QAYTCSNC1 Values

| Field Name Alias   | Field Name | Description                                                                                                                                                                                                                                                                                             |
|--------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SYSTEM_ID          | YTCSYID    | 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_HARDWARE_ID. (NCD MIB object: ncdSysLocalMACAddress) |
| SERVER_ID          | YTCSVID    | 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. (NCD MIB 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.                                                                                                                                                                                                                        |

Table 32. QAYTCSNC1 Values (continued)

| Field Name Alias      | Field Name | Description                                                                                                                                                                                                                                                                                                                              |
|-----------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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)                                                                                                                                                                                                                                                                 |
| SYSTEM_MODEL_ID       | YTCSMODI   | The model number of the Network Station. (MIB-II object: sysDescr)                                                                                                                                                                                                                                                                       |
| SYSTEM_MEMORY_SIZE    | YTCSYSYM   | 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   | <p>The national language configured for the boot monitor of the Network Station. Possible values are:</p> <ul style="list-style-type: none"> <li>• 1 = English</li> <li>• 2 = French</li> <li>• 3 = German</li> <li>• 4 = Italian</li> <li>• 5 = Spanish</li> <li>• 6 = Japanese</li> </ul> <p>(NCD MIB object: ncdBootPromLanguage)</p> |
| 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 88 on page 367 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)                                                                                                                                                                                                                         |

Table 32. QAYTCSNC1 Values (continued)

| Field Name Alias      | Field Name | Description                                                                                                                                                                                                                                                                                                                                               |
|-----------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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)                                                                                                                                                                                                             |
| 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: <ul style="list-style-type: none"> <li>• 6 = Ethernet</li> <li>• 9 = token-ring</li> <li>• 116 = TDLC (twinaxial data link control)</li> </ul> (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       | YTCSYSL    | The Terminal location value set in the Network Station Manager. (MIB-II object: sysLocation)                                                                                                                                                                                                                                                              |
| SYSTEM_CONTACT        | YTCSYSC    | 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: <ul style="list-style-type: none"> <li>• 1 = boot source was either a PROM, flash memory card, or OTP (one-time programmable) card.</li> <li>• 2 = boot source used the TCP/IP protocol TFTP.</li> <li>• 4 = boot source was NFS.</li> </ul> (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)                                                                                                                                                                                                                                      |

Table 32. QAYTCSNC1 Values (continued)

| Field Name Alias | Field Name | Description                                                                                                                                                    |
|------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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)
  - For an Ethernet line, type: CHGLINETH LIND(YY) MAXFRAME(ZZ)

The value YY is the line description's name ,and ZZ is maximum frame size (recommended minimum of 4096).

- \_\_\_ 2. Enlarge the Send/Receive buffer sizes.  
Type: CHGTCPA TCPRCVBUF (64000) TCPSNDBUF (64000).
- \_\_\_ 3. Change TFTP Attributes  
Type: CHGTFTP and press F4. The *Change TFTP Attributes* screen appears.

Change TFTP Attributes (CHGTFTP)

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 **Z** is the same as the value entered on step 1 on page 137.

## 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 33.

Table 33. Functional Description of the Setup Assistant

| Task Number | Function of the Setup Assistant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Task 2000   | Verify required PTFs and software                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Task 3000   | <ul style="list-style-type: none"> <li>• Configure or verify TCP/IP information, including: <ul style="list-style-type: none"> <li>– local domain and host name</li> <li>– host table entries</li> <li>– name server</li> <li>– TCP/IP interfaces</li> <li>– routes</li> </ul> </li> <li>• Set servers to autostart <ul style="list-style-type: none"> <li>– CHGTFTP AUTOSTART (*YES)</li> <li>– CHGHTTP AUTOSTART (*YES)</li> <li>– CHGTELNA AUTOSTART (*YES)</li> </ul> </li> <li>• Add HTTP directives <pre> 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/* </pre> </li> </ul> |



Table 33. Functional Description of the Setup Assistant (continued)

| Task Number | Function of the Setup Assistant                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Task 4000   | <p>Choose Boot Protocol</p> <ul style="list-style-type: none"> <li>If you choose *BOOTP:<br/> CRTDUPOBJ OBJ(QATODBT) FROMLIB(QSYS) OBJTYPE(*FILE)<br/> TOLIB(QUSRSYS) NEWOBJ(QATODBTP) DATA(*YES)<br/> CHGBPA AUTOSTART(*YES)</li> </ul> <p>The setup assistant then calls the WRKBPTBL.</p> <ul style="list-style-type: none"> <li>If you choose *DHCP:<br/> CHGDHCPA AUTOSTART(*YES)<br/> RMVLNK OBJLNK('QIBM\UserData\NetworkStation\StationConfig\hosts.nsm')</li> </ul>           |
| Task 5000   | <p>Start and Verify Required Servers</p> <p>The Setup Assistant executes the following commands:</p> <p>CRTUSRPRF USRPRF(QTFTP)<br/> PASSWORD(*NONE)</p> <p>CHGAUT OBJ('/QIBM/Service/NetworkStation/FFDC') +<br/> USER(QTFTP) DTAAUT(*RWX)</p> <p>CHGAUT OBJ('/QIBM/ProdData/NetworkStation/kernel') +<br/> USER(QTFTP) DTAAUT(*RX)</p> <p>CHGSYSVAL SYSVAL(QRETSVRSEC) VALUE('1')</p> <p>STRTCP<br/> STRSBS QSERVER<br/> STRHOSTSVR SERVER(*ALL)<br/> CALL QYTCUSVR 'STRTCPSVR '</p> |

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 34 on page 140 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 34. 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                   |
| 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” on page 141.
- To view and change your HTTP directives on a V4R1 or later system, see “HTTP Directives for V4R1 and Later Systems” on page 141.

## HTTP Directives for a V3R7 System

In addition to the HTTP directives in Table 33 on page 138, 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 34 on page 140. 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/Protect >
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 34 on page 140 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 CHGTFTP. 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 35 to **every** AS/400 server in your network. These PTFs prevent unpredictable results, including possible data loss.

*Table 35. 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 29 on page 143 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 29 provides a view of a sample network with the TME 10 NetView product that is installed on a PC.

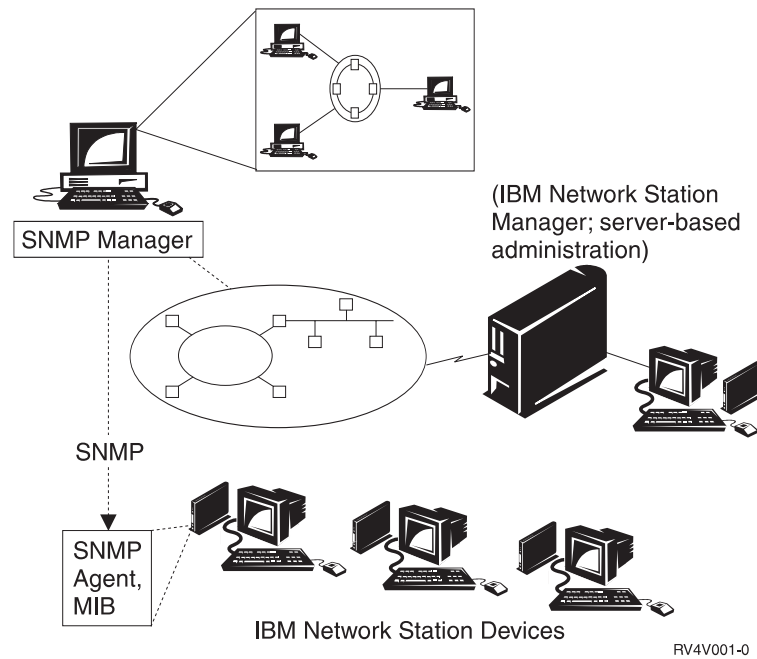


Figure 29. Network Station - SNMP Management

## 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".

---

## 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 36. 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. |                  |

Table 36. Gathering for Load Balancing (continued)

| Value                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Write Value Here |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 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. |                  |
| Bootstrap Server              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |

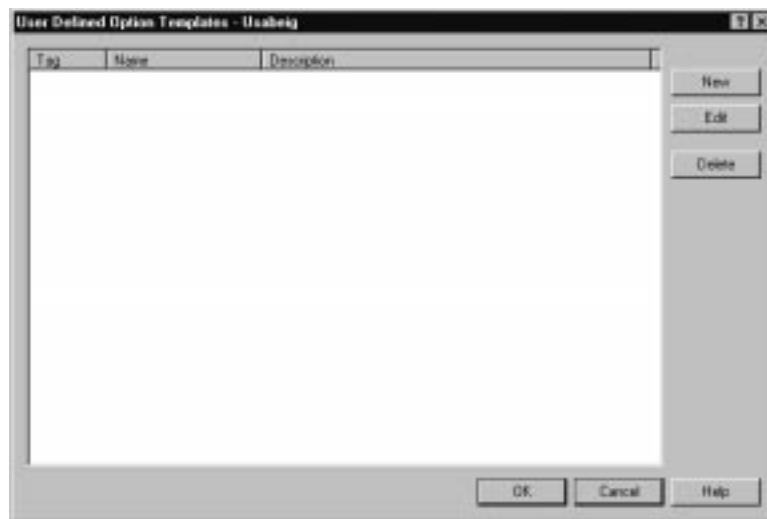
- \_\_\_ 1. In Operations Navigator, double-click **DHCP**. You should see a screen similar to Figure 30.



Figure 30. DHCP Server Configuration

- \_\_\_ 2. Click **File**.

- \_\_\_ 3. Click **Option Templates**. You should see a screen similar to Figure 31.



*Figure 31. 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 32 on page 147.



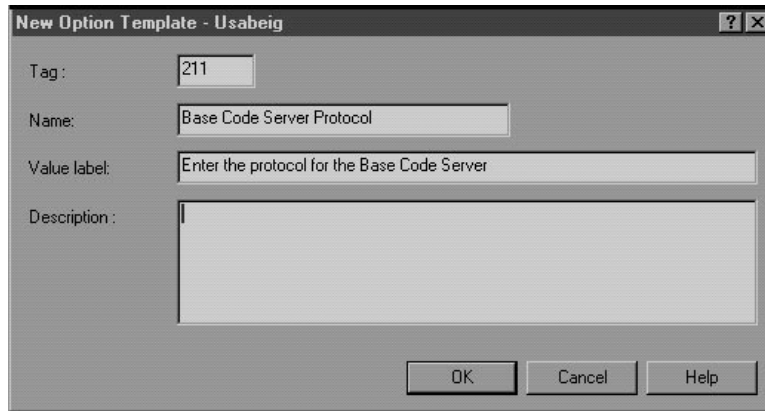


Figure 32. New Option Template

- \_\_\_ 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 23.

- \_\_\_ 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 33.

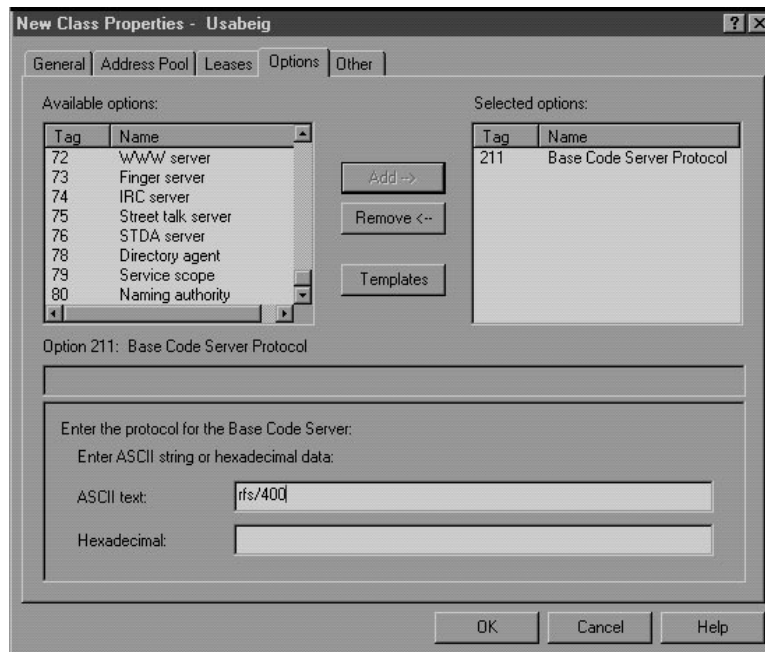


Figure 33. Subnet Properties Option 211

- \_\_\_ 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 34.

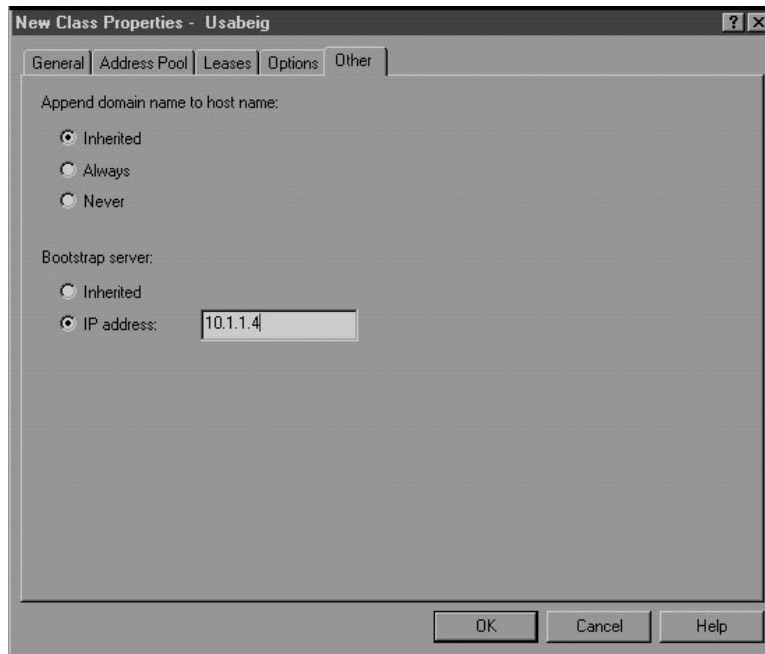


Figure 34. Subnet Properties Option 66

- \_\_\_ 28. Click the **OK** button.
- \_\_\_ 29. From the File menu, choose **Update Server**.
- \_\_\_ 30. Repeat step 17 on page 148 through step 29



---

## Chapter 4. Installing and Configuring an IBM Network Station Environment on an RS/6000 Server

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This chapter describes how to install and configure software on an RS/6000 to use the IBM Network Station network computer, hereafter called Network Station, in an RS/6000 environment.

**Note:** Please see the `/usr/netstation/doc/README` file for the latest updates on installing and configuring a Network Station environment on an RS/6000. Also see URL `www://ServerName/networkstation/admin` for further information.

---

### Installing Server Software

**Attention:** If you have manually modified 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.

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.

To install a Network Station server environment on an RS/6000, the following software must be installed before you install Network Station Manager filesets:

- AIX Version 4.2.1 for servers or later. These are the specific required AIX filesets:
  - **bos.rte** 4.2 or later
  - **bos.net.tcp.server** 4.2 or later if your system will use DHCP
- A web server, such as the Internet Connection Server (Domino GO Webserver) fileset **internet\_server.base** 4.2.1 or later.

You must install a web server to use the IBM Network Station Manager.
- The **bos.net.nfs.client** fileset to provide Network File System (NFS) support required by most Network Station applications.
- A web browser, such as Netscape (the **netscape** fileset). You must install a web browser to use the IBM Network Station Manager, which is required to do Network Station Configuration.

\_\_\_ 3. Verify network requirements.

LAN connectivity via Ethernet or token-ring must be installed, configured, and running.

\_\_\_ 4. Install the Network Station Manager filesets on the RS/6000 server.

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 the following filesets and select them to be installed:

**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 reboot the system if only the **netstation** filesets were installed.

- The software installation process runs the `/usr/netstation/bin/nfsconf` script, which sets up and enables the following on the RS/6000 server:
  - RS/6000 host-specific configuration
  - BOOTP
  - NFS
  - TFTP
  - Internet Connection Secure (ICS) Webserver

For more information about the `/usr/netstation/bin/nfsconf` script, see “Understanding the nfsconf Script” on page 167.

---

## 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 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 files 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 to use.

---

## Configuring an RS/6000 Server for Network Stations

Configuring an RS/6000 server for Network Stations requires the following tasks:

- Gathering configuration information
- Choosing a boot method
- Configuring the RS/6000 server

### Gathering Configuration Information

Table 37 lists the information you need to configure your RS/6000 server and Network Stations. Use this table to record information for your system:

*Table 37. RS/6000 Configuration Information Chart*





| Field                                                                                                                                                                                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Write Value Here |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
|  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.                                                                                                                                                                                                                            |                  |
|  Media Access Control (MAC) address (hardware address) of each Network Station                                         | The (Media Access Control) MAC address 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:<br><br><ol style="list-style-type: none"> <li>1. Power the network station on.</li> <li>2. After the keyboard controller test, press the Escape key.</li> <li>3. In the Setup Utility, press F2.</li> <li>4. Record the MAC address.</li> </ol> |                  |
|  IP address of each Network Station (not needed in DHCP environments if IP addresses are being assigned dynamically) | Each Network Station requires a unique IP address. You should ensure that the IP address is valid for your organization and that no other device in the network is using it.                                                                                                                                                                                                                                                                                                   |                  |
|  Host name of each Network Station                                                                                   | The host name identifies the Network Station as a unique destination within a TCP/IP network.                                                                                                                                                                                                                                                                                                                                                                                  |                  |



Table 37. RS/6000 Configuration Information Chart (continued)

| Field                                                                    | Description                                                                                                                                                                                                    | Write Value Here |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 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 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) | 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 it is recognized by the server 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 using Dynamic Host Configuration Protocol (DHCP). See “Boot Methods” on page 14 for a description of each boot method. Choose one of the following methods to configure your Network Stations:

- If you choose to use BOOTP, go to “Configuring BOOTP Protocol”.
- If you choose to use DHCP, go to “Configuring Dynamic Host Configuration Protocol (DHCP)” on page 158.
- If you choose to use NVRAM, go to “Configuring Network Stations Locally — NVRAM” on page 162.

### 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 317.

Each Network Station must have an entry in the BOOTP table on the server. Use the procedure 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`

The BootP Device menu is displayed as shown in Figure 35 on page 156:

```

 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 35. 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 36:  
333

```

 Add a new BootP Device

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

 [Entry Fields]

* Hostname []
* Hardware Type [] +
 Hardware Address []
* IP Address []
* TFTP Server IP []
* Boot File []
* Boot Directory []
 Domain Name Server []
 Gateway []
* Subnet Mask []

F1=Help F2=Refresh F3=Cancel F4=List
F5=Reset F6=Command F7=Edit F8=Image
F9=Shell F10=Exit Enter=Do

```

Figure 36. 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 recorded on line 4 in Table 37 on page 154.
- \_\_\_ b. The hardware Type of the Network Station (Choose from the list)
- \_\_\_ c. The hardware Address (the MAC address for the Network Station being configured)  
Use the value recorded on line 2 in Table 37 on page 154. 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 recorded on line 3 in Table 37 on page 154.
- \_\_\_ 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 37 on page 154.
- \_\_\_ 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 recorded on line 7 in Table 37 on page 154.  
  
**Note:** This field is optional. If this is not required in your environment, leave it blank:
- \_\_\_ i. The IP Address for the Gateway  
Type the value recorded on line 6 in Table 37 on page 154.  
  
**Note:** This field is optional. If this is not required in your environment, leave it blank:
- \_\_\_ j. The subnet mask  
Type the value recorded on line 5 in Table 37 on page 154.
- \_\_\_ 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 162.

- You can also configure Network Stations using the **chbootptab** script (see “Configuring Network Stations Using the chbootptab Script” on page 165 ) or by manually editing the **/etc/bootptab** file (see “Configuring Network Stations Manually” on page 166).

## Configuring Dynamic Host Configuration Protocol (DHCP)

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 is designed to replace BOOTP, and supports all features of BOOTP. There is no need to run both daemons on the same machine.

It is also possible to set up 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/dhcpd.conf** file automatically with the **/usr/sbin/bootptodhcp** command. This command appends the proper client entries to the DHCP configuration file. Further information can be found within the file **/etc/dhcpd.conf** and in the *AIX Version 4 System Management Guide: Communications and Networks* or *AIX Version 4.3 System Management Guide: Communications and Networks*.

Use the following procedure to set up the **/etc/dhcpd.conf** file for your network and start DHCP.

- \_\_\_ 1. Edit the **/etc/dhcpd.conf** file using the example in Figure 37 on page 160 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 will be less complex since this example contains all possibilities of how DHCP can assign IP addresses or host names.
- \_\_\_ 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 listed by the **ps** command.

- \_\_\_ d. Enter the following command to start DHCP :
- ```
startsrc -s dhcpcd
```

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 162 .

```
#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 itsc.austin.ibm.com #Domain name
#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
       }
       # hosts with class identifier for Network Station Model 8361-100
14 class "IBMNSM 2.0.0" 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"  # Boot Image directory
           option 211 nfs                # Boot Server TCP/IP 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 directory(s)
                                           # (two may be defined)
           option 214 nfs tftp          # Terminal Server TCP/IP access protocol
                                           # (two may be defined)
       } #end class definition
   } #end subnet
} #end network
15 #Actions for updating DNS
   updatedDNS
   "/usr/sbin/dhcpaction '%s' '%s' '%s' '%s' PTR NONIM >>/tmp/rmdns.out 2>&1"
   removedDNS
   "/usr/sbin/dhcpremove '%s' PTR NONIM >>/tmp/rmdns.out 2>&1"

```

Figure 37. Example DHCP Configuration File

The following list describes the entries in the example configuration file in Figure 37:

- 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 IP address cannot be renewed 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

These options are used by the Network Station 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 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 set to 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. See Table 8 on page 23 for the list of supported IBM Network Station Classes. In addition, six product defined options have been implemented to support separation of servers, see Table 7 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 317 to configure Network Stations locally.

Note: Reverse Address Resolution Protocol (RARP) is listed as a choice in the Network Station NVRAM boot choices; however, RARP is not supported for booting Network Stations on the RS/6000 platform.

Before You Continue

- 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 274.
- 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 309 for more information.
- Verify that your DHCP server or TFTP server, and HTTP server are started, and NFS daemons are running (biod, nfsd, rpc.mountd, rpc.statd, and rpc.lockd).
- 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 255 for information on using the Network Station Manager.

- 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 237
 - “Chapter 8. Using the IBM Network Station Manager Program” on page 255
 - “Chapter 10. Working With the IBM Network Station Setup Utility” on page 309

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. 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 a Network Station includes these tasks:

- Defining an AIX remote print queue
- Connecting a printer to the Network Station
- Verifying printer operation

Refer to “Appendix E. Serial Port Printer Connection” on page 377 for information on connecting a printer to a 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**, or, 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 38 on page 164:

Add a Remote Print Queue with Local Filtering	
Type or select values in entry fields. Press Enter AFTER making all desired changes.	
Description	[Entry Fields] 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 on remote server?	yes +
F1=Help	F2=Refresh
F5=Reset	F6=Command
F9=Shell	F10=Exit
F3=Cancel	F7=Edit
F4=List	F8=Image
Enter=Do	

Figure 38. 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 of the remote print queue 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 166
- “Understanding the nfsconf Script” on page 167
- “Setting Up AIX Server Routing” on page 168
- “Setting Up BOOTP Relay Configuration” on page 168

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
```

These optional flags may also be used:

```
-n domain_name_server  
-g gateway_ip  
-m subnet_mask
```

where:

- *hostname* is the value recorded on line 4 in Table 37 on page 154.
- *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 being configured, the value recorded on line 1 in Table 37 on page 154.
- *hardware_address* is the hardware address (the MAC address for the Network Station being configured).
Use the value recorded on line 2 in Table 37 on page 154. 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 recorded on line 3 in Table 37 on page 154.
- *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 recorded on line 7 in Table 37 on page 154.
- *gateway_ip* is the IP address for the gateway.
Enter the value recorded on line 8 in Table 37 on page 154.
- *subnet_mask* is the subnet mask.
Enter the value recorded on line 9 in Table 37 on page 154.

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=NAME_SERVER_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
NAME_SERVER_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 these lines to the **/etc/tftpaccess.ctl** file:

```
allow:/usr/netstation
allow:/usr/netstation/configs
allow:/usr/netstation/mods
allow:/usr/netstation/fonts/pcf/misc
allow:/usr/netstation/fonts/pcf/dw100dpi
allow:/usr/netstation/fonts/pcf/java
```

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, or you might 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 executed 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/local.nsm** 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/local.nsm** 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, which keeps them 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, execute 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
```

where 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**.

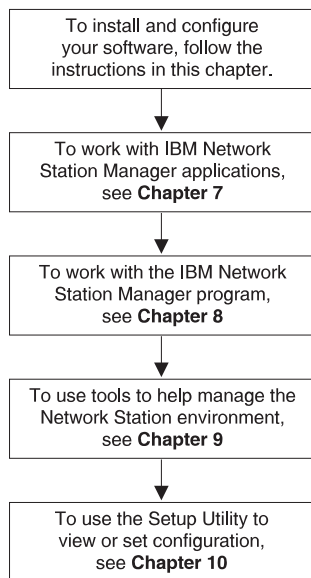
Chapter 5. Installing and Configuring an IBM Network Station Environment on an OS/390 Server

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About this Chapter

This chapter contains instructions for planning, installing, and configuring a Network Station environment on a OS/390 server. You will also be pointed to the *Program Directory for the Network Station Manager Release 3 for OS/390*, when necessary, 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.



RV4V047-1

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 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
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 is Network Station server code.
- 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 4.6.1, which is included in OS/390 Version 2 Release 4 and OS/390 Version 2 Release 5. Domino Go Webserver 5.0 (5697-D43) must be ordered and can only be used with OS/390 Version 2 Release 5.
- Network File System (NFS).

Note: The Network File System SAF or SAFEXP option requires OS/390 NFS, which is included in OS/390 Version 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 NFS for a limited time, under additional terms and conditions.

If the use of the EXPORT option is sufficient for your security environment, you may avoid the need for OS/390 NFS. The Network File System included with OS/390 V2R4 and OS/390 V2R5 supports this security environment.

- 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.
- JavaScript capable browser.

___ 3. Verify IBM Network Station memory requirements.

Verify that your IBM Network Stations have the amount of memory they need to run the applications your users expect.

Each application that is downloaded to the IBM Network Station requires memory. Use Table 6 on page 17 as a guide to determine how much memory each IBM Network Station should have. Each Network Station must download the Base System.

___ 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 code
- Network Station Manager program
- 40-bit NC Navigator browser

The *Program Directory for the Network Station Manager Release 3 for OS/390* that ships with the IBM Network Station Manager 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
 - Installation instructions
- ___ 5. Install **optional** software.
- ___ a. Install the 128-bit NC Navigator (5648-C20)
For installation instructions, see the *Program Directory for the Network Station Manager Release 3 for OS/390*.
- ___ 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. Continue to "Configuration Steps" to configure your TCP/IP environment and boot server.

Configuration Steps

- ___ 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 14 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, you must use DHCP to respond to BOOTP requests. Use the supportBootp and bootStrapServer statements in the DHCP configuration file to tell the DHCP server to respond to BOOTP requests.
- b. If you use DHCP 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 38. Available Boot Protocols and Boot Methods by Level of OS/390

Boot Method	V2R4 OS/390 Configuration Method	V2R5 OS/390 Configuration Method
DHCP	Edit the boot server configuration file (dhcpsd.cfg).	Edit the boot server configuration file (dhcpsd.cfg).

Table 38. Available Boot Protocols and Boot Methods by Level of OS/390 (continued)

Boot Method	V2R4 OS/390 Configuration Method	V2R5 OS/390 Configuration Method
NVRAM	No boot server configuration necessary.	No boot server configuration necessary.

Table 39. 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 176 . Otherwise, complete the following table.

Table 40. OS/390 Host Information Chart

Field	Description	Write Value Here
OS/390 IP Address	<p>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.</p> <p>In the example in Figure 5 on page 7, the OS/390 IP Address is 192.168.1.4. The OS/390 IP address is the address that uniquely identifies this OS/390 to TCP/IP. This address will be associated with the local host name to create a name entry in the Host Names table.</p> <p>For the networks within your 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. The authority at the time of this writing is Network Solutions, Inc. The address is:</p> <p style="padding-left: 40px;">Network Solutions InterNIC Registration Services 505 Huntmar Park Drive Herndon, VA 22070 1-703-742-4811 E-mail: hostmaster@internic.net WWW: http://rs.internic.net/</p> <p>Note: If your organization already has a range of IP addresses, you can use those instead of obtaining new IP addresses. For more information, see the <i>TCP/IP for MVS: Customization and Administration Guide</i>, SC31-7134.</p>	

Table 40. OS/390 Host Information Chart (continued)

Field	Description	Write Value Here
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.	
Domain Name Server IP Address	The 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 Domain Name Server IP Address is 192.168.1.5.	
OS/390 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.	
OS/390 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; for example, use com for commercial enterprises, gov for government organizations, edu for educational institutions, and uk for United Kingdom.	

___ 3. Gather LAN information.

Stop: If you have already configured the LAN that will serve the Network Stations, skip to step 4 on page 177. Otherwise, complete the following table.

For each LAN that is attached to your OS/390, you will need to duplicate and complete a copy of Table 41.

Table 41. OS/390 LAN Information Chart

Field	Description	Write Value Here
Line Description	You must create a line for your IBM Network Stations.	
LAN IP Address	The LAN IP address is the address that uniquely identifies each OS/390 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 has only one LAN.	

Table 41. OS/390 LAN Information Chart (continued)

Field	Description	Write Value Here
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 174. Otherwise, complete the following table.

For each router that is attached to your OS/390, you should duplicate and complete a copy of Table 42.

Table 42. OS/390 IP Router/Gateway Information Chart

Field	Description	Write Value Here
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.	
Route (Remote LAN) Subnet Mask	The subnet mask for the route.	
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 38 on page 174, perform the appropriate action:

- 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 7 on page 181.

___ 6. Gather information for a new DHCP environment.

Before you configure DHCP, you must first gather information about your network. Fill in the information in Table 43 on page 178 and Table 44 on page 178 . You will use this information in step 13 on page 183 when you configure DHCP.

Table 43. DHCP Global Information




DHCP Option Number or Statement	Field	Description	Write Value Here
supportBootp statement	 Migrate BOOTP	If your OS/390 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
bootStrapServer statement	 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.	
leaseTimeDefault statement	 Default lease time	This refers to the amount of time a server lets clients keep an IP address.	

Table 44 helps you collect the values to define a subnet in your DHCP environment. For each subnet you wish to define, copy and complete Table 44.

Table 44. DHCP Subnet Information



DHCP Option Number or Statement	Field	Description	Write Value Here
N/A	 Subnet based on range or 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
Option 12?	 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.	

Table 44. DHCP Subnet Information (continued)






DHCP Option Number or Statement	Field	Description	Write Value Here
N/A	 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.	
???	 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 the subnet mask of your network is not 255.255.255.0, refer to “Subnets and Subnet Masks” on page 9 for more information.	
N/A	 Starting address range 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.	
N/A	 Ending address range 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.	
Option 1	 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 44. DHCP Subnet Information (continued)

DHCP Option Number or Statement	Field	Description	Write Value Here
client 0 0 statement	<input type="checkbox"/> 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.	
N/A???	<input checked="" type="checkbox"/> Subnet lease time	The subnet lease time has three options. Choose one: <ul style="list-style-type: none"> • Inherit means that the subnet uses the value of the global lease time. • User-define is a value defined by you. • Never expire. 	inherit, user-defined, or never expire
The following values are delivered to the IBM Network Stations.			
???	<input type="checkbox"/> 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.	If yes, enter the gateway IP address or addresses.
Option 6 ??	<input checked="" type="checkbox"/> 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.	If yes, enter the DNS IP address or addresses.

Table 44. DHCP Subnet Information (continued)

DHCP Option Number or Statement	Field	Description	Write Value Here
Option 15 ??	<input checked="" type="checkbox"/> 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.	If Yes, enter domain name.
Option 1 ??	<input checked="" type="checkbox"/> 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 11 of Table 44 on page 178 . 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.	
Option 67	<input checked="" type="checkbox"/> 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.	<i>/usr/lpp/nstation/standard/kernel</i> The Boot File name is case sensitive.
N/A	<input checked="" type="checkbox"/> 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.
???	<input checked="" type="checkbox"/> Bootstrap server for subnet	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.	

___ 7. 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 the system for Network Station use.

- ___ 8. Verify that you installed the required software that is listed in step 2 on page 172.
- ___ 9. Configure the Domino Go Webserver.
To configure the Domino Go Webserver, follow these steps:
 - ___ a. Update the server configuration file, `httpd.conf`.
 - ___ b. Update and verify the `NLSPATH` setting in the `httpd.envvars` file.
 - ___ c. Access the IBM Network Station Manager program.

For details about configuring the Domino Go Webserver, see the *Program Directory for the Network Station Manager Release 3 for OS/390*.

- ___ 10. Configure the Network File System (NFS).
To configure and start NFS, follow these steps:
 - a. Set the transmission mode to binary.
 - b. Use `/hfs` as the prefix for the Hierarchical File System.
 - c. Specify the type of security checking you are using to provide access to your NFS data.

For details about configuring NFS, see the *OS/390 NFS Customization and Operations*, SC26-7253. For other information about NFS, see the *OS/390 NFS User's Guide*, SC26-7254 and the *OS/390 NFS Performance and Tuning Guide*, SC26-7255.

- ___ 11. Start the Trivial File Transfer Protocol (TFTP) server.

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:

- Run the shell script, `nstftpd`:
`/usr/sbin/nstftpd`

`nstftpd` is installed in `/usr/lpp/nstation/standard/bin/`.

- Issue the following `tftpd` command:
`tftpd -l -a /usr/lpp/nstation/standard`
`-a /etc/nstation /usr/lpp/nstation/standard /etc/nstation`

For the complete format and details of the `tftpd` command, see the *OS/390 eNetwork Communications Server: IP Configuration Guide*, SC31-8513.

- Use a JCL procedure (`proc`) to start TFTP.

___ 12. Select your boot protocol.

Based on your decision in step 1 on page 174, select your boot protocol.

- If you choose the DHCP protocol, continue to 13.
- If you are using the NVRAM method, go to “Chapter 10. Working With the IBM Network Station Setup Utility” on page 309, then return to step 11 on page 182 .

___ 13. 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. This configuration file is located in ??????.

The following is a sample DHCP configuration file:

```

#-----
# Global Server data:
# Overrides for server defaults and globally defined options
#-----
logFileName dhcpd.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 9.130.44.229

option 211 "nfs"
option 212 "9.130.48.75"
option 213 "/../VMBFS:K4POOL:QIBM/QIBM/ProdData/NetworkStation/configs"
option 214 "nfs"
option 67 /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 9.130.44.229

#-----
# Options related to all subnets served by this server.
# option 6 -> Domain Name Server IP addresses
# option 15 -> Domain Name
#-----
option 6 9.130.25.252
option 15 endicott.ibm.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 /usr/lpp/nstation/standard/kernel
}
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#-----
# Client Definitions:
#-----
# Token Ring (14-3-xxxx)
#-----
# Model 100
client 6 0000E580FCA8 ANY
{
}

# Model 1000
client 6 0000E5D40047 9.130.57.161
{
    option 12 nsmtest2
}

```

To create or change the DHCP server configuration file, go to "Changing the DHCP Configuration File" on page 188. Then return to 14.

___ 14. Start the DHCP server.

To start the DHCP server, use one of the following methods:

- Issue the following dhcpd command:

```
dhcpd [-q|-v] [-f configFile]
```

dhcpd is installed in the /usr/lpp/nsm/sbin directory:

-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 dealing 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 dhcpd.cfg in the directory that is specified by the etc environment variable.

- Use a JCL procedure (proc) to start DHCP.

___ 15. 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 that is logging into an IBM Network Station. The NSLD server first determines whether the user ID and password combination that are passed is 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 NLSPATH environment variable identifies the location of the NSLD CONFIG file.

- ___ a. If you are not changing any user configuration server, product defaults, or user's home directory definitions, go to step 15.b on page 186 to start the NSLD server. If you are changing definitions, follow these steps:

- 1) 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 = /etc/nstation/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 = /usr/lpp/nstation/standard/ProdData/NetworkStation/SysDef/
!
! User's home directory
home_mount_type = MOUNT_NFS
home_directory = /etc/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 =, the authentication server is used.

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 =, the user's HOME directory that is defined on the authentication server is used. 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 mountpoint. The path name must use a forward slash (/) as a directory delimiter.

- 2) Make any changes to this new CONFIG file.
- ___ b. Start the NSLD server by entering the following command:
`nsld [-l] [-f filename] [-t timeout] [-c concurrency_limit]`

You can use the following parameters with the nsld command:

- 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.

-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.

Go to 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. 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 274.
- 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 309 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 237
 - “Chapter 8. Using the IBM Network Station Manager Program” on page 255
 - “Chapter 10. Working With the IBM Network Station Setup Utility” on page 309

Changing the DHCP Configuration File

In the configuration file, you create a hierarchy of configuration parameters for a DHCP network by specifying some configuration values that are served globally to all clients, while other configuration values are served only to certain clients. The information supplied to the clients is determined by the statements you use and the position of the statements in the configuration file. Also, depending on your configuration, you can specify subnets, classes, vendors, and clients to provide configuration information to different groups of clients.

Editing Tips

When editing the DHCP server configuration file, keep in mind the following:

- Comments must begin with a pound sign (#).
- Class and vendor names that include spaces must be surrounded by double quotes ("").
- Parameters to the right of a left parenthesis are used only by the DHCP server configuration program graphical interface. A space must precede the left parenthesis. For example, (alias=mysubnet is used only by the DHCP server configuration program in the following:

```
subnet 192.67.48.0 255.255.240.0 192.67.48.1-192.67.48.15 (alias
=mysubnet
```
- Statement parameters are dependent on their position. If you omit a required parameter and enter a subsequent required parameter in a statement, the server recognizes that a parameter is missing, writes an error message to a log file, and continues to read the configuration file.
- A continuation character \ indicates that the information is continued on the next line. When used within a comment, the character is treated as part of the comment and is ignored as a continuation character.
- Braces are used to specify statements that are defined within other statements.
- If a parameter is specified in more than one place, the lowest level statement (which is the most specific) is used:

- Statements specified outside braces are considered global and are used for all addresses served by this server unless the statement is overridden at a lower-defined level.
- Parameters specified within braces under a statement such as a Subnet statement, are considered local and apply only to clients within the subnet.
- Definition of a parameter in a class takes precedence over definition of the parameter in a subnet.
- Vendor statements are always defined at a global level.
- Class statements are not allowed inside Client statements.
- Client statements are not allowed inside Option, Vendor, or Class statements.
- Subnet statements are not allowed inside Class or Client statements.
- Keywords are not case sensitive. The capitalization that is used in this documentation is not required in the configuration file. However, use the convention that keywords start with a lower case letter and subsequent "word" subparts start with a capital letter. For example, a keyword is proxyARec.

DHCP Server Statements

Define Vendors

To provide vendor configuration information to the DHCP clients in your network:

- At the global level, define a vendor and assign the appropriate configuration values. Unlike the Class statement, you cannot control the scope of the Vendor statement by its placement in the file. Vendor statements within Subnet, Class, or Client statements are ignored. Options can be redefined in the vendor class.
- The DHCP client identifies itself to the DHCP server as belonging to a vendor class by sending Option 60 (Class Identifier) with a specific vendor name.
- The DHCP server recognizes that the client has a specific vendor and returns encapsulated Option 43 (Vendor-specific Information), which contains vendor-specific DHCP options and option values.

To define a vendor, use the following statement:

```
vendor vendor_name [hex value] [{options}]
```

vendor_name

is the user-defined label that identifies the vendor. The vendor name is an ASCII string of up to 255 characters (for example, "IBM"). If the vendor name contains spaces, it must be surrounded by quotes ("").

[**hex** *value*]

value must be specified either as an ASCII string or as hexadecimal in the hexadecimal ASCII string construct. For example:

```
hex"01 02 03"
```

For more information, see descriptions of Option 60 (Class-Identifier) in "Specifying DHCP Options" on page 198.

The vendor statement can also be specified in the DHCP server configuration file as a vendor statement followed by a pair of braces containing the options particular to this vendor. Within these braces, the usual option value encoding and decoding rules do not apply.

Define a Subnet or a Subnet Group

Use the Subnet statement to specify configuration parameters for an address pool that is administered by a server. An address pool is a range of IP addresses to be leased to clients. If you configure subnets, you can set the lease time and other options for clients that use the address pool.

- Create a subnet.

To define a subnet or a subnet group, use the following statement:

```
subnet subnet_address [subnet_mask] range [(alias=name )
```

Note: The DHCP Server Configuration program uses the parameters to the right of a left parenthesis. The DHCP server parses statements to the right of a left parenthesis as comments.

subnet_address

is the address of this subnet, specified in dotted-decimal notation (for example, 192.67.48.0).

subnet_mask

is the mask for the subnet, specified in dotted decimal notation or in integer format. A subnet mask divides the subnet address into a subnet portion and a host portion. If no value is entered for the subnet mask, the default is the class mask appropriate for an A, B, or C class network.

- Class A network - 255.0.0.0
- Class B network - 255.255.0.0
- Class C network - 255.255.255.0

A subnet mask can be expressed either in dotted-decimal notation or as an integer between 8 and 31. For example, you can enter a subnet mask as a dotted decimal notation of 255.255.240.0 or an integer format of 20. In subnet 192.67.48.0, a mask of 255.255.240.0 implies an address range from 192.67.48.001 to 192.67.63.254. The value 20 is the total number of 1s in a mask that is expressed in binary as 11111111.11111111.11110000.00000000.

Although not required, in most configurations the DHCP server should send Option 1 (Subnet Mask) to DHCP clients. Client operation may be unpredictable if the client does not receive subnet masks from the DHCP server and assumes a subnet mask that is not appropriate for the subnet.

range

is all addresses, specified in dotted-decimal notation, to be administered to this subnet. The ranges should not overlap, for example, 192.67.48.1-192.67.48.128.

Notes:

1. In the range of addresses, do not include the address of the subnet and the address that is used for broadcast messages. For example, if the subnet address is 192.67.96.0 and the subnet mask is 255.255.240.0, do not include 192.67.96.0 and 192.67.111.255 in the range of addresses.
2. To exclude an IP address in a range of address, use the Client statement (see step 194).

(alias=name

is a symbolic name for ease in identifying a subnet.

- Define a subnet group.

To define a subnet group, use the following statement:

```
subnet subnet_address [subnet_mask] range [label:value[/priority]]
```

label:value[/priority]

identifies subnets that are grouped together on the same wire. *value[/priority]* is a string of 1 to 64 alphanumeric characters that identifies the subnet, followed by the priority in which this subnet's address pool is used. Do not use spaces when specifying the label. More than one subnet can have the same identifier. *priority* is a positive integer, where 1 is a higher priority than 2. If you do not specify a priority, the highest priority is assigned. If two subnets have identical priority, the subnets within a label are processed based on the physical position in the configuration file.

For example, the following two subnets are on the same wire:

inOrder

```
subnet 192.67.49.0 255.255.240.0 192.67.49.1-192.67.49.100 label:WIRE1/2
```

```
subnet 192.67.48.0 255.255.240.0 192.67.48.1-192.67.48.50 label:WIRE1/1
```

- Serve IP addresses from multiple subnets.

To serve IP addresses from multiple subnets, use the *inOrder* or *balance* statement. The *inOrder* or *balance* statement is defined at a global level.

inOrder labelslist

labelslist is a list of labels in which each label identifies a subnet group. Each listed group is processed in order within that group. The subnet address pool with the highest priority within that group is completely exhausted before the subnet address pool with the next highest priority is used.

balance: labelslist

labelslist is a list of labels in which each label identifies a subnet group. The server provides the first IP address from the subnet that is first in the priority list, and subsequent IP addresses from each lesser-priority subnet, repeating the cycle until addresses are exhausted equally from all subnets.

The following is an example using the *inOrder* statement. Requests for subnet group WIRE1 exhaust addresses in subnet 192.67.48.0 (WIRE1/1) first, followed by subnet 192.67.49.0 (WIRE1/2). WIRE1 and WIRE3 are not related. Requests for subnet group WIRE3 exhaust addresses in subnet 192.67.50.0 (WIRE3/1) first, followed by

subnet 192.67.51.0 (WIRE3/2), and then 192.67.50.0 (WIRE3/3), which has the same subnet address as WIRE3/1 but specifies a higher address range:

```
inOrder: WIRE3 WIRE1
subnet 192.67.49.0 255.255.240.0 192.67.49.1-192.67.49.100 label:WIRE1/2
subnet 192.67.48.0 255.255.240.0 192.67.48.1-192.67.48.50 label:WIRE1/1
subnet 192.67.51.0 255.255.240.0 192.67.51.1-192.67.51.50 label:WIRE3/2
subnet 192.67.50.0 255.255.240.0 192.67.50.1-192.67.50.50 label:WIRE3/1
subnet 192.67.50.0 255.255.240.0 192.67.50.51-192.67.50.100 label:WIRE3/3
```

The following balance statement uses all IP addresses equally in WIRE1/3 and WIRE1/4:

```
balance: WIRE1
subnet 192.67.49.0 255.255.240.0 192.67.49.101-192.67.49.200 label:WIRE1/3
subnet 192.67.48.0 255.255.240.0 192.67.48.201-192.67.48.300 label:WIRE1/4
```

A sequence of inOrder or balance statements is cumulative. For example, the statements:

```
inOrder: WIRE1
inOrder: WIRE3
```

have the cumulative effect of the single statement:

```
inOrder: WIRE1 WIRE3
```

Note: To disable multiple subnets, comment out either the balance or inOrder processing statement or the priority.

Define Classes

Use the Class statement to specify configuration parameters for a user-defined group of clients that are administered by a server. The scope of the Class statement is allowed at a global or subnet level. When the Class statement is specified within a Subnet statement, the server only serves clients in the class that are located in the specified subnet and request the class.

To define a class, use the following statement:

```
class class_name [range]
```

class_name

is the user-defined label that identifies the class. The class name is an ASCII string of up to 255 characters (for example, accounting). If the class name contains spaces, it must be surrounded by double quotes.

range

is a range of addresses. To specify a range of addresses, enter addresses in dotted-decimal notation, beginning with the lower end of the range, followed by a hyphen, then the upper end of the range, with no spaces between. For example, enter 192.17.32.1-192.17.32.128.

At a global level, a class cannot have a range. A range is allowed only when a class is defined within a subnet. The range can be a subset of the subnet range.

A client that requests an IP address from a class that has used all the addresses from its range is offered an IP address from the subnet range, if available. The client is offered the options associated with the class that has used all the addresses from its range.

To assign configuration parameters such as a lease time for all clients in a class, follow the Class statement with Option statements that are surrounded by braces. For more information about options, see “Specifying DHCP Options” on page 198.

Define Clients

Use the Client statement to specify a unique set of options for a client. You can assign either a static address and configuration parameters, or configuration parameters. You can also use the Client statement to exclude an IP address from a range of available IP addresses.

- Define a client.

To define a client, use the following statement (define the client statement at a global, subnet, or class level):

```
client hw_type clientID ipaddr [alias=name]
```

hw_type

is a number that represents the hardware type of the client computer, required to decode the MAC address. For more information about hardware types, see “Hardware Types” on page 213.

clientID

is either the hexadecimal MAC address, a string such as a domain name, or a name that is assigned to the client such as the host name. If you specify a string, you are required to enclose it in double quotes and specify 0 for the hardware type.

ipaddr

is the DHCP client's IP address in dotted-decimal notation. *ipaddr* must contain an address if unlisted clients are not supported.

(*alias=name*

is a symbolic name for ease in identifying the client. Enter **alias=name** immediately after a left parenthesis. This symbolic name appears in the display of the server configuration. If no name is entered, the MAC address is used.

For example, for a client (10005aa4b9ab), to reserve the static address 192.22.3.149 and also specify a lease time (Option 51) or 12 hours (43200 seconds) and a subnet mask (Option 1), use the following statement:

```

client 6 10005aa4b9ab 192.22.3.149
{
    option 51 43200
    option 1 255.255.255.0
}

```

- Specify options and assign any IP address to a client.

To specify options for any IP address from the subnet the DHCP client is in, use the following `client` statement:

```
client hw_type clientID ANY
```

ANY

specifies that any IP address can be assigned to the specific client ID.

- Exclude a client ID.

To have your DHCP server exclude requests from a particular client ID, use the following `client` statement:

```
client hw_type clientID NONE
```

NONE

specifies no IP address and no options are served to the specified client ID.

For example:

```
client 6 10005aa4b9ab NONE
```

- Exclude an IP address.

To exclude one or more IP addresses from the pool of addresses available for lease, use the following statements:

```

client 0 0 192.67.3.123
client 0 0 192.67.3.222

```

In this case, the hardware type and the client ID are 0. IP addresses 192.67.3.123 and 192.67.3.222 are excluded. You must specify a separate statement for each address you want excluded.

- Exclude a range of IP addresses.

To exclude a range of IP addresses from the pool of addresses available for lease, specify many `client` statements.

Each range of excluded addresses should contain no more than 10 addresses. Each excluded address results in a separate `client` statement in the configuration file. To exclude larger numbers of addresses, define subnets that do not include the addresses you want excluded. For example, to exclude addresses 50-75 in subnet 192.67.3.0, specify:

```

inOrder: WIRE1
subnet 192.67.3.0 255.255.240.0 192.67.3.1-192.67.3.49 label:WIRE1/1
subnet 192.67.3.0 255.255.240.0 192.67.3.76-192.67.3.100 label:WIRE1/2

```


Define DHCP Log Files

To enable logging by the server, you must specify all of the following:

- Number of DHCP log files.
`numLogFiles value`
value is the maximum number of log files maintained.
- Size of DHCP log file.
`logFileSize size`
size is the size of the log file in kilobytes.
- Name of DHCP log file.
`logFileName name`
name is the name of the most recent log file.
- At least one information type to log.
`logItem item`
item is the name of the item to be logged. *item* can be:
SYSERR
OBJERR
PROTERR
WARNING
EVENT
ACTION
INFO
ACNTING
TRACE

Migrate BOOTP Clients

- To specify whether the server responds to requests from BOOTP clients, use the following statement:
`supportBootP [YES | NO]`
The default value is NO.

If this server previously supported BOOTP clients and has been reconfigured not to support BOOTP clients, the address binding for any BOOTP clients that was established before the reconfiguration is maintained until the BOOTP client sends another request (when it is restarting). At that time, the server does not respond, and the binding is removed.

You should use this statement outside of braces. Therefore, all addresses that are issued by this server use this statement definition.
- To provide a permanent (static) IP address to BOOTP clients, use the following Client statement (Only BOOTP options are served. Any DHCP options that are specified are ignored):
`client hw_type clientID ipaddr [(alias=name)]`
See 193 for the description and format of the Client statement.

- To specify whether the DHCP server specifies a bootstrap server for BOOTP clients, use the following statement:

`bootStrapServer value`

value is the IP address of the bootstrap server for the client.

This statement can appear at the global level, or within a subnet, class, or client statement.

- Specify the boot file name.

For clients who need a boot or must load images to initialize, use the DHCP Option 67 (Boot File Name) for the name of the boot file. The client downloads the image from the BOOTP server. For additional information about Option 67, see "Specifying DHCP Options" on page 198.

Define Lease Parameters

- To specify the default lease duration for the leases that are issued by the server, use the following statement:

`leaseTimeDefault value`

value is a decimal integer, followed by a space and a unit of time. The unit of time can be years, months, weeks, days, hours, minutes, or seconds. The default is 1440 minutes.

To apply a global lease time for all addresses that are issued by this server, specify this statement outside braces. To override this statement for a set of clients, use Option 51 (IP Address Lease Time) for a specific client, a class of clients, a subnet, or at the global level.

- To specify the interval at which the lease condition of all addresses in the address pool is examined, use:

`leaseExpireInterval value`

value is a decimal integer optionally followed by a space and a unit of time, which can be years, months, weeks, days, hours, minutes, or seconds. The default is 1 minute. If you do not specify a unit of time, minutes are assumed. The value that is specified should be less than the value for `leaseTimeDefault` to ensure that expired leases are returned to the pool in a timely manner.

- To specify the maximum amount of time the server holds an offered address in reserve while waiting for a response from the client, use:

`reservedTime value`

value is a decimal integer optionally followed by a space and a unit of time, which can be years, months, weeks, days, hours, minutes, or seconds. The default is 5 minutes. If you do not specify a unit of time, minutes are assumed.

Define Server Parameters

- Querying in-use address.

Before the server allocates an IP address, it PINGS the address to make sure that it is not already in use by a host on the network. The server places an in-use address in a special pool and allocates a different address.

To specify the interval a DHCP server holds an in-use address in a special pool before returning the address to the active pool available for assignment, use the following statement:

`usedIPAddressExpireInterval value`

value is a decimal integer optionally followed by a space and a unit of time, which can be years, months, weeks, days, hours, minutes, or seconds. The default is 1000 seconds. If you do not specify a unit of time, minutes are assumed.

- To specify whether the server responds to requests from DHCP clients other than those whose client IDs are specifically listed in this configuration file, use the following statement:

`supportUnlistedClients [YES | NO]`

The default is YES. If you specify NO, the server responds only to requests from DHCP clients that are listed (by client ID) in the configuration file.

For example:

```
client 6 10005aa4b9ab ANY
client 6 10a03ca5a7fb ANY
```

If this statement is not specified, or if you specify YES, the server responds to requests from any DHCP client. Use this option to limit access to addresses that are issued by this DHCP server. Listing the client IDs for all acceptable clients may take a long time.

This statement should be specified outside braces. Therefore, all addresses issued by this server use this statement.

- Transform canonical addresses.

For 802.3 clients, use the canonical keyword to instruct the DHCP server to transform MAC addresses to canonical (byte starts with least significant bit) form. In most cases, you do not want the DHCP server to transform canonical addresses. MAC addresses of 802.3 clients are normally in canonical format on an 802.3 network. When 802.3 MAC addresses are transmitted across a transparent bridge, the bridge reformats the bits that identify an 802.3 client MAC address to a noncanonical (byte starts with most significant bit) form. When the bridge returns the MAC address to an 802.3 network, the bridge again reformats MAC addresses.

To cause the DHCP server to transform MAC addresses, use the following statement:

`canonical value`

value

is either NO (the default) or YES. NO prevents the DHCP server from transforming MAC addresses. YES causes the DHCP server to transform MAC addresses.

- Specify statistics snapshots.

To specify the number of intervals that expire before the DHCP server takes a snapshot of statistics, use the following statement:

`statisticSnapshot value`

The length of each interval is determined by the `leaseExpireInterval` keyword. For example, a value of 3 collects statistics after a span of three intervals, where each interval has a length specified by the `leaseExpireInterval` keyword. If no value is specified, the server takes a snapshot of statistics at the end of every lease expire interval.

Restrict Multiple Local Subnets

The DHCP server allocates IP addresses from subnet pools that are based on information about the client's subnet that is determined from the incoming request packet. If no subnet information is found, the server defaults to allocating an IP address from the local subnet pool. A problem arises if the serving host machine supports multiple local subnets. Packets that are forwarded from a Relay Agent contain the remote subnet information. Packets that arrive from clients on the local LAN segments do not. In the current release of the DHCP server, the clients on the local Ethernet and token ring LAN segments receive the IP address from the same subnet pool. To prevent this problem, you should reconfigure multiple local networks to be remote with a router running the Relay Agent.

Define Additional Options

To assign additional configuration parameters, use the `Option` statement. All clients inherit all globally-defined options. A client that is defined within a `Subnet` statement inherits global options and options that are defined for that address pool. To assign configuration parameters for all clients in a subnet, follow the `Subnet` statement with `Option` statements that are surrounded by braces.

Specifying DHCP Options

DHCP allows you to specify options, also known as BOOTP vendor extensions, to provide additional configuration information to the client. RFC 2132 defines the options that you can use. Each option is identified by a numeric code.

Architected Options 0 through 127 and Option 255 are reserved for definition by the RFC. The DHCP server and the DHCP client use options in this set. The administrator can modify some architected options. Other options are for exclusive use by the client and server. The administrator cannot or should not configure the following options at the DHCP server:

- 52 (Option Overload)
- 53 (DHCP Message Type)
- 54 (Server Identifier)
- 55 (Parameter Request List)
- 56 (Message)
- 57 (Maximum DHCP Message Size)
- 60 (Class Identifier)

Options 128 through 254 represent options that can be defined by administrators to pass information to the DHCP client to implement site-specific configuration parameters. Additionally, IBM provides a set of IBM-specific options, such as Option 192 (TXT RR).

The format of user-defined options is:

`option code value`

code can be any option code 1 through 254. *value* must always be a string. At the server, it can be an ASCII string or a hexadecimal string. At the client, however, it always appears as a hexadecimal string that is passed to the processing program.

The server passes the specified value to the client. You must, however, create a program or command file to process the value.

Configuration File Option Data Formats

The following is a list of the data formats for the DHCP options:

Table 45. Data Formats for DHCP Options

Option	Description
IP Address	A single IP address in dotted-decimal notation
IP Addresses	One or more IP addresses in dotted-decimal notation separated by white spaces
IP Address Pair	Two IP addresses in dotted-decimal notation separated by a single colon
IP Address Pairs	One or more IP address pairs, each pair separated from another by a white space
Boolean	0 or 1
Byte	A decimal number between -128 and 127 (inclusive)
Unsigned Byte	A decimal number between 0 and 255 (inclusive). You cannot specify a negative value for an unsigned byte.
Unsigned Bytes	One or more decimal numbers between 0 and 255 (inclusive) separated by white spaces. You cannot specify a negative number for an unsigned byte.
Short	A decimal number between -32768 and 32767 (inclusive)
Unsigned Short	A decimal number between 0 and 65535 (inclusive). You cannot specify a negative number for an unsigned short.
Unsigned Shorts	One or more decimal numbers between 0 and 65535 (inclusive) separated by spaces. You cannot specify a negative number for an unsigned short.
Long	A decimal number between -2147483648 and 2147483647 (inclusive)
Unsigned Long	A decimal number between 0 and 4294967295 (inclusive). You cannot specify a negative number for an unsigned long.
String	A string of characters. If embedded spaces are used, the string must be enclosed in double quotes.

Table 45. Data Formats for DHCP Options (continued)

Option	Description
N/A	Indicates no specification is needed because the client generates this information

Option Categories

The DHCP options are divided into the following categories:

- Base Options (see Table 46)
- IP Layer Parameters per Host Options (see Table 47 on page 202)
- IP Layer Parameters per Interface Options (see Table 48 on page 203)
- Link Layer Parameters per Interface Options (see Table 49 on page 203)
- TCP Parameter Options (see Table 50 on page 204)
- Application and Service Parameter Options (see Table 51 on page 204)
- DHCP Extensions Options (see Table 52 on page 206)
- Load Balancing Options (see Table 53 on page 211)
- IBM-Specific Options (see Table 54 on page 212)

Table 46. Base Options

Option	Description	Data Format
0, Pad	Causes subsequent fields to align on word boundaries.	
1, Subnet Mask	The client's subnet mask, specified in 32-bit dotted decimal notation.	IP address
2, Time Offset	The offset (in seconds) of the client's subnet from Universal Time Coordinated (UTC). The offset is a signed 32-bit integer.	Long
3, Router	IP addresses (in order of preference) of the routers on the client's subnet.	IP addresses
4, Timer Server	IP addresses (in order of preference) of the time servers available to the client.	IP addresses
5, Name Server	IP addresses (in order of preference) of the IEN 116 name servers available to the client.	IP addresses
6, Domain Name Server	IP addresses (in order of preference) of STD 13 name servers available to the client.	IP addresses
7, Log Server	IP addresses (in order of preference) of the MIT-LCS UDP log servers available to the client.	IP addresses

Table 46. Base Options (continued)

Option	Description	Data Format
8, Cookie Server	IP addresses (in order of preference) of the Cookie or quote-of-the-day servers available to the client.	IP addresses
9, LPR Server	<p>This option can be specified at both the DHCP client and DHCP server. However, if specified only at the DHCP client, the configuration will be incomplete.</p> <p>IP addresses (in order of preference) of the line printer servers available to the client. Option 9 eliminates the need for the client to specify the LPR_SERVER environment variable.</p>	IP addresses
10, Impress Server	IP addresses (in order of preference) of the Imagn Impress servers available to the client.	IP addresses
11, Resource Location Server	IP addresses (in order of preference) of the Resource Location (RLP) servers available to the client. RLP servers allow clients to locate resources that provide a specified service, such as the Domain Name Server.	IP addresses
12, Host Name	<p>This option can be specified at both the DHCP client and DHCP server. If the DHCP client does not provide a host name, the DHCP server does nothing with Option 12.</p> <p>Host name of the client (which may include the local domain name). The minimum length for the host name option is 1 octet and the maximum is 32 characters. See RFC 1035 for character set restrictions.</p>	String
13, Boot File Size	The length (in 512-octet blocks) of the default boot configuration file for the client.	Unsigned short
14, Merit Dump File	The path name of the merit dump file in which the client's core image is stored if the client crashes. The path is formatted as a character string consisting of characters from the Network Virtual Terminal (NVT) ASCII character set. The minimum length is 1 octet.	String

Table 46. Base Options (continued)

Option	Description	Data Format
15, Domain Name	This option specifies the domain name that that client should use when resolving host names using the Domain Name System. This option can be specified at both the DHCP client and DHCP server.	String
16, Swap Server	IP address of the client's swap server.	IP address
17, Root Path	Path that contains the client's root disk. The path is formatted as a character string consisting of characters from the NVT ASCII character set. The minimum length is 1 octet.	String
18, Extensions Path	The extensions path option allows you to specify a string that can be used to identify a file that is retrievable using Trivial File Transfer Protocol (TFTP). The minimum length is 1 octet.	String

Table 47. Options Affecting the Operation of the IP Layer on a Per Host Basis

Option	Description	Data Format
19, IP Forwarding	Enable (1) or disable (0) forwarding by the client of its IP layer packets.	Boolean
20, Non-Local Source Routing	Enable (1) or disable (0) forwarding by the client of its IP layer datagrams with nonlocal source routes. The length is 1 octet.	Boolean
21, Policy Filter	IP address-net mask pair used to filter datagrams with nonlocal source routes. Any datagram whose next hop address does not match one of the filter pairs is discarded by the client. The minimum length for the policy filter option is 8 octets.	IP address pair
22, Maximum Datagram Reassembly Size	Maximum size datagram the client will reassemble. The minimum value is 576.	Unsigned short
23, Default IP Time-To-Live	Default time-to-live (TTL) the client uses on outgoing datagrams. TTL is an octet with a value between 1 and 255.	Unsigned byte
24, Path MTU Aging Timeout	Timeout in seconds used to age Path Maximum Transmission Unit (MTU) values discovered by the mechanism that is described in RFC 1191.	Unsigned long

Table 47. Options Affecting the Operation of the IP Layer on a Per Host Basis (continued)

Option	Description	Data Format
25, Path MTU Plateau Table	Table of MTU sizes to use in Path MTU discover as defined in RFC 1191. The minimum MTU value is 68. The minimum length for the path MTU plateau table option is 2 octets. The length must be a multiple of 2.	Unsigned shorts

Table 48. IP Layer Parameters per Interface Options

26, Interface MTU	Maximum Transmission Unit (MTU) to use on this interface. The minimum MTU value is 68.	Unsigned short
27, All Subnets are Local	Client assumes (1) or does not assume (0) that all subnets use the same Maximum Transmission Unit (MTU). A value of 0 means the client assumes that some subnets have smaller MTUs.	Boolean
28, Broadcast Address	Broadcast address used on the client's subnet.	IP address
29, Perform Mask Discovery	Client performs (1) or does not perform (0) subnet mask discovery using Internet Control Message Protocol (ICMP).	Boolean
30, Mask Supplier	Client responds (1) or does not respond (0) to subnet mask requests using Internet Control Message Protocol (ICMP).	Boolean
31, Perform Router Discovery	Client solicits (1) or does not solicit (0) routers using router discovery as defined in RFC 1256.	Boolean
32, Router Solicitation Address	Address to which a client transmits router solicitation requests.	IP address
33, Static Route	Static routes (destination address-router pairs in order of preference) the client installs in its routing cache. The first address is the destination address and the second address is the router for the destination. Do not specify 0.0.0.0 as a default route destination.	IP address pairs

Table 49. Link Layer Parameters per Interface Options

34, Trailer Encapsulation	Client negotiates (1) or does not negotiate (0) the use of trailers (RFC 893) when using Address Resolution Protocol (ARP).	Boolean
35, ARP Cache Timeout	Timeout in seconds for Address Resolution Protocol (ARP) cache entries.	Unsigned long

Table 49. Link Layer Parameters per Interface Options (continued)

36, Ethernet Encapsulation	For an Ethernet interface, the client uses IEEE 802.3 (1) Ethernet encapsulation described in RFC 1042 or Ethernet V2 (0) encapsulation described in RFC 894.	Boolean
----------------------------	---	---------

Table 50. TCP Parameter Options

37, TCP Default TTL	Default time-to-live (TTL) the client uses for sending TCP segments.	Unsigned byte
38, TCP Keep-alive Interval	Interval in seconds the client waits before sending a keep-alive message on a TCP connection. A value of 0 indicates that the client does not send keep-alive messages unless requested by the application.	Unsigned long
39, TCP Keep-alive Garbage	Client sends (1) or does not send (0) TCP keep-alive messages that contain an octet of garbage for compatibility with previous implementations.	Boolean

Table 51. Application and Service Parameter Options

40, Network Information Service Domain	The client's Network Information Service (NIS) domain. The domain is formatted as a character string consisting of characters from the NVT ASCII character set. The minimum length is 1 octet.	String
41, Network Information Servers	IP addresses (in order of preference) of Network Information Service (NIS) servers available to the client.	IP addresses
42, Network Time Protocol Servers	IP addresses (in order of preference) of Network Time Protocol (NTP) servers available to the client.	IP addresses
43, Vendor-Specific Information	Option 43 is specified only at the DHCP server, which returns this option as an encapsulated packet to a client that sends Option 60 (Class Identifier). Clients and servers use this information option to exchange vendor-specific information. This option allows for expansion of the number of options that can be supported.	String
44, NetBIOS over TCP/IP Name Server	IP addresses (in order of preference) of NetBIOS name servers (NBNS) available to the client.	IP addresses
45, NetBIOS over TCP/IP Datagram Distribution Server	IP addresses (in order of preference) of NetBIOS datagram distribution (NBDD) name servers available to the client.	IP addresses

Table 51. Application and Service Parameter Options (continued)

46, NetBIOS over TCP/IP Node Type	Node type used for NetBIOS over TCP/IP configurable clients as described in RFC 1001/1002. Values to specify client types include: <table><tr><th>Value</th><th>Node Type</th></tr><tr><td>0x1</td><td>B-node</td></tr><tr><td>0x2</td><td>P-node</td></tr><tr><td>0x4</td><td>M-node</td></tr><tr><td>0x8</td><td>H-node</td></tr></table>	Value	Node Type	0x1	B-node	0x2	P-node	0x4	M-node	0x8	H-node	Unsigned byte
Value	Node Type											
0x1	B-node											
0x2	P-node											
0x4	M-node											
0x8	H-node											
47, NetBIOS over TCP/IP Scope	NetBIOS over TCP/IP scope parameter for the client, as specified in RFC 1001/1002. The minimum length is 1 octet.	Unsigned byte										
48, X Window System Font Server	IP addresses (in order of preference) of X Window System font servers available to the client.	IP addresses										
49, X Window System Display Manager	IP addresses (in order of preference) of systems running X Window System Display Manager available to the client.	IP addresses										
64, NIS Domain Name	Network Information Service (NIS)+ client domain name. The domain is formatted as a character string consisting of characters from the NVT ASCII character set. Its minimum length is 1.	String										
65, NIS Servers	IP addresses (in order of preference) of Network Information Service (NIS)+ servers available to the client.	IP addresses										
68, Home Address	IP addresses (in order of preference) of the mobile IP home agents available to the client. This option enables a mobile host to derive a mobile home address and determine the subnet mask for the home network. The usual length is four octets, containing a single home agent's home address.	IP addresses										
69, SMTP Servers	IP addresses (in order of preference) of the Simple Mail Transfer Protocol (SMTP) servers available to the client.	IP addresses										
70, POP3 Server	IP addresses (in order of preference) of the Post Office Protocol (POP) servers available to the client.	IP addresses										

Table 51. Application and Service Parameter Options (continued)

71, NNTP Server	IP addresses (in order of preference) of the Network News Transfer Protocol (NNTP) servers available to the client, for example: option 71 192.24.112.2	IP addresses
72, WWW Server	IP addresses (in order of preference) of the World Wide Web (WWW) servers available to the client.	IP addresses
73, Finger Server	IP addresses (in order of preference) of the Finger servers available to the client.	IP addresses
74, IRC Server	IP addresses (in order of preference) of the Internet Relay Chat (IRC) servers available to the client.	IP addresses
75, StreetTalk Server	IP addresses (in order of preference) of the StreetTalk servers available to the client.	IP addresses
76, STDA Server	IP addresses (in order of preference) of the StreetTalk Directory Assistance servers available to the client.	IP addresses

Table 52. DHCP Extensions Options

50, Requested IP Address	This option is specified only at the DHCP client. The DHCP server can refuse a DHCP client request for a specific IP address. Allows the client to request (DHCPDISCOVER) a particular IP address.	N/A
51, IP Address Lease Time	This option can be specified at both the DHCP client and DHCP server. The DHCP client can use Option 51 to override the defaultLeaseInterval value the DHCP server offers. Allows the client to request (DHCPDISCOVER or DHCPREQUEST) a lease time for an IP address. In a reply (DHCPOFFER), a DHCP server uses this option to offer a lease time.	Unsigned long

Table 52. DHCP Extensions Options (continued)

52, Overload	<p>This option indicates that the DHCP sname or file fields are being overloaded by using them to carry DHCP options. A DHCP server inserts this option if the returned parameters exceeds the usual space allotted for options. Values for this option are:</p> <ul style="list-style-type: none"> 1 Use the file field to hold options. 2 Use the sname field to hold options. 3 Use both the file and the sname fields to hold options. 	
66, Server Name	Trivial File Transfer Protocol (TFTP) server name used when the "sname" field in the DHCP header has been used for DHCP options.	String
67, Boot File Name	<p>Name of the boot file when the 'file' field in the DHCP header has been used for DHCP options. The minimum length is 1.</p> <p>Note: Use this option to pass a boot file name to a DHCP client. The boot file name is required to contain the fully-qualified path name and be less than 128 characters in length, for example:</p> <p>option 67 c:\usr\lpp\nstation\standard\kernel</p> <p>This file contains information that can be interpreted in the same way as the 64-octet vendor-extension field within the BOOTP response, with the exception that the file length is limited to 128 characters by the BOOTP header.</p>	String

Table 52. DHCP Extensions Options (continued)

53, DHCP Message Type	<p>This options identifies the DHPS message type. Values for this options are:</p> <p>1 DHCPDISCOVER</p> <p>2 DHCPOFFER</p> <p>3 DHCPREQUEST</p> <p>4 DHCPDECLINE</p> <p>5 DHCPACK</p> <p>6 DHCPNAK</p> <p>7 DHCPRELEASE</p> <p>8 DHCPINFORM</p>	
54, Server-Identifier	<p>DHCPOFFER and DHCPREQUEST messages use this option, and the DHCPACK and DHCPNAK messages can optionally use this option. DHCP servers include this option in DHCPOFFER to allow the client to distinguish between lease offers. DHCP clients use the contents of the server identifier field as the destination address for any DHCP messages unicast to the DHCP server. DHCP clients use this option in a DHCPREQUEST message to indicate which lease offers are being accepted.</p>	
55, Parameter Request List	<p>DHCP clients use this option to request values for specified configuration parameters. The list of requested parameters is specified as <i>n</i> octets. Each octet is a valid DHCP option code. The DHCP client may list the options in order of preference. The DHCP server is not required to return the options in the requested order, but must try to insert the requested options in the order requested by the client.</p>	
56, Message	<p>A DHCP server uses this option to provide an error message to a DHCP client in a DHCPNAK message in the event of a failure. A DHCP client may use this option in a DHCPDECLINE message to indicate why the client declined the offered parameters. The message consists of <i>n</i> octets of NVT ASCII text, which the client displays on an available output device.</p>	String

Table 52. DHCP Extensions Options (continued)

57, DHCP Message Size	The maximum length a DHCP message will accept. The length is specified as an unsigned 16-bit integer. A DHCP client may use this option in DHCPDISCOVER or DHCPREQUEST messages, but should not use this option in DHCPDECLINE messages.	
58, Renewal (T1) Time Value	Interval in seconds between the time the server assigns an address and the time the client moves to the renewing state.	Unsigned long
59, Rebinding (T2) Time Value	Interval in seconds between the time the server assigns an address and the time the client enters the rebinding state.	Unsigned long
60, Vendor Class-Identifier	<p>The DHCP client optionally uses this option to identify the vendor type and configuration of the client.</p> <p>For example, the identifier may encode the client's vendor-specific hardware configuration. The information is a string of n octets interpreted by servers. Vendors may choose to define specific vendor class identifiers to convey particular configuration or other identification information about a client.</p> <p>Servers not equipped to interpret the class-specific information sent by a client must ignore it. The minimum length is 1 octet.</p>	N/A

Table 52. DHCP Extensions Options (continued)

61, Client-Identifier	<p>DHCP clients use this option to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value must be unique for all clients in an administrative domain.</p> <p>The Client-Identifier may consist of type-value pairs. For example, it may consist of a hardware type and hardware address. In this case, the type field should be one of the ARP hardware types defined in STD2 [22]. A hardware type of 0 (zero) should be used when the value field contains an identifier other than a hardware address (for example, a fully qualified domain name).</p> <p>For correct identification of clients, each client's client-identifier must be unique among the client-identifiers used on the subnet to which the client is attached. Vendors and system administrators are responsible for choosing client-identifiers that meet this requirement for uniqueness.</p>	61, Client-Identifier
62, NetWare/IP Domain Name	Netware/IP Domain Name. The minimum length is 1 octet and the maximum length is 255.	String
63, NetWare/IP	<p>A general purpose option code used to convey all the NetWare/IP related information except for the NetWare/IP domain name. A number of NetWare/IP suboptions are conveyed using this option code.</p> <p>The minimum length is 1 and the maximum length is 255.</p>	String
77, User Class	DHCP clients use Option 77 to indicate to DHCP servers what class the host is a member of.	String

Table 52. DHCP Extensions Options (continued)

78, Directory Agent	The Dynamic Host Configuration Protocol provides a framework for passing configuration information to hosts on a TCP/IP network. Entities using the Service Location Protocol need to find out the address of Directory Agents in order to transact messages. In certain other instances, they may need to discover the correct scope and naming authority to be used in conjunction with the service attributes and URLs, which are exchanged using the Service Location Protocol. A directory agent has a particular scope and may have knowledge about schemes defined by a particular naming authority.	IP addresses
79, Service Scope	This extension indicates a scope that should be used by a service agent, when responding to Service Request messages as specified by the Service Location Protocol.	String
80, Naming Authority	This extension indicates a naming authority, which specifies the syntax for schemes that may be used in URLs for use by entities with the Service Location Protocol.	String

DHCP Load Balancing Options

To configure DHCP for load balancing on an OS/390 server, you must define Options 211 through 214. 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 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 53 lists and describes the DHCP load balancing options.

Table 53. DHCP Load Balancing Options

Option	Description	Data Format
211 (Base Code Server Protocol)	Protocol to use for Option 66 (Base Code Server).	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

Table 53. DHCP Load Balancing Options (continued)

Option	Description	Data Format
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.	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.	String

For example,

```
subnet __line
{
  option 211 "nfs"
  option 212 "192.5.179.25"
  option 213 "/usr/lpp/nstation/standard/configs/"
  options 214 "nfs"
}
class IBMNSM 1.0.0
class IBMNSM 2.0.0
vendor IBM Network Station
```

IBM-Specific Options

IBM provides a set of IBM-specific options that fall within nonarchitected Options 128-254, which administrators use to implement site-specific configuration parameters.

Additionally, architected Option 43 allows the definition of encapsulated, vendor-specific options. IBM Corporation, for example, has added the following IBM-specific options, denoted by an IBM-specific file in Option 60.

Table 54. IBM-Specific Options

200, LPR Printer	<p>Eliminates the need for the client to specify the LPR_PRINTER environment variable, which can be the name of a device such as LPT1 or a printer name (queue name) such as Printer.</p> <p>For example, option 200 "lpt1"</p> <p>An OS/2 client stores the updated option value in the TCPOS2.INI file.</p> <p>The length is 1 octet.</p>	String
------------------	---	--------

Options that are encapsulated as vendor-specific information must be carefully defined and documented to permit interoperability between clients and servers from different vendors. Vendors that define vendor-specific information must do the following:

- Document those options in the form that is specified in RFC 2132.
- Choose to represent those options either in data types already defined for DHCP options or in other well-defined data types.
- Choose options that can be readily encoded in configuration files for exchange with servers that are provided by other vendors.
- Be readily supportable by all servers.

Servers that are not equipped to interpret the vendor-specific information that is sent by a client must ignore it.

Clients that do not receive desired vendor-specific information should make an attempt to operate without it. Refer to RFC 2131 and RFC 2132 for additional information about this option.

Hardware Types

The following is a list of hardware types you can specify on the Client statement:

Type	Description
0	Unspecified. If you specify a symbolic name for the client ID, specify 0 for the hardware type.
1	Ethernet (100MB)
6	IEEE 802 Networks (which include 802.5 token ring)

Maintaining the DHCP Server

When you are using Network Station Manager, dadmin is installed in the /usr/lpp/nstation/nsm/sbin directory.

To maintain a running DHCP server, IBM provides the dadmin command to:

- Reinitialize a DHCP server by causing the server to reread its configuration file
- Delete a lease
- Control server tracing
- Display client information
- Display IP address information
- Display server statistics.

Notes:

1. This DHCP server release does not support earlier versions of dadmin clients. A new dadmin client that communicates with both previous and current releases of the DHCP server is provided with this release.

2. Verbose mode provides additional information for debugging purposes. Verbose mode is allowed on any of the following `dadmin` command instances. Verbose is shown as a parameter in those instances where additional, more detailed information is of particular value.

Displaying dadmin Command Syntax

To display information about the command syntax, enter:

```
dadmin -?
```

Reinitializing the Running Server

If you make changes to the configuration file, you will need to reinitialize the running server to put the changes into effect. To reinitialize the server, use the following form of the `dadmin` command:

```
dadmin [[-h]host] -i [-v]
```

-h specifies the host

host

is the IP address or host name of the DHCP server. If no server is specified, the local server is assumed.

-i reinitializes the specified server.

-v runs the command in verbose mode.

Displaying Client Information

To display information for a client ID, use the following form of the `dadmin` command:

```
dadmin -cvalue [-v]
```

-c requests information for one or more clients that match this client ID.

value

is the client ID MAC address. For example, enter 004ac77150fc. Information is returned for any matching hardware type.

-v runs the command in verbose mode.

Displaying IP Address Information

To display information for one IP address, use the following form of the `dadmin` command:

```
dadmin -qn.n.n.n [-v]
```

-q requests the IP address information.

n.n.n.n

is the IP address of the client.

-v runs the command in verbose mode.

Querying an Address Pool

To display information for a pool of IP addresses, use the following form of the `dadmin` command:

`dadmin -pn.n.n.n [-v]`

-p requests the address pool information.

n.n.n.n

is the IP address of the address pool.

-v runs the command in verbose mode.

Controlling Server Tracing

To start and stop tracing on the DHCP server, use the following form of the `dadmin` command:

`dadmin -tvalue [-v]`

-t specifies server tracing.

value

is the value ON to start tracing or OFF to stop tracing.

-v runs the command in verbose mode.

Displaying Server Statistics

To display statistics information about the pool of addresses that are administered by the server, use the following form of the `dadmin` command:

`dadmin[[-h]host] -nvalue [-v]`

-h specifies the host

host

is the IP address of the DHCP server. If no host is specified, the local server is assumed.

-n requests statistics for the server that is specified as *host*.

value

is a decimal integer from 0 to 100 that indicates the number of intervals. For example, a value of three returns a summary record that includes totals information, the current interval record, and the 3 most recent history records. A value of 0 returns a summary record of activity since the last summary.

-v runs the command in verbose mode.

Statistics include:

- Discover packets that are processed
- Discover packets with no response
- Offers that are made
- Leases that are granted
- Negative acknowledgements (NAKs)
- Informs that are processed, including informs plus acknowledgements (ACKs)
- Renewals
- Releases
- BOOTP clients processed
- proxyARec updates attempted
- Unsupported packets
- Monitor requests processed

For more information on defining statistics snapshots, see 197

Deleting Leases

If you find that an assigned lease is not being used and you want to make the IP address available for allocation, you can delete the lease. You can only delete one lease at a time. You will be prompted to confirm deletion of the lease. To delete the lease, use the following form of the `dadmin` command:

`dadmin [-f] [-v] [[-h]host]-dip_address`

-f forces deletion of the lease without prompting.

-v runs the command in verbose mode.

-h specifies the host

host

is the IP address of the DHCP server. If no server is specified, the local server is assumed.

-d deletes the lease for the specified IP address.

ip_address

is the IP address for the lease to be deleted

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 55 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.

Table 55. Applications and Datastreams

Application Name	PostScript Datastream	PCL Datastream
5250 Session	X	X
3270 Session	X	X
NC Navigator	X	
Lotus eSuite WorkPlace	X	

Configuring Basic Printer Scenarios

Table 56 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 56. Configuration Descriptions for Basic Printer Scenarios

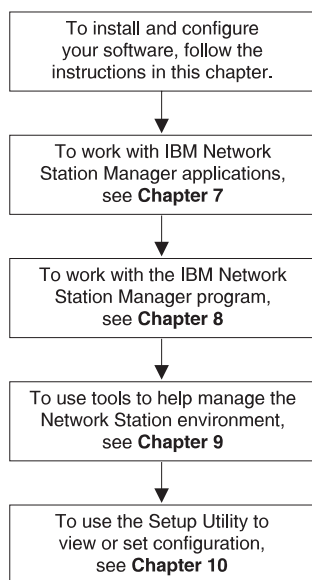
Desired Print Scenario	Configuration Instructions
Network Station to a LAN printer	In the Network Station Manager program, configure an entry in the <i>Remote Printer Server</i> field for the LAN printer.
Network Station to a locally attached printer	In the Network Station Manager program, configure an entry in the <i>Local Parallel Printer</i> or the <i>Local Serial Printer</i> 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 <i>Remote Printer Server</i> field with the IP address of the Network Station to which the printer is attached. In the <i>Queue name</i> field, type PARALLEL1 or SERIAL1, depending on how the printer connects to the Network Station.

Chapter 6. Installing and Configuring an IBM Network Station Environment on a VM/ESA Server

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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.



RV4V047-1

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.

Verify that your IBM Network Stations have the amount of memory they need to run the applications your users expect.

Each of the applications that are downloaded to the IBM Network Station requires memory. Use Table 6 on page 17 as a guide to determine how much memory each IBM Network Station should have. Each Network Station must download the Base System.

___ 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 14 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 57 to determine which boot method fits your needs and operating system.

Table 57. 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 58. 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 222 . Otherwise, complete the following table.

Table 59. VM/ESA Host Information Chart


Field	Description	Write Value Here
 VM/ESA IP Address	<p>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.</p> <p>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.</p>	

Table 59. 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 223. Otherwise, complete the following table.

For each LAN that is attached to your VM/ESA, you should duplicate and complete a copy of Table 60.

Table 60. 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 60. 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 221. 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 61.

Table 61. 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 57 on page 221, 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 225.
- If you choose to use the NVRAM boot method, go to step 8 on page 229.

___ 6. Gather information for a new BOOTP environment.

Use this section to gather information to configure a new BOOTP environment. Use Table 62 on page 224 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 62 on page 224 for each LAN adapter with attached Network Stations.

Table 62. 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: <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> • 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. 	

Table 62. BOOTP Network Station Information (continued)

Field	Description	Write Value Here
5 Gateway IP Address for Remote LANs	<p>If you do not use a gateway IP address for remote LANs, disregard this field.</p> <p>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.</p> <p>In Figure 5 on page 7, the gateway IP address for Network Station ns3.mycompany.com is 10.1.1.1.</p>	
6 Subnet Mask for Remote LANs	If you do not use a gateway IP address for remote LANs, disregard this field.	
7 Boot Type	The boot type is a constant. <i>IBMNSM</i> identifies this network device as a Network Station.	<i>IBMNSM</i>
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, <i>kernel</i> , is a constant.	<p><i>kernel</i></p> <p>The boot file name is case sensitive.</p>
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.	<p><i>/../VMBFS:VMSYSU:QIBM/ProdData/NetworkStation/</i></p> <p>The boot file path is case sensitive.</p>

Use Table 63 to define any additional Network Stations for the BOOTP table.

Table 63. 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 229.

___ 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 64 on page 226 to collect the necessary data for the DHCP global information.

Table 64. 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
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 23 . Record the class names here.	

Table 65 helps you collect the values to define a subnet in your DHCP environment. For each subnet you wish to define, copy and complete Table 65.

Table 65. 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 355 for twinaxial considerations and "Subnets and Subnet Masks" on page 9.	Yes or No

Table 65. 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 65. 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: <ul style="list-style-type: none"> • 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.	

Table 65. DHCP Subnet Information (continued)

Field	Description	Write Value Here
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.	
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 65 on page 226. 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 221, 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 309, then return to step 14 on page 231 .

___ 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 235.

- ___ 14. Configure the Trivial File Transfer Protocol daemon (TFTPD) server.

The TFTP server transfers files between the Byte File System (BFS) and the TFTP clients. TFTP supports access to files in a BFS directory structure that are mounted during initialization.

To configure the TFTP server, follow these steps:

- ___ a. Update the TCP/IP server configuration file.
- ___ b. Update the DTCPARMS file for TFTP.
- ___ c. Review and address additional configuration considerations.
- ___ d. Create the TFTP PERMLIST data file.
- ___ e. Create the TFTP USERLIST data file.

For details on configuring the TFTP server and using the TFTP 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 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.

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 233 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 66 provides the shortest abbreviation and a description for each NSLD subcommand.

Table 66. 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 274.
- 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 309 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 237
 - “Chapter 8. Using the IBM Network Station Manager Program” on page 255
 - “Chapter 10. Working With the IBM Network Station Setup Utility” on page 309

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 67 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 67. 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 69 on page 253 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 68 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 68. 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 <i>Remote Printer Server</i> field for the LAN printer.
Network Station to a locally attached printer	1. In the Network Station Manager program, configure an entry in the <i>Local Parallel Printer</i> or the <i>Local Serial Printer</i> 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 <i>Remote Printer Server</i> field with the IP address of the Network Station to which the printer is attached. In the <i>Queue name</i> 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

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Logging On

After you power on your IBM Network Station network computer, the login screen appears. Figure 39 on page 238 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 39. 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 40 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 40. 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 41 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 255 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 41. 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 281 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 42.

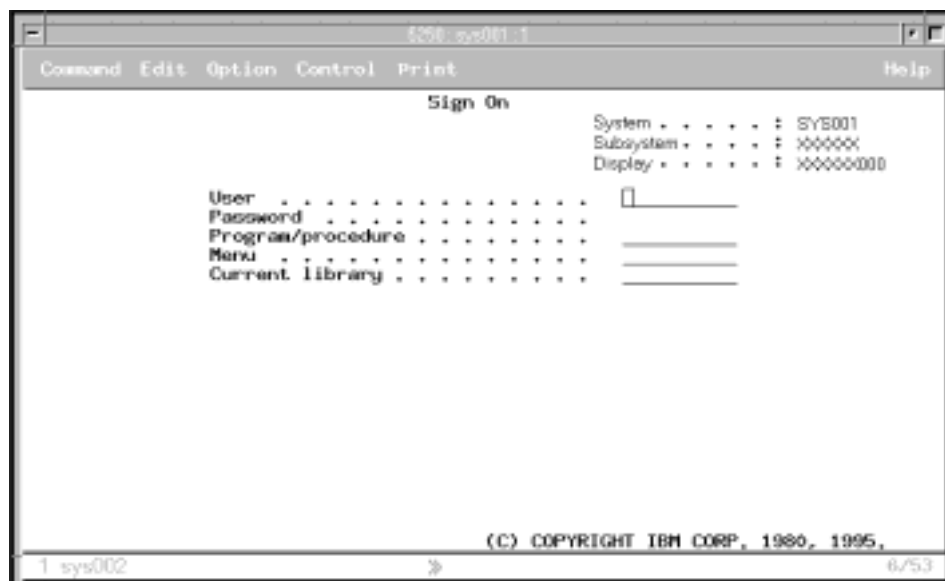


Figure 42. 5250 Session Display

If you click the 5250 button within the Network Station Menu bar, a New 5250 Session window appears. See Figure 43 on page 241.

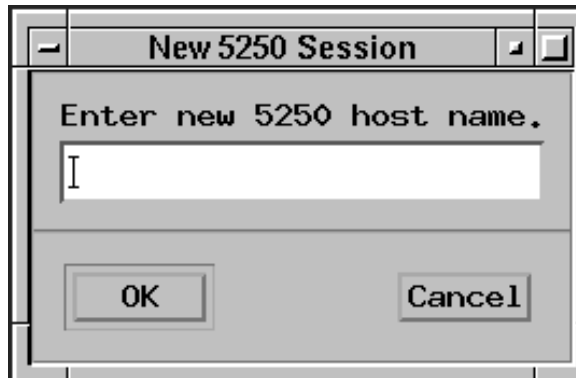


Figure 43. New 5250 Session Dialog Box

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 44 on page 242.

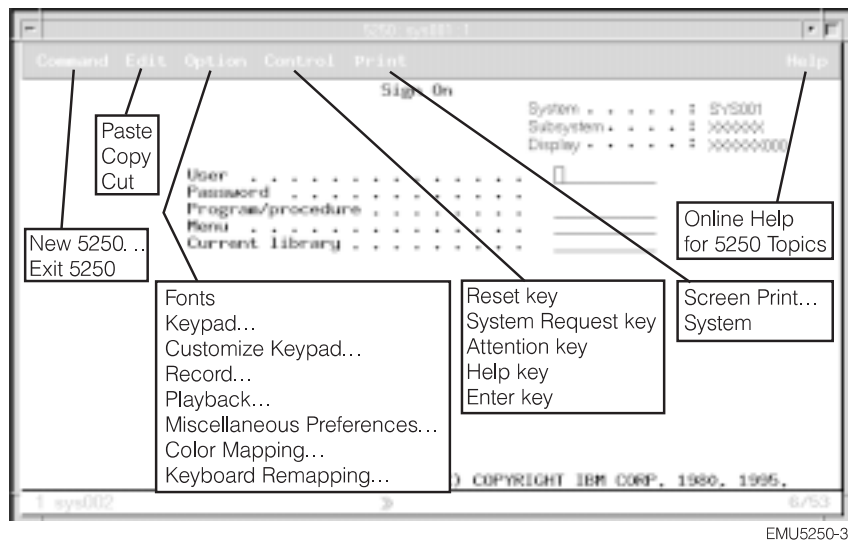


Figure 44. 5250 Emulation Session with Expanded Pulldowns

Pulldowns are available to allow you to quickly access 5250 emulation functions. See Figure 44. 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 remapping³
- Color mapping (basic and advanced)³
- Record/playback capability³
- Autostart of playback file (from the Record/playback function)³
- Auto-logon³
- User customized keypads³
- 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 function³
- Hotspot support
- Cursor style options (Cursor style options are block, underscore, blink, and no blink.)

3. The IBM Network Station Manager program controls these 5250 Emulation functions. See "Chapter 8. Using the IBM Network Station Manager Program" on page 255 for more information. The online help information in the IBM Network Station Manager program provides more information along with all default settings.

- Rule line support
- Row indicator and column indicator
- Customizable window title³
- 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 371 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.

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 45 on page 244.

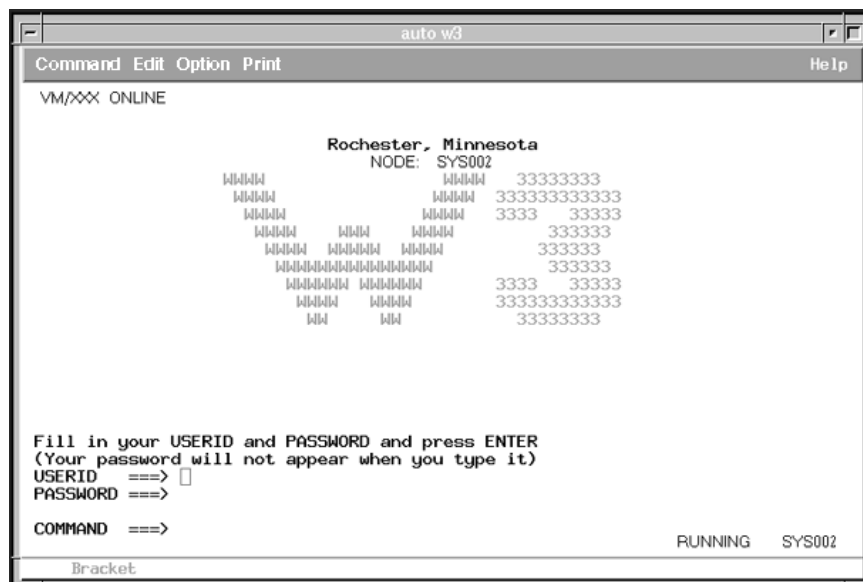


Figure 45. 3270 Session Display

If the 3270 session was configured not to autostart, and you click the 3270 button on the Menu bar, a New 3270 Session window appears. See Figure 46.

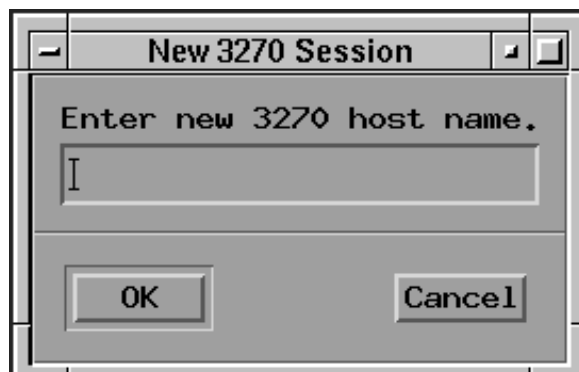


Figure 46. New 3270 Session Dialog Box

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 47:

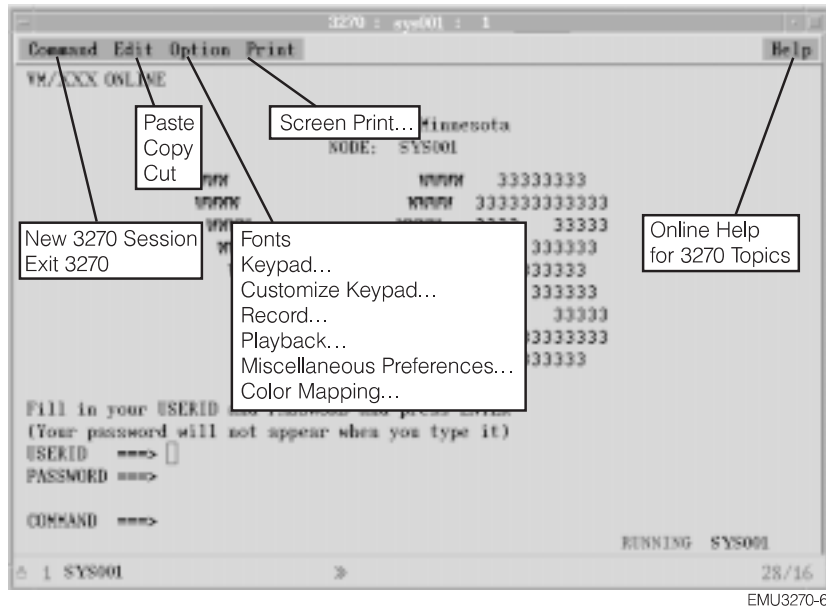


Figure 47. 3270 Emulation Session with Expanded Pulldowns

Figure 47 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 remapping⁴
- Color mapping⁴

4. The IBM Network Station Manager program controls these 3270 emulation functions. See "Chapter 8. Using the IBM Network Station Manager Program" on page 255 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.

- Record/playback⁴
- Autostart of playback file (from the Record/playback function)⁴
- Auto-logon⁴
- User customized keypads⁴
- Graphics support⁴
- Choosing an Enter key location⁴
- Screen size support (for example: 24 x 80, 32 x 80, 43 x 80, and 27 x 132)⁴
- Cut/Copy/Paste function⁴
- Auto action (hotspot support)
- Cursor style options (The cursor style options are block or underscore and blink or no blink.)⁴
- Rule line⁴
- Row and column indicator⁴
- Customizable window title⁴

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 371 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.

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 255 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 48 on page 247.

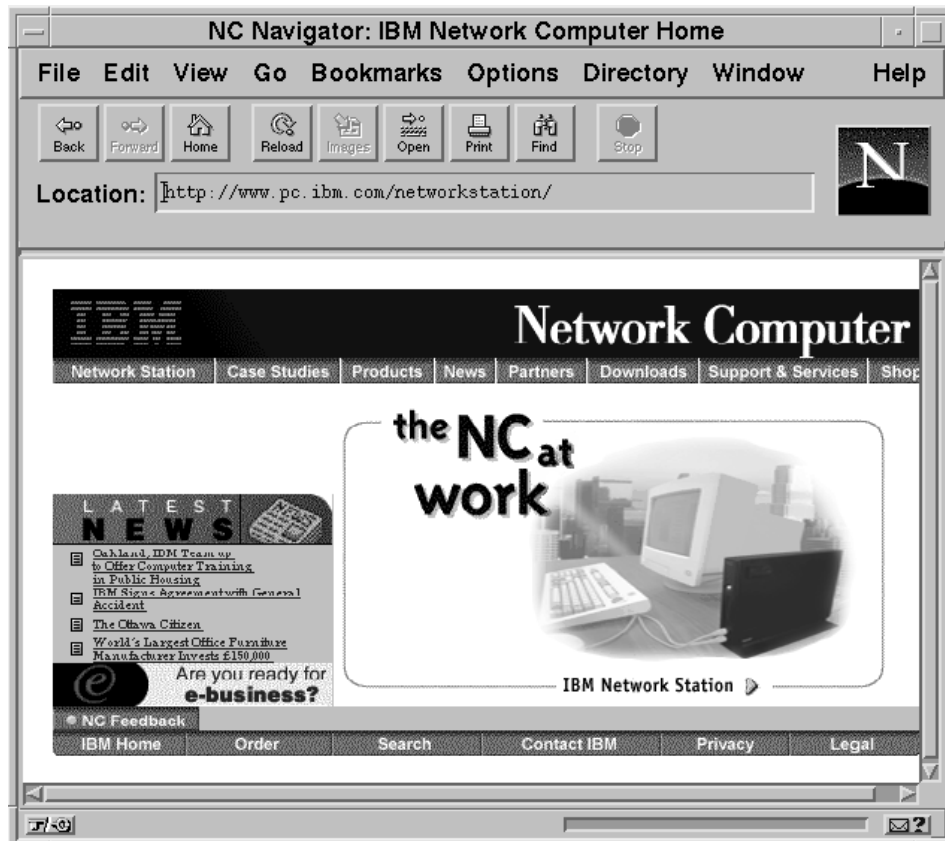


Figure 48. NC Navigator Browser Session Display

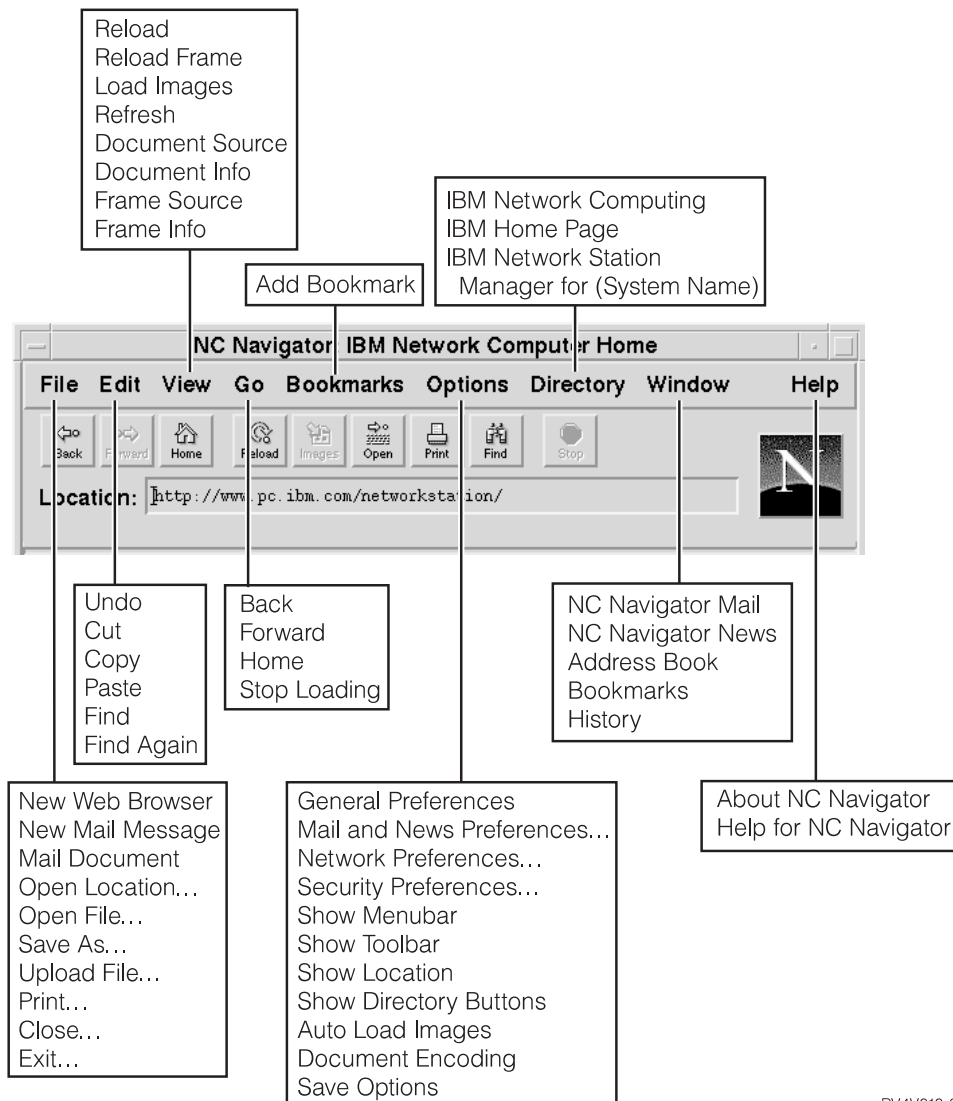
If you did not configure NC Navigator to autostart, and you click the **NC Navigator** button within the Menu bar, an NC Navigator session will appear. Depending on the volume of network traffic, you can expect it to take from several seconds to a minute for the *NC Navigator* screen to appear.

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 294 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 371 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 49.



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Figure 49. NC Navigator Browser with Extended Pulldowns

Figure 49 on page 248 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

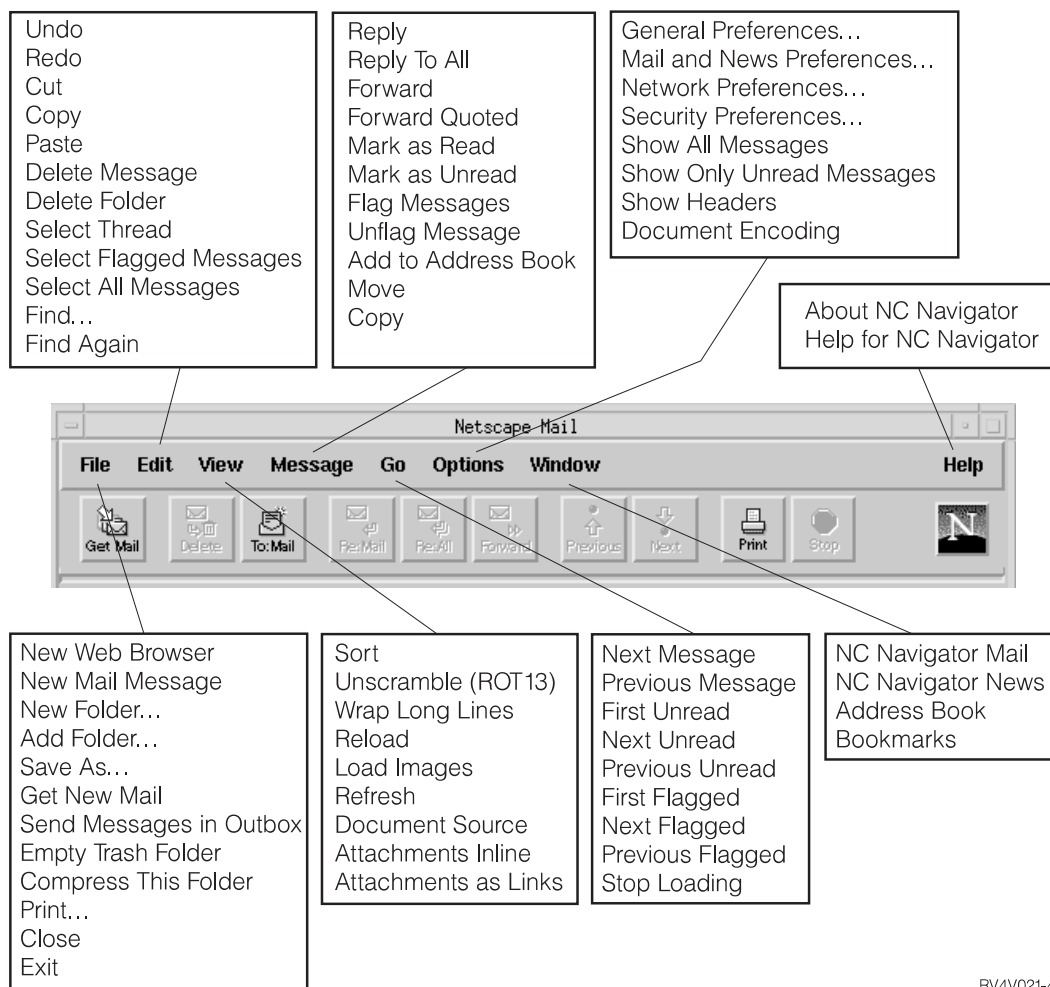
Directory buttons provide quick access to frequently used URLs.

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 83 on page 294 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 50 on page 250.



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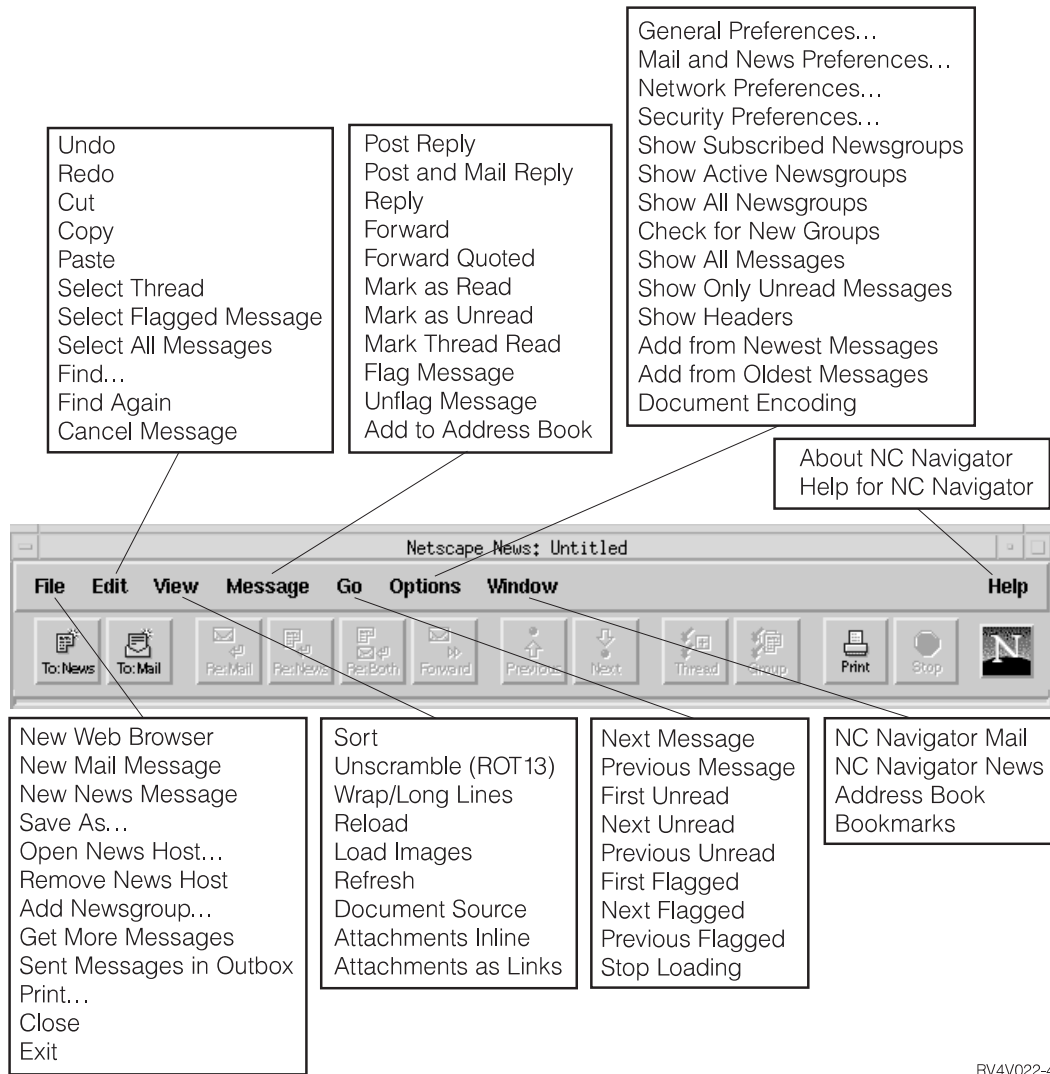
Figure 50. NC Navigator Mail with Extended Pulldowns

Figure 50 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 51.



RV4V022-4

Figure 51. NC Navigator News with Extended Pulldowns

Figure 51 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 using the Network Station Manager program.

See “Setting the Time Zone (TZ) Environment Variable” on page 284 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 69 shows the supported datastreams for each application.

Table 69. Applications and Datastreams

Default Application Name	PostScript Datastream	PCL Datastream
5250 Session	X	X
3270 Session	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 236 for VM/ESA.
- See “Configuring Printers on an AS/400” on page 126 for AS/400.
- See “Configuring Printers on Windows NT” on page 78 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 255 contains two examples about using printers with Network Stations:

1. "Configuring a Local Area Network Attached Printer" on page 278
2. "Configuring a Network Station-Attached Printer for Other Users" on page 279

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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 52 on page 257 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.

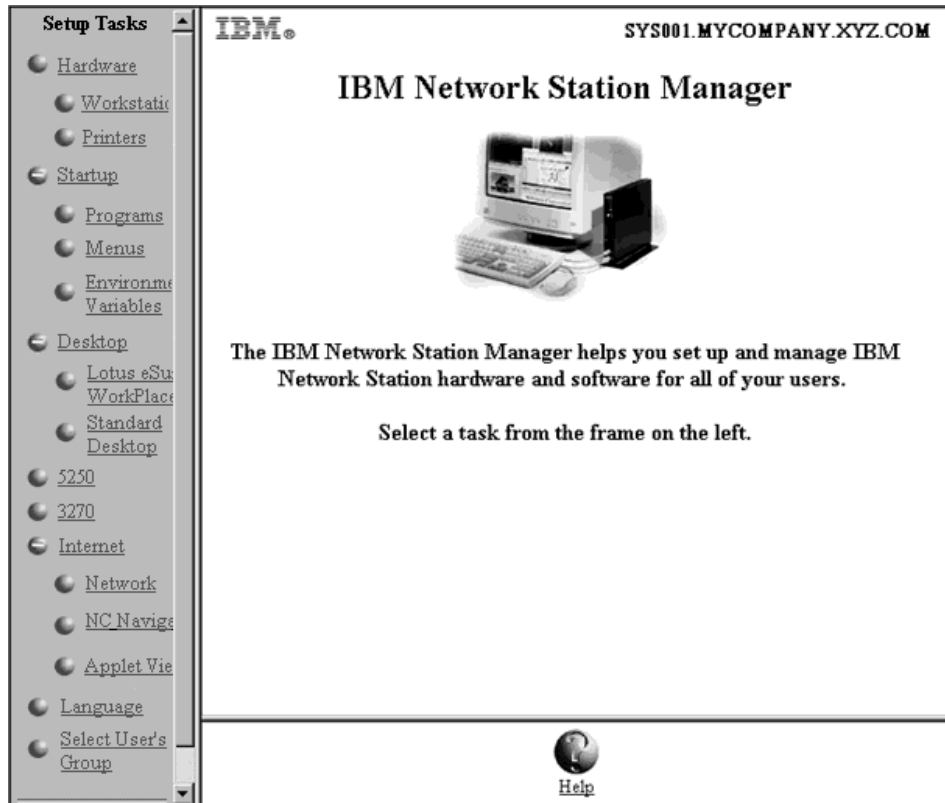


Figure 52. Network Station Manager Program Main Screen

Figure 53 on page 258 provides an expanded list of Setup Tasks that you can manage with the IBM Network Station Manager program:

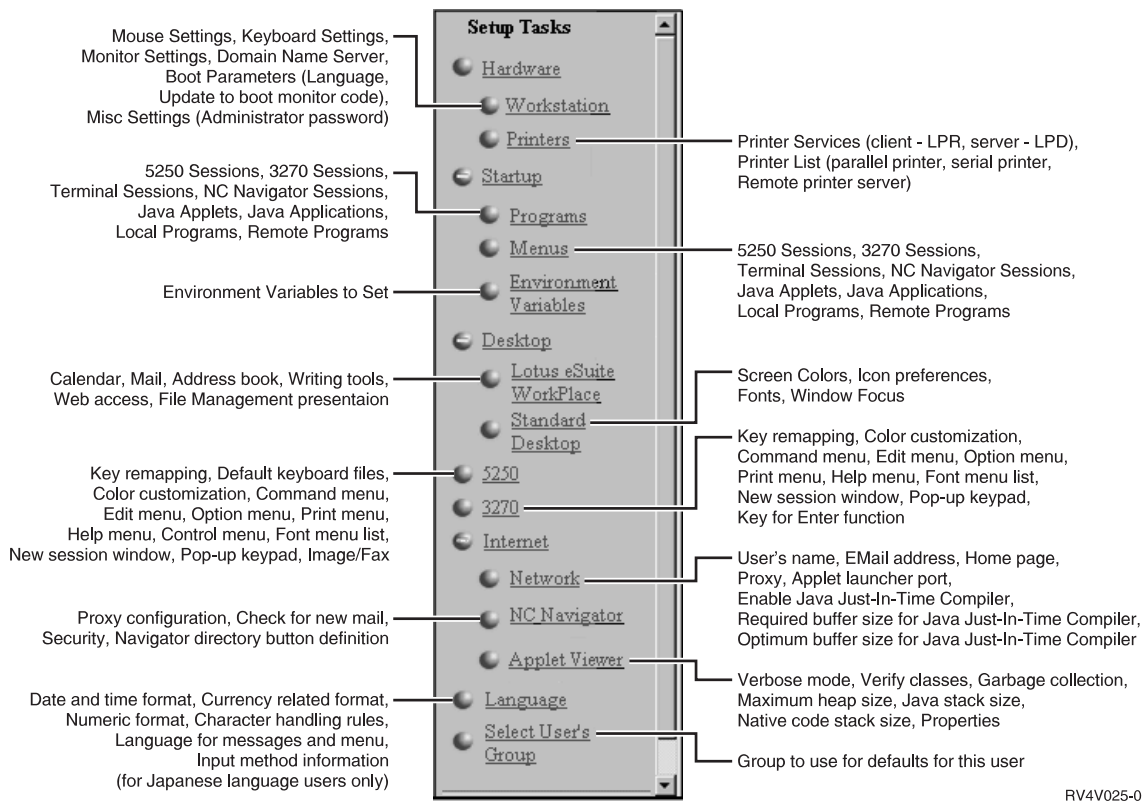
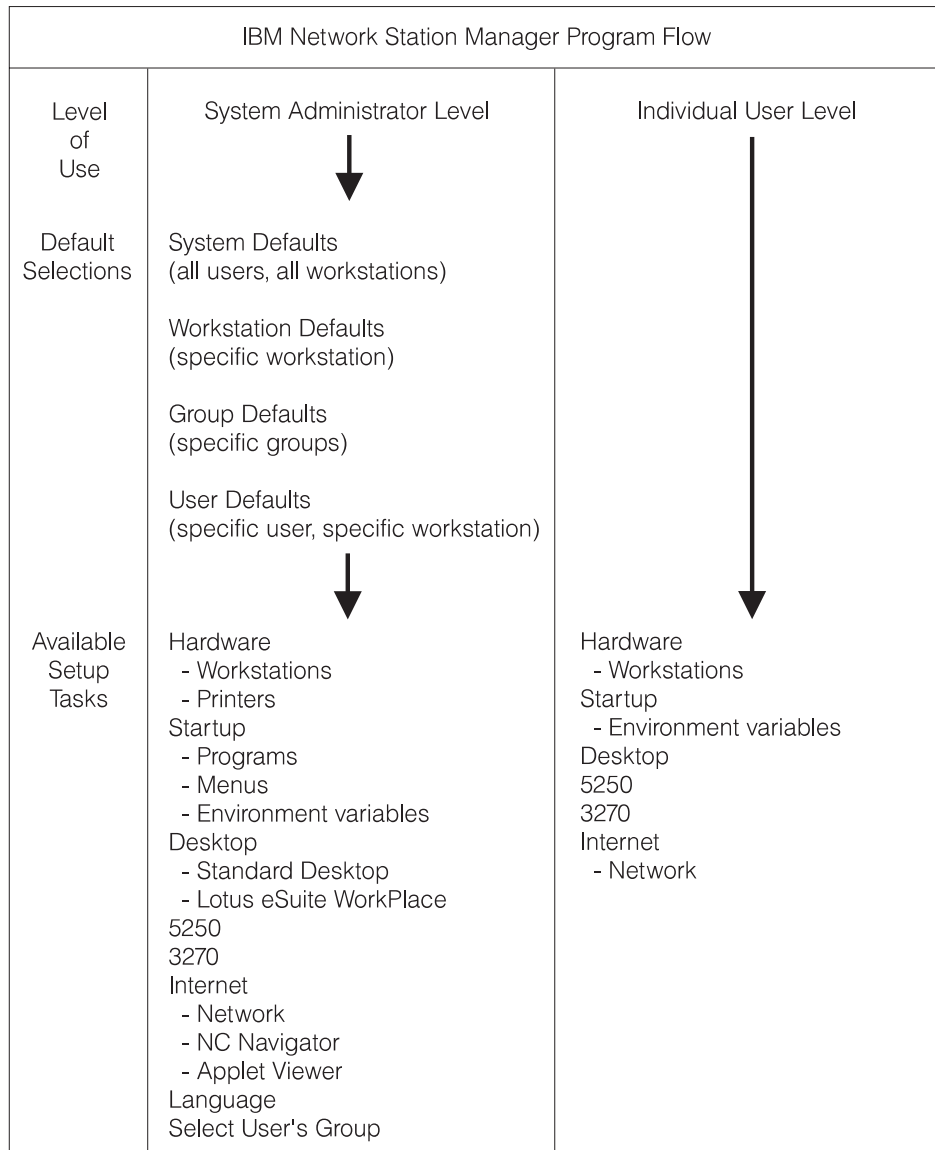


Figure 53. Setup Tasks Supported by the IBM Network Station Manager Program

IBM Network Station Manager Program Flow

Figure 54 on page 259 provides a graphical view of how the IBM Network Station Manager program flows. Take a moment to study Figure 54 on page 259; it highlights the differences between the defaults and setup tasks that a system administrator and end user can work with.



RV4V005-6

Figure 54. IBM Network Station Manager Program Flow

Who Can Use the IBM Network Station Manager Program?

Figure 54, 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 266.

Figure 55 on page 261 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.

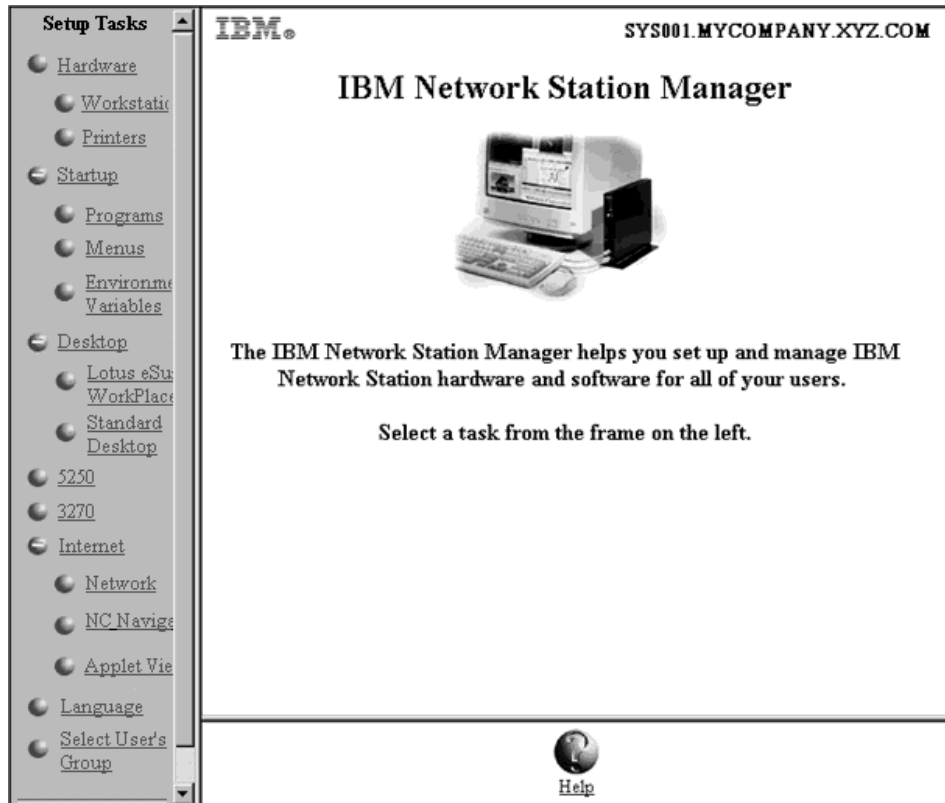


Figure 55. System Administrator Level

Figure 56 on page 262 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 56 on page 262 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.

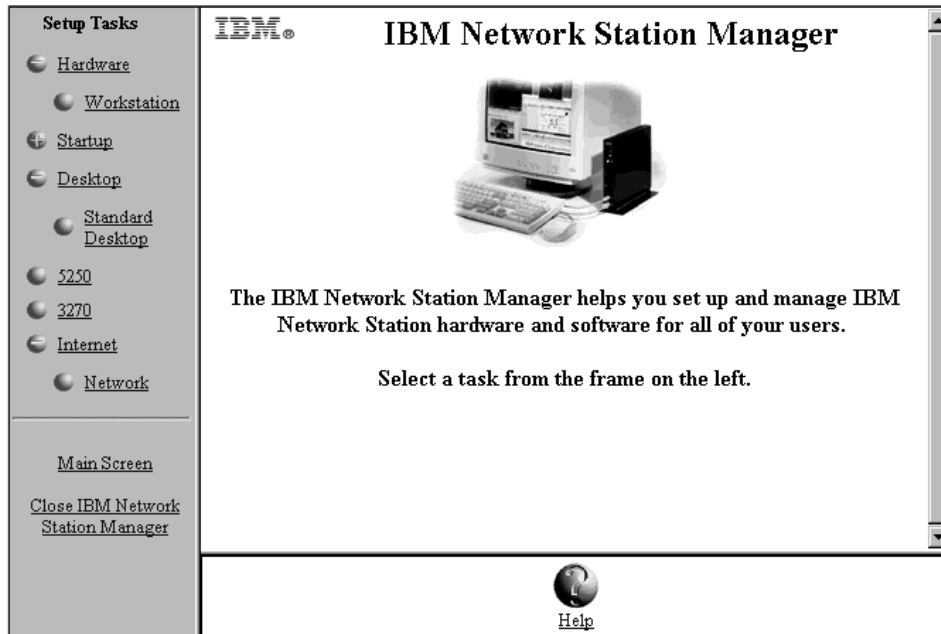


Figure 56. End-User Level

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 371 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. The *Default selection* panel is bypassed.

2. To see the Desktop background change, you must log off and then log on to the workstation.

Working with System-Wide Defaults

Figure 57 is representative of the panel that appears when a selection occurs from the *Setup Tasks* frame. This example uses the *Workstation Defaults* panel.

SYS001.MYCOMPANY.XYZ.COM

Workstation Defaults

On which set of defaults do you want to work?

☒ **System defaults**
Set workstation defaults for all workstations and users

☐ **Workstation defaults**
Set workstation defaults for this workstation:

☐ **Group defaults**
Set workstation defaults for this group:

☐ **User defaults**
Set workstation defaults for this user:

Figure 57. 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

Each Network Station must be configured using either DHCP or BOOTP. Each Network Station can be identified 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). Network Stations are told their hostname by BOOTP or DHCP. MAC addresses must be entered separated by colons (for example, 00:00:e5:80:7c:8f). IP addresses must be entered as dotted decimal (for example, 9.1.2.3).

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 the group.

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.

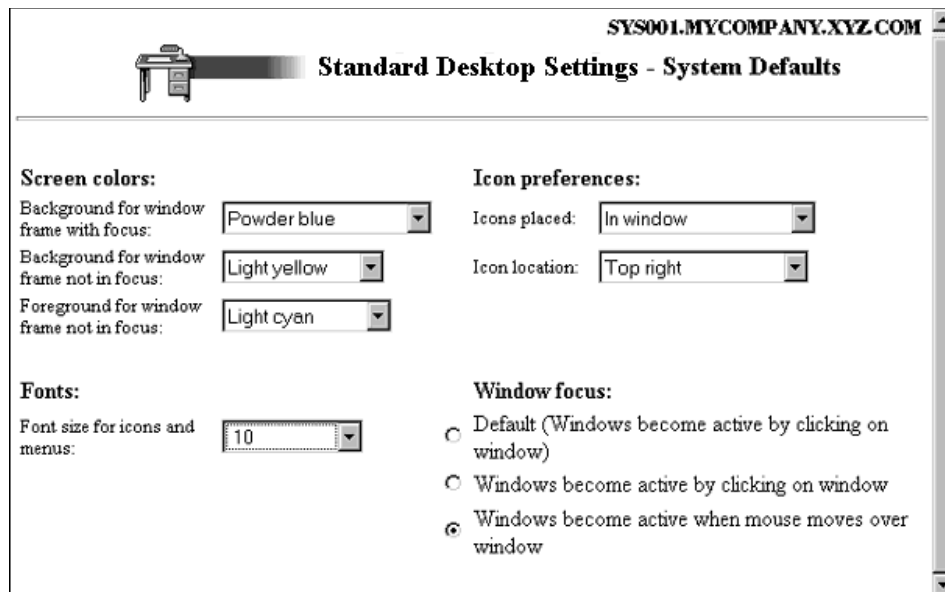
From any of the Default panels, select **User defaults**, type the user ID name, and press the **Next** button.

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 58 on page 266

page 266 shows the *Standard Desktop Settings* fields for Screen colors, Icon preferences, Fonts, and Window focus.



The image shows a dialog box titled "Standard Desktop Settings - System Defaults" with a URL "SYS001.MYCOMPANY.XYZ.COM" in the top right corner. The dialog is divided into four sections: "Screen colors", "Icon preferences", "Fonts", and "Window focus".

- Screen colors:**
 - Background for window frame with focus: Powder blue (dropdown)
 - Background for window frame not in focus: Light yellow (dropdown)
 - Foreground for window frame not in focus: Light cyan (dropdown)
- Icon preferences:**
 - Icons placed: In window (dropdown)
 - Icon location: Top right (dropdown)
- Fonts:**
 - Font size for icons and menus: 10 (dropdown)
- Window focus:**
 - ☐ Default (Windows become active by clicking on window)
 - ☐ Windows become active by clicking on window
 - ☒ Windows become active when mouse moves over window

Figure 58. Desktop Manager Settings Fields

Figure 58 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 59.

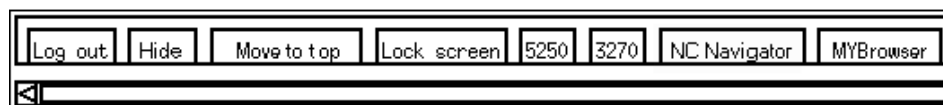


Figure 59. IBM Network Station Menu Bar

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 60.

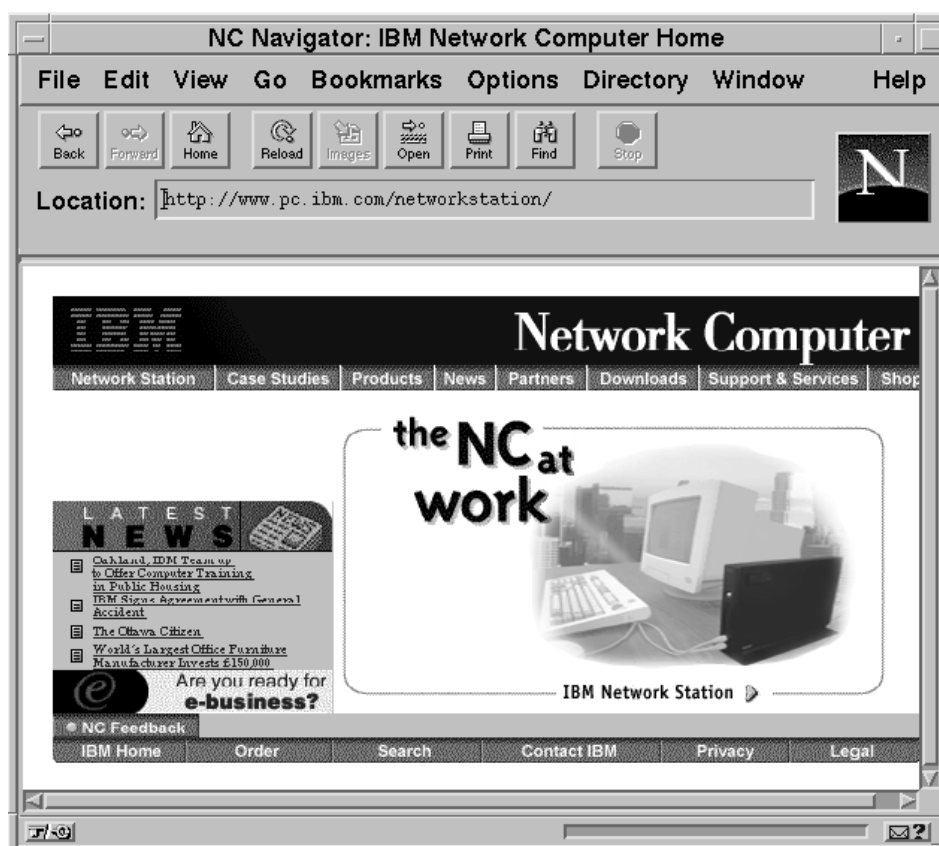


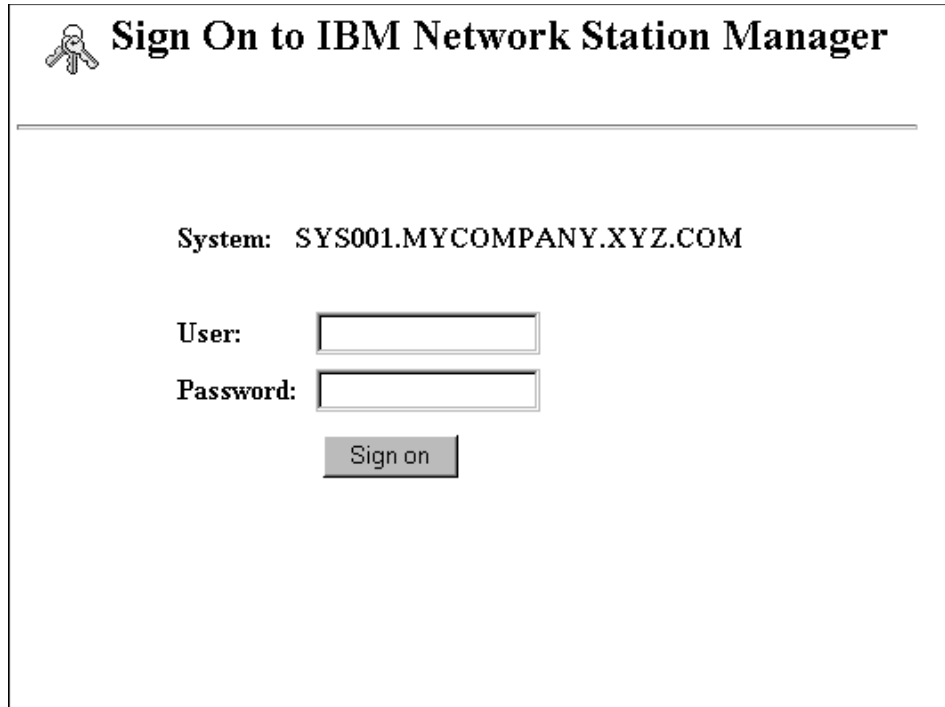
Figure 60. NC Navigator Browser

Click the **Directory** pulldown and select **IBM Network Station Manager for (Your Server Name)**. See Figure 61.



Figure 61. NC Navigator Browser with Directory Pulldown

The IBM Network Station Manager sign on screen appears:



The image shows a web-based sign-on screen for IBM Network Station Manager. At the top left is a small icon of a person with a key. To its right is the title "Sign On to IBM Network Station Manager". Below the title is a horizontal line. Further down, the text "System: SYS001.MYCOMPANY.XYZ.COM" is displayed. Below this are two input fields: "User:" followed by a text box, and "Password:" followed by a text box. Below the password field is a button labeled "Sign on".

Figure 62. 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 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.

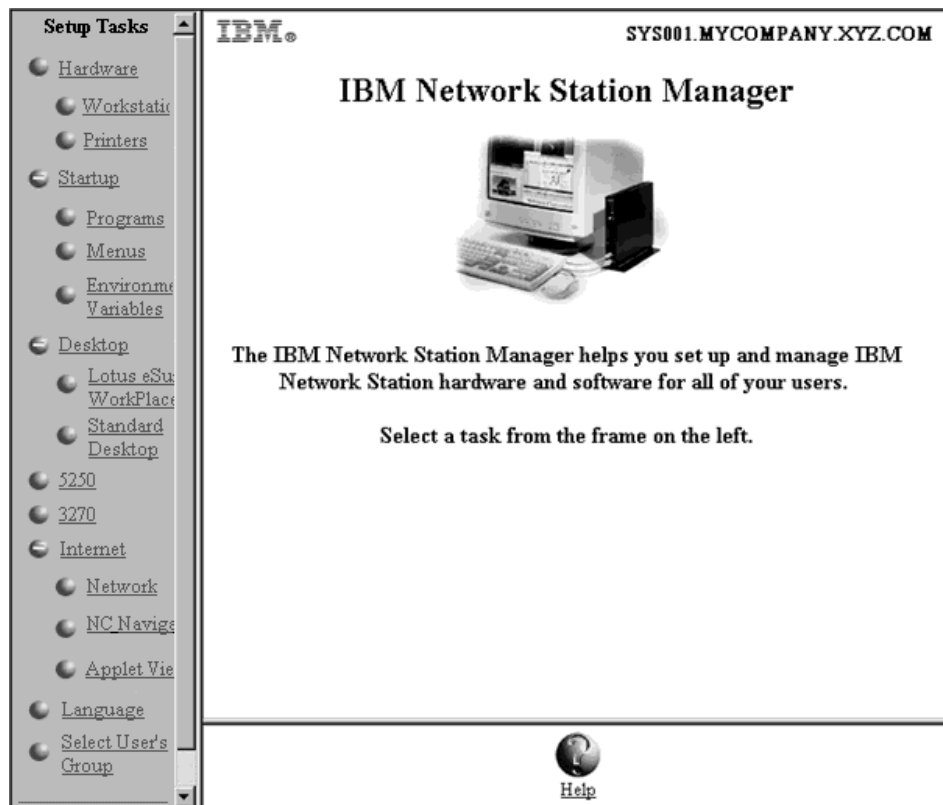


Figure 63. System Administrator Level

Working with the IBM Network Station Manager Program Setup Tasks - Examples

Note: You must be a system administrator to work with these examples.

Figure 63 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 299 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 menu bar support*. See Figure 64 on page 272 .

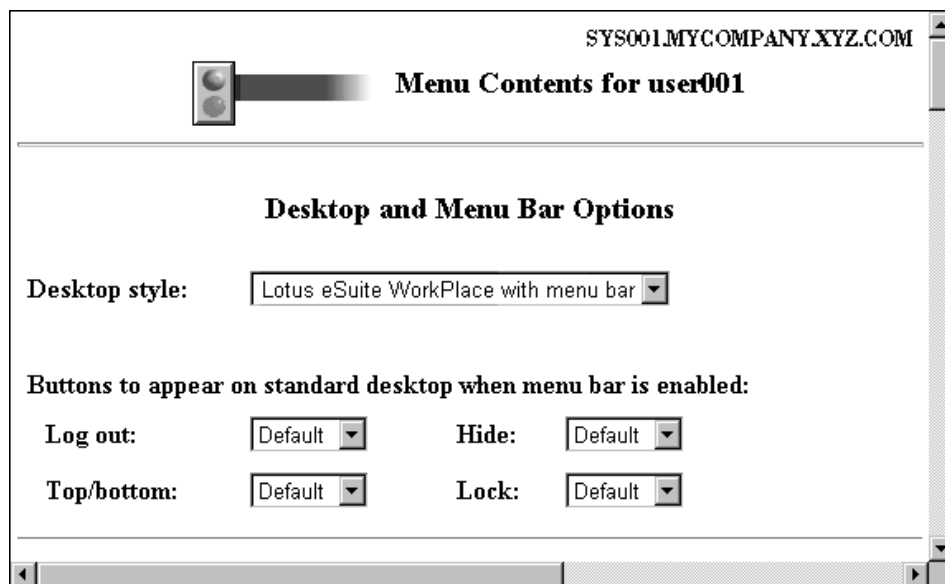


Figure 64. Desktop Style Selection


- ___ 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 65 on page 273.

SYS001.MYCOMPANY.XYZ.COM

 **Workstation Defaults**

On which set of defaults do you want to work?

☐ **System defaults**
Set workstation defaults for all workstations and users

☐ **Workstation defaults**
Set workstation defaults for this workstation:

☐ **Group defaults**
Set workstation defaults for this group:

☒ **User defaults**
Set workstation defaults for this user:

Figure 65. 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 66 on page 274.

Monitor Settings:

Minutes before screen saver turns on: ☒ Use Default (0-50) minutes.

Screen saver:

☒ Use default

☐ IBM (bitmap)

☐ Path for XBM file:

Desktop background:

☐ Use default

☒ Tiles (bitmap)

☐ Path for XBM file:

Background color

Foreground color

Local Services:

Figure 66. 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 67.

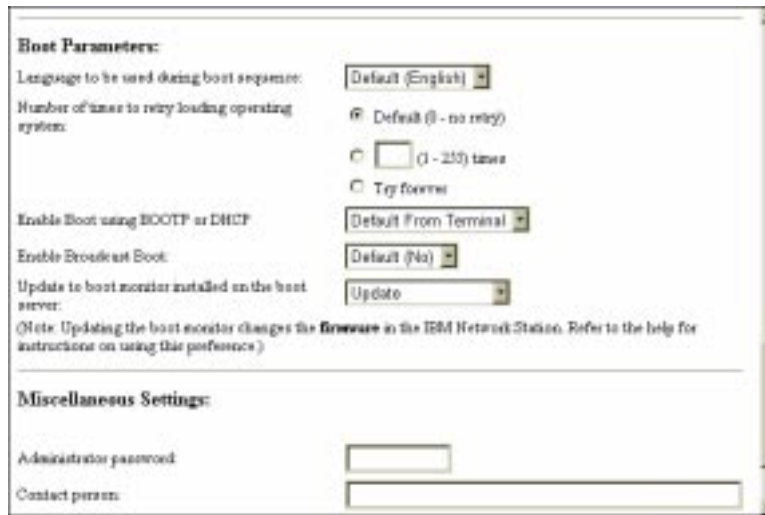


Figure 67. Updating the Boot Monitor

- ___ 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 68 on page 276 .

Boot Parameters:

Language to be used during boot sequence:

Number of times to retry loading operating system: ☒ Default (0 - no retry)
☐ (1 - 255) times
☐ Try forever

Enable Boot using BOOTP or DHCP:

Enable Broadcast Boot:

Update to boot monitor installed on the host server:

(Note: Updating the boot monitor changes the firmware in the IBM Network Station. Refer to the help for instructions on using this preference.)

Miscellaneous Settings:

Administrator password:

Contact person:

Figure 68. Overriding the Network Station Boot Setting

- ___ 5. Click the **Drop box**The possible choices are:

Default from terminal

If you select this choice 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

If you select this choice 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 If you select this choice the boot method is NVRAM.

The Network Station boots from whichever server was 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. This 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.

When changes occur to the DNS, domain name, or Hosts table of the server you can update the file on the Network Station 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, but the 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 69 on page 278.

Figure 69. Updating the Domain Name Server Code

- ___ 5. Click **Finish** to apply the change.

Configuring a Local Area Network Attached Printer

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 70 shows you how to describe a LAN-attached printer.

The screenshot shows a window titled "Printer List" with a table of printer configurations. The table has five columns: "Default Printer", "Printers", "Queue Name", "Stream Type", and "Description (Optional)".

Default Printer	Printers	Queue Name	Stream Type	Description (Optional)
Local Parallel Printer				
<input checked="" type="radio"/>	Printer attached	PARALLEL1	Postscript	Printer One
Local Serial Printer				
<input type="radio"/>	Printer attached	SERIAL1	Postscript	
Remote Printer Server				
<input type="radio"/>	10.1.12.34	LANPRINTER	Postscript	Office A
<input type="radio"/>			Postscript	
<input type="radio"/>			Postscript	

At the bottom right of the window is a button labeled "Add a Remote Printer".

Figure 70. Configuring a LAN-attached Printer

___ 5. Click **Finish** to apply the change.

When you type information in the Remote Print Server section, that information is used to construct the 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 users 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 71.
In the example where a locally-attached printer is configured as a remote printer

Printer List				
Default Printer	Printers	Queue Name	Stream Type	Description (Optional)
Local Parallel Printer				
<input checked="" type="radio"/>	Printer attached ▾	PARALLEL1	Postscript ▾	Printer One
Local Serial Printer				
<input type="radio"/>	Printer attached ▾	SERIAL1	Postscript ▾	
Remote Printer Server				
<input type="radio"/>	10.1.12.35	PARALLEL1	Postscript ▾	Joe's Printer
<input type="radio"/>			Postscript ▾	
<input type="radio"/>			Postscript ▾	
Add a Remote Printer				

Figure 71. Configuring a Network Station-Attached Printer as a Remote Printer for Other Users

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 72.

The screenshot shows a window titled "Menu Contents - System Defaults" with a URL "SYS001.MYCOMPANY.XYZ.COM" in the top right. The main content area is titled "Desktop and Menu Bar Options". It contains a "Desktop style:" label followed by a dropdown menu set to "Standard desktop with menu bar". Below this is a section titled "Buttons to appear on standard desktop when menu bar is enabled:". This section contains four labels with corresponding dropdown menus: "Log out:" (Default (Yes)), "Hide:" (Default (Yes)), "Top/bottom:" (Default (Yes)), and "Lock:" (Default (Yes)). At the bottom of this section is a checked checkbox labeled "Include default menu bar buttons (5250, 3270, and NC Navigator)".

Figure 72. 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 72 on page 281.
- ___ 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 73 on page 283.

The screenshot shows a window titled "Menu Contents - System Defaults" with a URL "SYS001.MYCOMPANY.XYZ.COM" in the top right corner. Below the title bar, there is a section titled "Desktop and Menu Bar Options". Under this section, the "Desktop style:" is set to "Standard desktop without menu bar" via a dropdown menu. Below this, a heading reads "Buttons to appear on standard desktop when menu bar is enabled:". There are four dropdown menus: "Log out:" set to "Default (Yes)", "Hide:" set to "Default (Yes)", "Top/bottom:" set to "Default (Yes)", and "Lock:" set to "Default (Yes)". At the bottom, there is a checked checkbox labeled "Include default menu bar buttons (5250, 3270, and NC Navigator)".

Figure 73. 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 74 on page 284 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 deselected.

SYS001.MYCOMPANY.XYZ.COM

Menu Contents - System Defaults

Desktop and Menu Bar Options

Desktop style: Standard desktop with menu bar

Buttons to appear on standard desktop when menu bar is enabled:

Log out: No **Hide:** Default (Yes)

Top/bottom: Default (Yes) **Lock:** No

☐ Include default menu bar buttons (5250, 3270, and NC Navigator)

Figure 74. 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 **User defaults**. In the bottom frame click **Next** to continue.
- ___ 2. The Environment Variable Settings frame appears. See Figure 75.

Figure 75. 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 GMT	Value	Description
0	GMT	Greenwich Mean Time
+1	ECT	European Central Time
+2	EET	European Eastern Time
+2	ART	
+3	EAT	Saudi Arabia
+3.5	MET	Iran
+4	NET	
+5	PLT	West Asia
+5.5	IST	India
+6	BST	Central Asia

Hours From GMT	Value	Description
+7	VST	Bangkok
+8	CTT	China
+9	JST	Japan
+9.5	ACT	Central Australia
+10	AET	Eastern Australia
+11	SST	Central Pacific
+12	NST	New Zealand
-11	MIT	Samoa
-10	HST	Hawaii
-9	AST	Alaska
-8	PST	Pacific Standard Time
-7	PNT	Arizona
-7	MST	Mountain Standard Time
-6	CST	Central Standard Time
-5	EST	Eastern Standard Time
-5	IET	Indiana East
-4	PRT	Atlantic Standard Time
-3.5	CNT	Newfoundland
-3	AGT	Eastern South America
-3	BET	Eastern South America
-1	CAT	Azores

- ___ 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 76 on page 287.

Figure 76. 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). See Figure 77.



Figure 77. 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.

- ___ 4. Click **Finish** to apply the change.

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). See Figure 78 on page 289.

Terminal Sessions to AutoStart

☐ Autostart a session with defaults

Custom sessions

Remote host	Other parameters (optional)
* 10.1.1.1	

Add a Terminal Session

Figure 78. 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.
2. From the *Setup Tasks* frame, click **Startup**, click **Menus**. In the bottom frame click **Next** to continue.
3. Scroll forward to **Terminal Sessions**.
4. In the **Other Parameters** field type:


```
-xrm '"NCDterm*logDirectory: <directory_name>"'
```
5. The directory must already exist. Make sure to type the single quote mark followed by the double quote mark where indicated.

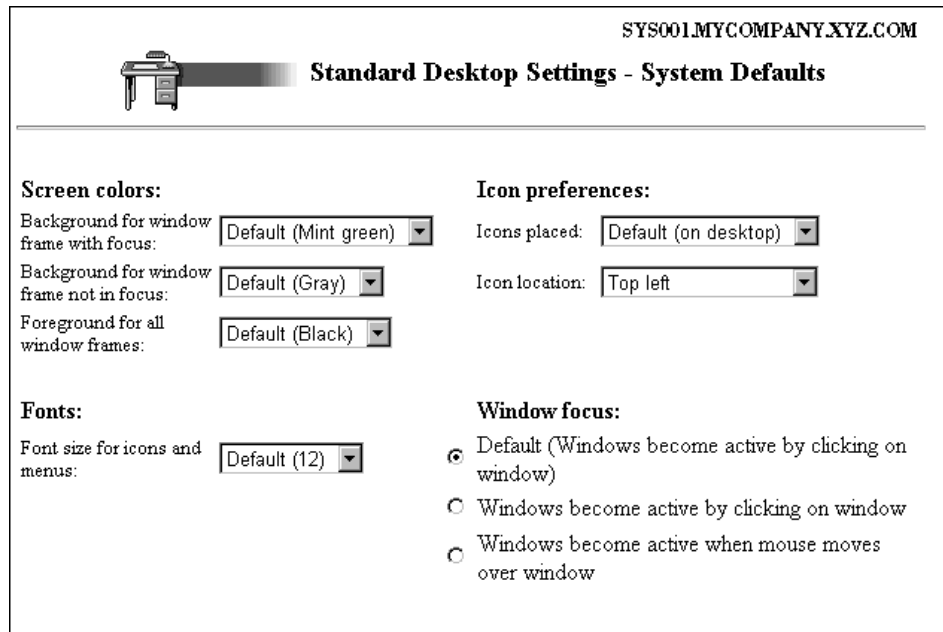
6. Following is a complete example that shows the debug log being created in the user's directory:

```
-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 79.



The image shows a dialog box titled "Standard Desktop Settings - System Defaults" with a computer icon on the left. The top right corner displays "SYS001.MYCOMPANY.XYZ.COM". The dialog is divided into four sections: "Screen colors", "Icon preferences", "Fonts", and "Window focus".

Section	Setting	Value
Screen colors:	Background for window frame with focus:	Default (Mint green)
	Background for window frame not in focus:	Default (Gray)
	Foreground for all window frames:	Default (Black)
Icon preferences:	Icons placed:	Default (on desktop)
	Icon location:	Top left
Fonts:	Font size for icons and menus:	Default (12)
	Window focus:	<input checked="" type="radio"/> Default (Windows become active by clicking on window)
		<input type="radio"/> Windows become active by clicking on window
		<input type="radio"/> Windows become active when mouse moves over window

Figure 79. 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 80.

Allow use of:

Command menu: Use default ▾	Edit menu: Use default ▾
Option menu: Use default ▾	Print menu: Use default ▾
Help menu: Use default ▾	Control menu: No ▾
Miscellaneous preferences: Use default ▾	Font menu list: Use default ▾
New session window: Use default ▾	Pop-up keypad: Use default ▾

Figure 80. 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.

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 81 on page 292.

Option menu: Use default ▼	Print menu: Use default ▼
Help menu: Use default ▼	Graphics: Use default ▼
Miscellaneous preferences: Use default ▼	Font menu list: Use default ▼
New session window: Use default ▼	Pop-up keypad: Use default ▼
<hr/>	
Screen size: 24X80 (no graphics) ▼	Telnet 3270 port to connect to: <input checked="" type="checkbox"/> (use default) <input type="text"/> (1-65535)
Key for Enter function: Use default ▼	

Figure 81. 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 82 on page 293.

Proxy configuration:

- ☒ Use default
- ☐ No proxies
- ☐ Manual proxies obtained from Internet Network panel
- ☐ Automatic proxy configuration

Configuration URL:

Security:

Enable JavaScript:

Enable Java Applets:

Network:

Use default

Maximum memory cache: ☒

Figure 82. 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 83 on page 294.

Navigator directory button definition:		
Name:	URL:	Fly-over help:
Button1	http://yourbusiness.com	URL for Your Business

Figure 83. 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 83 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:

- FTP
- HTTP
- GOPHER
- Security
- SOCKS
- Outgoing mail (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 84 on page 295.

Proxy:		Port:
FTP proxy:	OUR400.MYCOMPANY.COM	81
HTTP proxy:	OUR400.MYCOMPANY.COM	81
GOPHER proxy:	OUR400.MYCOMPANY.COM	81
Security proxy:	OUR400.MYCOMPANY.COM	81
SOCKS host:		
Outgoing mail (SMTP) server:	MAIL.MYCOMPANY.COM	
Incoming mail (POP3) server:	POP3.MYCOMPANY.COM	
News (NNTP) server:	NEWS.MYCOMPANY.COM	

Figure 84. Working with Your Network Proxies

The values in Figure 84 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 85 on page 296.

Language Settings for user001

Format to use for dates, currency, numbers, and messages:

Default (LANG)

You can specify a different format for the items below:

Date and time format:	Default	(LC_TIME)
Currency related format:	Default	(LC_MONETARY)
Numeric format:	Default	(LC_NUMERIC)
Character handling rules:	Default	(LC_CTYPE)
Language for messages and menus:	SV_SE--Swedish in Sweden	(LC_MESSAGES)

Figure 85. 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 86 on page 297.

NSDEV.RCHLAND.IBM.COM

 **Select User's Group**

For which user do you want to select a group?

Figure 86. 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 87 on page 298.

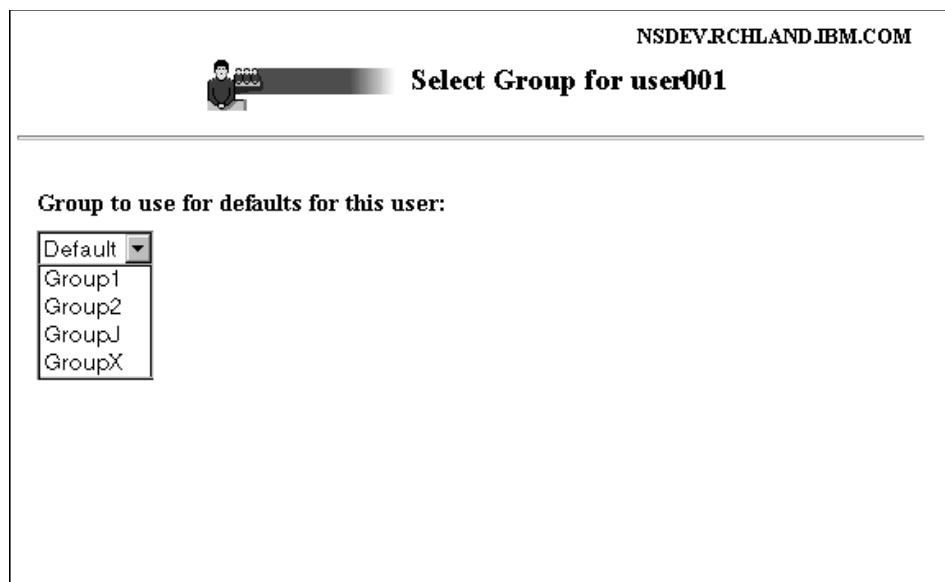


Figure 87. Selecting a Group to Use for Defaults

- ___ 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 88 shows a view of the Help Contents where How To... is located.

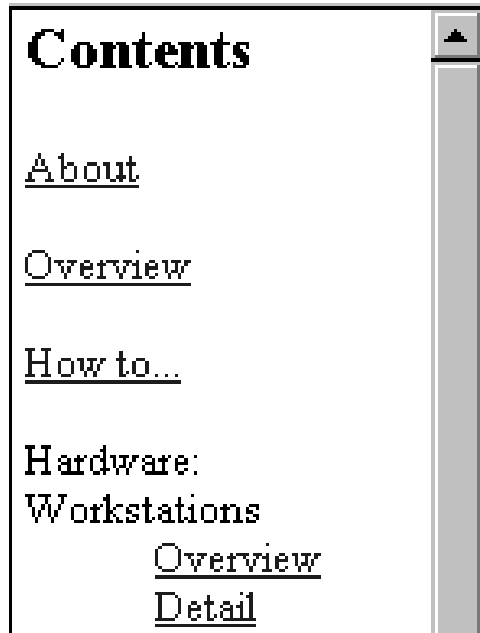


Figure 88. Finding How To... Help

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. 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 the **user ID** of that user 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 89 on page 301.

Menu item label	Remote host	Program to run	Optional parameters	Allow window to open
AIX-Session	9.5.35.23	aixterm	display \${IP}:0 -lang C	<input checked="" type="checkbox"/>
				<input type="checkbox"/>

Add a Remote Program

Figure 89. 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
```

- ___ 8. Click **Finish** to apply the AIX remote program setting.
- ___ 9. Log off and then log on your Network Station. The Menu bar should have a button labeled AIX-Session. See Figure 90.



Figure 90. Menu Button for Remote Program Example for AIX

- ___ 10. 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

Complete the following steps to set up a Windows NT session by using the IBM Network Station Manager program:

- ___ 1. Verify that you have a Windows NT machine in your network that has the WinCenter Pro 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 IBM 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 91.

Menu item label	Remote host	Program to run	Optional parameters	Allow window to open
WinCenter Pro	9.5.35.171	wincenter	-display \$(IP):0	<input checked="" type="checkbox"/>
				<input type="checkbox"/>

Add a Remote Program

Figure 91. 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.

Optional parameters

-display is a WinCenter Pro 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.

The required parameters for WinCenter Pro are:

```
-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. See Figure 92.



Figure 92. Menu Button for Remote Program Example for NT

- ___ 10. Click **WinCenter Pro** and a window opens with your WinCenter session.

Chapter 9. Working with User Services

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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 enabled.)
- Terminals (The Terminals User Service is not enabled.)
- WindowMgr
- Utilities
-
- Setup (The Setup User Service is not enabled.)
- Statistics

Accessing User Services

Access User Services by pressing the Shift, Alt, and Home keys all at the same time.

Figure 93 shows the User Services window with all the service programs that are displayed within the menu bar.

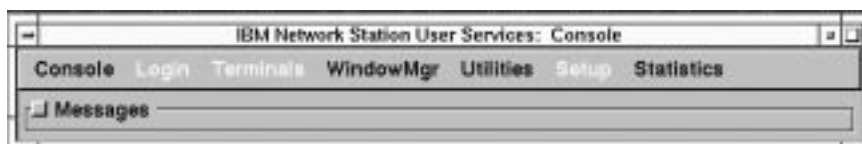


Figure 93. User Services Window

Console

This function provides a menu bar option (Console) for handling messages. Figure 94 on page 306 shows the tools available through the Console services option.

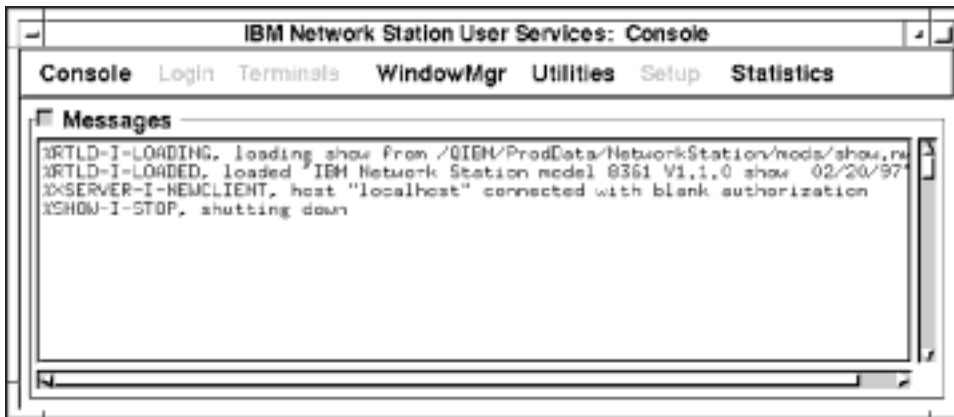


Figure 94. User Services: Console View

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 95 on page 307 shows the tools available through the WindowMgr services option.

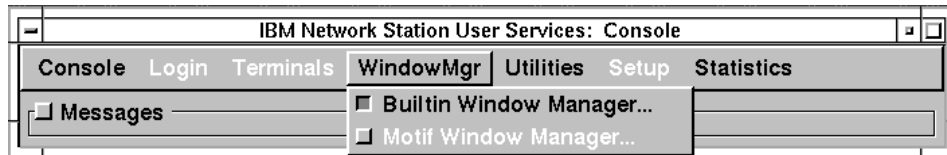


Figure 95. User Services: Window Manager View

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 96 shows the tools available through the Utilities services option.

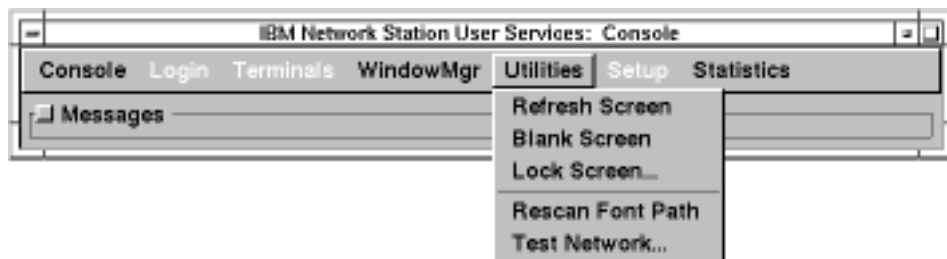


Figure 96. User Services: Utilities View

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 97 shows the tools available through the Statistics services option.

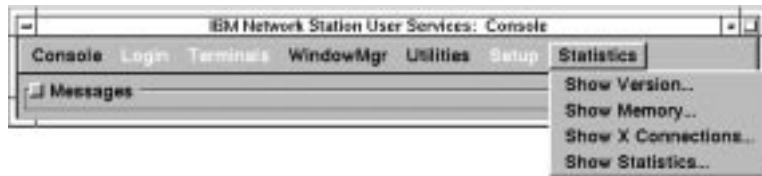


Figure 97. User Services: Statistics View

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

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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 70 on page 311 and Table 71 on page 311, in the text-based instructions which follow, or in both sources.

Table 70 on page 311 and Table 71 on page 311 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 317.

Table 70. 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 314.	N/A.
User-configurable MAC Address	See "Viewing the User-Configurable MAC Address" on page 315.	See "Specifying a User-Configurable MAC Address" on page 315.
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 71. Common Appearance Tasks in Setup Utility

Appearance Item	To View	To Set
Keyboard Language	F7.	F7. See "Selecting a Keyboard Language" on page 313.
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 313 .
Blanking Pedestal	F6.	See "Working With the Blanking Pedestal" on page 312.

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 313.

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 specified in the IBM Network Station Manager. The value in the IBM Network Station Manager overrides 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” on page 314.

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 is 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 275. 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 14. 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 72. Boot and Configuration Parameters for NVRAM Booting. Table 72 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

Table 72. Boot and Configuration Parameters for NVRAM Booting (continued). Table 72 on page 317 explains the configuration items and refers you to the sample values for Figure 4 on page 6.

Configuration Item	Description	Value for Network Examples
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
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 73. 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 73. 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	/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	/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 74.

Table 74. 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	standard.nsm
		VM	standard.nsm
		OS/400	standard.nsm
		AIX	standard.nsm
		NT	standard.nsm
First Configuration Directory	The path name that the configuration host uses to locate the configuration file of the Network Station.	OS/390	/usr/lpp/nstation/standard/StationConfig/
		VM	/QIBM/ProdData/NetworkStation/configs/
		OS/400	/QIBM/ProdData/NetworkStation/configs/
		AIX	/usr/netstation/configs/
		NT (NFS)	/netstation/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	/usr/lpp/nstation/standard/StationConfig/
		VM	/QIBM/ProdData/NetworkStation/configs/
		OS/400	/QIBM/ProdData/NetworkStation/configs/
		AIX	/usr/netstation/configs/
		NT (NFS)	/netstation/prodbase/configs/

Table 74. Configuration Parameters for NVRAM Booting (continued)

Configuration Parameter	Description	Platform	Type this value
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

- ___ 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

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Problem Resolution Tables

This appendix contains information to help you resolve error situations. Error situations that are specified in Table 75 are common across all server platforms. Other error situations are specific to individual operating systems. If you do not find the error in Table 75, 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 75. 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 75. Common Problem Resolution Table (continued)

Symptom	What you should do
Error message 404 - file not found	<p>This error indicates a URL that is not entered correctly.</p> <p>Verify the spelling and case sensitivity of the URL you used to access the IBM Network Station Manager licensed program.</p> <p>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.</p>
Color Problems	
Colors appear incorrectly in applications	<p>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.</p>
Cursor Problems	
Busy cursor (cursor seems busy trying to perform a task)	<p>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.</p>
Cursor in wrong position within an application	<p>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.</p>
DHCP Problems	
Duplicate address conflict	<p>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.</p> <p>Explicitly exclude the static IP address from your DHCP address range to resolve the duplicate address conflict.</p>
Rogue DHCP server	<p>If you have two DHCP servers in your network, ensure the ranges of IP addresses in the servers do not overlap.</p>
Migration problems from BOOTP to DHCP	<p>When you completely migrate from BOOTP to DHCP, disable BOOTP on the server.</p>
DHCP broadcasts do not pass through entire network	<p>Check the relay agent configuration in all of your routers and gateways.</p>

Table 75. Common Problem Resolution Table (continued)

Symptom	What you should do
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.
Timing problems when BOOTP and DHCP run at the same time	<p>BOOTP requires two packets for each transmission and DHCP requires four. This presents possible timing problems if both run at the same time.</p> <p>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.</p> <p>Disable BOOTP on the server.</p>
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 75. Common Problem Resolution Table (continued)

Symptom	What you should do
Host Unknown message appears on the Network Station	<p>This message could appear for several reasons:</p> <ul style="list-style-type: none"> You specified a wrong system name or IP address in the program or menu functions of <i>Startup Tasks</i> 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 <i>Startup Tasks</i> 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 <i>NC Navigator Options Network</i> preferences or <i>Network</i> panel are incorrect or they cannot be resolved. The remote print server on the Printers panel is incorrect or it cannot be resolved. <p>You should validate the system name or IP address.</p> <p>You should also access the <i>Hardware-Workstation Setup Task</i> 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.</p> <p>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.</p> <p>You must power down your Network Station and power on your Network Station for the name information to become available.</p>
IBM Network Station Manager Program	
Changed hardware Network Station settings not being applied	<p>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 (<i>Set Network Parameters</i>) and make sure the IP Addressed from parameter value is Network. See "Chapter 10. Working With the IBM Network Station Setup Utility" on page 309 for more information.</p>
Changed keyboard setting has not been applied	<p>Restart your Network Station in order for the changed keyboard setting to take effect.</p>
Changes made to 5250, or 3270 have not been applied	<p>Log out and log back in for changes to take effect.</p>

Table 75. 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: <ul style="list-style-type: none"> • 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 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	
<p>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 <i>User Services Statistics</i>. See "Chapter 9. Working with User Services" on page 305, for more information.</p> <p>The following Java error messages describe the error and give problem resolution information.</p>	

Table 75. Common Problem Resolution Table (continued)

Symptom	What you should do
Cannot find class or Class not found	<p>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 <i>Application (Class) Name</i> field does not contain the .class file name extension.</p> <p>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.</p> <p>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.</p> <p>For an applet, the codebase portion of the applet tag within the HTML file lists the locations where classes are found.</p> <p>Also check the file access permissions on the directories and files to make sure that users are allowed to read the files.</p>
IO exception while reading (a file name)	<p>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.</p>
IO exception while reading (a remote server name)	<p>An HTTP address rather than a file system location was passed to the applet viewer. <i>AppletViewer</i> 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 <i>Internet Setup Task</i> and then the <i>Network</i> section.</p> <p>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.</p>
<i>Launcher Shutdown Monitor</i>	<p>If your applet does not start and the next message in the console is <i>Launcher Shutdown Monitor</i>, 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.</p>

Table 75. Common Problem Resolution Table (continued)

Symptom	What you should do
Out of memory	<p>The Network Station may not have enough memory to run the application or applet. Possible causes include the following:</p> <ul style="list-style-type: none"> • 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 <i>Startup Tasks</i> (programs or menus) section. For an applet, the parameters are set in the <i>Internet Tasks</i> (Applet Viewer section).
Unusable class name (name)	<p>Check the name in the <i>Application (Class) Name</i> 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.</p>
Other	<p>If you do not see any messages in the <i>User Services Console</i> window that explain your problem, activate <i>Verbose Diagnostic Messages</i> by using the IBM Network Station Manager licensed program. For applications, Verbose messages can be set in the <i>Startup Tasks</i> (programs or menus) section. For an applet, Verbose messages can be set in the <i>Internet Tasks</i> (AppletViewer section). Additional messages are displayed when your application or applet is run.</p>
The following Java error conditions are not related to specific Java error messages:	

Table 75. Common Problem Resolution Table (continued)

Symptom	What you should do
Applet cannot read <i>Properties</i> or get a <i>Security Exception</i> while trying to read the <i>System Properties</i>	<p>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 <i>AppletViewer</i> configuration section. The default properties that may be read by an applet are as follows:</p> <ul style="list-style-type: none"> • java.vendor • java.version • java.vendor.url • java.class • os.name • os.version • os.arch • file.separator • path.separator • line.separator <p>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.</p>
Cannot close Java error message box	Scroll to the end of the error message box and click OK .
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 <i>Java Abstract Window Toolkit</i> (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, <i>Java Abstract Window Toolkit</i> 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	

Table 75. Common Problem Resolution Table (continued)

Symptom	What you should do
Wrong language appears on the Network Station when you power on the logic unit	<p>You must reset the keyboard language to your language from the Setup Utility.</p> <ul style="list-style-type: none"> • Power on the Network Station. • When the NS0500 <i>Search for Host System</i> 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: <ul style="list-style-type: none"> – 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	
Network Station displays a light blue screen and the Network Station does not log in properly	<p>This problem normally occurs when the required.nsm file could not be read during power on.</p> <p>If you boot from NVRAM check the following items to correct this problem:</p> <ul style="list-style-type: none"> • 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. <p>If you boot from DHCP, look for the correct configuration information in “Taking Advantage of Multiple Server Environments” on page 18.</p>

Table 75. Common Problem Resolution Table (continued)

Symptom	What you should do
Host xxx.xxx.xxx.xxx (IP address) not responding to ICMP Echo error message followed by NS0090 Press a key to continue message	<p>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.</p> <p>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.</p>
Login stops at NS0500 Search for Host System message	<p>There are several reasons this message appears:</p> <ul style="list-style-type: none"> • Your server may not be running. • Your network cable connections may not be tight. <p>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.</p> <ul style="list-style-type: none"> • 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 75. Common Problem Resolution Table (continued)

Symptom	What you should do
File not found	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>Each platform-specific problem resolution table contains a file structure for your server operating system. See the table for your operating system for a map of local to remote file system directory structures. Use these maps to determine where missing files are.</p>
Out of Memory Problems	
'Out of Memory' message appears	<p>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.</p> <p>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.</p> <p>If this process does not work, you may need to upgrade your Network Station RAM to run all of your applications.</p>
PANIC Appears on Your Network Station	

Table 75. Common Problem Resolution Table (continued)

Symptom	What you should do
<p><i>P A N I C</i> appears on your Network Station and you are given a > cursor</p> <p>or</p> <p>Screen turns reverse video (mostly black) and you are given a > cursor</p>	<p>The Network Station operating system stopped unexpectedly.</p> <p>See "PANIC Mode at an IBM Network Station" for more information about recovering from a <i>PANIC</i> situation.</p>
Resource File Does Not Exist Error	
<p>Error messages <i>Resource file does not exist</i> and <i>Unable to open resource</i> appear in the console log, but your Network Station network operates normally.</p>	<p>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.</p> <p>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.</p> <p>Every time the Network Station Manager licensed program unsuccessfully searches for a different operating system, it records a <i>Resource file does not exist</i> and <i>Unable to open resource</i> console log error message.</p>
Screen Flashes	
<p>Screen flashing or crackling sound</p>	<p>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.</p>

PANIC Mode at an IBM Network Station

When the Network Station operating system stops unexpectedly, a *PANIC* mode 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 76. 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.
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	<p>Bad NVRAM settings. Use the NV utility Boot Monitor command prompt to return to the default settings.</p> <p>To reach the Boot Monitor command prompt (>), press the Escape key after the Network Station displays the NS0500 <i>Search for Host System</i> message during the startup sequence.</p> <p>Then, press (Left)Alt - (Left)Ctrl - (Left)Shift - F1 from the IBM Network Station Setup Utility.</p> <p>Type NV and press Enter. Then, in the order that they are listed, use NV command functions: L, S, Y (yes), and then Q.</p> <p>Type RS and press enter to reboot the system.</p>

Table 76. Network Station Error Codes (continued)

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.
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.

Table 76. Network Station Error Codes (continued)

NS0700	Twinax timeout, unable to contact host	To correct this problem try the following items: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 77. 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	

Table 77. PC Server Problem Resolution Table (continued)

Symptom	What you should do
Error message: <i>Multiple instances of the Configuration Utility cannot be run while running the DHCP Configuration Utility</i>	<p>If the DHCP Configuration Utility ends abnormally, it may leave some registry entries, which prevent you from starting the utility again.</p> <p>From a command line, type tcpcfg -f. This command clears the unwanted registry and allows you to start the configuration tool.</p>
Installation Problems	
Error message: <i>An error occurred while configuring eNetwork On-Demand Server.</i>	<p>The install program could not configure the eNetwork On-Demand (eNOD) server. Perform the following steps and configure eNOD manually.</p> <p>You may also configure eNOD to run on a stand-alone DHCP server without installing the Network Station Manager licensed program code.</p> <p>If you need to manually install eNOD services, perform the following steps:</p> <ol style="list-style-type: none"> 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: <i>An error occurred while installing the NC Navigator (North American).</i>	<p>This error only pertains to the North American version of the Network Station Manager licensed program.</p> <p>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.</p> <p>Refer to "128-Bit NC Navigator Browser" on page 45 and install the NC Navigator program.</p>

Table 77. PC Server Problem Resolution Table (continued)

Symptom	What you should do
Error message: <i>An error occurred while trying to create the user directory for the IBM Network Station Manager.</i>	<p>The installation program did not create some or all of the following directories:</p> <ul style="list-style-type: none"> • \..\\nstation\\userbase • \..\\nstation\\userbase\\groups • \..\\nstation\\userbase\\sysdef • \..\\nstation\\userbase\\home • \..\\nstation\\userbase\\users • \..\\nstation\\AppBase <p>The installation program did not create some or all of the following base permissions:</p> <ul style="list-style-type: none"> • \\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
Error message: <i>The install drive is not formatted for NTFS.</i>	<p>You must select an install drive that is formatted for NTFS. You may either start setup again and choose another NTFS formatted drive. You may also convert your drive to the NTFS file system.</p>
Error message: <i>This machine does not have Windows NT Server 4.0 or Windows Terminal Server 1.0 installed.</i>	<p>You must run Windows NT Server 4.0 or Windows Terminal Server 1.0 to operate the Network Station Manager licensed program.</p> <p>Install one of these operating systems and try the setup again.</p>

Table 77. PC Server Problem Resolution Table (continued)

Symptom	What you should do
Error message: <i>This program requires a monitor with VGA or better resolution.</i>	<p>The Network Station Manager licensed program installation requires screen resolution of 640 x 480 or greater.</p> <p>Reset your screen resolution to a minimum 640 x 480 resolution by performing the following steps:</p> <ol style="list-style-type: none"> 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. <p>After you make these changes, try your setup again.</p>
Error message: <i>Unable to create one of the IBM Network Station Manager user groups.</i>	<p>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.</p> <p>See, "Adding User and Group Accounts" on page 76 for instructions on how to create the following groups:</p> <ul style="list-style-type: none"> • Local groups • Network Station Manager Administrator • Network Station Manager User
Error message: <i>Unable to install the NDIS Intermediate Driver 3.0.</i>	<p>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 42 for instructions.</p>
Error message: <i>Unable to load InServe.dll for installation and configuration of the Network Station Manager.</i>	<p>Your installation requires the InServe.dll that could not be loaded into memory. Reboot your PC Server and try to run the installation again.</p>
Error message: <i>Unable to obtain the Domain Controller name.</i>	<p>The install shield could not find the Domain controller for your Windows NT server name.</p> <p>Ensure that your Windows NT server Domain name is correct. Try the setup again.</p>

Table 77. PC Server Problem Resolution Table (continued)

Symptom	What you should do
Not enough space on your install drive	You need at least 500 MB of free space on your hard drive to install the Network Station Manager licensed program. Please choose a different drive.
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: <ul style="list-style-type: none"> • 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 78. OS/400 Problem Resolution Table

Symptom	What you should do
IBM Network Station Manager Program	
IBM Network Station Manager program will not start	<p>This could be because the Retain Server Security Data (QRETSVRSEC) system value was not set to 1.</p> <p>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').</p>
User Defaults browse button does not work	<p>To activate the browse button do the following:</p> <ol style="list-style-type: none"> 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	<p>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.</p> <p>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.</p>
Local and Remote File Structure	

Table 78. OS/400 Problem Resolution Table (continued)

Symptom	What you should do
Missing file	<p>Use this local and remote file structure map and symbolic links used map to find missing files.</p> <p>Client side = Server side</p> <p>/netstation/prodbase/ = /QIBM/ProdData/NetworkStation/</p> <p>/netstation/prodbase/configs = /QIBM/ProdData/NetworkStation/configs/</p> <p>/netstation/prodbase/SysDef/ = /QIBM/ProdData/NetworkStation/SysDef/</p> <p>/netstation/homebase/ = /QIBM/UserData/NetworkStation/users/'userid'/</p> <p>'userid' corresponds to the current User ID logged into the system.</p> <p>You may also want to check that the symbolic links on the AS/400 are correct.</p> <p>Directory A links to Directory B</p> <p>/QIBM/ProdData/NetworkStation/configs links to /QIBM/UserData/NetworkStation/StationConfig/</p> <p>/QIBM/UserData/NetworkStation/StationConfig/standard.nsm links to /QIBM/ProdData/NetworkStation/StationConfig/standard.nsm</p> <p>/QIBM/UserData/NetworkStation/StationConfig/required.nsm links to /QIBM/ProdData/NetworkStation/StationConfig/required.nsm</p> <p>/QIBM/UserData/NetworkStation/StationConfig/control.nsm links to /QIBM/ProdData/NetworkStation/StationConfig/control.nsm</p>
Login Problems	

Table 78. OS/400 Problem Resolution Table (continued)

Symptom	What you should do
<p>Communication error in a Network Station dialog box and Network Station users cannot log in</p> <p>or</p> <p>Catch-all for comm error in a Network Station dialog box and Network Station users cannot log in</p>	<p>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:</p> <p>Determine if the Network Station login daemon on your AS/400 authentication server is running by one of the following two methods:</p> <ul style="list-style-type: none"> • From the AS/400 console, type NETSTAT *CNN. • Look for an active local port 256. <p>If local port 256 is active, the Network Station login daemon is running.</p> <p>OR</p> <ul style="list-style-type: none"> • 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 QPWFSESVSD command.
System hangs at NS0500 <i>Search for Host System</i> 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	<p>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.</p> <p>Correct the error and run the migration again by issuing the command CALL PGM(QYTCMIMP).</p>

Table 78. OS/400 Problem Resolution Table (continued)

Symptom	What you should do
Unable to migrate file	<p>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'.</p> <p>Correct the error and run the migration program again by issuing the command CALL PGM(QYTC/QYTCMIMP).</p>
Unable to retrieve list of users	<p>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.</p> <p>Correct the error and run the migration program again by issuing the command CALL PGM(QYTC/QYTCMIMP).</p>
Unable to delete file	<p>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.</p> <p>Correct the error and delete the file using the Remove Link (DEL) command.</p>
Migration problem did not complete successfully	<p>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.</p> <p>Correct the error and run the migration program again by issuing the command CALL PGM(QYTC/QYTCMIMP).</p>
Error occurred while determining the national language ID and locale	<p>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.</p> <p>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'.</p>

Table 78. OS/400 Problem Resolution Table (continued)

Symptom	What you should do
Unable to determine the national language version of the system	<p>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.</p> <p>The IBM Network Station Manager licensed program has defaulted to United States English as the language of the Network Stations.</p> <p>If you wish to reset this value, see "Selecting the Startup Language" on page 312.</p>
No Login Window	
No Login window on monitor - User Services window appears instead	<p>The most likely cause is an incorrect entry for this Network Station in the BOOTP table.</p> <p>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.</p>
OS/400 Console Error and Log Messages	
<p>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.</p> <p>The error messages below help you resolve common IBM Network Station Manager errors.</p>	
NSM9505, NSM9507, NSM9508, NSM9509, NSM9510, and NSM9511 File transfer and network errors	<p>This series of errors indicates network transmission problems.</p> <p>Try some or all of the following to diagnose and correct these errors:</p> <ul style="list-style-type: none"> • 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.

Table 78. OS/400 Problem Resolution Table (continued)

Symptom	What you should do
NSM9530 Exiting abnormally, error code: xx	<p>Refer to the error code 'xx' in your error message and take appropriate corrective action.</p> <ul style="list-style-type: none"> • 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. <p>You may need to restart the network authentication server to correct the errors listed above.</p>
NSM9537 Memory allocation failed	<p>There is not enough free memory on your server for the Network Station Manager licensed program to operate.</p> <p>Check your storage pool allocations and allocate more memory for your server storage pool.</p>
NSM9549 Error retrieving server data	<p>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.</p> <p>Verify that all configuration files are not corrupt.</p> <p>Verify accuracy of configuration file information and configuration file syntax.</p> <p>Look in the displayed path to figure out where the configuration file should be.</p>
Printer Problems	
Printer not available to other applications	<p>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.</p>
Program Temporary Fix (PTF) Problems	
PTFs not working	<p>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.</p>
Problem communicating using Host names	

Table 78. OS/400 Problem Resolution Table (continued)

Symptom	What you should do
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.
Twinaxial timeout or Unable to connect to host	<p>Ensure that the twinaxial cable is plugged into the Network Station and the twinaxial workstation controller. Replace the cable if necessary.</p> <p>Ensure that the workstation controller is powered on and the workstation controller is varied on.</p> <p>If you suspect bad Network Station hardware, run the Wrap test to determine if your Network Station hardware is bad.</p> <p>To run the Wrap test, do the following:</p> <ul style="list-style-type: none"> • Restart the Network Station. • At the NS0500 <i>Search for Host System</i> 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. <p>If the message returned during the Wrap test says 'the wrap test was not successful', contact your local IBM your Network Station.</p>

Table 78. OS/400 Problem Resolution Table (continued)

Symptom	What you should do
Station address in use	<p>Change the twinaxial address to one not assigned to an active device on that port.</p> <p>To change the twinaxial address from the individual Network Station do the following:</p> <ul style="list-style-type: none"> Restart your Network Station. At the NS0500 <i>Search for Host System</i> 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 79. AIX Problem Resolution Table

Symptom	What you should do
BOOTP in Debug Mode	
Logging errors in debug mode to diagnose BOOTP problems	<p>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.</p> <p>Start debug mode by performing the following steps:</p> <ol style="list-style-type: none"> Enter vi /etc/inetd.conf Place a # character in column one in front of bootps. Save the changed file. Enter refresh -s inetd Enter ps -ef grep bootp Find the PID, and use kill <pid_no> Start bootpd in debug mode by entering bootpd -d -d -d -d -s /etc/bootptab <p>Power on the Network Station and look for errors on the RS/6000 screen where you started bootpd in debug mode from.</p> <p>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.</p>
Fonts Missing	

Table 79. AIX Problem Resolution Table (continued)

Symptom	What you should do
Missing fonts	<p>The fonts.dir file on your server font directories may not accurately reflect the correct number of fonts.</p> <p>To solve this problem perform the following tasks:</p> <ol style="list-style-type: none"> 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	
Keyboard map does not work under XDM	<p>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.</p> <p>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:</p> <pre>if [-z "\$EXT_NCD_SETUP"]</pre> <p>Then enter this string:</p> <pre>export XSTATION='echo \$DISPLAY cut -f1 - d\;'</pre> <pre>fi</pre> <p>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.</p> <p>Power down your Network Station and power on your Network Station for the changes to take effect.</p>
Network Traffic	

Table 79. AIX Problem Resolution Table (continued)

Symptom	What you should do
Network traffic when CDE dtterm is in focus	<p>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.</p> <p>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:</p> <ol style="list-style-type: none"> 1. Select Options from the dtterm menu bar. 2. Select Global. 3. In the Global window change the blinking cursor selection box to Disabled. <p>Note: You may also wish to change the cursor blink rate from this window.</p>
No DNS Entry	
No DNS Entry for server error message appears	<p>Add the following line at the bottom of the /etc/httpd.conf file to solve this problem:</p> <p>HostName host.full.domain.path</p>
No Login Window	
No Login window on monitor - User Services window appears instead	<p>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.</p> <p>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.</p>
NVRAM Setting Reverts to Network setting	
NVRAM setting only works for initial boot and NVRAM setting reverts to Network setting	<p>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.</p> <p>Change the ip-use-address-discovery variable in your required.nsm file to one of the following values:</p> <ul style="list-style-type: none"> • true for network setting • false for NVRAM setting <p>Change the value to true to boot via the Network setting and change the value to false to boot via NVRAM.</p>
PANIC situation in AIX	

Table 79. AIX Problem Resolution Table (continued)

Symptom	What you should do
PANIC caused by missing \$HOME environment variable	<p>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.</p> <p>Verify the environment variable by performing the following steps:</p> <ul style="list-style-type: none"> • Press the Pause key to start the Console Monitor • Select Setup • Select User Setup • Select Environment Variables • Verify your \$HOME environment variable <p>If the \$HOME environment variable is not set, run the Xstartup.ibm8361 script again.</p>
Printing Problems	
Stairstep, misaligned printouts	<p>In the UNIX operating system, the lines in files end in linefeeds 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.</p> <p>Format your print file locally and print remotely.</p> <p>OR</p> <p>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.</p>
Program Manager Problems	
Error message <i>403 error, access denied by rule</i> appears	<p>Verify all of your permissions.</p> <p>Verify the accuracy of your name servers.</p> <p>Verify the spelling of the URL for the http://../NetworkStation/Admin</p>
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	

Table 79. AIX Problem Resolution Table (continued)

Symptom	What you should do
Use syslogd to record system events when debugging problems	<p>Use the syslogd command to collect information on problem situations including booting, ftp, nfs, and so forth.</p> <p>Add the following line to the /etc/syslog.conf file:</p> <p>*.debug /usr/spool/mqueue/syslog.out</p> <p>This line collects system events and it records them in the file syslog.out. Read the syslog.out file messages to diagnose problems.</p>

OS/390 Error Situations

The errors in this table are specific to the OS/390 operating system.

Table 80. OS/390 Problem Resolution Table

Symptom	What you should do
Browser problems	
The IBM Network Station Browser will not start	<p>You may have deleted the IBM Network Station Manager for the OS/390 licensed program and then reinstalled it.</p> <p>In deleting the licensed program, some of the files that support the IBM Network Station Browser were also deleted.</p> <p>Reinstall the IBM Network Station Browser licensed program.</p>
Program Manager Problems	
IBM Network Station Manager program will not start	Check to see if the ICS server is running and configured properly.

VM/ESA Error Situations

The errors in this table are specific to the VM/ESA operating system.

Table 81. VM/ESA Problem Resolution Table

Symptom	What you should do
No Login Window	
No Login window on monitor - User Services window appears instead	<p>The most likely cause is an incorrect entry for this Network Station in the BOOTP table.</p> <p>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.</p>
Network Station Manager Debug Tool	

Table 81. VM/ESA Problem Resolution Table (continued)

Symptom	What you should do
Any problem that occurs in the Network Station Manager.	After a problem occurs, specify a user ID on the DEBUG statement (DEBUG: <i>userid</i>) 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 <i>Program Directory for Network Station Manager Release 3 for VM/ESA</i> for information about the NSM SETUP file.

Appendix B. Twinaxial Network Stations

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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 357.

Simple Twinaxial Subnet

Figure 98 on page 356 shows an example of an isolated twinaxial Network Station subnet. The AS/400 server does not connect to a LAN.

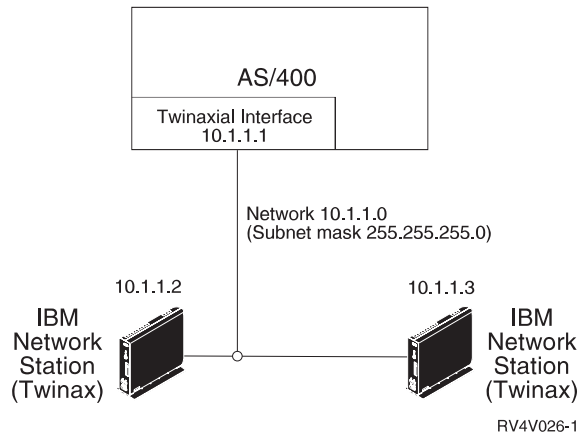


Figure 98. Simple Twinaxial Network Station Subnet

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 99 on page 357 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.

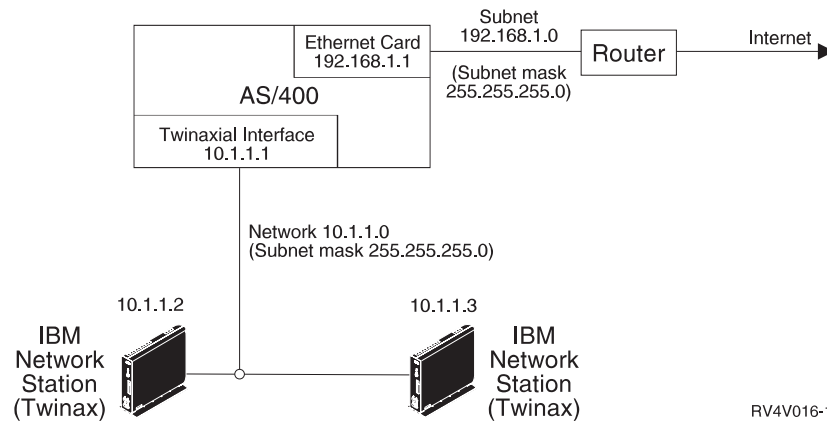


Figure 99. Isolated Twinaxial Network Station Subnet with an Unassociated LAN

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 98 on page 356. 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 100 on page 358 shows an environment in which the Network Stations can communicate beyond the workstation controller (such as the Internet).

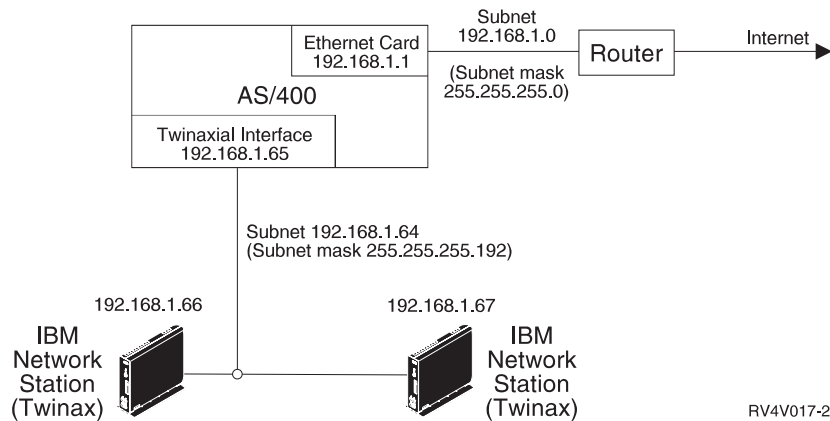


Figure 100. Network Stations associated with a LAN

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 357, 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 84 on page 361. 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 82 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 82. 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

Table 82. 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
168-175	168	169	170-174	175
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 83. 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 82 on page 359.

Table 83. 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

Table 83. Subnets Supporting Up to 13 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 255.255.255.240.

Range	Subnet Address	Interface Address	Available IP Addresses	Broadcast Address
224-239	224	225	226-238	239
240-255	240	241	242-254	255

Table 84 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 83 on page 360.

Table 84. 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 85, 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 85. 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 355.
- ___ 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 355, 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 86 on page 363. 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 90 and write BOOTP in Table 21 on page 90.

Table 86. Twinaxial TCP/IP Information. Use this table for “Simple Twinaxial Subnet” on page 355 and “Isolated Twinaxial Subnet with an Unassociated LAN” on page 356 only.




Field	Description	Write Value Here
 Line Description Name	<p>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:</p> <p>___ 1) Connect a twinaxial Network Station to its workstation controller. Note: Make sure the workstation controller is active.</p> <p>___ 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.</p> <p>___ 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.</p> <p>___ 4) After the Network Station has begun looking for a host server, type DSPMSG MSGQ(*SYS0PR) at an AS/400 command prompt.</p> <p>___ 5) In the message log, look for the message “DSPxx cannot connect. TCP/IP interface not added for line QTDLxxxxxx,” where QTDLxxxxxx is the name of the line description for the twinaxial Network Stations.</p>	
 Interface IP Address	<p>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 355 or “Isolated Twinaxial Subnet with an Unassociated LAN” on page 356, then you should use a private (10.x.x.x) IP address to identify your interface.</p>	

Table 86. Twinaxial TCP/IP Information (continued). Use this table for "Simple Twinaxial Subnet" on page 355 and "Isolated Twinaxial Subnet with an Unassociated LAN" on page 356 only.

Field	Description	Write Value Here
 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 355 or "Isolated Twinaxial Subnet with an Unassociated LAN" on page 356, 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 356, complete Table 86 on page 363. 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 90 and write BOOTP in Table 21 on page 90.
- c. If you have a scenario like "Twinaxial Subnet Associated with a LAN" on page 357, where the twinaxial Network Stations have real IP addresses, you will use the DHCP boot protocol.

Table 87. DHCP Twinaxial Information





Field	Description	Write Value Here
 Subnet Address	The IP address associated with a particular subnet. Use Table 82 on page 359, Table 83 on page 360, Table 84 on page 361, or Table 85 on page 361 to determine the range of IP addresses that you will need to obtain. The first IP address of the range is the subnet address.	
 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.	

Table 87. DHCP Twinaxial Information (continued)

Field	Description	Write Value Here
 Subnet Mask Address	<p>A value that enables network devices to direct packets of information accurately in a subnetted environment.</p> <ul style="list-style-type: none"> • If you used Table 82 on page 359 to determine your address range, then your subnet mask address is 255.255.255.248. • If you used Table 83 on page 360 to determine your address range, then your subnet mask address is 255.255.255.240. • If you used Table 84 on page 361 to determine your address range, then your subnet mask address is 255.255.255.224. • If you used Table 85 on page 361 to determine your address range, then your subnet mask address is 255.255.255.192. 	
 Associated Local Interface	<p>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 100 on page 358, the associated local interface address for the twinaxial interface is 192.168.1.1.</p>	

For each subnet that you want to define, complete a copy of Table 87 on page 364 . Return to step 2 on page 90 and write DHCP in Table 21 on page 90 .

Appendix C. National Language Support

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Locale Information

Table 88 lists all of the possible locales that are supported by the IBM Network Station Manager.

Table 88. 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

Table 88. Locale Information (continued)

Locale ID	Language / Locale
IT_IT	Italian / Italy
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	Ukrainian / 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 89. IBM Network Station Workstation Default Settings

Workstation Default Settings	
Item:	Default Value:
Mouse settings: <ul style="list-style-type: none">• Mouse button configuration• Mouse pointer speed	<ul style="list-style-type: none">• Right-handed• Medium
Keyboard settings: <ul style="list-style-type: none">• Keyboard Repeat rate• Keyboard Repeat delay• Keyboard mapping language	<ul style="list-style-type: none">• Medium• Medium delay• Default from terminal
Monitor settings: <ul style="list-style-type: none">• Minutes before screen saver turns on• Screen saver• Minutes before monitor standby• Minutes before monitor suspend• Minutes before monitor power down• Desktop background	<ul style="list-style-type: none">• 10• IBM bitmap• 20• 40• 60• IBM bitmap
Local Services settings: <ul style="list-style-type: none">• Allow remote X clients	<ul style="list-style-type: none">• No
Boot Parameters settings: <ul style="list-style-type: none">• Language to be used during boot sequence• Number of times to try reloading operating system• Update to boot monitor installed on the boot server	<ul style="list-style-type: none">• English• 0• No update except on Windows NT server

Table 89. IBM Network Station Workstation Default Settings (continued)

Workstation Default Settings	
Item:	Default Value:
Miscellaneous settings: <ul style="list-style-type: none"> • Allocate memory to speed window refresh 	<ul style="list-style-type: none"> • No

Table 90. IBM Network Station Printer Default Settings

Printer Default Settings	
Item:	Default Value:
Print Client settings: <ul style="list-style-type: none"> • Maximum LPR buffer size 	<ul style="list-style-type: none"> • 10%
Print Server settings: <ul style="list-style-type: none"> • Maximum LPD buffer size • Stream jobs if buffer overflows • Remote systems allowed to print on this IBM Network Station 	<ul style="list-style-type: none"> • 10% • Yes • All systems

Table 91. IBM Network Station Startup Menu Contents Default Settings

Startup Menu Contents Default Settings	
Item:	Default Value:
Desktop and Menu Bar option settings: <ul style="list-style-type: none"> • Desktop style 	<ul style="list-style-type: none"> • Standard desktop with menu bar
Buttons to appear on standard desktop when menu bar is enabled: <ul style="list-style-type: none"> • Log out • Hide • Top/Bottom • Lock 	<ul style="list-style-type: none"> • Yes • Yes • Yes • Yes

Table 92. IBM Network Station Standard Desktop Setting Default Values

Standard Desktop Setting Default Values	
Item:	Default Value:
Screen colors: <ul style="list-style-type: none"> • Background color for window frame in focus • Background color for window frame not in focus • Foreground color for all window frames 	<ul style="list-style-type: none"> • Mint green • Gray • Black
Icon preferences: <ul style="list-style-type: none"> • Icons placed • Icon location 	<ul style="list-style-type: none"> • On desktop • Bottom left
Fonts: <ul style="list-style-type: none"> • Font size for icons and menus 	<ul style="list-style-type: none"> • 12
Window focus	Windows become active by clicking on the window

Table 93. 5250 Default Settings

5250 Default Settings	
Item:	Default Value:
Key remapping capability	Disabled
Default keyboard file for: <ul style="list-style-type: none"> • PC Keyboard (101 keys) • PC Keyboard (102 keys) • 5250 Keyboard (122 keys) 	<ul style="list-style-type: none"> • None • None • None
Color Settings: <ul style="list-style-type: none"> • Color customization capability • Default color scheme • Additional color schemes to make available 	<ul style="list-style-type: none"> • Basic • None • None
Record/Playback Settings: <ul style="list-style-type: none"> • Record/Playback capability • Playback sequences to make available 	<ul style="list-style-type: none"> • Enabled • None

Table 93. 5250 Default Settings (continued)

5250 Default Settings	
Item:	Default Value:
Allow Use of Settings: <ul style="list-style-type: none"> • Command menu • Option menu • Print menu • Miscellaneous preferences • New Session window • Edit menu • Control menu • Help menu • Font menu list • Pop-up keypad 	<ul style="list-style-type: none"> • Yes • Yes • Yes • Yes • Yes • Yes • Yes • Yes • Yes • Yes
Screen settings: <ul style="list-style-type: none"> • Screen size • Column separators • Image/Fax Display 	<ul style="list-style-type: none"> • 27 rows, 132 columns • Disabled • Disabled

Table 94. 3270 Default Settings

3270 Default Settings	
Item:	Default Value:
Key remapping capability	Disabled
Default keyboard file for: <ul style="list-style-type: none"> • PC Keyboard (101 keys) • PC Keyboard (102 keys) 	<ul style="list-style-type: none"> • None • None
Color Settings: <ul style="list-style-type: none"> • Color customization capability • Default color scheme • Additional color schemes to make available 	<ul style="list-style-type: none"> • Basic • None • None

Table 94. 3270 Default Settings (continued)

3270 Default Settings	
Item:	Default Value:
Record/Playback Settings: <ul style="list-style-type: none"> Record/Playback capability Playback sequences to make available 	<ul style="list-style-type: none"> Enabled None
Allow Use of: <ul style="list-style-type: none"> Command menu Option menu Help menu Miscellaneous preferences New Session window Edit menu Print menu Graphics Font Menu list Pop-up keypad 	<ul style="list-style-type: none"> Yes Yes Yes Yes Yes Yes Yes No Yes Yes
Miscellaneous settings: <ul style="list-style-type: none"> Screen size Key for Enter function Telnet 3270 port to connect to 	<ul style="list-style-type: none"> 32 X 80 Control key 23

Table 95. Internet Network Default Settings

Internet Network Default Settings	
Item:	Default Value:
Web server port on the boot host	80
Applet launcher port	5555

Table 96. NC Navigator Browser Defaults

NC Navigator Browser Defaults	
Item:	Default Value:
Proxy configuration	Manual proxies obtained from Internet Network panel

Table 96. NC Navigator Browser Defaults (continued)

NC Navigator Browser Defaults	
Item:	Default Value:
Security Settings: <ul style="list-style-type: none"> • Enable JavaScript • Enable Java Applets • Enable SSL 2 • Enable SSL 3 	<ul style="list-style-type: none"> • Yes • No • Yes • Yes
Network Settings: <ul style="list-style-type: none"> • Maximum memory cache • Maximum TCP/IP connections • Network buffer size 	<ul style="list-style-type: none"> • 1024 KB • 4 • 32 KB

Table 97. 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: <ul style="list-style-type: none"> • Verbose • Only when needed 	<ul style="list-style-type: none"> • 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 98. Language Default Settings

Language Default Settings	
Item:	Default Value:
Format to use for dates, currency, numbers, and messages	Default from server

Appendix E. 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 101 on page 378).

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 99. 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 100. 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 100. Pin-out for Cable E, Printer/Terminal Interposer-EIA-232 (continued)

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 101. 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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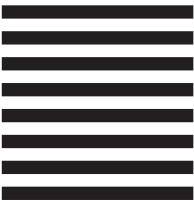
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