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Configuring IBM's Network Station 1000 for Java Applications

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IBM's Network Station 1000 (NS1000) is a network computer that provides 3270 and 5250 terminal emulation, a Web browser based on Netscape Navigator, a JVM that can run Java applets or applications, and several other capabilities. This article describes how to set up an NS1000 connected to an AS/400 so you can load and run graphical Java applications from the AS/400.

The NS1000 itself is a box about the size of a three-ring binder. It comes with a power pack and PC-style keyboard and mouse; you attach your own VGA monitor and, optionally, PC printer. You attach the NS1000 to a server over a local or remote LAN. For my work, I connected the NS1000 over a local Ethernet LAN to a model 170 AS/400 running V4R3.

Hardware Setup

Before you start the installation, locate the type and model of your Network Station (e.g., 8362-A53). This information is printed on the side of the box and on the side and bottom of the Network Station's stand. You need to know the type to know which manual to use.

Next, point your browser at <http://www.ibm.com/nc/pubs>, where you'll find a list of the latest IBM Network Station publications. From the list, select "Hardware Information," and then click the link for the appropriate Network Station type and your language. For my model 8362 NS1000 setup, I followed Chapter 3 in the English version of the manual for 8361 and 8362 types (SA41-0036-03). The instructions are clear and simple, and I won't go over them in detail here. It's important that you follow the instructions to record the serial number, machine type and model, and MAC address, as described. The instructions say to record the amount of installed memory from the packaging slip, but the packaging slip that came with my NS1000 didn't list the amount of memory. However, the model number indicates the amount of memory and type of connection:

| Type-Model | Memory | Connection |
|------------|--------|------------|
| 8362-A22 | 32 MB | Token-Ring |
| 8362-A23 | 64 MB | Token-Ring |
| 8362-A52 | 32 MB | Ethernet |
| 8362-A53 | 64 MB | Ethernet |

Tip: You'll probably want a model with at least 64 MB of memory to run Java applications.

Follow the directions to connect the power supply, keyboard, mouse, and LAN connection, but do not turn on the NS1000 power at this point. Turning on the power initiates the boot sequence, which you want to do only after you've configured your AS/400, as I describe next.

Installing and Configuring the Network Station Manager for AS/400

The manual IBM Network Station Manager Installation and Use November 1998 (SC41-0664- 02) describes the AS/400 configuration process. You can check the publication Web site mentioned above for the latest version of this manual. As of June 1, the hard copy that came with the NS1000

was the latest version.

Chapter 1 explains the three alternative boot methods you can use for a Network Station. In simple terms, the boot methods are

- NVRAM, which uses a fixed IP address stored in the Network Station's nonvolatile RAM
- BOOTP, which uses a table on the AS/400 that maps each Network Station MAC address to a fixed IP address
- DHCP, which uses the AS/400 for both static and dynamic assignment of IP addresses for MAC addresses

I chose the BOOTP method for my setup because it's somewhat simpler than DHCP but lets you control IP addresses on the AS/400. You can migrate from BOOTP to DHCP later if you begin with BOOTP. You also have to choose a boot file service, but for an AS/400 server, the only choice is Trivial File Transfer Protocol (TFTP).

Once you decide on a boot method, consult Chapter 3 of the manual for a series of steps to follow to configure the AS/400 as a boot server. The major tasks are

- install and apply OS/400 PTFs to prepare for installation of the Network Station Manager for AS/400 (NS Manager) product
- install the NS Manager product
- install and apply PTFs for the NS Manager product
- run the Network Station Setup Assistant to configure TCP/IP, the NS Manager, and related AS/400 services

Be sure you follow all the steps carefully, paying special attention to steps required if you've installed a previous version of the NS Manager or related products. This was my initial install of the NS Manager, and I encountered no problems installing it or the PTFs. Note that the two sets of PTFs are on one CD, labeled "AS/400 Network Station PTFs." The PTF CD I used was dated December 1998.

The manual first guides you through a series of fill-in-the-blank forms to identify configuration values. For the BOOTP configuration, I found most of these items fairly obvious, but be aware that for Ethernet LANs you'll need to know whether the LAN type is IEEE 802.2 or IEEE 802.3. Once you've recorded these values, you use the AS/400 STRNSSA command to start the Network Station Setup Assistant. The NS Setup Assistant is a green-screen program that steps you through a series of configuration tasks in which you enter the values you recorded earlier. The process is straightforward, but be sure to use the proper upper, lower, or mixed case for values (e.g., kernel, IBMNSM).

I encountered no problems until the last task (5000), which was supposed to start and verify the required TCP/IP, host, and Network Station login services. For task 5000, there's an option to end TCP/IP, which the instructions say to do only if you added new lines or TCP/IP interfaces. Because I hadn't added lines or interfaces, I didn't select this option, although I did already have TCP/IP running. When I attempted to complete task 5000, the setup assistant incorrectly reported that the task failed, based on a noncritical message that some services were already started. Several attempts to clear this error failed, but the actual state of the system was fine, with all the necessary services started. My contact at IBM told me it's okay to ignore this error as long as all the services are running when you exit the NS Setup Assistant. (Page 146 of the manual lists the commands to start the required services from the OS/400 command line, if necessary.)

I encountered a couple of related glitches in the AS/400 Operations Navigator (installed with Client Access V3R2M0). Under the Network|Servers|TCP/IP category, the Network Station Login Daemon (i.e., the Network Station Login Server) is always shown as "Stopped" even after it's started. Also,

using this item's Properties dialog box to check the Start when TCP/IP is started option seemed to have no effect. I always have to start the login server manually, using the command

```
Call QYTC/QYTCUSVR 'StrTcpSvr '
```

Notice the space at the end of the quoted string. See page 128 in the manual for more information about starting and stopping the NS Login Server.

Once you've successfully completed this part of your configuration, you'll have the NS Manager installed, the NS Login Server running, and your HTTP Server configured to support requests to run NS Manager. The directives shown in **Figure 1** will have been added to your HTTP Server default configuration (e.g., CONFIG).

Figure 1 Directives added to HTTP Server default configuration

```
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/*
```

Setting Network Station Start-up Settings on the AS/400

When a Network Station is booted, it first uses some information in its own nonvolatile RAM to begin. Then it connects to the boot server — in this case, an AS/400 — to get the rest of the start-up settings and executable code. You run the NS Manager on the AS/400 to control these start-up settings. Chapter 8 explains how to use the NS Manager; see page 260 for more information about starting it. I ran the NS Manager by entering the following URL in the Internet Explorer (4.72) browser:

<http://picantesoft.com/QIBM/NetworkStation/Admin>

You're also supposed to be able to start the NS Manager by selecting the IBM NS Manager link from the AS/400 Tasks Web page displayed for the HTTP Server Administration, but this approach failed on my system because the NS Setup Assistant had apparently set the URL for the link incorrectly.

When the NS Manager starts, it displays a sign-on page, on which you enter an AS/400 user name and password. The user must have *SECADM, *ALLOBJ, and *IOSYSCFG authorities. After you sign on to the NS Manager, the Setup page is displayed. Here, you can select various items for which to set defaults. Note that changes made in the NS Manager don't take effect on a Network Station until the next time the Network Station logs in.

The first time you run the NS Manager, select Hardware| Workstations from the Setup Tasks menu, and then select the System defaults radio button on the Workstation Defaults page and click the Next button. On the Workstation Settings — System Defaults page, scroll down to the Boot Parameters section, and make sure Yes is selected for Enable Boot using BOOTP or DHCP. Also, select Update for the Update to boot monitor installed on the boot server option. This setting updates the firmware in the Network Station the next time the Network Station is booted up from the AS/400. IBM supplies firmware PTFs as part of a normal AS/400 PTF for the NS Manager, and setting this option to Update propagates any firmware PTFs to the Network Stations. After all Network Stations have received the latest update, you can change this setting to No Update. Click the Finish button after you've entered the option values.

To enable Java applets to run in the NS1000's browser, select Internet|NC Navigator from the Setup Tasks menu, and then select the System defaults radio button to enable Java applications on all attached Network Stations; or, select a specific Group or User to enable a subset of Network Stations. Click the Next button. On the NC Navigator Settings — System Defaults page, scroll down to the Security section, and select Yes on the Enable Java Applets drop-down list. Click the Finish button.

To make a Java application available, select Startup| Menus from the Setup Tasks menu. Then select the System defaults (or Group or User) radio button, and click the Next button. On the Menu Contents — System Defaults page, scroll down to the Java Application Menu Items section. Enter any string you want for the Menu item label field (e.g., Simple Example). Enter the Java application class name (without the .class extension) and any arguments in the respective fields; for my example, I used SimpleExample as the class name and no arguments. Enter a CLASSPATH value, using a colon (:) to separate entries. I used the value in **Figure 2**.

Figure 2 CLASSPATH for sample application

```
/netstation/prodbase/java/nwspackg.zip:/netstation/prodbase/java/classes.zip:  
/swing/1.1.1Beta/swing.jar:/jes/lib/SimpleExample/SimpleExample.jar
```

Note that the /netstation/prodbase/ path is mapped to /QIBM/ProdData/NetworkStation/ when you install NS Manager on the AS/400. I'll explain shortly how the CLASSPATH directories are used to hold various files used by the Java application.

To have complete status and diagnostic messages emitted as the Java application is loaded and run, check the Verbose mode check box. Select Remote only on the Verify classes drop-down list. You can optionally set application properties, the runtime heap and stack sizes, and garbage collection attributes; I left these blank for my example. On this page, you can add multiple Java applications to the Network Station's menu; however, the Network Station can run only one Java application at a time. Click the Finish button when you're done entering values for one or more Java applications.

Tip: Once you have a Java application running properly from a menu item, you can specify that it be started immediately when you log in to the Network Station. Use the NS Manager Startup|Programs configuration page to set this option. The values you specify on this page are the same as those used for a Java menu item.

Setting the Network Station Boot Values

The AS/400 is now ready to be used as a boot server for Network Stations. The next task is to run the Setup utility on the Network Station and set a few boot values. Chapter 10 covers this utility in detail; in this section, I just mention items I verified or changed for my example. To run the Setup utility, power on the Network Station and press the Esc key when the "NS0500 Search for Host System" message appears on the black screen. You'll see the Setup Utility menu, from which you can review and/or change various items. For my example, I used the settings listed in **Figure 3**. After you verify or set these values, press Enter at the Setup Utility menu to reboot with the new settings.

During the boot process, you'll see the current PROM version displayed. The NS1000 I received initially had Version 3.0.1. After I installed the NS Manager and the PTFs that came with the NS1000, the PROM version was 3.0.7.2. I subsequently applied Network Station PTF 6 to the AS/400, and after the boot process updated the PROM, I had version 3.0.7.6. This last version was noticeably faster than earlier versions loading my sample Java application, so be sure you stay up-to-date with Network Station PTFs. You can order the SF99082 group PTF to get the latest NS Manager and prerequisite PTFs. (Note that Network Station PTFs are numbered 1, 2, and so on, rather than with typical AS/400 PTF numbers. However, as I mentioned, the SF99082 group PTF includes the Network Station PTFs.)

When the Network Station boot-up is finished, you'll see a login dialog box. Enter an AS/400 user name and press Enter; then enter the associated password and press Enter. At the bottom of the display, you should see several buttons, one of which is labeled with the value you specified for the Java application (e.g., Simple Example). Don't click this button yet; we've still got one more step to complete.

Setting Up the Java Class Files

For the final step, let's look at what's needed for your Java class files. The current version of the

Network Station software supports JDK 1.1.4, which is a bit outdated but can still run many Java applications, including those with Swing graphical components. Although the Sun documentation for Swing says no Swing version is supported with JDK 1.1.4, I was able to run a simple example successfully. IBM says that a later 1.1.x release of the JDK will be available in the third quarter of this year but provided no indication of when a Java 2 (i.e., JDK 1.2) JVM would be delivered.

Look again at the CLASSPATH in Figure 2. The first two entries should always be as shown for all your Java applications. The Network Station requires the nwspackg.zip and classes.zip files that are installed in the AS/400's /QIBM/ProdData/ NetworkStation/java directory. Do not try to replace the /netstation /prodbase/java/classes.zip entry in the CLASSPATH with a version of classes.zip from a more recent JDK — it won't work.

The third CLASSPATH entry points to the Swing classes. For my tests, I downloaded the JFC 1.1 With Swing 1.1.1 Beta 2 file from the JavaSoft site (<http://java.sun.com/products/jfc>), installed this version of the JFC, and copied the swing.jar file to the /swing/1.1.1Beta directory that I created on my AS/400. Note that this version of swing.jar uses the newer javax.swing package names.

The fourth CLASSPATH entry provides the location of the application's class files. For my test application, I used the SimpleExample.jar file from the /examples /SimpleExample subdirectory that's installed along with the JFC 1.1 files. I copied SimpleExample.jar to the /jes/lib/SimpleExample directory that I created on my AS/400. For your own applications, just follow normal conventions for the subdirectories where you store the class files and the corresponding CLASSPATH entries.

Once you have the Swing and application files in their proper directories, you can click the menu button on the NS1000, and you should see your Java application begin to run. It's exciting — this Java "thin client" stuff actually works!

Diagnostics

If you follow the manuals and the advice in this article carefully, you should be able to get your Java applications running on the NS1000 without too many hassles. You can also pick up additional information from the IBM Redbook Java Thin-Client Programming for a Network Environment (SG24-5115), available at <http://www.redbooks.ibm.com>. This manual covers an older release of the Network Station software, but it still has some valuable programming and deployment suggestions. In case you run into problems, here are a few tips.

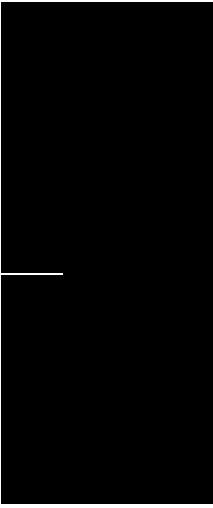
Remember that you must log out and log back in to the Network Station to have any changes you make with NS Manager on the AS/400 take effect. If you change hardware- specific items, you have to reboot the Network Station.

After you've logged into the Network Station, you can view status and diagnostic messages by pressing Alt+Shift+ Home to run the Network Station User Services Console. When the NS Console window is displayed, click the Messages button to open a window displaying messages. You can clear messages with the Console|Clear Messages menu item.

The NS Console message buffer may not hold all the messages you need to review, especially when you're loading a Java application with the Verbose option enabled. To capture all messages, you can connect to the Network Station via a Telnet session from a PC connected to the same LAN as the Network Station. In Windows NT, run the Accessories|Telnet program. Select the Connect|Remote System menu item, and enter the Network Station's IP address (or name) for the Host Name and 5998 for the Port. When you click the Connect button, you should see all the current messages scroll in the Telnet window. You can use the Telnet Preferences|Start Logging option to capture messages to a text file. This technique is very valuable for analyzing problems.

During my work with the SimpleExample application, I encountered two error messages that you may also see. The first was "NSK4902 Error reading zip file: /swing /1.1.1Beta/swing.jar Unable to locate end-of-central-directory record." A corrupted swing.jar file caused this problem. An apparent problem in my current version of Client Access corrupts JAR files when I use Windows Explorer drag-and-drop or the Copy command to copy a JAR file from a PC directory to an AS/400 IFS directory. By using FTP to copy the file, I eliminated the problem.

The other error resulted in the "Exception: java/lang/ NoClassDefFoundError (can't backtrace



because of a missing context)" message followed by "Can't find class SimpleExample." This error occurs when the Java application can't find a required class — despite the second message, it does not necessarily mean that the application class file itself (e.g., SimpleExample.class) can't be found. In my case, the error resulted when I tried to run a Java application that used the javax.swing package names using a CLASSPATH that pointed to an older version of swing.jar that used the com.sun.java.swing package names. Once I pointed to the compatible swing.jar file, the problem went away.

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