

IPX/SPX to TCP/IP Compatibility Mode Components of NetWare 5

Various methods can be used to migrate to a pure TCP/IP network. However, by implementing the Compatibility Mode migration method you can quickly remove IPX/SPX from your network while still providing support for the legacy applications that rely on the IPX/SPX protocol.

ONE of the most important features of NetWare 5 is its ability to run using the TCP/IP protocol. All of the NetWare Core Protocols (NCPs) have been re-written in NetWare 5 to use TCP/IP. Before NetWare 5, NetWare file servers could participate in TCP/IP-only networks using the NetWare/IP product. With NetWare/IP, the NetWare NCPs were still communicating using IPX/SPX, and NetWare/IP would encapsulate these IPX/SPX packets within TCP/IP packets. While this setup would allow NetWare file servers to participate in pure TCP/IP networks, there was additional overhead associated with the packet encapsulating process. With NetWare 5, this encapsulation process has been almost eliminated, as we will see in this article.

Most corporate networks have a variety of hardware and software platforms, such as mainframe computers, NetWare file servers, Windows NT file and application servers, and UNIX servers. The networks that connected these disparate platforms required robustness and flexibility to support the different network protocols used by each platform. It was not uncommon for a single network to support the SNA protocol for the mainframe computers, IPX/SPX for the NetWare servers, NetBEUI for the Windows network, and TCP/IP for the UNIX servers. Supporting all of these protocols was difficult in a local area network (LAN) and cumbersome in a wide area network (WAN). Over the past few years, the TCP/IP protocol has become the de-facto standard, and most of the major hardware and software systems available today support the TCP/IP protocol. Now you can run a single protocol on

your networks and maintain connectivity to all of your platforms. Running a single protocol on the network simplifies network design and troubleshooting. Configuring and troubleshooting routers in a WAN is also much simpler when the only protocol used is TCP/IP. Running a pure TCP/IP network also helps on the client workstation side of the network. Rather than loading multiple protocol stacks on the client workstations, you can simply load the TCP/IP protocol and still access all of the computers on the network. The bottom line is the less complex the network, the easier it is to support and maintain. Reducing the number of protocols running on the network is a great way to reduce the complexity of any network.

This article will review the various methods that can be used to migrate to a pure TCP/IP network and will show you how to implement the Compatibility Mode migration method so that you can quickly remove IPX/SPX from your network while still providing support for applications that rely on the IPX/SPX protocol.

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IPX/SPX TO TCP/IP MIGRATION STRATEGIES

There are several strategies that can be used to migrate NetWare servers from IPX/SPX to a pure TCP/IP network. The migration method you choose will depend upon your current server, workstation, network and application mix.

The "Big Bang" Method

With the big bang method, you implement TCP/IP as the only protocol on your NetWare 5 file server(s). The data and

applications running on older IPX-based NetWare servers are migrated to NetWare 5. The client workstations must be configured with the TCP/IP protocol stack. NetWare print services must be migrated to the IP-based Novell Distributed Print Services.

The big bang method is good for shops that already have the TCP/IP protocol loaded on their workstations (or shops that can quickly implement the TCP/IP protocol on all of their workstations). With the big bang method, you cannot use any IPX/SPX-based application. The big bang method is the quickest way to get to a pure TCP/IP networking environment.

The Dual Protocol Method

With the dual protocol method, both TCP/IP and IPX are loaded on the NetWare 5 server(s). The client workstations can then be migrated to TCP/IP on a scheduled basis. Applications and clients that utilize the IPX/SPX protocol will still operate with the dual protocol method, yet the NetWare core services will be using the TCP/IP protocol.

The dual protocol method is good for shops that have several workstations that are not configured with the TCP/IP protocol stack. The dual protocol method is also one of the safest migration strategies since the applications that rely on IPX will still operate normally. The conversion of the NetWare printing services to NDPS can also be gradually phased in.

The Migration Gateway Method

With the migration gateway method an isolated IPX network is connected to a pure TCP/IP network using a Migration Agent Gateway (included with NetWare 5). This migration method is useful in shops where older IPX-based servers will be gradually phased out, but connectivity between the older NetWare server and the newer TCP/IP-based NetWare servers is required.

The TCP/IP Backbone Method

With the TCP/IP backbone method the goal is to utilize TCP/IP as the only protocol on the backbone of the network. Migration Agent Gateways are placed on each IPX segment, which convert the IPX traffic to TCP/IP before placing the packets on the network. This type of migration is useful for sites that must quickly convert their network backbones to pure TCP/IP.

The Compatibility Mode Method

IPX/SPX has existed for a very long time, and many legacy applications are built to communicate using the IPX/SPX protocol, thus making it impossible for many shops to migrate to a pure TCP/IP network. Novell took this into account when designing NetWare 5 and has provided the Compatibility Mode server and client components. Compatibility Mode works in the same way as NetWare/IP. Compatibility Mode intercepts legacy applications' IPX/SPX packets before they hit the network adapter and encapsulates the IPX/SPX packets within TCP/IP packets. This allows you to run in a pure TCP/IP network while the legacy applications continue to communicate internally using the IPX/ SPX protocol. The Compatibility Mode client component then recognizes these encapsulated IPX/SPX packets and feeds them to the client component of the legacy application.

In the following sections, I will demonstrate how to set up, test and utilize the Compatibility Mode server and client components.

This method of migrating to a pure TCP/IP network is perhaps the simplest and quickest method available to environments where IPX/SPX has been heavily used by legacy applications.

Compatibility Mode Components

There are three main NetWare 5 Com-patibility Mode components:

- CMD Server
- Migration Agent Gateway
- Workstation Components

The server-side components CMD Server and Migration Agent Gateway are integrated into the SCMD.NLM module. The CMD server is used to support legacy IPX/SPX applications that must use the IPX/SPX protocol. When an IPX-based application tries to place IPX/SPX packets on the network, the CMD server intercepts and encapsulates the packets into TPC/IP packets.

Migration Agent Gateway connects IPX networks to TCP/IP networks as explained in the "Migration Gateway Method" and the "TCP/IP Backbone Method" migration scenarios. Migration Gateways are placed on each IPX/SPX network segment, encapsulate IPX packets into TCP/IP packets, and forward these packets over a pure TCP/IP network to other Migration Gateways that reside on other IPX-based network segments.

Workstation Compatibility Mode components reside on the workstations and allow the client to process encapsulated IPX packets and to encapsulate IPX packets originating from that client into TCP/IP packets. The client-side Compatibility Mode components

FIGURE 1: DETERMINING IF THE SERVER SIDE COMPATIBILITY MODE COMPONENTS ARE INSTALLED

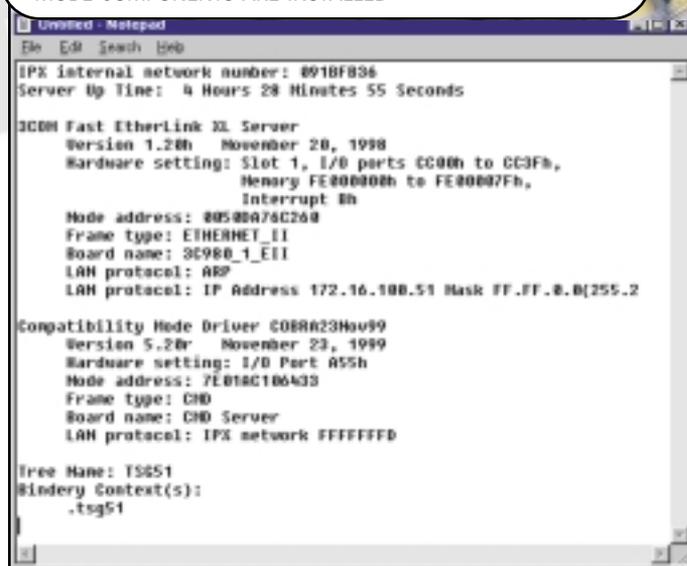
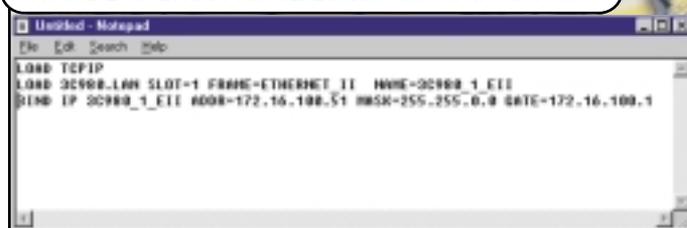


FIGURE 2: CHECKING AUTOEXEC.NCF FOR TCP/IP SUPPORT



are included with version 3.2 and higher of the NetWare client software. Version 3.2 of the NetWare client can be obtained from the Novell web site.

DETERMINING IF COMPATIBILITY MODE IS ALREADY INSTALLED

To determine if your server already has the Compatibility Mode components installed, perform the following steps:

1. From the System Console, enter "config".
2. Examine the sample output in Figure 1. TCP/IP is configured in the top section of the output, and the Compatibility Mode Driver is installed on the bottom half of the output. If you do not see the Compatibility Mode Driver section in the output of your "config" command, this means that the server-side Compatibility Mode components are not installed on your file server.

INSTALLING THE COMPATIBILITY MODE SERVER COMPONENTS

To automatically install the Compatibility Mode components set up a NetWare 5 file server as an IP-only file server. See the section "Implementing the Client Side Compatibility Mode Component" for information about how to address your workstations and completely remove IPX/SPX from your network.

Adding TCP/IP to the Network Adapter

Before implementing the server-side Compatibility Mode components, you must enable the TCP/IP protocol and remove the IPX protocol. In most cases, the TCP/IP protocol will already be loaded and operational on your NetWare 5 file server. There are two ways to ensure that TCP/IP is loaded on your file server:

1. Examine the AUTOEXEC.NCF file. If TCP/IP is loaded, you will see a statement that loads the TCP/IP protocol, a statement that loads the LAN driver, and a statement that binds the IP protocol to the LAN adapter, as shown in Figure 2.
2. If you are using the INETCFG.NLM method of maintaining your network adapters, enter "load inetcfg.nlm" from the System Console.

FIGURE 3: USING INETCFG TO DETERMINE IF TCP/IP IS LOADED ON A NETWARE 5 FILE SERVER

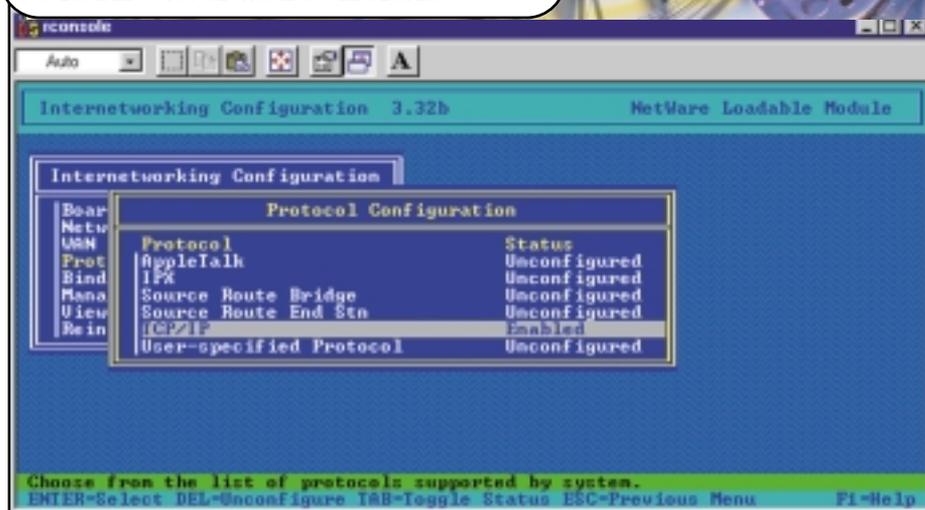


FIGURE 4: CODE TO DETERMINE IF YOU ARE USING THE AUTOEXEC.NCF METHOD FOR LOADING IPX



FIGURE 5: SELECT YES TO MIGRATE YOUR LAN CONFIGURATION PARAMETERS

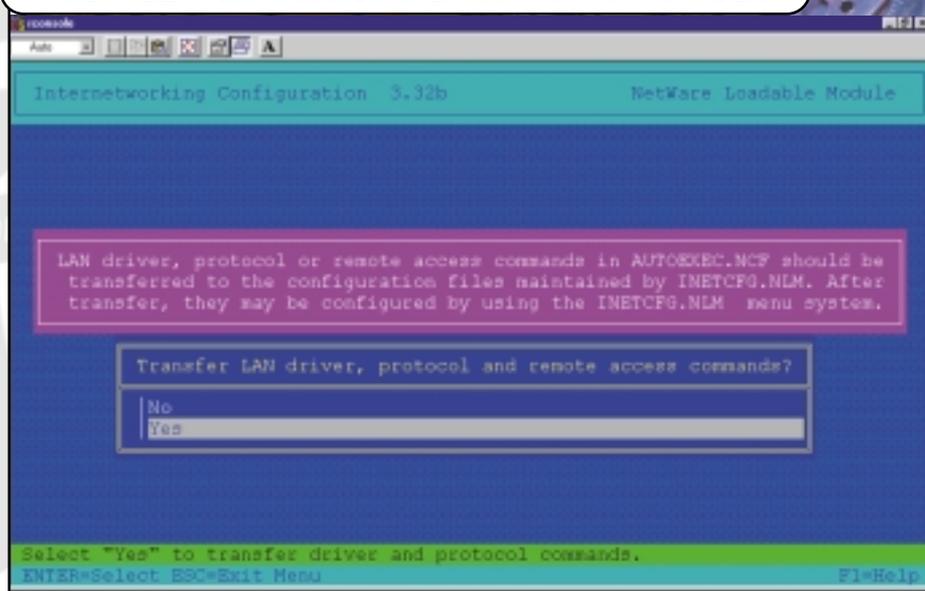
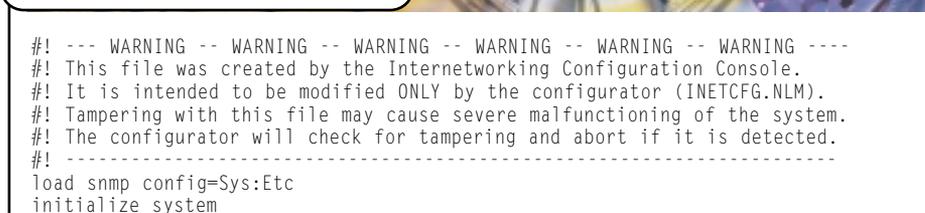


FIGURE 6: SAMPLE INITSYS.NCF FILE



3. From the Internetworking Configuration menu, select "Protocols." A screen similar to the one shown in Figure 3 will be displayed. If the TCP/IP protocol shows that it is "Enabled," TCP/IP is loaded on your file server.
- Note:** To verify that TCP/IP is active on your NetWare 5 server and to test the DNS

name, you can "ping" the server by using its fully qualified name (for example, nwserv-er.tsg.com), its short IP name (for example, nwserv) and its TCP/IP address.

4. If TCP/IP is not loaded on your file server, add the three lines shown in Figure 2 to your AUTOEXEC.NCF file and restart your server. You must, of course, modify these lines as required by your LAN adapter and TCP/IP addressing structure.

Removing IPX from the Network Adapter

After TCP/IP is loaded and operational on your file server, you can remove the IPX protocol from the server.

Note: Applications that use the IPX/SPX protocol will be unavailable until you load the server- and client-side Compatibility Mode components.

Be sure to use the INETCFG.NLM method (available from the NetWare 5 file server) to load and configure network protocols.

1. You can determine if you are using the AUTOEXEC.NCF method for loading IPX by looking in the SYS:\SYSTEM\AUTOEXEC.NCF file for lines similar to those shown in Figure 4. To convert to the INETCFG.NLM method, enter the following command from the file server's System Console:

```
LOAD INETCFG
```

The screen shown in Figure 5 will be displayed.

2. Select "Yes" when you receive the "Transfer LAN driver, protocol, and remote access commands?" prompt. When the conversion completes, you will be prompted to restart your server. You must restart the server before continuing. The conversion to the INETCFG.NLM method of managing your network interfaces will create the following two files:

```
SYS:\ETC\initsys.ncf
SYS:\ETC\netinfo.cfg
```

Figures 6 and 7 show sample configuration files with IP and IPX enabled.

3. After your server restarts, load the INETCFG.NLM utility from the file server's console. You will be presented

FIGURE 7: SAMPLE NETINFO.CFG FILE

```
#!VERSION=2.3
#!
#! --- WARNING -- WARNING -- WARNING -- WARNING -- WARNING -- WARNING ---
#! This file was created by the Internetworking Configuration Console.
#! It is intended to be modified ONLY by the configurator (INETCFG.NLM).
#! Tampering with this file may cause severe malfunctioning of the system.
#! The configurator will check for tampering and abort if it is detected.
#! -----
#!
#!SERVERTYPE=NORMAL
#!
#!UIMODE=NONE
#!
#!BEGINENLOAD
LOAD SNMP
LOAD BCALLSRV
```

FIGURE 8: SELECT THE FAST STARTUP METHOD

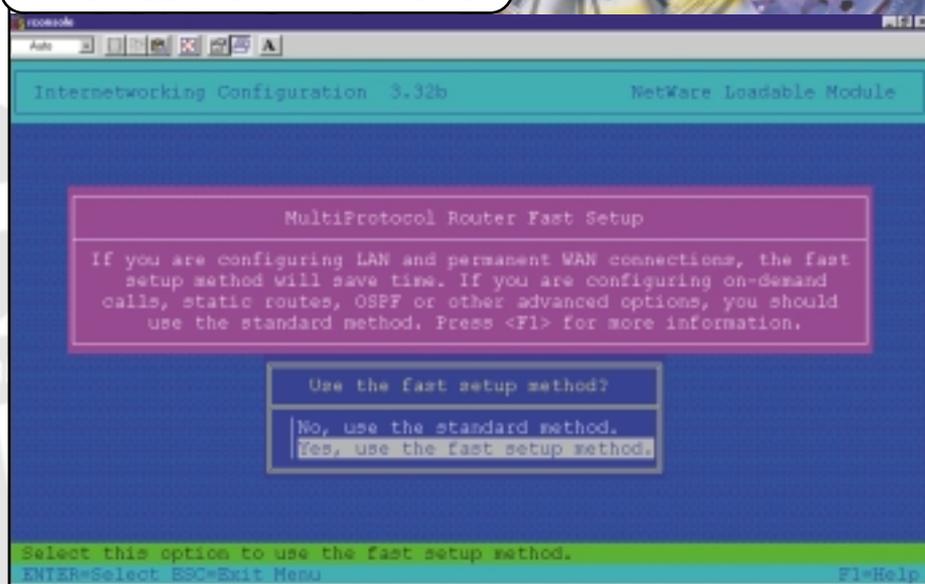
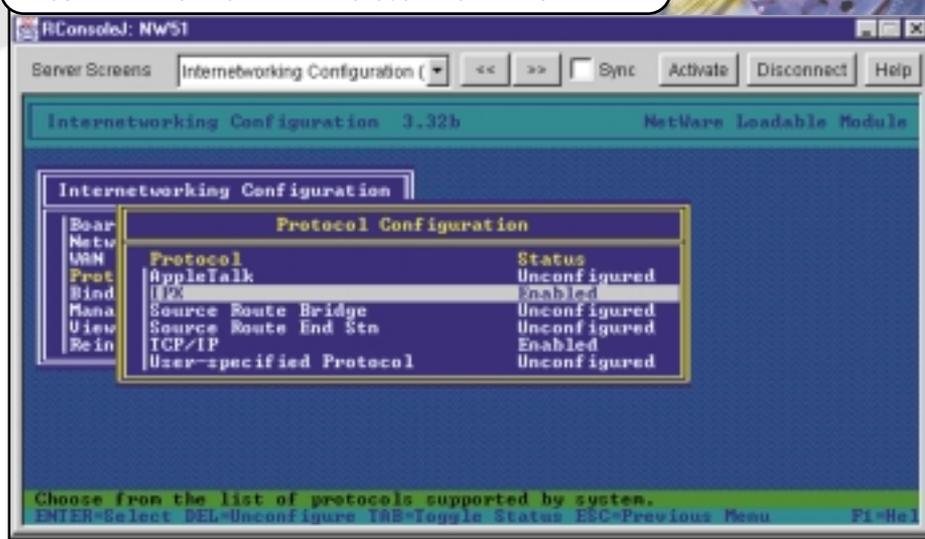


FIGURE 9: REMOVING THE IPX PROTOCOL FROM THE SERVER



with the screen shown in Figure 8. Choose the "Yes, use the fast setup method" option.

4. When presented with the "Internetworking Configuration" panel, select "Protocols."

FIGURE 10: USE THE CONFIG COMMAND TO VERIFY THAT SCMD.NLM IS CONFIGURED CORRECTLY

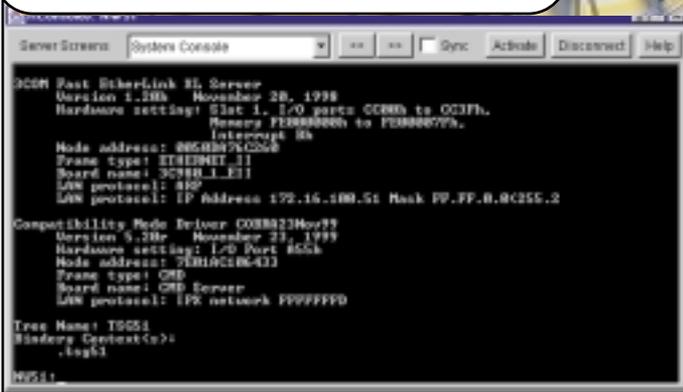
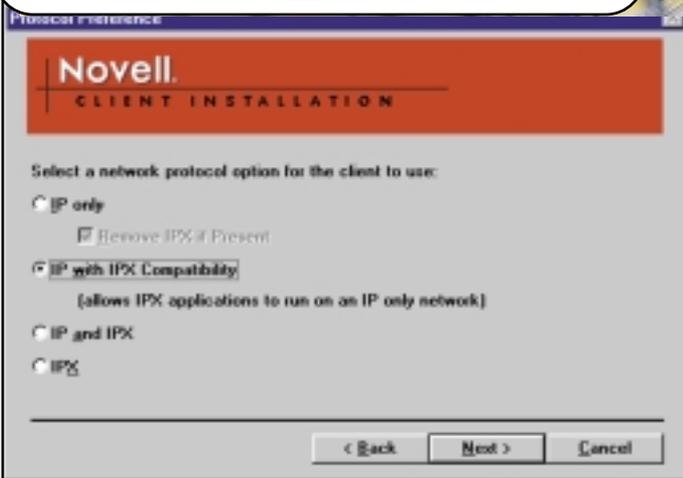


FIGURE 11: SELECT "IP WITH IPX COMPATIBILITY" TO ENABLE THE CLIENT SIDE COMPATIBILITY MODE COMPONENT



5. From the "Protocol Configuration" panel, shown in Figure 9, highlight IPX, then press the delete key.
6. Press ESC to exit from the INETCFG.NLM utility. You must restart your server after exiting INETCFG.NLM.

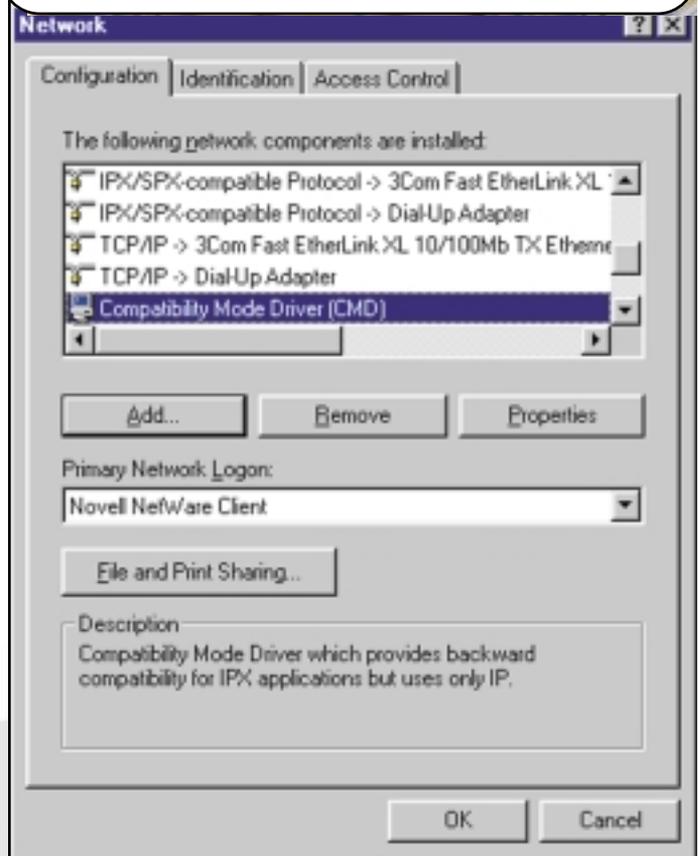
Tip: Instead of restarting your server after exiting INETCFG.NLM, you can enter the "reinitialize system" command at the System Console prompt.

Configuring SCMD.NLM

You can implement the CMD Server Compatibility Mode server component by using the SCMD.NLM module. To load the CMD Server Compatibility Mode component, perform the following steps:

1. Enter "SCMD.NLM" from the system console. The following message will be displayed: CMD Server initialized and functional.
2. Enter "CONFIG" from the system console. You should see a screen similar to the one shown in Figure 10.
3. After testing the SCMD.NLM module (as illustrated in the "Testing the Compatibility Mode Components" section of this article) add a line in the AUTOEXEC.NCF file to automatically load SCMD.NLM when the server is restarted.

FIGURE 12: THE CLIENT SIDE COMPATIBILITY MODE COMPONENT WILL INSTALL THE IPX/SPX DRIVER IN THE WORKSTATION



Note: Once every five minutes, the SCMD.NLM will look for a Migration Agent Gateway to communicate with. In the migration scenario described here, we do not use a Migration Agent. Therefore, every five minutes the following message will be displayed on your file server's console:

Unable To Contact Any Migration Agent.

Ignore this message, as it can be a bit annoying. Hopefully, Novell will correct this in the next service pack.

IMPLEMENTING THE CLIENT SIDE COMPATIBILITY MODE COMPONENT

To implement the client side Compatibility Mode component you must install (or re-install) version 3.2 of the NetWare client software. Version 3.2 of the client software is located on the NetWare 5.1 installation CD-ROM or can be obtained from the Novell web site.

Note: If you have already installed Version 3.2 of the NetWare client on a workstation, but did not initially implement the Compatibility Mode component, you must completely re-install the client software. You cannot modify the client settings to "turn on" Compatibility Mode.

1. From the workstation, start the client software installation program. When prompted for either a "Typical" or a "Custom" installation, select "Custom. The screen shown in

Figure 11 will be displayed.

2. Select "IP with IPX Compatibility" and click on Next. Follow the remaining prompts to complete the client installation. The client software installation will implement the "Compatibility Mode Driver" and the "IPX/SPX Compatible" protocol drivers in the network settings of your workstation, as shown in Figure 12. But don't worry, your workstation will not be placing IPX/SPX packets on the network.

TESTING THE COMPATIBILITY MODE COMPONENTS

After the server and client Compatibility Mode components are installed, you can test the IPX/SPX Compatibility Mode configuration. The best way to accomplish this is to run an IPX/SPX- based application and check the network for IPX packets while this application is running. You can use the RCONSOLE program as your test IPX/SPX application. Rconsole utilizes SPX to communicate between the client and the server, which makes it a perfect testing program.

1. From the file server, enter the following commands to load rconsole:

```
Load rconsole
Load rspx
```

2. From the workstation, click on Start > Run > SYS:\PUBLIC\ rconsole.exe. Rconsole should work if the Compatibility Mode components are working correctly. With rconsole running, you can check your network with a protocol analyzer and you should see no IPX/SPX traffic between the server and your workstation.

As an added test, you can unload SCMD.NLM from your server, then try to run rconsole again. This test should fail since we are not running the IPX protocol on the file server and the SCMD.NLM module is not available to encapsulate the IPX/SPX packets into TCP/IP.

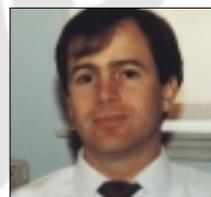
CONCLUSION

Migrating to a pure TCP/IP protocol is well worth the required effort. Managing a single network protocol is much easier and less error prone than maintaining multiple protocols. In WAN environments, this is even more important.

You can use the Compatibility Mode components to perform a phased approach for migration to pure TCP/IP. One of the

most important subsystems you must concentrate on is your NetWare printing system. Once you have the printing converted to IP-based NDPS, more than half the battle has been won. The next big stumbling block is your client workstations. The workstations must be configured with the TCP/IP protocol and possibly the client side Compatibility Mode component (if the workstation will be running IPX/SPX applications in compatibility mode).

Remember, if you get into trouble when implementing TCP/IP, you can always simply re-configure and re-load IPX on your file server! 



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